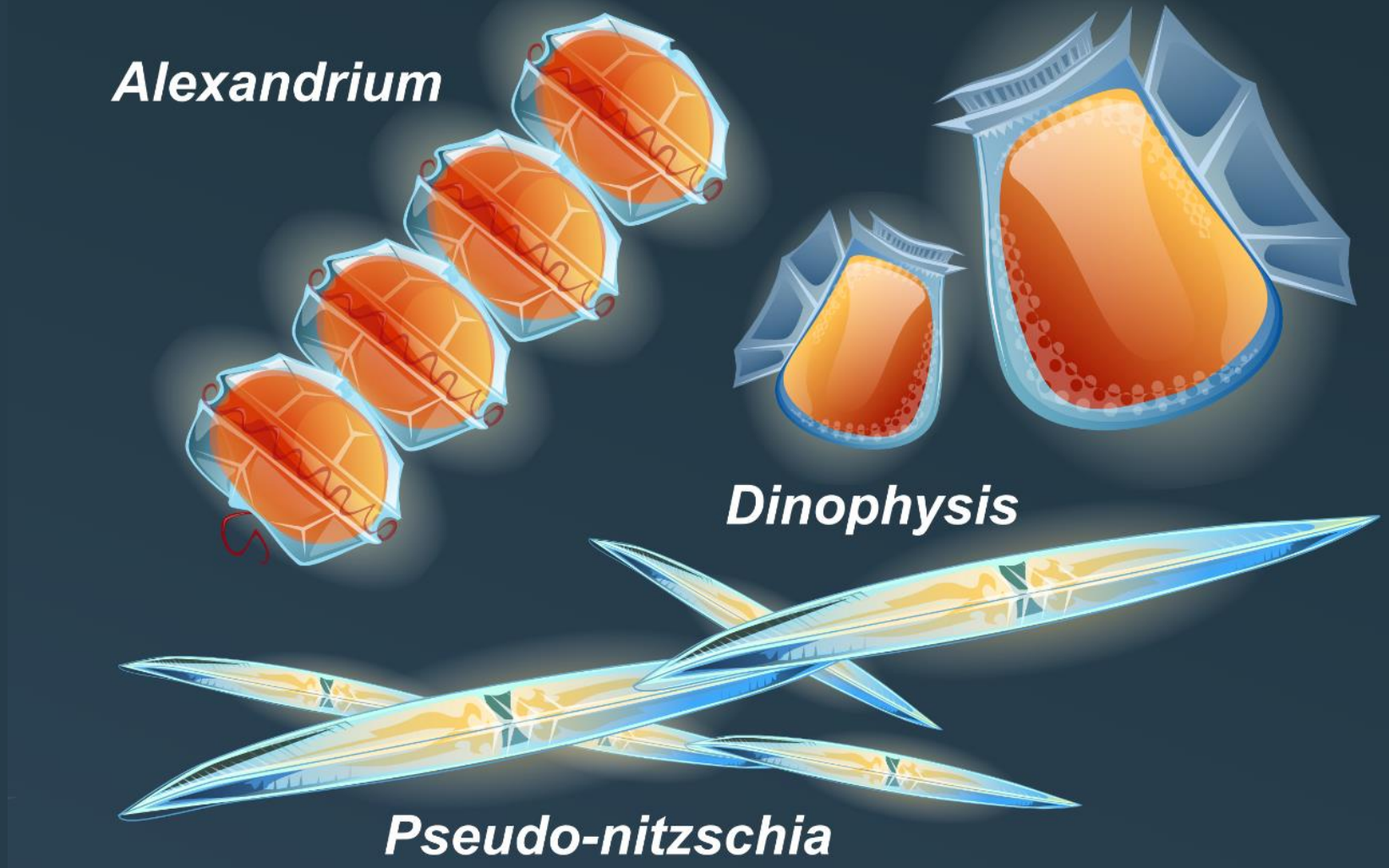
Makah Shellfish Biotoxin Monitoring Program Expansion

