What's Blooming in Budd in 2023?

Location: Port Plaza dock (in front of Anthony's)

Date: Every Thursday (June 22 – August 31)

Time: 10:00-12:00

This summer, PSI will sample weekly at Port Plaza, Budd Inlet thanks to generous funding from Stream Team and the Rose Family Foundation!

Come join us to see what's blooming and earn your Octopus Genius or Nudibranch Love stickers as part of the Sound Science Stewards program. All for the love of plankton!

PSI will have water quality equipment, plankton nets, and microscopes available for plankton viewing and identifying harmful algal bloom (HAB) species for NOAA's SoundToxins program. As always, you may check here weekly to view data, photos, videos, and a commentary on our sampling experience.

Every week, plankton communities change. Every week, we see something new!

We would love to hear from you! Contact us anytime with your burning plankton questions, or to arrange for a small group presentation.

Mary Elizabeth maryelizabeth@pacshell.org and Aimee Christy, aimee@pacshell.org

June 22, 2023 – Budd Inlet, Port Plaza

Secchi disk (water clarity): 2.1 meters

Blooming Phytoplankton Species: *Pseudo-nitzschia* and *Noctiluca*

Common Phytoplankton Species: *Scrippsiella, Protoperidinium*

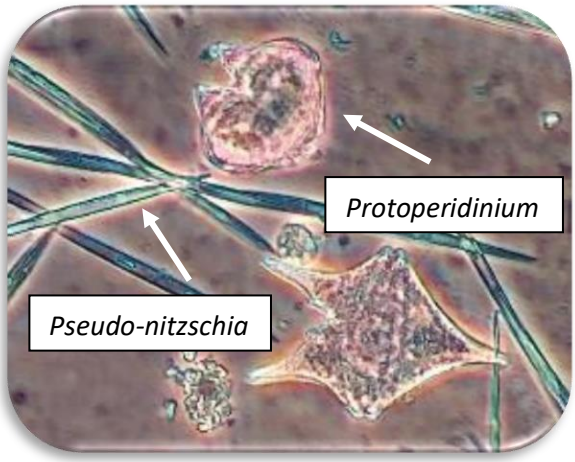
Zooplankton: bivalve larvae, copepods, larvaceans, polychaete larvae, rotifers, crustacean nauplii, marine Cladocera, tintinnids

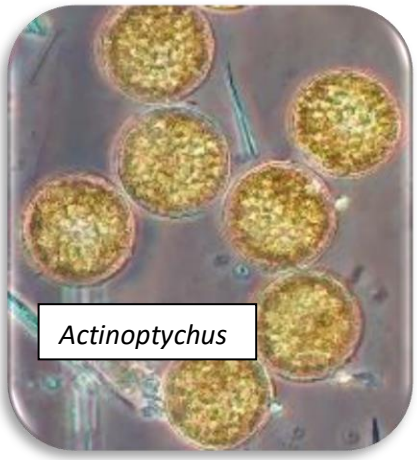
Harmful Algal Bloom (HAB) Species: *Pseudo-nitzschia* (95,000 cells/L), *Dinophysis spp* (202 cells/L)., *Akashiwo sanguinea* (12 cells/L)

	Surface	1.5m	3m
Temp (°C)	14.8	15.4	13.9
Salinity (ppt)	10.97	27.59	28.25
Oxygen (mg/l)	8.54	10.11	7.15
pH	8.03	8.04	7.78

What an amazing kick-off to the What's Blooming in Budd summer season. Thank you, Jeanne and Roberta, for volunteering to educate folks about plankton and Budd Inlet water quality! I couldn't have done it without you! We had almost 80 visitors swing by the table to peek through the microscopes, including an entire fleet of campers from Olympia Community Sailing!

The *Pseudo-nitzschia* bloom (responsible for Amnesic Shellfish Poisoning) continues to persist in lower Budd Inlet. Last week, cell counts were 1,356,000 cells/L (!); this week they are 95,000 cells/L. If you were on the waterfront today, you may have noticed that the water was streaked with large bands of bright orange (visible in the photo behind Roberta and Jeanne)! This is *Noctiluca scintillans*, bioluminescent in most places. *Dinophysis* (responsible for Diarrhetic Shellfish Poisoning) are also on the rise!





