

NAME OF SHIP/PLATFORM: John P Tully

DATE: FROM: 22 June 2020

TO: 14 July 2020

SCIENCE CRUISE NUMBER: 2020-005

SHIP'S PATROL NUMBER: 20-04

CHIEF SCIENTIST[S]: Marie Robert

SCIENTIFIC PERSONNEL:

Female	Male
Moira Galbraith (IOS)	Glenn Cooper (IOS)
Marie Robert (IOS)	Scott Rose (IOS)
Hayleigh Shannon (IOS)	Kenny Scozzafava (IOS)
	Julian Smith (IOS)

AREAS OF OPERATION: Strait of Georgia, Haro Strait, WCVI, Clayoquot Sound, Nootka Sound, Explorer Seamount, part of Line P, Queen Charlotte Sound, Discovery Islands, Jervis Inlet, Burrard Inlet, Indian Arm, Iona Island.

INTRODUCTION/PROGRAMS BACKGROUND:

La Perouse: The La Perouse field program consists of two annual surveys. The first survey takes place in late May/early June and represents: 1) oceanographic conditions representative of the start of the annual upwelling cycle; and 2) the peak biomass of zooplankton and phytoplankton communities of the British Columbia outer coast and represents lagged responses to winter conditions and the previous year. The second survey in late August/early September represents: 1) oceanographic conditions at the end of the productive upwelling season – often representative of the cumulative summer conditions; 2) a secondary peak of zooplankton biomass which also provides a snapshot of the success/productivity of zooplankton relative to their spring/early summer biomass and conditions experienced during the growing season; and 3) provides an expectation for the next spring. Both late spring and late summer La Perouse surveys provide critical information for useful interpretation of ocean productivity, ocean monitoring (especially with respect to continuing regional scale warm water anomalies), and conditions for fisheries. Zooplankton biomass anomalies for both surveys each year are used to estimate the amount and type of zooplankton available to higher trophic levels (fish such as outmigrating juvenile salmon). This information has regularly been presented at the media briefings for the start of each salmon fishing season. Information on highly unusual ocean conditions, such as occur during marine heat waves in 2015 and which may have occurred in 2019, are also used by DFO salmon stock assessment staff to condition their expectations for future salmon returns. Although a June survey will take place ~3 weeks later than the typical May survey, it is viewed as important as it will still provide necessary information on productivity for the early summer zooplankton community and, critically, will provide necessary context for interpreting oceanographic and biological patterns measured as part of the late summer (August/September) survey.

Explorer Seamount mooring: The mooring is an autonomous acoustic recorder, and it ultimately has several purposes. The main purpose for the mooring is to assess the frequency of occurrence of cetaceans, especially those listed under the SARA (Blue Whales, Fin Whales, Sei Whales, Right Whales, and Killer Whales) to aid in decisions regarding Critical Habitat designation.

The sample rates also allow the recording of all other marine mammals in the area. Ultimately, the hope is to assess the importance of seamounts to marine mammals, and this dataset will complement other acoustic datasets from other seamount complexes in BC (like Dellwood, Bowie, Union, and Paul Revere ridge - so far).

The recorders are calibrated so the data will also serve as a baseline for the soundscape characteristics of the Explorer Seamount area.

The data can also be used to detect fish, if desired.

Weather stations program: The application of FVCOM (Finite Volume Community Ocean Model) to model the hydrodynamics in BC coastal regions where aquaculture occurs requires meteorological data (including wind speed and direction, solar radiation, air temperature). The model is being used in Discovery Islands, the west coast of Vancouver Island (Nootka Sound and Clayoquot Sound), and Queen Charlotte Strait. We have used two sources to acquire these data; Environment Canada's High Resolution Deterministic Prediction System (HRDPS) at 2.5 km resolution, and weather stations installed and maintained at specified locations within the FVCOM model domain.

Existing data from meteorological models cannot adequately resolve the wind field in some of the more topographically complex regions, or identify some diurnal variability in the wind field. In these locations, weather stations have been installed to directly measure the meteorological parameters (wind speed and direction, and atmosphere/ocean heat flux).

