# Cruise Report C3O/DBO 2013-05

## Pacific Region Vessel CCGS *Sir Wilfrid Laurier*

**DATE:** **FROM:** 4 July 2013 **TO:** 24 July 2013

**SCIENCE CRUISE NUMBER:** 2013-05 **SHIP'S PATROL NUMBER:**

**CHIEF SCIENTIST:** Svein Vagle

### INTRODUCTION/PROGRAM BACKGROUND:

This research cruise is part of the Distributed Biological Observatory (DBO) effort, which is an international effort to make repeat oceanographic observations at chosen stations in the Southern Chukchi Sea and in Barrow Canyon. It is also a continuation of the Canada Three Oceans project "C3O" which was part of Canada's contribution to the International Polar Year research effort. The focus of this collaboration between DFO-IOS and University of Maryland, Center for Environmental Science, Clark University and NOAA in the US, University of Victoria in Canada, and Japan Agency for Marine-Earth Science and Technology (JAMSTEC) in Japan is to study impacts of climate variability on the sub-arctic and Arctic water circulation and on the associated ecosystems. This year the ship transect across the NE Pacific again was along the great circle route between southern Vancouver Island and Unimak Pass in the Aleutians.

### CRUISE OBJECTIVES:

During this cruise aboard the CCGS Sir Wilfrid Laurier data were collected on the physical, biological and geochemical properties of ocean waters across the North Pacific Ocean, and the shelf regions of the Bering and Chukchi Seas. Data were also collected on the benthic ecosystems in the Bering & Chukchi Seas.
The shipboard data collection included physical, biological, geochemical and benthic sampling:

- Profiles of water temperature and salinity were obtained with a Seabird Conductivity, Temperature and Depth (CTD) system, and using an Oceanscience Underway CTD system (UCTD). In addition five expendable CTD probes (XCTD) were deployed from the ship across the NE Pacific.
- Additional sensors on the Seabird CTD profiler collected *in-situ* data on phyto-plankton concentrations (fluorometer), optical clarity (transmissometer), dissolved oxygen and photoactive radiation (PAR).
- A rosette bottle sampler was used with the CTD to obtain water samples from discrete depths for a broad suite of biological and geochemical parameters, some for onboard analysis, others to be stored for later analysis in shore-based laboratories following the return of the ship to Victoria in the autumn.
- Benthic sampling using Van Veen grabs.
- Both bio-acoustic backscatter data and depth-varying current information were collected using a RDI Longranger 150 kHz Acoustic Doppler Current Profiler (ADCP) and a four frequency (125, 200, 455 and 768 kH) Acoustic Zooplankton Fish Profiler (AZFP) from ASL Environmental

Sciences. These two instruments were mounted in a stainless steel frame and deployed over the port side of the ship at most of the science stations.

- Zooplankton samples were obtained in vertical hauls by Bongo-nets lowered to 100 m or from bottom depth minus 10 m in waters shallower than 110 m.
- Continuous underway sampling of near-surface seawater temperature, salinity, fluorescence, oxygen and nitrogen.
- Onboard laboratory primary productivity experiments were performed in incubators located on the helicopter deck.
- Extensive onboard chlorophyll sampling and filtering were done for comparisons with satellite ocean observations.
- Bird and marine mammal observations (Marine mammal observations all the way from Victoria and designated bird observations from Dutch Harbor onwards).
- Drift-bottle deployments.
- Recovery and redeployment of two biogeochemical JAMSTEC moorings in Southern Chukchi Sea along the DBO 3 line.
- Deployment of a single biogeochemical JAMSTEC mooring near Barrow Canyon. Moorings already in water could not be recovered due to sea ice and the deployment position of the new mooring had to be moved closer to shore, also due to significant sea ice.
- Deployment of 8 Argo floats for Howard Freeland (DFO).
- Deployment of 2 Surface velocity profilers (SVP) for Environment Canada.
- Deployment of Axys wave-rider buoy for David Atkinson at UVIC

**DAYS ALLOCATED:** 21 **DAYS OF OPERATION:** 21

**SCIENTIFIC PERSONNEL:** In Victoria (VIC), 5 scientists embarked July 4th and stayed onboard until Barrow Alaska (Bar) (Disembarked July 24th) . Another 9 scientists embarked in Dutch Harbor (DH) July 11th and disembarked in Barrow July 24th.

| Name | Tasks | Affiliation | from | To |
|---|---|---|---|---|
| Svein Vagle | Bio-acoustics/Underway surface water analysis/UCTD/CTD | DFO-IOS | VIC | Bar |
| John Nelson | Zoo-plankton/Bio-acoustics | UVIC/IOS | VIC | Bar |
| Karina Giesbrecht | Phyto-plankton | UVIC | VIC | Bar |
| Robert Izett | Phyto & zoo-plankton | UVIC | VIC | Bar |
| Bruce Paterson | Marine Mammal observer | | VIC | Bar |
| Jackie Grebmeier | Benthic/water sampling | U.Maryland | DH | Bar |
| Lee Cooper | Benthic/water sampling | U.Maryland | DH | Bar |
| Monika Kedra | Benthic/water sampling | U.Maryland | DH | Bar |
| Christian Johnson | Benthic/water sampling | U.Maryland | DH | Bar |
| Christie Wood | Water analysis | Clark University | DH | Bar |
| Kristen Shake | Water analysis | Clark University | DH | Bar |
| Takashi Kikuchi | Moorings/water sampling/benthic | JAMSTEC | DH | Bar |
| Stoshi Osawa | Moorings/water sampling/benthic | JAMSTEC | DH | Bar |
| Tamara Zeller | Bird Observer | US Fish and Wildlife Service | DH | Bar |

