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:** 3 June 2011 **TO:** 21 June 2011

SCIENCE CRUISE NUMBER: 2011-26 **SHIP'S PATROL NUMBER:** 11-03

CHIEF SCIENTIST[S]: Marie Robert

SCIENTIFIC PERSONNEL:

Female	Male
Hiu Yan Choi (CUNY)	Michael Arychuk (IOS)
Constance Couture (UBC)	Doug Bell (BIOS)
Martine Lizotte (U Laval)	Seth Bushinsky (UW)
Josiane Mélançon (U Laval)	Keith Johnson (IOS)
Marie Robert (IOS)	Roger P. Kelly (URI)
Nes Sutherland (IOS)	Hugh Maclean (IOS)
	Craig Mewis (UBC)
	Keith Ronnholm (NOAA)
	Johan Schijf (U Maryland)
	John Shanley (NOAA)
	Kyle Simpson (IOS)
	Doug Yelland (IOS)

AREAS OF OPERATION: North East Pacific, Line P, Station P.

INTRODUCTION/PROGRAM BACKGROUND: Line P is a long standing program which surveys a 1400 km long section 3 times annually. Data has been collected along this line since 1956 and shows 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.

This cruise (2011-26) was 100% successful. All stations were visited, all casts were done, and we even managed to deploy an Argo float 103 nautical miles west of Papa, float that we tried to deploy for about two years now. The main positive aspect of this cruise was the new plugs on the CTD and the new CTD computers which finally allowed us to do our work without computer crashes and spikes. The slightly negative aspect was the damage done to some instruments of the surface buoy while recovering the NOAA mooring (See NOAA cruise report).

CRUISE OBJECTIVE/OBJECTIVES: Repeat hydrography section. Deploy one Argo float for IOS and recover one Iridium float for University of Washington. Perform a Drifting Sediment Trap Experiment. Deploy and recover NOAA surface moorings. Catch some *Clio pyramidata* pteropods.

DAYS ALLOCATED: 18 **DAYS OF OPERATION:** 16

DAYS LOST DUE TO WEATHER: None. Just had to slow down somewhat.

SAMPLING:

- The Line P survey was 100% successful. All stations were sampled, all casts done, and we finally did all the stations in order (coast to offshore).
- One Argo float was deployed for DFO/IOS 103 nm west of Station Papa and one Iridium float was recovered for the University of Washington about 46 nm NNW of P23.
- The drifting sediment traps experiment went very well. The traps got deployed at first light on Saturday 11 June and were recovered late afternoon on Tuesday 14 June.
- The NOAA mooring PA-005 got deployed on Saturday 11 June without incident. PA-004 got recovered on Monday 13 June, with some damage to the top buoy instruments (see NOAA report).
- We also stopped in the centre of an eddy to do a "bonus" rosette cast, and we performed a live net tow on the edge of the eddy. Unfortunately the planned trace metal sampling and bongo tow were cancelled in the centre of the eddy due to weather.
- The samples collected include:

  1) Underway: **IOS**: Thermosalinograph (Temperature, Salinity, Fluorescence), pCO_2, acoustic sounder.

  2) "E-data" from CTD: Pressure, Temperature, Conductivity, Dissolved Oxygen, Transmissivity, Irradiance, Fluorescence.

  3) From the Rosette: **IOS:** dissolved oxygen, salinity, nutrients, chlorophyll, HPLC, DIC, Alk, DMS, DMSP-p, DMSP-t, pH – **UBC (Mewis, Couture):** dissolved nitrogen (N_2), oxygen (O_2), carbon dioxide (CO_2), argon (Ar), nitrous oxide (N_2O), number of cells per millilitre, bacterial genomic (DNA, RNA), Hydrogen Sulfide, Methane, Ammonia – **UW (Bushinsky):** Oxygen, ^{17}O, ONAr (Oxygen, Nitrogen, Argon), salinity, DIC, DOC – **City Uni. NY, URI, BIOS (Choi, Kelly, Bell):** Thorium, Polonium, Total Chlorophyll, 5µm Chlorophyll, Total HPLC, 5µm HPLC, FCM, µplankton, Primary Production.

  4) From the pump/X-Niskins: **IOS:** Iron (Dissolved and Total dissolved, three different treatments) – **U Laval (Mélançon, Lizotte):** DMS, DMSP-t, DMSP-d, nutrients, HPLC, chlorophyll, Dissolved Iron, Total Dissolved Iron, Primary Production, nitrate assimilation, bacteria.

  5) **IOS and City Uni. NY (Choi):** Zooplankton using vertical net hauls and Multinet Plankton Sampler; **U Maryland (Schijf):** *Clio pyramidata* pteropods using Multinet Plankton Sampler and horizontal live net.

RADIOISOTOPE USE:

The following radioisotope was used in the Rad-Van: $NaH^{14}CO_3$ in solution. Wipe tests were done in all appropriate areas of the ship upon completion of the studies and the lab was decommissioned at the end of the cruise.

PROBLEMS [SCIENTIFIC GEAR AND OPERATIONS]:

The window of the old door in the Rad-Van was leaking heavily in the rain.

The thermosalinograph was getting plugged up by small jellyfish getting in the system. There used to be a mesh that would stop this from happening, but it must be misplaced or damaged. We had to take the thermosalinograph apart 3 times during the cruise, and lost many data points because of this.

SUCCESSES [SCIENTIFIC]:

We were *finally* able to do all our CTD casts without any spikes, computer crashes, or without having to create three different files to complete one profile. The new "wet-pluggable" connectors and the new CTD computers have been long overdue, but it is sure nice to finally have them.

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

There was a problem with the hydro winch losing power during a deep Go-flo cast. The deepest Go-flo on the Kevlar line was at 400 m and the winch stopped working for a few hours. Finally the engineers got it working again but the spooling system had to be handled manually.

The bongo winch was hard to control. Thanks to the engineers for working on the hydraulic system to make it react a lot smoother.

The AVOS system needed rebooting many times during the cruise. The problem seems to be getting worse and it is rare for the system to work an entire cruise without a crash. It is very unreliable and unfortunately the data streaming from it does not seem to be used by the Bridge so they don't notice when it goes down. At least now all OOW know how to reset this system so that we won't have to wait for one specific person anymore to get the data back when the system fails.

SUCCESSES [SHIP]:

We had new deck crew not accustomed to the LARS crane, but every deployment/recovery of the rosette was very well done.

The email account on the ship's email system that was not set-up properly since August 2010 has finally been modified and is now operational. Thanks to Mike and Rhona for their patience and perseverance.

We had no problem with the loop water pump despite a high demand of water – aft-deck, Rad-van, main lab, incubators on heli-deck.

Thanks to everyone for being ready to leave on Friday night. This worked much better for the timing of stations P2 and P4.

DELAYS [OTHER THAN WEATHER]:

2 hours for hydro winch repairs.

SAFETY CONCERNS:

None.