A four-year monitoring program to directly observe the meteorological conditions using weather stations was proposed and funded in 2016. Starting in 2017 weather stations were installed in two configurations; in the Discovery Islands as stand-alone units at locations used in a previous monitoring program (these stations require a maintenance visit every 100 days to download the data), and internet connected weather stations installed on fish farms in Nootka and Clayoquot Sounds, and Queen Charlotte Strait. The stations located on fish farms require maintenance when the fish farms change position, there is an internet malfunction at the fish farm, or when upgrades are required to the weather station firmware.

Line P: Line P is a long standing 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 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. Unfortunately, due to lack of time during this cycle, only stations P4 to P12 are being sampled.

Jervis Inlet Water Properties Survey: The objective is to complete seven CTD stations in Jervis Inlet to acquire background HAB-free (Harmful Algal Bloom) water properties in the vicinity of two fish farms. These CTD profiles would augment the industry's high-resolution, early-warning system they have on their sites in the Jervis entrance. The off-lease water structure is key in anticipating HABs. Rosette samples will be collected for salinity, oxygen, chlorophyll, nutrients, and phytoplankton.

Burrard Inlet Water Properties Survey: The objective is to continue sampling the water properties at 17 stations in Burrard Inlet and Indian Arm as part of the Oceans Protection Plan to collect comprehensive marine ecosystem data for the Port of Vancouver pilot site. The data is particularly relevant to a parallel sampling program being undertaken by the Tsleil-Watuth First Nation.

ECCC Mooring Recovery: The objective is to recover an ADCP mooring near the Point Grey disposal site. The ADCP is part of an ECCC project, and will stop recording in mid-June.

<u>CRUISE OBJECTIVE/OBJECTIVES</u>: Water property and zooplankton sampling at 102 stations on the west and north coasts of Vancouver Island; Servicing of weather stations in seven sites in Clayoquot sound, six sites in Nootka sound, one site in Queen Charlotte sound and two sites in Okisollo channel; Water property and zooplankton sampling at a few Line P stations (P4 to P12); Service Marine Mammal mooring at Explorer Seamount; Water property and zooplankton sampling in Burrard Inlet and Indian Arm supporting Tsleil-Watuth monitoring program; HAB sampling in Jervis Inlet; Recovery of one ADCP mooring near Iona Island for ECCC.

<u>CRUISE DESCRIPTION</u>: This cruise (2020-005) was the second half of the 28-day cruise trying to accommodate parts of 11 different programs (Chandler, Freshwater, Vagle, Sastri, Cooper, Robert, Nichol, Young, Sutherland, Covert, Leung). It is the first DFO cruise to be approved since the beginning of the restrictions due to the COVID-19 pandemic. It is a very important cruise in many ways; not only because it helps to 'test' all the Safe Work Procedures and Standard of

Operations that were developed for work at sea during a pandemic, but also because it tries to salvage part of the field work that had to be cancelled in April and May of this year. Even though the data were collected later than would have been ideal, we gathered some invaluable information regarding the state of the inshore and coastal waters of Vancouver Island.

Needless to say, with so much work to perform it was an extremely busy cruise for everyone on board. Even though most of the work was completed, it would not be recommended to use this cruise as a precedent to reduce the number of ship days allocated to science during a regular year. If all the cruises were as busy as this one the toll on everyone would be too great. Despite this fact, it is very satisfying to have been able to accomplish as much as we did to rescue critical parts of our programs.

The highlight of the cruise was the four hours at station LD11 (48°27.7N 126°43.0W) during which a humpback whale circled the ship and seemed to be rubbing herself along the hull. Most of us had never seen a whale behave as such, let alone so close to the ship! It was a truly amazing (and smelly!) experience.

Of note too is the fortunate timing for our return to the Strait of Georgia in the last few days of the cruise. The Neocalinus cruise for Kelly Young which was supposed to start on July 13 being cancelled because of COVID-19 concerns, we were able to perform that sampling only a few days prior to the original planned dates.

DAYS ALLOCATED: 21 DAYS OF OPERATION: 20

DAYS LOST DUE TO WEATHER: About a day.

