PACIFIC SALMON FOUNDATION

A MANUAL FOR OCEANOGRAPHIC DATA COLLECTION IN THE SALISH SEA – 2022

Prepared for PSF Citizen Science Oceanographic Program

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IOS

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Cover photos by Mitch Miller (top) Nicole Frederickson (left and centre) and Rob Newell (right)

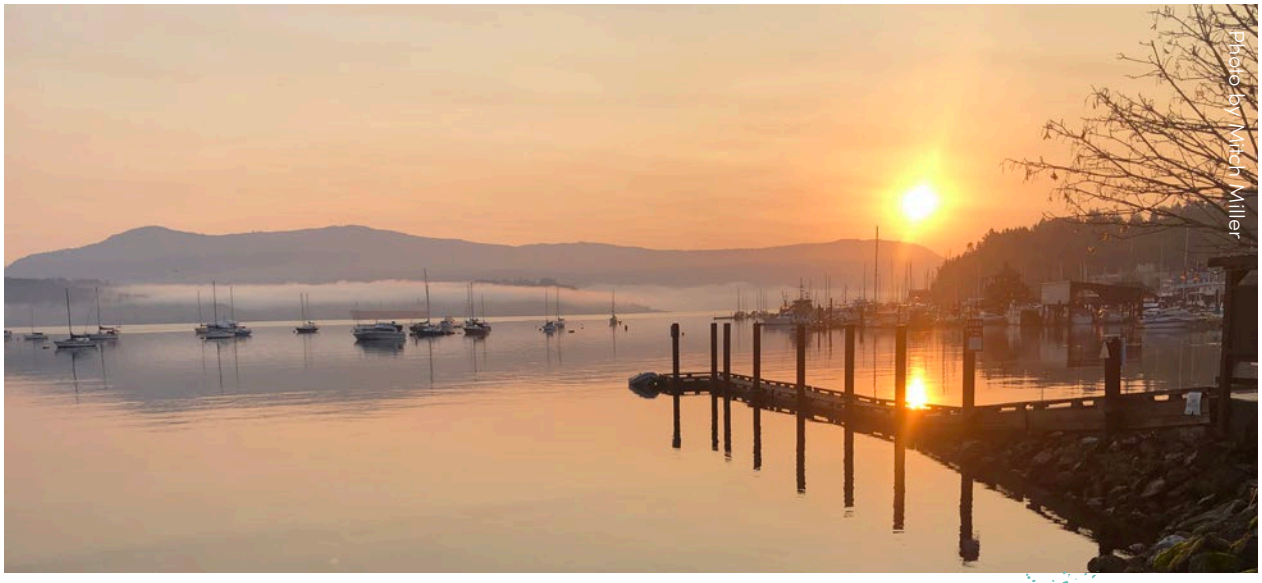


Photo by Mitch Miller

QUICK START CHECKLIST FOR STATIONS

BEFORE HEADING OUT ON THE WATER:

- ☐ check all gear is packed (tablet charged, cooler with ice packs, put nutrient & chlorophyll filters in holders, sample bottles, data sheets, Hydrocolor kit (black case with grey card and instructions)).
- ☐ Label sample bottles with Date & Fill out Daily Cruise log.
  > **Be sure to record NUTRIENT Ziploc Bag # and bottle #'s on Daily Cruise Log**
- ☐ Check to make sure the tablet and CTD work and pair.
- ☐ Check to make sure there are no frays or kinks in the downrigger cable or the backup-safety line.

ARRIVE ON STATION. BE WITHIN 100 M OF GPS COORDINATES.

- ☐ Turn on CTD. The Green light on the CTD will blink; the light will turn solid green when it is ready to pair and start logging.
- ☐ Turn on the tablet and open "Community Fishers" app.
  Push the "START"button to connect to the CTD and start logging.
- ☐ Connect the CTD to the Downrigger and the backup safety line.
  Make sure you have the bottom weight attached to the CTD.
- ☐ REMOVE CTD CAPS!
- ☐ Begin filling out Station Logsheet. Record Lat/Long from Vessel GPS. Record Start/Arrival Time.
- ☐ Lower CTD to just below surface and wait 30 seconds so instrument can equilibrate with water.
- ☐ Begin lowering CTD at approximately 0.5 m per second (1 turn per second if using manual downrigger).
- ☐ CAST DEPTH: In shallow water, aim to lower the CTD to no more than 10 m of the ocean bottom. Do not let the weight hit the bottom. In deeper water stop when you reach the maximum safe line out on the downrigger/safety line (approx.150 m).
- ☐ Wait 30 seconds at bottom, then winch up to just below surface.
- ☐ Wait 30 seconds, and then bring the CTD on board, place tablet next to it and push the "DOWNLOAD DATA" button in the app to download data.
- ☐ View CTD depth results on tablet. If it's a good cast, no second cast needed!
- ☐ Put the tablet on sleep mode; you can leave the CTD on between stations.
- ☐ Collect surface phyto sample and preserve with Lugol's (dark tea color).
- ☐ Take Secchi depth reading twice (sun behind you, no sunglasses).

FULL STATION:

☐ Nutrient samples (surface and 20 m). Lower Niskin to 20 m. Wait 30 seconds and send messenger (attach carabiner to line as well). Return Niskin to surface. Rinse 60 ml syringe 3 times, attach filter holder to syringe, fill the syringe, gently force water through filter (go slow and do not use too much force); fill nutrient bottle to line. DO NOT OVERFILL. Repeat for surface sample. Place samples upright in cooler.

> **Remember to record nutrient vial numbers on logsheet**

BUSY STATION:

☐ In addition to surface phyto, collect 3 phyto samples from depth (5 m, 10 m, 20 m) using Niskin. Rinse bottle 3 times with sample water. Preserve with Lugol's. Take duplicate (x2) nutrient samples at 20 m and surface (use same procedure as stated above for nutrients).

> **Record nutrient vial numbers on logsheet**

LAST FULL OR BUSY STATION:

☐ Take two chlorophyll samples at 5 m. Rinse syringe 3 times, attach filter holder to syringe, fill to 140 ml, force water through filter (careful not to allow air through filter and careful not to use too much force; go slow). In a shady location (avoid exposing the filter to direct sun as much as possible), remove the filter from the filter holder. The filter is the sample! Place filter in vial sample side up (use forceps to handle filters at all times!), place vials in small black bag immediately and put in cooler.