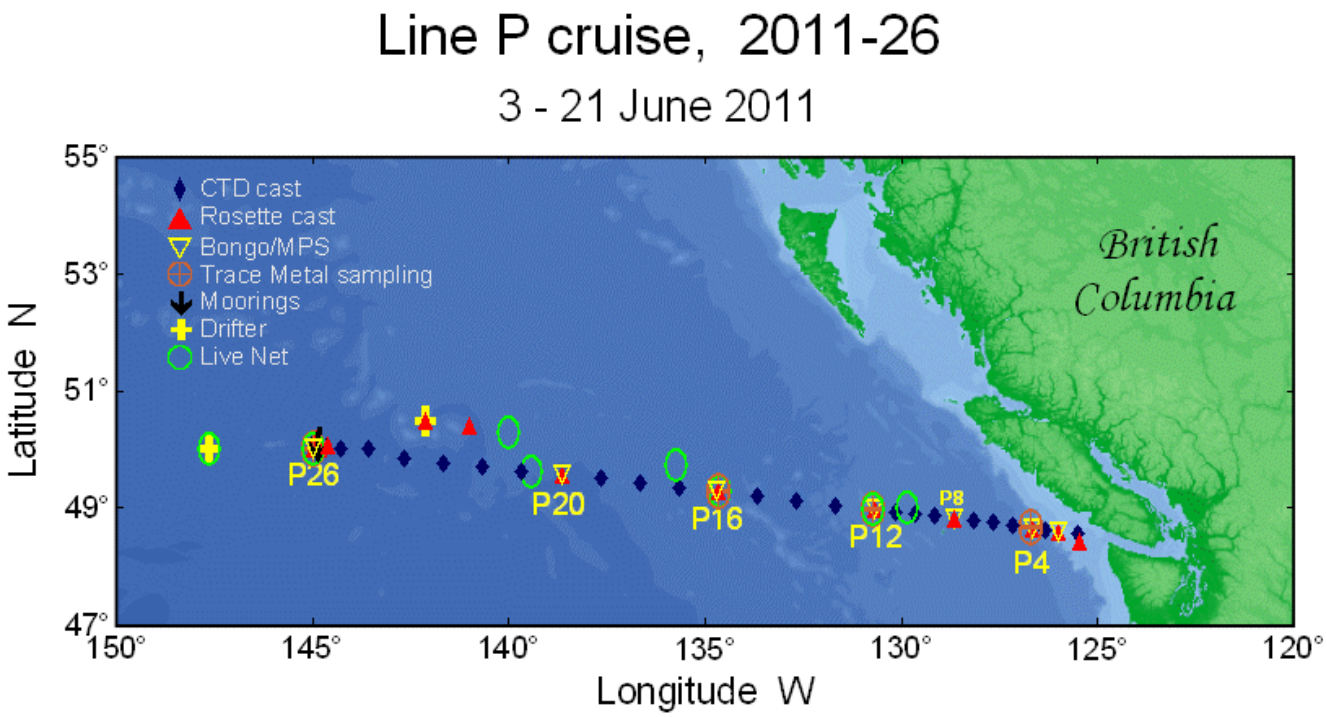
HAZARDOUS OCCURRENCES:

None involving science personnel.

EVENT LOG:

DATE		OPERATIONS
Friday	3 Jun:	Start loading the ship at IOS. Depart after dinner.
Saturday	4 Jun:	Start Line P. Arrive at P4 ~ 1830 for 15 hours.
Monday	6 Jun:	Station P12 for 9 hours.
Wednesday	8 Jun:	Station P16 for 11 hours.
Thursday	9 Jun:	Station P20 for 12 hours.
Saturday	11 Jun:	Arrive near Papa. Deploy drifting sediment traps. Deploy NOAA mooring PA-005.
Sunday	12 Jun:	Most of the Papa work. Weather too rough for mooring recovery.
Monday	13 Jun:	Recover NOAA mooring PA-004. Start heading west of Papa.
Tuesday	14 Jun:	Deploy IOS Argo float 103 miles west of Papa. Recover drifting sed. traps.
Wednesday	15 Jun:	Start heading east. Recover UW Iridium float.
Thursday	16 Jun:	Rosette cast in centre of Eddy.
Saturday	18 Jun:	Sample station LB08.
Sunday	19 Jun:	Arrive at IOS and start offloading.
Monday	20 Jun:	Complete offloading in the morning.
Tuesday	21 Jun:	Ship fuels in Pat Bay.

CRUISE TRACK:



SUMMARY/FINAL COMMENTS:

- We would like to thank everyone on board for such great help. All departments – bridge, galley, deck, engineers – did a fantastic job. It's been three great cruises with the White Crew, and we're looking forward to sailing to Station Papa with you again in August 2012!

- Many thanks also to all people at IOS who have helped making this cruise a success: Janet, Wendy, Nina, Glenn, Marty, Melissa, Scott, Moira … your help is always greatly appreciated!

- Finally, Keith, it was a pleasure sailing with you, and you may be sure that your memory will sail with us for a LONG time yet!

Marie Robert and the science team.

- The success of this cruise and of our experiments would not have been possible without the incredible dedication and hard work of many people. First, we would like to extend our sincerest and warmest thanks to chief scientist Marie Robert who, year after year, has proven to be the most efficient, accommodating and friendly chef scientist we have known. Our most sincere thank you goes out to Michael Arychuk for not only kindly adapting his schedule in order to analyze freshly collected DMS samples but also for his steady help during pre-cruise preparations, cruise activities and post-cruise work. We wish to thank Keith, Nes and Kyle for their generous help with our filtrations and tireless efforts with TMC work and Fe analysis. We truly appreciate all your help on board as well as on land; this experiment would not have been possible without you. A great big thank you to Darren Tuele for pre-cruise preparations, incubator and LICOR set up. Thank you to all fellow scientists on board which made the trip so enjoyable and to collaborators involved in this project.

- We would also like to extend our thanks to Captain Simon Schwarz, the officers Alan Young, Rhona Lettau and Jodi Heske, chief engineer Scott Ware and his gang, bosun Leonard Bielby and all the crew of the Tully for their invaluable assistance. Special thanks to Sheldon Vos and Frank Taylor for lending a hand with heavy loads and high elevation jobs. We are so very grateful and happy to have worked alongside such a friendly crew. Last but not least, thank you to Vince Gabas and Nathan Small for their friendly disposition during mealtimes as well as to the cooks Alex Wright, Phil May and and Ivy Rogers for keeping us well fed!

Martine Lizotte and Josiane Mélançon

- I want to gratefully acknowledge the excellent support of IOS personnel and Tully crew members, especially Marie Robert for her continuous support and kind invitations to participate in these unique missions, Doug Yelland for his expertise and help with the multi-net system, Hugh Maclean for his assistance with net tows at all hours of the night, Moira Galbraith for her advise on microscope equipment, and quartermasters Josh and Pavel for their safe operation of the winch and other heavy equipment on deck, and their unwavering belief that "tonight we'll catch some snails for sure."

Johan Schijf

- Thanks to the rest of the science party and to the crew of the John P. Tully for all of their help during sampling, deployment, and recovery. Thanks as well to our collaborators at the NOAA-Pacific Environmental Laboratories for their invaluable help with the mooring instrumentation.

Seth Bushinsky

- **It was a very successful cruise for the NOAA/PMEL and UW moorings team.**

- We are very grateful to IOS, DFO and Chief Scientist Marie Robert for the opportunity, ship time, bunks and deck space to participate in this cruise. Without this ship time support, the moorings at Ocean Station Papa would not be a reality.

- We are especially grateful for the excellent support provided by the Captain and Crew of the *CCGS John P. Tully*. Captain Simon Schwarz was easy to work with, and was very supportive of our mooring work. The ship handling was well done and enabled the successful, and safe, deployment and recovery of the PAPA moorings under adverse weather conditions.

- The Chief Officer, Alan Young's experience and maritime knowledge were evident on the back deck. The deck crew, led by Boatswain Leonard Bielby, did an excellent job during all mooring operations and he was very willing to listen to suggestions. Operations were conducted safely, calmly, and he expertly controlled the deck under a less than ideal sea state. The crane was operated skillfully by Glenn McKechnie. Rod Parsons was very skillful in boat handling under adverse weather conditions during the close-in maneuvering needed for the surface float recovery. Deckhands Pavel, Josh, Sheldon and Frank were both very helpful and eager to help with the operations – and any time it was needed.

- And a special thanks to the cooks and stewards (Vince and Nate) for the excellent food and cheerful service.

