




**PACIFIC
SALMON**
FOUNDATION



CITIZEN SCIENCE PROGRAM NEWSLETTER

VOL. 4 | February 2022



Sunny day in April 2021 with the Squamish Chief in the background.

Photo by Kevin Swoboda. Left to right: Myia Antone (Marine Reference Guide Indigenous Research and Engagement Coordinator), Kevin Swoboda (skipper), Fiona Beaty (Marine Reference Guide project director), Bridget John (Marine Reference Guide research assistant and plankton project lead).



PACIFIC SALMON FOUNDATION CITIZEN SCIENCE PROGRAM ENTERS 8TH YEAR

Another year of the Citizen Science Oceanography Program is ramping up, with our first sample date of the 2022 season scheduled for February 23. This year marks the 8th year of the program, which originally started back in 2015 as part of the Salish Sea Marine Survival Project. The brainchild of Dr. Eddy Carmack — a retired scientist from the Institute of Ocean Sciences, DFO — it involves volunteers using a “mosquito fleet” of their own fishing vessels to do oceanographic surveys in seven overlapping areas of the Strait of Georgia approximately every two weeks throughout the year.

To date, no other program has collected this amount of data at such a fine spatial scale. What’s even more remarkable is the fact that the majority of our current Citizen Scientists have been with us since the beginning of the program. Talk about dedication, support and passion! With each year, we are one-step closer to achieving decadal scale oceanographic information for the Strait of Georgia.

Decadal scale information and long-term monitoring is critically important for helping to parse out regular seasonal and inter-annual variability versus longer term, permanent ecological changes. Understanding these changes can help us detect trends, plan for the future and ultimately contribute to the protection and understanding of our oceans and marine resources.



Entrance Island Lighthouse. Photo by: Mitch Miller

Watch a video of our very own PSF Citizen Science crew out sampling:



Source: youtu.be/ZKnicp7viKY

Video by: Ed Oldfield and John Sinclair, Powell River

Sampling Year	Vessel Trips	CTD casts	Nutrients Collected	Phyto-plankton Collected	Chlorophyll Collected	Secchi Recordings	Zoo-plankton Collected ¹	Biotoxins collected	Total Samples
2015²	150	2,264	1,809	1,381	193	2,088	146	0	7,881
2016	199	1,445	1,587	2,064	349	2,825	60	0	8,330
2017	197	1,420	1,529	1,934	340	2,814	54	0	8,091
2018	196	1,125	1,575	1,981	352	2,823	66	0	7,922
2019³	133	741	972	1,053	186	1,482	54	0	4,488
2020	119	731	1,257	1,378	231	1,836	54	0	5,487
2021⁴	121	897	1,183	1,264	222	1,746	59	78	5,449
7 years	742	8,623	9,912	11,055	1,873	15,614	493	78	47,648

CITIZEN SCIENCE OCEANOGRAPHY PROGRAM SAMPLE SUMMARY TO DATE

To date, the PSF Oceanography program has collected over 47,000 individual samples since the inception of the program in 2015.

This includes over:

- ▶ 8,600 CTD casts
- ▶ 9,900 nutrient samples
- ▶ 11,000 phytoplankton samples,
- ▶ 1,800 chlorophyll samples
- ▶ 15,000 secchi recordings
- ▶ 490 zooplankton samples
- ▶ 78 Biotoxin samples

Specific details for the 2021 sampling season, which ran from February 19th to December 12th, 2021 include:

- ▶ 64 locations regularly sampled
- ▶ Total number of samples collected: 5,449
- ▶ Total number of CTD casts processed: 883
- ▶ 1,183 nutrient samples collected
- ▶ Biotoxin sample collection began at three sites (Irvine/Sechelt, Baynes Sound, Cowichan Bay patrols)
- ▶ 1,264 phytoplankton samples collected

All CTD casts from the Pacific Salmon Foundation 2021 sampling season have been processed and can be discovered geospatially at data.oceannetworks.ca/GeospatialMap. Data can be downloaded via the Geospatial Map (login required) or by using data.oceannetworks.ca/DataSearch.

The new set of AML-6 instruments were a welcome upgrade and contributed to the 2021 sampling season running so smoothly. Very few data quality issues were encountered during this past year.

1. Biotoxin sample collection started in 2021 at the following sites: IS-2, BS-6, CBE-2.
2. 2015 - crews did duplicate CTD casts at every station. This was not done any other year, which is why the CTD casts for 2015 are so much higher relative to other years.
3. The number of patrols and crews decreased slightly in 2019.
4. 2021 data are still preliminary.

