



Regional Operations Centre **Canadian Coast Guard – Pacific**

PACIFIC REGION CCG VESSEL - POST CRUISE REPORT

Line P Program – Fisheries and Oceans Canada

NAME OF SHIP/PLATFORM: John P Tully

DATE: **FROM:** 28 February 2025

TO: 15 March 2025

SCIENCE CRUISE NUMBER: 2025-001

SHIP'S PATROL NUMBER: 24-13

CHIEF SCIENTIST[S]: Marie Robert

SCIENTIFIC PERSONNEL:

Female	Male
Danielle Caleb (IOS)	Mark Belton (IOS)
Kailee Clarke (MUN)	Kyle Simpson (IOS)
Deniz Coskuner (UBC)	Garrett Sharpe (NCSU)
Moir Galbraith (IOS)	
Chloe Immonen (IOS)	
Marie Robert (IOS)	

AREAS OF OPERATION: Juan de Fuca Strait, Line P, Station Papa, Queen Charlotte Sound, Queen Charlotte Strait, Strait of Georgia.

INTRODUCTION/PROGRAMS BACKGROUND:

Line P is a long standing monitoring program which surveys a 1400 km long section 3 times annually. Data have been collected along this line since 1956 and show evidence of the impact of climate variability on ocean productivity. It is the only Canadian long time-series that allows scientists to monitor climate changes so far offshore in the Pacific Ocean. It is also the best opportunity for other programs (e.g. Universities) to do research in the Pacific since the Line P data give them background as well as current water properties.

CRUISE OBJECTIVE/OBJECTIVES: Repeat hydrography, zooplankton, trace metal, and carbon survey along Line P. Hydrography and zooplankton stations in Queen Charlotte Sound and Queen Charlotte Strait, Burke Channel, Knight inlet, and Strait of Georgia. Deploy a glider for IOS near station P24 and recover a glider for WHOI at Station P.

CRUISE DESCRIPTION: This cruise went really well. Only one station and a few casts were skipped along Line P, and we managed to sample most of the Strait of Georgia stations.

DAYS ALLOCATED: 15

DAYS OF OPERATION: 14

DAYS LOST DUE TO WEATHER: Just a few hours before of slower speed going into the swell.

SAMPLING:

- Since we left from Victoria base, we didn't sample Haro59 on our way to Line P as we normally do. We took loop samples at the four JF stations then started Line P. The trace metal sampling was cancelled at P4 because of issues with the winch. Station P6 was skipped due to high winds. Both bongo casts and the shallow rosette cast were cancelled at P20 due to high winds. Haro59 was sampled on our way back.
- We could not perform any glider operations due to weather.
- The samples collected include:
 - 1) Underway: **IOS**: Thermosalinograph (Temperature, Conductivity, Fluorescence), met data via SCS software.
 - 2) "E-data" from CTD: **IOS**: Pressure, Temperature, Conductivity, Dissolved Oxygen, Transmissivity x2, Irradiance, Fluorescence.
 - 3) From the Rosette: **IOS**: Dissolved oxygen, salinity, nutrients, chlorophyll, pigments (HPLC), dissolved inorganic carbon (DIC), alkalinity, phytoplankton, and Chitobiase (secondary production estimates) – **MUN (Clarke)**: total organic carbon (TOC), dissolved organic carbon (DOC), coloured dissolved organic matter (CDOM), speciation of dissolved organic matter (SPE-DOM) – **UBC (Coskuner)**: Particulate Organic Matter (POM) – **NCSU (Sharpe)**: phytoplankton cultivation, marine bacteria community cryostocks, glutaraldehyde preserved seawater for cell counts, large size fraction bacterial filters for DNA (greater than 5µm, particle associated bacteria), small size fraction bacterial filters for DNA (0.2-5µm, free living bacteria).
 - 4) Zooplankton nets: Vertical net hauls using a Bongo, 236 µm mesh size, were done to either 10 m off the bottom, 250 m, or 1200 m – **UBC (Coskuner)**: Some zooplankton were picked and preserved from the nets for analysis of zooplankton fatty acids.
 - 5) Trace metal Go-flos: **IOS (Caleb, Simpson)**: trace metals filtered, trace metals unfiltered, nutrients, salinity.

RADIOISOTOPE USE:

No radioisotopes were used during the cruise.

