

## 2016 Stream Team Phytoplankton Monitoring Summary

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City of Olympia Stream Team partnered with Pacific Shellfish Institute (PSI) to conduct its fifth year of the “What’s Blooming in Budd?” phytoplankton monitoring program in Budd Inlet, downtown Olympia. The goal was to offer engaging hands-on activities that educated the public about local water quality issues and encouraged environmental stewardship.

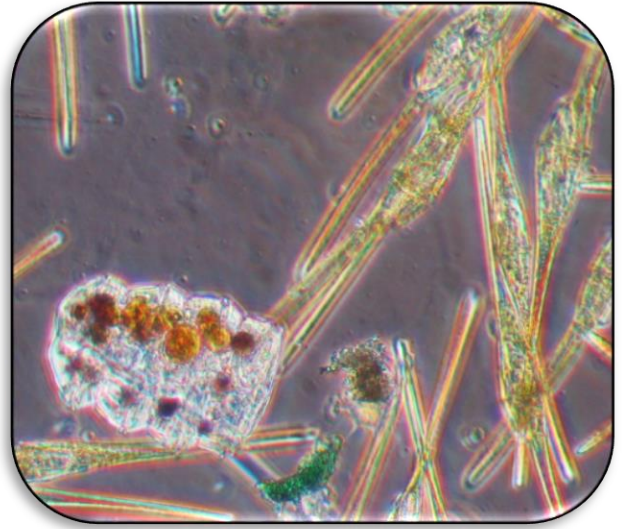


*Citizen Scientists at Port Plaza dock, September 15, 2016*

To meet this goal, volunteers met on Thursday afternoons between June and September at the Port Plaza dock to collect information about weather, tides, water temperature, salinity, and water clarity. A phytoplankton sample was also collected by performing a vertical net tow from a depth of 3 meters. Participants viewed and identified plankton on the dock using battery powered AmScope field microscopes.

After the plankton samples were collected, they were transported to LOTT’s Wet Science Center classroom and projected onto a large screen where volunteers generated a complete list of species present. A 20-ml sample was also preserved and quantitatively screened for phytoplankton species known to produce biotoxins using Sound Toxins protocols.

The data was entered directly into NOAA/Sea Grant’s Sound Toxins monitoring database. Sound Toxins is a volunteer monitoring program designed to provide early warning of harmful algal blooms (HABs) in order to minimize human health risk and economic losses to fisheries. Monitoring results were also updated weekly on PSI’s “What’s Blooming in Budd?” web page which included a summary of citizen monitoring highlights, photos (plankton and volunteers), raw data and Final Reports from 2013-2016.



On-the-ground sampling confirmed a bloom of *Ceratium fusus* in lower Budd Inlet on July 21st. Also featured is the dinoflagellate *Polykrikos kofoidii*, a pseudocolony of zooids that feed on other dinoflagellates and diatoms. Photo credit: WDOE's Eyes Over Puget Sound and PSI.

“What’s Blooming in Budd” data was also utilized by Washington Department of Health’s Shellfish Program (WDOH) and Washington Department of Ecology’s Eyes Over Puget Sound Program. WDOH closed Budd and Henderson Inlets to shellfish harvesting for several weeks beginning on June 16<sup>th</sup>, 2016 due to elevated Diarrhetic Shellfish Poisoning (DSP) toxins in mussel tissue. Although the closure began days prior to the first citizen monitoring event, PSI continued to notify WDOH throughout the season when *Dinophysis* and *Pseudo-nitzschia*, the species responsible for producing toxins associated with DSP and Amnesic Shellfish Poisoning, were on the rise.

In mid-July, the “What’s Blooming in Budd” program was featured in the Eyes Over Puget Sound July 20<sup>th</sup> Surface Conditions Report. Dr. Christopher Krembs contacted PSI – after being alerted to significant orange blooms in lower Budd Inlet – to coordinate a simultaneous flyover survey in conjunction with on-the-ground field sampling. Sampling revealed a bloom of the dinoflagellate *Ceratium fusus*. In July, PSI also presented data collected during “What’s Blooming in Budd” events during a WDOE Marine Condition Update Summary Webinar.

