



PACIFIC SALMON FOUNDATION



CITIZEN SCIENCE PROGRAM NEWSLETTER



ANNUAL CITIZEN SCIENCE SYMPOSIUM

The PSF Citizen Science Oceanography Program held their Annual Citizen Science symposium on May 31, 2022. The symposium was held virtually again this year, as Covid precautions were still not fully lifted during the initial planning phases. Because the team wanted to ensure the annual symposium would not be disrupted, holding the meeting via Zoom felt like the safest option.

The symposium was a full day, and provided the opportunity for the Citizen Scientists to share stories and feedback about the program, as well as ask questions and learn from some of the lead researchers. Participants discussed highlights of the 2021 season, and discussed how the data are being used by researchers and academics around the world.

There were a number of guest presenters including:

- ▶ Svetlana Esenkulova, Pacific Salmon Foundation
- ▶ Rich Pawlowicz, Dept. of Earth, Ocean, and Atmospheric Sciences, University of British Columbia
- ▶ Andrew Ross, Institute of Ocean Sciences, DFO
- ▶ Akash Sastri and Kelly Young, Institute of Ocean Sciences, DFO
- ▶ Spencer Taft – Tsleil-Waututh Nation

The Citizen Science Symposium is something that we all look forward to every year and we are hopeful that next year we will be meeting in person!

Cover photos by Mitch Miller



KEY TAKEAWAYS FROM THE MEETING – WHAT WE LEARNED IN 2021

The Citizen Scientists have collected an overwhelming amount of data since the start of the program. In 2021 alone, they collected a combined 5,449 samples and conducted over 121 vessel trips. We've learned so much from the samples these crews have collected. Read on to get a glimpse of what we learned in 2021.

Table 1: Citizen Science samples collected to date

YEAR	VESSEL TRIPS	CTD CASTS	NUTRIENTS COLLECTED	PHYTO-PLANKTON COLLECTED	CHLORO-PHYLL COLLECTED	SECCHI RECORD-INGS	ZOOPLANK-TON COLLECTED	BIO-TOXINS COLLECTED	TOTAL SAMPLES
2015	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
2019	133	741	972	1,053	186	1,482	54	0	4,488
2020	119	731	1,257	1,378	231	1,836	54	7	5,494
2021	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	85	47,655

PHYSICAL OCEANOGRAPHY

Data collected by the Citizen Scientists are used to detect trends in oceanographic conditions throughout the Strait of Georgia. This information is updated annually and available online via the [“Atlas of Oceanographic Conditions in the Strait of Georgia”](#). In 2021, the following key observations were noted:

Annual surface warming in the Strait of Georgia occurred slightly earlier than usual; while the seasonal temperature cycle at depth appeared to be delayed.

During the summer months (June to September) temperature and oxygen levels in the upper 50 m of the water column were within the avoidance threshold for salmon.

Surface waters were relatively fresh in summer and fall compared to other years.

The Spring bloom occurred from March 26th to April 18th.

PHYTOPLANKTON & HARMFUL ALGAE DYNAMICS

In 2021, the following observations were reported based on the citizen science data:

Significant *Noctiluca scintillans* blooms were observed in April throughout the Strait of Georgia from Gabriola Island, north to Texada Island.

A bloom of dinoflagellate *Heterocapsa triquetra* occurred in June in Bute Inlet.

Local blooms of silicoflagellate *Dictyocha* species occurred in Cowichan Bay, Howe Sound, and on the Sunshine Coast. These were most abundant in July and August.

Alexandrium and *Dinophysis* species were very abundant in 2021 from March through September in Baynes Sound, Cowichan Bay, Irvine’s/Sechelt and Powell River. These are dinoflagellate species which are known to cause paralytic shellfish poisoning (PSP) and diarrhetic shellfish poisoning (DSP).

BIOTOXINS

To date, results collected from Irvine’s/Sechelt and Cowichan Bay up to October 2021 have been analyzed and indicate the following:

Multiple biotoxins are present in these areas, including amnesic shellfish poisoning (ASP) (domoic acid), PSP (saxitoxins), DSP and other toxins — one of which (azaspiracid) had not been reported in B.C. before.

ASP and PSP toxins have been found to be harmful to marine mammals and also cause harm to other animals (including humans).

Biotoxin levels appear to correlate with water temperature and/or presence of harmful algae that produce them. However, the relationship between toxin concentration and temperature depends on the location, timing, and extent of the spring algal bloom.

Results suggest that some toxins can persist in seawater in the absence of harmful algae during the winter.

Domoic acid, which can cause ASP appears to peak in both the Irvine’s/Sechelt and Cowichan Bay samples in April following the spring bloom.

A PSP toxin called “C1” appears to be more abundant in the Irvine’s/Sechelt samples in 2020 than in 2021. In contrast, C1 appears to be more abundant in Cowichan Bay samples in 2021 than in 2020.

For Cowichan Bay, DSP toxins peaked in June/July and had similar concentrations in 2020 and 2021. In contrast, DSP toxins were generally more abundant in 2020 than in 2021 for Irvine’s/Sechelt samples.

