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Comparison of Alexandrium spp. surface sediment cyst maps from Quartermaster Harbor in 2007 and 2017

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The Spatial and Temporal Distribution of *Alexandrium* Cysts in Quartermaster Harbor

Cheryl Greengrove
Julie Masura
Thanh-Thuy Nguyen
Mitch Schatz
& a host of other UWT Students
Puget Sound Watershed

Victoria
Seattle
Olympia
Quartermaster Harbor
Bellingham Bay
Hood Canal
Seattle
Quartermaster Harbor
Olympia

Salish Sea
Life Cycle of a Harmful Alga: *Alexandrium*

1. Cyst
2. Vegetative cells
3. Gametes
4. Zygote

Harmful Algal Bloom (HAB)

Dinoflagellate

Paralytic Shellfish Toxin (PST) Producer

http://www.whoi.edu/redtide/
The Puget Sound *Alexandrium* Harmful Algal Bloom (PS-AHAB) project laboratory experiments found:

**Factors controlling cyst germination**

*Prefers light and warmer conditions*

Puget Sound *Alexandrium* growth rates

*Puget Sound *Alexandrium* are euryhaline (20-35 psu) with a broad optimal temperature range (13-24°C)*

Why do we care?

What are the ways we can detect *Alexandrium* and Paralytic Shellfish Toxins (PSTs)?

- Cysts in the sediment
- Vegetative cells in the water column
- PSTs in shellfish
Alexandrium outbreaks, shellfish toxicity, & human illnesses have plagued Puget Sound for decades

Native American Stories & Ship Logs

HMS Discovery

1793

Captain George Vancouver
http://www.vancouvermaritimemuseum.com

PSP More Recently:
• 1942 – 3 deaths
• 2012 – 9 reported PSP illnesses
• Most years – shellfish bed closures

Shellfish Bed closures due to PST

Shellfish harvesting closures due to PST by decade in Puget Sound based on Washington State Department of Health (WDOH) monitoring data. Trainer et al. (2003)
Where are cysts located?

*2005 data from Horner et al. (2011): Harmful Algae
Maximum PST Levels in Shellfish
(ug/100 g shellfish tissue)

80 ug/100 g is the closure limit

Data courtesy of Washington State Department of Health
Quartermaster Harbor
*Alexandrium* in water column & PST in shellfish

80 ug/100 g is the closure limit

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**WADOH PSP data in Quartermaster Harbor 2000 - 2013**

- PSP detection (ug toxin/100g shellfish tissue)
- 2000
- 500

**Alexandrium spp. concentration (cells/Liter) in Quartermaster Harbor, WA 2007 - 2012**

- 200000
- 100000
- 20000
- 0

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Fig. 3. Changes in PSP in muscles and density of *G. catenella* in afternoon samples at 0.5 m depth, Station DT, April-July 1981.
Comparison of *Alexandrium* cyst distribution in the surface sediments of Quartermaster Harbor

2007 Quartermaster Harbor Cyst Abundance

2017 Quartermaster Harbor Cyst Abundance

![Alexandrium Cyst Distribution Maps](image-url)
Alexandrium cysts, grain size and TOC down core in Quartermaster Harbor

Methods


WHY?

- Shallow incubator bay (light)
- The right water properties (temperature & stratification)
- Long residence time

Mean flush: 85 days

Summary

• Quartermaster Harbor is a hotspot for *Alexandrium* cysts in the sediment, vegetative cells in the water column & PST in shellfish.

• Cyst distribution pattern in the bay remains fairly constant, but the absolute abundance of cysts varies from year to year.

• Factors contributing to making this bay *Alexandrium* heaven are that it is a shallow incubator bay with the right water properties and long residence time.
Questions?

Thanks

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• Captains & Crews of multiple vessels
• Many, many UWT Students