Pacific Northwest Harmful Algal Blooms Bulletin

Aug 28, 2019   HAB risk = ⚠️

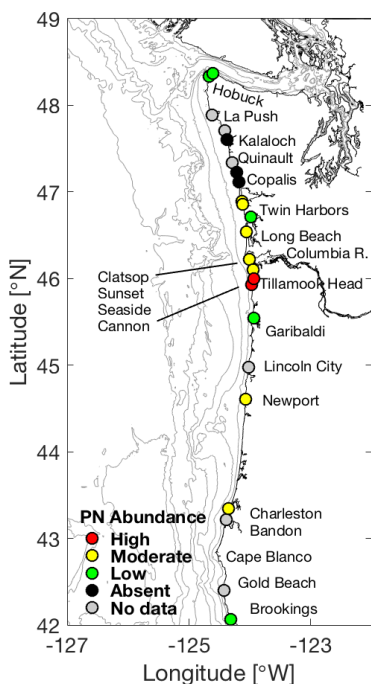**HAB risk key:**
- ✅ = low
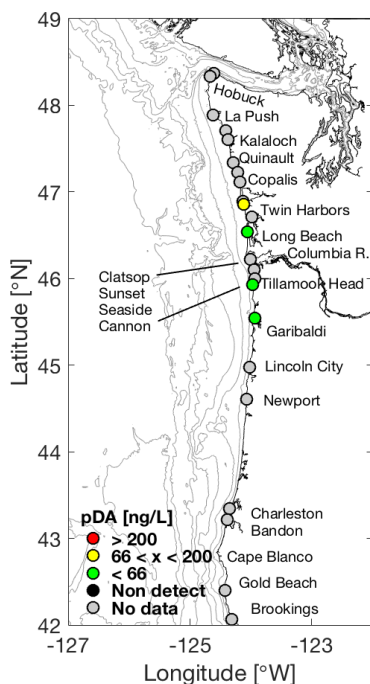- ⚠️ = medium
- ❌ = high

Beach Sampling

(*Pseudo-nitzschia*)

(particulate domoic acid)

PN Abundance
- 🔴 High
- 🟡 Moderate
- 🟢 Low
- ⚫ Absent
- ⚪ No data

pDA [ng/L]
- 🔴 > 200
- 🟡 66 < x < 200
- 🟢 < 66
- ⚫ Non detect
- ⚪ No data
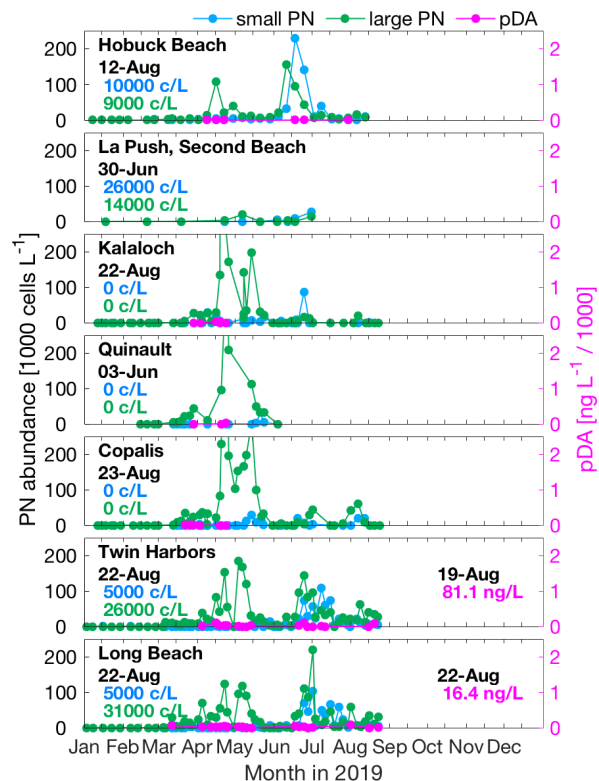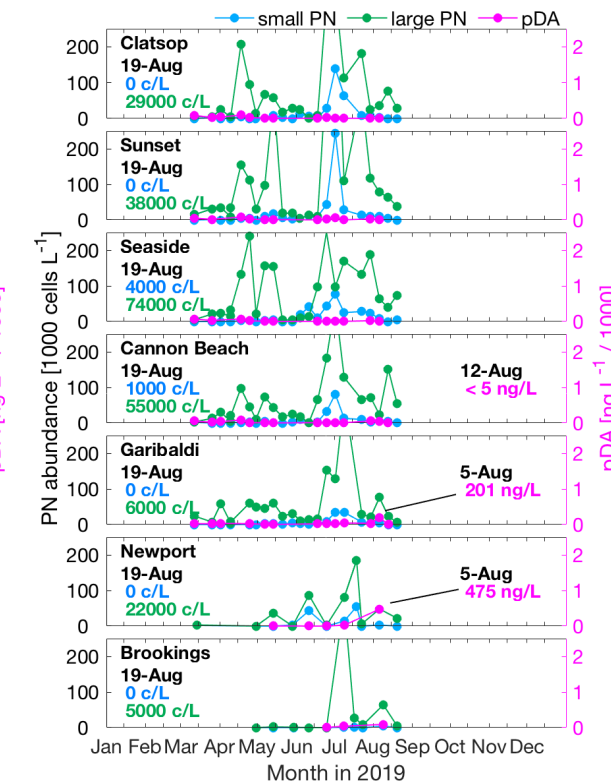
Offshore Sampling