Keith Ronnholm and John Shanley

- We wish to thank the Tully crew for their assistance and excellent work throughout the cruise. Thanks to Marie Robert and the scientists onboard for their help on deck and in the lab. Special thanks to everyone who helped us collect samples.

Craig Mewis and Constance Couture

- Thanks to the officers and crew of the John P. Tully for a successful cruise. Thanks and appreciation to Len Bilby and the deck crew for assistance securing and deploying our equipment on the weather decks. We would also like to thank Marie Robert and the science party for their sampling assistance. Thanks to Mike Arychuk for assistance with inter-cruise chemical storage and handling. We'd also like to thank Darren Tuele, Janet Barwell-Clarke, and Hugh Maclean for help during pre- and post-cruise operations.

Roger P Kelly, Yan Choi, Doug Bell.

PROJECTS AND RESULTS:

Water masses. Marie Robert, DFO/IOS.

During this cruise the weather was mainly good – no major storm – but it stayed cool for most of the trip. The surface waters were colder than the long term average (1956 – 1991) along the whole Line, with anomalies higher than -1.0°C in the more coastal regions (P9 – P16). There was a pool of warmer waters between 70 and about 300 m from P18 to P25 (Fig. 1). This was probably due to the edge of an eddy we sailed through (Fig. 2). Along with these colder waters, the DMS and Chlorophyll levels were very low this June, and the pteropods *Clio pyramidata* were very hard to find. We only managed to capture the pteropods on the edge of the second eddy that we sampled on the return leg (Fig 3) as well as at one other station in the area.

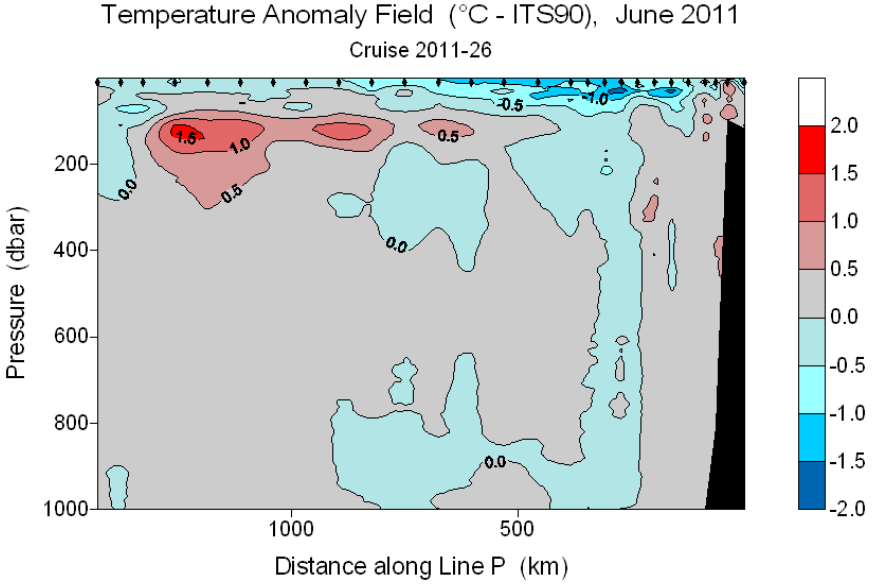


Figure 1: Temperature anomaly field (°C) in June 2011 with respect to the 1956-1991 average.

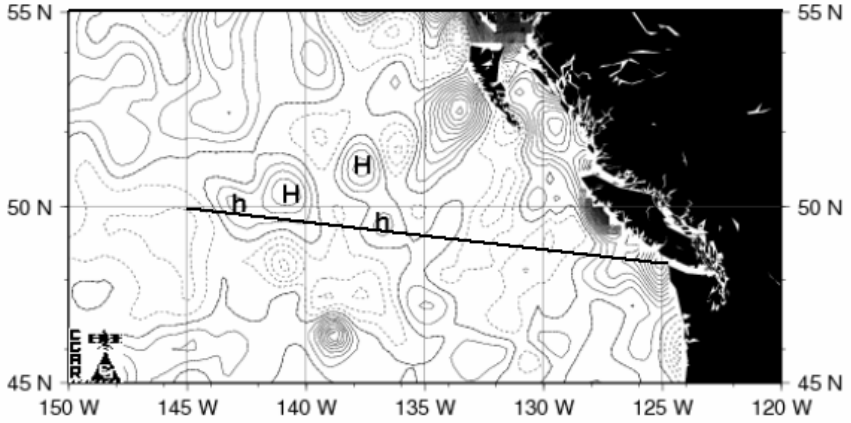


Figure 2: Line P track intersecting the edge of an eddy between 139° and 143° west.

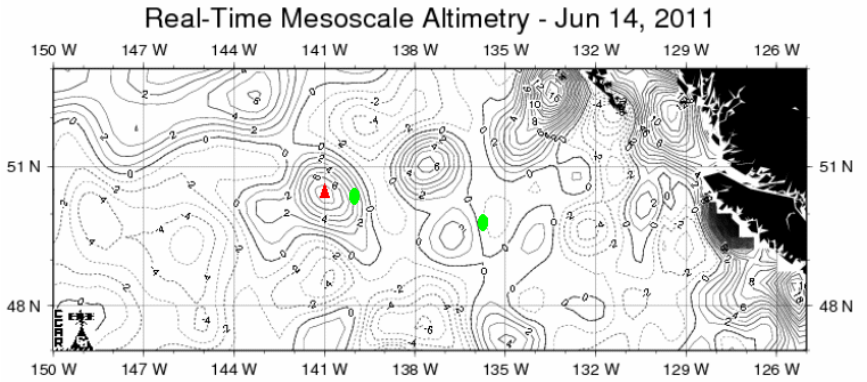


Figure 3: Position of the "Eddy Centre" rosette cast (red triangle) and of the two Live Net tows (green circles). These Live Net tows contained some *Clio pyramidata* pteropods.

Impact of Volcanic Ash Deposition on the North Pacific Ecosystem and Climate - June 2011 Line P cruise report. Martine Lizotte, Josiane Mélançon, and Maurice Levasseur (PI), Université Laval, Québec City, Qc, Canada

Bioavailability of iron (Fe) limits the growth of autotrophic plankton in High Nutrient - Low Chlorophyll (HNLC) oceanic regions. The iron-limited status of the Alaska Gyre phytoplankton community has been previously investigated through several *in situ* observations and a large scale Fe fertilization experiment (SERIES). These studies highlighted the diverse ways Fe can be sporadically delivered through the Gyre: lateral transport and vertical mixing, advection of coastal-born eddies, and aeolian deposition of dust and volcanic ash. Most of theses studies have relied on indirect evidences or the use of chemical forms of iron ($FeSO_4$) as a proxy for aeolian depositions. It is only recently that experimental studies using natural dust and ashes have started to emerge. Given our poor understanding of the bioavailability of iron in the ocean, it is expected that dust or ash fertilization will generate responses different than those triggered by the addition of chemical forms of iron. During this cruise, a series of onboard incubation experiments designed to test the impact of various sources and concentrations of volcanic ashes on the North Pacific plankton ecosystems was conducted at two stations along Line P. Our experiments will help to determine the effect of volcanic ash fertilization on the plankton ecosystem in general and more particularly on the dynamics of dimethylsulfide (DMS), a highly climate-relevant gases.