SAMPLING:

- The cruise was very successful. Most of the planned stations were sampled on the La Perouse portion of the survey. Of those, five stations didn't get sampled on the LD line, and two are missing from the LBP line, all due to weather. Also we are missing one station on the SS line, and none of the NL stations got sampled because of the time spent going to recover Wall-E the glider. On the other hand, the glider recovery gave us the chance to fully sample the LG and LJ lines which had been only partially sampled at our first attempt due to bad weather.
- One mooring was recovered and another one deployed for Linda Nichol (PBS) at Explorer Seamount.
- We sampled stations P4 to P12 along Line P.
- Most of the planned weather stations servicing was accomplished. The work was 100% done in Clayoquot Sound and Esperanza Inlet/Nookta Sound. We could not service the stations on Duncan Island because of communication issues with the farm owners but the work on the stations in Okisollo Channel was completed.
- All the Jervis Inlet stations were sampled for Terri Sutherland and most of the Burrard Inlet/Indian Arm stations were sampled for Paul Covert.
- We recovered the mooring near Iona Island for Roanna Leung (ECCC) and Gwyn Lintern (NRCan).
- The samples collected include:
 - 1) <u>Underway</u>: Thermosalinograph (Temperature, Conductivity, Fluorescence), acoustic sounder, ADCP.
 - 2) <u>"E-data" from CTD</u>: Pressure, Temperature, Conductivity, Dissolved Oxygen, Transmissivity x2, Irradiance, Surface Irradiance, Fluorescence.
 - 3) <u>From the Rosette</u>: Dissolved oxygen, ammonia, salinity, nutrients, chlorophyll, pigments (HPLC), dissolved inorganic carbon (DIC), alkalinity, phytoplankton.
 - 4) <u>Zooplankton nets</u>: Zooplankton using vertical net hauls using:
 - a) Bongo, 236 µm mesh size, casts to the bottom when shallower than 250 m; 250 m casts, 1200 m casts
 - b) Mini-bongo, 64 µm mesh size, casts to 50 m.
 - c) Multinet plankton sampler (MPS), 250 µm mesh size, casts to 2000 m.

RADIOISOTOPE USE:

No radioisotopes were used during this cruise.

NOTE: For the four following sections, refer also to Cruise Report 2020-028 as it was basically the same cycle. Below are the additions for the last part of the cycle.

PROBLEMS [SCIENTIFIC GEAR AND OPERATIONS]:

The glider Wall-E encountered some problems during its mission. Its buoyancy got affected and it had to drop its weight and drift at the surface. It is believed that it probably hit something on Explorer Seamount. We had to stop collecting our data and go rescue Wall-E, which also meant going back towards the high seas. Fortunately the weather calmed down the next day and the recovery was a success.

During the month of June we had access to the ONC internet signal with high bandwidth. Then on July 1st the signal switched to low bandwidth. Many sites were not accessible anymore due to lack of bandwidth which created problems for some people. It shows yet again that everyone now relies on internet to do their work and this service should be part of our work place.

The ONC internet signal can only be seen in the main lab, which is not practical for people working on laptops in their cabins. We need reliable repeaters on the science deck and to the chief scientist cabin.

The flow meters on the bongo seemed to be doing only half of the revolutions that were expected for each of the depths that we sampled. No explanation was found yet to explain why. Hopefully the RBR data will help solve the mystery. It would be good for future cruises to have the necessary cables and software to download the RBR data while at sea. We will double check the winch speed calibration with the winch shop personnel when back to IOS.

The internet signal, either through Ethernet or Wi-fi via Tully_Guest, was really unreliable in the chief scientist cabin.

SUCCESSES [SCIENTIFIC]:

The recovery and deployment of the Explorer Seamount mooring were done flawlessly.

We were able to sample the Strait of Georgia stations for Kelly Young at approximately the same time she would have been sampling if her cruise on the Neocaligus had been approved.

The mini-bongo worked well. It was easy to switch between the main bongo set and the mini bongo. It was also easy to deploy it off the aft deck with 50 kg on the weight line.

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

There were a few problems with the motor of the marshalling boat during the recovery of Wall-E.

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SUCCESSES [SHIP]:

We sampled the stations in Burrard Inlet / Indian Arm for the first time from the Tully. Usually this work is done from a much smaller vessel such as the Vector.