☐ Collect biotoxin samples (if required). Collect one sample at 0 m and one sample at 20 m (using the Niskin). Fill the bottles to the 1000 ml line. Put the bottles in the cooler. You will need to filter these when you return to shore at the end of the day. (See detailed biotoxin filtering instructions).

☐ Check to make sure all data/samples have been collected and recorded on the logsheet. Make any other additional notes as needed (e.g., wildlife observations, equipment issues, weather observations, etc.)

You're done this station! Move on to the next.

END OF DAY CHECKS:

☐ Fresh water rinse: all gear including syringes, filter holders, CTD, Niskin bottle and messenger, Secchi, downrigger, fishing rod and reel, etc.

☐ Check to make sure all bottle labels are filled out correctly and completely.

☐ Freeze nutrient samples as soon as possible. You should have been provided a plastic test tube rack. Please make sure to place nutrient tubes in this rack for freezing to ensure they are frozen standing upright. They should not be frozen upside down or on their sides.

☐ Phyto samples stored in cool, dark place. Double check that you have added enough Lugol's to preserve the sample (tea coloured).

☐ If you collect biotoxins, complete the filtering process (detailed instructions below) and then freeze the water sample bottles AND the filters in the provided vials (ensure you have labelled the bottles and the vials).

☐ Log sheets: scan or take a picture of completed log sheets and send to Nicole at end of day (nfrederickson@psf.ca).

☐ Scannable App works great! Get it free by using the QR code on page 17.

☐ Once you have a WiFi connection, using the tablet and Community Fishers App, send the day's data to Ocean Network Canada.

☐ Recharge tablet and CTD.

DETAILED INSTRUCTIONS

BEFORE GOING OUT ON WATER:

1. **FIRST AND FOREMOST; check the marine weather forecast to ensure there is a safe weather window for the day.**

   Good weather sources:

   Government of Canada Marine Weather
   Windy App
   UBC Waves for Today (contact: rpawlowi@mail.ubc.ca to get access)

2. Confirm all parts of the gear are packed. Make sure the tablet is charged and kit is stocked with frozen ice packs, phyto, nutrient and chlorophyll bottles, filters, syringes, data sheets and pencils. When possible, pre-load nutrient/chlorophyll filters into the filter holders. Fill out dates on sampling bottles.

3. Fill out the daily cruise info on your daily cruise logsheet (boat name, date, participants and Patrol location)(Fig. 1). Record the serial number of your CTD. **Record (Ziploc) Nutrient Bag # and nutrient vial #'s. Note that you will only have one Daily Cruise logsheet per trip.**

Daily Cruise info	
Date (YYYY-MM-DD)	
Boat	
Boat Code (eg ELV)	
Geographic area	
CTD serial #	
Fluorometer serial #	
Optode serial #	
Net type & mesh size	
GPS used for events	
Captain	
Crew	
Crew	
Nutrient bag #	

Notes

(Time departed, weather, wildlife observations, gear/equipment issues etc.)

Station info	
Date (YYYY-MM-DD)	
Station Name & Type *(i.e, Full/Busy/Norm)*	
Latitude (N)	
Longitude (W)	
CTD Cast 1 Start Time (local)	
Cast 1 counter at bottom	
Water Depth from sounder (m)	
Nutrient samples in dup?	surf: Y / N 20m: Y / N
Phyto sample with Lugol's?	surf: Y / N
Chlorophyll sample (5m)?	Y / N
Nutrient bottle id (surf):	Surf: Dup:
Nutrient bottle id (20 m):	20 m: Dup:
Secchi depth	1: m 2: m

Notes

Figure 1. An example of the Daily Cruise logsheet (left; only one per sample trip) and the Station logsheet (right; one for every station you visit).

Photo 1. The Powell River crew with PSF Oceanographic Program Manager out on the water sampling (Left to Right: Ed Oldfield, Nicole Frederickson, John Sinclair). Photo credit: Nicole Frederickson

ON THE WATER:

Navigate to the station. Stop the boat within 100 m of the given GPS coordinates for the station. Place the CTD on whichever side of the boat is safest given winds and currents.

Begin filling out the "Station" logsheet. Record the station name (for example IS-2), sample latitude and longitude coordinates, time, and date in Year-Mon-DD format (e.g. 2022-Aug-04) (Figure 1). For a cast depth, the counter on the downrigger should only be used as a guide (see "Cast depth" on page 3 for details).

Phytoplankton surface samples are taken at every station, except for the "**BUSY**" station where you will take four samples (surface, 5 m, 10 m and 20 m).

Nutrient samples are only taken at "**FULL**" and "**BUSY**" stations. One sample is taken at the surface and one is taken at 20 m. For "**BUSY**" station, you take duplicate nutrient samples at the surface and 20 m (total 4 samples).

The last "**FULL**" or "**BUSY**" station of the day: duplicate chlorophyll samples are taken at 5 m.

Each label must have month and day info. Format mon/dd (please use double digits (for example, August 9 will be Aug/09). Some labels (chlorophyll and biotoxin samples) need station name to be filled out.

Photo 2. An image of all of the required sampling gear and bottles, incluidng: CTD and backup rod, cooler for putting samples in to keep them cool after collection, all sample bottles (phytoplankton, nutrients, chlorophyll bottles), except biotoxin bottles, Niskin bottle and Secchi disk. Photo credit: Nicole Frederickson

USING THE CTD TO COLLECT WATER PROFILE DATA:

Figure 2. Image of the Community Fishers App logo.