In addition to citizen monitoring at the dock, PSI also hosted educational activities at the Hands On Children’s Museum (HOCM) on July 13<sup>th</sup>. Activities performed at the science table included identifying local shellfish species, viewing live plankton and macroinvertebrates under magnification, conducting a shellfish filtration demonstration, and learning about water quality issues in south Puget Sound. Approximately 200 contacts were made during this event.

PSI also participated in the City of Olympia’s Great Yards Get-Together Backyard DIY event on September 10<sup>th</sup>. At this event, attendees learned about water quality issues in lower Budd Inlet such as excess nutrients and fecal coliform bacteria pollution. Participants learned about the

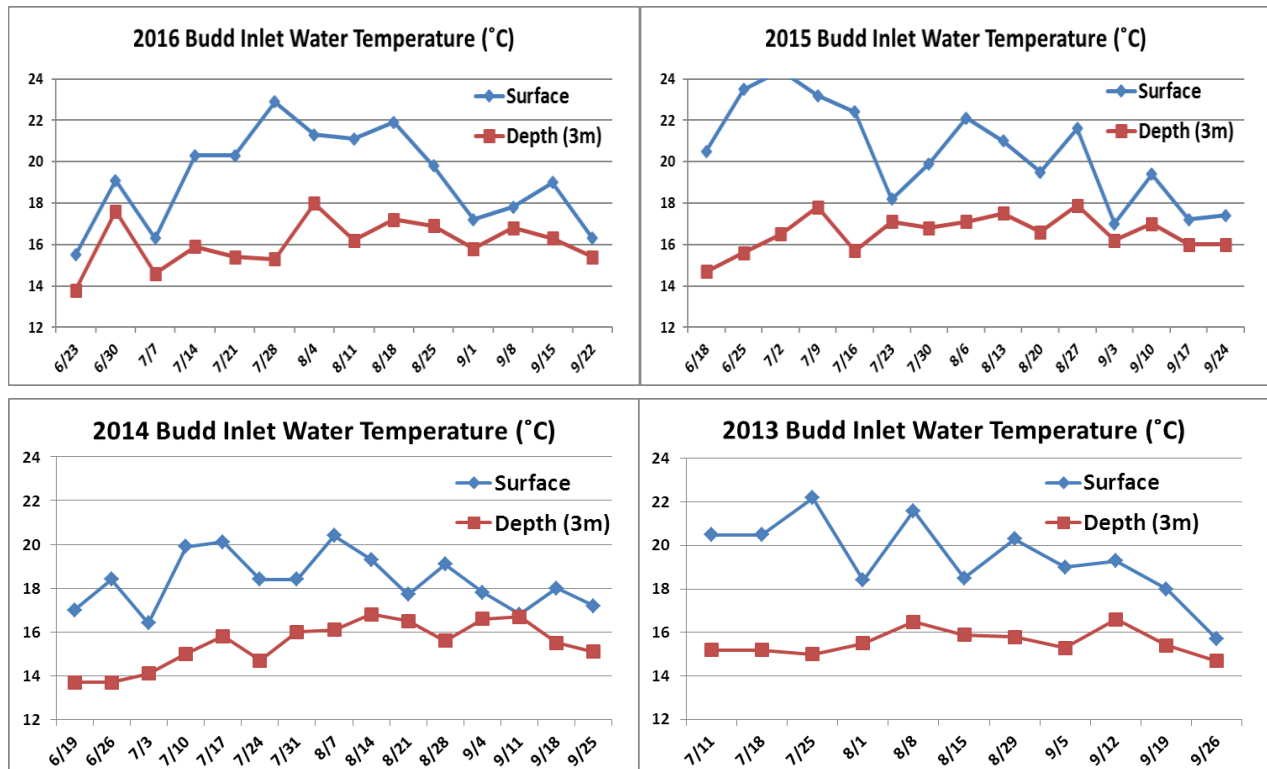
benefits of organic compost and took home samples of PSI's Surf-to-Turf mussel compost. Free bags-on-board and information about the importance of cleaning up pet waste were offered to dog owners. The event was well attended and PSI distributed six 30-gallon totes worth of organic mussel compost to the public.