**SUMMARY of RESULTS:**

Underway data collection included:

- Without slowing down the ship 20 UCTD profiles (one every 6 hours) to a depth of 400 m were collected across the NE Pacific from the west coast of Vancouver Island and shortly before arrival in Dutch Harbor.
- Daily XCTD was deployed (total number=5) to a depth of 1100 m while crossing the NE Pacific. The ship was slowed to 8 knots for a couple of minutes during each deployment.
- Eight Argo floats where deployed at predetermined longitudinal crossings during the Pacific transect.
- Continuous monitoring of surface water properties with electronic sensors from the seawater loop in the main laboratory (temperature, salinity, chlorophyll, oxygen, and nitrogen),
- Marine mammal observations (Victoria to Barrow) and bird observations (Dutch Harbor to Barrow) during all daylight hours,
- Meteorological and ship position data from ship sensors.

At the 50 science stations in the Bering and Chukchi Seas, the following science tasks were completed

- 50 CTD/Rosette casts,
- 29 150 kHz ADCP and AZFP deployments,
- 36 Bongo plankton net hauls,
- 33 Benthic sampling stations with up to 5 van Veen mudgrabs per station.

Deployment of Axys wave buoy for David Atkinson at UVIC and sponsored by NOAA and EPA in the US at 18:25 ADT on July 15 (Figure 1). Deployment position: 65$^{o}$ 00.574'N 169$^{o}$ 27.211'W at a depth of 51.2 m.

**Figure 1.** Axys wave buoy shortly before deployment near the Bering Strait (65$^{o}$ 00.574'N 169$^{o}$ 27.211'W).

**AREAS OF OPERATION:**

North Pacific, Bering Sea, Chukchi Sea.

The maps below (Figures 2 and 3) show the science stations and underway CTD (UCTD) drops occupied along the route. A list of these science station locations, dates and activities is included in appendix 1. There were no stops during the transect across the Pacific. The ship left Victoria 18:30 PDT July 4th and arrived in Dutch Harbor 08:30 ADT July 11th. Left Dutch Harbor 18:30 ADT July 11th. Arrived at Port Clarence at 17:00 ADT July 16th for exercises with US Coastguard (Figure 4). Departed July 18th to continue science stations. Arrived Barrow July 24th when the science party departed the ship. Science party flew from Barrow on July 25th.

