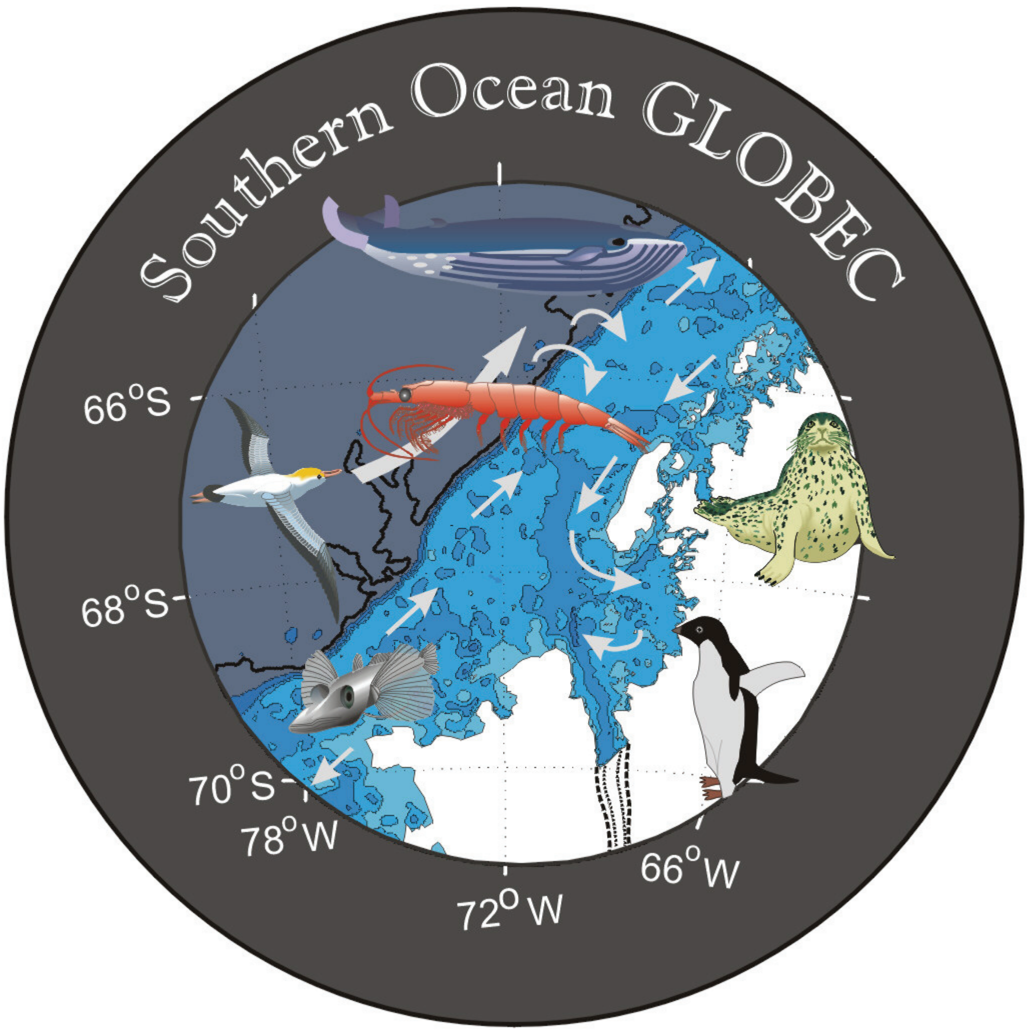
**Reports of**
***RVIB Nathaniel B. Palmer*** **Cruise NBP01-04 and**
***R/V Lawrence M. Gould*** **Cruise LMG01-06**
**to the**
**Western Antarctic Peninsula**
**24 July to 31 August 2001**
**and**
**21 July to 1 September 2001**




**United States Southern Ocean**
**Global Ocean Ecosystems Dynamics Program**
**Report Number 3**

# Report of
# *RVIB Nathaniel B. Palmer* Cruise NBP01-04
# to the
# Western Antarctic Peninsula
# 24 July to 31 August 2001

Report prepared by Peter Wiebe, John Klinck, Kendra Daly, Jose Torres, Carin Ashjian, Scott Gallager, Christine Ribic, Erik Chapman, Jay Peterson, Frank Stewart, Wendy Kozlowski, Ari Friedlander, Ana Sirovic, Gareth Lawson, Karen Fisher, and Kathleen Gavahan with assistance from other colleagues in the scientific party and the Raytheon Support Services.

## United States Southern Ocean
## Global Ocean Ecosystems Dynamics Program
## Report Number 3

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Norfolk, VA 23529

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**Acknowledgments**

The success we have enjoyed on this expedition is due in large part to the very excellent technical assistance we have received from all nine members of the Raytheon Marine Technical support group. Their can-do spirit was present from start to finish of the cruise. Likewise Captain Joe, the officers, and crew of the *N.B. Palmer* provided excellent support for every aspect of our scientific endeavors. The success of the cruise is due to the collective efforts of all of these individuals. The friendly atmosphere that was set by Captain Joe was evident throughout the ship. It made this expedition a pleasure to be on.

**NBP01-04 Cruise Participants on the *RVIB N.B Palmer***
(see facing page)

Kneeling (L-R): Kerri Scolardi and Ari Friedlander

Row 1 (L-R): Peter Wiebe, Hae Cheol Kim, Scott Gallager, Sinan Husrevoglu, Thomas Bailey, Jason Hyatt, Ana Sirovic, John Klinck, Gareth Lawson, Jay Peterson, Philip Alatalo, Kathleen Gavahan, Erik Chapman, Rebecca Pirzl, Romeo Lariviere, Carin Ashjian, and Rob Masserini

Row 2 (L-R): Wendy Kozlowski, Erin Macri, Emily Yam, Chris Ribic, Jennifer White, Jonnette Tuft, and Mari Butler

Row 3 (L-R): Karen Fisher, Kendra Daly, Jose Torres, Scott Burghart, Joel Bellucci Yulia Serebrennikova, Jeff Otten, Christian McDonald, Ernest Joynt, and Tom Bohlmer

Not shown: Chris Shepard, Jay Ardai, Frank Stewart, and Kary Claffey

**NBP01-04 Cruise Participants**

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## PURPOSE OF THE CRUISE

The U.S. Southern Ocean GLOBEC (SO GLOBEC) Program is in its first field year. The focus of this study is on the biology and physics of a region of the continental shelf to the west of the Antarctic Peninsula extending from the northern tip of Adelaide Island to the southern portion of Alexander Island and including Marguerite Bay. The primary goals are:

1) To elucidate shelf circulation processes and their effect on sea ice formation and Antarctic krill (*Euphausia superba*) distribution; and

2) To examine the factors that govern krill survivorship and availability to higher trophic levels, including seals, penguins, and whales.

The field program began with a mooring cruise in March and April aboard the *R/V L.M. Gould* during which a series of moorings were placed across the continental shelf of the Adelaide Island and across the mouth of Marguerite Bay, and a series of bottom-mounted moorings instrumented to record marine mammal calls and sounds were deployed. A pair of cruises took place during April-June 2001. A process cruise took place on the *R/V L.M. Gould* and the first in a series of four broad-scale cruises took place aboard the *RVIB N.B. Palmer*. This report describes and details the second broad-scale cruise to take place this year. The first broad-scale cruise is described in U.S. SO GLOBEC Report Number 2. Two others are intended to take place at the same times next year. Our effort is mainly devoted to developing a shelf-wide context for the process work being conducted during the same time periods aboard the *R/V L.M. Gould* and for the modelers who will be using both the broad-scale and the process data in their model computations. Our specific objectives with regard to the broad-scale survey were:

1) **To conduct a broad-scale survey of the SO GLOBEC study site to determine the abundance and distribution of the target species, *Euphausia superba* and its associated flora and fauna;**
2) **To conduct a hydrographic survey of the region;**
3) **To collect chlorophyll data, nutrient data, and to make primary production measurements to characterize the primary production of the region;**
4) **To collect zooplankton samples with nets at selected locations throughout in broad-scale sampling area;**
5) **To survey the sea birds throughout the broad-scale sampling area and determine their feeding patterns;**
6) **To survey the marine mammals throughout the broad-scale sampling area both by visual sightings and by passive listening techniques;**
7) **To map the bank-wide velocity field using an Acoustic Doppler Current Profiler (ADCP);**
8) **To collect acoustic, video, and environmental data along the tracklines between stations using a suite of sensors mounted in a in a towed body (BIOMAPER-II); and**
9) **To collect meteorological data.**

In addition, two process oriented groups were present on this cruise whose primary objectives were:

1) **To determine the abundance and distribution of micronektonic krill predators, primarily fishes within the study area;**
2) **To determine rates of metabolism and excretion of all life stages of Antarctic krill;**

3) **To assess numerical abundances of krill larvae underneath sea ice using SCUBA and videography;**
4) **To capture krill larvae underneath sea ice using SCUBA and hand nets for experimental manipulation;**
5) **To take samples of the surface layer under the sea ice to assess food concentrations;**
6) **To freeze krill of all life stages to assess composition and biochemical indicators of condition;**
7) **To evaluate the behavioral and physiological overwintering strategies used by different life history stages of the Antarctic krill; and**
8) **To assess the sexual maturity stages of female krill during winter in relation to environmental parameters.**

The cruise track was determined by the position of 92 station locations distributed along 13 transect lines running across the continental shelf and perpendicular to the western Antarctic Peninsula coastline (Figure 1). The work was a combination of station and underway activities (see the Event Log, Appendix 1). The along-track data were collected from the Bio-Optical Multifrequency Acoustical and Physical Environmental Recorder (BIOMAPER-II), the ADCP, the meteorological sensors, through-hull sea surface sensors, expendable bathythermograph (XBT) sensors, expendable conductivity-temperature-depth (XCTD) sensors, and sonabuoys. At the stations, a cast with a CTD/Rosette equipped with oxygen, transmissometer, and fluorometer sensors was made to the bottom. In water depths less than or equal to 500 m, a Fast Repetition Response Fluorometer (FRRF) was added to the Rosette. At selected stations, a 1-$m^2$ and a 10-$m^2$ Multiple Opening/Closing Net and Environmental Sensing System (MOCNESS) were towed obliquely between the surface and near the bottom or 1000 m, if the bottom was deeper, for collection of zooplankton (335 µm mesh) and micronekton (3 mm mesh). A Tucker Trawl was used to make collections of live animals for use in shipboard experimental studies. A Plummet Net was used to make vertical net tow collections of zooplankton, most often when pack ice and wind conditions prevented towing the other net systems. A surface ring net tow was also made at some stations for collection of phytoplankton. Seabeam data, which are used for bathymetic mapping, were collected along the survey tracklines.

## CRUISE NARRATIVE

### 22-23 July

We left the port of Punta Arenas, Chile after a week of cruise preparation, at 1800 hours on Sunday, 22 July 2001 with a moderate wind and partly cloudy skies. The sailing was delayed a day primarily because during the assembly and testing of the sensor systems on BIOMAPER-II, it was determined that the high frequency echosounder system was not working. Since this instrument system was so important to the along track surveying, it was essential to figure out what was wrong and fix it in port if possible. The failure was finally traced to a new part installed in the echosounder between the previous cruise in April-May 2001 and this one, and once replaced with a backup part, the equipment returned to normal operation. Delaying the sailing also made it possible to receive a late shipment of $^{14}C$ and the FRRRF (also out for repair), both needed for the productivity studies, and to enable one of the mates on the *L.M Gould*, who had several airline flights cancelled and missed the *Gould's* sailing, to sail with us.

The course to the survey area (first station was at 65° 38.93 S; 70° 37.92 W) took us east from Punta Arenas through the Straits of Magellan. After dropping the pilot at the eastern entrance to the Straits of Magellan, we steamed down the Atlantic side of the tip of South America and entered the waters of the circumpolar gyre after leaving the Straits of La Maire to the east of Tierra del Fuego. From there we headed nearly due south for the western Antarctic

Peninsula region of the Antarctic Continent and the start of the Southern Ocean GLOBEC broad-scale survey grid. The distance from Punta Arenas to the work site was approximately 900 nm.

NBP0104 Cruise Track and Observation Sites

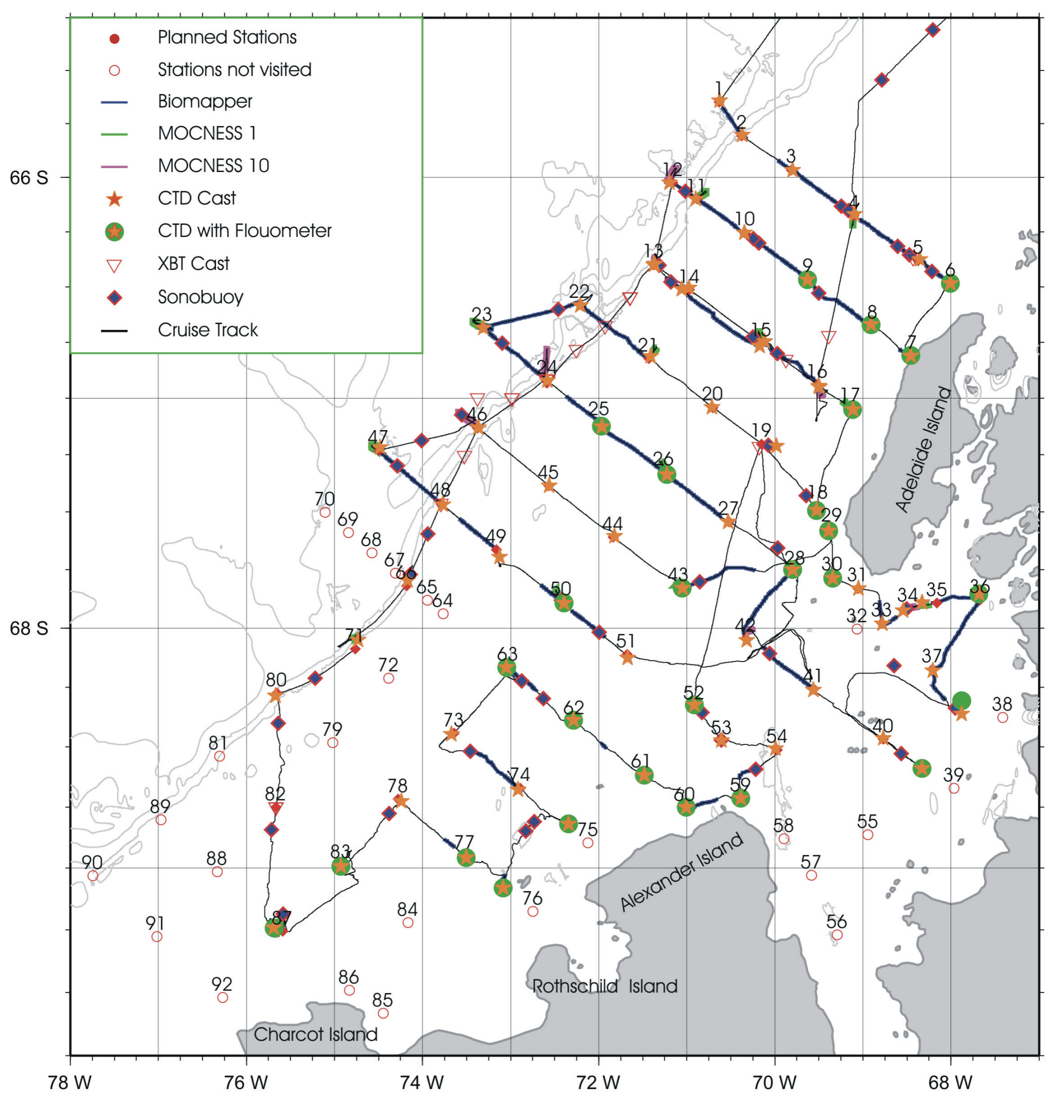



Figure 1. *RVIB Nathaniel B. Palmer* (NBP01-04) cruise track, showing locations of stations and along-track observations. Locations of specific activities are in the individual reports and in the event log (Appendix 1).

