Apr 4th, 2:30 PM - 2:45 PM

Harmful algae in the Strait of Georgia, citizen science data

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Svetlana Esenkulova, Isobel Pearsall

Salish Sea Ecosystem Conference, April 2018

Salish Sea Marine Survival Project

5 year, >60 organisations, 10M Project https://marinesurvivalproject.com

Goal:

To determine the primary factors affecting the survival of juvenile salmon and steelhead in the Salish Sea

Dr. Isobel Pearsall – project coordinator
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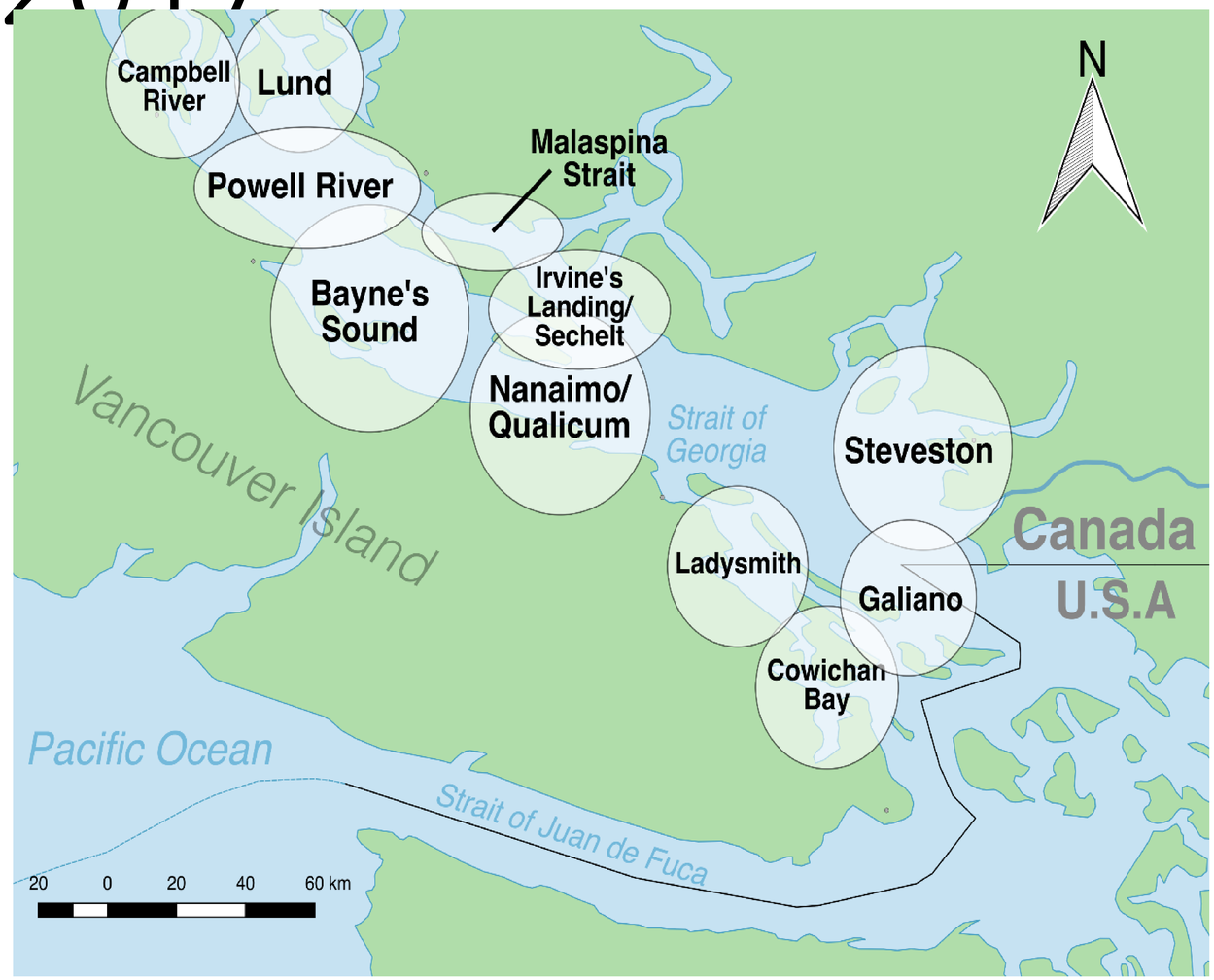
Citizen Science Project