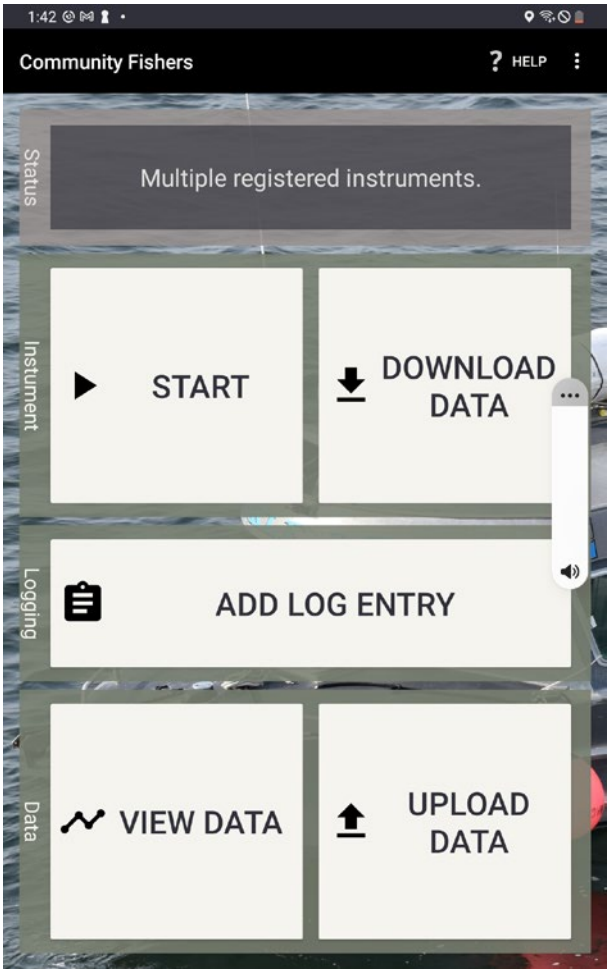


Photo 3. Community Fishers App Interface.

COLLECTING DATA:

1. Turn on the tablet and open Community Fisher's app.
2. Turn on CTD (twist the power switch/status indicator)
   - > The indicator light should flash orange/white/blue signifying powering up.
   - > When the light is steady green or red the instrument should be ready.
3. Press START to collect data (Photo 3): note the CTD will not actually record data until it is in seawater. The light will begin flashing green (- - - -) once in the water.
4. Lower the CTD carefully into seawater and let it settle for about 30 seconds submerged at the surface.
5. Begin cast by steadily lowering CTD at about 1 metre per second
6. Lower no more than 10 metres from the sea floor (to avoid damaging the sensors by hitting the bottom).
7. Remove the instrument and press DOWNLOAD DATA to get data from CTD to tablet (CTD is now ready for the next cast).

Photo 4. An image of the AML CTD instrument used to collect conductivity, temperature, dissolved oxygen and depth measurements. Photo credit: Nicole Frederickson.

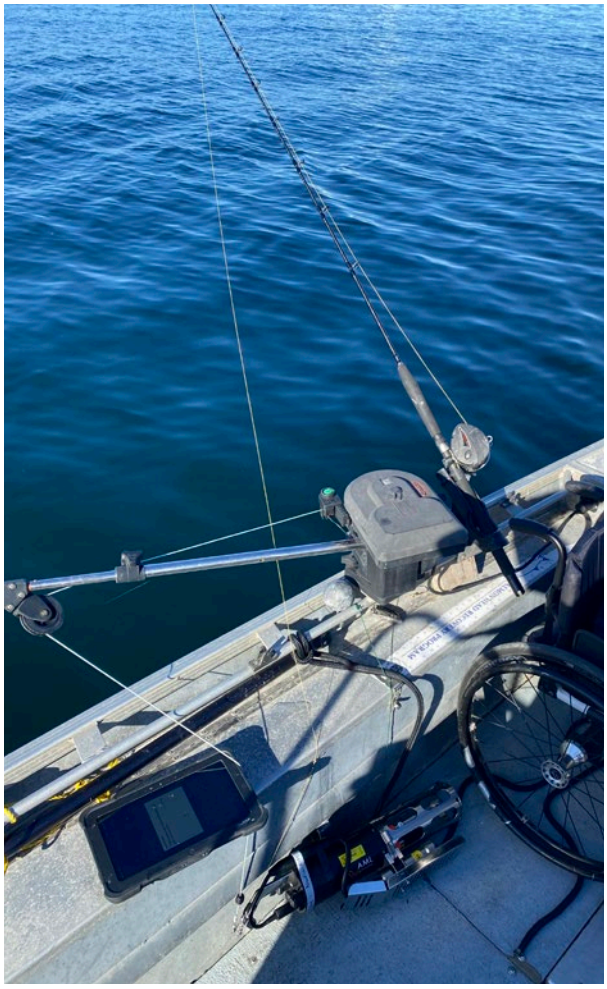


Photo 5. An image showing the CTD connected to the downrigger cable and the back-up safety line (heavy duty Penn fishing rod and reel, with 80 lb test braided fishing line).

IMPORTANT NOTES/TIPS WHEN LOWERING THE CTD:

- Be sure that the downrigger cable is under some tension or secured to the reel at all times – it can spring loose and get kinked if this is not done.
- Remember to clip the CTD to the downrigger cable and the weight to the line from the bottom of the CTD.
- **Attach the back-up safety line** (fishing line on the rod and reel). This is the only mitigation measure to prevent the CTD from being lost, should the downrigger cable fail. PLEASE DO NOT FORGET TO ATTACH THE BACK-UP SAFETY LINE. It is important to keep tension on the fishing line when lowering and retrieving the CTD. Failure to keep tension on the line may result in the fishing line and downrigger line getting extremely tangled.
- **Remove the covers from the optode and fluorometer.**
- Try to lower the CTD at an even speed of approximately ½ metre per second.
- Record the depth from the downrigger's counter on the Station logsheet.
- Raise the unit two turns, wait for 30 seconds and then bring it up. The speed coming up is not critical.

Photo 6. The crew getting ready to pair the CTD with the tablet to begin collecting data, prior to lowering the CTD in the water.

Photo 7. Ted and Gail Newell, who operate the Steveston Patrol, connecting the CTD to the downrigger line.

Photos credit: Rob Newell.