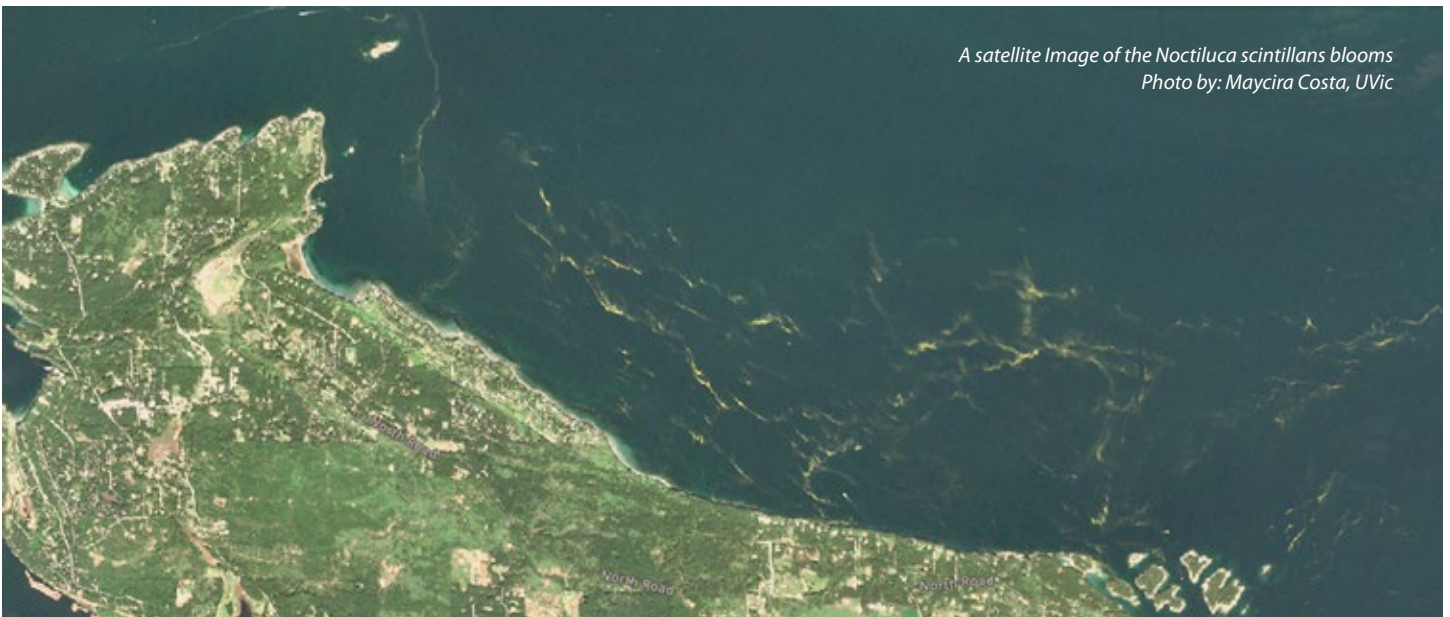


All four zooplankton samples collected in April in Howe Sound/Átl'ka7tsem (left to right: Port Mellon, Porteau Cove, Squamish Estuary, Strait of Georgia south of Bowen Island) Photo by: Bridget John, Howe Sound/Átl'ka7tsem Marine Reference Guide.



Photo by: Mitch Miller

A satellite Image of the *Noctiluca scintillans* blooms
Photo by: Maycira Costa, UVic



Preliminary Phytoplankton Results for 2021 (information provided by Svetlana Esenkulova)

According to sample results collected by the citizen scientists, phytoplankton dynamics in 2021 were quite interesting and there were several noteworthy events.

Firstly, as we reported in some of our 2021 newsletters, there were thick, vivid orange *Noctiluca scintillans* blooms which occurred in the Strait at the end of April. Blooms were seen from the north end of Texada Island, to south of Victoria. These blooms were even seen from space.

Noctiluca is nontoxic. It is bioluminescent. It drastically reduces water clarity and often causes low dissolved oxygen. It disrupts classic energy transfer and 'steals' food from zooplankton.

During the last 7 years of our monitoring, similar *Noctiluca* blooms occurred only in 2018.