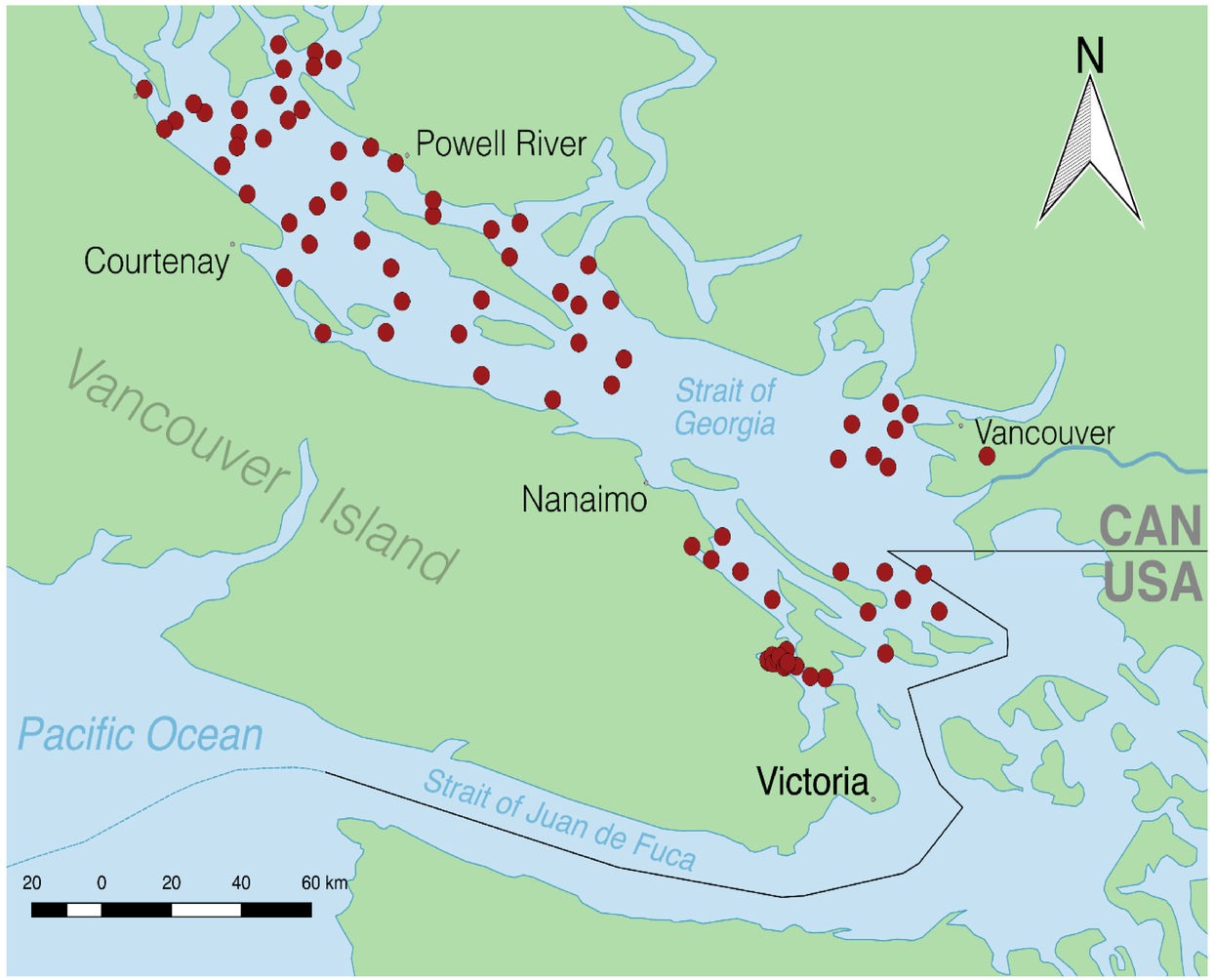
Citizen science is *"scientific work undertaken by members of the general public, often in collaboration with or under the direction of professional scientists and scientific institutions" (*Oxford English Dictionary)

Pacific Salmon Foundation + Ocean Networks Canada + Department of Fisheries and Oceans Canada