PROBLEMS [SCIENTIFIC GEAR AND OPERATIONS]:

We had to load all our gear at Victoria base. As we left IOS to head down to Victoria, the cube van stopped working. We had to transfer all the gear into three vehicles, which was not ideal.

The 'red' transmissometer (650 nm) got flooded during the deep P12 cast.

We did not have a dummy plug for the PAR sensor. Thanks to Chloe for setting up another sensor to be used at dummy plug so the whole cable did not have to be removed from the CTD every deep cast.

SUCCESES [SCIENTIFIC]:

The pressure and altimetry display repeater from the CTD laptop to the CTD winch operator station worked really well.

It was very handy to have the -80 and -20 freezers in the helicopter hanger and not in the hold.

PROBLEMS [SHIP'S EQUIPMENT/OPERATIONS/PLATFORM SUITABILITY]:

There seems to be some issues with the internal Wi-fi system that allows data and GPS string to be shared by many work stations. Thanks to Shane Fraser for all his help making it work.

The bongo winch did some strange noises at P4 and had to be fixed.

The Trace Metal winch was not working at first; the drum would not turn one way or the other. After contacting the winch staff on land it was determined that it was an issue with phase. That got resolved and we were going to sample for trace metals at P4 when we realised that there was no winch counter for that winch, meaning that we had no way of determining how deep the Go-flo bottles were being lowered. We had to skip sampling at P4 while the engineers and electrician modified the spare counter from the bongo winch to fit the trace metal winch. A test at station P10 with the weights and RBR determined that the "new modified TM winch counter" confirmed that we could use that counter for the remainder of the cruise.

The sheave of the CTD winch started squeaking after station P20 and had to be greased before every cast following that.

SUCSESSES [SHIP]:

See above [problems, ship's equipment] regarding the engineers and electricians adapting the spare bongo winch counter so it worked with the trace metal winch.

We used the tension monitoring device on the CTD Hawboldt winch for the first time and it allowed us to do all our deep casts.

The "new" (for us!) stairs going to the hold allowed us to conduct our Trace Metal sampling since we could walk down with the Go-flos bottles.

DELAYS [OTHER THAN WEATHER]:

None.

SAFETY CONCERNS:

None.

HAZARDOUS OCCURRENCES:

A virus had been circulating through the vessel before we boarded, with a third of the crew already affected. We were informed of the situation and given the option not to sail, which one member of the science party chose to take. Although many people were still coughing as we left Victoria, no member of the science team became sick.

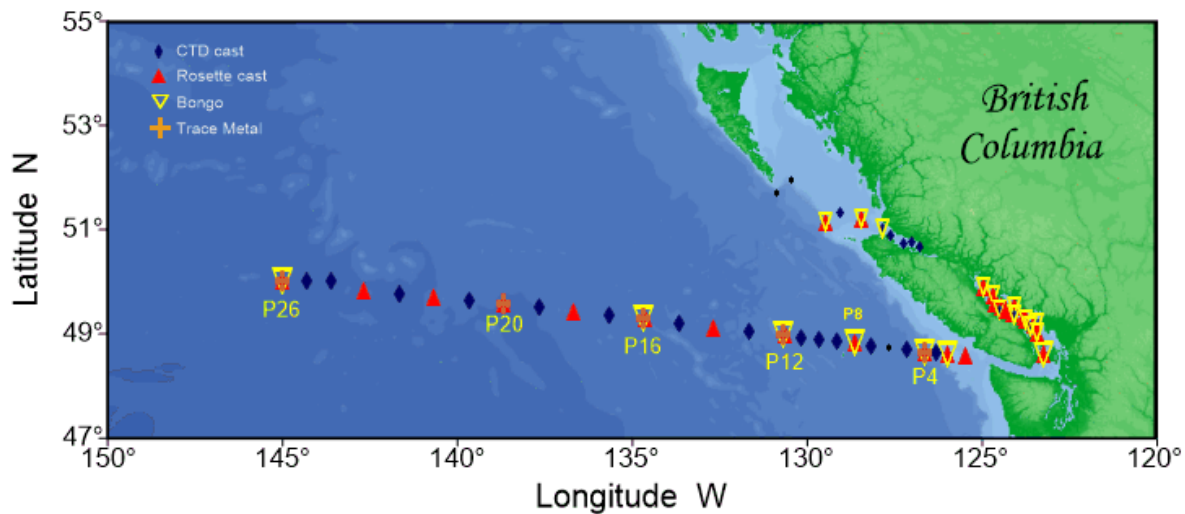
EVENT LOG:

Friday 28 February:	Leave IOS in the morning with the cube van to bring the gear to Victoria base. The cube van breaks down. Transfer all the gear into three other vehicles. Load the science gear, container and cages on the ship. Safety meeting at 1100. Everyone stays on board.
Saturday 1 March:	Leave the dock at 0900. Test CTD and bongo casts off Victoria, then head off towards Line P. Loop samples at JF1 to JF1 and P1. Fire and abandon ship drill after lunch.
Sunday 2 March:	P2 to P5, skip P6 due to high winds, start P7. Discover winch counter issues for trace metal winch at P4, TM sampling cancelled.
Monday 3 March:	Complete P7, stations P8 to P11, start P12. Engineers and electrician adapt a winch counter to the TM winch. Test at P10, it's good.
Tuesday 4 March:	Complete P12. P13 to P14.
Wednesday 5 March:	P15 to P17.
Thursday 6 March:	P18 to P20.
Friday 7 March:	P21 to P23.
Saturday 8 March:	P24 to P35, Start P26.
Sunday 9 March:	Complete P26, start sailing east.
Monday 10 March:	Sailing east. Asses weather for glider deployment in eddy but still too rough.
Tuesday 11 March:	Sailing east. Science presentations in the afternoon. Scott2, CI04, CS09.
Wednesday 12 March:	CPE1, QCS3 to QCS1. 1700 Seymour Narrows tide. 14, 12.
Thursday 13 March:	9, 6, CPF2, 3, 2, 24, CPF1, 27, GEO1, 38, 39, 40, 42.
Friday 14 March:	Haro59. Arrive at Victoria in the morning and offload.

CRUISE TRACK:

Line P cruise, 2025-001

28 February - 15 March 2025



SUMMARY/FINAL COMMENTS:

- THANK YOUs go to many people on this cruise:
 - To Sean, Kevin, and Scott for all flat deck transport of heavy equipment.
 - To Scott, Mike, Steve, Daniel and Francesca for driving us to and from Vic Base.
 - To Paul and Sarah for helping setting up all the “Arctic CTD gear” and giving a hand to Chloe and Mark getting the TSG and other Laurier science equipment ready.
 - To Sean and Bill for answering our calls on the weekend.
 - To the engineers and electrician for making the winches work with the parts they had on board.
 - To Kurt and his deck team for all the help they provided.
 - To Shane for countless demands of help with Wi-fi and cameras and monitors and GPS pucks and so many other things. Thank you for not giving up on the GPS issue.
 - To the officers on the bridge for keeping station for hours on end.
 - To Kerri, Richard and their galley crew for such delicious food and great smiles.
 - To Captain Hamilton for orchestrating such a great bunch of people.
 - And as usual, thanks to everyone at IOS who prepared all the gear for us to use.

Marie Robert

- I would like to thank the captain and crew of the Sir Wilfrid Laurier and Chief Scientist Marie Robert for making this cruise possible and undertaking the planning and preparation to make it go forward. I would like to thank my watch leader, Moira Galbraith, for all the guidance and help provided during the cruise. I would like to thank the other scientists on watch for their hard work and for making the trip a memorable experience.