June 29, 2023 – Budd Inlet, Port Plaza

Secchi disk (water clarity): 3.5 meters

Blooming Phytoplankton Species: *Noctiluca*

Common Phytoplankton Species: *Scrippsiella, other very small dinoflagellates*

Zooplankton: bivalve larvae, copepods, larvaceans, polychaete larvae, rotifers, crustacean nauplii, tintinnids, barnacle larvae.

Harmful Algal Bloom (HAB) Species: *Pseudo-nitzschia* (381 cells/L), *Dinophysis spp* (6 cells/L), *Akashiwo sanguinea* (12 cells/L)

	Surface	1.5m	3.0m
Temp (°C)	19.1	14.9	13.4
Salinity (ppt)	26.01	28.11	28.4
Oxygen (mg/l)	8.17	6.81	5.62
pH	8.06	7.97	7.85

It was a busy day at the dock! Gerardo Chin-Leo, professor at The Evergreen State College, and his summer students were collecting water quality data before boating on to a new location. Olympia Community Sailing campers stopped by as well. Mia, from Olympia High School, and Jeanne, PSI's fabulous volunteer, were on-hand to help folks use plankton nets, secchi disks, the YSI, and load slides onto microscopes! Thank you, both! Zooplankton were plentiful in the samples today with the true stars being the jellyfish! An enthusiastic party from Indiana scooped dozens of ctenophores and egg-yolk/fried-egg into the viewing bin.

Harmful algal bloom species were not of concern. The *Pseudo-nitzschia* bloom (*P.N. pungens*) has completely dissipated and *Dinophysis* cell counts were extremely low. *Akashiwo sanguinea*, a dinoflagellate associated with shellfish mortality events (and seabird mortality on the coast) were found, but in small numbers. *Noctiluca* were plentiful floating to the top of the jar and forming an orange band. Here are a few of today's zooplankton species….

July 6, 2023 – Budd Inlet, Port Plaza

Secchi disk (water clarity): 1.5 meters

Blooming Phytoplankton Species: *Ceratium*

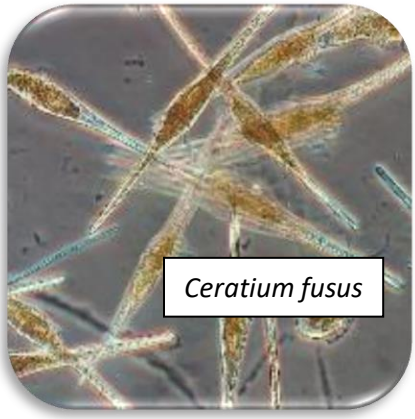
Common Phytoplankton Species: *Scrippsiella, Protoperidinium, and other very small dinoflagellates*

Zooplankton: copepods, rotifers, tintinnids, barnacle larvae.

Harmful Algal Bloom (HAB) Species:, *Dinophysis spp* , *Akashiwo sanguinea*

	Surface	1.5m	3.0m
Temp (◦C)	21.6	17.4	14.7
Salinity (ppt)	22.02	27.46	28.38
Oxygen (mg/l)	10.8	11.7	9.0
pH	8.17	8.48	7.99

Boy was it a hot one at the dock today! Gathering samples from the water offered some relief from the heat and man did we have fun splashing around with the Olympia Community Sailing campers again- those kids are a hoot! Thank you again Jeanne, our incredible volunteer for helping with our Sound Toxins sampling and Outreach. It was so pleasant to interact with so many out-of-town folks here on their 4th of July trips. What a great place to celebrate! This week the water was pretty brown to the naked eye. When participants gathered a secchi disc reading the water clarity was only 1.5m! We grabbed our plankton sample and observed there were SO many *Ceratium* (a dinoflagellate phytoplankton) in the water. It's incredible to see the change in phytoplankton blooms week to week. Harmful Algal Bloom species present this week were *Akashiwo sanguinea* and *Dinophysis spp* . Both were in low concentration and do not pose a threat at this time.



July 13, 2023 – Budd Inlet, Port Plaza

Secchi disk (water clarity): 3 meters

Blooming Phytoplankton Species: *Ceratium*

Common Phytoplankton Species: *Polykrikos*, *Scrippsiella*, *Protoperidinium, and other very small dinoflagellates*

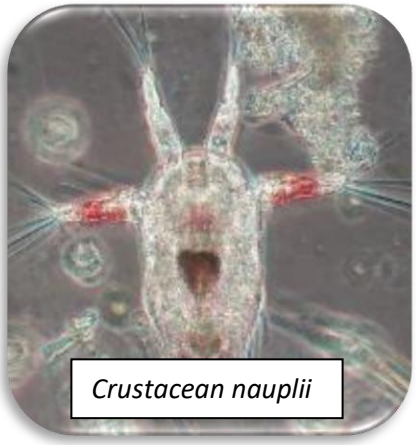
Zooplankton: Tiarina, Bivalve Larvae copepods, crustacean nauplii, polychaete.