3 year project **2015 – 2017** unprecedented amount of data

Sampling stations - Citizen Science 2015 - 2017

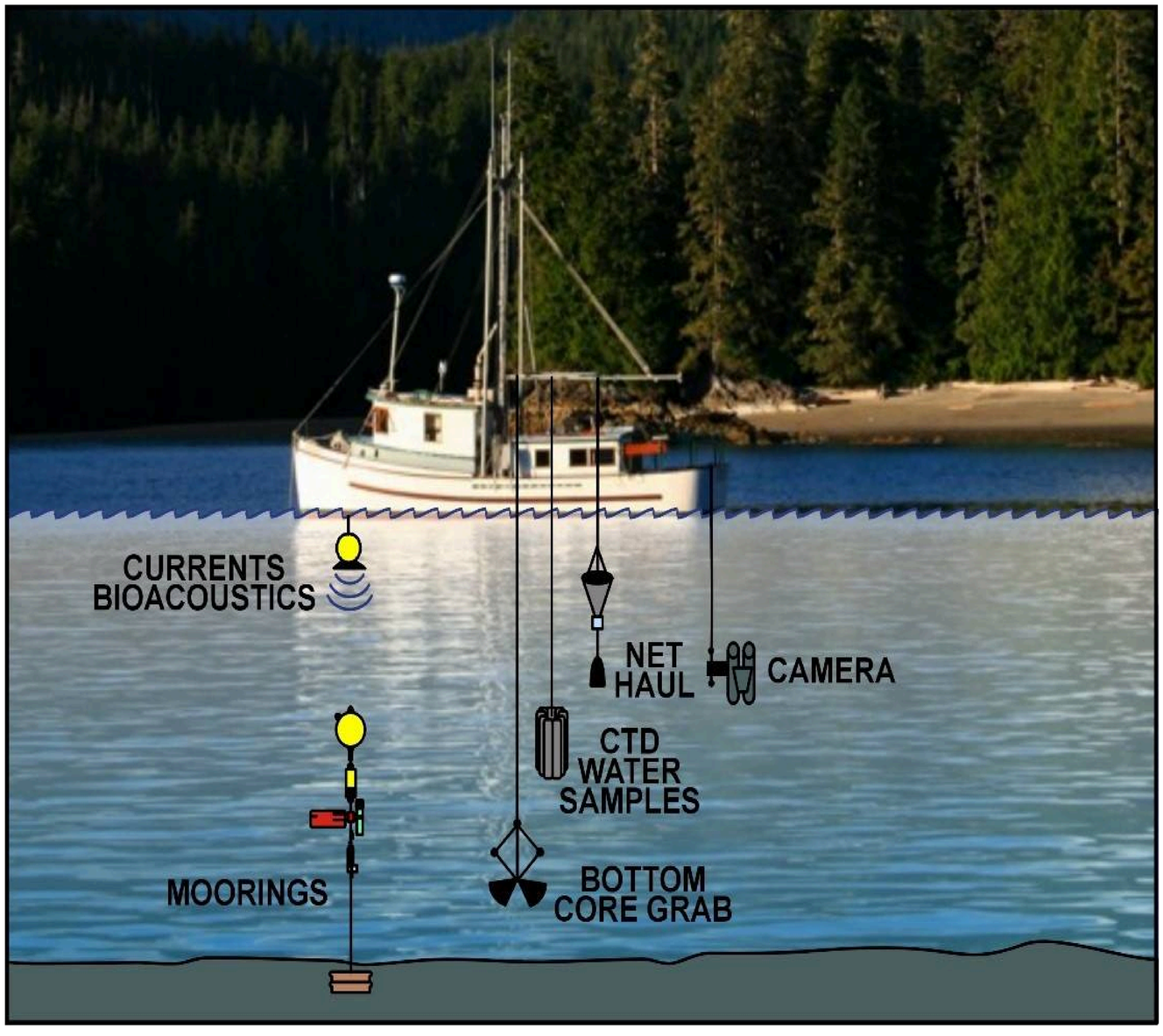




~ 80 stations

~ twice a month from February to October

Sampling: 2015-2017 February to October every ~2 weeks



Physical and chemical parameters

>5000 CTD casts

80 stations
temperature, salinity, density, fluorescence, oxygen,
Secchi ~7700 reading

Nutrients ~5000 samples

10 stations
nitrate+nitrite, silicate, phosphorus

Phytoplankton ~5000

80 stations at the surface 0m
10 stations at 0, 5, 10, 20 m

Zooplankton 260

3 stations

Pit tagging during *Heterosigma* bloom, July 2014

Chinook juveniles caught by purse seine displayed lethargic behavior as well as a dramatic (up to 25 fold) increase in mortality of individuals after a PIT-tagging procedure.