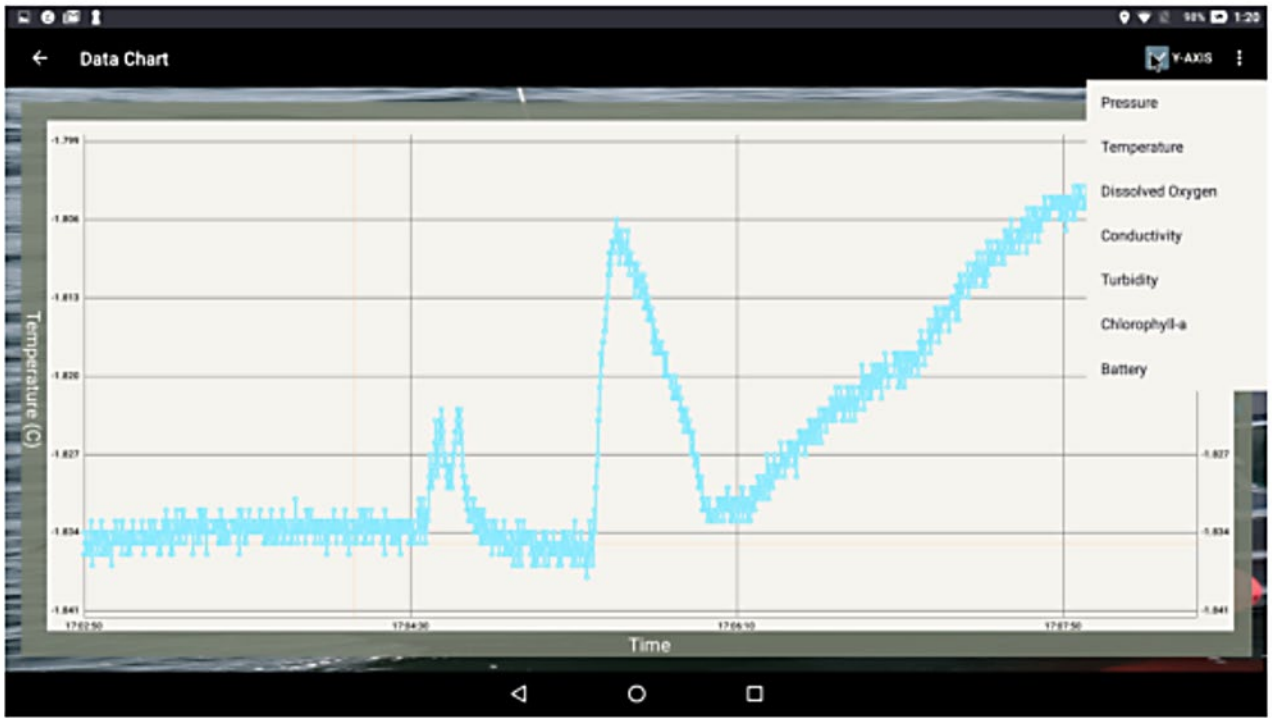


Figure 3. Visualization of the temperature data

VISUALIZING CASTS:

Once you have collected some data you can view it plotted on your tablet – we sometimes call these water profiles. Profiles are traditionally plotted with a variable e.g. water temperature plotted against depth (Figure 3).

- Press VIEW DATA.
- Select cast file (date, time and station location stamped).
- Choose the variable you wish to plot (temperature, salinity, etc.).

Once the CTD work is done, you can leave it on — this will make it quicker to pair with the App at your next site. Place the CTD in a safe spot on deck between sites. At the last site of the day, turn the CTD off by twisting the top cap (the lights should turn off), replace the sensor caps and place it gently in a safe spot on deck.

WATER SAMPLES:

If this is a water sampling station (**FULL/BUSY** station), you will do 1 Niskin bottle cast. Attach the Niskin bottle (in open position with "hammer" facing upwards) to the rope marked by one meter increments. Lower the Niskin to 20 m (so 20 m mark on rope is just touching the waters' surface), then attach the messenger and send it down to close the Niskin bottle. Once you have felt the messenger hit the bottle, bring the unit back to the surface. Bring the Niskin bottle on deck and take required water samples from it.

- **Be sure to record nutrient vial # on log sheet**
- Double check labels on nutrient vials to ensure you have the correct bottle (labels are colour coded – e.g. **20 m** is red, **surface** is blue)

For nutrient **surface** sample, lean overboard (ensuring it is safe to do so first) and scoop water (using syringe) from just below sea surface. Make sure to rinse syringe three times with surface water before taking sample.

- **Be sure to record nutrient vial # on log sheet**

Photo 8. Brian Dearden (of the Gulf/Galiano Patrols) collecting surface water samples for Biotoxin analysis. Photo credit: Luci Marshall.

Photo 9. The Powell River crew (Ed Oldfield and John Sinclair) collecting water samples from the Niskin bottle. Photo credit: Nicole Frederickson

NUTRIENT SAMPLING:

It is strongly recommended that you pre-load nutrient filters into the filter holders prior to setting out on the water.

Take the filter holder and unscrew it so you have three parts (Figure 4a).

Use forceps to grab an individual 25 mm glass fibre filter (**GF/C**, Nutrient filters are in tin foil packaging because they have been specially baked).

Note: the filters have one side that has a cross-hatch pattern.

Place the filter on the circular platform of the filter holder base with the crosshatch pattern facing down (away from syringe side) (Fig. 4b).

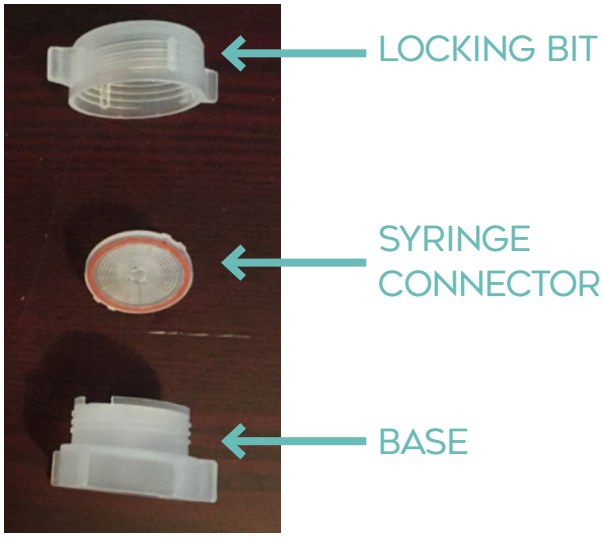


Figure 4a. Three parts of the filter holder (the locking bit, the syringe connector and the base).

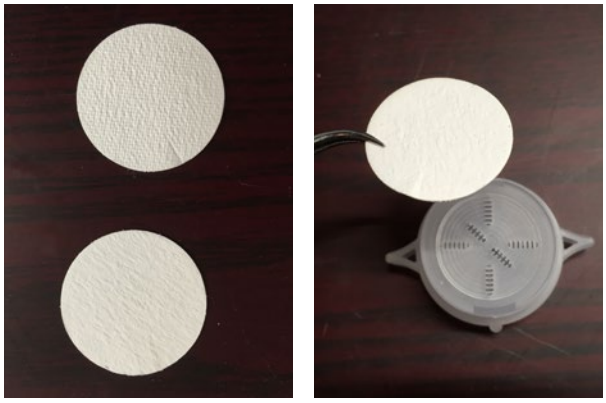


Figure 4b. Filter placement on filter holder base. Crosshatch pattern facing down.