During this cruise, water samples were collected at Stations P4 and P20 at 10 m depth by pumping water with a teflon diaphragm pump to avoid trace metal contamination. Samples were collected in acid-clean 10-L labtainer gas-tight collapsible bags for incubation. Before the start of the incubation, the water samples were subjected to the following treatments (in triplicate):

Identification	**Treatment**
Control	No addition
Treatment 1	Addition of $FeSO_4$ (+ 0.6 nmol L^{-1})
Treatment 2	Addition of Chaiten volcanic ash (Medium = 1.2mg L^{-1})
Treatment 3	Addition of Chaiten volcanic ash (High = 10mg L^{-1})
Treatment 4	Addition of Chaiten volcanic ash (Low = 0.12mg L^{-1})
Treatment 5	Addition of Kasatochi volcanic ash (Medium = 1.2mg L^{-1})

The incubation bags were hermetically sealed and incubated during 96 hours from P4 and 144 hours for P20 in outdoor incubators at *in situ* temperature and irradiance on the helicopter deck of the CCGS John P. Tully. Continuous ambient photosynthetic active radiation (PAR) was determined using a LICOR light meter installed starboard of the helideck and water temperature inside the incubators was monitored periodically. The following variables were monitored at T0, T48, T96 and T144 hours: chlorophyll *a* (chl *a*) concentrations, nutrients, bacterial enumeration, fluorescence, photosynthetic efficiency (Fv/Fm ratio), total dissolvable Fe, dissolved Fe concentration, Fe speciation, dimethylsulfoniopropionate (DMSP) concentration, and DMS concentration. Phytoplankton pigments (HPLC) and particulate organic carbon (POC) and particulate organic nitrogen (PON) were monitored at T0 and T96 (P4) or T144 (P20). Sub-sampling of the incubation bags took place inside a laminar flow hood located in the main lab, except for total dissolvable Fe, dissolved Fe and speciation subsamples which were subsampled in the Trace-Metal Clean (TMC) "bubble" in the main lab. Furthermore, 500 mL bottle incubations were run in parallel to the bag incubations to determine rates of nitrate assimilation ($K^{15}NO_3$) and primary production ($NaH^{13}CO_3$). Samples of DMS and dissolved Fe were analyzed onboard the ship within hours of collection. Chl *a* was also measured onboard the ship in the radvan towards the end of the cruise. The remaining samples will be analyzed at the Institute of Ocean Sciences (IOS), the University of Victoria (UVic), the University of British Columbia (UBC) and Laval University in Quebec City.

The work area provided in the main lab and the occasional use of the instrument lab was very satisfactory and we were able to efficiently carry out all of the different facets related to our experiments: from subsampling of the gas-tight bags, to filtrations, to chemical spiking, to running a small incubator in the sink next to our work station. TMC collection of the Fe samples was made possible within the TMC bubble thanks to the iron experts Keith Johnson, Nes Sutherland and Kyle Simpson, who kindly accepted to run filtrations during our subsampling periods. Overall, this cruise ran very smoothly and we were able to accomplish all the work we had set out to do.

The success of this cruise and of our experiments would not have been possible without the incredible dedication and hard work of many people. First, we would like to extend our sincerest and warmest thanks to

chief scientist Marie Robert who, year after year, has proven to be the most efficient, accommodating and friendly chef scientist we have known. Our most sincere thank you goes out to Michael Arychuk for not only kindly adapting his schedule in order to analyze freshly collected DMS samples but also for his steady help during pre-cruise preparations, cruise activities and post-cruise work. We wish to thank Keith, Nes and Kyle for their generous help with our filtrations and tireless efforts with TMC work and Fe analysis. We truly appreciate all your help on board as well as on land; this experiment would not have been possible without you. A great big thank you to Darren Tuele for pre-cruise preparations, incubator and LICOR set up. Thank you to all fellow scientists on board which made the trip so enjoyable and to collaborators involved in this project.

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End-of-mission report for 2011-26, CCGS *John P. Tully*; Dr. Johan Schijf, assistant professor, Chesapeake Biological Laboratory

My objective on this mission was to catch thecosome pteropods of the species *Clio pyramidata* at all major stations along line P. Onboard ship the specimens are manually sorted from the net catches. The animals are removed from their aragonite shells with dissecting tweezers under a stereomicroscope. Finally, the shells are rinsed in pH-buffered freshwater to remove salt and organic matter, and preserved dry for return to the University of Maryland. There, the shells will be dissolved in dilute acid for trace metal analysis by inductively coupled plasma mass spectrometry (ICP-MS) in the context of ongoing NSF-funded research on the effects of ocean acidification. Our normal approach is to do net catches away from the coast and in the dark, as pteropods are believed to vertically migrate to shallower depths after sunset. A new aspect of this procedure on this particular mission was to be the use of a multi-net system, allowing pteropods to be retrieved from known discrete depths.

No pteropods of the correct species were found in any net tows along line P on the outbound leg, including horizontal and vertical multi-net tows (down to 2000 m), vertical bongo tows (down to 250 m), and horizontal tows with a single open-rim net (between 50-300 m). The multi-net system could only be used at a few stations due to rough weather conditions. In some catches, specimens of other gymnosome and thecosome pteropod species were observed that are unsuitable for my work for various reasons, for example *Clione limacina* (no shell), *Limacina helicina* (curved shell, too small), and *Clio recurva* (internal shell). Three individuals of the latter species were preserved in seawater/buffered formalin for study by Dr. Moira Galbraith of IOS, because of their relative rareness.

Clio pyramidata were finally caught on the inbound leg with the open-rim net (100-300 m depth), on the trailing edge of an eddy that had been tracked by satellite (~140°W). Due to the ship schedule, this cast was uncharacteristically performed during daylight hours. Later that night, additional *Clio* were caught further east (~135°W). Both catches contained copious salps and other gelatinous organisms. No further pteropods were caught after that. In total, about 100 pteropod shells were preserved from depth-integrated tows. About half of these shells were opaque, suggesting partial dissolution or recrystallization to calcite. Such samples will most likely be used for method development.

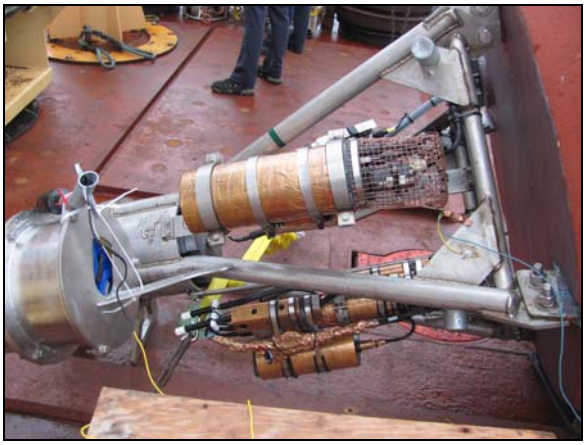
I want to gratefully acknowledge the excellent support of IOS personnel and Tully crew members, especially Marie Robert for her continuous support and kind invitations to participate in these unique missions, Doug Yelland for his expertise and help with the multi-net system, Hugh Maclean for his assistance with net tows at all hours of the night, Moira Galbraith for her advise on microscope equipment, and quartermasters Josh and Pavel for their safe operation of the winch and other heavy equipment on deck, and their unwavering belief that “tonight we’ll catch some snails for sure.”

Seth Bushinsky (University of Washington)

On this cruise we deployed a SeaBird CTD package and a SAMI pH sensor on the PAPA mooring and recovered the same from the old mooring. The CTD packages measure temperature, salinity, oxygen through both a Seabird 43 and Aandaeraa optode, total gas pressure from a Gas Tension Device, and fluorescence and backscatter using a Wetlabs ECOFLNTUS. To both calibrate these sensors and provide data for mixed layer export models we took discrete water samples of oxygen, ONAr (Oxygen, Nitrogen, and Argon), alkalinity, dissolved inorganic carbon, and salinity. Additionally, ^{17}O was measured to estimate biological production.

The transport of carbon from the atmosphere into the ocean plays a major role in controlling the carbon dioxide content of the atmosphere. This flux is driven both by physical absorption and biological production. The amount of biologically produced carbon that is exported to the deep ocean can be measured by making precise oxygen measurements. These oxygen measurements, coupled with measurements of the biologically inert gases nitrogen and argon, allow distinction between physical processes that affect gas saturation from biological production and consumption of oxygen. The discrete measurements taken on this cruise, coupled with the high-resolution data collected from the mooring allows us to estimate carbon export and work towards constraining the carbonate system at PAPA.

