

***Heterosigma akashiwo* bloom in Cowichan Bay, Canada during 2014 and associated environmental conditions**

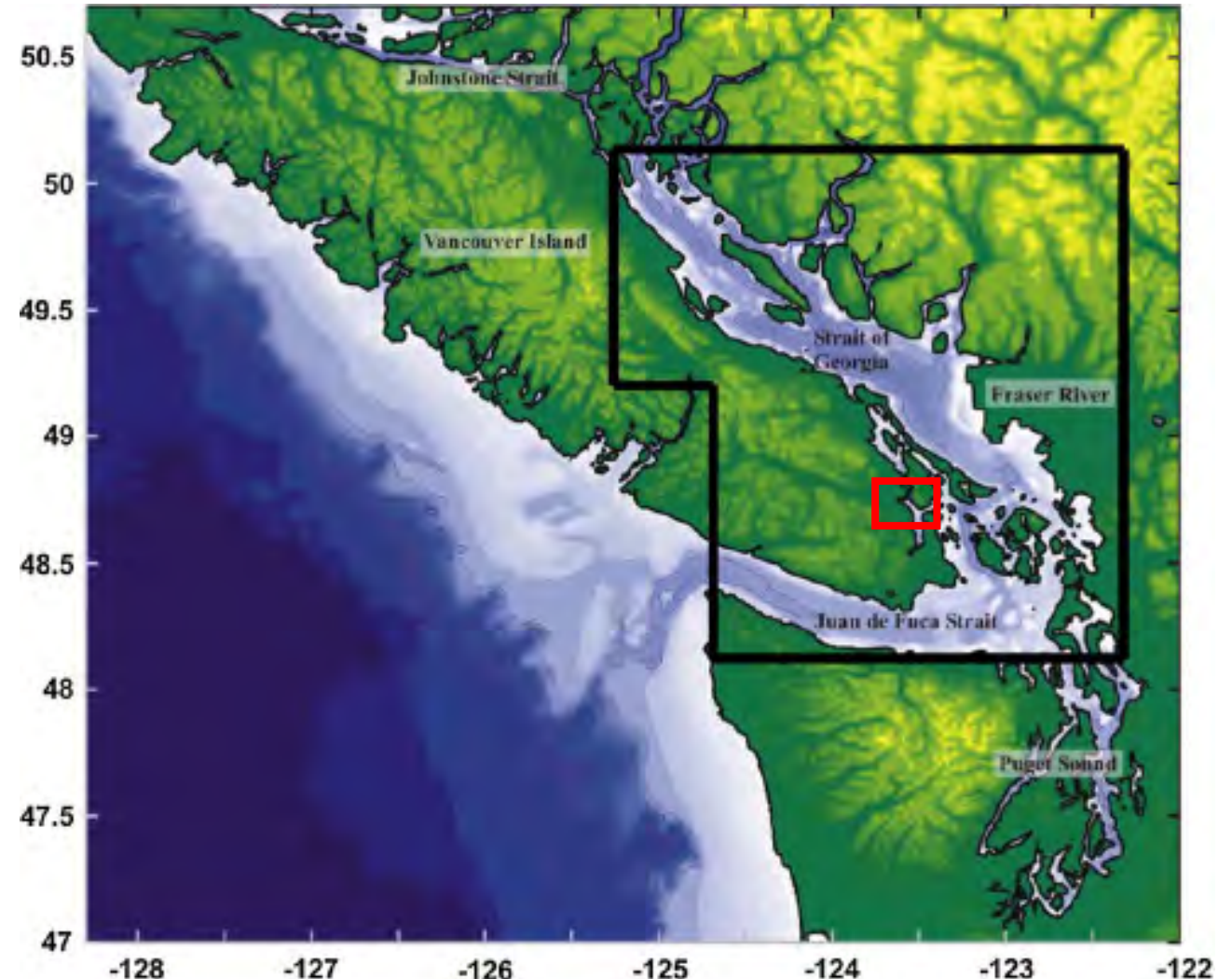
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1 Pacific Salmon Foundation
2 Department of Fisheries and Oceans