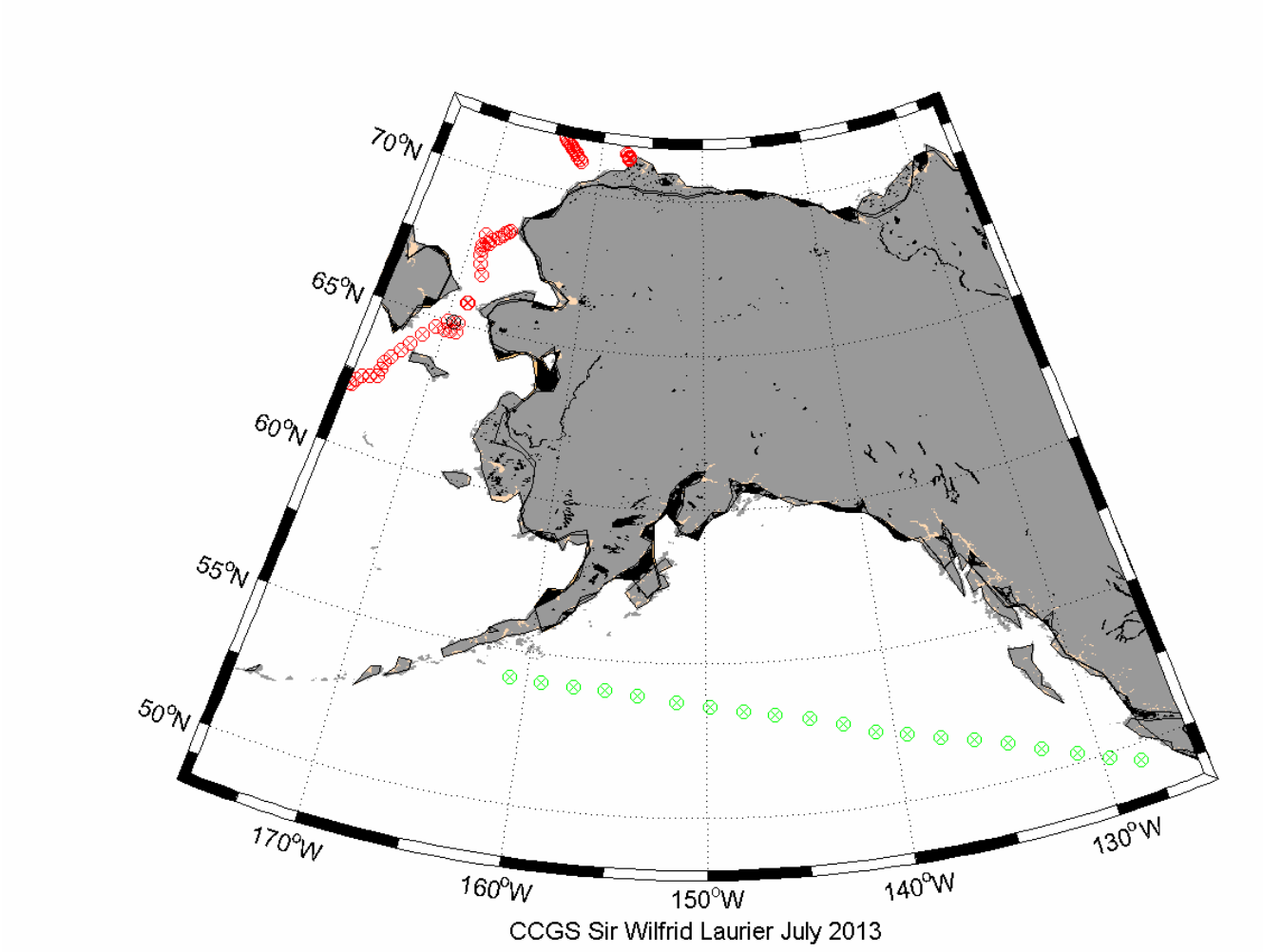


**Figure 2.** Map showing locations of UCTD profiles across the NE Pacific (green symbols) and the science stations (red symbols) during 2013-05.

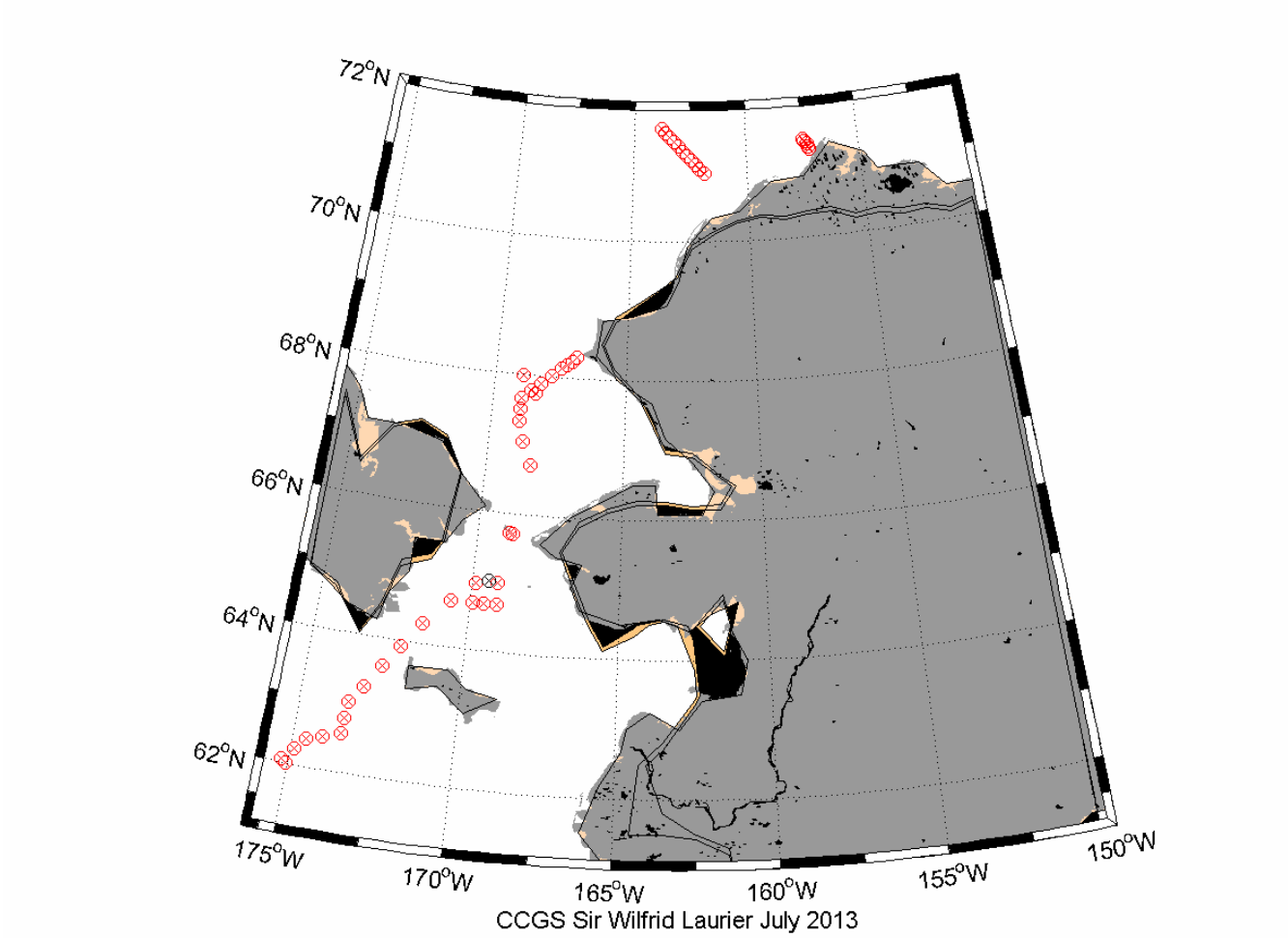


**Figure 3.** More detailed map of science stations (red symbols) in Bering and Chukchi Seas. The black symbol south of the Bering Strait is the location of the wave buoy.


**Figure 4.** Exercise with US Coastguard in Port Clarence 16-18 July.

The approximate total distance travelled from Victoria to Barrow was about 3060 nautical miles, and the estimated incremental time required for the extra steaming and all science stations was under 5 days.