Thanks to the rest of the science party and to the crew of the John P. Tully for all of their help during sampling, deployment, and recovery. Thanks as well to our collaborators at the NOAA-Pacific Environmental Laboratories for their invaluable help with the mooring instrumentation.




Before (left) and after (right) deployment at Ocean Station Papa. The sensors are covered in copper foil to reduce fouling. The SAMI-pH sensor is the upper instrument in both pictures; the SeaBird CTD package is the lower set of instruments.

NOAA/PMEL – Station Papa Moorings; K. Ronnholm, J. Shanley

Summary of Mooring Operations		
Nominal Site	Mooring ID #	Operation
50N 145W	PA005	Deploy
50N 145W	PA004	Recover

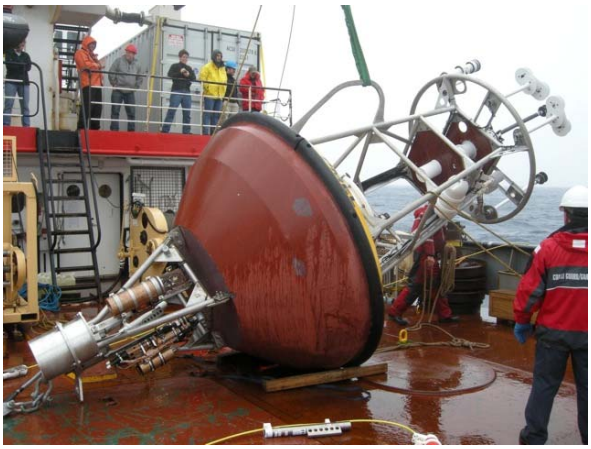
The National Oceanic and Atmospheric Administration's (NOAA) Pacific Marine Environmental Lab (PMEL) and University of Washington have enjoyed a very beneficial collaboration with DFO Line P program to maintain moorings at Station Papa since 2007. PMEL participated in the 2011-26 cruise aboard *CCGS John P. Tully* to continue the research moorings at Ocean Station Papa as a part of the global network OceanSITES reference time series. All data from these moorings are publicly available through the project website http://www.pmel.noaa.gov/stnP/ and much of this is available in near-real-time. A subset of the near-real-time data is also available through the Global Telecommunication System (GTS) under WMO ID 48400.

PMEL's Ocean Climate Stations (OCS) Program, in partnership with University of Washington, deployed the PAPA-2011 (PA005) surface mooring and recovered the similar surface mooring (PA004), deployed from the *Tully* in June 2010. In addition, the 2011-26 cruise recovered a profiling float for the University of Washington's Applied Physics Lab.

Staging and assembly of the buoy at IOS went very smoothly thanks to the assistance of the IOS Winch Shop – Phil and Luke. This year we brought the buoy fully assembled with the tower and bridle attached to the surface float. This removed the necessity to use the forklift and/or crane during buoy preparation. However the assistance of Luke in transporting our equipment with the crane and forklift from the staging area to the pier was essential.

The majority of our lab equipment was craned to the Bridge deck, and hand carried into the hydrographic chart room. This space was comfortable for our purposes; it provided adequate space for setup and instrument preparation. And it was close to the antennas mounted two decks above on the "Monkey bridge". The stowage arrangements on deck worked fine with the new PAPA mooring tied down middeck, just aft of the large winch.

The deployment of the new surface mooring (PA-005) was performed on the first full day at ocean station PAPA, out of 4 days scheduled. We started laying out the wire on deck at 8 AM (1400 GMT) on 11 June 2011, after the successful deployment of a set of sediment traps which used the same A-frame block that we would use. It was cool, breezy (20 knots), gray with a light rain. By 10:30 AM we had the first 60 m of instruments on the wire, and restarted our data acquisition systems in their deployment modes. The captain chose to defer deployment until after lunch.



We restarted the deployment process at noon (1900 GMT), and the buoy was released at 1925. The buoy was deployed over the starboard side via the crane, and the small boat was used as a tag line platform to pull the buoy away from the side of the ship. Sea state was 2-2.5 meters, 20 knot winds, and rain. The release went well with no damage to sensors. The line ran from the capstan to a block 2m forward (forming an acute angle) and then to the 7 ton block right of center on the A-frame. A 16' strap, basketed, was used for lifting the buoy (the 14' strap was too short), with one end in the crane hook so it was automatically recovered.

The remaining sensors were added to the wire, ending at 2020. 6 spools of nylon were deployed, and the 1.5 hour tow started at 2210. Anchor drop occurred at 2342 at 50° 07.21' N 144° 48.76' W with a water depth of 4221m and the anchor lifting was done via the crane. Tag lines were used on the anchor. Deployment duration was 4 hours 42 minutes.

On flyby at 0015 GMT 12 June 11, the buoy was at 50° 07.77' N 144° 49.64 W and riding well. The mooring has dual meteorological instrumentation and data transmission systems, subsurface temperature and conductivity sensors to 300 m, a pCO2 measurement system, with pH and oxygen/gas tension measurements at 1 m, and a downward looking ADCP mounted on the bridle. The Flex and Atlas systems were returning good data from all sensors and a later email from the CO2 group indicated that the pCO2 system was running fine. All systems are transmitting data back to Seattle.

Ops Report - PMEL PA004 HLB Recovery

Sunday 12 June, the day after PA-005 deployment, we mustered at 6:30 AM in preparation for the recovery of PA-004. Conditions were 10-12' seas with winds 30+ knots. Although the deck department initially wanted to get started, we looked at a weather forecasts on the bridge and decided to wait a day. The IOS deep cast was begun, and other water sampling work proceeded during the day.

On Monday, 13 June, we again mustered on the back deck at 6:00 AM in preparation for the recovery. Conditions were 6-8' seas with winds 15 - 18 knots. Although we would have preferred better conditions, these seemed workable, and we did not want to wait until Tues as the conditions, although forecast to be slightly better, could have worsened. (Indeed, Tues was a bit better, but by Wednesday we had winds to 40+ with 12-15 ft seas and a few waves washing over the working deck).

We started at 1400 GMT on 13 June 2010 with on-deck preparations and setting up the ORE acoustic release transducer. We set-up the deckset in the CTD closet midships on the main deck, and deployed 100 feet of transducer line, turned off the echo sounder and declutched the props. After a couple of adjustments to the deck set, we received good confirmation of a release at 1408 GMT. The location was 50°N 02.94'N, 144° 52.87'W. The closet proved to be ideal, as it was quiet and close to where we put the transducer in the water. As apposed to 2010, the ship did not launch the small boat until after we were done with the release.

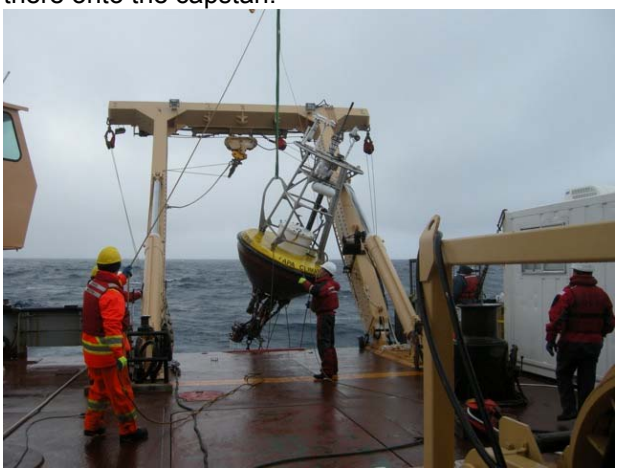
The small boat was used to attach a tow line to the buoy, and the buoy was hauled in to within 15 feet of the stern. Two tag lines were attached by the personnel in the small boat. Unfortunately a squall line came up at this time, and winds and seas picked up (25 knots, 8' – 10' waves , with an occasional larger swell), and it began to rain. As the small boat was towing the buoy, it slid down a swell and impacted one outboard motor on the FRB, doing minor damage.