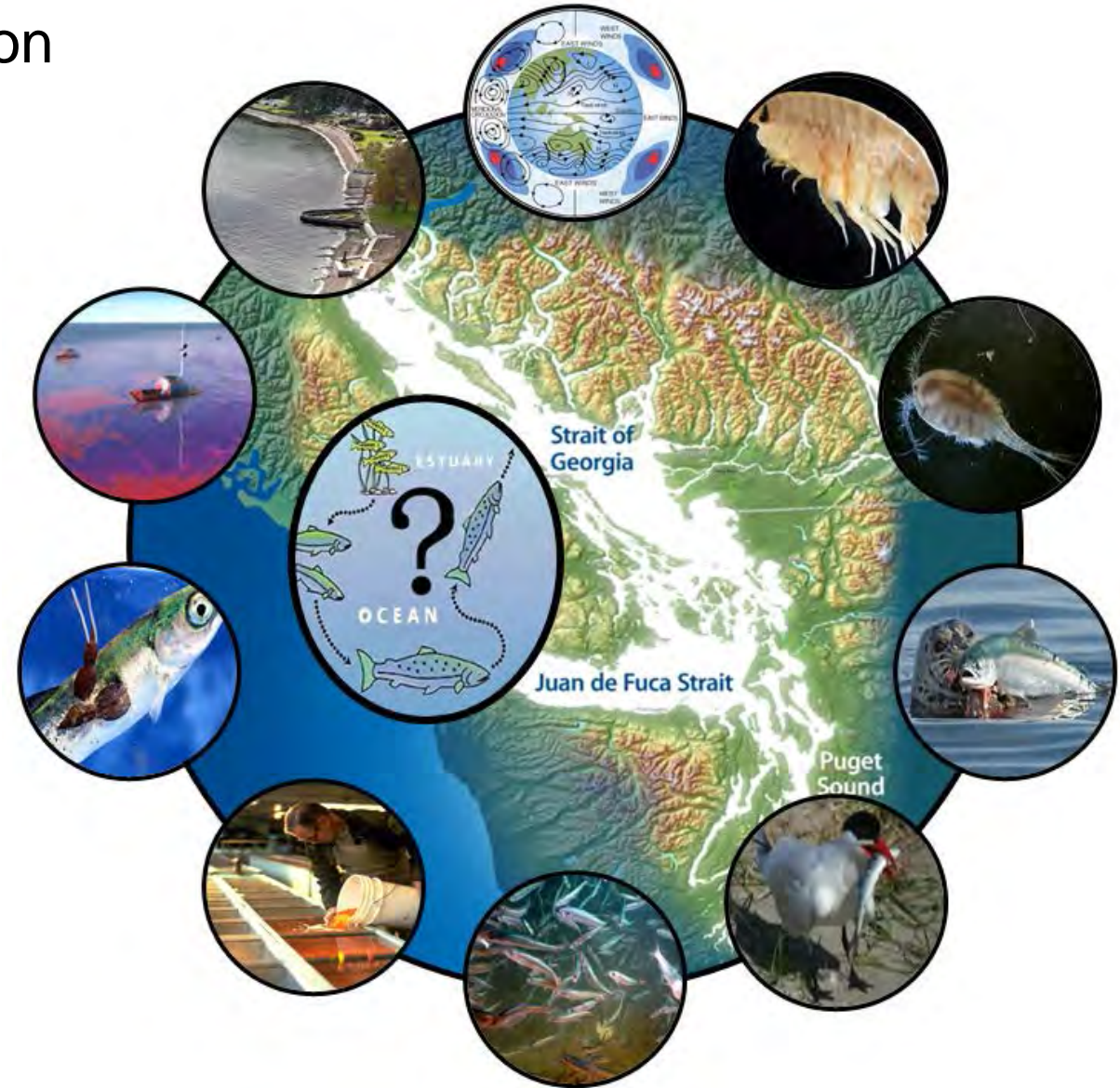
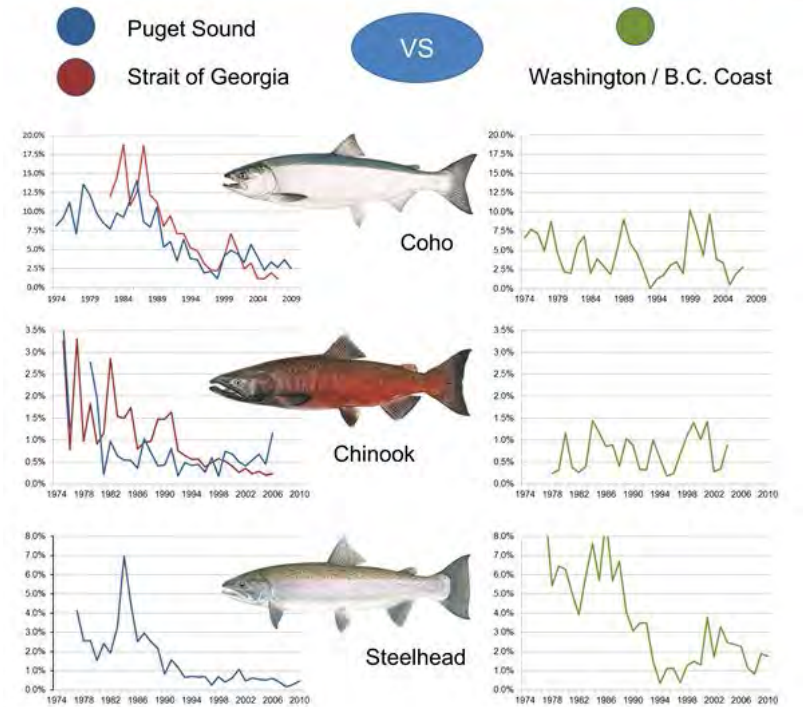


