Apr 4th, 4:00 PM - 4:15 PM

Interannual variation of the toxic raphidophyte Heterosigma akashiwo in Departure Bay (Nanaimo): data from the harmful algae monitoring program 2001-2017

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Interannual variation of the toxic raphidophyte *Heterosigma akashiwo* in Departure Bay (Nanaimo):

Data from the Harmful Algae Monitoring Program 2001 - 2017

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Salish Sea Ecosystem Conference 2018, Harmful Algae Session

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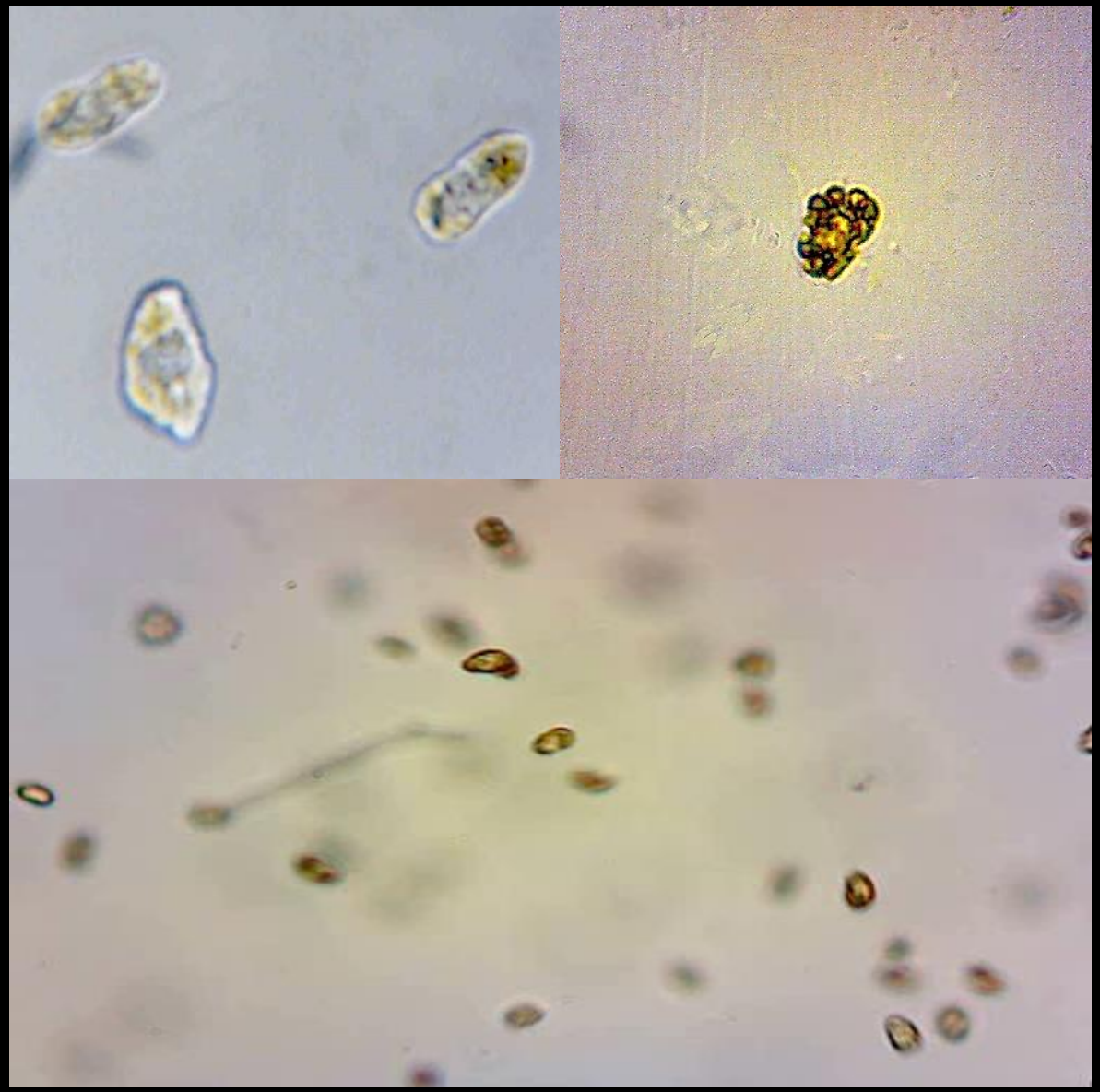
In this talk

- *Heterosigma akashiwo*
- Departure Bay and the Fraser River
- Methods
- Results
- 2017
- Summary