**FIELDWORK:**

Science activities aboard the CCGS Sir Wilfrid Laurier for the July leg of the program covered two distinct segments:

1. Across the North Pacific from Victoria, BC to Bering Shelf:
   - Continuous measurements of near-surface water properties from the salt-water loop in the main laboratory.
   - Underway CTD-probe deployed to a depth of 400 m behind the ship every 6 hours without any interruption to ship speed and routines.
   - XCTD probe deployments to a depth of 1100 m every 24 hours. Ship slowed to 8 knots during these deployments.
2. During the Bering/Chukchi Seas segment from the Aleutian Islands to Barrow, Alaska, a number of repeat benthic stations was occupied as outlined in the table in the appendix. At these benthic locations:
   - Rosette casts were done to get samples from the overlying water column for the biology and geochemistry groups;
   - A Bongo plankton net haul was done at most stations,
   - ADCP 150 kHz backscatter data and current profiles plus 4-frequency acoustic backscatter data were collected from an instrumented package deployed first and recovered last at most stations. (It was not safe to deploy this package when operating in ice.)
   - Van Veen mudgrabs (between 2 and 5 grabs per station) were collected at most stations.
   - Water was collected and filtered at a number of depths at most stations.
   - Primary productivity incubation experiments where conducted using water from a subgroup of stations (Figure 5).

**Figure 5.** Phyto-plankton incubators on the helicopter deck. These were operated by Karina and Robert from the Varela lab. at UVIC.

## Shipboard labs

Laboratory spaces on board were used to collect samples for nutrients and salts and electronic sensor data from the seawater loop and to filter rosette samples for chlorophyll. Isotope analysis associated with phytoplankton incubation experiments were also conducted in the main laboratory. Zooplankton samples from Bongo casts were prepared and stored for subsequent analysis back at IOS.

Deck space was used by science for launch and retrieval of equipment and instrumentation, including CTD/rosette for profiling & water sampling and for the launching and recovery of the underway CTD (UCTD) system. The breezeway on the port side of the ship was also used to deploy and recover the combined 150 kHz ADCP plus 4-frequency backscatter sonar package for acoustic current and zooplankton measurements. The zooplankton Bongo nets and the van Veen grabs were deployed and recovered using the A-frame on the port side of the well deck.

To facilitate the science, two container labs were installed and used during leg 1. The 20-ft. green container on the well deck was used for sample preparations following Bongo net hauls and for storage of equipment used for benthic sampling. The 20-ft aluminium container on the boat deck was used as a water filtering station by the UVIC team and provided much needed temporary storage space. It was also used to hold a UVIC surface PAR sensor.

The container labs are well suited for lab duties, outfitted with counter space, shelving, simple sink, heat and power for instruments. Both are hooked up to electrical power for lights and heat, and had phone, ship's intercom and network connections.

## CTD/rosette system

A Seabird SBE-9 profiling CTD was used with a custom built compact 24-bottle rosette water sampler. The CTD was equipped with the standard suite of pressure, temperature and conductivity sensors, and additional external sensors: a fluorometer to measure chlorophyll-a concentrations, a transmissometer to measure water clarity, a dissolved oxygen probe, and an acoustic altimeter to get accurate height above the bottom.

The 24-bottle rosette system (Figure 6) was equipped with a Seabird Carousel pylon to remotely trigger the 10-litre Niskin sample bottles. An SBE-11 deck unit was used with Seasave software to acquire real-time data from the CTD and to close the bottles at depths selected before and/or during the cast. The deck unit included a NMEA board to automatically add GPS position into the header of the data file. This system worked very well during the trip.

**Figure 6.** The 24 Niskin-bottles rosette system successfully used during the trip to collect water at selected depths.

## Plankton nets

Single Bongo plankton net hauls to a depth of water-depth minus 10 m were done at most stations, using the hydro winch and A-frame on the well-deck. These casts were done right after the CTD/rosette casts while water was being sampled from the rosette Niskin bottles or sometimes at the same time as the CTD/rosette casts.

## Benthic sampling

Up to five 0.1 $m^2$ van Veen grab deployments were made at each science station for collections of surface sediment chlorophyll, organic carbon/nitrogen content, grain-size, and benthic marcrofaunal population structure (Figure 7).

**Figure 7.** Benthic sampling in Bering and Chukchi Sea by Jackie Grebmeier and Lee Cooper's group from the University of Maryland.

## ADCP/Backscatter sonar

A 150 kHz Teledyne RDI Acoustic Doppler Current Profiler (ADCP) was mounted in a stainless steel frame and lowered over the side when stopped at each science station (Figure 8). New this year was an additional ASL Environmental Sciences Acoustic Zooplankton Fish Profiler (AZFP) with four acoustic frequencies (125, 200, 455, and 768 kHz). This self-contained instrument was also mounted in the same stainless steel frame. This package was the first to be deployed at each science station and the last to be recovered. Data from this instrument gives current profiles below the ship to a maximum depth of 500 m and a measure of plankton layers in the water column down to approximately 100 m.

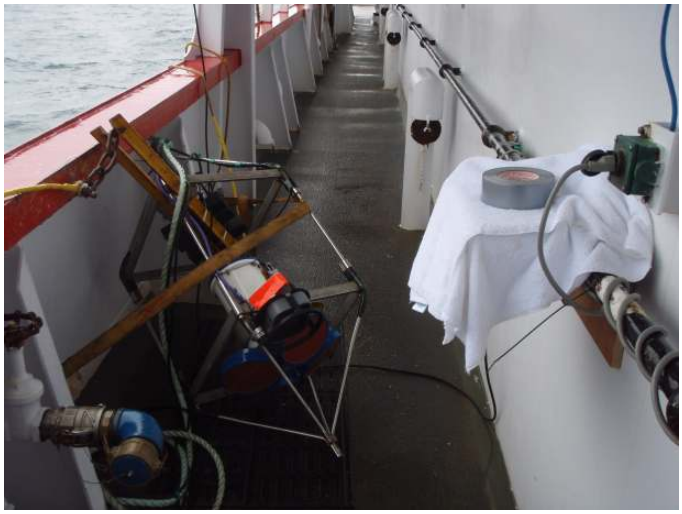

**Figure 8.** The 150 kHz Acoustic Doppler Current Profiler (ADCP) and the 4-frequency Acoustic Zooplankton and Fish Profiler (AZFP) in their stainless steel frame on deck just prior to deployment.