Shortly after leaving port, we had our first safety meeting with First Mate David Fahey presiding. This included dawning the survival suits and the exercise of getting the entire science party into a large lifeboat and strapped in. The safety meeting was followed by a science meeting lead by Marine Project Coordinator (MPC) Chris Shepard and Chief Scientist Peter Wiebe. During the evening of 22 July, while steaming through the Straits of Magellan, we slowed for a test deployment of BIOMAPER-II. This enabled those who handled the launch and recovery of the towed body to become familiar with the procedures in running the winch, slack tensioner, and overboarding sheave and docking mechanism together with the operation of the stern A-frame under good weather and sea conditions. It also provided an in-water test of all of the sensors systems while the system was being towed.

During 23 July, we steamed along the eastern side of the southern tip of South America reaching the Straits of La Maire just after dusk. Winds were in the 10 to 15 kt range for most of the day with partly cloudy skies and an air temperature around 4°C. It was a very good day to develop one's sea legs and to continue the setup of laboratory and deck based instrument systems. It was also a day for ping editing class. The Seabeam bathymetry data have to be edited manually and all in the science party were expected to share in accomplishing this task. Kathleen Gavahan taught the newcomers how to do the editing on the workstations in the computer lab and a test editing file was used throughout the day to develop ping editing skills.

**24 July**

This was a steaming day at an average speed of about 10 kts. Winds were a steady 20-30 kts out of the west-northwest and seas were 2 to 4 m from the same direction. The skies were mostly clear, but some clouds produced occasional snow showers. There were no scheduled over-the-side sampling activities because we were within Argentina's 200-mile limit for the entire day. There were, however, bird and mammal observations made during the daylight hours. Others in the scientific party worked to finish setting up the laboratory experimental equipment and the Raytheon technicians continued to set up the CTD and MOCNESS systems for a test deployment scheduled for mid-day on 25 July.

**25 July**

By 25 July, we were in the southern portion of the Drake Passage steaming on a southerly course at about 10 kts. Seas were somewhat higher than the previous day. Strong westerlies in the range of 30 to 35 kts prevailed most of the day and seas were running 4 to 5 m. The skies were partly cloudy with some occasional light snow in squalls that passed by. The air temperatures were right around the freezing mark. The work schedule was again light with XBTs, a couple of sonabuoy deployments, and bird and mammal observations the order of the day. The test deployments of the CTD and MOCNESS systems were delayed to wait for better sea conditions.

Around 2145, the ship abruptly slowed when we encountered the northern edge of the first year pack ice. Our position when we encountered the sea ice was 62° 46.707 S; 68° 35.801 W. Once we were into the sea ice, the high waves and swells were dramatically damped and the ship's ride significantly improved. Our time to the first station, however, was lengthened, because the ship's speed had to be lowered from around 10 to11 kts to between 6 and 8 kts.

**26 July**

This was our first full day in the pack ice. There were large areas of pancake ice interspersed with open leads. Seas were smooth with the sea ice cover even though there was a southerly wind blowing in the low 20-kt range. The air temperature had fallen dramatically—it was about -9.0°C for a most of the day. A thick low cloud cover made the scene a bit gloomy. Snow was coming down lightly. What a difference the sea ice cover made to the ride of the vessel. While there was some movement as the ship plowed through the ice floes, leaving a temporary trail of open water in its wake, there was no noticeable rolling or pitching.

In the early afternoon, we stopped about 70 nm from station 1 to conduct a test station where the instruments that were routinely used during the grid survey were deployed into the water. Samples for the laboratory analyses were obtained to enable the investigators to get their experimental procedures down and the kinks out. First in the water was the CTD, followed by the 1-$m^2$ MOCNESS. After dinner, the remotely operated vehicle (ROV) was deployed for under-sea ice surveys of larval and adult krill. All tests were completed successfully, although the MOCNESS tow was done without the optical plankton counter (OPC) or the strobe light being operational. Both instruments are still in a testing stage and were not ready for deployment on the net system. Once the gear was back on board, we continued steaming to station 1. The trackline to the station was adjusted so that we steamed over Scripps Institution of Oceanography (SIO) passive acoustic mooring 3, which was deployed last March on the U.S. SO GLOBEC mooring cruise. This passive listening equipment sitting on the seafloor requires periodic temperature profile measurements to be made so that sound velocity profiles can be computed. An XBT was done of the site as we passed over it and also a sonabuoy was deployed.

**27 July**

The official start of the second U.S. SO GLOBEC broad-scale survey began on 27 July. Winds were out of the southwest (240°) at 15 to 20 kts and the temperature was -12°C. We arrived at station 1 in the early morning (~0600) and work commenced with a CTD, then a phytoplankton net tow, followed by deployment of BIOMAPER-II. In the course of the day, we completed work at stations 1 to 3 and began the work at station 4. BIOMAPER-II was towyo'd between the stations to collect biological and environmental data down to 250 m, and bird and mammal surveys took place along the transits between the stations during the daylight hours.

Working in the pack ice took some getting use to. The minimal ship motion was a big positive, but plowing through the sea ice and the leads resulted in quite variable ship speeds and made the towing of gear more difficult. In addition, the width of the open water in the wake depended strongly on the nature of the ice pack and how fast the ship was moving. At slow speeds, 1.5 to 2.5 kts, the open wake area was narrower and the ice moved in to fill it sooner. Thus, towing wires for the nets which may have an angle of 45° or more off the stern of the vessel often hung up on ice chunks as they got in the way of the tow wire.

**28 July**

Sunrise in the pack ice on a crystal clear and very cold (-12°C) winter morning on the western Antarctic Peninsula continental shelf was a spectacular event. This morning, there were gorgeous golds and reds of predawn light and a ghostly reflection of what looked like the sun above the horizon, which was yet to rise. To the north and east, there were massive ice bergs scattered about in the pack ice silhouetted against the pre-sunrise light as was the outline of Adelaide Island's mountain crests some 30 to 40 nm away. During the day, we worked our way towards the northern end of Adelaide Island. In the late afternoon, winds were fairly light at 10 to 12 kts out of the southwest (235°) and the air temperature was -9.4°C.

After midnight on 28 July, the work at station 4 was finished. During the day, sampling was completed at stations 5 and 6, and in the late evening we moved onto transect 2, where work at station 7 was completed. Between stations, we towyo'd BIOMAPER-II and surveyed birds and mammals. The station work included net tows for phytoplankton and zooplankton, the CTD casts, sea ice collection (at station 4), an ROV deployment (at station 4), and an under-ice dive (at station 5). The success of the divers in collecting krill from small patches under the ice for experimental purposes, made it unnecessary to take a Tucker trawl for live animal collection later in the day. The day was not without its mishaps. At station 4, the 1-$m^2$ MOCNESS was damaged as a result of the wire hanging up on the sea ice as it was being towed and it took more than a day to repair the damage and make it operational again.

**29 July**

The weather was clear and cold. There was very little wind most of the day, around 5 kts, but the air coming off the ice shelf was really frigid, around -14°C. The winds changed direction from southeast to northeast during evening. Sea smoke (caused by evaporation of seawater as a result of the big difference in temperature between the warmer surface sea water at -1.85°C and the air) reduced the horizontal visibility, especially when we were in areas with a lot of open water as we were in the morning. The sea smoke and the resulting relatively low horizontal visibility stayed with us until we were far out onto the shelf in 10/10 pack ice and little open water.

Early in the morning (~0400) on 29 July, the *RVIB N.B. Palmer* had a rendezvous with the *R/V L.M. Gould*. The *Gould* had been working in a region near our station 1 and the ship was in the process of moving to a new location at the southern end of Adelaide Island. The purpose of the rendezvous was to swap some equipment and supplies between the vessels. The swap with the *Gould* went well. In spite of fairly solid pack ice, the *Palmer* did some side thrusting to make a small "pond" of open water and then the *Gould* came into open water pointed in an opposite direction and launched a Zodiac, which came across the pond. The transfer of equipment was made with the *Palmer's* crane. In the transfer was a barrel of hydraulic fluid for the *Palmer*, and medical supplies and some other items needed on the *Gould*. Included were some of the excess live krill that Kendra Daly had on the *Palmer* that went to Rodger Harvey on the *Gould* in support of his experimental work.

The work along transect line 2 was completed at stations 8, 9, and 10, and was started at station 11. BIOMAPER-II was towyo'd for most of the transits between stations and during the daylight, bird and mammal observations were made.

**30-31 July**

During 30 July, the work along transect 2 was completed and transect 3 started in weather that was mostly cloudy and windy, around 30 kts out of the northeast (045°), with a light snow off and on throughout the day. The air temperature was around -4.5°C, noticeably warmer than the -14°C of yesterday.

Most of the day was taken with work at the offshore deep water station 12 (depth around 2970 m). In addition to a CTD, the MOCNESS-10 was towed for the first time by Jose Torres. It was a long deep haul to 1000 m. As is now becoming expected in towing in the pack ice, the towing wire had a number of sea ice hang ups while shooting and hauling the net. On a couple of occasions to free the wire, the ship had to stop and back up until the net was hanging almost vertical. But the tow was successfully completed. Not successful was the towyoing of BIOMAPER-II. The same problems with the towing wire being caught by large ice cakes in the wake that have affected the net operations occurred with BIOMAPER-II during the transit between stations 12 and 13. Ice filling the ship's wake, snagged the towing wire and as the ship steamed away from that large chunk of the ice, the wire was pulled up over the ice slab and the towed body hit the bottom of the ice pack at high speed before the ship could be stopped. The result was that the towed body sustained serious damage and needed substantive repairs.

July 31 found us working on the middle to inner portion of the continental shelf on transect number 3. While the air temperature was around 0°C, which made for much more comfortable working conditions on the deck, it was very cloudy and light snow fell most of the day, associated with a low pressure system that had moved in over us. Winds were moderate all day, in the range of 12 to 18 kts. Two stations, 15 and 17, had a number of data collecting events scheduled besides the customary CTD. At station 15, a 1-$m^2$ MOCNESS tow was successfully completed.

After the MOCNESS tow, Jose Torres and company went diving under the sea ice to collect krill for experimental work on the *Palmer*. While they were there, a crabeater seal came in under the ice to see what they were doing and so also did an Emperor penguin, which popped up next to the Zodiac and then hopped up on the ice to see what was going on. Following the dive, the sea ice collectors, led by Frank Stewart, went to work on an ice cake next to the ship. They were put onto the sea ice using a personnel basket attached to the crane to get them out away from the ship. During the work at station 15, we learned that the *L.M. Gould* was stuck in the ice some 60 miles away just to the south of Adelaide Island and for a while it looked like we would have to steam down to assist them to break free. But a couple of hours later, they reported that they were free and did not need our assistance.

At station 17, in addition to a CTD, a 1-$m^2$ MOCNESS tow and an ROV deployment were successfully completed. This station had quite a lot of open water in leads that were interspersed between pack ice that was a mixture of some that was newly formed and some that was older. The underside of the newly formed sea ice was smooth while the older had a more rugged bottom. The ROV was driven by Scott Gallager back and forth under the two bottom types looking for differences in krill abundance.

**1 August**

We began at the inner most station on transect line 4 just off the southwestern tip of Adelaide Island. In the early morning, it was cloudy with a light snow falling. This was another day under the influence of a large low pressure system that had been over us for the past couple of days. Pressure gradients were low, however, and as a result winds were light, 5-8 kts, out of the northwest, and air temperature was down around -10°C.

Work at station 18 began just after first light (at 0845) and included a phytoplankton net tow and a CTD cast. While the CTD was deployed in an open lead in the pack ice, a half-dozen seals were seen swimming in a lead not far away. A large iceberg sat a 1/4 mile to our stern and there were several more in the vicinity. The cloud deck was just high enough so that the flanks of the rugged mountains of southwestern portion of Adelaide Island were visible to 15 miles or so to our east.

During the steam to station 19, the sun came out for a brief time giving us a terrific view of the snow covered peaks of Adelaide Island. Work at station 19 began midday and consisted of a CTD cast to 600 m, a live Tucker trawl tow, and a 10-$m^2$ MOCNESS tow. For most of the transits between stations, we were plowing through the omnipresent pack ice, but fortunately it was possible to do the net towing at station 19 in a large lead. By this time, it had clouded over again and for most of the afternoon and evening there was a light snow falling. In the evening at station 20, the only work scheduled was a CTD to 500 m. Bird and mammal surveys took place during the morning daylight period during the transit between stations 18 and 19, but noticeably absent was the towyoing of BIOMAPER-II, which was still under repair.

**2 August**

Work at only two stations, 21 and 22, was completed on 2 August, primarily because of the long steams between stations 21, 22 and 23, and because of the increased time it took to do the CTD cast to the bottom at station 22 and a deep live Tucker Trawl tow (to 1000 meters). Station 22 was off the continental shelf in water some 3376 m deep. Station 21 was noteworthy because BIOMAPER-II was returned to service after 72 hours of work to repair the severe damage that occurred when the towing wire was snagged by sea ice while towyoing between stations 12 and 13. To improve the reaction time, an observer was posted to watch the towing wire during the tows and to report immediately when a sea ice hangup occurs to the bridge. The weather was mostly cloudy with an air temperature of around -4.8°C. The winds were moderate at 12 - 16 kts out of the north northeast (020°).

**3 August**

This was another two-station day. The air temperature during the day was around -1.0°C and the wind was out of the north-northwest (335°) at 18 to 20 kts. The barometer had been falling a bit during the day and in the evening was reading 978.7 mb. A light snow fell off and on all day and into the evening, and on the unheated decks, an inch or two accumulated.

Station 23 was another deep station (water depth 3647 m) and the CTD to the bottom and 1-m MOCNESS tow to 1000 m took 3 to 4 hours each. In addition, there was again a long steam to get back onto the continental shelf and station 24 while towyoing BIOMAPER-II and doing bird and mammal surveys. Just before arriving at station 24, Jose Torres did a 10-$m^2$ MOCNESS trawl tow to 1000 m, which also took about 4 hours and ended about 1945. Then, we steamed the 8 miles back to the station 24 location to begin the phytoplankton ring net and CTD cast before putting BIOMAPER-II back into the water for the run to station 25.

**4 August**

The work on 4 August was along the middle portion of the continental shelf on transect 5. In the early morning the air temperature was much warmer than we have experienced recently, around +1.0°C and the wind was out of the northwest at about 30 kts. Skies were cloudy with some mixed precipitation earlier in the morning, but later in the day the snow on the decks rapidly melted and water was cascading off the upper superstructure and down onto the helo deck and main deck creating small water falls. In the evening (2030), the winds were lighter, 14 to 18 kts out of the north (004°), but the snow returned in spite of an air temperature around 0.2°C. The weather map showed a large low pressure system headed our way and already the barometer was dropping with a reading of 962.7 mb, down from 973.0 mb at 1300.

Work was completed at stations 25, 26, and 27. The CTD at station 25 came close enough to the bottom (~341 m) that some sediment was apparently kicked up and got into the pumping system used with the conductivity and temperature probes (there are two sets of each kind of probe on this CTD). Conductivity values on one of the two probes was very noisy on the up portion of the cast and the values were bad. Flushing the system during the transit to station 26 and then during the soak period at the station apparently fixed the problem. In addition to a phytoplankton tow and a CTD at 25, sea ice collections were made by Frank Stewart and Erin Macri. The personnel basket and the crane were used to put them over onto the sea ice next to the ship. Station 26, in the middle of the continental shelf (bottom depth about 340 m), was a major station with under ice diving by the Torres group and a 1-$m^2$ MOCNESS tow in addition to the phytoplankton ring net tow and CTD to the bottom. An ROV was also scheduled, but electronic problems with the ROV communication system resulted in its being cancelled. Station 27 was a short station with only a CTD cast and a phytoplankton net tow.

During the transit between stations, BIOMAPER-II was towyoed, until an ice ridge was encountered near station 27 that the *Palmer* could not get through without backing and ramming. The bridge requested that the towed body be recovered and since we were only 4 miles from the station, it stayed on the deck until after the station was completed. There was some daylight available in the afternoon transit for bird and mammal observations.