There were several summer blooms of the silicoflagellate *Dictyocha* species in some areas of the Strait. *Dictyocha* is toxic but it is only harmful at high concentrations: maximum concentrations in 2021 were moderate and did not reach high levels. There were no *Heterosigma* blooms.

Dinoflagellate taxa producing paralytic shellfish poisoning (PSP) and diarrhetic shellfish poisoning (DSP) toxins, *Alexandrium* species and *Dinophysis* species, were very abundant in surface samples collected between March and September of 2021 (Table 1, top right). In fact, the abundance of *Dinophysis* during this time period in 2021, was the highest we have ever recorded in our seven-year time series and was close to levels observed in 2018. Remarkably, both of these years (2018 and 2021) were years with *Noctiluca* blooms. Both *Noctiluca* and *Dinophysis* are heterotrophic. To our knowledge, this is the first time an apparent link between spring *Noctiluca* blooms and high *Dinophysis* summer abundance has been reported.

The last unusual thing that we noticed is that summer phytoplankton communities in June/July of 2021 were often dominated by *Ditylum brightwellii*. This diatom species is very common in the Strait but it usually dominates phytoplankton communities in fall, not in summer. Hence, this observation is not typical and was likely related to unusual summer conditions.

Year	<i>Alexandrium</i>	<i>Dinophysis</i>
2015	15.2	2.1
2016	19.2	0.5
2017	21.4	1.8
2018	19.6	5.7
2019	14.6	4.1
2020	21.1	3.4
2021	20.6	6.7

Table 1. Percentage of citizen science surface samples containing algae from March to September, 2021 from four areas of the Salish Sea (Baynes Sound, Cowichan Bay, Irvine/Sechelt and Powell River patrols). The highest values are in red, the lowest values are in green.



Photo by: Mitch Miller



NEW FOR 2022 — ADDITIONAL MEASUREMENT OF OCEAN COLOUR

By Rich Pawlowicz, UBC



Currently the PSF CitSci program measures the Secchi depth as well as profiles of chlorophyll fluorescence at each station, each of which are related to water colour, chlorophyll content, and transparency.

More information about turbidity can be obtained through ocean colour. Although this is available from satellite observations (when the skies are not cloudy, which is only a small fraction of the time in the Strait of Georgia), the School of Marine Sciences at the University of Maine has developed an App called “Hydro-Color” which is designed to make estimates of ocean colour and turbidity by combining information from 3 different unshaded images, taken in specific directions. The procedure lasts less than a minute when practiced, from a boat at sea in waters deep enough that the bottom is not visible.

Beginning in 2022, PSF Citizen Scientists will be collecting hydrocolor measurements at each existing sampling station. The resulting dataset of an estimated 1000 images per year can then be used in conjunction with Secchi depth and CTD fluorometer data to better estimate surface turbidity and primary productivity, as well as providing a baseline for satellite observations.

For more information visit:

misclab.umeoce.maine.edu/research/HydroColor.php

Ed Oldfield of the Powell River patrol, happy after the back-up line saved the CTD.

SAFETY FIRST

This year, our crews are implementing the use of a back-up safety line attached to the AML CTD. This is an extra measure to help mitigate any further losses of any of the CTD's. Some crews have been using this back-up safety line since the 2021 season. One crew even (unintentionally) had put it to the test and they can vouch that it works!

The back-up safety lines consist of a heavy-duty Penn fishing rod and reel, equipped with 300 yards of 80 lb test braided fishing line. In addition, the Scotty downriggers have been equipped with 200 lb test Power Braid line. This is low stretch, braided line that will not kink, fray or rust like stainless steel cable. For crews still using manual downriggers, those have been equipped with 1/16" aircraft cable.

