# WA Marine Biotoxin Program

<table>
<thead>
<tr>
<th>Biotoxin Type:</th>
<th>Paralytic Shellfish Poisoning (PSP)</th>
<th>Amnesic Shellfish Poisoning (ASP)</th>
<th>Diarrhetic Shellfish Poisoning (DSP)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Microscopic Phytoplankton:</strong></td>
<td><img src="image1.png" alt="" /></td>
<td><img src="image2.png" alt="" /></td>
<td><img src="image3.png" alt="" /></td>
</tr>
<tr>
<td><strong>Caused by:</strong></td>
<td>Dinoflagellate <em>Alexandrium catenella</em></td>
<td>Diatom <em>Pseudo-nitzschia spp.</em></td>
<td>Dinoflagellate <em>Dinophysis spp.</em></td>
</tr>
<tr>
<td><strong>Toxin Produced:</strong></td>
<td>Saxitoxin (Neurotoxin)</td>
<td>Domoic Acid (Neurotoxin)</td>
<td>Okadaic Acid</td>
</tr>
<tr>
<td><strong>Started Monitoring Samples/year:</strong></td>
<td>1957 ~3200 tests/year</td>
<td>1991 ~1500 tests/year</td>
<td>2012 ~2500 tests/year</td>
</tr>
<tr>
<td><strong>Action Level:</strong></td>
<td>≥80 µg/100g tissue</td>
<td>≥20 ppm in tissue</td>
<td>≥16 µg/100g tissue</td>
</tr>
</tbody>
</table>
Biotoxin Program

Monitoring Sites

~111 sites in Washington
42 sampled year round
69 sampled seasonally

Coordinated effort among DOH staff, DFW, DNR, local health, tribes, industry and citizen volunteers
Biotoxin Early Warning System

- Biotoxin Testing
- Phytoplankton Monitoring
- Weather and Climate Data
Connection to Climate Data

- More factors, more stress, less resilience
  - Temperature extremes
  - Storm events
  - Ocean acidification
  - Upwelling changes (season, persistence)
- “Changing ocean conditions”
- Change in our reliance on fisheries species and seasonality…
Using Weather and Climate Data

**Current Weather Conditions**

Helps predict where and when harmful algal blooms may occur or where they will travel once present.

**Long term Climate Trends**

Helps our program explain current events and prepare for the future.

**Working with Partners**

Research partners help develop resources which aid in the forecasting of current and future biotoxin trends.
Using Current Weather Conditions

Tracking a PSP Bloom in Hood Canal with current wind data.
Using Long Term Climate Trends

Stephanie K. Moore (2009) Harmful Algae
Using Long Term Climate Trends

First PSP Closure of the Year in Puget Sound

- Pierce
- Clallam - Straits*
- Jefferson - Eastern*
- Whatcom*
- San Juan

Graph showing long-term climate trends in Puget Sound with various categories and years.
Working With Partners, Part 1

Development of a Decision Support Tool for HAB Risk Prediction in Puget Sound in a Changing Climate

Compare the influences of the OCEAN, WATERSHED, and ATMOSPHERE on Puget Sound oceanography & Alexandrium now and in the future.
Project Outcomes

- Better understanding of possible climate impacts related to PST occurrences and distribution regionally
- Decision Support
  - Stakeholder planning
  - Allocation of resources
  - PST Risk Index
An early warning system for *Pseudo-nitzschia* HABs on Pacific Northwest outer-coast beaches

Current beach monitoring allows managers to detect when a toxin bloom has already arrived.

**Project Goal** is to develop a model- and monitoring-based forecast system for toxin blooms along the Washington and northern Oregon coasts that will supplement current beach sampling.
**Toxic cell abundance**

- *Pseudo-nitzschia* spp. have not been found in recent whole water samples except Hobuck Beach on 9/4 at 14,000 cells/L of the small cell type. The highest levels of DA in razor clams are found at Quinault Res. B & MocRocks BC on 8/24 at 7 ppm. *Alexandrium* spp. are present all along the WA coast in recent samples. The highest counts are at Long Beach on 9/4 at 7,000 cells/L of A. catenella. PSP is detectable in shellfish at several sites along the WA coast. The highest levels are at La Push, Second Beach on 9/2 1ug/100g in CA mussels according to WDOH. *Dinophysis* spp. have been common in recent samples. The highest levels are at Raft River on 8/27 at 4,000 cells/L of D. acuminata.

**Winds**

Strong downwelling favorable winds (from the south) have been prevalent during early September, as observed at NDBC buoy 46029. Surface currents are directed northward over the continental shelves of southern Washington and northern Oregon, and surface drifters have moved northward and toward shore. Model results show the Columbia River plume influencing the southern Washington coast. It is likely that phytoplankton populations along the coast have originated from offshore, especially along the northern Washington coast where the

**Drifters**

Forecast – Upwelling favorable winds are expected to resume Thursday 9/10 through Saturday 9/12. The marine forecast has winds returning to downwelling favorable by Monday 9/14. As the fall season approaches, there is a greater likelihood of downwelling winds. We forecast high risk levels for transport of *Pseudo-nitzschia* (not necessarily toxic) from the Juan de Fuca eddy region to coastal beaches in the following week. Condition is red.
In Conclusion

1 Working Well
Partnerships provide valuable research and resources used by the biotoxin program that help explain current biotoxin events and prepare for future events.

2 Challenges
Program capacity to look at weather and climate data is limited.
There is still a lot to learn about factors that can impact biotoxin events.

3 Takeaways
Weather and climate data is an important early warning tool for the biotoxin program.
Contacts

Jerry Borchert
Marine Biotoxin Coordinator Lead
Jerry.Borchert@doh.wa.gov
360-236-3328

Audrey Coyne
Marine Biotoxin Coordinator
Audrey.Coyne@doh.wa.gov
360-236-3354

Office of Environmental Health and Safety
Shellfish Certification and Licensing Section
Biotoxin Program