**5 August**

The work plan on 5 August was altered so that we could provide ice-breaking assistance to the *R/V L.M. Gould* as it steamed to their next work site which was at broad-scale station 42 located in the outer margin of Marguerite Bay. The *Gould* set out towards station 42 from a point near Avian Island off the southern tip of Adelaide Island, while the *Palmer* was still working at station 28 in the early morning. In fact, they did not need our assistance breaking ice to get to the location and they arrived about an hour ahead of us. After we pulled BIOMAPER-II out of the water upon our arrival, the *Palmer* made a series of circles around the *Gould* to break the sea ice open in order to more easily approach the *Gould* for an equipment transfer. The equipment included a pair of ice buoys that Chris Fritsen and Bob Elder wanted us to deploy at stations 40 and 49. In a very skillfully orchestrated maneuver, Captain Joe brought the bow of the *Palmer* up to the stern of the *Gould* and then the crane on the main deck forward of the bridge on the *Palmer* was used to pick up a cargo net full of the equipment and haul it up to the bow of the *Palmer*. The return of the cargo net included a package of samples for the *Gould*. In addition to the equipment, a couple of cases of peanut butter were also passed from the *Gould* to the *Palmer* because there was a dire shortage on the Palmer of this essential food stuff from the vegetarians view point.

The operation was completed by 1000 and we immediately started a phytoplankton tow and a CTD at this station location. Following the CTD, the 10-$m^2$ MOCNESS was deployed and in spite of the sea ice, the tow was successfully completed. We then set off towards station 41, while towyoing BIOMAPER-II. As a result of the diversion, we elected to steam the portion of the survey grid running from station 42 to station 29 in reverse order until we returned to the location where the survey was diverted. But it got much tougher to go through the ice pack, which was criss-crossed with ridges, and backing and ramming became frequent. As a result, we pulled the towed body from the water some 4 or 5 miles from station 41 to wait for better towing conditions. The CTD and phytoplankton tow were quickly completed at station 41 and we continued on towards station 40 in increasingly restraining sea ice conditions without BIOMAPER-II being deployed.

August 5 was a day for weather contrasts. A deep low pressure system passed over the Marguerite Bay with winds throughout the day in the 30 kt range. For a good portion of the day the air temperature remained about freezing (0°C) accompanied by snow and sleet. In the early evening, a front passed and the air temperature dropped precipitously to below -13°C. During the night the temperature dipped to -20°C, with wind chills well below -30°C. Fortunately, the winds dropped as well.

**6 August**

This was the coldest day of the cruise thus far. The relatively warm weather (temperatures around freezing) was swept away last night with a vengeance. A nearly full moon was visible through a thin cloud layer as the *Palmer* approached station 40 in the wee hours of 6 August. The temperature was still falling towards -20°C when Frank Stewart, Jay Ardi, Wendy Kozlowski, and Erin Macri were transferred to a large sea ice floe to install an ice buoy and to make sea ice collections. This station also had a CTD and a phytoplankton tow and was completed in the early morning about daybreak. The steam towards station 39 became harder and harder with increased ice ridging and a very sticky snow. The *Palmer* reached a point where, in backing and ramming, it was only making a ship length or two before coming to a stop and backing up again. So we stopped short of the station location and did a phytoplankton tow, a CTD cast, and a series of Plummet net vertical casts to collect zooplankton. The use of the plummet net was as a partial replacement for the 1-$m^2$ MOCNESS, which could not be towed properly in the very heavy pack ice. Likewise, BIOMAPER-II was sidelined for the entire day because of the backing and ramming. In the evening, to get to station 38, we elected to backtrack to a position west of the Kirkwood Islands and then to head east toward the station 38 to the north of the Islands. During the day, temperatures remained below -17°C. Late in the day, the winds shifted to the southeast (126°) at 7 to 10 kts, and the air temperature was -18.6°C. The barometer remained at a low point of 967.1 mb.

**7 August**

The mountains encircling Marguerite Bay on three sides were clearly visible on 7 August in the partly cloudy skies and bright sunshine, as we worked at the eastern end of Marguerite Bay.

In spite of the cold, it was a great viewing day. Temperatures were around the -20°C mark, the winds were moderate at 8 to 10 kts out of the west (269°), and the barometer made a recovery up to about 985 mb. The pack ice was not as resistant to our passage and there were many more open leads that made towing BIOMAPER-II between stations possible. We passed a number of large icebergs during our transits between station locations and at station 37, we did the CTD and phytoplankton ring net tow within a few hundred meters of one giant iceberg just as the sun was setting. This was a particularly spectacular sunset because a sun dog appeared and stayed to the right of the setting sun for half an hour or more. We completed work at stations 38, 37, and 36 that included 3 CTDs, 3 phytoplankton net tows, BIOMAPER-II towoying between stations, and some bird and mammal observations.

**8 August**

On August 8, the work centered on the northern reaches of Marguerite Bay, including Laubeuf Fjord, and in the shallow water area to the south of Adelaide Island where a coastal current was observed on the April/May broad-scale cruise. The weather had changed dramatically and there were thick clouds and a heavy snowfall - blizzard conditions - for part of the day. The wind was out of the northeast (030°) at 30 to 35 kts and the air temperature was around -8.6°C. The barometric pressure was not changed much at 983.6 mb. The pack ice was much thinner, however, making for much better steaming and working conditions, and one indicator of this was the fact that the *Palmer* was running on two engines rather than four.

The deep Laubeuf Fjord was a hot spot for krill on the previous cruise and we were hoping to find the high concentrations of krill that we sampled then. Adult krill were present in the MOCNESS net tow collections, but they were not nearly as abundant as previously. This was a disappointment to the experimentalists on board who were hoping to collect sufficient numbers of adult krill to enable some experiments to be done. Because the sea ice conditions in this area were much more favorable, none of the towing operations had to be cancelled. Work was completed at stations 35, 34, 33, 31, and 30. Station 32 was dropped from the schedule because its position was in the middle of a shoal area. On the previous cruise, it had been moved to the south, but that move had not been taken into account in preparing the positions for this cruise. Moving it again to the south did not fit well with the transits to the other stations in the area, so it was dropped. The work on 8 August included 5 CTD casts, two phytoplankton tows, one 1-$m^2$ MOCNESS tow, one 10-$m^2$ MOCNESS trawl, one Tucker Trawl and one ROV under ice deployment. BIOMAPER-II did shallow towyo's between stations 35 to 33, and part way to station 31. Collision with a chunk of sea ice passing under the ship, however, again brought an end to the towing and the need for more repair work. Bird and mammal observations were made between stations during daylight transit periods.

**9 August**

The reality of winter in the Antarctic was with us again with blowing snow and winds in the mid 20 kt region that kept the visibility low most of the day. Winds are out of the west (270°) at 30 to 35 kts. The temperature at -2.5°C, however, was much warmer than over the past few days and the barometer was down some to 977.6 mb.

We worked in windy snowy conditions at the final station (29) in the coastal current region south of Adelaide Island and then the *Palmer* steamed out to the middle of the continental shelf to continue work on transect 6 that was started four days ago after we moved with the *Gould* to station 42. Two mid-shelf stations, 43 and 44, were occupied to the west of Marguerite Bay. We arrived at station 43 about 1200 and started the work with an under-sea ice dive by the Jose Torres group. The ice dive went well, in spite of the 30+ kt winds. After the divers returned to the ship around 1400, Ari Friedlaender and Rebecca Pirzl went out for a short cross-bow tutorial in the Zodiac before it was brought back on board. This was followed by a CTD, a 1-$m^2$

MOCNESS tow, and an under ice survey using the ROV. Only a CTD cast was done at station 44. BIOMAPER-II was towyoed a portion of the distance from station 29 to 43, but suffered another electronic failure that could be traced to the sea ice collision of the previous day.

**10 August**

The deep ocean (in this case 2363 m) requires long station times in order to sample to the sea floor with the CTD or even to 1000 m in the case of the net tows. So for much of the day work took place at station 46, at the end of the line on transect 6. In spite of that, we completed work at three stations, 44, 45, and 46. The work was done under weather conditions that had not changed appreciably from the day before. A large low pressure system was still approaching and the barometer was slowly dropping. Relatively warm conditions with air temperatures around the freezing mark, strong winds in the 20 to 30 kt range, heavy dark clouds, and off and on snow prevailed, but not much accumulated. The barometer was down a bit more at 970.1 mb.

The pack ice was much thinner just off the edge of the continental shelf and the ship was able to move more easily through it, no need for backing and ramming. Still towing is problematical with the tow cable always in constant danger of being snagged by a large chunk of sea ice as the pieces pushed aside by the passage of the ship fill in the wake.

Included in the work were 3 CTDs, a 10-m$^2$ MOCNESS trawl, a Tucker Trawl, and one phytoplankton ring net tow. During the day, two sonabuoys were deployed. Unfortunately, although there were transits between stations during the day light period, the very poor visibility resulting from the falling and blowing snow prevented the bird and mammal surveyors from conducting their quantitative surveys. Only incidental observations were possible. BIOMAPER-II remained under repair and was not towyoed during this day.

**11 August**

Another long day at a deep water station took place on 11 August. Work was completed at only two stations, 47 and 48. Station 47 took an especially long time (~12 hours) because it was a full deep station at one of the furthest points offshore in the survey grid. Snow was again with us most of the day along with moderate temperatures around freezing and winds out of the northwest in the 20 to 30 kt range. Accumulations on the unheated decks amounted to a couple of inches. The barometer was much lower at 959.8 mb. At station 47, there were patches of pack ice that, when over-turned in our wake after being pushed aside by the ship, had a light tan to dark brown appearance, a sign that they had considerable ice algae growing on them and that these pieces of ice were older. We had not seen many of these heavily colonized pieces of ice in the more inshore portions of our survey area. Work completed at these two stations included two CTD casts to the bottom, a 1-m$^2$ MOCNESS tow to 1000 m, a phytoplankton ring net tow, an ROV under ice survey, and a Tucker trawl. BIOMAPER-II was returned to service and towyoed between stations 47, 48, and 49.

**12 August**

This was the first day that we had seen the sun and had any blue sky to speak of since we left Marguerite Bay. The barometer hit bottom in early morning at about 946 mb and by 0800 was rising. It seemed that we were in the eye of the low pressure system that was passing over us and that was why, for a while, the skies were clear overhead. Temperature, which for the past several days had been around freezing, fell down into the -5 to -7°C range. There were strong gusty winds in the 25 to 35 kt range for a good portion of the day. Off and on throughout the day, clouds would move in and create white-out snow conditions. Work was completed at two stations, 49 and 50, and nearly completed at station 51. At station 49, in addition to a CTD cast, an ice buoy was deployed along with the collection of ice cores. At station 50, an ROV under sea ice survey, an ice dive, CTD cast, and a 1-m$^2$ MOCNESS tow were done. The MOCNESS tow was not successful because during launch a large sea ice slab slid in from the wake edge and rammed into the mouth of the net system bending the net bar slides. Although the tow was attempted after a check out, the net bars failed to function properly. Jose Torres and his group did a dive in bright sunshine just 50 m or so from the ship. The ice pack, however, was particularly heavy and tended to close up the open water area that was created by the ship. By the time the dive was completed, their return was blocked by quite a number of big chunks of sea ice. The Captain had to maneuver the ship back and forth several times before he could get close enough to the Zodiac to put the personnel basket over the side to pick up people. In the process, the ship shoved ice cakes under the Zodiac beaching it. The personnel transfer was quickly made as was the Zodiac recovery. At station 51, a Tucker trawl to collect live animals, a CTD cast, and a sea ice collection were made. The trawl catch was a particularly nice one. Many adult krill were caught and Kendra Daly and Jose Torres had the experimental animals that they had long been looking for. Later in the night, a 1-$m^2$ MOCNESS was attempted, but it proved too windy and the sea ice too thick to permit it.

**13-14 August**

On 13 August, we completed the work at station 51 about 0200 and then broke off the survey to assist the *R/V L.M. Gould* get free of the pack ice that they were stuck in. We had planned to meet the *Gould* at a rendezvous point midway between stations 42 and 52 about 0800 on 13 August, but the *Gould* had been unable to move from the location of their last station. Just after getting underway on a northeasterly course from station 51, there was enough snow to cause a white out and force the *Palmer* to stop and wait until visibility improved. Winds were from the north in the 40 kt range and there were gusts up in the 50 kt range. The temperatures, which had been around -5°C, fell precipitously during the morning hours to down about -20°C by noon. But the skies cleared and we traveled through the pack ice strewn with an amazing and majestic series of icebergs. By 1245, the *Gould* was in sight and by 1432, it was following us back down the trackline that we came in on. Their plan was to work south of Adelaide and into the Laubeuf Fjord area and then head up the west side of Adelaide Island and make another ice camp. Late in the afternoon the procession stopped in an area with open leads and a transfer of equipment and a person (Kerry Claffey) was done prior to the vessels parting ways. One item that came to the *Palmer* was an intermediate ice buoy which the *Gould* had planned to deploy on the southern end of the survey grid, but the logistics of getting to the location became too difficult for the *Gould* and so this task was undertaken by the *Palmer*. An item that went from the *Palmer* to the *Gould* was a band saw for cutting up ice cores. The *Gould's* band saw self-destructed and could not be repaired.

The *Palmer* got under way for station 52 about 1600 with snow falling heavily at times. The *Gould*, however, had difficulty carrying out its plan, and by about 1930, we received a call requesting additional assistance getting to a place where they might have a chance of getting to work sites and then to Palmer Station on its own. Since leaving them, the *Gould* reported that they had only managed to go 2 nm. We turned around and steamed about 3 hours to their location. During the steam, the snowfall increased and the barometer dropped down to the lowest point in the cruise 946.5 mb, and was still falling. The air temperature rose some to -11.8°C and the wind was out of the southeast (122°) at 30 kts. The snow was horizontal across the decks. By 2315 when we had arrived next to the *Gould*, the barometer had fallen to 939 mb and the wind speed had risen to between 30 and 40 kts out of the southeast. It was a raging blizzard and the barometer was still falling. White-out conditions made it impossible to move and so both vessels were hover to in the ice pack, waiting for the storm to abate.

Neither ship moved all night because of the zero visibility from the high winds and blowing snow. There was no way the *Gould* could have followed the *Palmer*, even if it could have steamed along a course line, and there was no steaming with zero visibility in these iceberg-filled seas. The barometric pressure got down to 935 mb about 0100 on 14 August before coming up again and the winds were in the 40-kt range with gusts into the high 50-kt range for most of the late night. The snow ended around 0800 and skies began clearing, the wind speed dropped into the low 20-kt range and shifted to being out of the north northwest (299°). The temperature plummeted to the lowest point on the cruise thus far, -24.8°C, and the barometer was rising (955.8 mb). With improved visibility, the procession was again started, this time to the north toward broad-scale station 19, a location where the *Gould* was able operate on its own.

During the morning of 14 August, the scientific party on the *Palmer* held a meeting to discuss alterations to the survey plan given the possibility that additional assistance might be required by the *Gould* to leave the survey area and make its way to Palmer Station. A plan was developed that involved doing an abbreviated across-shelf survey (i.e., inshore to mid-shelf) working our way southwest down to the second transect line from the end of the survey grid. Then, work would proceed along the outer shelf stations back to the northeast. The plan enabled a core set of stations to be sampled before the *Palmer* might have to conclude its sampling program and steam towards the *Gould*.

The morning steam in bright sunshine, but very cold temperatures, was through solid pack ice and there was some backing and ramming to get through some pressure ridges. About mid-day, whale spouts were seen in open leads and a number of penguins were spotted in small groups along the trackline. About the same time, the clear skies began to cloud over. The afternoon steam between stations 28 and 19 put us in lighter ice pack with more open cracks and leads. The two ships arrived at station 19 about 2100 hrs. The *Gould*, able to move around the area on its own steam, actively started looking around the area for a suitable location to set up an ice station. Just before the *Palmer* left the site around 2230 on 14 August and started steaming for station 52, an XBT was dropped at the *Gould's* request to provide them with a temperature profile.

**15 August**

August 15 began as a beautiful pre-dawn morning with clear skies overhead and a dark bank of clouds off to the north and west. To the east were some high lenticular clouds that were lit up with the rays of the sun like beacons in the sky. To the south were the ghostly white cloaked mountains at the northern end of Alexander Island. And on the horizon in many directions were the varied shapes of icebergs breaking the flat plain of ice that continuously covers the sea surface in this area. Closer ahead were flat snow covered floes, which ended in irregularly shaped ridges, areas where the floes have met and one has over-ridden the other. The ridges snaked along, then divided into two or more parts and continued to wind their way across the ice pack surface. The day was extremely cold with temperatures hovering at or below -25°C. During the transits between stations, steam was rising out of the open water of our wake. The sea water temperature was about -1.84°C, but cold as that was, it was much, much warmer than the air and it was visibly giving up heat and moisture to the air. Looking out over the vast ice floes, there were other areas giving rise to plumes of steam from freshly opened cracks or small leads. The ice was a dynamic entity, moving with the wind and the tides, opening cracks and leads and closing them.