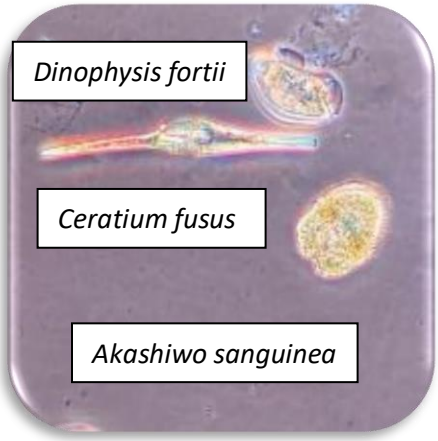
Harmful Algal Bloom (HAB) Species:, *Dinophysis spp* , *Akashiwo sanguinea*

	Surface	1.5m	3.0m
Temp (°C)	18	17.7	14.9
Salinity (ppt)	20.94	27.00	28.50
Oxygen (mg/l)	6.63	8.36	4.90
pH	7.96	8.09	7.72

What a wonderful turnout to today's What's Blooming event!! Nearly 90 folks joined us on the dock to see what was in the water. One guest was lucky enough to catch a nudibranch! Another retrieved their own plankton sample and found two barnacle larvae in it. There was still a large presence of *Ceratium* in the water, though not as highly concentrated as last week. As for HABs: two species of *Dinophysis* and a handful of *Akashiwo* were observed - low concentrations again. The water was much clearer, 3.5 m, and slightly colder than last week. A scattering of Egg yolk Jellies and Ctenophores had the kiddos scooping voraciously to try and catch them.

Thank you again to Jeanne and Roberta for helping us collect our Sound Toxins sample, and for offering your expertise and wisdom to our participants. We appreciate your volunteer work!





July 20, 2023 – Budd Inlet, Port Plaza

Secchi disk (water clarity): 2.8 meters

Blooming Phytoplankton Species: *Ceratium fusus*

Common Phytoplankton Species: *Akashiwo sanguinea, Dinophysis*

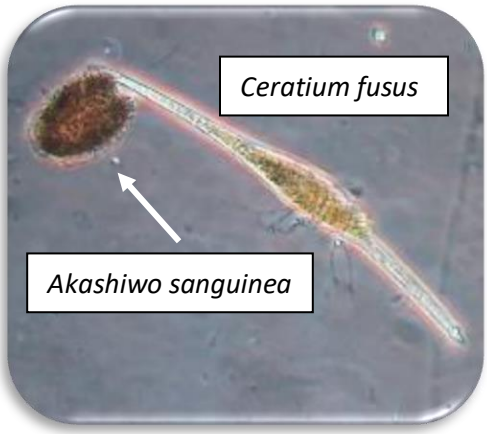
Zooplankton: Tiarina, bivalve larvae copepods, crustacean nauplii, larvaceans, rotifers

Harmful Algal Bloom (HAB) Species:, *Dinophysis spp (1,393 cells/L)* , *Akashiwo sanguinea* (1,101 cells/L), *Protoceratium reticulatum (*12 cells/L)

	Surface	1.5m	3.0m
Temp (°C)	20.8	18.0	16.2
Salinity (ppt)	23.81	27.74	28.4
Oxygen (mg/l)	6.22	10.67	8.42
pH	7.94	8.45	8.23

It's been hot all week! Plankton richness was up…we recorded 37 different species – 16 diatoms, 11 dinoflagellates and 10 zooplankton species. However, most of the sample was comprised of the dinoflagellates *Ceratium fusus, Akashiwo sanguinea* and *Dinophysis spp*. The first 2 turning the plankton nets a rich orange color as we pulled them out of the water. Akashiwo and Protoceratium are both associated with shellfish mortality events. Dinophysis is the species responsible for Diarrhetic Shellfish Poisoning. Counts for all 3 of these species will be entered into the SoundToxins database.