Deniz Coskuner

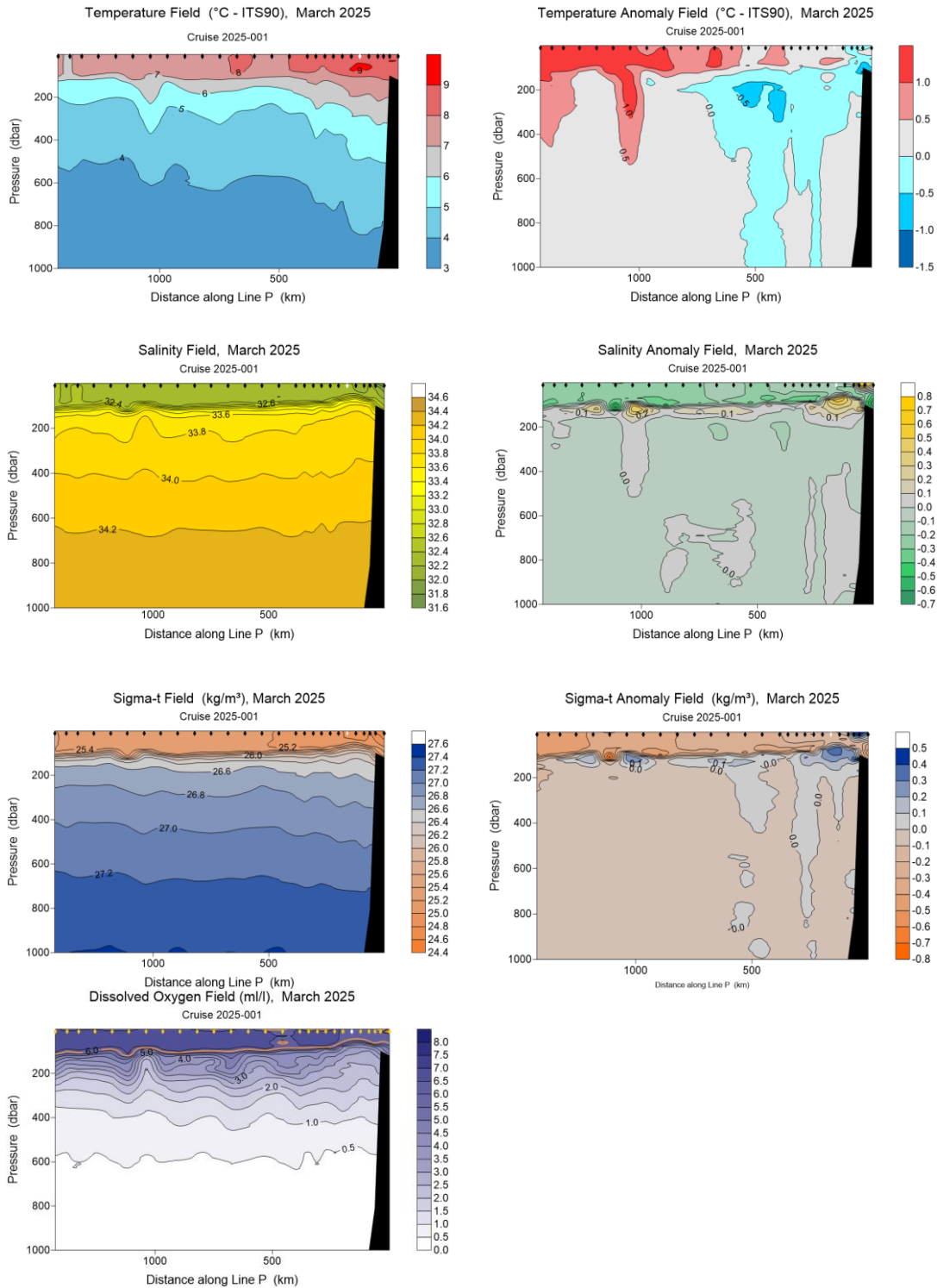
- I’d like to thank the Captain and crew of the CCGS Sir Wilfrid Laurier for all of their assistance and hard work throughout this cruise, and for taking an interest in our work. As always, thank you to Marie Robert, for helping to provide me with the opportunity to collect these samples, and the continued support throughout this project.

Kailee Clarke

PROJECTS AND RESULTS:

Water masses – Marie Robert, DFO/IOS.

The Pacific waters seemed pretty ‘normal’ this winter, with a ~100m mixed layer depth west of P12. The offshore waters are warmer than the inshore waters, but the anomalies (with respect to the 1956-1991 averages) are small: -1.5 to 1.0°C, as shown in the top right panel. We can also note the signature of an eddy near P21.



March 2025 Line P Trip Report – Deniz Coskuner, UBC.

Zooplankton are crucial components of marine food webs, making up a key link between primary producers and higher trophic level organisms such as marine fish and mammals. The nutritional quality and quantity of zooplankton prey for these higher trophic organisms is seen as an important component of early marine success for juvenile fish. More nutritious zooplankton prey can improve growth and health, leading to better predation avoidance and resilience for these organisms, ultimately increasing survival.