Study area – Cowichan Bay, British Columbia, Canada



Salish Sea Marine Survival Project

striking decline of Chinook and Coho salmon abundance during the past 20 years



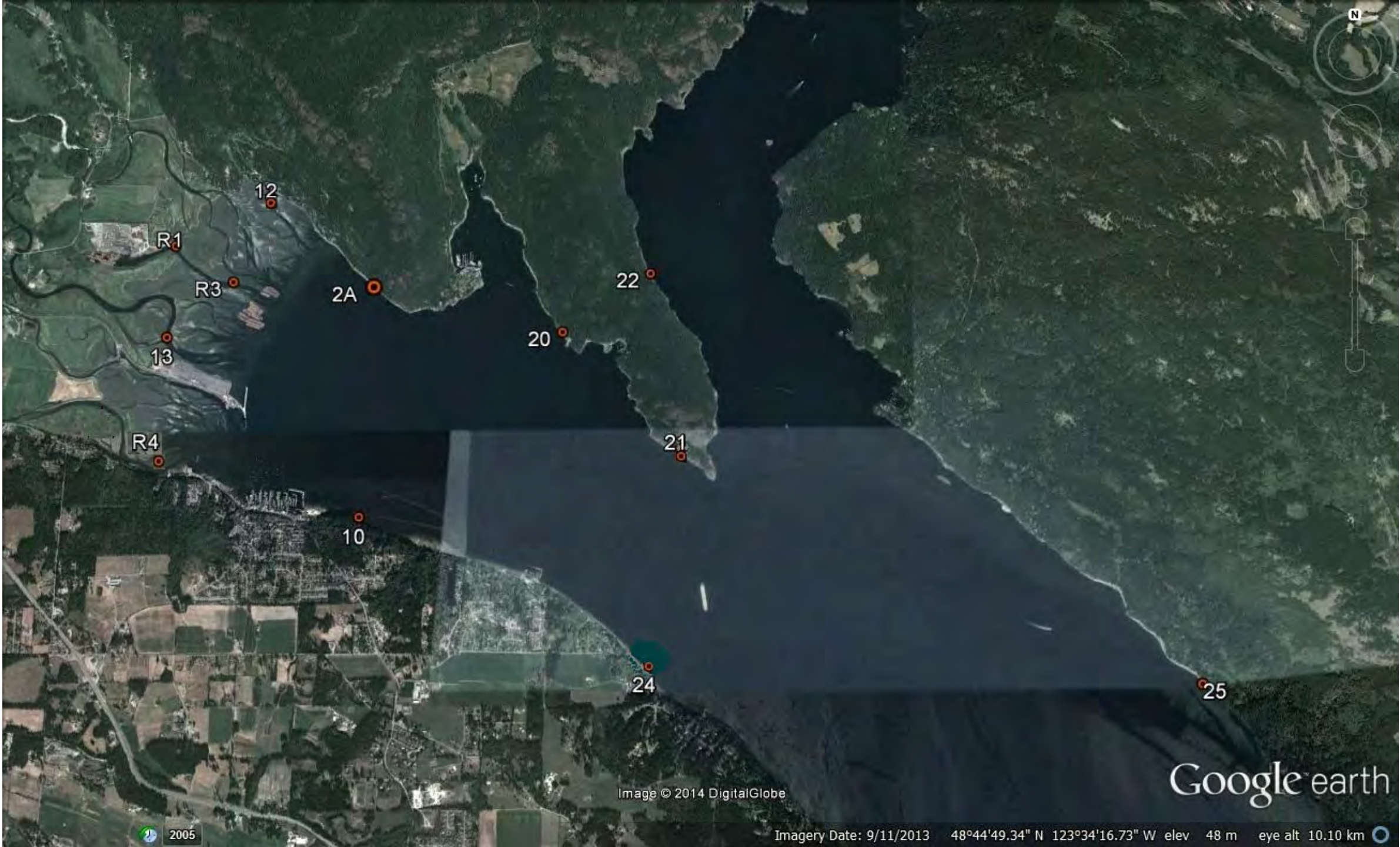
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While these data are predominantly from Fisheries BC, studies included that used PIT have generally been following the same trend.
Data courtesy of Northwest Indian Fisheries Commission, Washington Department of Fish and Wildlife, and the Pacific Salmon Foundation.