Line up the syringe connector piece on top of the base making sure the nubs on syringe connector fit in the notches on the filter holder base (Fig. 4c). This will sandwich the filter between the two pieces.

Lastly, place the locking bit over the syringe connector and tighten to base. The wings on both the locking bit and base should be in line with each other (Fig. 4d).

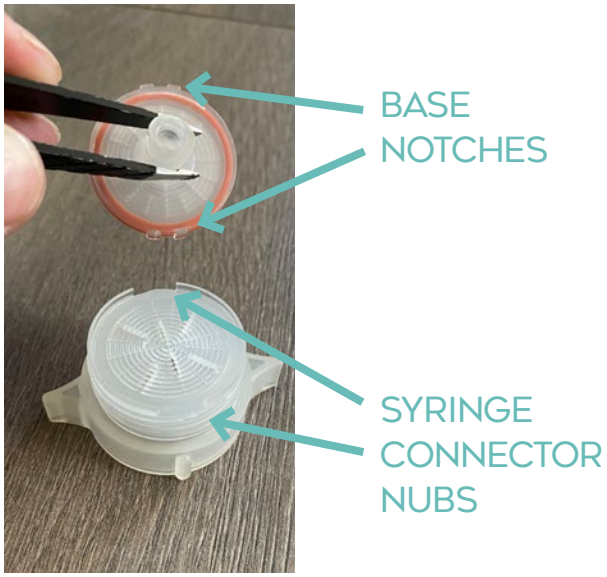


Figure 4c. Syringe connector placement on to base. Nubs on syringe connector fit in notches on base.

Figure 4d. The filter holder put back together with locking bit wings in line with base wings.

SAMPLING PROCESS:

NUTRIENTS:

Connect the filter holder to the end of syringe. Rinse the provided syringe three times with water from sample source prior to collecting sample. Once the syringe is filled with water, push the water through the filter for 5 seconds to flush the filter. Then fill the provided and sterilized nutrient tube to the top line, ensuring there is a little bit of space to allow expansion when sample is frozen. DO NOT OVERFILL. Repeat the same procedure again but with water collected from the surface. In total, there will be two nutrient samples taken at a FULL site (20 m and surface) and duplicate samples taken at a BUSY station (two at 20 m, two at surface). Note that nutrient sample labels are color coordinated, where **surface** sample bottles have a **blue** label, and **20 m** sample bottles have a **red** label. Place nutrient samples upright in rack in cooler. It's important that nutrient samples stay cool during the day and are frozen as soon as possible to prevent bacterial damage to sample.

- **Record nutrient vial number(s) on Station logsheet.**

PHYTOPLANKTON:

Rinse and then fill a pre-labelled bottle with sea water scooped from surface; wearing gloves, add a few drops of Lugols iodine solution, the exact number of drops depends on the water quality and can't be prescribed so add enough to turn the water the color of dark tea (Photo 11). You may have to gently swirl or tilt the sample to evenly mix the Lugols. Place back in the Zip-Lock in the cooler or another cool location (make sure date is put on Zip-Lock).

Photo 10. A water sample collected from the surface to be analyzed for phytoplankton. Lugols has been added as a preservative, which is what causes the amber/tea colour.

Photo 11. An example of the correct amount of Lugols needed to preserve phytoplankton samples

SECCHI DISK:

With the sun behind you, lower the Secchi disk over the side of a boat and record the depth at which the white surface of the disk just disappears from sight. Note: the Secchi line is marked in 0.5 m and 1.0 m increments. The 0.5 m marks are red, while the 1.0 m marks are black. Record to the nearest 0.5 m. For example, 6.5 m. Take a second reading and record it. It is recommended that sunglasses are not worn.

Make notes on the Station logsheets on anything observed while on station — for example that you were pushed off station by wind, had to manoeuvre to avoid another boat, saw lots of shiners — anything notable. In particular, make notes about difficulties encountered with sampling or deployment and simple weather observations.

Move onto the next station.

Photo 12. Gail Newell of the Steveston Patrol, getting ready to lower the Secchi disk.
Photo credit: Rob Newell.

Photo 13. A chlorophyll filter after the filtration process. Photo credit: Rob Newell.

CHLOROPHYLL SAMPLING/FILTERING PROTOCOL:

At the last FULL water station of the day, a duplicate chlorophyll sample will be taken. Before sampling, prepare chlorophyll bottle labels. You will need two labels for each sample; chlorophyll is sampled in duplicate (like nutrients). **Make sure to put date and station on label.**

Using water from Niskin bottle from 5 m depth, take duplicate samples of chlorophyll.

FILTER HOLDER SET UP:

Read filter holder set up under the **Nutrient Sampling** section on page 11.

The only difference for chlorophyll is we use the **GF/F filters**. These come in a box. They are not wrapped in tinfoil.

SAMPLING PROCESS:

Rinse the syringe three times, and then fill to the top. Squeeze out water and air (ensure there are no air bubbles) so that syringe contains 140 ml. It is preferable to do the filtering in the darkest location on the vessel.

Screw the filter holder onto the end of the syringe. Gently, push the plunger until all the water has been filtered through the syringe. Be careful not to use too much force or filter too quickly. Using forceps put the filter in a scintillation vial (sample side up). Reload the filter holder with another filter and repeat the process for a duplicate sample. **THE FILTER IS THE SAMPLE.**

Place the two vials in the provided small black bag, place on ice and in freezer asap. Do not allow samples to thaw or be exposed to light.

Make a note on the station log sheet; "2 chl samples collected from 5 m".

BIOTOXIN SAMPLES:

Collect water samples using the provided 1 L plastic sample bottles.

- Collect one sample at surface (0 m) — Label the sample bottle with the Station Name, Date (Mon-dd-year) and Depth (e.g. Surface).
- Collect one sample at 20 m, using the Niksin bottle. Label the sample bottle with the Station Name, Date (Mon-dd-year) and Depth (e.g. Surface)

Put the samples in the cooler. They will need to be filtered later when you are back on land.

FILTERING PROCESS:

To be done once you return home at the end of the day.

On a stable surface gather the samples, and the Filter chamber, filter vials and hand pump.