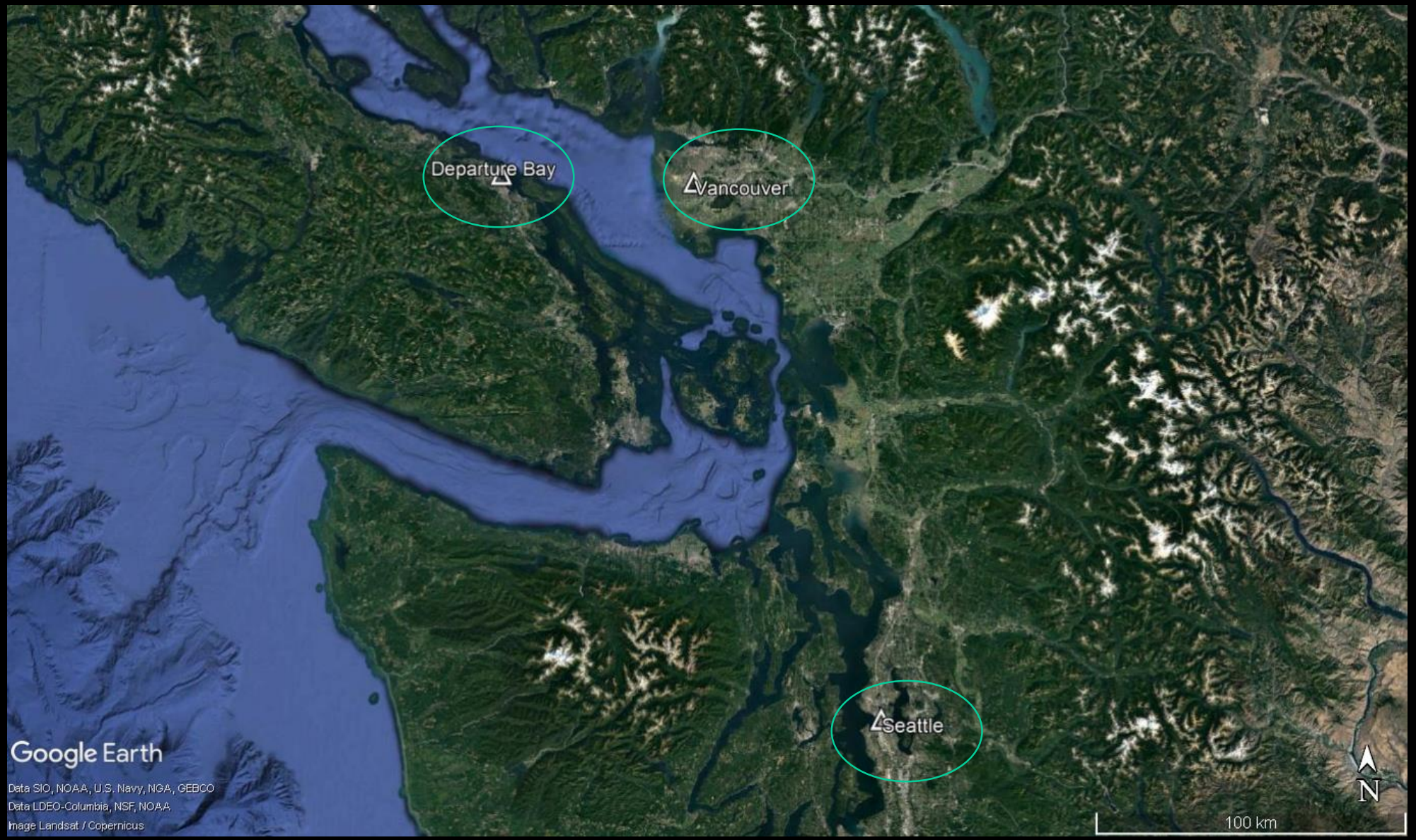
Heterosigma akashiwo



Heterosigma akashiwo cell in Lugol's iodine. Photos by Nicky Haigh and Tamara Brown

- Toxic, bloom-forming raphidophyte.
- Most significant toxic algae in the marine waters of BC (Rensel 2010).
- E.g. 2014: ~280K cultured *S. salar* died over 3 days near Port Hardy due to *Heterosigma*.
- Likely negatively affects juvenile wild salmon during their seaward migration (Rensel et al. 2010).
- Densest in Departure Bay typically mid-late June; lesser blooms July to mid-Sept.
- Global distribution and frequency of *Heterosigma* blooms are increasing (Lewitus 2012).