Aaron Parker, Makah Fisheries Water Quality Specialist

Courtney Winck, Water Quality Technician II

MARINE BIOTOXINS



Previous Program Limitations

- Monthly tissue sample “ship-out” lab analysis
- Weekly sampling when moderate levels existed
- No lead time or trend awareness
- Localized benefit

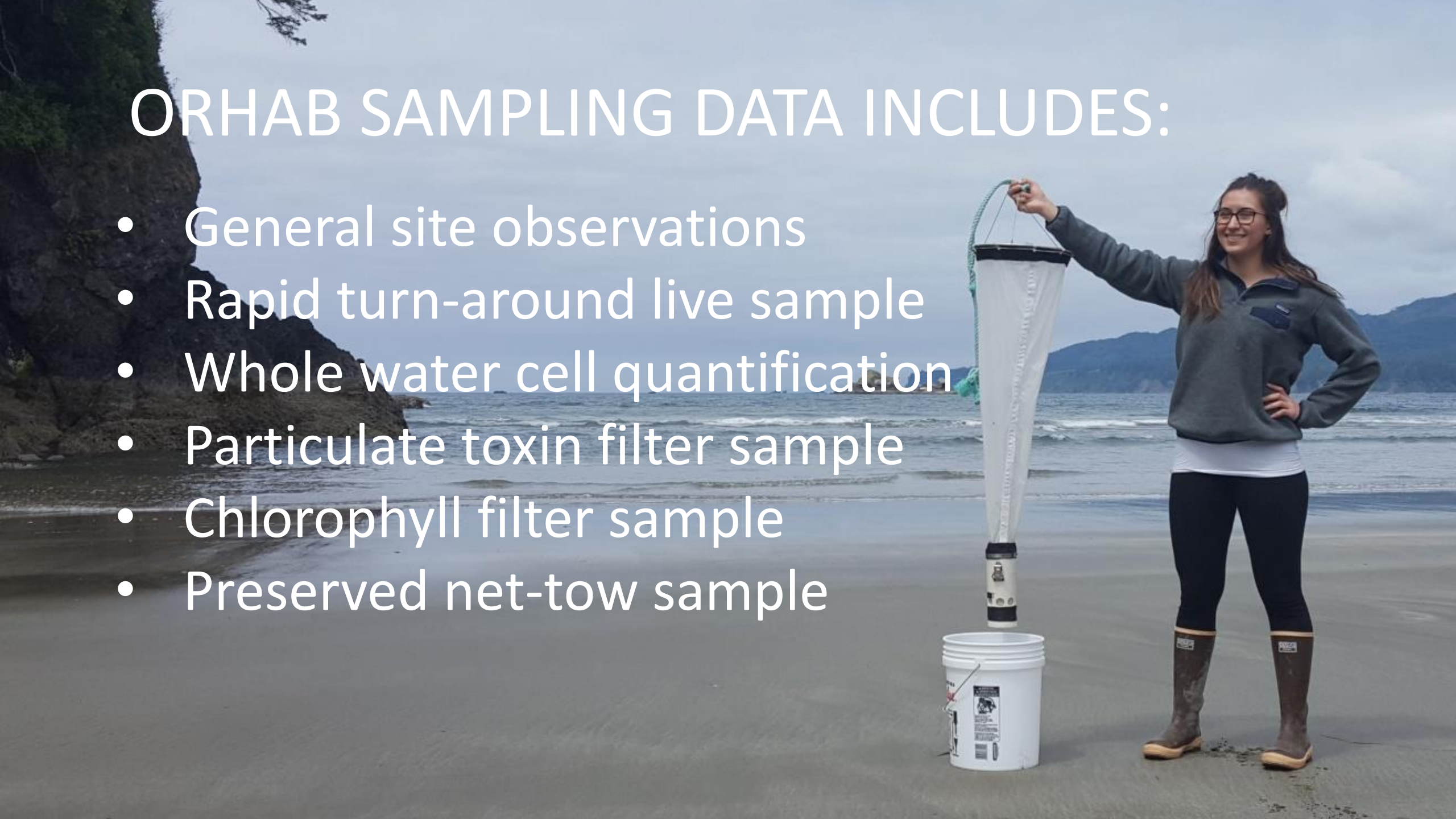
Program Expansion ORHAB

OLYMPIC REGION HARMFUL ALGAL BLOOM PARTNERSHIP

- Newly instituted partnership
- Greater coastal awareness
- Some trend awareness and limited forecasting
- Improved service to the community
- Increased participation and value toward scientific progress