Oxygen and pH levels have fortunately increased since last week. Egg yolk/fried egg jellies were plentiful as well as a nice mix of smaller zooplankton, especially tiarina. Families and groups joined us all the way from Minnesota, Florida and even Thailand! So fun spending time with so many marine enthusiasts!



July 27, 2023 – Budd Inlet, Port Plaza

Secchi disk (water clarity): 2.4 meters

Blooming & Common Phytoplankton Species: *Ceratium fusus & Akashiwo sanguinea; Dinophysis*

Zooplankton: Tiarina, bivalve larvae crustacean nauplii, tintinnids, rotifers

Harmful Algal Bloom (HAB) Species: *Dinophysis (1,667 cells/L), Akashiwo sanguinea (6,690 cells/L), Protoceratium reticulatum (107 cells/L), Pseudo-nitzschia (24 cells/L).*

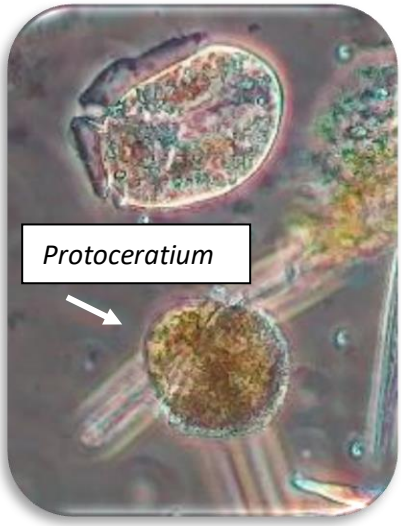
	Surface	1.5m	3.0m
Temp (°C)	18.6	16.9	15.0
Salinity (ppt)	21.63	28.31	28.7
Oxygen (mg/l)	8.55	11.97	3.48
pH	8.32	8.38	7.73

So wonderful having Shriya (Oly HS intern, now UW Freshman) and Jeanne helping today!

Akashiwo and *Ceratium* are blooming! You may have noticed the orange/brown coloration of the water, especially in East Bay. *Dinophysis* continues to increase and *Protoceratium* and *Pseudo-nitzschia* were also present. Each of these species (except *Ceratium*) are HAB species that must be enumerated and reported to SoundToxins. *Akashiwo* and *Protoceratium* are associated with shellfish mortality; *Dinophysis* with Diarrhetic Shellfish Poisoning (DSP), & *Pseudo-nitzschia* with Amnesic Shellfish Poisoning.

Last week, *Dinophysis* counts rose sharply to 1,300 cells/L. After reporting to SoundToxins, Washington Department of Health responded by requesting additional DSP testing for Budd Inlet. Cool! That's exactly how this program is designed to work – a citizen science program that works to protect human health and safety. Love it!

This week, we immediately preserved our plankton sample with Lugol's iodine solution. Unpreserved, this athecate (no-plate) dinoflagellate quickly turns to "mush" on warm days…even if kept in a cooler. This quick degradation makes counting cells in the lab extremely difficult. Check out the difference! Come join us next week to see what's blooming!



August 3, 2023 – Budd Inlet, Port Plaza

Secchi disk (water clarity): 1.3 meters

Blooming & Common Phytoplankton Species: *Ceratium fusus; Akashiwo sanguinea & Protoceratium reticulatum.*

Zooplankton: Barnacle larvae, crustacean nauplii, copepod, polychaete, tintinnids, larvaceans.

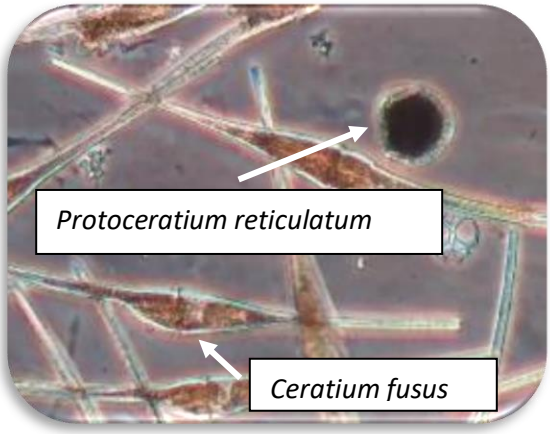
Harmful Algal Bloom (HAB) Species:, *Dinophysis (482 cells/L) , Akashiwo sanguinea (702 cells/L), Protoceratium reticulatum (946 cells/L).*