Salish Sea Marine Survival Project



Over 40 organizations are working internationally to examine the level of mortality during this early marine period and factors affecting the survival of juvenile Chinook and Coho Salmon

More on the Project marinesurvivalproject.com



R1

R3

R4

12

13

2A

10

20

22

21

24

25

Image © 2014 DigitalGlobe

Google earth

2005

Imagery Date: 9/11/2013 48°44'49.34" N 123°34'16.73" W elev 48 m eye alt 10.10 km

Sampling

- From mid May to mid July
- 2-4 days a week at 4-8 locations
- beach and purse seining
- fish samples, environmentalals
- + phyto samples at the surface

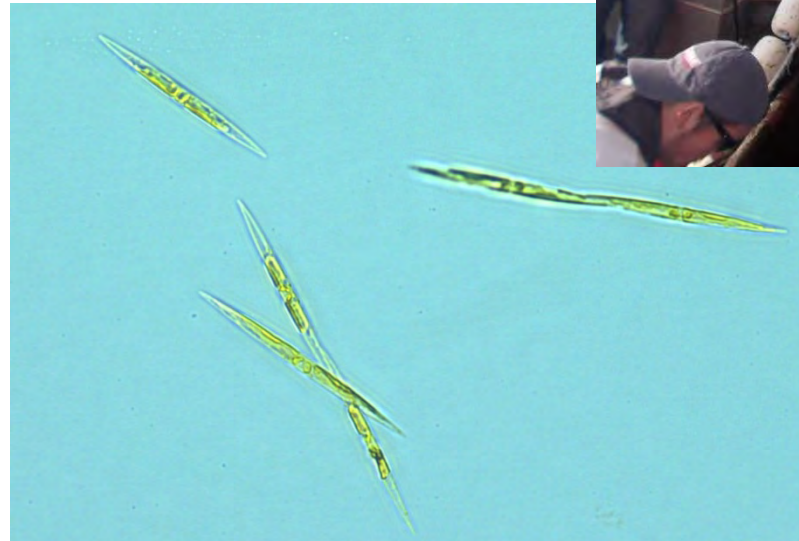


Blooms 2014

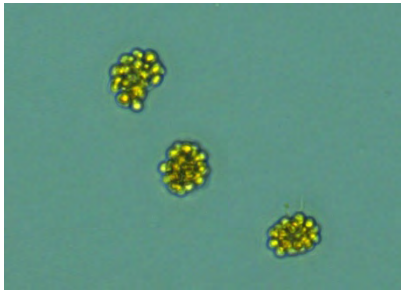
- Bloom of *Pseudo-nitzschia* spp. in late May
- *Heterosigma* bloom in June
- *Skeletonema* bloom in July