Zooplankton prey that are higher in fatty acids essential for organism health and development are considered of greater nutritional quality. Different zooplankton species differ in composition of these essential fatty acids. Along Line P, I collected zooplankton species commonly found offshore from IOS bongo net casts from stations P4, P8, P16, P20 and P26. These casts ranged from 250m to 1200m in depth. Zooplankton species were collected, identified and frozen for fatty acid analysis back at UBC. These profiles will be used to compare with data from other Line P surveys for changes in fatty acid composition both seasonally and spatially (Coastal, on shelf etc.).

Fatty acids play a crucial role in marine environments, serving as biomarkers for various biological processes and environmental conditions. Assessment of fatty acids in marine environments are a useful tool for indicating the source and quality of organic matter, assessment of primary production, trophic relationships, and energy flow within marine ecosystems. Particulate organic matter (POM) makes up the base of the pelagic food web and is a significant source of high-quality fatty acids for higher trophic level organisms (i.e omega-3). I collected seawater from 5m depth at 6 stations in the Strait of Georgia. Water was vacuum filtered on GF/F filters for fatty acid analysis back at UBC, as well as for complementary stable isotope analysis. This data will be used to characterize the nutritional quality of POM available for predators in the Strait of Georgia.

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Cruise Report: Line P 2025-001 – Kailee Clarke – Graduate student, Memorial University of Newfoundland

It is believed that deep ocean dissolved organic carbon (DOC) is ultra-stable and highly resistant to degradation, persisting for hundreds to thousands of years. Recent monitoring of total organic carbon (TOC) and DOC along the Line P transect has shown unexpected patches of increased carbon concentration at various depths, including in deep ocean waters below 2000 meters. These patches - observed during productive seasons in 2018 and again in 2021 - demonstrate irregular behaviour, being rapidly removed by the following winter.

DOC and chromophoric dissolved organic matter (CDOM) samples were collected by filtering directly from the Niskin bottles through a 0.2µm filter cartridge at P2, P4, P8, P12, P14, P16, P18, P20, P22, P24 and P26. TOC samples were collected directly from the Niskin bottles at P2, P4, P12, P16, and P26. Samples for solid phase extraction of DOM (SPE-DOM) were filtered at 75m and 2000m from station P18 and P22, with additional depths collected at P22 to assess for differences throughout the water column. SPE-DOM samples allow for DOC to be concentrated and dried for high-resolution analysis of structural properties of organic carbon at the depths collected, which will be compared to samples collected previously in Winter 2024 (2024-002), Spring 2024 (2024-006), and Summer 2024 (2024-008) to gain insight about the carbon's origin and how it gets transformed over time. TOC and DOC measurements are both used to quantify carbon concentrations, and the ratio of TOC to DOC indicates whether carbon export is being driven by sinking biological particulates or microbial transformations of dissolved molecules.

The study of these unexpected high-flux carbon events is important to further the global understanding of oceanic carbon burial, and to better predict such events in the future. This is especially important in predicting the effects that rising atmospheric carbon dioxide concentrations will have on natural carbon cycles.

Acknowledgments:

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Cruise Report: Line P 2025-001 – Garrett Sharpe – North Carolina State University

All sample types listed { phytoplankton cultivation, marine bacteria community cryostocks, glutaraldehyde preserved seawater for cell counts, large size fraction bacterial filters for DNA (greater than 5µm, particle associated bacteria), small size fraction bacterial filters for DNA (0.2-5µm, and free living bacteria) } were collected for stations P4, P12, P16, P20, P26, Scott2, 12, and 42, with all selected sample depths being within the upper 150 meters of the water column. 118 microbe filter samples (59 samples each for large size fraction of greater than 5 microns in size and for small size fraction of 0.2-5 microns in size) were collected for DNA of the microbial community. 81 samples were filtered through a 5 micron filter and preserved in 0.025% glutaraldehyde for flow cytometry and calculating bacterial and cyanobacterial cell concentrations. 81 samples were collected and preserved in 20% glycerol to make cryopreserved stocks for later bacterial cultivation attempts. Water from multiple depths was also filtered through 1.2 micron filters and diluted into phytoplankton growth media for culturing cyanobacteria. Water for all samples were initially collected from the CTD rosette.