Departure Bay within the Salish Sea



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Fraser River plume. Photo by Nicky Haigh

Fraser River Plume

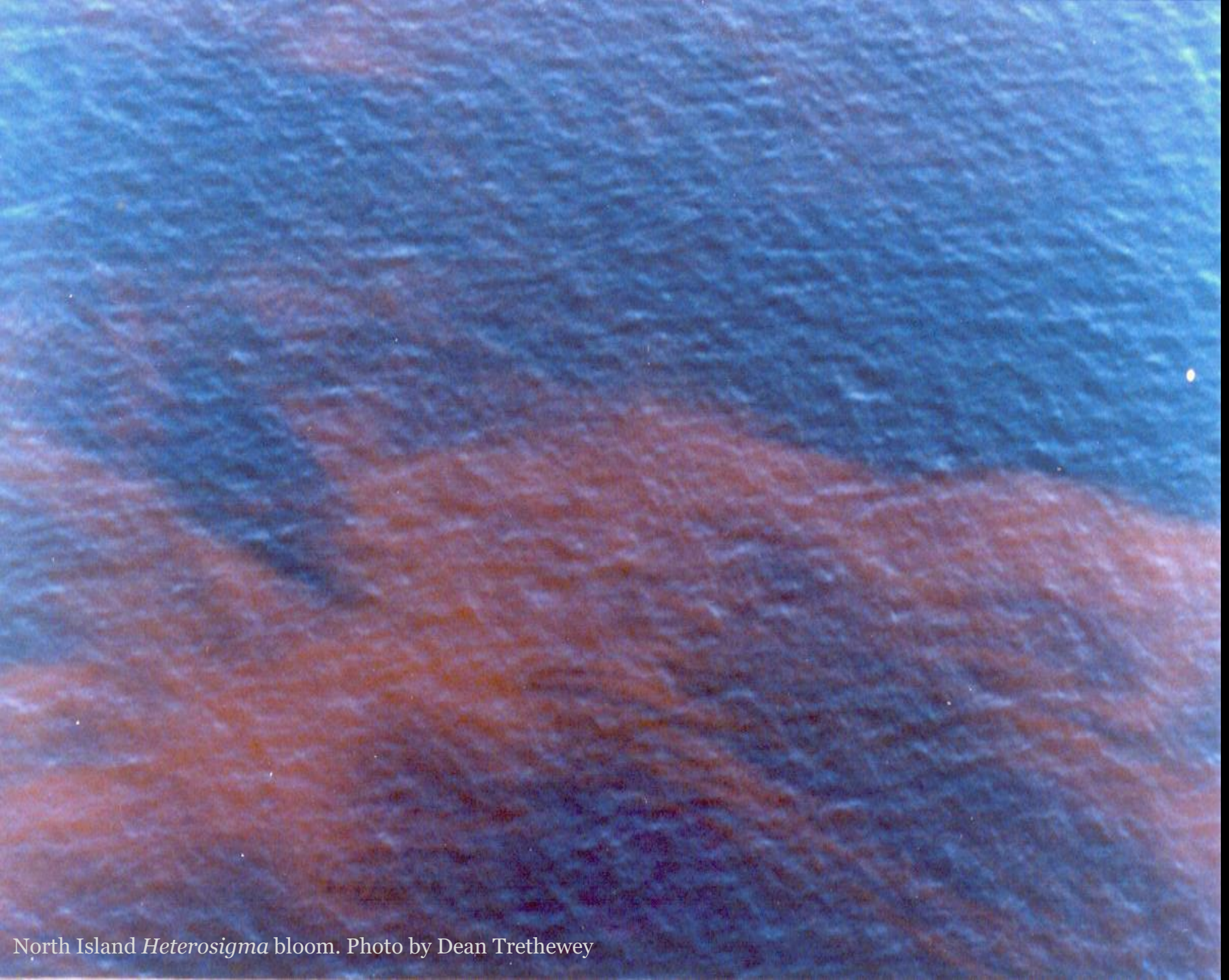
- Strong driver of plankton dynamics in the Salish Sea.
- *Heterosigma* bloom conditions seem to be associated with a decrease in surface salinity due to the Fraser River plume.
- *Heterosigma* cells are strongly advected by the Fraser River (Taylor and Haigh, 1993).