Pic 1 and 2.
Nets covered in a
Pseudo-nitzschia spp. bloom,
May 20, Cowichan Bay



Pic. 3 Water sample from
Cowichan purse seine May
20, 2014 under microscope



Heterosigma bloom, mid July 2015

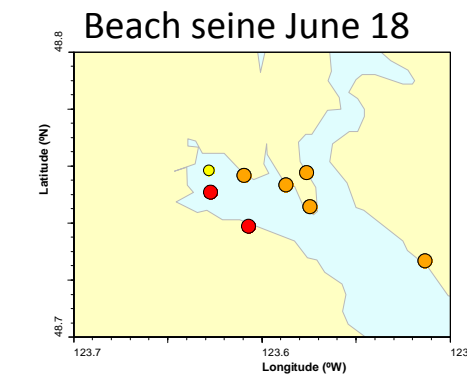
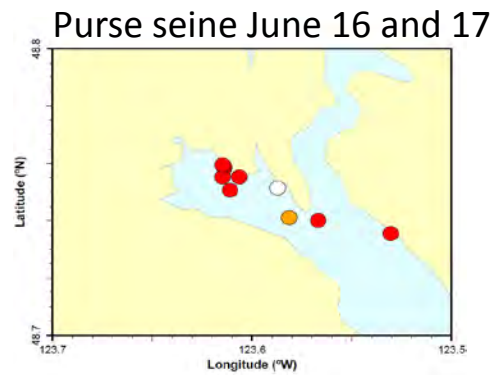