## Drift bottles

As part of a project started in 2000, 104 drift bottles, each containing a message with serial number and reporting contact information, were launched at five selected locations along the ship's track. This year the bottles were prepared by students at Sidney Elementary and Parkland Secondary schools. The drop locations are logged, and when finds are reported this provides information on ocean surface drift trajectories. A website is maintained at IOS to document all drops and finds, and map the results.

## Underway CTD system

During this cruise an underway CTD system was successfully used to collect temperature and conductivity (salinity) data from the surface and down to a maximum depth of 400 m while the ship was moving at cruising speed (Figure 9 and Figure 10). The probe was dropped to approximately 400 m. Across the Pacific the probe was deployed every 6 hours and the complete operation took less than 20 minutes per cast. This is an excellent method to collect high quality water property data from the ship without interfering with speed and ship operations. These data were augmented with expendable CTD probes dropped from the stern of the ship every 24 hours to extend the depth to 1100 m.

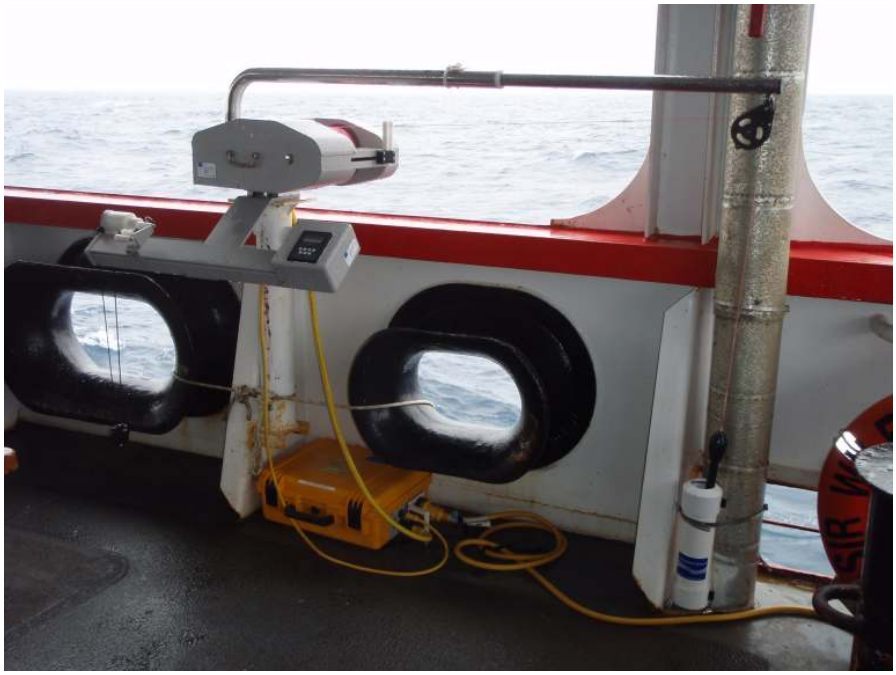

**Figure 9.** Underway CTD system mounted at the stern of the ship. During the trip profiles were obtained every 6 hours across the Pacific to a maximum depth of 400 m.