### Results

A total of 14 sampling events were conducted at Port Plaza between June 23<sup>rd</sup> and September 22<sup>nd</sup> totaling 278 contacts with the public. The average number of visitors was 20 (dock and LOTT combined), with the highest attendance on July 7<sup>th</sup> (n=49) and July 14<sup>th</sup> (n=33). A majority of the contacts (n=182) were made at the dock, while a smaller, but significant number were made at the LOTT Wet Center (n=96). A total of 275 additional contacts were made at community events including the HOCCM on July 13<sup>th</sup> and Great Yards Get-Together on September 10<sup>th</sup> for a combined total of 553 contacts over the duration of the contract.

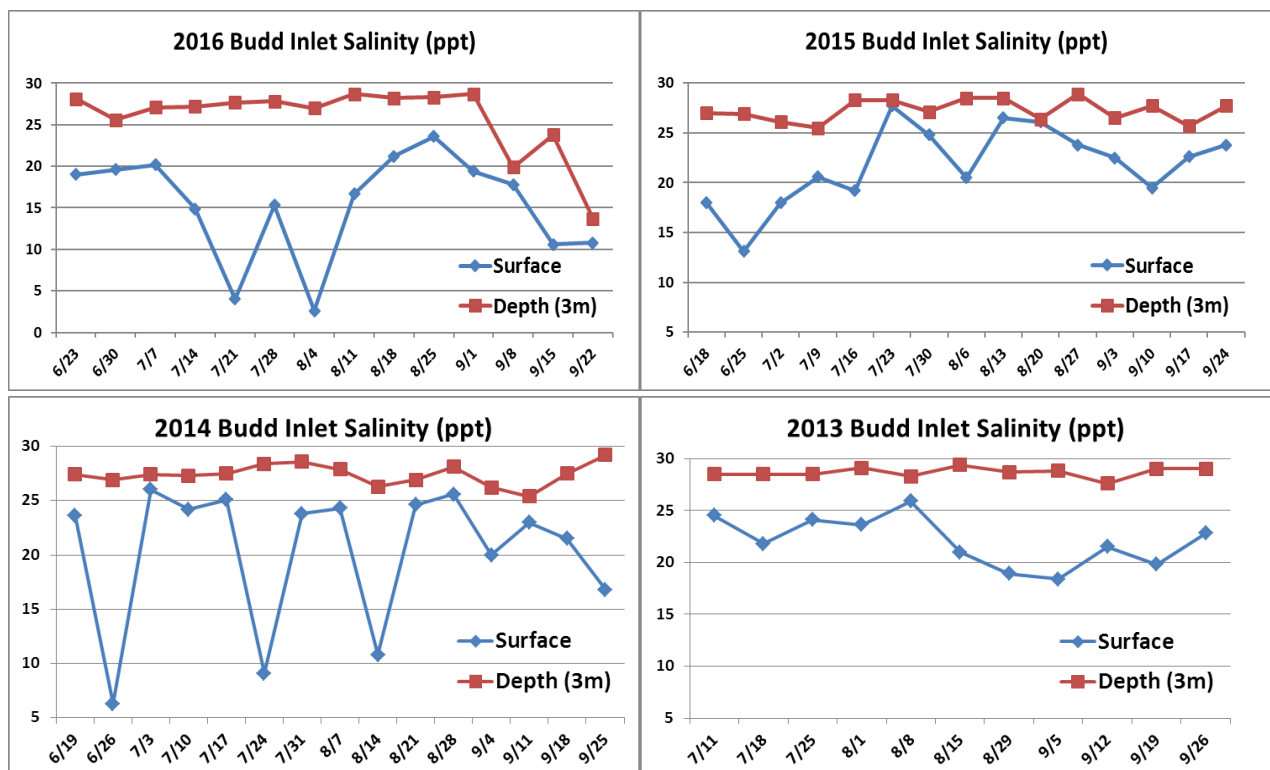
### Temperature

Surface seawater temperatures ranged from 15.5°C to 22.9°C (59.9°F to 73.2°F), peaking on July 28<sup>th</sup> and then decreasing as the season transitioned to fall. At 3 meter depth, the temperatures ranged from 13.8°C to 18.0°C (56.8°F to 64.4°F). 2016 surface temperatures were cooler than 2015 when temperatures were approximately 2°C higher throughout the entire Puget Sound due to the unusually warm water mass in the North Pacific nicknamed "the blob." (Refer to Stream Team's 2015 Fall Edition newsletter for more information on the blob).