Methods

Devan Johnson sampling the wild plankton

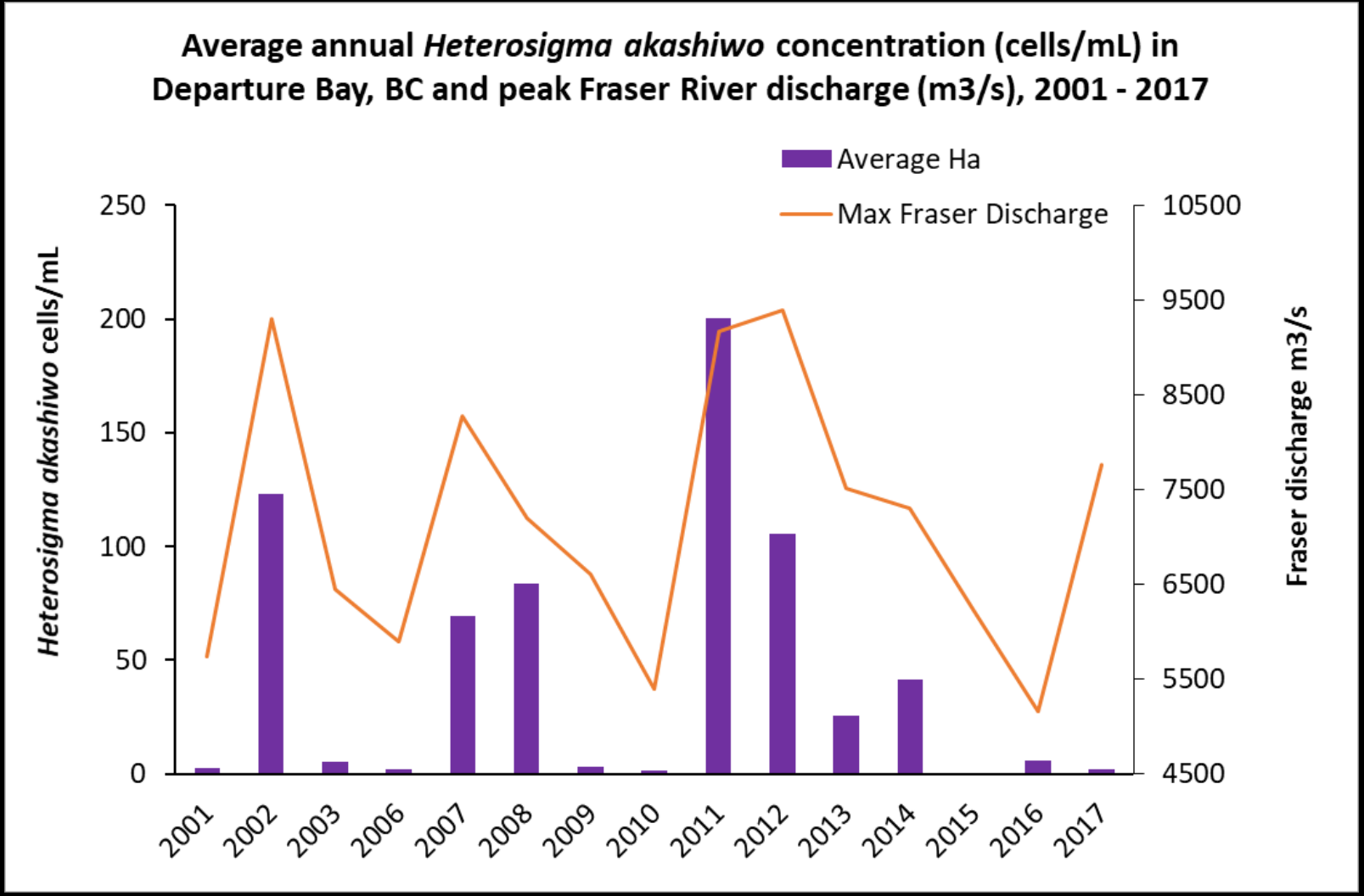
- Weekly samples are taken at 1, 5, and 10 m and preserved with Lugol's iodine.
- Species ID, enumeration, and biomass estimates are made using a Sedgewick-Rafter counting chamber.
- Sampling has been conducted since 1999 by the Harmful Algae Monitoring Program (HAMP).
- HAMP is 100% funded by BC salmon aquaculture companies.
- In this presentation, *Heterosigma* blooms were defined as >200 cells/mL.