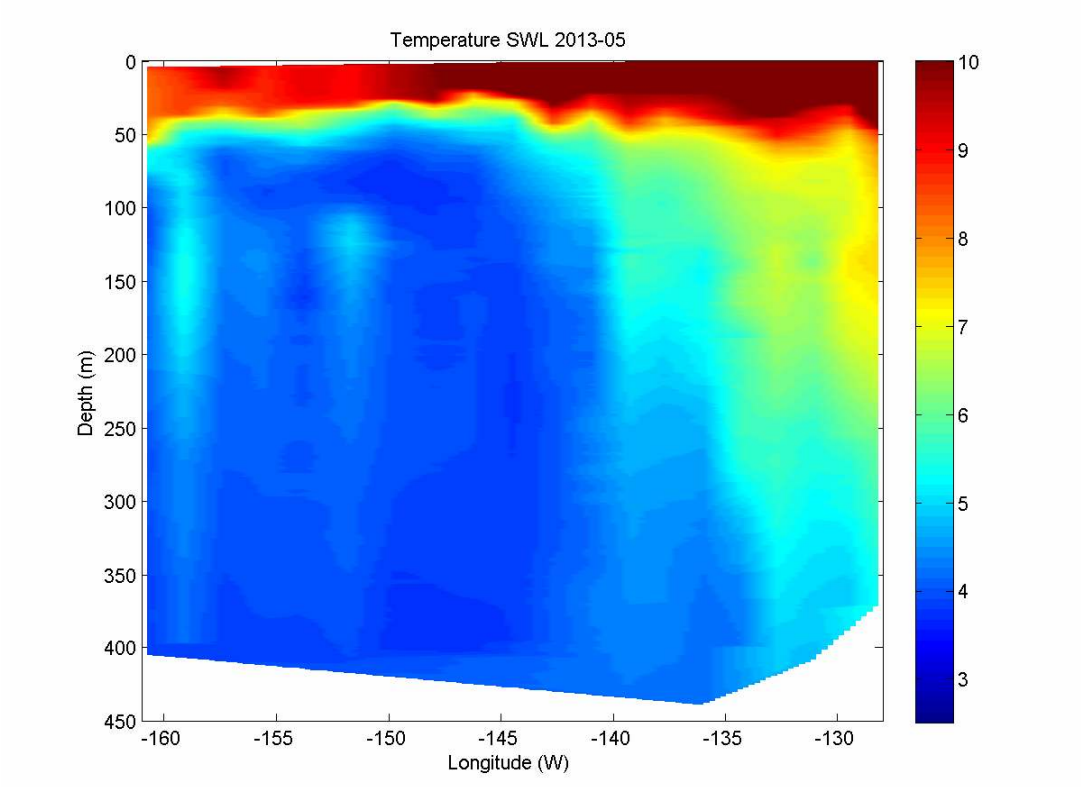


**Figure 10.** Temperature field across the NE Pacific from the UCTD profiles in July 2013.

## JAMSTEC moorings

On July 20th two biogeochemical moorings were successfully recovered at Hope Valley (SCH-12-2, SCH-12w-2) and two new moorings deployed in the same location (SCH-13, SCH-13w) (Table 1 & Figure 11). On July 24th a third mooring was deployed close to the DBO-5 line near Barrow Canyon (BCH-13). The location of this mooring deployment had to be changed last minute due to too much ice in the original location. The new mooring also ended up being a combination of the two originally planned moorings. Two moorings in Barrow Canyon (BCH-12-2, BCH-12w-2) we were supposed to recover could not be recovered due to the difficult sea-ice conditions. These will be recovered by R/V Mirai cruise in Sept.-Oct. 2013.

**Summary of mooring missions during CCGS S. W. Laurier 2013 July cruise**

| Station | Type | Area | Latitude | Longitude | Depth of top float (m) | Water depth (m) | Date OUT | Vessel |
|---|---|---|---|---|---|---|---|---|
| Recovery | | | | | | | | |
| SCH12 | Water properties & MF-AZFP | Hope Valley | 68 02.004 N | 168 50.027 W | 52 | 59 | 20-Jul-2013 | CCGS S. W. Laurier |
| SCH12w | Acoustic monitoring | Hope Valley | 68 03.005 N | 168 50.002 W | 53 | 60 | 20-Jul-2013 | CCGS S. W. Laurier |

| Station | Type | Area | Latitude | Longitude | Depth of top float (m) | Water depth (m) | Date IN | Vessel |
|---|---|---|---|---|---|---|---|---|
| Deployment | | | | | | | | |
| SCH13 | Water properties & MF-AZFP | Hope Valley | 68 02.0025 N | 168 50.0284 W | 53 | 60.3 | 20-Jul-2013 | CCGS S. W. Laurier |
| SCH13w | Acoustic monitoring | Hope Valley | 68 03.0059 N | 168 50.0031 W | 52 | 60.3 | 20-Jul-2013 | CCGS S. W. Laurier |
| BCH13 | Acoustic monitoring & water properties | Barrow Canyon | 71 18.9202 N | 157 08.8015 W | 53 | 61.5 | 24-Jul-2013 | CCGS S. W. Laurier |

Agency: Japan Agency for Marine-Earth Science and Technology (JAMSTEC)
Contact: Dr Takashi Kikuchi, Tel., +81-46-867-9486, FAX +81-46-867-9374, takashik@jamstec.go.jp

Table 1. JAMSTEC mooring information for moorings recovered (SCH12 and SCH12w) and the three moorings deployed during the cruise.