ORHAB SAMPLING DATA INCLUDES:

- General site observations
- Rapid turn-around live sample
- Whole water cell quantification
- Particulate toxin filter sample
- Chlorophyll filter sample
- Preserved net-tow sample



PROGRAM EXPANSION MERHAB

MERHAB: An early warning system for *Pseudo-nitzschia* HABs on Pacific Northwest outer-coast beaches

PARTNERS:

eil Banas and *Ryan McCabe* (co-leads), *Barbara Hickey* and *Parker MacCready,* University of Washington

Vera Trainer and William Peterson, NOAA Northwest Fisheries Science Center

Matt Hunter, Oregon Department of Fish and Wildlife

Raphael Kudela, Department of Ocean Sciences, UC Santa Cruz

Aaron Parker, Makah Tribal Fisheries

Rich Osbourne and Bernard Bormann, ORHAB leads

ORHAB partnership (Washington State Dept of Health, Fish and Wildlife, OCNMS, QIN, Quileute Tribe, ONRC, etc)

Jan Newton, NaNOOS

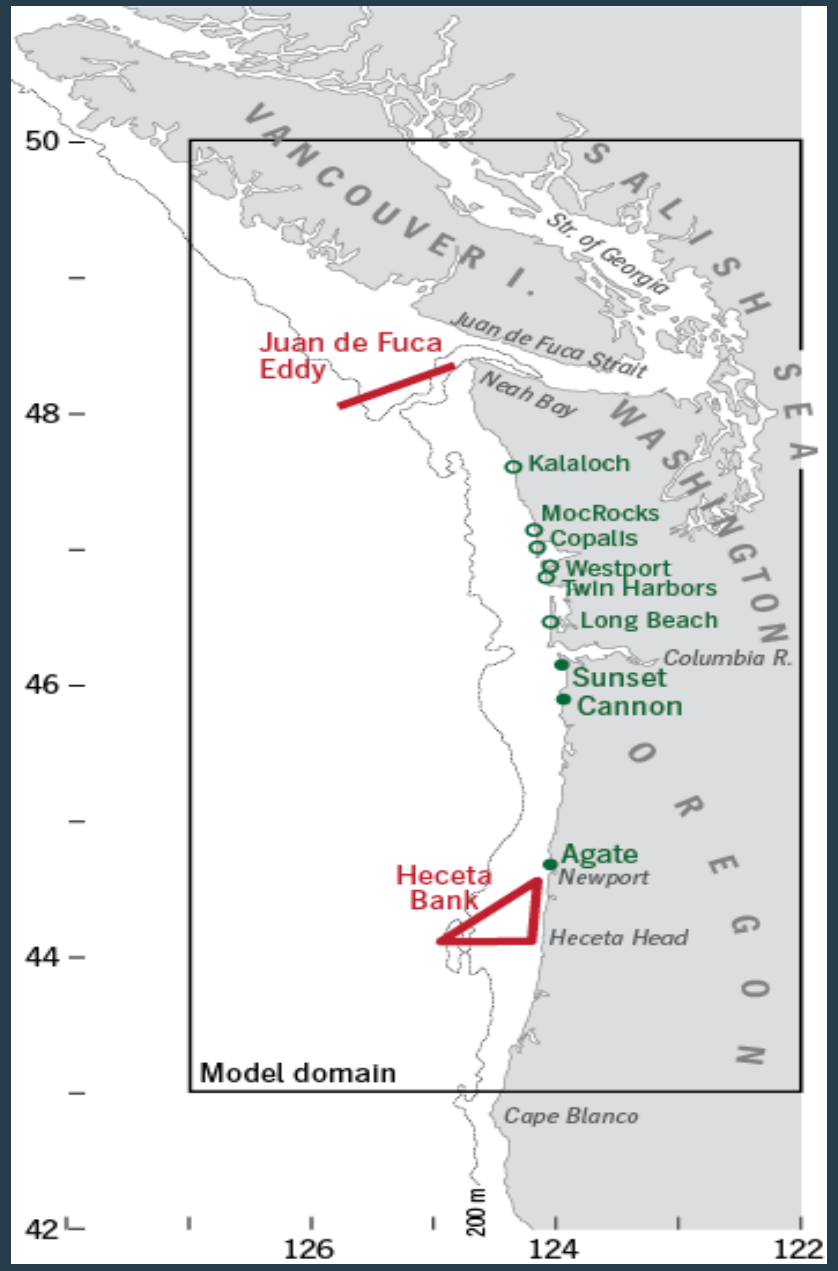
Allison Allen, NOAA Ecological Forecasting Program