Future work is aimed at identifying and predicting the effects of environmental drivers on the abundance of algal biotoxins and their potential impacts on coastal marine ecosystems.

To watch the recording or access any of the presentations visit this [link](#).



SPRING AND NEAP TIDES

Ever wonder how the Citizen Science Sampling schedule is planned each year? Easy! We plan around the tides. Tides are defined as the rise and fall of sea levels around the planet, as the ocean is “pulled” back and forth by the gravitational pull of the moon and the sun and the rotation of the Earth.

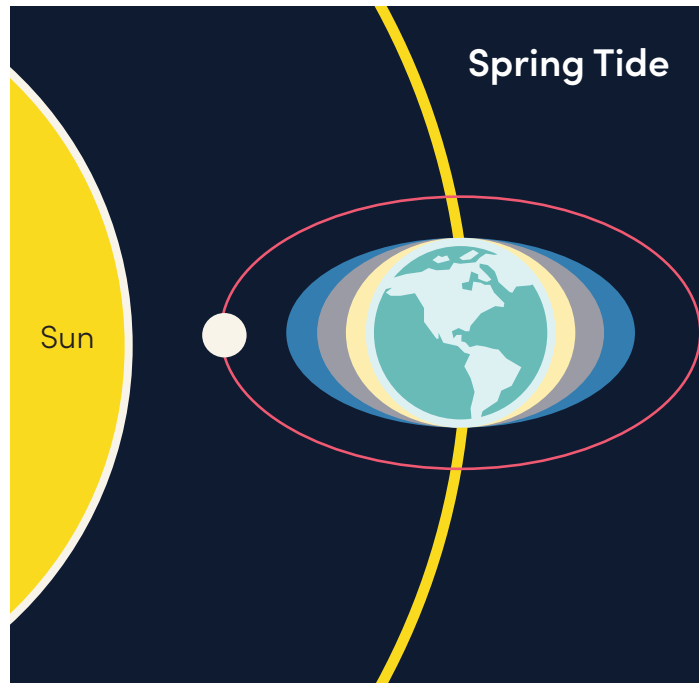
There are two unique tides which occur twice during each lunar cycle, known as Spring and Neap tides.

“Spring” tides occur just after a new or full moon. They are called “Spring” tides, not for the season they occur in, but rather because of the idea that the tide is “springing forth”. During this period, there is the greatest difference between high tide and low tide. Or in other words, high tides are a little higher and low tides are a little lower than average.

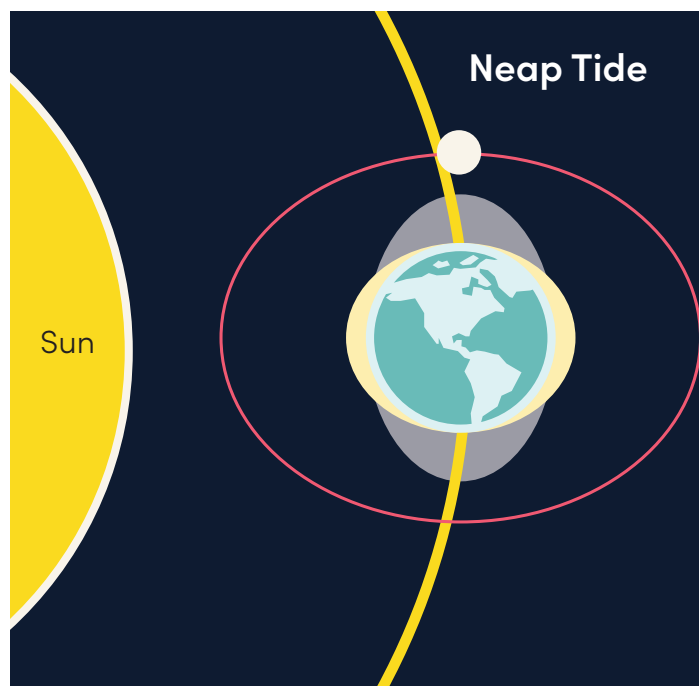
“Neap” tides occur seven days after spring tides, when the sun and moon are at right angles to each other. This positioning of the sun and moon causes the tidal effects from both planets to cancel each other out. Neap tides occur when the moon phase is in its first and third quarters. During this period, there is less of a difference between high tide and low tide. Or, in other words, high tides are not as high, and low tides are not as low.¹

Each Citizen Science sampling date is scheduled to fall on either a Spring or Neap tide. Spring – Neap tides provide different mixing energy and result in tidally driven variability in the magnitude and timing of primary production. Spring-Neap tidal variability may impact the timing of the spring bloom, possibly by briefly interrupting the development of spring stratification ([Sharples et al., 2006](#)). This is important because the timing of the bloom is known to play an important role in the growth and survival of other components of the marine ecosystem, e.g. copepods ([Head et al., 2000](#)), fish larvae ([Platt et al., 2003](#)) and seabirds ([Frederiksen et al., 2006](#)). Salmon also are impacted as a result of changes or mismatches in the food web from plankton through zooplankton to forage fish. Other impacts include changes to carbon and nitrogen fluxes in the ocean, and there is some suggestion that red tides tend to occur during the stronger stratification at Neap tides ([Balch, 1986](#)).