The morning sunshine gave way to clouds about the time we ended the long transit from station 19 where we left the *Gould* setting up for an extended stay at that location and arrived at station 52. At that station, we did a CTD and a phytoplankton ring net tow. Scheduled was a 1-$m^2$ MOCNESS, but the pack ice closed in on the wake too quickly to permit the tow to take place, even by following our previous trackline leading to the station. The steam to get from station 52 to 53 in pretty heavy ice pack was a struggle with the need to back and ram occurring frequently. As a result, BIOMAPER-II was sidelined during the transit. At station 53, in addition to a CTD, the sea ice collectors were out collecting cores and measuring the properties of the ice in a large floe. Upon their return to the *Palmer,* BIOMAPER-II was put into the water to get an acoustic and video profile at the station. While the towed body was deployed, a series of plummet net casts were done to try to catch what was in an acoustic layer observed on the echosounder. The plummet nets, which fished 0-40 m, 40-100 m, and 100-400+ m, did not catch very much, although it was sufficient for Jose Torres to get some animals for his experimental work. The work at station 53 ended after midnight.

**16 August**

Work was completed at stations 54, 59, and 60, which were located along the southern and outer margin of Marguerite Bay, on 16 August. It was another clear day in which massive ice bergs, some open leads, and magnificent views of the mountains of Alexander Island were highlighted. It was also a day of extreme cold and harsh outdoor working conditions. Fortunately, most of the day, the easterly winds were light and the wind chill *per se* was not a very significant factor. The air temperature was mostly around -27°C. The jump in station numbers (54 to 59) reflects the fact that we dropped stations 55 to 58, which were located in the southern end of Marguerite Bay, an area known as George VI Sound. The ice pack conditions made it too difficult and time consuming to attempt to get there. At station 54, a CTD, a phytoplankton ring net tow, and a sea ice collection was done. BIOMAPER-II was deployed for a portion of the transit to station 59. This transit was interesting because it started in the very deep water (greater than 1000 meters) associated with canyon system that comes across the continental shelf and into Marguerite Bay. In steaming south to station 59, the steep canyon walls rose up abruptly to a shoal depth of about 140 m and then dipped down again into another trough with depths of 400+ m before rising to shallower depths near the coast. The cold air temperatures on this day limited some of our activities at station 59. Thus the dive that was scheduled for the Torres group was nixed because it was just too cold- below -25°C. This was unfortunate because we had been running through a number of good sized leads which would have made diving an easy thing to do. At station 59, a CTD, ring net tow, and a ROV under-ice survey took place. Several long leads allowed BIOMAPER-II to again be deployed for a portion of the transit to station 60. After the usual CTD and ring net, a Live Tucker Trawl was scheduled, but had to be dropped because of impossible towing conditions. A series of Plummet net vertical tows were done instead. Even that last resort method of collecting zooplankton was marginal under the extreme cold. The net froze almost immediately once above the sea surface and the sample had to be quickly removed to prevent it from freezing, too.

**17 August**

Early in the morning on 17 August, it was very cold, windy (wind chills around -50°C), and gloomy, but by noon, it had turned into a beautiful day with clear skies and great visibility. The mountains of Alexander Island were still visible way off in the distance to our east, but only one very large rectangular shaped iceberg was in view. The rest was a vast expanse of sea ice, a mixture of large out-of-round floes ringed with ridges. Occasionally there were thin sea ice areas that were likely to have been open water ponds some days ago. It was still quite cold, below -20°C, but the wind had dropped and being on deck was not such a problem. Work on this day was completed at stations 61, 62, and 63, which were located off the northwestern tip of Alexander Island from near the coastline to mid-shelf. The tasks at station 61 were done quickly late at night and consisted only of a CTD and phytoplankton ring net tow. During the transit to station 62, BIOMAPER-II was deployed for about an hour during a period when ice conditions permitted towyoing. A Tucker trawl was scheduled for station 62 along with a CTD, and ring net tow, but the pack ice conditions did not allow it. Instead, the Plummet net was used to make vertical zooplankton collections. On the way to station 63, we came into pack ice conditions that again permitted BIOMAPER-II towyoing. The station work at 63 was more extensive and included an ROV under-ice survey, a CTD cast, a phytoplankton ring net tow, and a 1-$m^2$ MOCNESS tow. The 1-$m^2$ MOCNESS tow was done while the *Palmer* retraced the path taken to steam to station 62, since towing across unbroken ice was not possible. A 10-$m^2$ MOCNESS was also scheduled, but the ice conditions were just marginal enough to cause it to be cancelled. Snow started falling as we finished the MOCNESS tow and the winds were starting to pick up.

**18 August**

This was mid-winter on the western Antarctic Peninsula and the pack ice was still in the development phase. As a result, as we headed into the southern portion of the survey grid, we encountered increasingly tough ice conditions to work in. The extreme cold was also making working conditions quite difficult. Still we were moving from station to station and were able to do much of what was intended. On 18 August, only two stations (73 and 74) were completed. This was in part due to a white-out condition that forced us to stay at station 73 for about 5 hours waiting for conditions to improve. It was also a day where extra time was needed to install an intermediate sea ice buoy at station 74. In addition, adding to the time demand, was the fact that it has become more difficult and time consuming to attempt to make net tows. There were only two tasks scheduled for station 73, a CTD and a phytoplankton ring net. At station 74, the installation of an intermediate ice buoy took place on a large ice floe and required about 6 hours to complete. This provided an opportunity for those not involved with the buoy installation to put down the tools of science for a short time and enjoy the environment in which the work was being done. There was enough time to put out the gangplank and to let the ship's scientists, officers, and crew walk out onto the ice pack and see the *Palmer* from a unique vantage point. Once the sightseeing was done, a game of football was organized and played with great zeal. During the initial period of the stay at the floe, the skies cleared briefly and visibility improved substantially, but then the clouds returned and it began snowing again. The winds were in the 30 kt range out of the northwest (337°) and the air temperature was -7.6°C. The barometer in the late afternoon was at 957.3 mb.

At station 74, in addition to the ice buoy deployment and ice collection, a CTD was done. An attempt to take a 10-m$^2$ MOCNESS involved steaming the ship a distance of 4 nm into the wind and then returning along the trackline to the beginning point where the tow could be started. The hope was that the opening cut by the ship would remain open long enough to conduct the tow without having to back and ram. On this occasion, it was not to be. The ice floes were under a lot of pressure and the gap for much of the trackline was closed tight before the tow could be started and so it was cancelled. The steam from station 74 towards 75 was also difficult as the ice ridges occurred in increasing numbers as we approached the coastline of Alexander Island. There was a period during the day while steaming between stations 73 and 74 when a number of leads appeared and BIOMAPER-II was deployed for a good portion of the transit distance.

**19 August**

On 19 August, work was completed at stations 75 and 76. These two inshore stations were very difficult to approach and a great deal of time was spent attempting to get close to the intended locations. As it was, we only managed to get within about 5 miles of station 75 and 9 miles of station 76. There were patches of open water and some leads in the area, but they were interspersed between heavy ridges that the ship had to back and ram to get through. A contributing factor was the weather in the morning, which was cloudy with poor visibility. The very low contrast lighting and the absence of shadows made it hard to see the sea ice structure well from the bridge. There was some suspicion that by the time we stopped to do the work, we were in fast ice, ice attached to the coastline. That ice is often harder to break through because the ice has less give and no place to be displaced to when the ship comes through it. Both stations were in an area with quite variable bottom topography and depths ranging from 100 m to more than 500 m. BIOMAPER-II was deployed for a short distance after leaving station 76 in an open lead that ran for a mile or so, but then had to be picked up as we ran into heavier sea ice conditions. A storm centered to the north and producing northerly winds of 50 kts at Palmer

Station also keep us in cloud cover all day, but because we were so much further south our winds were in the 20 kt range and out of the southwest.

**20 August**

A large intense low pressure system centered to the north continued to dominate our weather on 20 August. There was a nice pre-sunrise with shades of red highlighting the clouds where the sun later appeared. High winds (above 30 kts) and blowing snow (from recent snowfalls) prevailed for most of the day. Only in the late afternoon did the winds diminish before again picking up in the evening when the barometer dropped again to ~944.4 mb, and the winds picked up with gusts to 50 kts. The air temperature, however, was higher than it had been for several days at -5.9°C. Work was completed at stations 77, 78, and 83. Station 77 had a relatively light work schedule with a CTD and a phytoplankton net tow done around 0300. BIOMAPER-II was deployed for about an hour in an area between stations 77 and 78 where sea ice conditions permitted towing. In the late morning at station 78, an ROV deployment was done in addition to a CTD cast and a phytoplankton tow. There was an attempt to create an open track in the sea ice along which to do a 1-$m^2$ MOCNESS tow by steaming back along the track coming into the station. Sharply increasing winds into the 40 to 50 kt range around noon, however, made it impossible to deploy the net, so the attempt was abandoned and we went on to station 83. Sea ice collection was added to the list of tasks, in addition to a CTD and phytoplankton net tow, for this last station of the day. Once again, MOCNESS towing was thwarted by pack ice under a lot of pressure; the ship's wake closed very quickly after our passage making it impossible to set up a run that did not require backing and ramming. In the late evening, about 4 nm from station 83, on the way towards station 84, we stopped at a small open water pond and did some Plummet net casts, since no other zooplankton or mid-water fish sampling was possible.

**21 August**

The pack ice had its way with us on 21 August. Our attempts at getting to two of the scheduled stations close to the Charcot Island shoreline proved to be too difficult. We had already come to the realization that station 85 was a pipe dream and had not included it in the schedule. But heavy ice ridging and thick floes made it too time consuming to push on to stations 84 or 86. Thus, part way to station 84, we opted to turn and steam instead to station 87. During this transit, high winds out of the east in the 45 to 55 kt range continued until early morning. There was one gust recorded on the maximum/minimum indicator on the bridge around 0100 that was 100 kts. During the day, winds slacked and were mainly out of the southwest (240°) at 15 to 20 kts. The air temperature was in the -16.0°C range, and the barometer was fairly steady at 954.7 mb. Skies were partly cloudy.

In the early morning light, during the approach to station 87, we came across an area with a lot of big open leads. BIOMAPER-II was deployed in hopes of getting a short run to characterize the backscattering environment and to get a VPR profile of zooplankton images, but an electronic failure dashed those hopes. The site looked good, however, for other towing, so in spite of some fairly tough ridges, the decision was made to try and make a run of about 4 nm through a couple of the leads and then tow the MOCNESS and Tucker Trawl systems in order to characterize the zooplankton and micronekton in this our most southern station on the survey grid. The initial attempt in late morning to start a 1-$m^2$ MOCNESS tow was ended after an encounter with sea ice in the wake during the launch. A second attempt in the early afternoon proved better, but ended with some difficulties and led to another tow at the end of the station. A 10-$m^2$ MOCNESS was deployed successfully and made the entire run with only one wire snag that required some corrective action. While temperatures on deck did not feel all that cold because winds were relatively light during the day, the sensors for both MOCNESS systems froze up while on deck and once in the water took about 30 minutes to thaw out. "Flying" a MOCNESS without good pressure readings is disconcerting at best given the complexities of towing in the ice pack.

A live collection to gather animals for experimental purposes was done next with the Tucker Trawl. As a result of BIOMAPER-II being incapacitated, the two frequency HTI echosounder was deployed in the early evening from the starboard stern crane in a quiet area of a lead to get a time-series acoustic record while Plummet net casts were done to ground truth the water column. A CTD cast followed a couple of hours of sea ice collecting and by midnight, the *Palmer* was being positioned to enable an under-ice survey with the ROV to be done in an area undisturbed by the ship. A final task in the late night period was to use the 1-$m^2$ MOCNESS to take a short "repeat" tow in the upper 100 m.

During the afternoon communications with the *L.M. Gould* on 21 August, it became clear that the *Gould's* ability to move around in the area off Adelaide Island was severely limited. In order for the vessel to arrive at Palmer Station as scheduled on 26 August, the *Palmer* was requested to provide them with assistance in moving through the pack ice toward their destination. A contingency plan was established some time ago that if such a request was forth coming, we would break off our planned survey work at the end of August 21 and head back towards the *Gould,* which was about 160 nm to the northeast of us. This plan, put into effect at the end of the day's work, was intended to enable the *Palmer* to meet up with them somewhere in the vicinity of station 19, where we last left them, by mid-day on 24 August. Then there was to have been a convoy up towards Palmer Station.

**22 August**

Thinner sea ice pack, and a number of open leads made traveling easier on 22 August as we moved to the outer margin of the continental shelf from station 87 on the inner shelf. The outer shelf region on the southern portion of the broad-scale survey grid was the last to be sampled during this cruise and then only in an abbreviated fashion, given the need to move to the *Gould's* location by mid-day on 24 August and then assist that ship move up the coast to Palmer Station (67° 21′S; 70° 26′W).

August 22 was a spectacularly bright day. Winds were light, out of the southwest (227°) at 15 to 22 kts, the barometer was rising slowly (969.9 mb), and there were few clouds most of the day. The visibility was really unlimited. Even though the sun does not get very high in the sky at this time of year, the light reflecting off the white ice pack can make it very bright. Air temperatures remained cold, around -15°C. A trackline to take the *Palmer* to the *L.M Gould's* position was laid out to enable us to briefly sample at stations along the outer margin of the continental shelf along the southern portion of the survey grid. A science meeting was held at 1300, which was well attended, to discuss the scientific tasks that could be accomplished in the time available and where along the trackline they would be done. A flexible work plan was created that would allow for some work to be done over the next couple of days, while spending most of the time steaming.

We completed work at stations 82, 80, and 71, as well as finishing up the work at station 87 during the late night hours of 21/22 August. An XBT was dropped as we steamed past the station 82 location. At station 80, only a CTD profile to 800 m and phytoplankton net tow were done. A more complete set of tasks was scheduled for station 71 and most, but not all were accomplished. These included a CTD, phytoplankton net tow, sea ice collection, 1-$m^2$ and 10-$m^2$ MOCNESS tows, a Tucker Trawl, and an ROV survey. The 1-$m^2$ MOCNESS had electrical problems and was not done and the 10-$m^2$ MOCNESS tow was cancelled. Bird and mammal surveys were conducted for a large fraction of the daylight hours as a result of the increased amount of steaming time versus time spent working on station.

**23 August**

The steam along the shelf break with a more open and thinner ice pack allowed the *Palmer* to move steadily towards the northern end of the survey grid on 23 August, while mapping the sea floor along that region and finishing the abbreviated observations at stations on the southern portion of the grid. About mid-day, we learned that the *Gould* was able to move northward at 3 to 5 kts without the *Palmer's* assistance and after the evening communication, it was clear that they were no longer waiting for us to come and lead them up the coast toward Palmer Station through the pack ice. This development required the modification of our plan to meet up with the *Gould*. An alternative science plan was prepared to enable ideas that had been expressed over the last few days to be incorporated, since the pressure to leave the survey area early and assist the *Gould* was lessening. To fill in the gaps in bathymetric data between transect lines along the continental shelf break, the decision was made to continue steaming along the shelf break until reaching station 13 on transect line 3. This line had special interest because it cuts across the northern side of a large clock-wise flowing eddy that, based on data collected earlier in the cruise, seemed to be transporting oceanic water onto the shelf. At the shore end of the line, station 16 appeared to have water with some oceanic properties. Work along this line to confirm the presence of that water type and to provide solid evidence of the impact that the eddy was having on this portion of the study area, was planned for the next two to three days.

Work was finished up in the early hours of 23 August at station 71. A CTD cast to 800 m and a phytoplankton net tow were done at station 66, the last of the grid stations to be sampled for the first time this cruise. While sea beaming along the shelf break on the transit to the northeast, XBTs were dropped at stations 48, 46, and at the half-way points between the stations in order to define the hydrographic structure along the shelf margin.