Detailed info – “Observations of *Heterosigma akashiwo* bloom and associated wild salmon lethargic behavior in Cowichan Bay, Canada, 2014” in HAN 50, 2015

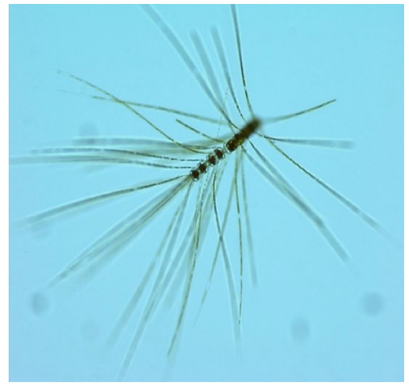
Heterosigma akashiwo levels (maximum counts per month, all depths)

	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
	2015								2016								2017							
Baynes	0	0	0	0	0	1	0	0	0	0	0	1	1	0	0		0	0	0	0	0	2	0	0
Cowichan	0	0	0	0	1	0	0		0	0	0	0	0	2	2	0	0	0	0	0	0	2	0	0
Campbell	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2	1	0
Irvine's	0	0	0	0	0	0		0	0	0	0	1	2	2	3		0	0	0	1	1	2	2	0
Lund	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0
Nanaimo	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	0	0	0	0	1	0	0	0	
Powell	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	0	0	1	0	0	0	1	1	0

Levels: 0 – no cells; 1 – very low; 2 – low; 3- moderate; 4 – high; 5 – very high

no significant (>1000 cells per mL) Heterosigma akashiwo blooms

Chaetoceros convolutus and *concavicornis* levels (maximum counts per month, all depths)



	2015								2016								2017							
	March	April	May	June	July	August	September	October	March	April	May	June	July	August	September	October	March	April	May	June	July	August	September	October
Baynes	4	3	4	1	0	0	0	4	4	0	0	1	0	0	0		1	0	4	0	0	0	0	4
Cowichan	4	0	4	0	0	4	4		0	0	3	0	0	3	0	0	0	0	0	4	0			
Campbell	5	0	5	4	2	0	0	4	0	0	0	2	0	0	0	0								
Irvine's	3	3	2	4	4	2		0	3	0	0	0	0	0	0		4	2	0	0	0	0	0	4
Lund	5	0	5	4	4	0	0	4	3	0	0	0	0	0	0	0	3	4	0	2	0	4	0	4
Nanaimo	1	0	0	2	0	0	0	0	3	0	0	0	2	0	0	0	3	0	0	2	0	2	0	
Powell	4	0	5	4	4	3	0	0	4	1	0	0	0	0	0	0	4	3	0	0	0	4	0	5

Levels: 0 – no cells; 1 – very low; 2 – low; 3- moderate; 4 – high; 5 – very high

Very high levels were recorded in spring 2015 in northern areas of the Strait

Dictyocha spp. levels
(maximum counts per month, all depths)

	2015								2016								2017							
	March	April	May	June	July	August	September	October	March	April	May	June	July	August	September	October	March	April	May	June	July	August	September	October
Baynes	0	0	2	1	0	1	0	0	1	0	1	2	0	1	0		0	0	0	1	2	2	1	1
Cowichan	0	0	0	0	2	1	1		0	0	1	3	3	1	1	1								
Campbell	0	0	0	0	2	1	0	0	0	0	0	3	2	1	0	0	0	0	1	0	0			
Irvine's	2	0	0	1	1	0		0	0	0	0	3	3	3	0		1	0	0	1	2	3	2	1
Lund	0	2	0	0	1	1	1	1	1	0	2	3	3	2	0	1	1	1	1	2	1	3	2	1
Nanaimo	1	0	0	1	0	0	0	0	1	0	1	3	3	2	0	0	1	1	1	1	0	2	0	
Powell	2	0	1	1	1	0	0	1	1	1	0	2	3	3	0	1	1	1	1	1	2	3	1	0

Levels: 0 – no cells; 1 – very low; 2 – low; 3- moderate; 4 – high; 5 – very high