A double length lifting strap (14' + 16') was basketed on the t-cup handle, and a throw line from the boat was used to transfer the lifting strap to the Tully deck. The crane hook was lowered and connected to the lifting strap by the deck crew. The first attempt to lift the buoy failed, as only one end of the basketed strap made it on to the hook, and as the crane tried to lift the buoy through the fully outboard A-frame, the buoy dropped back down (perhaps only 2' of lift had occurred), and the Vaisala multifunction met sensor and one radiation sensor were damaged by striking the hull and the A-frame. The captain moved the ship forward, as we regrouped for a second attempt.

The small boat reattached the lifting straps, but by now the tag lines were hanging in the water off the buoy, as the buoy bounced and danced in the seemingly worsening seas.

On the second attempt, with great difficulty, both ends of the lifting strap were attached to the crane hook. The buoy was 10' astern and although bouncing quite a bit, was not damaged further while on the surface. The crane lifted the buoy from the water, and as it swung around, the buoy tower was too close to the port side of the A-frame, and both wind masts made contact with the frame. The Flex Gill wind mast was knocked off first, and the Atlas tall wind mast was bent in a right angle as it hit the A frame. The float was brought onboard at 1524 GMT by the crane. Tag lines were used to stabilize it, but at one point it nearly impacted the A-frame control console and the main capstan. Once it was on deck, and tied down, the wire, top socket and top section were disconnected and recovery of all the subsurface sensors was accomplished with no major issues.

The ships wire winch was used to pull in on the termination to uncouple the stopper chain, and transfer the load to the Yale grip/working line, run over a block on the port side of the A-frame, a turning block on deck, and from there onto the capstan.



The wire was brought onboard via a block on the A-frame and the capstan, and ALL instruments were recovered. There were no barnacles below 20m and no evidence of fishing. We did drop one and one half sets of SBE37 mounting blocks, and the 5 m Sbe39-T was on the rounded stern lip while the buoy was disconnected and the tension ripped two screws from the mounting block.

The buoy is in good shape, with minimal algae growth on the top, with a far smaller crop than the 2010 recovery of barnacles on the bridle and bridle instruments. The CO2 equilibrator was not damaged during the recovery.

All elements of the mooring were recovered (wire, nylon and release.) The release was brought on board at 1847 GMT (50°N 3.6'N 144° 51.5' W). From triggering the release to having the release onboard took 4 hrs 44 minutes.

The SBE37TCs and 39TPs were placed in a barrel of water and were turned off on 14 and 15 June. All subsurface sensors appear to have a full data record. The Atlas tube, which has not transmitted since 15 Nov 2010, would not communicate. The Flex and pCO2 data systems were shut down and the power pulled. The Flex system successfully collected 62 MB of data.

Ops Report - UW/APL Float Recovery

We started looking for the small float at ~2030 PDT on 15 June 2011 under misty gray skies with limited visibility, a large 10-15' swell and winds of 30 knots. Based on an Argos position, we searched an area that turned out to be 2.5 miles from the eventual location. Several phone calls were made to Craig McNeil to obtain a newer position. At 2200, a new GPS based position arrived via email and we proceeded to that location. We had no luck seeing the float, until we began a turn to port to start a new line, when Seth Bushinsky observed the float 150m off the starboard bow. We almost missed seeing it, as we would have soon been heading in the opposite direction.

In the gathering dusk, the ship maneuvered to have the float 10m off the starboard stern, and then eased closer. The float was grabbed by a long ships pole with a right angle hook on the end, and lifted to the rail, dangling off this pole. It was brought on board by hand, and turned off via the green magnet. We removed the drogue skirt, and placed in an empty Argo float box. We had the UW grappling hook on deck ready to use, but a deckhand was already using the ships pole and hook, before the UW hook could be employed.

The float was recovered at ~2247 PDT 15 June 2011 (0547 16 June 2011 GMT) at 50°N 28.41' N, 142° 07.96 W. Winds had dropped to 18 knots by this time, and the swell was running 8'- 11'.

It was a very successful cruise for the NOAA/PMEL and UW moorings team.

We are very grateful to IOS, DFO and Chief Scientist Marie Robert for the opportunity, ship time, bunks and deck space to participate in this cruise. Without this ship time support, the moorings at Ocean Station Papa would not be a reality.

We are especially grateful for the excellent support provided by the Captain and Crew of the *CCGS John P. Tully*. Captain Simon Schwarz was easy to work with, and was very supportive of our mooring work. The ship handling was well done and enabled the successful, and safe, deployment and recovery of the PAPA moorings under adverse weather conditions.

The Chief Officer, Alan Young's experience and maritime knowledge were evident on the back deck. The deck crew, led by Boatswain Leonard Bielby, did an excellent job during all mooring operations and he was very willing to listen to suggestions. Operations were conducted safely, calmly, and he expertly controlled the deck under a less than ideal sea state. The crane was operated skillfully by Glenn McKechnie. Rod Parsons was very skillful in boat handling under adverse weather conditions during the close-in maneuvering needed for the surface float recovery. Deckhands Pavel, Josh, Sheldon and Frank were both very helpful and eager to help with the operations – and any time it was needed.

And a special thanks to the cooks and stewards (Vince and Nate) for the excellent food and cheerful service.

Craig Mewis and Constance Couture (UBC) Line P – June 2011

Objectives:

Describe the taxonomic and metabolic diversity of the bacterial communities involved in the cycling of major nutrients and gases along Line P, focusing on the communities in the Oxygen Minimum Zone. Establish underway surface and depth distributions of the climate active gases nitrous oxide (N_2O), methane (CH_4), carbon dioxide (CO_2) and dimethylsulfide (DMS), measure underway surface O_2/Ar gas distributions to infer Net Community Production.

Sampling plan:

At 5 stations (P4, P12, P16, P20, P26):

1) Count the number of cells per millilitre using Flow Assisted Cytometry at 16 depths.
2) Filter 1 L samples at 16 depths for high resolution bacterial DNA and sequencing.
3) Measure dissolved nitrogen (N_2), oxygen (O_2), carbon dioxide (CO_2), argon (Ar) and dimethyl sulfide (DMS) continuously at the surface using a membrane inlet mass spectrometer (MIMS).
4) Measure ammonia by fluorometry at depths above 400m.
5) Filter 40L of water at 4 depths (10m, 500m, 1000m, and 2000m). 20L were filtered for in-lab genomic libraries and 20L were filtered to support the Earth Microbiome project. 2L were also filtered at these depths for RNA. Furthermore, Flow Cytometry data was also collected to support these samples as well as betaine preservation for single cell analyses.
6) Also at P8, sample water at 17 depths for in-lab measurement of dissolved nitrogen (N_2), methane (CH_4) oxygen (O_2), carbon dioxide (CO_2), argon (Ar) and nitrous oxide (N_2O) using a gas chromatography mass spectrometer (GCMS).
7) Also at P2 and P8, water was filtered at 3 depths for Mario Lebrato from the Liebnitz Institute in Kiel that are used to monitor Mg/Ca changes in the sea water as it pertains to coccoliths calcite.

At P4 only, hydrogen sulfide was measured at 16 depths.

At Station Papa we collected viral particles as well as bacterial cells from the seawater samples of 4 depths (10m, 500m, 1000m, and 2000m) for Elke Allers and Jenn Brum from the University of Arizona in order to analyze the viral community within the OMZ and also interactions of virus and potential bacterial hosts.