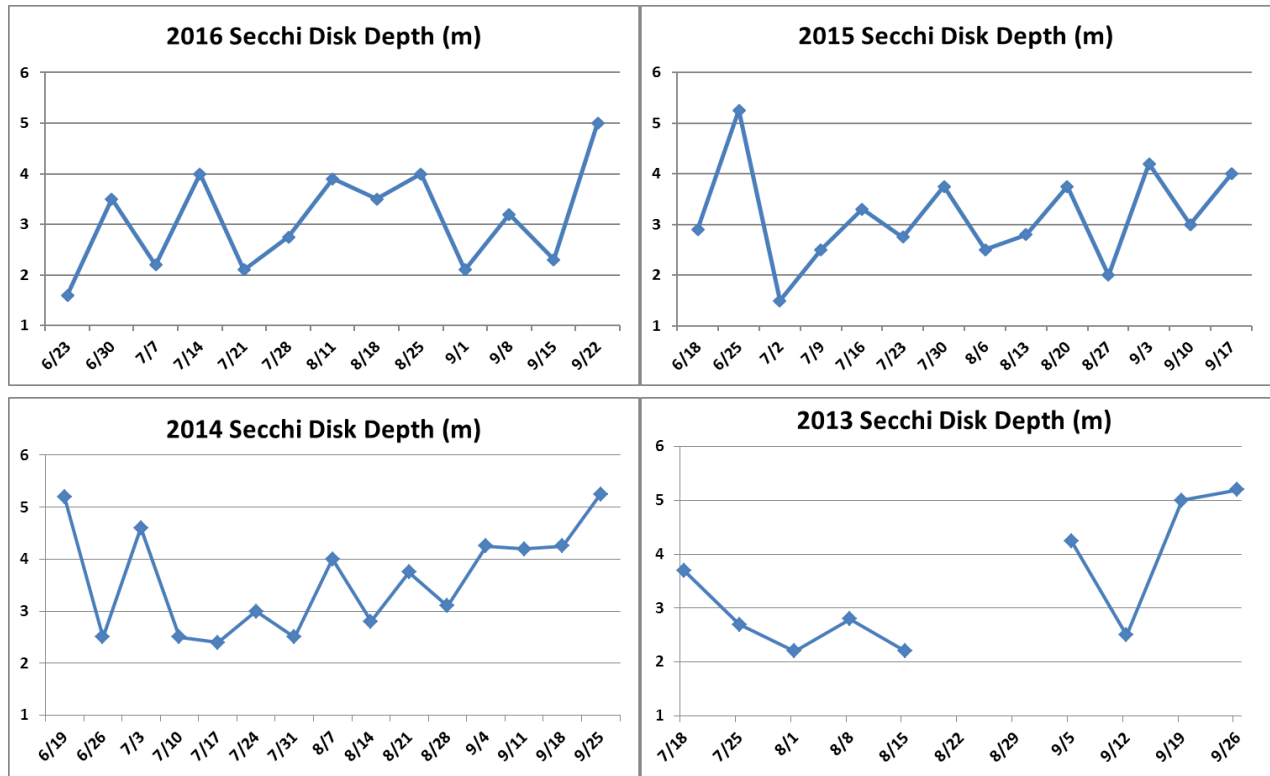
## Salinity

Surface salinities were very low during two sampling events this season, July 21<sup>st</sup> (4 ppt) and August 4<sup>th</sup> (2.6 ppt). During this time of the year, the water was very stratified with warm fresh water overlying the cool salty water below. Both of the low salinity readings occurred during low tide, when the freshwater influence from the Deschutes River was most pronounced. The average surface water salinity was 15.4 ppt. Similar to other years, the salinity at 3 meters fluctuated very little and was typically between 25 and 30 ppt. Starting in September, salinity at depth began an atypical decrease to 13.7 ppt. This unusual pattern is due to instrument error. The handheld YSI instrument entirely malfunctioned by the end of September. The equipment far surpassed its lifetime expectancy and PSI has budgeted for a replacement YSI unit.