During 23 August, skies were partly to mostly cloudy, but visibility was good. Winds were mostly in the 20 to 25 kt range out of the southwest as the region was under the influence of an approaching high pressure system. It remained cold, however, with temperatures staying at or below -15°C. The barometer held steady at 970.9 mb. The ice pack conditions were no longer an obstacle to steaming and the *Palmer* easily made 6 kts during transit between station locations.

**24 August**

August 24 was the second day in a row with rather benign weather on the continental shelf off the western Antarctic Peninsula. Winds were moderate out of the southwest at about 20 kts and the skies partly cloudy to clear in the late afternoon, but cold air around -17.5°C remained. The barometer was increasing slowly at 984.8 mb. Occasional icebergs were sighted out along the edge of the shelf, but they were lone sentinels compared to the numbers seen closer to shore and in Marguerite Bay. During the day, we finished the steam along the shelf break and we began working from the edge of the continental shelf towards the Adelaide Island coast along transect line 3.

Work on 24 August was completed at stations 24, 21.5 (halfway between stations 21 and 22), 13, and 14. XBTs were used to obtain temperature profiles at stations 24, 21.5, and at halfway points between them. CTD casts to the bottom were done at stations 13 and 14 as part of the study to look at the influence of offshore water on the shelf along transect line three and XBTs were dropped at the halfway points. A partially successful 10-$m^2$ MOCNESS tow was done off the shelf at station 13. The tow was taken into the wind, i.e., to the southwest, but the Antarctic Circumpolar Current was coming at the ship moving towards the northeast. As a result, the wire tended to the port and got frequently hung up on the sea ice. About two-thirds of the way through the tow, it was aborted, but it still took a long time to get it up and on board. Pulling the nets on board was a real struggle. The nets froze almost immediately after they came out of the water and pulling them up out of the water and over the stern was like pulling up leaden sheets. BIOMAPER-II was deployed at the end of the work at station 13 and towyoed on the transits to stations 14 and 15. The Plummet Net was used at station 14 to try and sample one of the small patches of strong acoustic scatterers that were observed between 60 and 90 m as the station was approached.

**25 August**

The last major effort of the second U.S. SO GLOBEC broad-scale cruise to the western Antarctic Peninsula was completed on 25 August. The work along transect line 3 ended at station 16, which was located about 20 nm west of the middle of Adelaide Island. Unfortunately, the weather changed during the last 12 hours. Around midnight, the stars were shining and a half-moon, low in the sky, was a bright yellow. Winds were out of the southwest. On this day, the snow covered peaks of the Island were not visible, because a weak low pressure system moved in and brought with it low clouds, brisk northeast winds (25 to 30 kts), and snow for a good portion of the day.

Shortly after midnight on 25 August, the *Palmer* arrived at station 15 and BIOMAPER-II was brought on board to allow the CTD cast to be done. Ice and wind conditions were such that it would have been difficult to have "parked" the towed body at its normal on-station depth (around 30 m) and to position the ship to do the CTD. It was again deployed once the CTD was back on board and the towyo to station 16 was easier than to station 15 because the pack ice became thinner and leads more frequent. At station 16, BIOMAPER-II was recovered. The station work consisted of a CTD, a 10-$m^2$ MOCNESS tow, a ROV under-ice survey, an ice collection, and a Plummet Net cast. The 10-$m^2$ MOCNESS again had its problems with the sea ice. At the time of the start of the tow in a fair-sized lead, visibility was good in spite of low clouds. But during the tow, a heavy snowfall started and the wind picked up, significantly reducing the visibility. The tow was completed about 0950, but the ending was bad. The ship ran out of the lead and into the pack ice before the last net had finished fishing and was closed. As a result, the last net caught some sea ice and that made recovery of the net system a real bear. In addition, the nets again froze the minute they got above the water and became as stiff as a board. This time a rig was set up to use the tugger to help pull the nets up, but it was very time consuming and the working conditions with the blowing snow in the 30 kt winds and temperatures around -15°C made it a very difficult net recovery. A 1-$m^2$ MOCNESS tow was scheduled, but was cancelled because the lead that the tow was going to be done in had closed significantly and was too short. In addition, calibration of the acoustic systems was cancelled because of the weather conditions. The ROV survey under the sea ice was possible and produced a lot of excitement when the VPR cameras showed that present were some of the largest larval krill concentrations yet seen associated with the pack ice. This generated the need to do a sea ice collection and to try and sample the krill larvae using a pumping system hose pushed through a coring hole to sample the water under the ice. Work at the station ceased about 1830 and the long steam to the ice edge zone via station 4 began. As a result of the daylong series of measurements made at station 16, no bird or marine mammal surveys were done.

**26 August**

The marginal sea ice edge zone, the location where there is a transition from pack ice to open water, in the winter is ill defined. In the western Antarctic Peninsula region north of our survey area, it can be spread out over 10s of miles under one wind condition (westerlies or south-westerlies) or more compacted during another (north-easterlies). This zone, the intended survey area for the daylight period, was some distance from the survey grid and it took the morning to get up into a region where the pack ice was significantly different in character. Thus, 26 August was largely a day of steaming. There was a brief stop at broad-scale survey station 4 to do a 1-$m^2$ MOCNESS tow to replace the one that had failed early in the cruise.

The hope on the part of the bird and mammal researchers was that there would be significantly more birds and mammals, especially whales, in the marginal ice zone. There was a change in the sightings of seals, with elephant seals and leopard seals included in the mix. But no whales were sighted. Although it was cloudy all day, visibility remained good for the surveying until mid-afternoon when it began to snow. Our trackline took us up the middle of the continental shelf until we reached latitude 65°S and then we turned to steaming more to the east so that we reached the Bismark Straits in the evening and the Gerlache Straits in the late night. In the evening, the wind was out of the north at 23 to 25 kts, the temperature was -1.6°C, and the barometer was holding steady at 987.7 mb.

King Neptune arrived on the *Palmer* with an entourage of court members in the early evening of 26 August. He held court and sought out the polliwogs in the scientific party, those who had never crossed the Antarctic Circle. After various and sundry rituals, the polliwogs earned the right to be called shellbacks.

**27 August**

In the early morning of 27 August, low clouds and a light snow kept the mountains of surrounding Paradise Harbor hidden as we turned east out of the Gerlache Straits and went into it to conduct a series of calibrations on the high frequency acoustical systems used to survey zooplankton during the cruise. This harbor also provided an opportunity for the marine mammal surveyors to use the Zodiac to see if whales were in the vicinity. By noon, however, the clouds lifted and provided a breath taking view of snow capped peaks and glaciers running down the slopes to the water's edge. Most of the daylight period was spent doing the calibrations and we did not leave the area until late afternoon. The steam down the Gerlache Straits lead to a passage way to the open waters of the continental shelf.

**28 August**

By early morning on 28 August, we were out on the continental shelf and headed for La Maire Straits and our first point of land on the tip of South America. During the transit across the Drake Passage and until we reached the 200 mile limit of Argentina, an XBT survey and passive listening with sonabouys were done. At the start of this journey back to South America the winds were light (10 kts) out of the west-northwest (297°), the air temperature was -3.0°C, and the barometer was falling slowly at 977.6 mb.

**29-31 August**

The steam across the Drake Passage was done in remarkably fine weather. Winds and seas were modest and once past the Polar Front, air temperatures climbed above the freezing mark. We passed the Estrecho de La Maire late in the evening of 29-30 August. Fine weather was also with us as we steamed along the eastern coastline of Argentina to Estrecho de Magallanes, where the pilot for the 80 nm trip to Punta Arenas, Chile was picked up. We arrived in Punta Arenas, Chile around 1000 on 31 August, thus ending the cruise.

## INDIVIDUAL PROJECT REPORTS

### 1.0 Report for Hydrography and Circulation Component

(John M. Klinck, Yusuf Sinan Husrevoglu, Hae-Cheol Kim, and Jason Hyatt)

#### *1.1 Introduction*

The overall goal of the U.S. Southern Ocean GLOBEC program is to elucidate circulation processes and their effect on sea ice formation and Antarctic krill (*Euphausia superba*) distribution and to examine the factors that govern Antarctic krill survivorship and availability to higher trophic levels, including penguins, seals, and whales. Consequently, a primary objective of this second U.S. SO GLOBEC broad-scale survey cruise (NBP01-04) is to provide a description of the water mass distribution and circulation on the west Antarctic Peninsula (WAP) continental shelf in the region of Marguerite Bay.

Historical hydrographic data for this region are limited, particularly during times other than austral summer. However, these data show that the water masses in the area consist of Antarctic

Surface Water (AASW) in the upper 100 m to 120 m, a cold Winter Water layer at 80 m to 120 m, and a modified form of Upper Circumpolar Deep Water (UCDW) that covers the shelf below the permanent pycnocline at 150 m to 200 m. The UCDW, which is the source for the modified water on the WAP shelf, is found at the outer edge of the continental shelf at depths of 200 to 600 m. Thus, the first objective of the hydrography component is to fully describe the water mass distribution on the WAP continental shelf. This objective also includes showing how the water structure changes from the first regional survey, which was only two months ago.

Circulation in the study region, which has been inferred from the limited hydrographic observations, suggests a clockwise gyre on the continental shelf near Marguerite Bay, upwelling of UCDW at specific sites in the study region, and across-shelf flow of UCDW into Marguerite Bay at depth. However, the details of the circulation and the spatial and temporal variability of the flow remain to be determined. Thus, the second objective of the hydrography component is to provide a description of the large-scale circulation for the portion of the WAP continental shelf included in the study region. The resulting circulation distribution can then be compared with drifter, moored current, and shipboard ADCP measurements as well as circulation derived from theoretical models.

### *1.2 Data Collection and Methods*

#### 1.2.1 Data Distribution

The hydrographic data were collected from individual stations that were aligned in across-shelf transects that ran perpendicular to a baseline situated along the coast. The base survey grid consisted of thirteen across-shelf transects and 92 stations. The stations were run from north to south, starting with the outer shelf station on survey transect one (station 1). Spacing between transects was 40 km; station spacing along individual transects varied from 10 to 40 km.

Of the original survey stations, 23 were not occupied due to a variety of reasons. Station 32 was skipped because it was over a shallow bank. Stations 55-58 were in heavy sea ice in the southern end of Marguerite Bay and so could not be reached with a reasonable effort. Stations 64-70 were a high density sampling line across the shelf break and slope to measure the structure of the ACC. Because of time constraints, only the shelf break station (66) was sampled. Stations 72, 79, 81, 82, 88, and 89 were on the outer end of the southern sections and were not sampled because of time constraints. Stations 84-86, near Charcot Island, were skipped because of heavy sea ice or adverse sea ice movement. Finally, all of the southernmost line (stations 90 - 92) was not sampled because of expected heavy sea ice and time constraints.

#### 1.2.2 CTD and Water Samples

The primary instrument used in the hydrographic work was a SeaBird $911^+$ Niskin/Rosette conductivity-temperature-depth (CTD) sensor system. The CTD included dual sensors for temperature and conductivity. Other sensors mounted on the CTD-Rosette system measuring dissolved oxygen concentration, transmission (water clarity), fluorescence, and photo-synthetically active radiation (PAR). All but two CTD profiles were done to within 5 m of the bottom. At many stations where the bottom depth was less than 500 m, a Fast Repetition Rate Fluorometer (FRRF) was mounted on the Rosette. In all, 74 casts were made with the CTD (Appendix 2).

The 24-place Rosette was equipped with 10-liter Niskin bottles. For most casts, only 22 bottles were mounted to accommodate the FRRF. The number of discrete water samples taken on each cast was variable (Appendix 3). However, samples were generally taken at the surface and bottom, above, within and below the oxygen minimum layer, and at a series of standard depths between 100 m and the surface. Additional water samples were taken in order to better resolve specific features seen in the vertical profiles.

On each cast, water samples were taken at several depths for salinity determinations to be used for calibration of the conductivity sensors on the CTD (Appendix 3). A total of 1244 bottle samples were collected and from these 437 samples (including replicates) were collected for salinity analysis. The bottle conductivities were measured during the cruise using the NBP Guildline AutoSal 8400B No. 2 laboratory salinometer, and the values converted to salinity using the Guildline data logging software. The CTD primary and secondary temperature and conductivity sensors were compared for internal consistency. Salinity computed from each conductivity sensor was compared with the bottle salinities.

Internal consistency within the CTD is determined by comparing primary (0) and secondary (1) temperature and conductivity sensors (Figure 2, Top Panel). Differences between these paired sensors results in difference statistics of :

T0 - T1 = 0.00082 +/- 0.0106°C, for N= 339,
S0 - S1 = -0.00064 +/- 0.0106 psu, for N= 334.

Differences between the primary sensor (0) and secondary (1) CTD sensors and bottle (b) salinity values,

S0 - Sb = 0.00354 +/- 0.0058 psu, for N = 296
S1 - Sb = 0.00272 +/- 0.0053 psu, for N = 294.

Difference values greater than +/- 0.02 were not included in the computation of mean and confidence limits. This limitation removed 38 and 40 points, respectively for each of these comparisons.

Overall, the *N.B. Palmer* CTD worked well. The differences between the primary and secondary temperature and conductivity values were small throughout the cruise, with no indication of change with time in temperature and a clear drift in conductivity. However, the range of the drift (about 0.002) is about the accuracy of the salinity determination from the CTD.

The comparisons of the primary and secondary salinities with the bottle salinities suggest that both CTD salinity sensors reported slightly higher salinity than the AutoSal at the beginning of the cruise (Figure 2, Bottom Panel). There is a small drift over time by both primary and secondary salinities relative to the bottle salinities with the primary drifting away from the AutoSal and the secondary drifting closer. The overall drift between CTD and bottle salinities is small.

Linear regression between the primary minus bottle and secondary minus bottle values versus sample number gives a mean drift of 0.00205 psu and -0.00100 psu, respectively, per 100 samples. This level of drift is within the bounds of accuracy for the secondary cell, but is about twice the accuracy for the first cell over a cruise generating around 300 samples.

The titration of dissolved oxygen was done to test the performance of the dissolved oxygen sensor mounted on the CTD sampler and, if necessary, to calibrate the sensor based on a more accurate method. On every CTD cast, water samples were taken for determination of dissolved oxygen concentration in the lab (Appendix 4). A total of 426 oxygen samples were taken during the cruise. These oxygen samples were taken from 3 to 6 bottles of different depths of a water column at each CTD cast. Two replicate samples were taken from the same bottle from the surface and the bottom, respectively, and one sample was taken from the rest of the depths. The oxygen samples were fixed right after they were collected and were analyzed on board the ship, strictly within 24 hours of collection, using an automated amperometric oxygen titrator developed at Lamont-Doherty Earth Observatory.

The automated amperometric oxygen titration method used in this study showed relatively high precision. As an example, the reproducibility between replicate samples was good. The average percent difference (|Sample A - Sample B|*100/average of replicate samples) between two replicate samples was 0.491% from a total of 139 samples. Figure 3 (Top Panel) is the difference between replicate samples with respect to cast number sequence, which illustrate small differences.