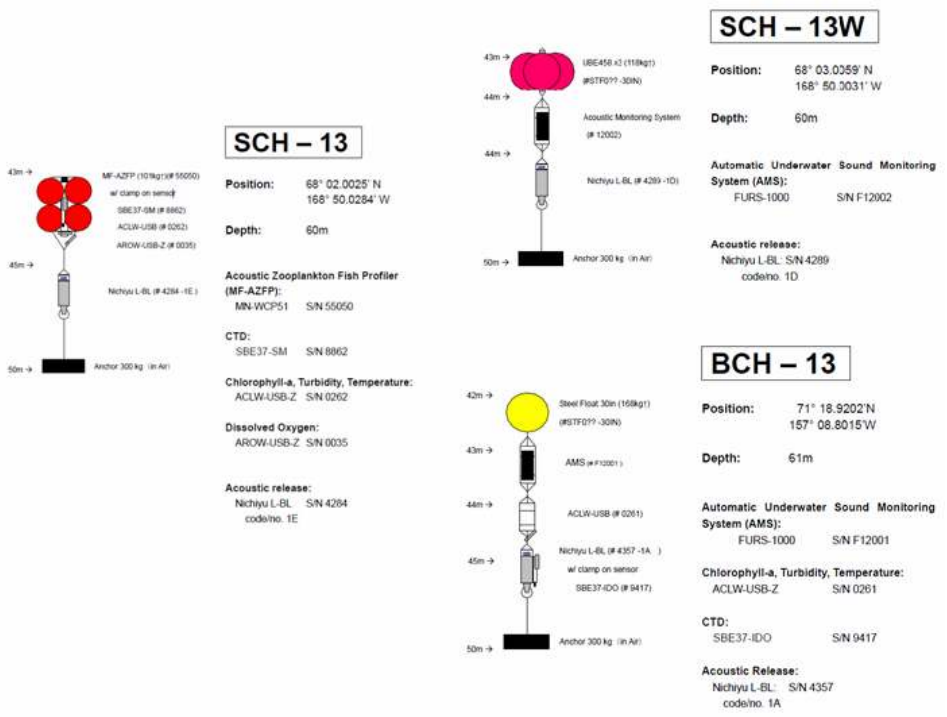


**Figure 11.** JAMSTEC moorings deployed from the SWL during the cruise (see Table 1).

**SUCCESSES AND PROBLEMS [SCIENTIFIC]:**

All of the science instrumentation provided scientifically valuable data, and will help to combine biological findings with measurements of the physical characteristics of the ocean. All the scientific equipment performed well throughout the trip. The data collected will be used with data collected along the same ship track and at similar stations in earlier years to investigate interactions between the biological conditions and the physical parameters that govern their environment and to allow for studies of possible ecosystem changes due to climate change.

The only scientific problems experienced where due to difficult ice conditions at several stations and where moorings were going to be recovered and deployed (Barrow Canyon). Two JAMSTEC moorings had to be left in place because they were under ice and the two replacement moorings were replaced by a single mooring which had to be deployed in 50 m water depth instead of the planned 100 m depth. Because of the ice-floes it was also not possible to deploy the ADCP/AZFP system at stations in the ice. This is reflected in the station summary shown in the Appendix.

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

The ship is very well suited for this type of oceanographic work. No problems were reported during the cruise. A major reason for yet another successful mission is the wonderful support from and professionalism of the ship's officers and crew. Even though we experienced significant sea-ice coverage at the locations of our northern stations, the captain and his crew managed to get us to most of these under less than ideal conditions (significant fog in addition to the bad ice). As mentioned above, it was not possible to recover two of the JAMSTEC moorings because of the ice. Also, the captain and his crew made a significant effort in trying to find a location in 100 m of water to deploy the new moorings. Eventually we had to give up in trying to find a big enough hole in the ice to deploy these moorings. A modified mooring was later deployed in 50 m ice-free water.

**SUCCESSES [SHIP]:**

The support of officers and crew in getting our equipment onboard, up and running, and during all station operations and data collection is invaluable and greatly appreciated. The professionalism of the Canadian Coastguard became obvious to the whole science team during this trip. The science party had a wonderful time onboard the ship.

**DAYS LOST DUE TO WEATHER:**

No science lost due to weather.

**DELAYS [OTHER THAN WEATHER]:**

No delays. The two day exercise with the US Coast Guard during the middle of the cruise was planned well in advance.

**SAFETY CONCERNS:**

No real safety concerns were reported. However, it was raised by several scientists that perhaps the isotope work can be moved from the main laboratory and into the boat deck container next time to eliminate any worry. The potential risks were well explained right at the beginning of the trip, but nevertheless, this is something worth discussing for next year.

**SUMMARY/FINAL COMMENTS:**

Again we want to express our gratitude for all the help and support we received from Commanding Officer Norman Thomas and his officers and crew onboard CCGS Sir Wilfrid Laurier, resulting in a successful trip and the collection of significant amount of interesting and valuable scientific data and samples.

for additional information on this report contact
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## Appendix Science Stations

-ADCP is the down-looking 150 kHz Acoustic Doppler Current Profiler **and** the 4-frequency AZFP.
-CTDR is the CTD/Rosette electronic profiling and water sampling instrumentation deployed to the seafloor minus 5 m at each science station.
-CTD is a CTD cast only.
-Mud indicates collection of benthic sediment samples using a Van Veen grab by the University of Maryland team. Between 2 and 5 grabs per station.
-Bongo is the dual plankton net vertical haul from depths of 100 m or less at the shallower stations.

In addition, an underway salinity, temperature, depth (UCTD) probe was deployed every six hours while underway between Victoria and the Aleutian Islands and to fill in between science stations in the Bering and Chukchi Seas.