By sampling at these extremes, we can further our understanding of and associate changes in oceanographic variables with tidal mixing and variability.



Spring tide is caused by the alignment of the sun and the moon



Neap tide is where the sun and the moon are at their least aligned point

1. Source: NOAA. What are spring and neap tides? National Ocean Service website, oceanservice.noaa.gov/facts/springtide.html, accessed on 7/7/20.

CITIZEN SCIENCE SPOTLIGHT: Ed Oldfield & John Sinclair, Powell River

This month we had the pleasure of sitting down, in-person, with the Powell River crew to interview them for this edition of the Citizen Science Spotlight. When one sits down with these two, it quickly becomes apparent that Ed and John are not just two strangers who go out on the ocean on a weekly basis to collect samples for PSF – they have a deep friendship that honestly would warm the heart of anyone who has the opportunity to be in their shared company. It's the kind of friendship and camaraderie that you just can't help but revel in.

Ed and John both signed on as citizen scientists back in 2015, which was the inaugural year of the Citizen Science Oceanography program - at that time, it was a component of the much broader, transboundary Salish Sea Marine Survival Project (SSMSP). Ed signed on knowingly... he had heard about the SSMSP from PSF staff at one of the annual PSF Fundraising dinners before the program got started. Once he heard PSF was looking for a boat and a crew to run the Powell River route, Ed was interested in volunteering. He had just retired from his 36 year teaching career and figured he'd have some time to dedicate to the program.

John on the other hand, may have gotten a little hood-winked. The story, as we heard it, was that John got a call one Saturday from his buddy Ed, who asked him if he would want to come out on the boat and do some citizen science work for the day. John happily agreed and off they went. But once they got out there, Ed informed him "by the way, we have to do this 16 times per year." Once John agreed to that, Ed set the hook a little deeper and roped him into doing a second route, which at that time was referred to as the Lund Patrol. We use the terms "roped" and "hoodwinked" lightly, because it is very apparent that John and Ed both love getting out on the water and getting the job done. The shared camaraderie is an added bonus. John even went so far as to say that he wishes more people could have the experience of being citizen scientists because he's had so much fun and has such a great sense of accomplishment in collecting so many samples.

Ed, who was originally born in Orilla, Ontario but moved to Duncan when he was 12, is also a talented artist. When he is not out on the water sampling for PSF, gardening, or working on one of the other various projects he's got on the go, he can be found in his home workshop creating unique ceramic Raku pottery. He sells his pottery in galleries around Vancouver Island and the Lower Mainland. One of his more recent projects, appropriately titled the "215 Remembrance Project", saw him creating 215 orange Raku Maple leaves to recognize the 215 children found at the Kamloops Residential School. Ed has been secretly



John Sinclair (left) and Ed Oldfield (right) of the Powell River patrol, before heading out to sample.

“If it’s not fun don’t do it. When it quits being fun, stop and do something else.”

– Life advice from Ed



Ed Oldfield, holding a yelloweye rockfish when recreational anglers were allowed to retain them.



John Sinclair on his boat in Toba Inlet

“Don’t take yourself too seriously and give credit to others.” – Life advice from John

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/



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placing these leaves in quiet, natural settings throughout the Lower Mainland and on Vancouver Island for the past year. His hope is that the leaves will spread awareness and provoke thought surrounding issues of racism in the people who find them.

You can learn more about Ed’s work at: www.edsraku.com.

When asked what is the most significant thing he’s seen change in the world in his lifetime, he said, a world population explosion from 3 to 7.9 billion people has put an enormous strain on natural resources (including water), food production, and habitable land. Ed recognizes the intricacy and the importance of salmon to west coast civilizations, noting that they were once an abundant, sustainable food source, which provided Indigenous people here the luxury of food security not available in other parts of the world. He feels strongly about rebuilding salmon stocks, and believes we have the knowledge should we make it a priority.

John, who was born and raised in New Westminster, moved to Powell River in 1989. John had an early interest in biology and zoology. In fact, he completed a Bachelor of Sciences, majoring in zoology at UBC before going on to complete his law degree, also at the University of British Columbia. John ended up following his legal education and worked as a prosecution lawyer for 20 years before he retired. When John is not volunteering for PSF, you can find him gardening, fishing, creating woodwork and spending time with his grandkids... often it’s a combination of grandkids and gardening, or grandkids and fishing, or grandkids and woodworking. In fact, he just recently finished making a cribbage board with one of his grandsons. It is evident that he is very proud of his grandchildren. It would even appear that his pride in his grandchildren and his dedication to being a loving and present grandfather is rivaled only by his dedication and pride in his work as a citizen scientist.



Photo by John Sinclair

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