(*Pseudo-nitzschia*)

20-Aug maximum:
large PN = 8000 c/L
small PN = 1000 c/L

(particulate domoic acid)

20-Aug maximum:
pDA = 0 ng/L

PN Abundance
- 🔴 High
- 🟡 Moderate
- 🟢 Low
- ⚫ Absent
- ⚪ No data

pDA [ng/L]
- 🔴 > 200
- 🟡 66 < x < 200
- 🟢 < 66
- ⚫ Non detect
- ⚪ No data

WA *Pseudo-nitzschia* & Domoic Acid

— small PN — large PN — pDA

- **Hobuck Beach** 12-Aug, 10000 c/L, 9000 c/L
- **La Push, Second Beach** 30-Jun, 26000 c/L, 14000 c/L
- **Kalaloch** 22-Aug, 0 c/L, 0 c/L
- **Quinault** 03-Jun, 0 c/L, 0 c/L
- **Copalis** 23-Aug, 0 c/L, 0 c/L
- **Twin Harbors** 22-Aug, 5000 c/L, 26000 c/L; 19-Aug, 81.1 ng/L
- **Long Beach** 22-Aug, 5000 c/L, 31000 c/L; 22-Aug, 16.4 ng/L

OR *Pseudo-nitzschia* & Domoic Acid

— small PN — large PN — pDA

- **Clatsop** 19-Aug, 0 c/L, 29000 c/L
- **Sunset** 19-Aug, 0 c/L, 38000 c/L
- **Seaside** 19-Aug, 4000 c/L, 74000 c/L
- **Cannon Beach** 19-Aug, 1000 c/L, 55000 c/L; 12-Aug, < 5 ng/L
- **Garibaldi** 19-Aug, 0 c/L, 6000 c/L; 5-Aug, 201 ng/L
- **Newport** 19-Aug, 0 c/L, 22000 c/L; 5-Aug, 475 ng/L
- **Brookings** 19-Aug, 0 c/L, 5000 c/L

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

Jun2019 ONI = 0.54
Jul2019 PDO = 1.03

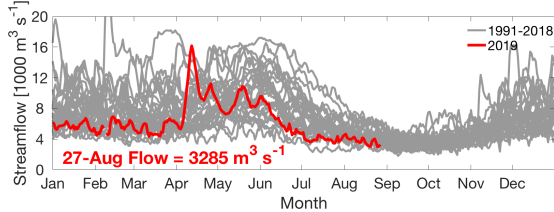El Nino (ONI ≥ 0.5)   La Nina (ONI ≤ -0.5)   Neutral (-0.5 < ONI < 0.5)
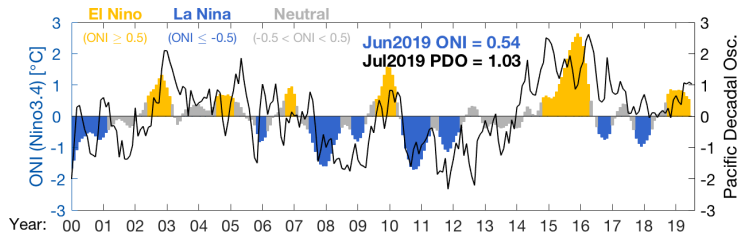
Research has shown that toxic HAB events off WA and OR tend to occur during or following periods of El Niño and/or positive phases of the PDO, when ocean temperatures are relatively warm.

North-south Wind Stress

northward

southward

NDBC 46041
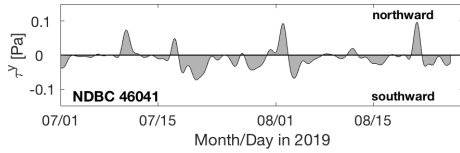
Southward wind stress drives coastal upwelling that can lead to plankton blooms. Northward wind stress tends to push any existing offshore plankton and toxins towards beaches. In addition, summer/fall toxic blooms often occur in years with a moderate cummulative upwelling index (i.e. during years with fluctuating winds) rather than in years with sustained upwelling or downwelling winds.