- Rinse the **support plate**, **upper chamber**, and **receiver** (Figure 5) of the filtration assembly with clean, fresh water (preferably distilled and/or deionized).
- Place the support plate with O-ring into the top of the receiver
- Place a clean Filter onto the support plate using forceps
- Screw the upper chamber (with o-ring) onto the support plate and tighten the locking ring.
- Seal one of the side-arms of the receiver chamber with a small rubber cap (if not done already).
- Connect the tubing of the hand pump to the other side-arm of the receiver chamber.
- Pour 500 mL of sample water into the upper chamber.

The chamber only holds 500 mL of water at a time. So, once you have filtered 500 mL, you will have to refill the chamber with an additional 500ml (to get a total sample volume of 1000 ml). Note: if you did not collect enough water to meet the 1000 ml, just record how much water you filtered on the sample bottle (e.g. 900 ml).

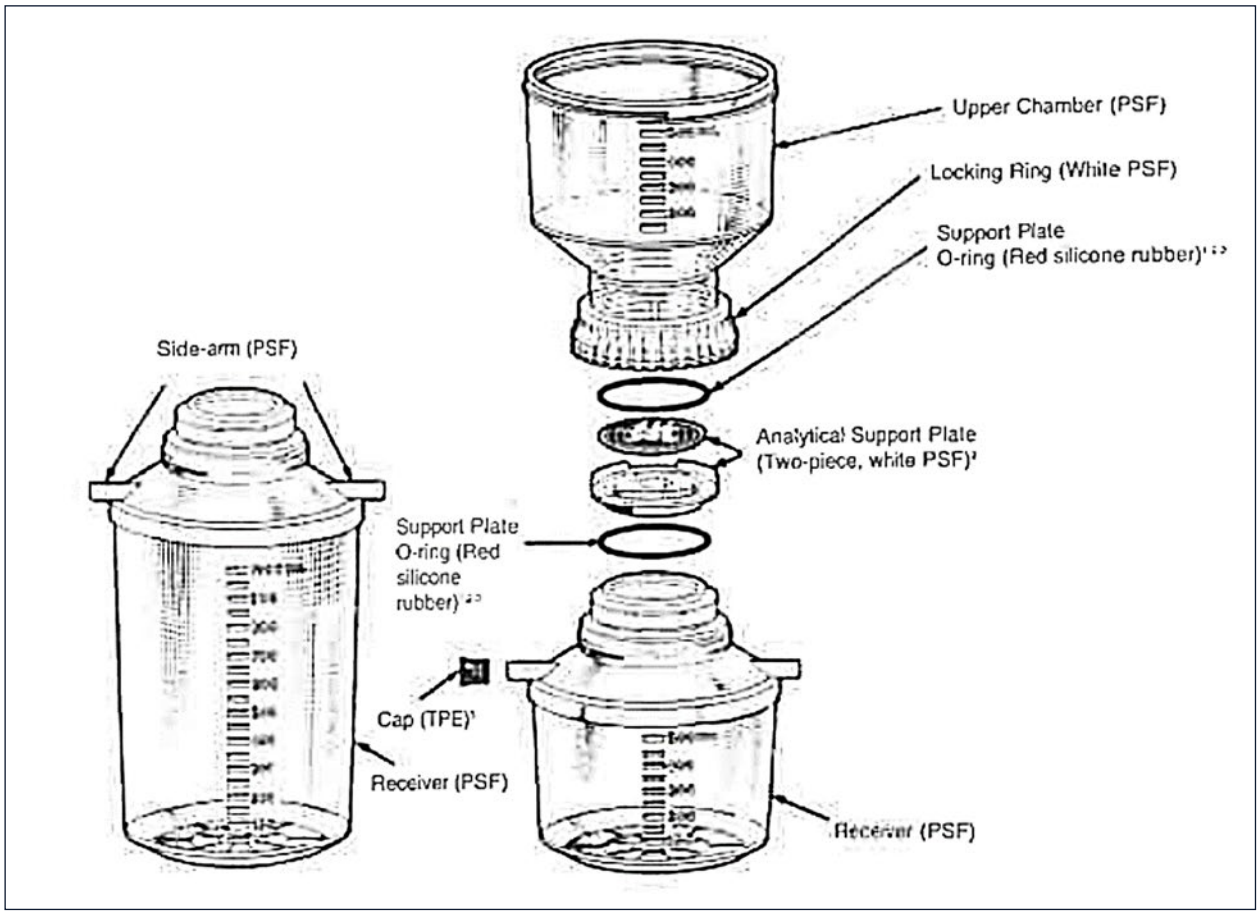


Figure 5. The biotoxin filtration system components.

Photo 14. A photo of the biotoxin sample bottle, filter chamber during the filtering process. Photo credit: Nicole Frederickson

- Begin pumping the hand pump until the gauge reads 4 in Hg. Continue to pump at a speed that maintains (but not exceeds) 4 in Hg.

NOTE: It is important that you do not exceed the 4 in Hg because that can damage the biotoxins and provide inaccurate results.

- Once the Upper Chamber is empty, add the remaining water from the sample and filter using the pump. Remember to make a note of the total volume of water that you filtered through the chamber, because you will need to record this on the sample bottles.
- Release the vacuum by pushing the small lever below the pump gauge.
- Undo the Locking Ring and remove the Upper chamber.
- Using the tweezers or gloved hands, carefully fold or roll the filter into a clean 5 ml cryovial.
- **Label** the cryovial with the sampling location, depth, date and volume of water filtered (e.g. 1000 ml)
- Remove the support plate from the receiver and carefully empty the water in the receiver back into the 1 L sample bottle.
- Be sure the sample bottle is labelled with the sampling location, depth, date and volume of water filtered (e.g. 1000 ml).
- Place the sample bottle and the cryovial into the freezer.

NOTE: Both the filter and the water are the samples.

- Repeat for the next sample.

CARE OF EQUIPMENT AT END OF DAY:

Rinse the CTD, Niskin bottle and downrigger completely with fresh water.

CTD POST SAMPLING AFTER CARE:

1. Turn off the CTD after sampling.
2. Saltwater can do a lot of damage, so to maintain the integrity of the instrument and sensors they should be rinsed thoroughly with freshwater after every trip.
3. Place protective caps on sensors.
4. Wait until the instrument is dry until fully storing and sealing the instrument box.
5. Equipment should be stored all together in designated cases in a dry location.