MERHAB: An early warning system for *Pseudo-nitzschia* HABs on Pacific Northwest outer-coast beaches

Objectives:

1. institute a new, low-cost *harmful algal bloom* monitoring program for the offshore hotspots (the Juan de Fuca Eddy and Heceta Bank), and develop citizen-science partnerships with coastal communities that can make sustain this monitoring in the future
2. build a state-of-the-art forecasting system for *PN* HAB transport to beaches, based on an existing, well-tested circulation model, which will be continuously re-validated against data from new NOAA and NSF observing system assets (glider lines and moorings).
3. Model- and satellite-based chlorophyll predictions will be used to reduce false positives.
4. Extended, probabilistic forecasts of HAB beach events up to 14 d in advance.

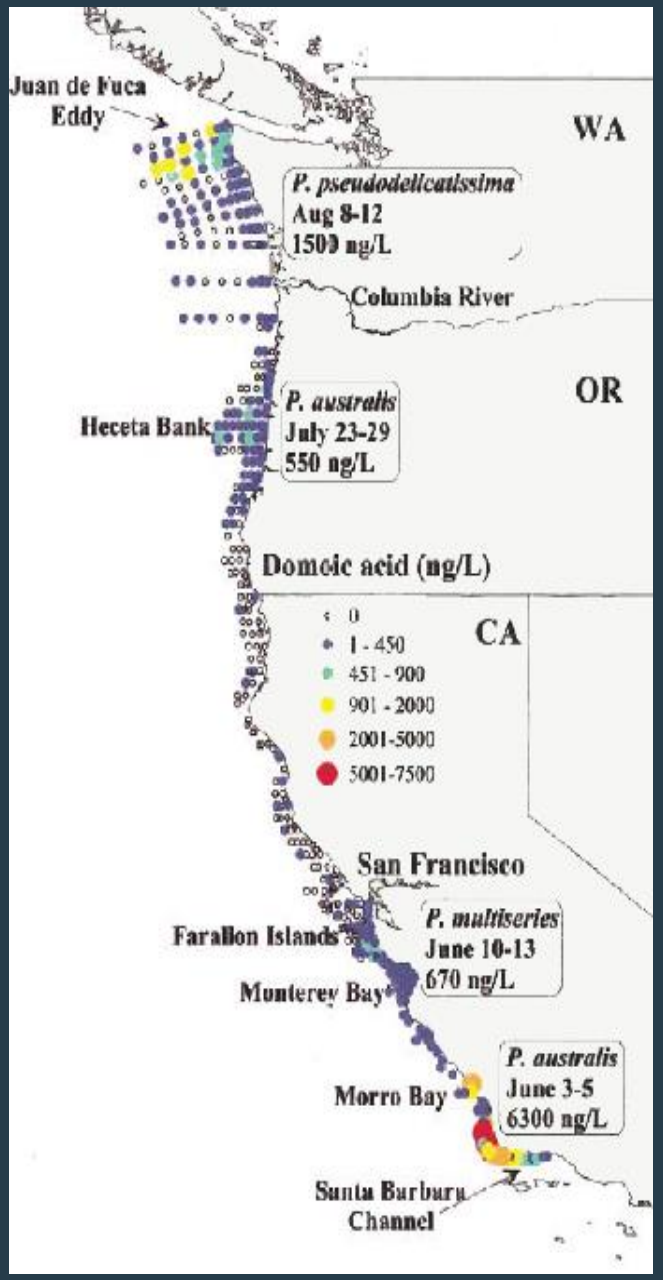
Results will be disseminated through an improved PNW HAB Bulletin, and also made publicly available through a graphical interface.