Results



North Island *Heterosigma* bloom. Photo by Dean Trethewey

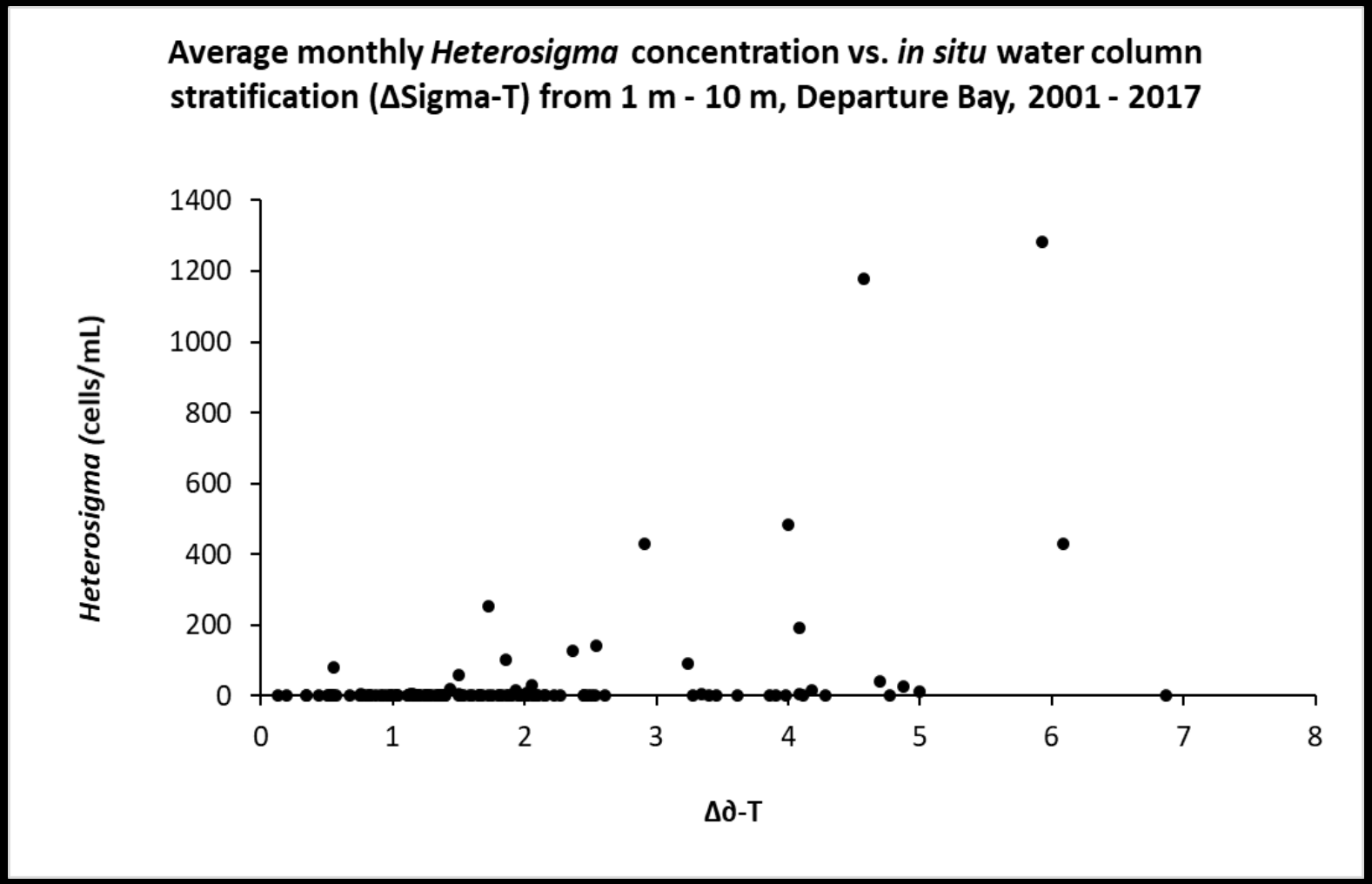
Departure Bay *Heterosigma* and Fraser River Discharge, 2001 - 2017



- ANOVA P < 0.001, very significant
- *Heterosigma* blooms occurred when Fraser River discharge was 2030 – 9400 m3/s, mean 5474.
- *Heterosigma* bloom years: 2002, 2007, 2008, 2011 2012, 2013, and 2014.
- What happened to *Heterosigma* in 2017?

Brown and Haigh, Interannual variability of Heterosigma, SSEC 2018

Heterosigma vs. ΔSigma-T in Departure Bay, 2001 - 2017



- ΔSigma-T is difference between water density at 1 and 10 m; it is a measure of water column stability.
- ANOVA $P < 0.01$, significant
- *Heterosigma* blooms occurred when ΔSigma-T was 0.55 – 6.09, mean 3.12.
- Large ΔSigma-T doesn't implicitly mean *Heterosigma* blooms.