Cumulative Wind Stress

1987-2019
mean
mean ± sd
2019
NDBC 46041

Columbia River Discharge

1991-2018
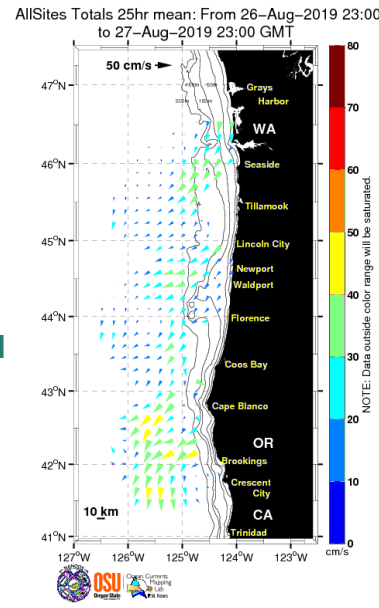2019

27-Aug Flow = 3285 m³ s⁻¹

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.
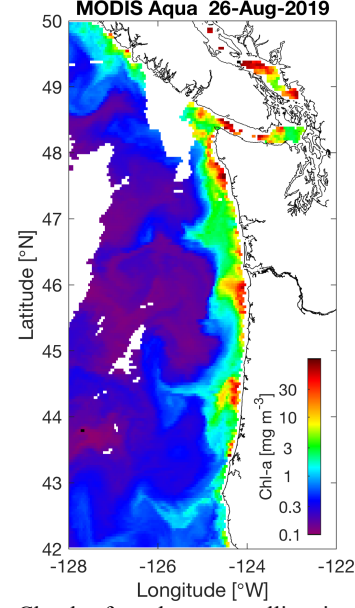
Marine Weather Forecast

Thur	Fri	Sat	Sun

Thur - SE wind, 10 kt
Fri - S wind, 10 kt
Sat - S wind, 10 kt
Sun - S wind, 10 kt

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

Ocean Surface Currents

AllSites Totals 25hr mean: From 26–Aug–2019 23:00 to 27–Aug–2019 23:00 GMT

50 cm/s

Grays Harbor
WA
Seaside
Tillamook
Lincoln City
Newport
Waldport
Florence
Coos Bay
Cape Blanco
OR
Brookings
Crescent City
CA
Trinidad

10 km

NOTE: Data outside color range will be saturated.

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

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.

Surface Salinity [28.5-33]

200 m
2000 m

Three Day Tracks

cas6_v3_lo8b

2019-08-30 16:00 PDT

0.1 Pa Windstress

Juan de Fuca Eddy 24 Hour Tracks

Heceta Bank 24 Hour Tracks

Satellite Chlorophyll-a

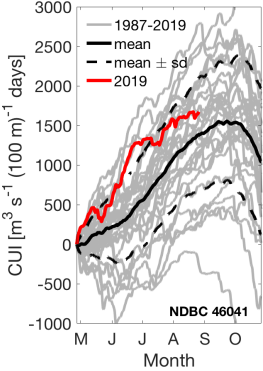MODIS Aqua 26-Aug-2019

Chl-a [mg m⁻³]

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.

Summary - Weak upwelling favorable winds and southward, upwelling favorable currents have remained in place throughout August. Coastal phytoplankton blooms are evident in recent satellite images, with elevated chlorophyll appearing off northern WA, and northern and central OR. Recent beach samples have documented mostly modest abundances of *Pseudo-nitzschia* (*PN*) near shore. Highest cell counts have been off northern OR (Seaside: 74,000 cells/L of large morphology *PN* on 19-Aug) and southern WA (Long Beach: 31,000 cells/L of large *PN* on 22-Aug). Seawater particulate domoic acid (pDA) was 81 ng/L at Twin Harbors, WA, on 22-Aug, and has recently been low or undetectable off OR. However, pDA could still be present offshore; elevated pDA as high as 475 ng/L was documented at Newport on 5-Aug. Other OR beaches including Cape Meares and Charleston also had pDA >200 ng/L on 5-Aug. No recent *PN* species information is currently available. Seawater samples collected off northern WA near the Juan de Fuca eddy on 20-Aug contained no measureable pDA and few *PN* cells. A maximum of 8,000 cells/L of large *PN* was documented near shore. Razor clam samples from WA beaches have had very low DA values (≤ 2 ppm). In OR, razor clams from Coos Bay were at 20 ppm on 16-Aug. Sparrow Park (north of Charleston, OR) had razor clam DA at 14 ppm; Gold Beach razor clam DA continues decreasing and is currently at 12 ppm. OR beaches from Tillamook Head to the Umpqua River (north of Coos Bay) are open to razor clam harvest.

Forecast - A mild El Niño is transitioning to ENSO neutral conditions that should persist through fall. The PDO index is positive. Southward winds are expected through Wednesday. Thursday will bring a change to weak but sustained northward winds. Near surface water, plankton, and any toxins will then be forced shoreward as indicated by the LiveOcean forecast. We expect *PN* cell abundances to increase at beaches. The longer-term weather forecast calls for northward winds to continue through Monday. There are three factors of concern in recent conditions: coastal water temperature remains warm; elevated pDA values have been observed at OR beaches within the last month; and winds have remained upwelling favorable but weak since early August. This suggests that there is the potential for an unconfirmed DA hotspot to exist offshore of Newport, OR. For these reasons we recommend caution and diligent sampling during the following week, particularly in central OR.