LOG SHEETS:

If you have a scanner, it would be ideal if you could scan the completed log sheets or use the tablet to take clear, close-up pictures of the log sheets.

There is a free app by Evernote called "**Scannable**" that also works well.

Use the QR code to get the free app.

Email these files/images to the PSF Citizen Science Oceanography Program Coordinator:

Nicole Frederickson
e-mail: **nfrederickson@psf.ca**

Put filled-out paper log sheets behind your manual binder or somewhere for safe keeping.

Make sure to submit log sheets with matching samples when submitted.

CTD UPLOADING INSTRUCTIONS:

Data will be collected by the Ocean Networks Canada "Community Fishers Application" on the tablet. When you get home, connect the tablet to your Wi-Fi network and press "UPLOAD DATA" on the Community Fishers app. This will allow the data to be stored and processed by Ocean Networks Canada and hosted on their website (Oceans 2.0).

Press UPLOAD DATA

Choose from the options:

Upload data to server

Upload data to server and remove from app — this is the recommended option.

Backup data on device and remove from app (Figure 6)

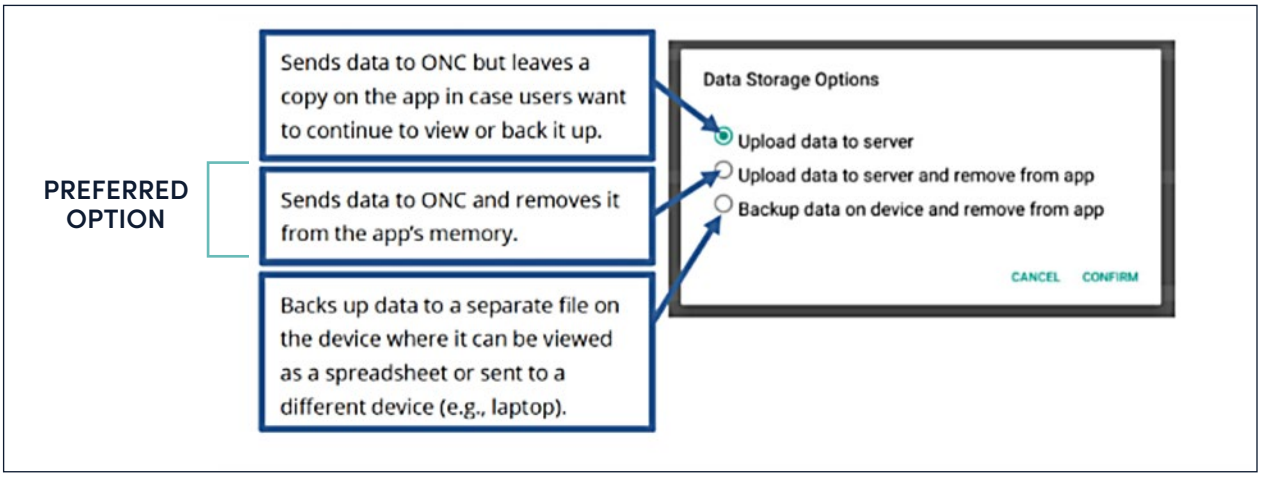


Figure 6. Showing the options available when uploading the CTD data to ONC at the end of a sampling day. The recommended option is "Upload data to server and remove from app".

CTD/TABLET TROUBLESHOOTING:

The app fails to connect to ONC to register an instrument

- From the drop-down menu (three vertical dots) in the top right corner of the screen, select "view registered instruments" and make sure the correct 5-digit serial number was entered.
- Retry registering the instrument.
- Make sure the mobile device has a strong WiFi connection to the internet.
- Make sure the WiFi internet network being used does not have security settings or restrictions that will prevent connection.

The app fails to upload the data to ONC

- Try uploading again by pushing the UPLOAD DATA button on the app
- Make sure the mobile device has strong WiFi connection to the internet
- Make sure the WiFi internet network being used does not have security settings or restrictions that will prevent connection.
- Turn the app and/or tablet off and on and retry uploading the data.
- If data does not upload to Oceans 2.0 backup data on tablet. Ask one of the community support specialists.

NOTE: A personal/home WiFi network will likely provide the best connection because it will be unrestricted whereas public networks may prevent certain connections.

The app stalls/freezes completely when trying to transfer data to the tablet

- Stop and quit the app by pressing the triangle-shaped back ("soft key") pm the bottom left side of the tablet screen. Wait for the app to quit and then perform the following steps:
  1. From the home screen, open the apps list by clicking on the white circle (with 6 dots) at the bottom of the screen.
  2. Once the apps list is open, go to the tablet's setting ("gear" shaped icon).
  3. Here, click on "Apps" (under the "device heading) and click on the Community Fishers app.
  4. Press on the "force stop" to shutdown the app.
  5. Refresh both the CTD and Tablet by turning them off and on again.

After the cast the data fails to be downloaded to the app/device

- Try downloading again by pressing the DOWNLOAD DATA button on the app. The instrument may need to be refreshed (turned on and off again).
- Turn both the tablet and the instriment off and on again and retry downloading the data from the last cast.

The app asks for a manual GPS input

- Make sure the mobile device has been on for 5 to 10 minutes and has an unobstucted view of the sky.
- Enter the GPS location from a separate device (your ship's GPS).

The instrument is "connected" but fails to start

- Retry starting the instrument by pressing the START button on the app (try two or three times if necessary), make sure that the instrument is connected to the tablet via WiFi.
- Refresh the instrument (by turning it on and off again) and retry starting the instrument using the app (try two or three times if necessary).
- Turn both the tablet and the instrument off and on again and re-attempt to start the instrument using the app.