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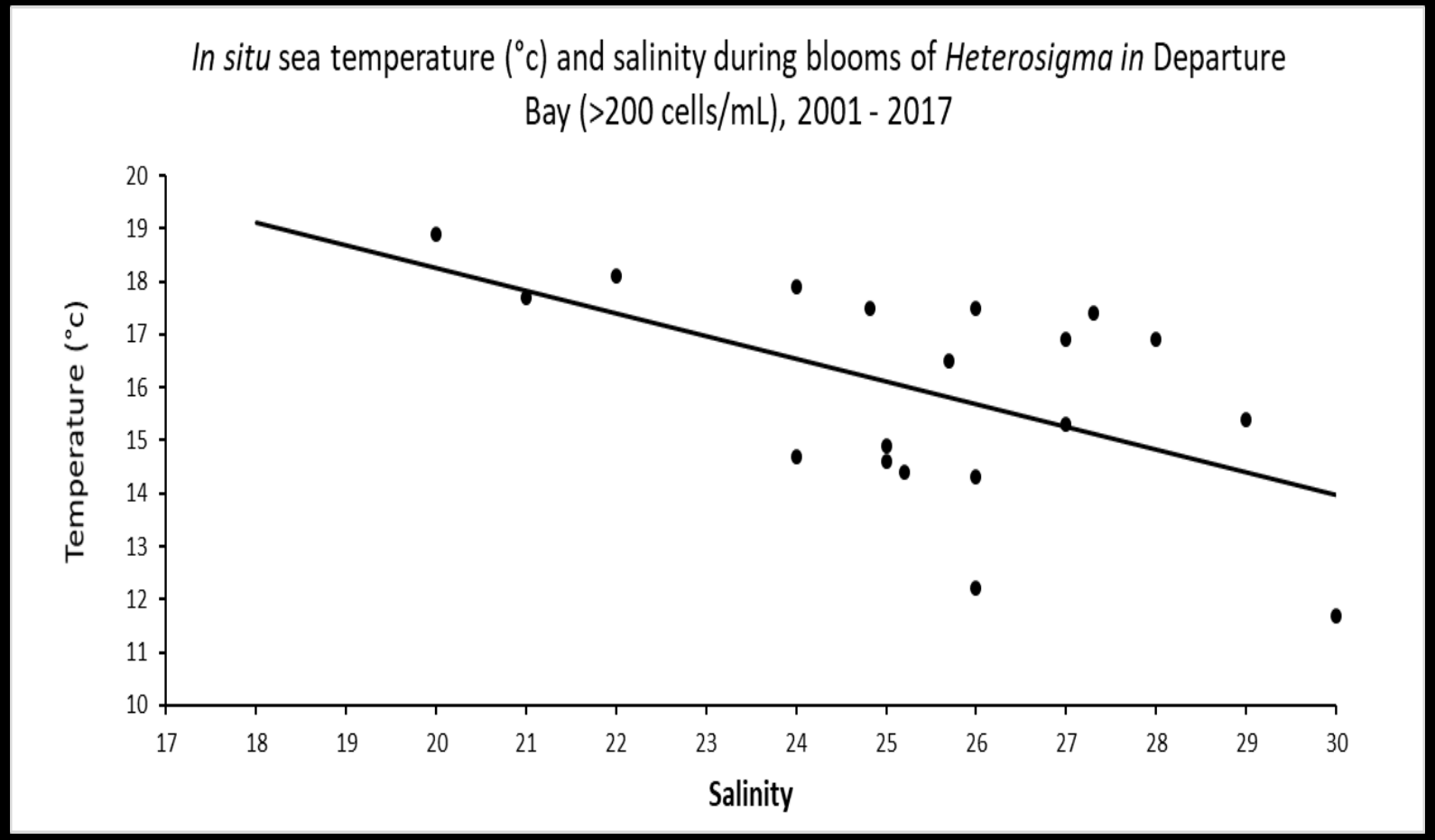
Temperature vs. Salinity during *Heterosigma* blooms in Departure Bay, 2001 - 2017



- *Heterosigma's* relationship to temperature or salinity not significant.
- *Heterosigma* blooms occurred when temperature was 12 - 22 C, mean 16.
- And when salinity was 20 – 30, mean 25.
- Salinity and temperature during *Heterosigma* blooms appear inversely related.