Map of study region and sampling locations for *Pseudo-nitzschia* and domoic acid

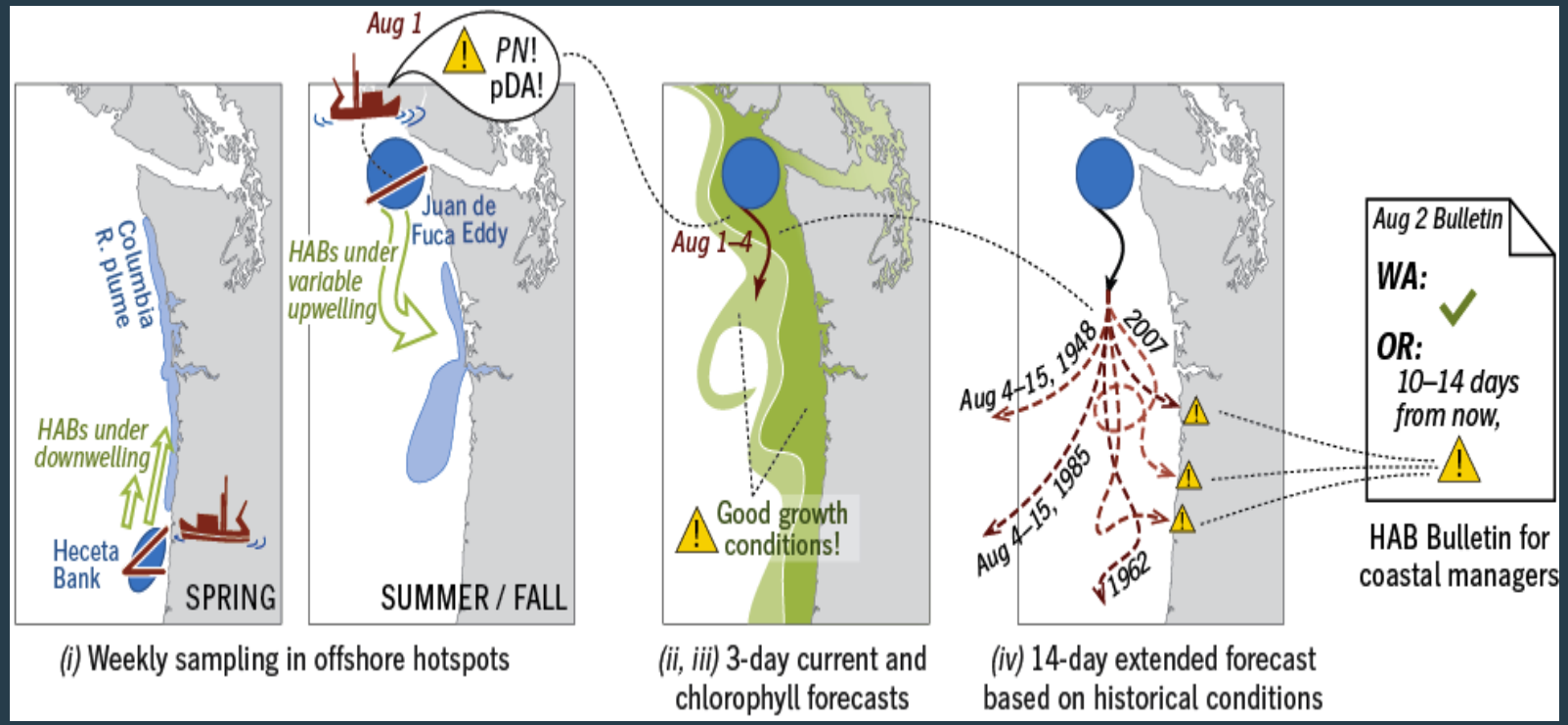
Offshore hotspot monitoring (red lines) and OR beach monitoring (green dots) to be supported by this program, and WA beach data to be provided by partnership with ORHAB (green circles).