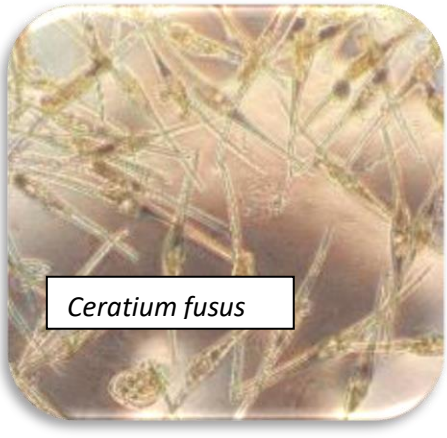
Great turnout at the dock today, 100+ participants!!

	Surface	1.5m	3.0m
Temp (°C)	21.8	17.0	15.6
Salinity (ppt)	24.40	28.57	28.64
Oxygen (mg/l)	7.51	6.08	4.17
pH	8.41	8.37	8.14

We had a remarkable time today seeing What's Blooming in Budd. The water this morning was so still and there was not even the slightest breeze until 11:30. These stagnant conditions coupled with long sunny days allow for stratified water. As you can see from the YSI data we have a surface temperature of 21.8°C and 15.6°C at 3 meters. In these conditions we tend to see a shift in community towards the locomotive phytoplankton, our dinoflagellates. Today's sample showed just that. To the eye the water was a dense brown color and under the scopes we found a bloom of *Ceratium fusus.* This dinoflgellate is not a species of concern and is very typical for the region.

Over the past two weeks *Dinophysis* counts have remained over 1,000 cells/L and this week *Dinophysis* is still present but has plummeted to 482 cells/L. Presence of *Akashiwo sanguinea* is still common but went down slightly. There was an interesting up-tick in the presence of *Protoceratium reticulatum* which will be monitored closely. This species has been associated with shellfish mortality events in the past. PSI also conducted a cleanup at Port Plaza that a great number of individuals helped with. THANK YOU!! Your efforts lead to a cleaner Puget Sound. We tallied a total of 75 trash items.





August 10, 2023 – Budd Inlet, Port Plaza

Secchi disk (water clarity): 3.5 meters

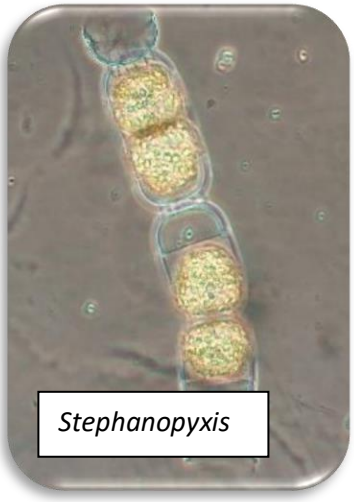
Blooming & Common Phytoplankton Species: *Akashiwo sanguinea. Ceratium, Ditylum, Coscinodiscus, Polykrikos*

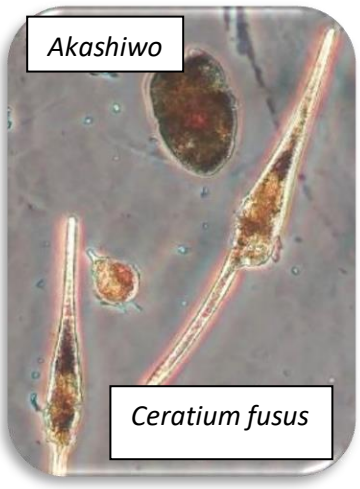
Zooplankton: Polychaete, bivalve larvae, barnacle larvae, rotifer, crustacean nauplii, copepod, tintinnids.

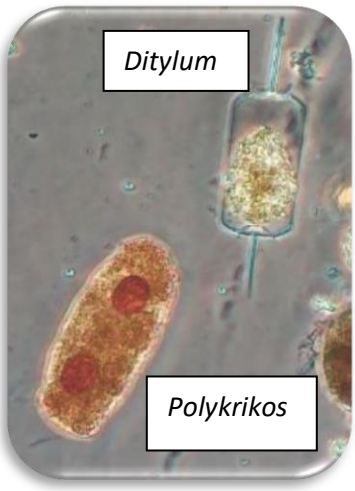
Harmful Algal Bloom (HAB) Species: *Dinophysis(387cells/L), Akashiwo sanguinea (2071 cells/L), Pseudo-nitzschia (220cells/L).*