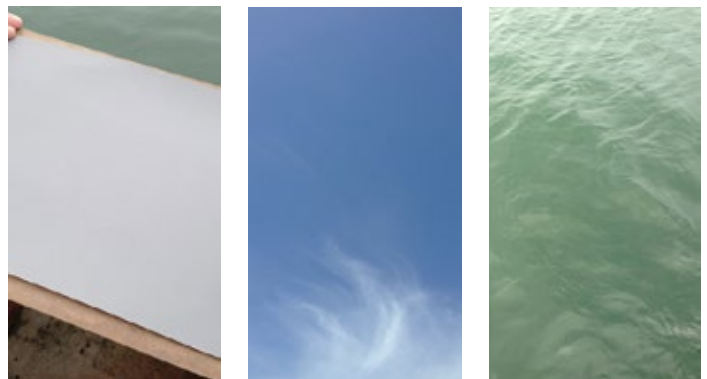


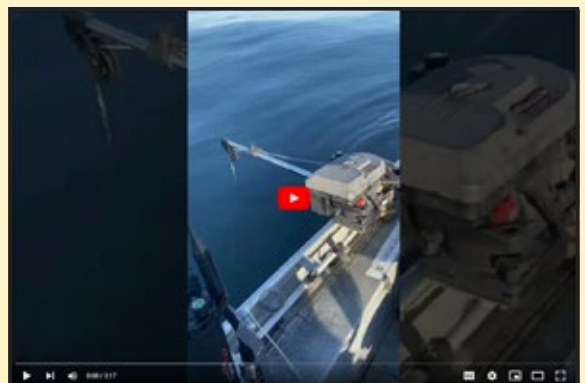
Figure 2. Example of the three images collected by a HydroColor user. These three images are used to calculate the remote sensing reflectance.

To use the back-up safety line:

- Step 1:** Attach the downrigger line and the backup safety line to the CTD
- Step 2:** Lower the CTD and backup safety line
- Step 3:** Bringing up the CTD and safety line

Watch the “How-To” Video here:

youtu.be/ylrvl9MD6rs



FEATURED CITIZEN SCIENTISTS: John Field, André Alarie, and Susan Servos-Sept Irvines/Sechelt Patrol

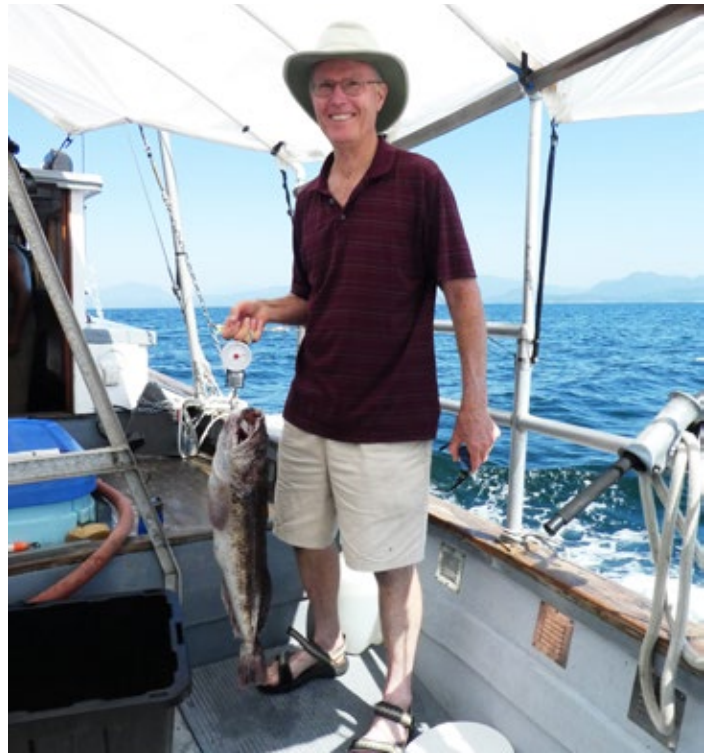
John Field signed on with the PSF Citizen Science Oceanography Program way back in 2014, ahead of the first official field season in 2015. He originally learned about the program through his role at the time as the Director of the Ruby Lake Lagoon Nature Reserve Society (now referred to as the Loon Foundation). He was researching potential long-term monitoring projects that would be suitable for a new marine aquarium, research and education facility at Irvines Landing, called PODS. It was a natural fit for the marine biologist, who had taken oceanography as an undergrad at the University of Victoria and had previously been involved in a variety of formal and informal citizen science projects with other NGOs on the Sunshine Coast.

John enjoys being on the water, and finds it rewarding to be able to put his scientific background to beneficial use.

John, a retired science instructor at Capilano University, has recently taken up birding as a hobby -it seems like a fitting subject for a previous and current marine buff to dabble in; what better natural bridge between the aquatic and terrestrial worlds than birds? He particularly enjoys doing complete surveys and is active on eBird and iNaturalist. He also enjoys fishing – with a particular interest in fly-fishing on local and interior lakes. His first project after retirement was building an addition to his home. John, with the help of his wife, did everything except pour the concrete.