Comments:

This cruise went very well, although we particularly liked having all our experiments (MIMS and filtrations) in the same area of the main lab near the sinks during previous cruises, this lab setup provide just enough space to get all the work done.
Unfortunately, we were not able to bring a spectrophotometer with us to measure Nitrite concentrations.

The sampling and filtering for all the bacterial genomics work went smoothly. On deck measurements of temperature seem appropriate for detecting misfires and we will continue that precaution on future cruises where we collect large volumes for bacterial concentration. This cruise we had no misfires.

We have brought back the MIMS for underway gas sampling. This set up is slightly more complicated and requires the use of 2 water baths. The sensitivity of the instrument to detect gases, especially DMS, is much better and will likely be continued in the future. We would like to have the same working space for the MIMS (on its own table next to the sink with the loop) on future cruises as we need access to the loop water and we generate a large flow of water to be constantly drained.

We wish to thank the Tully crew for their assistance and excellent work throughout the cruise. Thanks to Marie Robert and the scientists onboard for their help on deck and in the lab. Special thanks to everyone who helped us collect samples.

Trace metal Sampling and Carbonate Studies - W. K. Johnson, Kyle Simpson and Nes Sutherland

Line P trace metal sampling was carried out with IOS's normal clean sampling techniques using the Asti, all Teflon, pump for 5 to 40m samples and 12L X-Niskins for depths between 75m to 800m. The HEPA flow hood was set up on deck aft of the "Chains" just outside the Wet lab. Ducting was set up from the Air King blower (in the wet lab) to the clean hood. The clean hood was used for all pumped samples. All samples (5-40m), for both unfiltered and filtered (0.2µm Opti cartridge) and bulk seawater sampling were collected into acid cleaned polyethylene containers.

Samples taken between 40 - 800m were collected using X-Niskins deployed on Kevlar line. The winch had an issue with the electronics and the spooler stopped working. This was remedied by operating the spooler manually.

The Zodiac was used for subsurface sampling at 2 stations, P20 and P26. Samples were filtered in the temporary clean room (bubble) using pre-cleaned Durapore 0.2µm membrane filters.

Sampling was focused on the major Line-P stations to 150m with only P20 and P26 to 400m and 600m respectively. Labile (unfiltered) and dissolved iron (filtered) analyses were completed onboard in the clean tent/bubble. Two incubation experiments (roughly 280 samples) were performed (Université Laval), one at P04, and one at P20. Bulk trace metal clean seawater was also collected for IOS at P20 (10m). All samples including the iron/dust Incubation samples from Université Laval were analyzed on board.

Extra samples were collected to compare our historical methodology with the new Geotraces protocol for iron analysis. We normally collect 4 samples per depth; 2 for analysis onboard (filtered and unfiltered) and two that are acidified with 1 ml of 1:1 conc. Seastar Baseline HCl per 125ml seawater for "total" analysis (completed at a later date). Rather than collecting acidified samples for future analysis we collected 2 bottles per depth for 12+ hour digestion at pH 1.8 as per GEOTRACES protocol. Station-P was collected in duplicate. Salinities and nutrient samples were collected from all sample depths greater than 50m to confirm depth of sample.

All samples were collected by Keith and Kyle; the analyses were shared by Keith, Kyle and Nes.

Sampling Summary for Fe, profiles

Depth	P04	P12	P16	P20	P26
0m				X	XX
5m					
10m	X	X	X	X	XX
25m	X	X	X	X	XX
40m	X	X	X	X	XX
70m		X	X	X	XX
100m		X	X	X	XX
150m			X	X	XX
200m				X	XX
300m				X	XX
400m				X	XX
600m					XX
800m					

Notes: The iron system was run on a 24 hour basis for most of the cruise.

Carbonate Studies - W. K. Johnson, Mike Arychuk and Kyle Simpson

We are monitoring four aspects of the carbonate system on expeditions to OSP. Both pH and underway continuous automated pCO2 are measured onboard the Tully. Samples for DIC and TA are collected, preserved and returned to the shore-based lab for analysis.

1) pCO2

pCO2 was run using the seawater loop system for the entire expedition up until Juan de Fuca strait (~0800 on June 4th).

The forward air intake was used for the duration of the trip. This resulted in some stack gases being analyzed at times but this data will be easy to remove from the file. The AVOS weather data collection worked well but did crash a few times.

2) DIC/alkalinity sampling

DIC/alkalinity samples were collected in 500ml bottles at all major stations on line P. This made the first sampling day very busy with 2 major stations on one day (P02 &P04). One duplicate was collected at each station between 1000 and 3000m as well as a duplicate bottle tripped at one of the deeper depths.
A calibration cast was conducted at P23 on the way to OSP (5 bottles for DIC/TA were tripped at 2000m and each sampled in triplicate). Station P26 was sampled in duplicate for DIC/TA if required. Sampling was carried out by a variety of personnel.

A station near P22 called Eddy station was sampled for DIC, pH, and Alkalinity,... but was not sampled for trace metals due to inclement weather conditions.

3) pH

pH was conducted at major line P stations using the Agilent (HP) spectrophotometer and the m-cresol purple technique of Clayton and Byrne. Cells (100mm cylindrical glass) were filled directly from Niskins. They were stabilized at 25^{o} C using a constant temperature bath and the IOS aluminium block. A temperature controlled cell holder was also used to maintain sample temperature at 25C. Profiles consistent with DIC/TA depths were collected from all major line P stations as well as a calibration cast at P23 where 5 Niskins for pH were each sampled in triplicate.

The pH system was set up in the temperature controlled lab. The lab temperature remained relatively stable throughout the trip. The temperature of the seawater in the cells was measured after each analysis to confirm the temperature. Sample collection and analysis was shared by both Keith Johnson and Kyle Simpson.

PROJECT TITLE

POC production, POC export and POC-^{210}Po-^{234}Th interactions in relation to plankton community structure in the subarctic NE Pacific

PI's: Gillian Stewart, City University of New York, Queens College, Flushing NY USA
Bradley Moran, University of Rhode Island, Graduate School of Oceanography, Narragansett, RI USA
Michael Lomas, Bermuda Institute of Ocean Sciences, St. George, BERMUDA

2011-26 June Line P Cruise Participants:
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OBJECTIVES and BACKGROUND

The overarching goal of this collaborative project is to investigate the relationship between variability in plankton community structure with variability in POC production, POC export and POC-^{210}Po-^{234}Th interactions in the subarctic NE Pacific.

This study is motivated by the need to illuminate the role of euphotic zone ecosystem processing in predicting the eventual fate of export flux in the mesopelagic. The project will provide a mechanistic understanding of the processes controlling the production and export of POC and associated elements in the upper subarctic Pacific. Specifically, we will investigate and directly test hypotheses on ecosystem processes that link variability in plankton community structure to variability in particle production, export, and POC-210Po-234Th interactions in the upper ocean. We anticipate that outcomes from field work at Line P in conjunction with laboratory experiments will demonstrate strong and consistent relationships between planktonic food webs and the rates of carbon, ^{210}Po, and ^{234}Th packaging, sinking, and remineralization. Further, the information gathered will guide future use of radionuclide tracers, including mechanistic justifications for which tracer to use, when and where to use each tracer, as well as insight into the specific aspect of carbon that ^{210}Po and ^{234}Th are tracing. This project is relevant to several national and international research programs. These include: GEOTRACES, which is focused on the global-ocean distribution of trace elements and isotopes in seawater; and IMBER, which is focused on the structure and functioning of ocean ecosystems. This project will also build upon the results of earlier process studies at OSP including SUPER (Subarctic Pacific Ecosystem Research, Miller 1993), VERTEX (VERTical EXchange, Martin et al. 1987) and the Canadian JGOFS study.