| Station Name | Date | Start (UTC) | Lat. North (deg) | Lat (min) | Long. West (deg) | Long (min) | Science Tasks |
|---|---|---|---|---|---|---|---|
| Victoria | 7/5/2013 | 01:30 | 48 | 25.215 | 123 | 23.343 | Depart for Arctic |
| SLIP-1 | 07/14 | 04:05 | 62 | 0.6 | 175 | 3.57 | ADCP, CTDR, Bongo, Mud |
| SLIP-2 | 07/14 | 06:04 | 62 | 3.01 | 175 | 12.59 | ADCP, CTDR, Bongo, Mud |
| SLIP-2B | 07/14 | 08:40 | 62 | 13.2 | 174 | 52.59 | CTD |
| SLIP-3 | 07/14 | 10:17 | 62 | 23.44 | 174 | 34.23 | ADCP, CTDR, Bongo, Mud |
| SLIP-3B | 07/14 | 12:58 | 62 | 28.086 | 174 | 4.98 | CTD |
| SLIP-5 | 07/14 | 14:38 | 62 | 33.607 | 173 | 32.99 | ADCP, CTDR, Bongo, Mud |
| SLIP-5B | 07/14 | 17:05 | 62 | 47.274 | 173 | 30.03 | CTD |
| SLIP-4 | 07/14 | 18:42 | 63 | 1.824 | 173 | 27.58 | ADCP, CTDR, Bongo, Mud |
| SLIP-4B | 07/14 | 21:27 | 63 | 16.799 | 173 | 4.824 | CTD |
| SLIP-4C | 07/14 | 23:50 | 63 | 36.271 | 172 | 35.4 | CTD |
| BCL-6A | 07/15 | 02:08 | 63 | 55.207 | 172 | 5.921 | ADCP, CTDR, Bongo |
| BCL-6B | 07/15 | 04:57 | 64 | 17.496 | 171 | 29.8 | CTD |
| BCL-6C | 07/15 | 07:56 | 64 | 40.333 | 170 | 38.72 | CTD |
| UTBS-5 | 07/15 | 09:57 | 64 | 40.258 | 169 | 55.25 | ADCP, CTDR, Bongo, Mud |
| UTBS-4 | 07/15 | 12:38 | 64 | 57.756 | 169 | 53.31 | ADCP, CTDR, Bongo, Mud |
| UTBS-1 | 07/15 | 15:24 | 64 | 59.51 | 169 | 8.352 | ADCP, CTDR, Bongo, Mud |
| UTBS-2 | 07/15 | 18:18 | 64 | 40.978 | 169 | 6.277 | ADCP, CTDR, Bongo, Mud |
| UTBS-2B | 07/15 | 20:00 | 64 | 40.642 | 169 | 33.06 | CTD |
| BRS-5 | 07/16 | 15:20 | 65 | 43.013 | 168 | 53.58 | CTDR |
| BRS-3 | 07/16 | 16:04 | 65 | 42.2 | 168 | 46.77 | ADCP, CTDR, Bongo |
| UTN-1 | 07/19 | 12:03 | 66 | 42.654 | 168 | 23.92 | ADCP, CTDR, Bongo, Mud |
| UTN-2 | 07/19 | 14:53 | 67 | 3.022 | 168 | 43.72 | ADCP, CTDR, Bongo, Mud |
| UTN-3 | 07/19 | 17:21 | 67 | 19.667 | 168 | 56.53 | ADCP, CTDR, Bongo, Mud |
| UTN-4 | 07/19 | 19:06 | 67 | 29.995 | 168 | 56.6 | ADCP, CTDR, Bongo, Mud |
| SEC-1 | 07/19 | 20:55 | 67 | 40.219 | 168 | 56.59 | ADCP, CTDR, Bongo, Mud |
| UTN-6 | 07/19 | 22:53 | 67 | 44.501 | 168 | 26.11 | ADCP, CTDR, Bongo, Mud |
| SEC-2 | 07/20 | 00:04 | 67 | 46.756 | 168 | 36.48 | ADCP, CTDR, Bongo, Mud |
| SEC-8 | 07/20 | 05:35 | 68 | 17.976 | 166 | 56.84 | ADCP, CTDR, Bongo, Mud |
| SEC-7 | 07/20 | 07:08 | 68 | 14.575 | 167 | 7.25 | ADCP, CTDR, Bongo, Mud |
| SEC-6 | 07/20 | 08:25 | 68 | 11.06 | 167 | 18.51 | ADCP, CTDR, Bongo, Mud |
| SEC-5 | 07/20 | 09:45 | 68 | 7.646 | 167 | 29.64 | ADCP, CTDR, Bongo, Mud |
| SEC-4 | 07/20 | 11:32 | 68 | 0.828 | 167 | 52.07 | ADCP, CTDR, Bongo, Mud |
| SEC-3 | 07/20 | 13:32 | 67 | 53.891 | 168 | 13.94 | ADCP, CTDR, Bongo. Mud |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| UTN-7 | 07/20 | 16:03 | 67 | 59.924 | 168 | 56.44 | ADCP, CTDR, Bongo, Mud |
| DBO-4.6 | 07/21 | 19:07 | 71 | 36.889 | 163 | 47.1 | CTDR, Bongo, Mud |
| DBO-4.5A | 07/22 | 03:21 | 71 | 33.439 | 163 | 35.71 | CTD |
| DBO-4.5 | 07/22 | 05:05 | 71 | 29.485 | 163 | 24.34 | CTDR, Bongo, Mud |
| DBO-4.4A | 07/22 | 07:29 | 71 | 25.777 | 163 | 14.06 | CTD |
| DBO-4.4 | 07/22 | 08:53 | 71 | 21.62 | 163 | 1.669 | CTDR, Bongo, Mud |
| DBO-4.3A | 07/22 | 10:51 | 71 | 17.692 | 162 | 49.86 | CTD |
| DBO-4.3 | 07/22 | 12:06 | 71 | 13.945 | 162 | 38.42 | CTDR, Bongo, Mud |
| DBO-4.2A | 07/22 | 13:43 | 71 | 10.258 | 162 | 28.03 | CTD |
| DBO-4.1A | 07/22 | 14:36 | 71 | 6.166 | 162 | 16.59 | CTD |
| DBO-4.1 | 07/22 | 16:10 | 71 | 2.431 | 162 | 5.491 | ADCP, CTDR, Bongo, Mud |
| BarC-2 | 07/22 | 17:25 | 70 | 58.367 | 161 | 53.95 | ADCP, CTDR, Bongo, Mud |
| BarC-1 | 07/23 | 04:59 | 71 | 17.483 | 157 | 13.83 | ADCP, CTDR, Bongo, Mud |
| BarC-3 | 07/23 | 06:27 | 71 | 14.698 | 157 | 11.13 | CTDR, Bongo, Mud |
| BarC-4 | 07/23 | 08:55 | 71 | 20.09 | 157 | 17.62 | CTDR, Bongo, Mud |
| BarC-5 | 07/23 | 11:34 | 71 | 22.352 | 157 | 24.28 | CTDR, Bongo, Mud |
| Barrow | 7/24/2013 | | | | | | Science program ends |