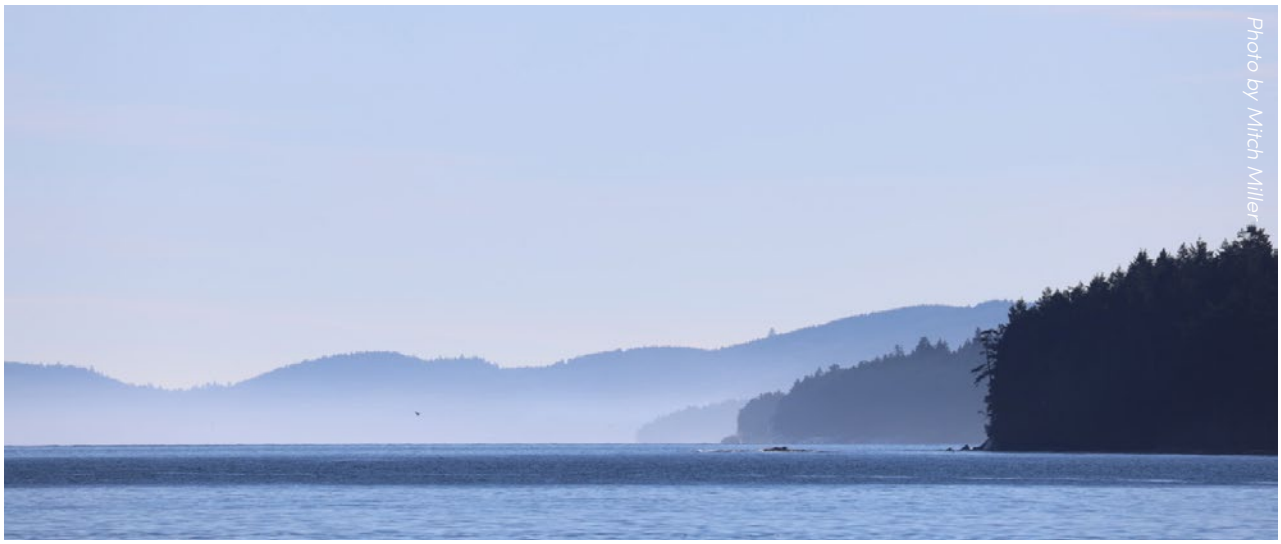
The instrument is "on" but "there are no instruments available"

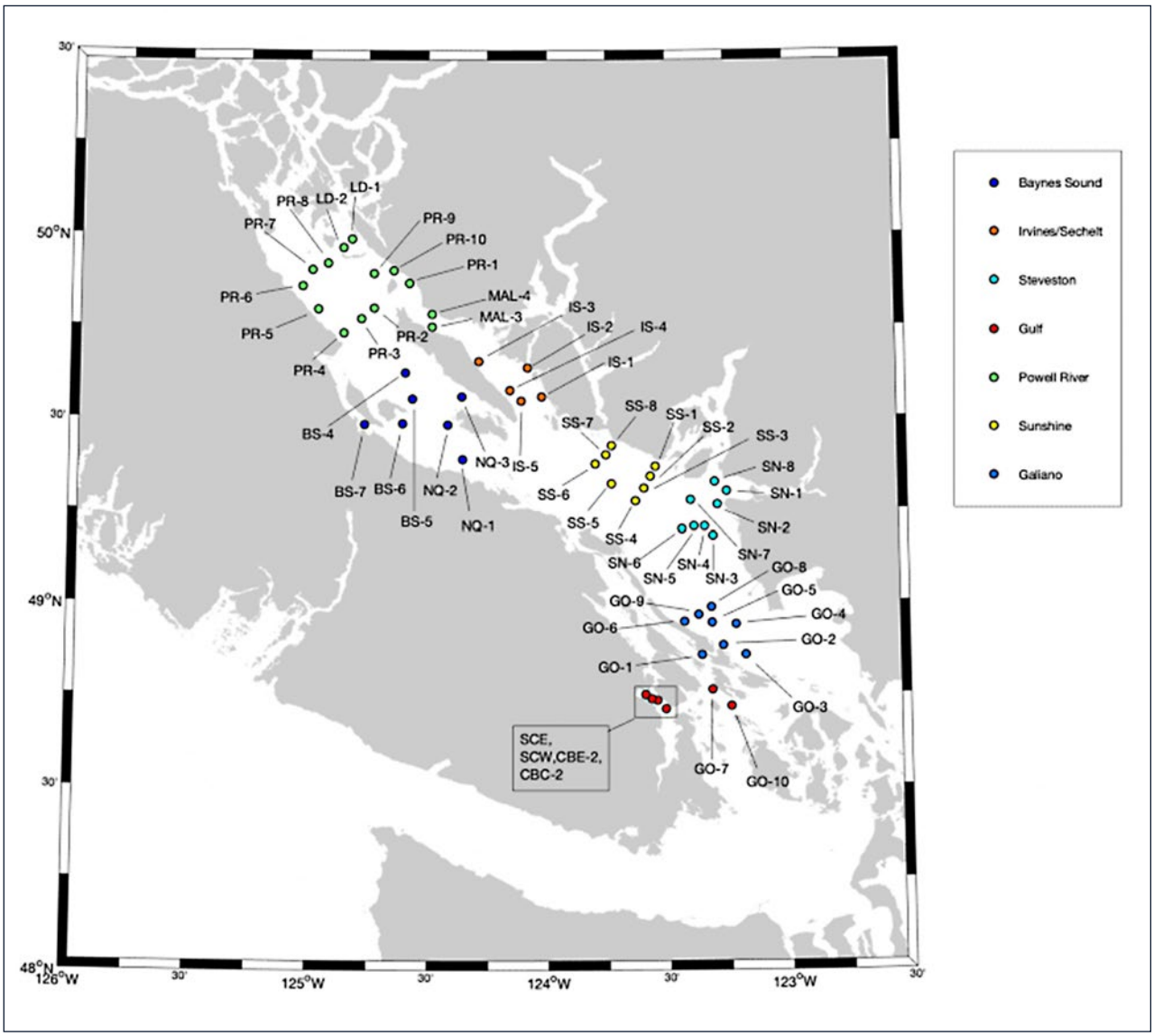
- Check to make sure the correct instrument is "registered".
- Try turning the instrument off and on again and wait 10 seconds (try two or three times if necessary).

The instrument is "available" but fails to connect

- Make sure the instrument is connected to the tablet via WiFi connection (the connection options can be accessed through the drop-down menu in the app).
- Refresh the instrument (by turning it off and on again) and retry connecting the instrument via WiFi (try two or three times if necessary).
- Turn both the tablet and the instrument off and on again, and re-attempt to connect the instrument.

MAP OF ALL STATIONS (2020):





Map of all stations in 2019 and 2020. Station markers are coloured by patrol.

Photo by Mitch Miller

If you require any help with the app or other issues, contact the PSF Citizen Science Program Coordinator.

Nicole Frederickson
Cell: 778-268-1904
E-mail: nfrederickson@psf.ca

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