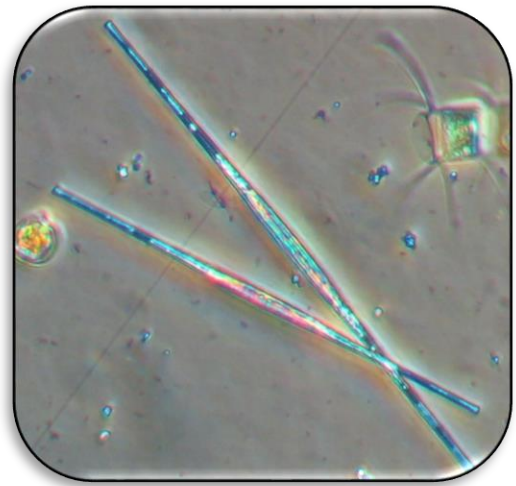
## Water Clarity

Water clarity ranged from 1.6 meters in June to 5 meters in late September. Similar to past years, the readings fluctuated greatly from week to week. Beginning in mid-July there was a thick bloom of *Ceratium fusus* which turned the water a dark reddish-brown, and persisted through early August. This caused low visibility between July 21<sup>st</sup> and August 11<sup>th</sup>. Water clarity dramatically increased on our last sampling event on September 22<sup>nd</sup>, when we also saw a decrease in *Ceratium fusus* and an increase in diatom species in our phytoplankton samples.



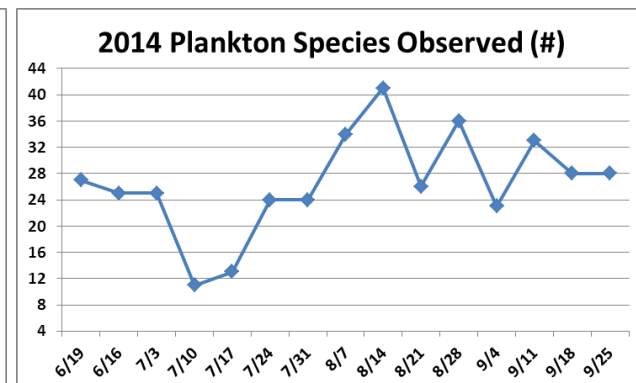
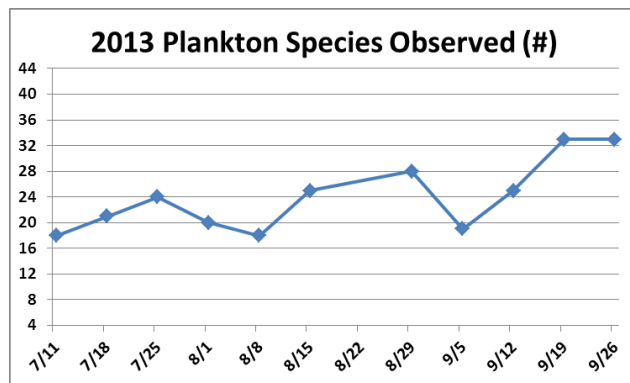
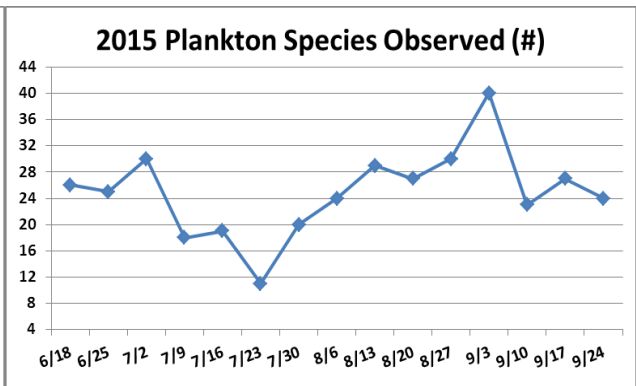
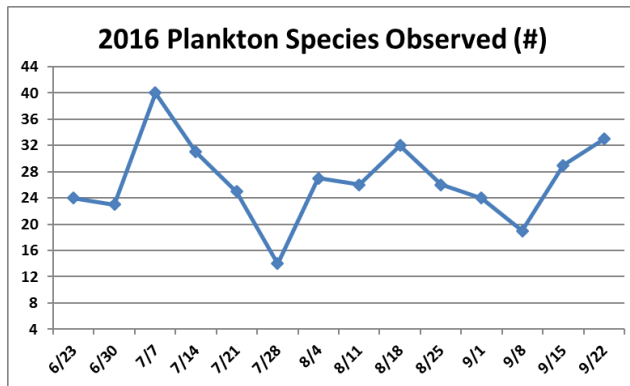
### Plankton