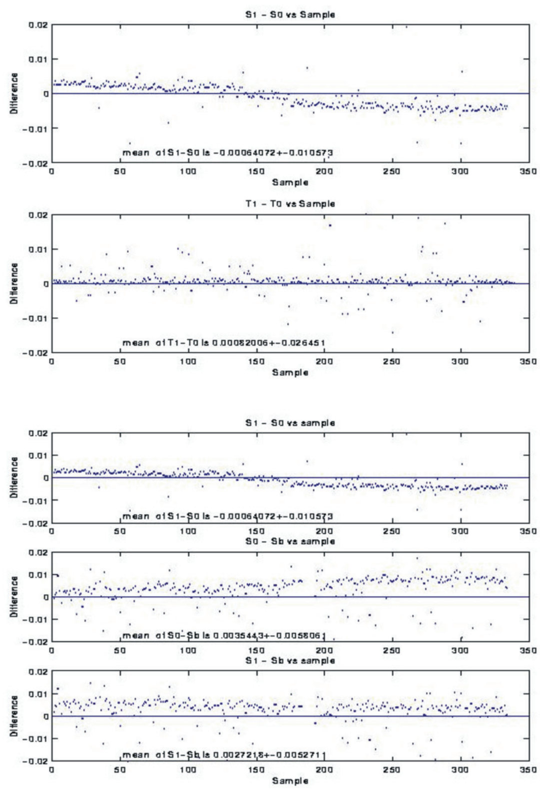
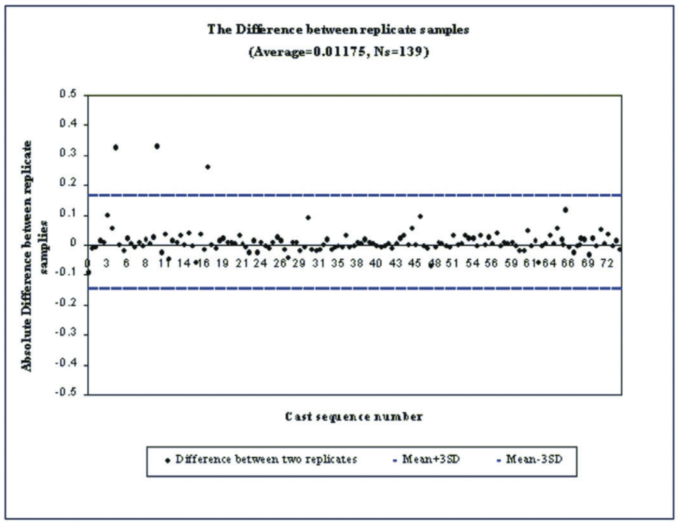



Figure 2. Top two panels: Comparisons between the primary (0) and secondary (1) temperature and conductivity sensors on the CTD. Samples (numbered successively) are taken at times when bottles are closed. Bottle closings are successively numbered and approximate time through the cruise. Bottom three panels: Comparisons between bottle salinity and salinity calculated from the primary (0) and secondary (1) conductivity sensors on the CTD. Bottle closings (samples) are successively numbered and approximate time through the cruise.

The comparison of the titrated oxygen values with the corresponding values from the oxygen sensor on the CTD showed small discrepancies at each sample (Figure 3, Bottom Panel). Overall, the values from the oxygen sensor were a little higher than those from the titration, except at the beginning of the cruise.

The linear regression between the titrated oxygen values and values from the oxygen sensor on the CTD was done after removing 8 points exceeding 3 standard deviation of the discrepancy (Figure 4, Top Panel). The result showed excellent agreement between two sets of values with a high correlation coefficient (0.99). The slope was 0.985 which is close to one. A slight offset (0.214 ml $l^{-1}$) implies the values from the sensor are a little higher than those from the titration. However, overall agreement between two sets of values was very good.



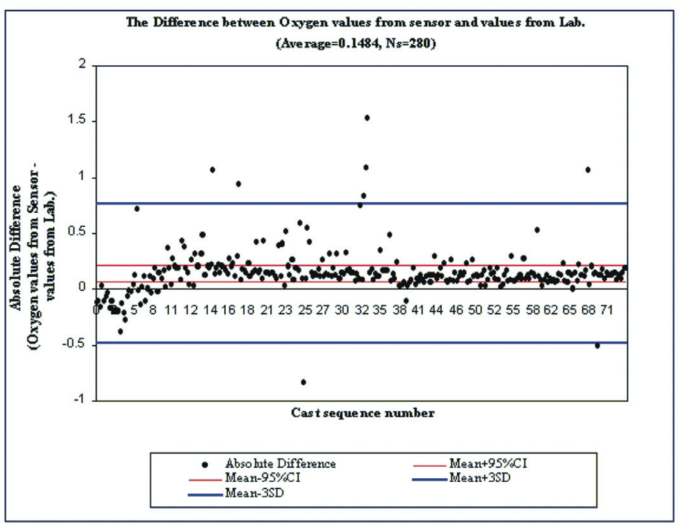
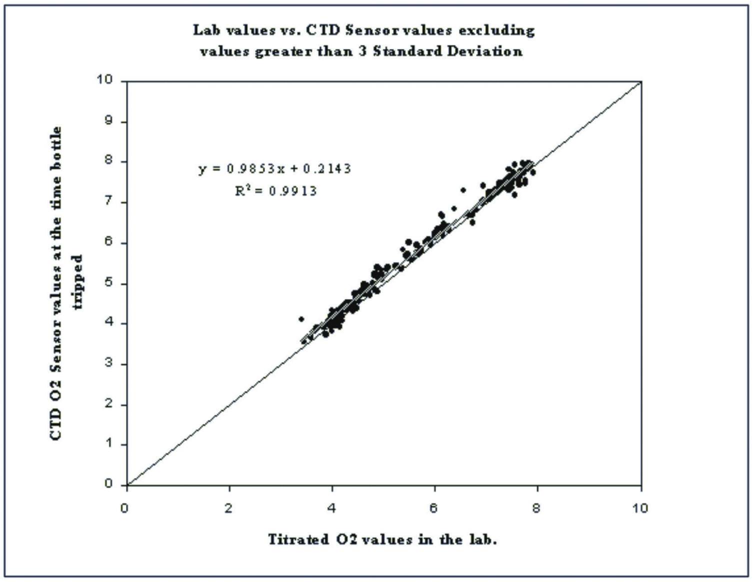




Figure 3. Top Panel: The difference between replicate samples. Bottom Panel: The difference between oxygen values from sensor and values from the laboratory.



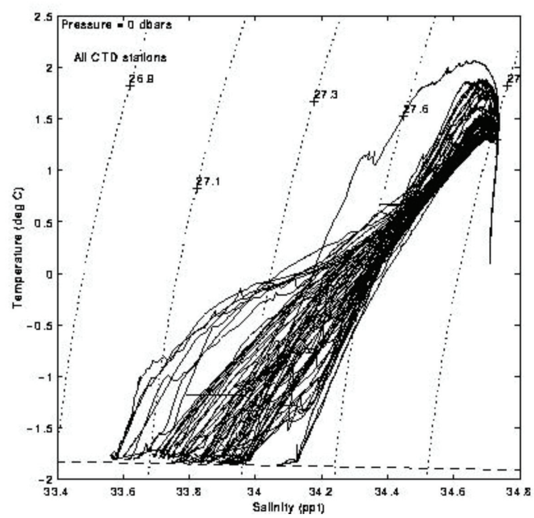




Figure 4. Top panel: The linear relationship between the values from sensor and the values from laboratory. Bottom panel: Potential temperature-salinity diagram using all CTD observations. The contours represent lines of constant potential density ($\sigma_0$). The dashed line indicates the freezing temperature at each salinity.

Preliminary processing of the CTD data was done during the cruise using the procedures and algorithms given in UNESCO (1991). The temperature and salinity values were plotted and compared with historical data sets to check the accuracy of the data. Additional checking of data quality consisted of comparing the temperature and salinity values obtained from the dual sensors on the CTD. However, additional checking and post-cruise calibration of the sensors on the CTD by SeaBird remains to be done. It is anticipated that the final hydrographic data set will not differ substantially from what is described in this report.

Water samples for nutrient determination were taken from each Niskin bottle on each cast. The methods and techniques used for this are described in Section 5.0 of the cruise report. Similarly, water for chlorophyll determination was taken on each cast and the methods and techniques used for this are described in Section 6.0 of the cruise report. The discrete chlorophyll samples provide calibration for the fluorometer on the CTD.

1.2.3 Expendable Probes

Expendable BathyThermographs (XBT) and expendable CTDs (XCTD) were used to fill in information between stations, to replace sampling by the CTD, and to make measurements across Drake Passage. The bulk of the expendable probes were used for the Drake Passage measurements using 42 probes on the southbound trip to make 32 stations and 28 probes, including one XCTD, on the northbound to make 24 stations. An additional 19 XBTs were used in various places on the grid. The largest number were used along the shelf break in our transit from station 87 up the shelf break to resample stations 13-16. The XCTD and XBT probe drops are summarized in Appendix 5.

The XBT data were collected using either T-4 (nominal depth of 460 m), T-7 (nominal depth of 760 m), or T-5 (nominal depth of 1830 m) probes. The XCTD probes provide data to 1000 m.

The XCTD and XBT probes were deployed using a hand-held launcher from the main deck of the ship. The XCTD and XBT probes were manufactured by Sippican and had a troublesome failure rate. Eighty-seven probes were used to make 73 stations for a failure rate of 8.4%. Two XCTD were attempted. One was loaded and worked correctly; the other was not recognized by the software. An XBT was substituted because of time constraints.

No comparisons were make between XBT, XCTD, and CTD instruments. The previous cruise (NBP01-03) made such measurements and found no difference. Thus, no calibrations are necessary in order to merge these data sets.

1.2.4 ADCP Measurements

The RDI 150 kHz Acoustic Doppler Current Profiler (ADCP) system mounted in the hull of the *RVIB N.B. Palmer* was set to begin collecting data 25 July 2001 at the start of the U.S. SO GLOBEC survey cruise. The system continued to collect data until 30 August 2001, when it was turned off at the end of the cruise. Jeff Otten (Raytheon Polar Services) supervised the ADCP during this cruise. Thus, the ADCP system ran continuously throughout the cruise without any instrument or software problems. The ADCP system was configured to acquire velocity measurements using fifty eight-meter depth bins and five-minute ensemble averages. This configuration provided velocity measurements from the first bin, at 31 m, to 300 m and sometimes 400 m. Depth bins two through ten were used as the reference layer.

The ADCP was run in bottom tracking mode during times when the survey was taking place in water with depths less than 500 m. Because much of the area included in the survey grid is less than 500 m, the majority of the ADCP data were collected in this mode. Bottom tracking was disabled during times when the survey extended beyond the continental shelf edge and into deeper water for several hours.

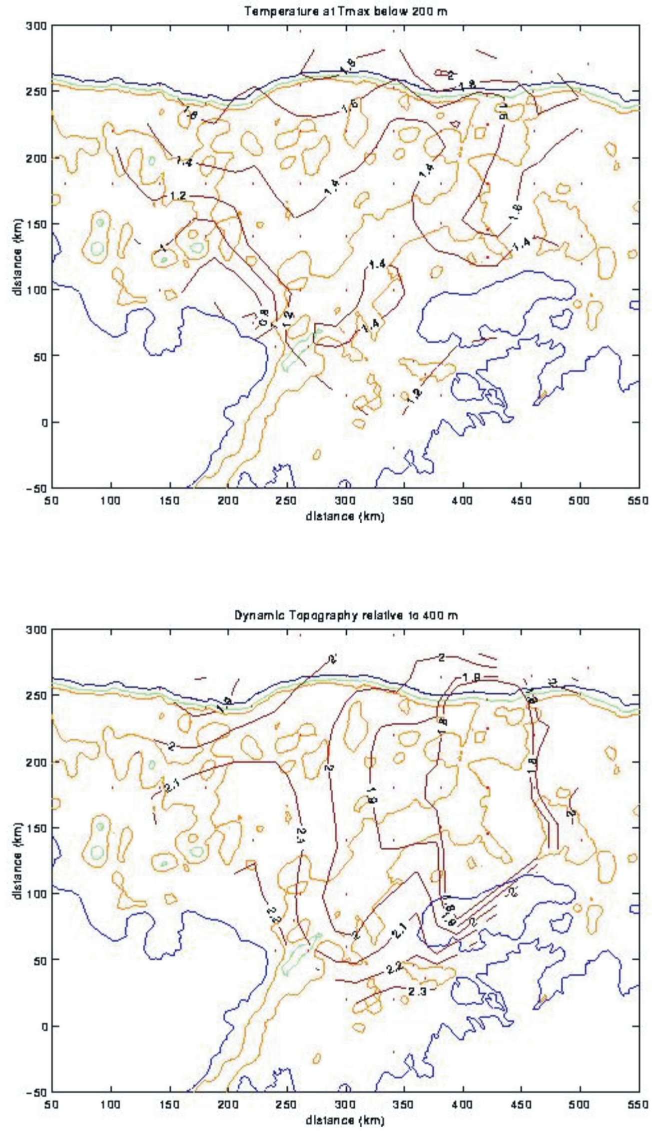



Figure 5. Top panel: Distribution of the temperature maximum below 200 m and constructed from CTD temperature observations. Station locations are indicated by dots. The dark, unnumbered lines are the coastal outline. The lighter, unnumbered lines show isobaths (500, 1000, 1500 m). Bottom panel: Dynamic topography (dynamic meters) at the surface relative to 400 m. Station locations are indicated by dots. The dark, unnumbered lines are the coastal outline. The lighter, unnumbered lines show isobaths (500, 1000, 1500 m).

Preliminary processing of the ADCP data was done during the cruise using an automated version of the Common Oceanographic Data Access System (CODAS) developed by E. Firing and J. Hummon from the University of Hawaii. Maps of the ADCP-derived current vectors along the ship track were generated at daily intervals. During times that the ship was steaming through sea ice, the ADCP was unable to receive sufficient samples to generate proper statistics. It was only while the ship was stationary or moving slowly that the ADCP was able to detect currents. These times were relatively rare, but do provide important information about circulation in this sparsely sampled area. A final assessment of ADCP measurements will be done by specialists after the cruise.

### *1.3 Preliminary Results*

#### 1.3.1 Water Mass Distributions

The potential temperature-salinity (θ-S) diagram constructed using all of the CTD data (Figure 4, Bottom Panel) allows the water masses in the study region to be identified. All water at the surface is on or near the freezing line, so throughout the cruise, near surface water was in its winter state. The surface mixed layer depth was typically around 80 m, but ranged from 50 to 150 m.

The cluster of points on the θ-S diagram at temperatures of 1.0°C to 2.0°C and salinities of 34.6 and 34.7 represents Circumpolar Deep Water. This water is composed of two varieties: Upper and Lower Circumpolar Deep Water. The Upper CDW is characterized by a temperature maximum at a density of 27.72. Lower Circumpolar Deep Water is characterized by a salinity maximum of 34.72 at a potential density of 27.8.

The majority of the points on the θ-S diagram are associated with a modified form of Upper CDW. This water is the result of cooling of Upper CDW on the shelf by heat loss upward in to the mixed layer. The modified CDW water is characterized by temperatures of 1.0°C to 1.5°C and salinities of 34.6 to 34.7.

#### 1.3.2 Spatial Distributions and Estimated Circulation

Distributions of various water properties are helpful in estimating the pathway of exchange between the oceanic ACC and the WAP continental shelf. Earlier surveys have used the subsurface temperature maximum of UCDW as a tracer on the shelf. This is a transient tracer as heat exchange reduces the temperature contrast over some time (as yet unknown but thought to be of order of a month or two).

The temperature of the temperature maximum below 200 m (to avoid surface warm layers) for this cruise shows one strong plume of intruding oceanic water (Figure 5, Top Panel). Water above 1.6°C is flooding the shelf towards the center of Adelaide Island. Interestingly, the plume seems to follow the northeast side of the Marguerite Trough, not the center. This could be a false impression due to the misplacement of the bathymetry or due to the limited samples used to construct the figure. The entrance to Marguerite Bay has a small area of warmer water (above 1.4°C) which is likely an earlier intrusion which has cooled. This may be the intrusion that was seen during the previous U.S. SO GLOBEC Cruise (NBP01-03). Finally, there is a second possible intrusion across the center of the grid, but the signature is weak and ambiguous. This could be an early indication of an intrusion or the remnant of an old intrusion. Perhaps the current meter records will let us sort out the timing and path of these warm water intrusions.

A more traditional indicator of circulation is the dynamic topography which is vertically integrated density anomaly which is used with the geostrophic balance (pressure gradients balance the Coriolis acceleration) to infer circulation. For this shelf, the stratification is weak and the results of such calculations are usually difficult to interpret. Nevertheless, the dynamic topography of the surface relative to 400 m was calculated (Figure 5, Bottom Panel). This calculation estimates the circulation at the surface assuming no flow at 400 m. The pattern of flow is an onshore flow along the northeastern end of the Marguerite Trough with a general offshore flow off Marguerite Bay. A second region of onshore flow (due southward) is seen over the southern third of the grid.