The Makah Tribe will assist with or conduct the sampling at the Juan de Fuca eddy and conduct laboratory sample analysis, including phytoplankton net-tows and CTD deployment



Harmful algal bloom toxins (domoic acid) *on the U.S. West Coast in 1998*

This figure shows that the Juan de Fuca eddy is a known initiation site or "birthplace" for harmful algal blooms – the toxin (domoic acid) and the harmful cell (Pseudo-nitzschia)



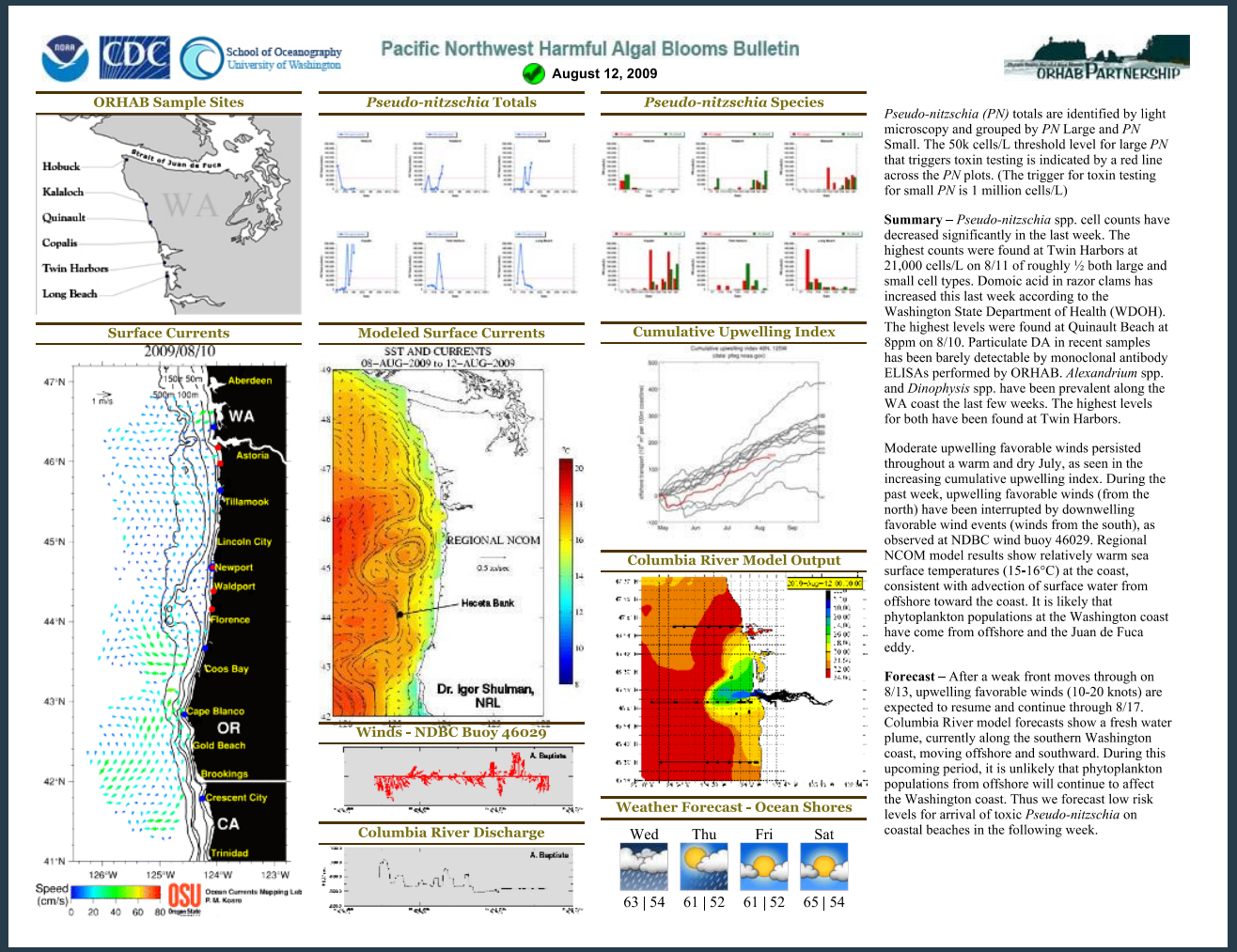
Schematic of spring and summer/fall PN HAB transport patterns (left; green arrows) and the proposed forecast system.