The total number of species (phytoplankton and zooplankton) observed in samples ranged from 14 species in late July to 40 species in early July. The dinoflagellate, *Ceratium fusus*, dominated the samples throughout most of the season between mid-July and early September. In late July, species diversity declined, particularly for diatoms, with *Ceratium fusus* as the dominant species. Diversity began increasing as we observed the return of diatom species on September 15<sup>th</sup>. *Nitzschia acicularis* and *Chaetoceros spp.* were the dominate diatoms during these sampling events.

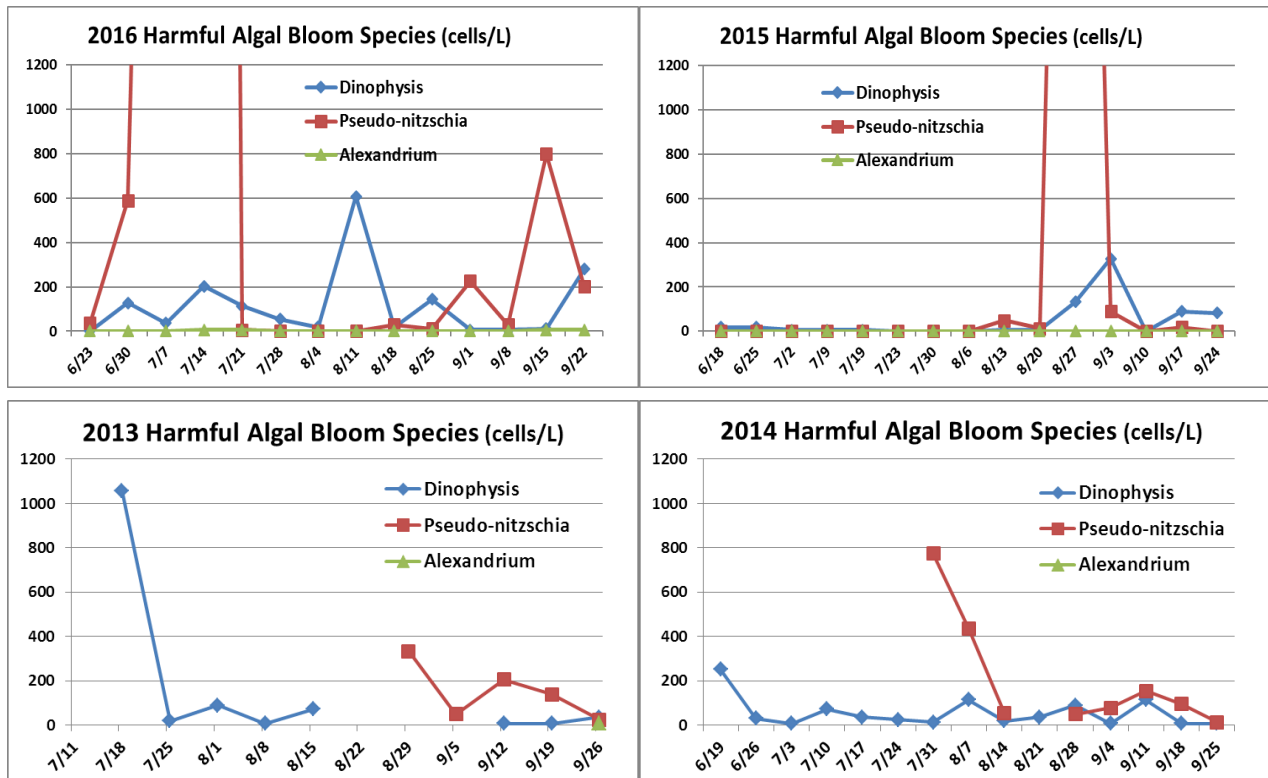


*Nitzschia acicularis* September 22, 2016.



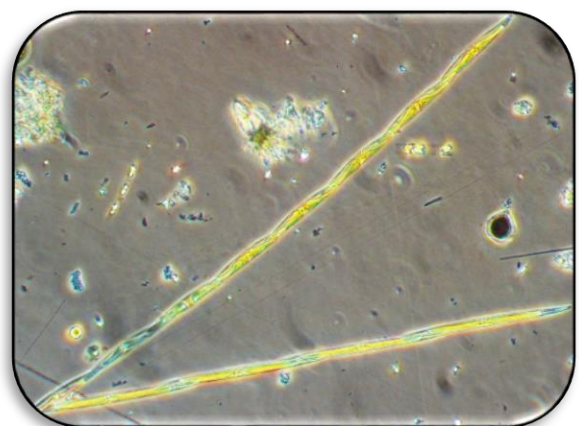


During the 2016 season, harmful algal bloom (HAB) species *Dinophysis*, *Pseudo-nitzschia*, and *Alexandrium* were observed. *Dinophysis*, the species responsible for Diarrhetic Shellfish Poisoning (DSP) was observed at low concentrations through much of the season with a bloom of over 600 cells/L on August 11th. *Pseudo-nitzschia*, the HAB species responsible for Amnesic Shellfish Poisoning (ASP) was also detected in samples during most of the season with large blooms on July 7<sup>th</sup> and 14<sup>th</sup> reaching 7,220 cells/L and 22,173 cells/L respectively. These concentrations were the highest observed since the program started in 2013. Very low numbers of *Alexandrium spp.* were also observed in Budd Inlet. One solitary cell was observed during 4 sampling events: 7/14, 7/21, 9/15, and 9/22. *Alexandrium cantenella* is the species responsible for Paralytic Shellfish Poisoning (PSP).



## Conclusions

The 2016 “What’s Blooming in Budd?” events attracted an average of 20 volunteers per sampling event during June and September – similar to 2015’s average of 20 individuals per event. Community members enjoyed learning about water quality issues in Budd Inlet such as eutrophication and HABs while collecting useful data for the SoundToxins monitoring program. Information about the plankton monitoring events, including up-to-date water quality and



Community scientists observing chains of *Pseudo-nitzschia* on July 14<sup>th</sup>.

plankton data, were available to the public by visiting the “What’s Blooming in Budd?” web page hosted on PSI’s web site.



### **Acknowledgements**

Thank you City of Olympia Stream Team for supporting the “What’s Blooming in Budd?” program. The program has attracted many enthusiastic participants and has generated five years of water quality and phytoplankton data for lower Budd Inlet.

A special thank you to Roberta Woods, an extraordinary volunteer that has participated in almost every phytoplankton monitoring event over the past few summers. PSI appreciates your time and dedication to the program – it is a pleasure having you!