To keep this circulation in perspective, it is possible to calculate the speed of the flow across the center of the shelf. The dynamic height difference, 0.3 m (= 2.1 - 1.8), is converted to a speed by dividing by the distance and the Coriolis parameter (100 km * .0001 $s^{-1}$) to give an estimated speed of 3 cm $s^{-1}$. This is a weak circulation which would move water at 2.6 km $d^{-1}$. At these speeds, the intruding plume would take about 45 days to obtain the observed shape.

Two of the nutrients measured on the cruise can be used to estimate circulation. The silicate measurements below the pycnocline were the only ones to display any spatial structure. The distribution at 300 m (Figure 6, Top Panel) illustrates that subpycnocline water on the shelf has higher silicate concentrations (100-110 μM) compared to ACC water (60-70 μM). The deeper water in the center of the proposed gyre (Figure 5, Bottom panel) as well as water in Marguerite Bay, which likely have the longest residence time, have the highest concentrations indicating a flux of silicate from the sediments. The region of higher silicate is coincident with the center of the gyre from the dynamic topography. The plume of lower silicate water from offshore matches the plume of higher temperature water confirming the onshore flow in this region.

The other nutrient with a spatial structure is the ammonium which has high concentrations in the mixed layer. The ammonium concentration in the mixed layer (Figure 6, Bottom Panel) is again consistent with the gyre circulation and the onshore flow of oceanic water near the surface at the same place that subpycnocline water properties indicate onshore flow. Low ammonia is seen in the oceanic water moving onshore. Marguerite Bay has the highest ammonia in the region and the offshore flowing side of the gyre has intermediate concentrations. The cause of these high ammonia values is at present unknown, but there is clearly no primary production or this nutrient would be at much lower concentrations. Nevertheless, its structure shows that not only is subsurface water moving from the shelf onshore, but the same onshore motion occurs throughout the water column.

### *1.4 Acknowledgments*

Much of the credit for the high quality hydrographic data set collected during NBP01-04 is due to the efforts of Raytheon marine technicians, Jay Ardai, Christian McDonald, and Jennifer White; electronics technicians, Jeff Otten and Romeo LaRiviere; and marine science technician, Jonnette Tuft. Their willing and cheerful response to all requests made the collection of the hydrographic data set a pleasure. Their efforts are most appreciated.

### *1.5 References*

UNESCO, 1991. Processing of oceanographic station data. United Nations Educational, Scientific and Cultural Organization, Paris. 138 pp.

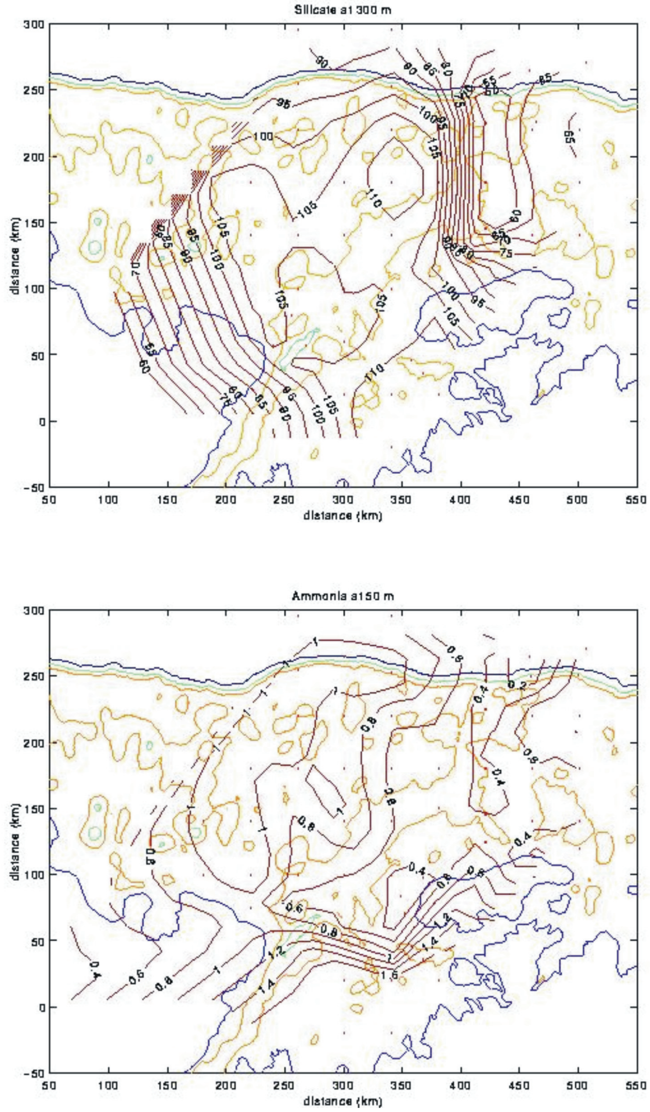



Figure 6. Top panel: Silicate concentration (μM) at 300 m depth. Station locations are indicated by dots. The dark unnumbered lines are the coastal outline. The lighter unnumbered lines show isobaths (500, 1000, 1500 m). Bottom panel: Ammonia concentration (μM) at 50 m depth in the mixed layer. Station locations are indicated by dots. The dark unnumbered lines are the coastal outline. The lighter unnumbered lines show isobaths (500, 1000, 1500 m).

## 2.0 Meteorological Measurements

(Jason Hyatt and Bob Beardsley [PI not present on cruise])

### *2.1 Introduction*

Underway meteorological data were collected during NBP01-04 to help document the surface weather conditions encountered during the cruise and to characterize the surface forcing fields in the SO GLOBEC study area during austral winter. The *N.B.Palmer* (NBP) arrived near the start of the large scale physical-biological survey on 27 July 2001 (YD 208) and left the area to survey the sea ice edge to the north on 26 August 2001 (YD 238). A full suite of meteorological data were collected during this 30-day period. This report provides a preliminary description of the meteorological data collected on NBP01-04 and some initial results concerning the surface forcing during winter.

### *2.2 Instrumentation*

The NBP was equipped with the following set of meteorological and surface oceanographic instrumentation to collect continuous underway data during NBP01-04 (Table 1). A pair of Belfort propeller/vane anemometers and sensors to measure incident short and longwave radiation (SW, LW) and PAR were mounted on the top of the NBP's main "science" mast (Figure 7A). The air temperature (AT) and relative humidity (RH) sensors and precision barometer (BP) were mounted near the base of the main mast on the 04 deck, aft of the bridge (Figure 7B) to avoid the warm plume from the exhaust stacks. The heights of the anemometers and the air temperature and relative humidity sensors above sea level were estimated to be 33.5 and 17 m, respectively. Sea surface temperature (SST) was normally measured using a remote sensor and intake in the stern thruster housing when the thrusters were not in use or on standby. Sea surface salinity (SSS) and raw fluorescence (FL) were measured using a thermosalinograph and fluorometer placed in the aft chemistry laboratory. Water for both instruments came from the intake in the stern thruster housing when it was not in use. A second intake, from the ship's sea chest, was used when the thrusters were on standby or in use.

While in Punta Arenas, Chile, we performed a comparison of meteorological data from *the L.M. Gould* and NBP while they were tied at the dock next to each other. These comparisons showed excellent agreement from all sensors.

### *2.3 Data Acquisition and Processing*

The raw NBP shipboard meteorological data were collected using the ship's data acquisition system (RVDAS). A 1-minute subsample of the raw data was saved at the end of each day in a flat ASCII text file on the ship's DAS_DATA directory on drive Q (e.g., the data for YD=99 and YD=100 are located in Q:\NBP0103\geopdata\JGOF\ g099.dat and jg100.dat, respectively). This 1-minute time series was produced using a JGOFS program that merged the meteorological data with navigation and other data and combined the ship's motion and the measured (relative to the ship) wind speed and direction data to make "true" wind speed and direction relative to the ground.

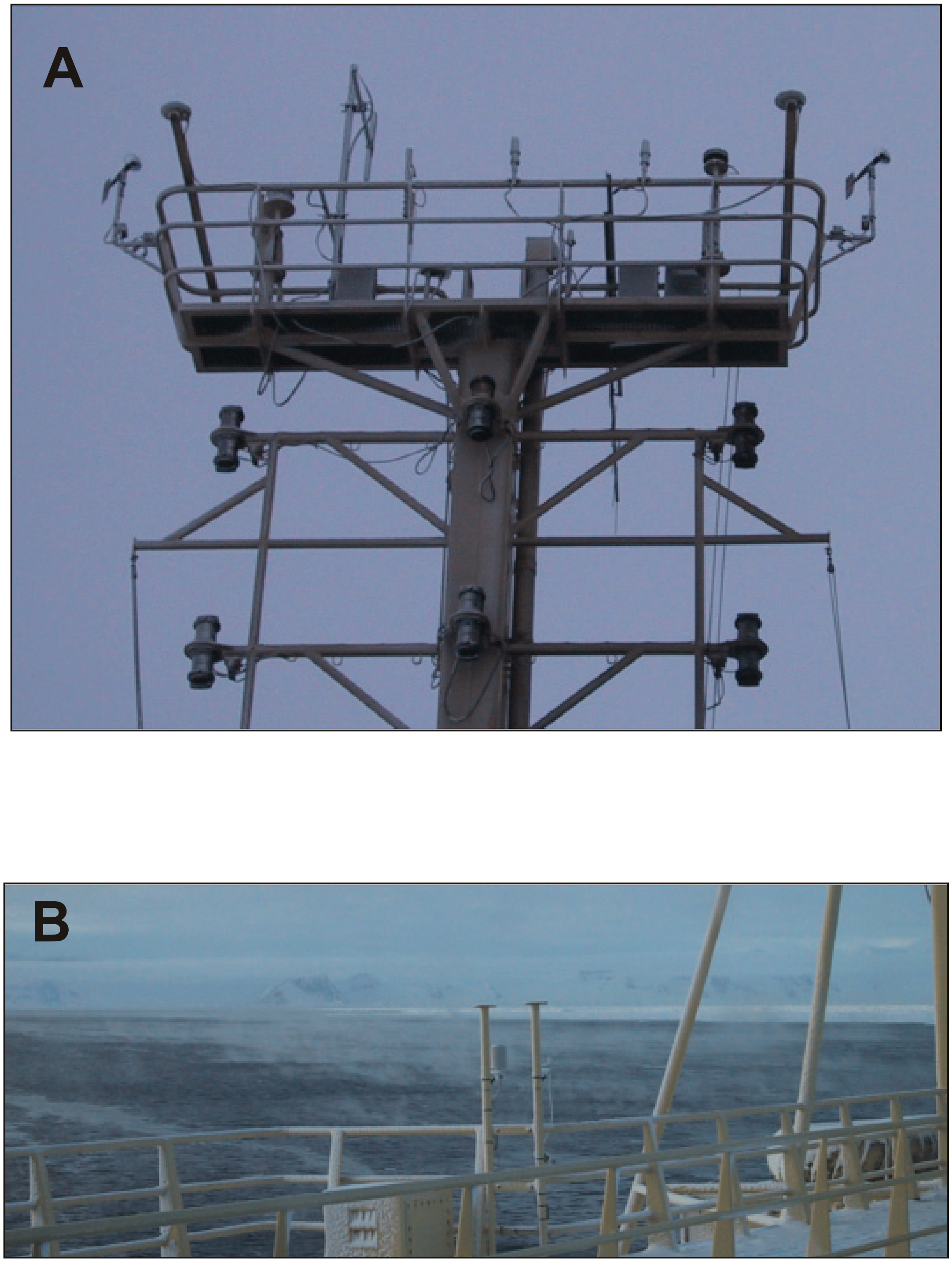



Figure 7. A) The NBP "science" mast, with port and starboard anemometers and shortwave, longwave, and PAR sensors mounted to the railing. B) The temperature, relative humidity, and longwave radiation sensors, with sea smoke in the background.

The daily data were obtained from drive Q and converted into standard variables using the MATLAB mfile read_palmer_met1m(yd), with some modifications from the NBP01-03 version. This program also removed pad values (produced when the DAS recorded no data), edited several variables, and stored the new data set in a MATLAB matfile for each day (e.g., jg100.mat for YD=100). An additional variable, 'jd', has been added and is the julian day. This variable can be used easily in the 'timeplt' toolbox for time series plotting, which is contained in timeplt.zip, and was used for generating all of the plots herein. The SW nighttime bias of 8.592 W $m^{-2}$ was calculated, so the SW record was edited to remove the bias and make a positive only SW series. Both the SST and SSS data included large spikes associated with the change in intake when the ship's stern thruster was placed on standby or being used. Removal of these values can be difficult, however, the SST over the study area in winter is generally uniform at the freezing temperature, which is a good assumption considering we experienced 10/10 sea ice cover most of the time. Analysis of the SSS signal is more difficult, considering the existence of a slight freshening at the coast evident in the CTD data.

The mfile merge_palmer_met1m(first_yd,last_yd) was used to combine the 1-day jgxxx.mat files into a single 1-minute continuous time series for each variable. The merged data were then stored in palmer_met1m.mat. Alternatively, the m-file buildjgofsvar('var',days) was used to build time series of individual variables for the specified days.

For further analysis, the 1-minute data in palmer_met1m were lowpass filtered and subsampled using make_palmer_met5m into 5-minute time series. The filter used is the pl66tn set with a halfamplitude period of 12 minutes. The 5-minute data were then used to estimate the surface wind stress and heat flux components using bulk methods called by compute_palmer_wshf5m. The surface wind stress and heat flux data were then added to the palmer_met5m, so that this 5-minute time series contains best versions of the surface meteorological conditions and forcing for the cruise. Both the 1-minute palmer_met1m and 5-minute palmer_met5m data are included on the cruise data CD-ROM.

### *2.4 Problems and Solutions*

Several problems with the meteorological and underway instrumentation or data logging became clear during the cruise. These problems and suggested solutions are summarized next.

#### 2.4.1 RVDAS recording format

Since NBP01-03, the recording precision of the MET system has been satisfactorily improved. In fact, most of the instruments had been newly mounted before this cruise (Table 1). Before departing from Punta Arenas, Chile, we caught that the recording precision of the barometer logging was only 1 dbar, and this was subsequently improved to 0.1.

#### 2.4.2 Brief Air Temperature Recording Failure

The RM Young system was reconfigured before the cruise in Punta Arenas, Chile. One unfortunate result is that once the ship experienced air temperatures below -10°C, a bug caused a problem in data logging. This occurred on yearday 207.6, and was caught and corrected on 208.1, before we entered the grid area.

Table 1. NBP01-04 meteorological sensors, their calibration history, time of installation, and conversion factors used to convert raw voltage output to scientific units.

| **Sensor Meteorology and Radiometers** | **Model** | **Serial Number** | **Last Calibration** | **InstalledConversion** |
|---|---|---|---|---|
| Port Anemometer | RMYoung 5106 | WM46262 | 04/11/01 | 7/15/01 (m $s^{-1}$, °C) |
| Starboard Anemometer | RM Young 5106 | WM46263 | 04/11/01 | 7/15/01 (m $s^{-1}$, °C) |
| Barometer | RM Young 61201 | 01705 | 06/01/01 (new) | 7/15/01 (mb) |
| Temperature and RH | RM Young 41372VC | 06134 | 06/01/01 (new) | 7/15/01 (°C, %) |
| PIR | Eppley PIR | 32845F3 | 02/22/01 | 7/15/01 W $m^{-2}$ = voltage (mv) x (1volt / $10^3$mv) / (4.13 x $10^{-6}$ )volts / W $m^{-2}$) |
| PSP | Eppley PSP | 33090F3 | 11/07/00 | 1/28/01 W $m^{-2}$ = voltage (mv) x (1volt / $10^3$mv) / (8.28 x $10^{-6}$ )volts / W $m^{-2}$) |
| Mast PAR | Biospherical QSR-240 | 6356 | 02/15/01 | 4/18/01 µE $m^{-2}$ $s^{-1}$ = (voltage (mv) x (1volt / 103mv) - 0.0003 volts_dark) / ((6.08 volts/(µE $cm^{-2}$ $s^{-1}$) x ($10^4$ $cm^2$ $m^{-2}$)) |
| GUV | Biospherical PUV-511 | 9228 | 06/26/01 | 7/20/01 |
| PUV | Biospherical PUV-500 | (Not used) | | |

2.4.3 Icing and anemometer failures

The meteorological sensors on the mast collected ice during parts of this cruise. Visual inspections of the MET tower were made on a daily basis with binoculars for obvious problems. In addition, whenever Jeff Otten (Electronics Technician) climbed the mast for any purpose (often for the sonobuoy antennae) the sensors, connections and wiring were checked.