SAMPLING:

At 5 major stations (P4, P12, P16, P20, and P26) two discrete rosette/CTD casts were made to collect seawater for our measurements. One cast was made for 234Th and 210Po samples, tripping bottles at 13 depths, of which 12 were fixed depths (5, 10, 20, 30, 50, 75, 100, 150, 200, 300, 400, 500m) and 1 was the chlorophyll maximum (DCM). The DCM was chosen based on observation of the instrument traces (fluorometer, transmissometer), which varied at each station but generally ranged between 40-60m. When no discernable fluorescence peak was observed, a depth near the midpoint of the surface mixed layer was selected. The second cast was for phytoplankton community structure and primary productivity samples. 7 depths were selected based on PAR light levels (100%, 50%,30%,17%,9%,5%,1%). Water samples were processed on board (described below) for later analyses at respective PI laboratories.
Phytoplankton structure profiles were measured from 7 depths based on PAR light levels.

Fluorometric chlorophyll – 400-500ml filtrations each for "total" (GF/F filters, nominally 0.7µm) and 5 µm (polycarbonate membrane filters) size fractions in duplicate, stored in -80°C.
HPLC pigments – 400-500ml filtrations each for "total" (GF/F filters, nominally 0.7µm) and 5 µm (polycarbonate membrane filters) size fractions, occasional duplicates, stored in -80°C.
Flow Cytometry – 4ml samples preserved with 200 µl paraformaldehyde, stored in -80°C.
Preserved microplankton – 200ml samples preserved with 10ml buffered formalin and 1 ml alkaline lugols solution, stored in the dark at room temperature.

Thorium profiles were measured on 12 depths (DCM, 1, 10, 20, 30, 50, 75, 100, 150, 200, 300, 500m). 4L samples were pH adjusted with 8 drops 28% NH_4OH then 25 µl 0.2M $KMnO_4$ and 10 µl 1 M $MnCl_2$ to form a MnO2 precipitate which was collected on GM/F filters. The filters were stored frozen (-20C) and brought to URI-GSO for analysis by direct beta counting.

Polonium profiles were measured on a subset of 10 depths. Whole-rosette bottle samples (10.1 L) were drained into 20L cubitainers (contained in milk crates for easier handling). Samples were pH adjusted with HNO_3 then spiked with 25 µl ^{210}Po tracer, 1 ml Pb standard and 5 ml $FeCl_3$. Samples were pH adjusted again with NH_4OH, oxidized with 1 ml $NaCrO_4$, and pH increased again with more NH_4OH. Samples were allowed to precipitate and sediment for at least 10-12 hours. Samples were decanted to ~1L and transferred, with most of the precipitate to LDPE bottles.

Cesium profiles were measured on 8 depths (1, 100, 200, 300, 400, 600, 800, 1000 m). Large-volume (60 L) samples were collected on two rosette casts at P4 and P26, and extracted onto KCFC (potassium cobalt ferrocyanide) ion-exchange resin at ~ 300 ml/min. The resin was then rinsed with 100 ml of milli-q water, then sealed for radiometric analysis at the Bedford Institute of Oceanography in Dartmouth, Nova Scotia.

Large volume size-fractionated particles were collected at two depths (50, 100 m) near P26. Large-volume samples (80L) were filtered through sequential nitex screens to collect plankton size-fractions (>100, 100-70, 70-53, 53-20, 20-10, 10-1 µm). The screens were rinsed into collection jars and preserved in 10% formalin for future analysis by microscope.

***In-situ* pumps** were deployed twice at near P26 for collection of size-fractionated particles. Three McLane and two Challenger pumps were deployed for 4 hours (0.5 hour delay, 3.5 hour pump time) to sample particles (>53, 53-10, 10-1 µm nitex screens) at 30, 50, 100, 150, and 200 m. Upon recovery, the nitex screens were rinsed and sonicated to extract the particles, which were then filtered onto precombusted GF/F filters for organic carbon, thorium, polonium, and pigment analysis.

Sediment traps were deployed near P26 and allowed to drift freely for ~3 days. They were abandoned to complete science objectives at other locations, but their position was monitored by ARGOS transmissions which were received by ships email. The traps were deployed with filtered seawater brine (~80 ppt), and collected particles at 30, 50, 100, 150, and 200 m. Upon recovery, the trap tubes were allowed to stand for ~1hr to allow the brine layer to stabilize, at which time the top layer of seawater was siphoned off and discarded. All four trap tubes from a given depth were combined, and sub-samples were collected for particulate organic carbon, thorium, polonium, pigment, and microscope analysis. Swimmers were picked from filtered samples.

Summary table of samples collected on 2011-01 Line P cruise by URI-BIOS-CUNY•QC group.

Samples were collected at P4, P12, P16, P20, and P26

Sample	P4	P12	P16	P20	P26
Total Chlorophyll	11	11	11	11	22
5 µm Chlorophyll	11	11	11	11	22
Total HPLC	11	11	11	11	22
5 µm HPLC	11	11	11	11	22
FCM	7	7	7	7	42(1.2ml x 3rep)
Preserved Microplankton	4	4	4	4	8
Primary Production					2 incubations of 7 light depths, with To, 3 light replicates and 1 dark per light depth.
Total Cesium	8				8
Total ^{234}Th	12	12	12	12	24
Total ^{210}Po	11	11	11	11	11
Bongo Tow	2	2	2	2	2
In-situ pumps					10
Sediment Traps					10
LVSF Particles					2

RADIOISOTOPE USE:

The following radioisotope was used in the Rad-Van: $H_{14}CO_3$, A total of 3 wipe tests were conducted over the cruise. One, before the stock was brought on the ship and then immediately after its daughter stocks were created (June-4). Second, after the first incubation at P26 (June-11), and then a third and final test after the second incubation at P26 and to complete the cruise (June-16). Additionally, short wipe tests, were made to prove that the radioisotope waste had been properly acidified, ventilating C14 to the atmosphere, before it was disposed via the "hot" rad van drain. The drain was checked afterwards for contamination. There were no incidences to report with any level of contamination. The daughter stocks left on after the February cruise, and the ones prepared for the June cruise were disposed along with the waste produced. The only radioisotope left behind is the main stock, kept at IOS for future cruises.

RADIATION VAN REPORT:

The IOS radiation van had undergone a complete refurbishment earlier this year. Overall the van was easy to work in. The floor space is good. Bench height is comfortable to work on. There is plenty of bench space and drawers. The mats should be removed. If spike was spilt on them they would be impossible to clean. Window covers were provided for light reduction, but they are rather difficult to snap into place. Over the cruise, only 2 incidences occurred that are of concern. First, the forward, starboard window had a leak. It is relatively large and funneled in rain quite rapidly. Luckily, the rain water had pooled on the non-"hot" side of the countertop.

The crew acted quickly to mend the hole, and succeeded using a type of putty. Second, power failed twice. Emergency lights flicked on, but everything else shut off for 1-2 minutes. Heater, low level light, fume hood, and a vacuum pump were all working at that point. It was necessary to shut off the heater and briefly the fume hood, for the power to stay on. Other than those two occurrences, the van was excellent to work in. Issues addressed after the February Line-P, such a fume hood, carboy security, magnetic drawer system, heater all worked quite agreeably.

SUMMARY/FINAL COMMENTS:

Thanks to the officers and crew of the John P. Tully for a successful cruise. Thanks and appreciation to Len Bilby and the deck crew for assistance securing and deploying our equipment on the weather decks. We would also like to thank Marie Robert and the science party for their sampling assistance. Thanks to Mike Arychuk for assistance with inter-cruise chemical storage and handling. We'd also like to thank Darren Tuele, Janet Barwell-Clarke, and Hugh Maclean for help during pre- and post-cruise operations.