	Surface	1.5m	3.0m
Temp (°C)	16.6	15.2	15.2
Salinity (ppt)	24.25	28.81	28.82
Oxygen (mg/l)	3.53	4.68	5.00
pH	8.41	8.98	9.31

What a difference a week makes! For the past two weeks the water looked tea colored brown and then poof, today it was clear again. The secchi disc reading was back to 3.5m. Unusual? Not really. Temperatures (both air and water) have dropped considerably this week with winds gusting to 20 mph on the 9th. Plankton communities can shift quickly, especially when the weather changes. Winds can stir up surface waters - sometimes causing existing blooms to dissipate and be replaced by new species. The dissolved oxygen levels were lower than we have seen in a while, averaging about 4 mg/l throughout the water column. When a blooming population dies, it can often lead to areas called dead zones. As the phytoplankton settle to the seafloor, they are consumed by bacteria, which respire and take out massive amounts of oxygen from the area. These dead zones become a harsh place for benthic communities to live, given the lack of oxygen. Sessile animals often perish while the more mobile ones can migrate to healthier waters. At the surface, however, there are open spaces for new plankton to proliferate and these are a few of this week's species.







August 17, 2023 – Budd Inlet, Port Plaza

Secchi disk (water clarity): 1.5 meters

Blooming & Common Phytoplankton Species: *Ceratium fusus, Akashiwo sanguinea. Coscinodiscus, Prorocentrum, Scrippsiella, Protoperidinium*

Zooplankton: Bivalve larvae, crustacean nauplii, rotifers.

Harmful Algal Bloom (HAB) Species: *Dinophysis, Akashiwo, Pseudo-nitzschia.*

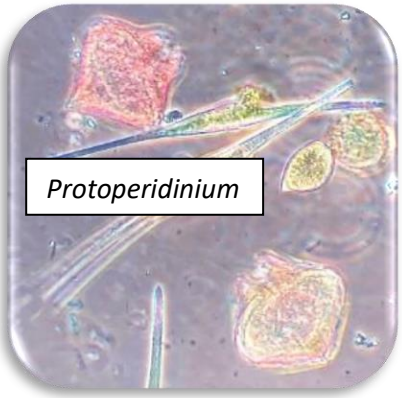
	Surface	1.5m	3.0m
Temp (°C)	23.6	17.0	16.5
Salinity (ppt)	23.23	28.58	28.80
Oxygen (mg/l)	8.80	7.57	4.52
pH	9.07	8.92	8.47

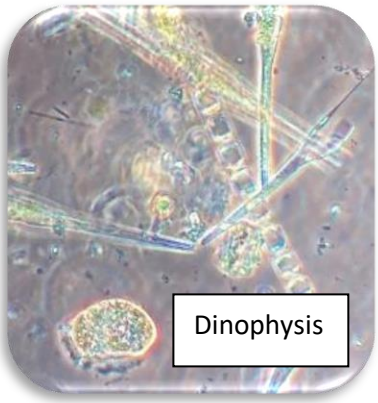
Young scientist measuring salinity with a hydrometer.

Question: How hot does it need to be to get a dock full of people interested in plankton!? Answer: any temperature! This week's heat definitely persuaded people to come down to the dock to cool off. This week was a scorcher with temperatures consistently in the mid 90's and yesterday reaching 97°F!! National Weather Service issued an EXCESSIVE HEAT WARNING so please, drink lots of water and keep cool. Ok, let's see what the heat did for our plankton community.

The YSI data collected today shows a stark difference in surface temperature (23.6°C) and 3-m depth (16.5°C). Our sample was full of a diverse mixture of diatoms, dinoflagellates and zooplankton. *Ceratium fusus* dominated the sample, but there were a fair amount of *Akashiwo sanguinea* still in the mix. These two species are often found together throughout many south Puget Sound inlets during the summer and into fall.

The PSI crew was once again joined by campers from Olympia Community Sailing program. Thank you, kids, for collecting data! Many participants noticed forage fish that were struggling to survive. *Akashiwo sanguinea* has been associated with shellfish, bird and fish mortality and it is believed that the phytoplankton irritates gills inhibiting breathing, creates a surfactant, and/or leads to low DO levels upon decomposition.





August 24, 2023 – Budd Inlet, Port Plaza

Olympia community sailor helping us collect data with a depth gauge.