Warning symbols describe an example of how a late-summer PN*/pDA event originating in the Juan de Fuca Eddy could unfold, as seen by the forecast system.*

Pacific Northwest Harmful Algal Bloom Bulletin

The ultmate goal of this project is to provide a new, improved forecast to State and Tribal managers

https://habsweb.nwfsc.noaa.gov/bulletin



Pseudo-nitzschia (PN) totals are identified by light microscopy and grouped by *PN* Large and *PN* Small. The 50k cells/L threshold level for large *PN* that triggers toxin testing is indicated by a red line across the *PN* plots. (The trigger for toxin testing for small *PN* is 1 million cells/L)

Summary – *Pseudo-nitzschia* spp. cell counts have decreased significantly in the last week. The highest counts were found at Twin Harbors at 21,000 cells/L on 8/11 of roughly ½ both large and small cell types. Domoic acid in razor clams has increased this last week according to the Washington State Department of Health (WDOH). The highest levels were found at Quinault Beach at 8ppm on 8/10. Particulate DA in recent samples has been barely detectable by monoclonal antibody ELISAs performed by ORHAB. *Alexandrium* spp. and *Dinophysis* spp. have been prevalent along the WA coast the last few weeks. The highest levels for both have been found at Twin Harbors.

Moderate upwelling favorable winds persisted throughout a warm and dry July, as seen in the increasing cumulative upwelling index. During the past week, upwelling favorable winds (from the north) have been interrupted by downwelling favorable wind events (winds from the south), as observed at NDBC wind buoy 46029. Regional NCOM model results show relatively warm sea surface temperatures (15-16°C) at the coast, consistent with advection of surface water from offshore toward the coast. It is likely that phytoplankton populations at the Washington coast have come from offshore and the Juan de Fuca eddy.

Forecast – After a weak front moves through on 8/13, upwelling favorable winds (10-20 knots) are expected to resume and continue through 8/17. Columbia River model forecasts show a fresh water plume, currently along the southern Washington coast, moving offshore and southward. During this upcoming period, it is unlikely that phytoplankton populations from offshore will continue to affect the Washington coast. Thus we forecast low risk levels for arrival of toxic *Pseudo-nitzschia* on coastal beaches in the following week.

Trajectory

Strengthen our long-standing Co-management Partnership With Washington State Department of Health

New and Developing Program Partnerships

- ORHAB Partnership
- NOAA, Northwest Fisheries Science Center

Long-Term Goals

- Significant expansion of Makah Fisheries Laboratory capabilities
- HAB monitoring activities that have local, regional, and national significance in both the protection of human health and the progress of marine science

Thank You

Aaron Parker Makah Fishe