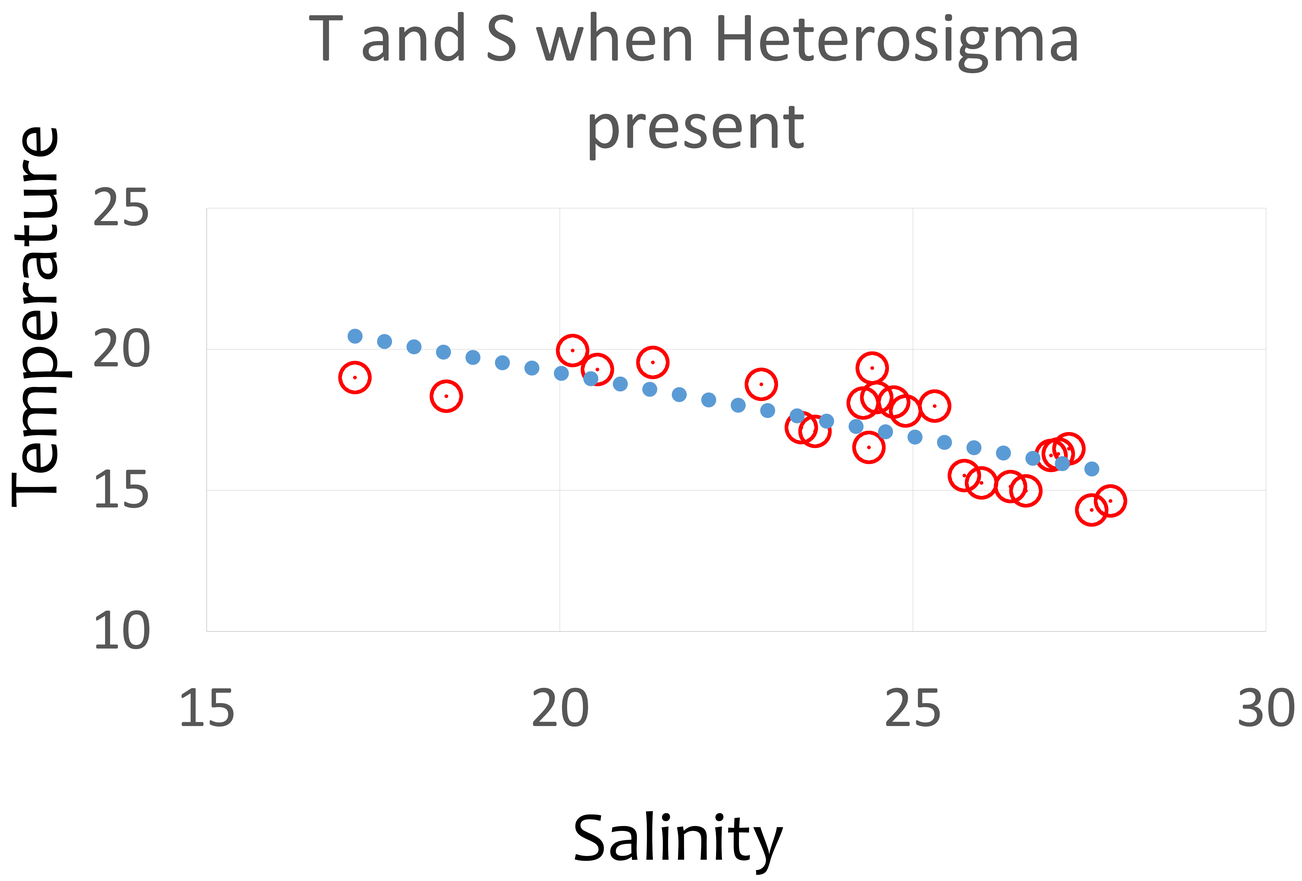
Low and moderate levels were observed from June to August 2016 and during August 2017 at most of the sampling areas

Glimpse at the environmental parameters

Based only on 3 sites in Malaspina Inlet, phytoplankton samples 0m

Heterosigma, 30 samples

- NO3+NO2 at 0m, average=1.39 (from 0 to 20.4); 20m = 14.62 (from 0 to 22.13)
- PO4 at 0 m, average=0.19 (from 0 to 1.89); 20 m =1.01 (from 0 to 2.52)



Average
Temperature at 1m =24
Salinity at 1m =17

Esenkulova, S., Pearsall, I., Novak, C., 2017: Ecology of Alexandrium spp. in the Strait of Georgia, British Columbia, Canada 2015. Harmful Algae News 56, 7-8

Harmful species prevalence

Total number of analyzed phytoplankton samples – 5081

	%
Dictyocha spp. (N=937)	18.4
Rhizosolenia setigera (N=776)	15.3
Alexandrium spp. (N=669)	13.2
Chaetoceros convolutus and concavicorne (N=257)	5.1
Heterosigma akashiwo (N=177)	3.5
Dinophysis spp. (N=76)	1.5
Cochlodinium fulvescens (N=36)	0.7
Noctiluca scintillans (N=25)	0.5

Summary

- Citizen Science is an extremely cost efficient way to gather samples
- SoG 2015 - very high levels of algae mechanically harmful to salmon, 2016/17 - moderate levels of toxic
- Citizen Science Program is going to run in 2018
- Harmful Algae data collected through this program is going to be analyzed and (hopefully) published

Thank you