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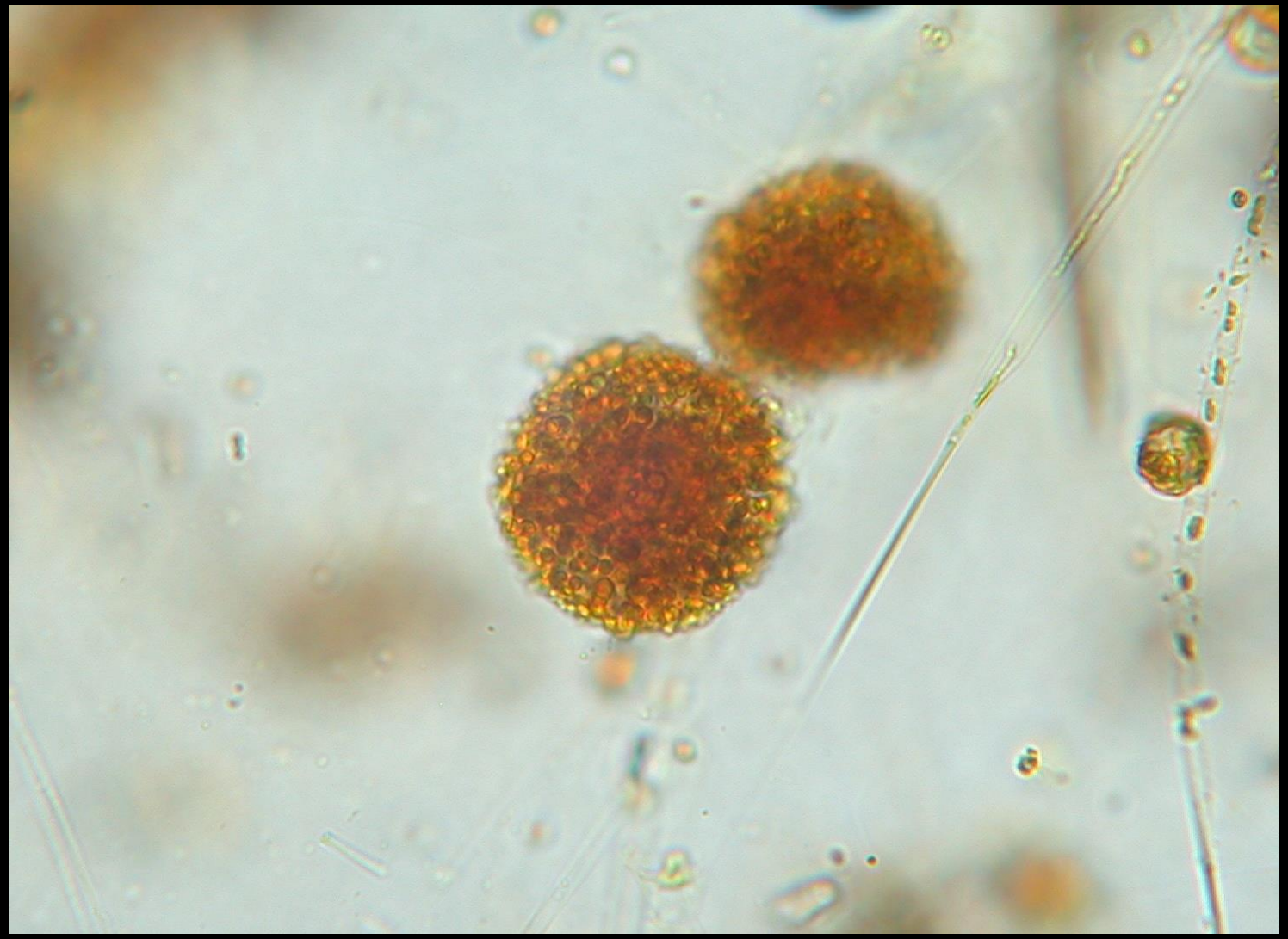
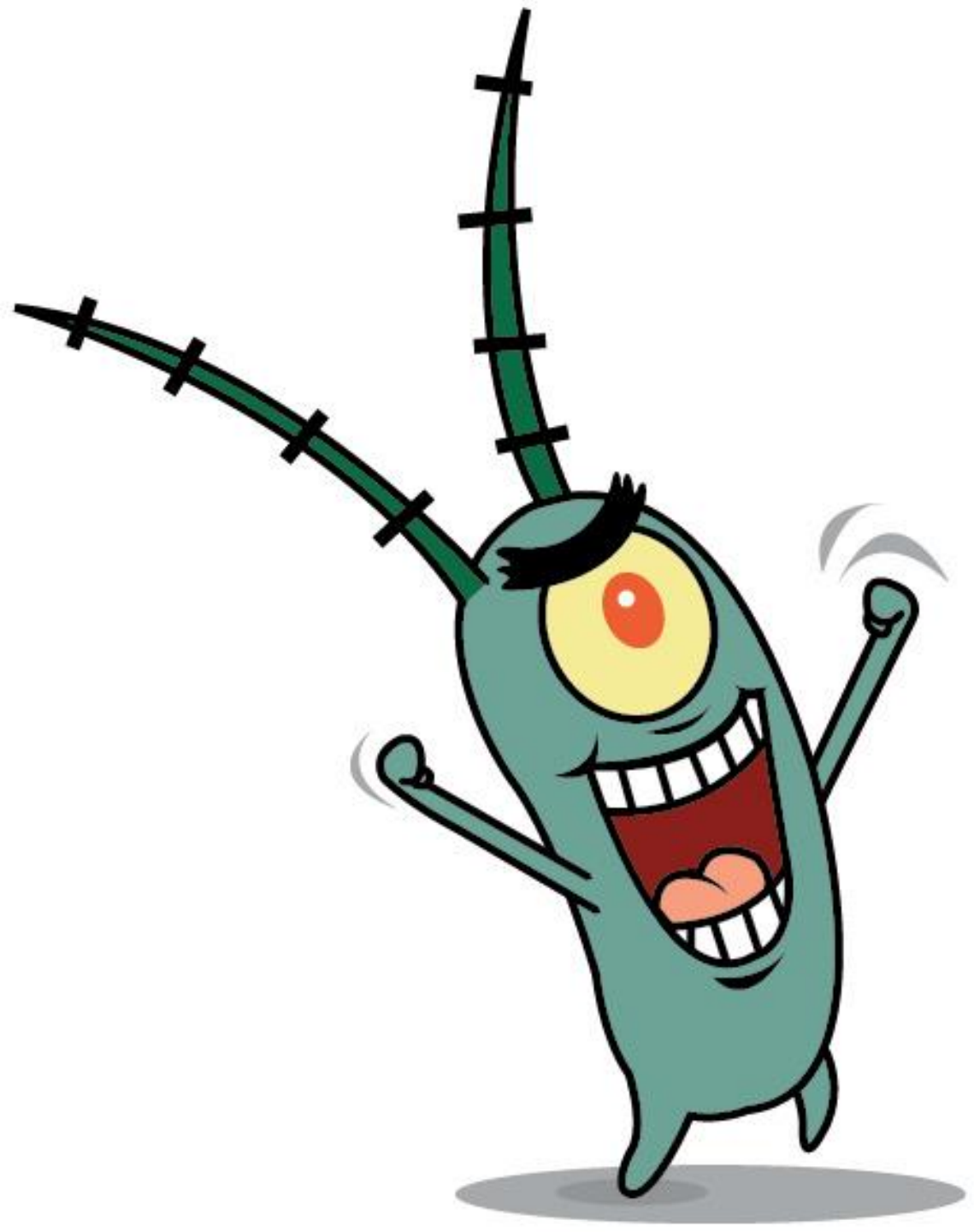
What happened to *Heterosigma* in the Salish Sea in 2017?



Non-skeletal *Dictyocha*. Photo by Nicky Haigh

- Ultimately, we don't know.
- Discharge volume and timing were very close to the mean.
- We didn't see blooms of *Heterosigma* at any of our sites: north Salish Sea, Sechelt and Jervis Inlets, or Departure Bay.
- But, we did see high levels of non-skeletal *Dictyocha* and diatoms when we would expect to see *Heterosigma*.



Summary:

- *Heterosigma* blooms are significantly related to Fraser River discharge and water column stability (ΔSigma-T).
- Temperature nor salinity were significant in regards to *Heterosigma* in Departure Bay.
- There appears to be an inverse relationship between temperature and salinity during *Heterosigma* blooms.
- We don’t know why we didn’t observe Salish Sea *Heterosigma* blooms in 2017, but we saw more diatoms and non-skeletal *Dictyocha*.

Acknowledgements:

- Department of Fisheries and Oceans
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- Marine Harvest Canada
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- Nicky Haigh and Devan Johnson at Microthalassia (The HAMPsters!)

Thanks for listening!

Any questions?

The HAMPsters