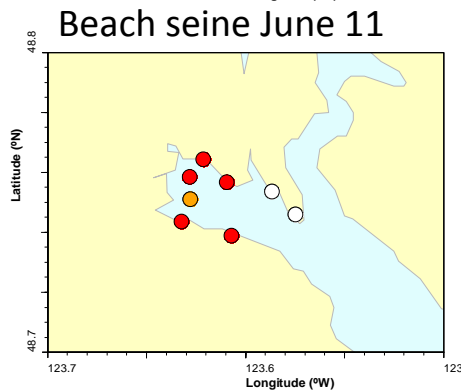
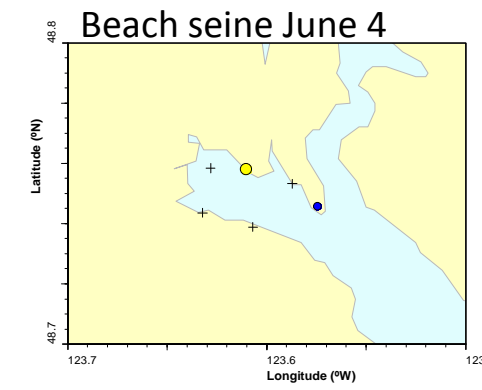
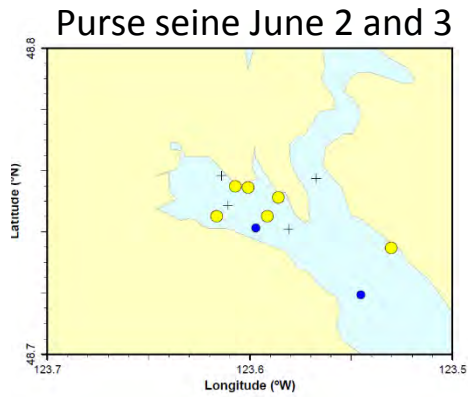
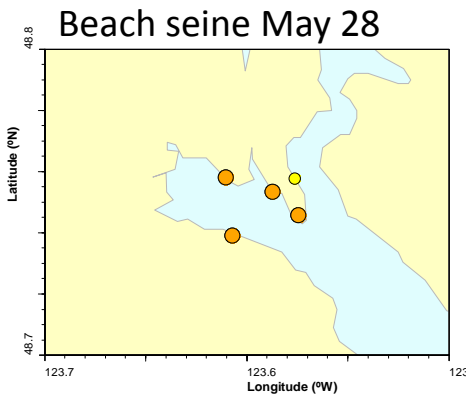
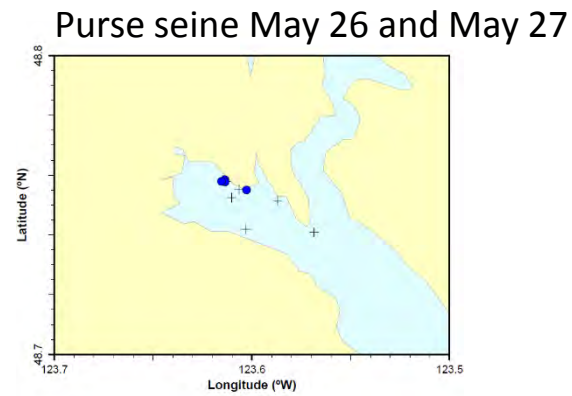
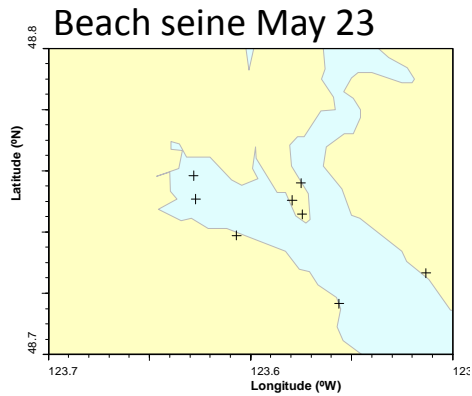
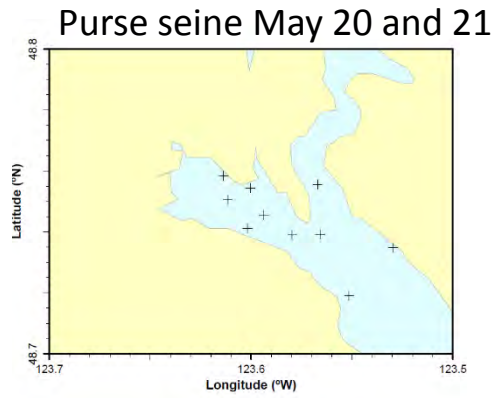