The weather station program was added to this cycle at the very last minute, yet most of the work was completed without any external assistance.

We completed the cycle without any COVID-19 concerns whatsoever.

It was great to have a dedicated hand washing station in the main lab. This is something that should stay past "COVID regulations" time.

DELAYS [OTHER THAN WEATHER]:

- ~ 24 hours for the recovery of Wall-E.
- ~ 4 hours because of a humpback whale.
- ~ 9 hours to pick up groceries in Port Hardy.
- ~12 hours to get the right tide from Indian Arm to Vancouver Harbour.

SAFETY CONCERNS:

None.

HAZARDOUS OCCURRENCES:

None.

EVENT LOG:

Start LB line. LB01 to LB07.
LB07 to LB16. Recover and deploy La Perouse mooring for Svein Vagle.
LB16 Multinet. LC12 to LC03.
LCO2 and LCO1. P9 to P11.
P12 nets. Explorer Seamount mooring. P12 rosette. P8.
P7 to P4. LD11. Delays and missed work because of weather.
LD02 to LD06. Service weather stations in Nookta Sound. LG02 and LG03. Weather still bad.
LJ03 to LJ01. Service weather stations plus CTD/Ros/Bongo in Esperanza Inlet and Tahsis Inlet.
Weather too rough to work LJ line. LBP8 to LBP5.
Nets only at LBP3 and LBP2. Too rough for CTD. CPE2 and JS15. Leave the area to go pick-up
Wall-E the glider.
Recover Wall-E. Head towards LG line.
LG09 to LG01. LJ01 to LJ05
LJ06 to LJ09. Humpback whale interrupting all work for a little over four hours.
LQ03, JI22, CS00 to CS05.
CS1B to CS10. Stop in Port Hardy for groceries. SS7 and SS6.
SS5 to SS1. NewODAS. CPE1.
JS. Service weather stations in Okisollo Channel. Stations 15, 14, 13, 12, 20.
Jervis Inlet stations, stations 22, 24, 9, 6, CPF2, BS11, 3, 2.
CPF1, 27, GEO1, VAN3, all the work in Vancouver Harbour and Indian Arm.
VAN0, VAN1, VAN2, recover ECCC mooring, 39, 42, 46, 56, SC04, 59.
Arrive at IOS and offload.
Fueling at IOS.

CRUISE TRACK:









Okisollo Channel weather stations.



Burrard Inlet and Indian Arm stations.

SUMMARY/FINAL COMMENTS:

- First of all, many thanks to Kim Houston, Michel Breton, Neil Dangerfield, Peter Chandler, and everyone else at IOS who fought very hard for this cruise to happen. It was not an easy battle, but you guys never gave up and here we are. Thank you.
- A huge thank you to everyone on board for the exceptional amount of work accomplished during this cycle. These are special times, and this was indeed a special cruise.
- Thank you to all the people at IOS who we contacted during the cruise for some help of one kind or another: Nina, Kelly, Kim, Peter, Michel. Much appreciated.
- Thank you to the whole Tully crew for letting us sail with you guys, for constantly cleaning, for giving up your "regular seat" in the mess so we could respect the regulatory social distancing, for providing the thermometer so we could monitor our temperature twice each day, for all the hand sanitizer dispensers; etc.

- Special thank you to Captain Gronmyr for your constant watch of the weather forecasts, and your help in deciding where we should work next. Thank you too for taking us all the way up Indian Arm!
- Thanks to Simon, Al, and Oliver for hours of station keeping, and putting up with the constant changes of plan.
- Thanks to Bruce and your whole deck crew for your help with bongos and weather stations and moorings and everything else we put you guys and gals through.
- Chief and your crew: this was not an easy one for you guys; it sure didn't start well! Yet you kept answering all our questions with patience and good humour, thanks!
- Almost last but definitely not least: thanks to Cam and the whole "hospitality" department for looking after us so well. Matt and your magic show, Kari and your laugh (and your masks!), Mimi, Phil and Surya for all the delicious food, many many thanks.
- And finally: good luck to Lily and David in your future career. May we see you again on the Tully very soon! PS: Thanks Lily for the weather file.