John was born in Guatemala City, Guatemala, where he spent his first eleven years before moving to El Salvador. He came to Vancouver Island at age 13 to go to boarding school, and apart from doing graduate school in Australia, has been in Canada ever since. He has been a proud Canadian since 1975.

John is a strong advocate for local volunteer organizations. When asked what life advice he would pass along to others, he said: "Make sure that you enjoy your work! Also, get involved in local volunteer organizations that match your values and talents."



John Field, of the Irvines/Sechelt Patrol holding a ling cod on the deck of the Marianna III.

“Make sure that you enjoy your work! Also, get involved in local volunteer organizations that match your values and talents.” – Life advice from John



André Alarie, Captain of the Marianna III, from the Irvines/Sechelt Patrol. Taking the opportunity to drop a line while out sampling.

“I have no life advice yet, I am still trying to figure it out!” – Life advice from André (spoken like a true philosopher)

André was born in Montreal, but moved to B.C. in 1967. He immediately fell in love with the ocean and the smell of “seaweed” that greeted him when he stepped off the bus in downtown Vancouver. André was a commercial prawn fisherman for 25 years, and the crew now uses his old commercial prawn vessel to do the citizen science sampling. This vessel is unique to the program, as its size and design allow it to have a hydraulic winch, which is used to deploy the zooplankton tow net. This is the only patrol that currently samples for zooplankton.

Even though he’s retired, he hasn’t given up his passion for fishing. This is something he enjoys doing when he’s not volunteering for PSF. He also enjoys gardening and playing the Mandolin.

André got involved with the program in 2015, through his friendship with John and their existing work doing bird counts every year. He enjoys the opportunity to do something for salmon, and to be able to be out on the water. For him, the ocean is a source of peace when it’s calm and a force of nature when it’s stormy.

“Take the best care of our environment as we possibly can.” – Life advice from Susan



Susan Servos Sept, of the Irvine's/Sechelt crew, on-board the Marianna III, standing next to the zooplankton tow net during a sampling patrol.

Susan became involved in the program in 2016 when a friend of hers mentioned that her husband (André) and his friend (John), were looking for someone to help them out with a volunteer project they were working on. The opportunity to be able to get out on the water immediately piqued Susan's interest and she has been involved ever since. For a farm kid who grew up on the shores of Lake Ontario, she sure does have a strong love for the ocean. For Susan, salmon and the oceans are “an amazing part of our natural world to enjoy and be grateful for on so many levels.”

She enjoys being involved in something that she believes is very important and she loves being on the water, learning new things, and working with John and André. Not only does Susan act as a deckhand and crew member, she also acts as the “unofficial” team photographer — often capturing photos of the crew in action, or scenic ocean shots.

When Susan is not volunteering with PSF, she enjoys gardening, kayaking, exploring, and playing the ukulele. She is also involved with other environmental related projects in her local community. She has always had a keen interest for the environment. Prior to retiring, she spent her professional career as a classroom teacher, specializing in Environmental Education.

When asked what life advice she would pass on to others, her passion for the natural world shines through: “Take the best care of our environment as we possibly can.” Degradation of our natural environment is what Susan considers to be one of the most significant changes she's witnessed in her lifetime.



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Thank you to John, André, and Susan for taking the time to answer our questions and for their ongoing dedication and support to the PSF Citizen Science Program. We would also like to express our gratitude to others who have participated frequently with the Irvines Patrol. Unfortunately, due to Covid safety measures the crew has remained smaller than normal in recent years.

2022 Sampling Schedule

Citizen Science Sample Dates
January
Monday January 17, 2022 (Spring)
February
Wednesday February 23, 2022 (Neap)
March
Thursday March 10, 2022 (Neap)
Friday March 18, 2022 (Spring)
Thursday March 24, 2022 (Neap)
April
Friday April 8, 2022 (Neap)
Saturday April 16, 2022 (Spring)
Saturday April 23, 2022 (Neap)
May
Sunday May 15, 2022 (Spring)
Sunday May 22, 2022 (Neap)
June
Tuesday June 14, 2022 (Spring)

HOW YOU CAN HELP:

- ▶ Become a monthly donor
- ▶ Volunteer
- ▶ Participate in one of our many events

To stay up-to-date on all of the work that PSF is doing to support salmon:

- ▶ Subscribe to our [YouTube](#) page
- ▶ Follow us on [Facebook](#) & Twitter (@PSF)

Learn More about the Citizen Science Program:

- ▶ www.marinescience.ca/citizen-science-programs/

For further information, please contact:

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