Pic. 1 *Heterosigma* bloom, Cowichan beach seine
Max. concentration 45000 cells per mL



Pic. 1 *Heterosigma* bloom, Cowichan purse seine
Max. concentration 12000 cells per mL

Heterosigma bloom development, 2014



black cross=0 *Heterosigma*
blue circle 1 - 10 cell/mL
yellow circle 10 -100 cell/mL
orange 100 - 1000 cell/mL
red 1,000-10,000 cell/mL
white >10,000 cell/mL

Heterosigma bloom, mid July 2015

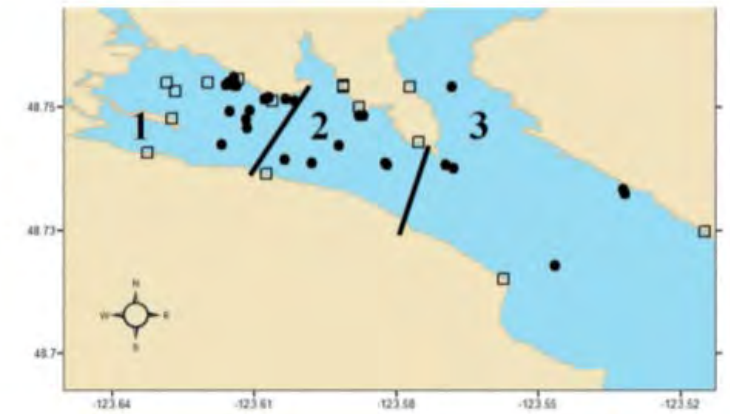


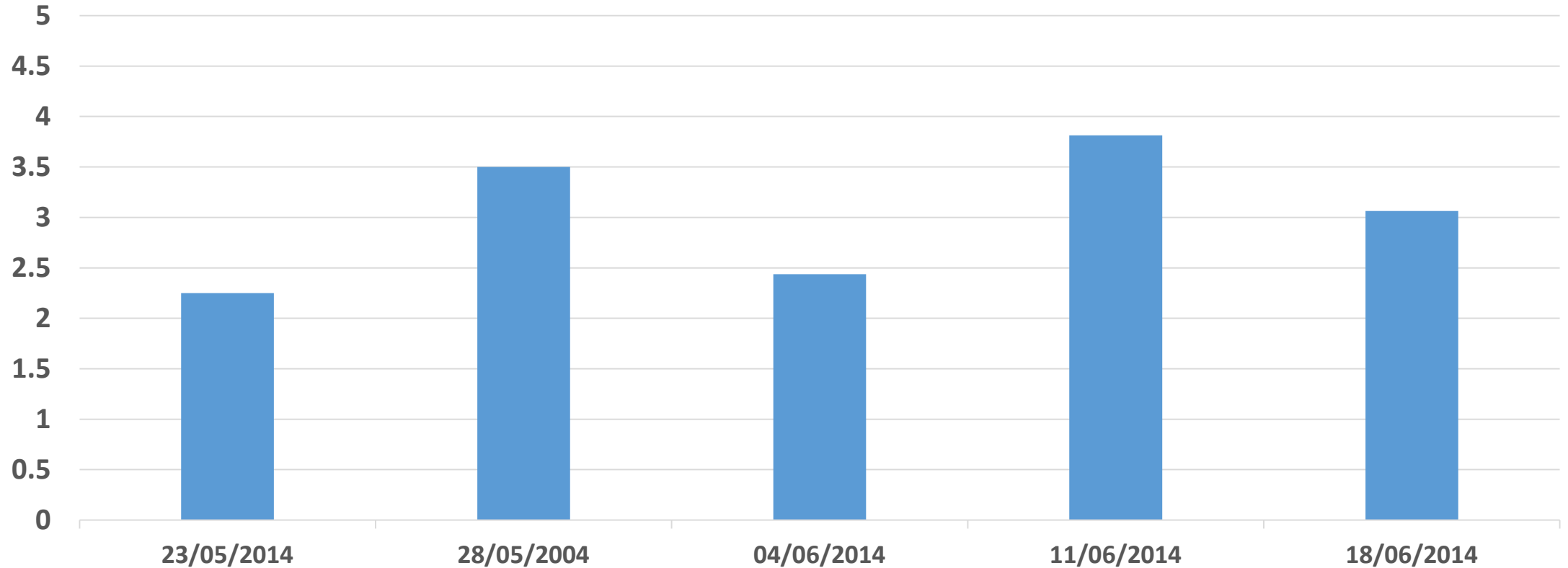
Table 1. Purse seine locations and *Heterosigma akashiwo* cell mL⁻¹ at surface water samples.

Day	Area	Number of sets	<i>Heterosigma akashiwo</i> (cell mL ⁻¹)	<i>H. akashiwo</i> (cell mL ⁻¹) (average per area)
26-May	1	5	0-5	1
	2	1	0	0
	3	1	0	0
27-May	1	4	0-5	2
	2	1	0	0
2-Jun	1	2	0	0
	2	3	0-10	5
	3	2	0-8	4
3-Jun	1	3	30-60	43
	2	1	20	20
	3	1	30	30
16-Jun	1	3	2500-5000	3500
	2	2	800-12000	6400
17-Jun	1	3	3200-5000	4067
	3	2	7000-8000	6500

Table 2. Beach seine locations and *Heterosigma akashiwo* cell mL⁻¹ at surface water samples.

Day	Area	Number of sets	<i>Heterosigma akashiwo</i> (cell mL ⁻¹)	<i>H. akashiwo</i> (cell mL ⁻¹) (average per area)
28-May	1	1	220	220
	2	3	120-850	490
	3	1	10	10
4-Jun	1	3	0-15	5
	2	3	0-3	1
11-Jun	1	5	900-3200	2300
	2	3	4000-40000	24667
18-Jun	1	3	20-2500	907
	2	3	170-2000	957
	3	2	300-800	550