Secchi disk (water clarity): 4 meters

Blooming & Common Phytoplankton Species: *Ceratium fusus, Prorocentrum, Scrippsiella, Skeletonema.*

Zooplankton: tintinnids, tiarina, rotifers

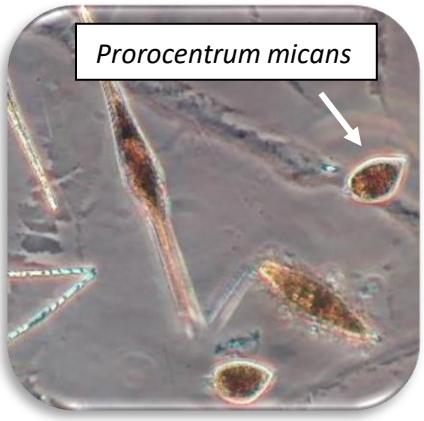
Harmful Algal Bloom (HAB) Species: *Dinophysis, Akashiwo sanguinea, Pseudo-nitzschia.*

	Surface	1.5m	3.0m
Temp (°C)	17.6	16.9	15.9
Salinity (ppt)	19.8	28.51	28.92
Oxygen (mg/l)	6.24	5.66	3.27
pH	8.47	8.39	8.25

What's Blooming today was fantastic! There was a slight breeze and plenty of sunshine to make this a plankton spectating dream. We were visited by a family who just moved to Olympia from Germany and this was their first day here - what a gorgeous welcome! Jeanne and Roberta got right to sampling and noticed a large difference between the surface salinity (19.8 ppt) and the salinity at 3-m depth (28.92 ppt). This is likely due to the rain we had this week, introducing some fresh water to the Sound and not mixing very thoroughly with the denser salt water beneath. The plankton was a rich mix of dinoflagellates with a sprinkling of diatoms, and not a large representation of zooplankton.

The enormous cargo vessel the Star Kirkenes stole the show today. According to the Port of Olympia, it is the first time this massive 684-foot Norwegian vessel has docked here. Last month the ship traveled from Peru, Panama, and El Salvador before coming to Olympia. Its expected date of departure is August 26th.

We were lucky enough to be accompanied by a young scientist who stumbled upon us last week and came back for more. For hours, James diligently collected samples for us to view and enthusiastically said, "When I look through the microscope it looks like there are billions of shooting stars, like tiny fireworks that I can almost touch!" Thank you James- we agree! Here are a few of this week's stars:



September 1, 2023 – Budd Inlet, Port Plaza

Secchi disk (water clarity): 3.5 meters

Blooming & Common Phytoplankton Species: *Ceratium fusus, Prorocentrum micans, Odontella mobiliensis*

Zooplankton: tintinnids, tiarina, rotifers, larvaceans, bivalve larvae, crustacean nauplii, polychaete larvae.

Harmful Algal Bloom (HAB) Species: *Dinophysis, Akashiwo sanguinea, Pseudo-nitzschia.*

	Surface	1.5m	3.0m
Temp (°C)	17.4	16.6	16.2
Salinity (ppt)	24.27	28.85	29.0
Oxygen (mg/l)	4.34	5.36	4.16
pH	8.25	8.53	8.46

Due to yesterday's downpour, we postponed our event until today, Friday, which coincides with Olympia's Harbor Days. What a grand finale! Over 100 people stopped to look through the microscopes. Thank goodness I had my faithful team with me – thank you Jeanne, Roberta, and Mary Elizabeth!

Today's sample was diverse and beautiful. *Ceratium fusus* was still blooming, but there was a nice assemblage of diatoms (17 species), dinoflagellates (13 spp.) and zooplankton (8 spp.). *Prorocentrum micans* and *Odontella mobiliensis* were very common. I rarely see *Odontella mobiliensis* (even my taxonomy book states that it's never abundant), but today it was everywhere and actively dividing. *Noctiluca* floated to the surface for a nice end-of-season appearance.

The HAB species, *Pseudo-nitzschia, Dinophysis*, and *Akashiwo* were all present, but in low concentrations. Oxygen levels were on the low side, but not alarming like they can be this time of the year. Overall, the water looked great, and we were excited to observe tons of sea stars cruising around under the docks during low tide. Thanks for stopping by today to see what's blooming, eat zucchini bread, and talk about plankton! See you on the dock next year!