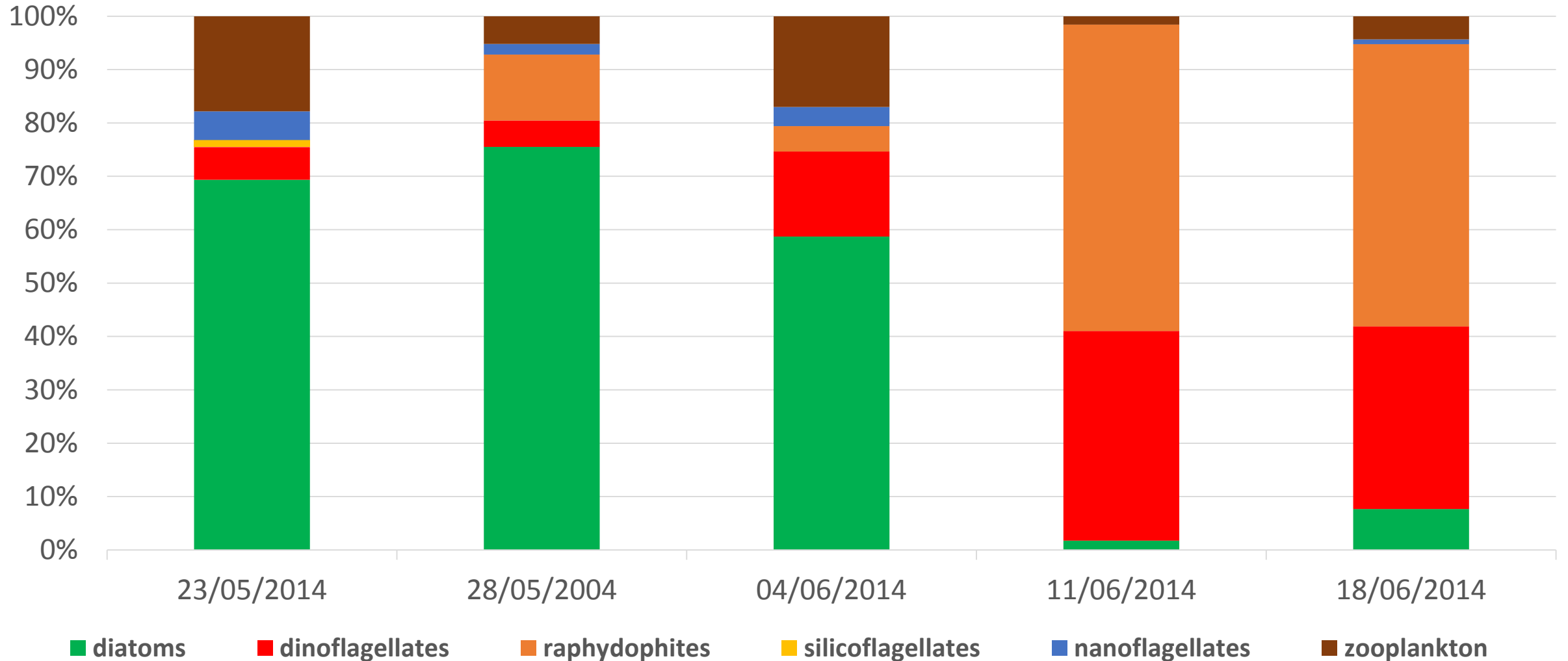
Beach seine, May 23-June 18



Dominant species cell count (mL ⁻¹)	Dominant species
179	<i>pseudo nitzschia spp.</i>
963	<i>pseudo nitzschia spp.</i>
283	<i>pseudo nitzschia spp.</i>
10688	<i>heterosigma akashiwo</i>
1019	<i>heterosigma akashiwo</i>

Beach seine, May 23-June 18 average data

Biomass in constituent groups %



Heterosigma and environmental parameters

Date	2014-05-23	2004-05-28	2014-06-04	2014-06-11	2014-06-18
Heterosigma	0	340	9	10688	1019
Water_temp_surface	14	14	16	18	15
Water_temp_1m	12	13	15	18	15
Salinity_surface	21	20	20	22	25
Salinity_1m	28	26	24	23	24
WEATHER_COMMENTS		light rain, wind 5-10	sunny	breez	wind 5

Pit tagging during *Heterosigma* bloom, July 2014



Chinook juveniles caught by purse seine displayed lethargic behavior as well as a dramatic (**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

Thank you!