Despite potential icing problems, the two anemometers appeared to give similar data for much of the cruise. One failure mode of the port anemometer was for one of the two output voltage signals to be zero (presumably due to a connection problem), thus making both the wind speed and direction wrong. Post-cruise analysis of the raw anemometer data should allow a detailed comparison of the data from both units, which in turn should allow periods of poor performance to be identified and eliminated from the computation of "true" wind.

2.4.4 "True" wind computation

There were several periods during the cruise when the JGOFS "true" winds were weak (under 5 m $s^{-1}$) and exhibited jumps in wind speed caused by the motion of the ship. This was especially obvious as the ship towed BIOMAPER-II at 4 kts between CTD stations. The JGOFS format includes only "true" wind and direction (thought to be computed using the port anemometer data only), so it is not possible to re-compute true wind using just the JGOFS data.

The m-file dotrue.m corrects for ship motion in the true wind calculation, and does a weighted average of the two windbirds, weighting the upwind side in a .5+sin(θ)/2 fashion. This weights them evenly on a head- or tailwind. The variable Ut is the true wind and is on the data CD in the both the full 5-minute and daily files. Ut is in 'oceanographic' format, i.e. a vector pointing with the wind, with a trigonometric angle used. Realize that this is a preliminary correction, and any subsequent corrections will be posted on the SO GLOBEC website, along with the same true wind variables calculated for other cruises.

2.4.5 Thermosalinograph contamination

The NBP SeaBird thermosalinograph (TSG) produced high quality data for some of the cruise; however, the data taken just before and on station were corrupted and should be used only with great care.

When approaching a station, the thruster generator was first started and a servo system activated so that the thrusters could be used on demand. The TSG intake is normally located in the stern thruster housing, and this servo system automatically switches the TSG intake to another location. This change in intake caused a pulse of warm water to pass thought the TSG, creating a large spike in temperature and salinity lasting 5-10 minutes. A similar spike occurred when the ship left station and the thruster generator was turned off. While these two spikes had a characteristic shape, using the thrusters on station also caused jumps in the TSG temperature and salinity data. These jumps were irregular in shape and duration, making identifying them difficult. The SST and SSS data included in the palmer_met1m and palmer_met5m data sets have been edited to remove the most obvious of these fluctuations; however, we suggest not using the SST and SSS data when the ship was nearing or was on station. For NBP01-04, much of the cruise was spent in full sea ice cover, so the SST can be nearly assumed to be at the freezing temperature. The SSS, on the other hand, did show some fluctuations in the record which agree qualitatively with the CTD cast surface values. Teasing these subtleties from the data should be done with great care before making inferences.

In view of the inherent high accuracy of the ship's SST and TSG data when the ship is underway, thought should be given to relocate the intake so that the problems associated with the thruster generator and intake switching could be eliminated. If this is not possible, then perhaps the actual switch in intake could be postponed until the ship is actually on station. This would allow the TSG to collect good data for the 10-15 minutes prior to each station. At a minimum, the bridge could keep a log of times when the thruster generator was turned on and off. There are plans to correct this situation with a sounding tube during the next dry dock period.

*2.5 Description of Cruise Weather and Surface Forcing*

Time series of the 5-minute surface meteorological data and surface forcing collected during NBP01-04 while in the study area are shown in Figures 8 and 9. Figure 8 shows the wind speed and direction, air and sea surface temperatures, relative humidity, barometric pressure, and the incident short and longwave radiation. Figure 9 shows a vector plot of the surface wind stress plus stress amplitude and direction, the net surface heat flux ($Q_{net}$), and its four components, the shortwave ($Q_{sw}$), longwave ($Q_{lw}$), sensible ($Q_{sen}$), and latent ($Q_{lat}$) fluxes. Note that these are bulk flux calculations, and therefore only apply to open water, which we did not see very much of during most of the cruise.

Figures 8 and 9 cover the period 27 July to 26 August, when the NBP was working in the SO GLOBEC study area. The NBP then headed north to Punta Arenas, Chile via Hyatt Cove, Paradise Harbor, and Drake Passage.

Weather conditions during the austral winter in the Marguerite Bay area are generally characterized by the passage of low pressure systems as they wander eastward around the Antarctic Continent. There exists a general pattern, starting with some high pressure, low winds, and colder clearer atmosphere with relatively low moisture. Next, a low approaches from the east, causing the winds to shift to the north and bring down warmer, moister air, and often snowfall. We actually experienced above freezing conditions on a number of occasions. As the low pressure continues its eastward motion, its center can pass almost directly overhead. After this, the slightest increase in pressure signals that the low has passed and the winds shift around to the east, bringing very cold dry air off of the Antarctic Continent. The low passes, followed by another high pressure ridge, clear skies, and some light southerly winds bringing cold dry air.

This cycle repeated itself a number of times during the cruise, with a period on the order of two to four days. However, there were times the lows did not behave predictably, and stalled over us, or split up as they encountered the mountains of the Antarctic Peninsula. In addition, lows often did not appear with much warning from the isobaric analysis figures. Nevertheless, inspection of the isobar figures, received twice daily, and keeping a careful eye on the pressure and wind direction, made for some explicable weather patterns.

Weather conditions experienced during the cruise ranged from severe gale (with peak winds above 50 kts and blinding snow) to very clear and sunny. Air temperatures ranged from -28.8°C to 1.4°C, with a mean of -11.1°C, and the lowest barometric pressure recorded was an amazing 935 mb. Daylight and incident shortwave radiation increased with time, while the longwave radiation showed normal fluctuations. The net heat loss of the open waters was very high at times, with strong winds and cold dry air of southerlies making for strong latent, sensible, and longwave heat losses. We observed incredible seasmoke, a sign of latent heat flux, over open waters. Again, it must be stressed that all heat flux calculations are valid only for open water, and that we had nearly full ice cover with only some leads during the cruise. During times of strong heat loss (max of -831 W $m^{-2}$!), ice formed quickly, which effectively insulates the water. During one CTD cast, we observed the formation of approximately 1 or 2 cm of ice in about 45 minutes.

As the cruise progressed and more was learned about the surface weather and forcing conditions on the WAP, it became possible to prepare preliminary notes on several aspects of the surface heat flux occurring during this cruise. The shipboard MET measurements were used to estimate the surface wind stress and heat flux components. The net surface heat flux ($Q_{net}$) is composed of four components, the net shortwave radiation flux ($Q_{sw}$) and net longwave radiation flux ($Q_{lw}$) and the two air-sea flux components, sensible heat flux ($Q_{sen}$) and latent heat flux ($Q_{lat}$). Since the underway SST data are so corrupted, a constant value of -1.8°C has been assumed.

2.5.1 Surface Cooling Part 1 "Well-Behaved" Weather

The NBP entered the SO GLOBEC study area on 27 July 2001 (YD 208), and through 5 August 2001 (YD 217), the weather behaved in a relatively predictable fashion, as outlined above. Two lows passed over us and the correlation coefficient between barometric pressure and air temperature shows as -0.93. The strong negative correlation agrees with the general picture of lows passing, falling barometer means rising temperatures, and vice versa.

During this period, the winds also behaved well, with a mean scalar speed of 7.7 m $s^{-1}$ and a maximum of 18.5 m $s^{-1}$. The winds appear to be mostly southward, primarily due to the fact that the chosen interval ends before a strong burst northward. The mean wind was 4.6 m $s^{-1}$ towards 266°T (S), with an average scalar wind speed of 7.7 m $s^{-1}$. The mean air temperature was -6.4°C, with several periods above 0°C, and the mean relative humidity was 95%.

The contributions of sensible and latent heat fluxes were of the same order as the longwave heat flux during times of freezing air temperatures. The longwave flux dominated during the warmer air temperatures. It is interesting to note that there was actually negative (into the ocean) net heat flux at times. The mean and standard deviations of $Q_{net}$ and the four components for the six-day period are given in units of W $m^{-2}$ in Table 2.

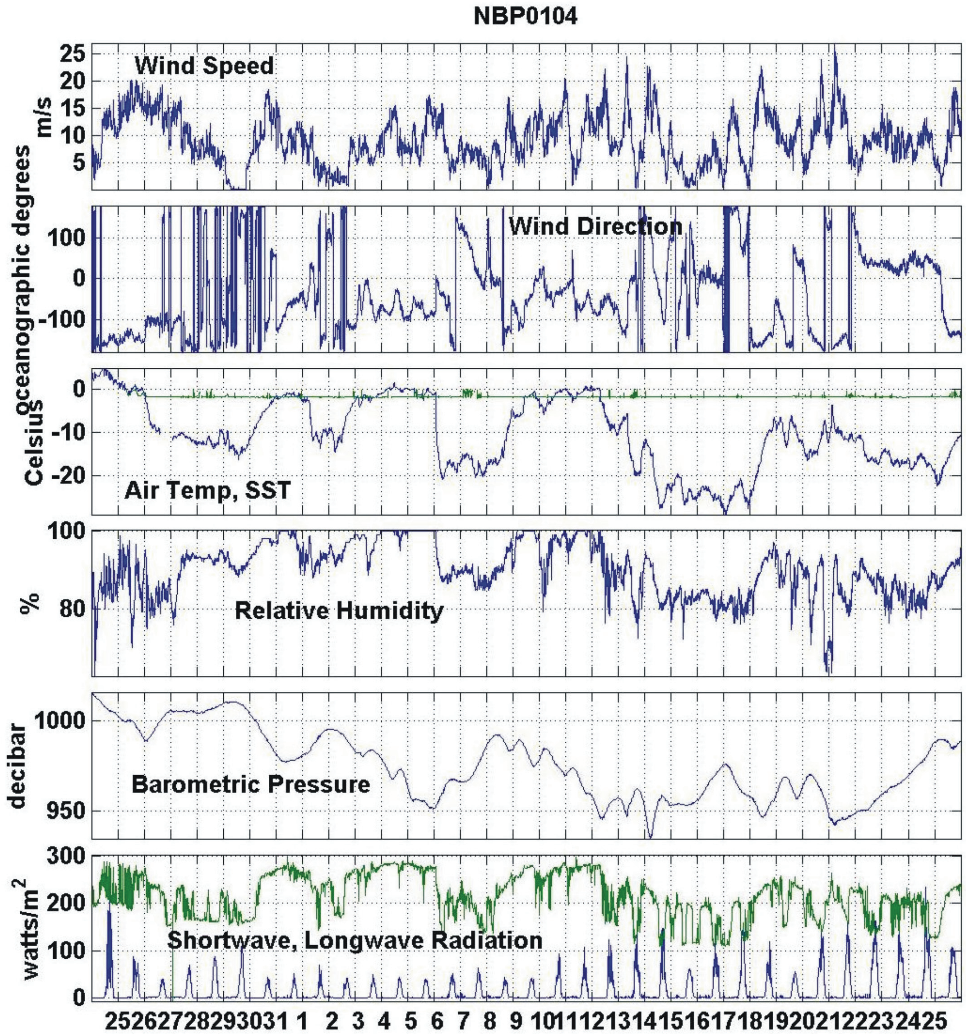



Figure 8. Meteorological data collected during NBP01-04 (July-August 2001).

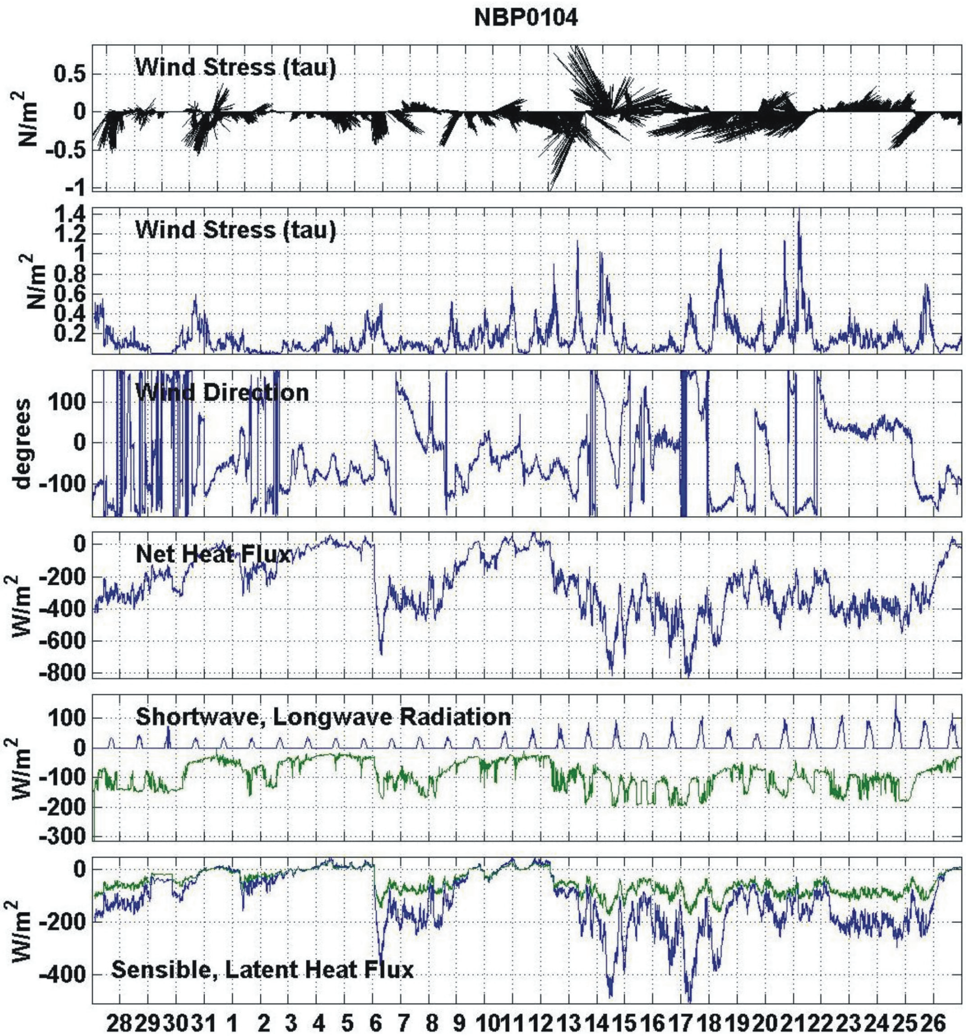



Figure 9. Surface heat flux data for NBP01-04.

While these estimates of the heat flux components include significant measurement uncertainty, the basic picture is one of strong heat losses in open water, which constitutes a small fraction of the surface.

Table 2. Heat flux statistics for "well-behaved" period.

| Variable | Mean | STD | MIN | MAX |
|---|---|---|---|---|
| $Q_{net}$ | 131 | 122 | -425 | -62 |
| $Q_{sw}$ | 5 | 11 | 0 | 74 |
| $Q_{lw}$ | -74 | 45 | -313 | -5 |
| $Q_{sen}$ | -42 | 56 | -195 | 48 |
| $Q_{lat}$ | -21 | 29 | -110 | 35 |

2.5.2 Surface Cooling Part 2 "Poorly-Behaved" Weather

The prior time period was selected primarily because of the near perfect negative correlation between barometric pressure and air temperature. For the remainder of the cruise, the general picture of low pressure systems arriving from the west and causing relatively warm northerlies still holds. However, the passage of strong low pressure systems caused a surge of cold air from the south, and a drop of 20°C in 4 hours and kept air temperatures between -15 and -20°C for 3 days and greatly reduced the correlation coefficient. After that, the air temperature became more spiky than the air pressure.

We experienced some odd weather as low pressure systems approached and squirted over and around the Antarctic Peninsula, often breaking up into multiple lows. For example, 14 August (YD 226) was a day of weather extremes for the cruise. We experienced winds of 29 m $s^{-1}$ (55.24 kts) at 0510 UTC, the lowest air temperature thus far, -27.9°C at 1413 UTC, the lowest barometric pressure of the cruise at 933.6 mb at 0522, and besides the first day, 24 July, we experienced the sunniest day thus far, with shortwave solar insolation reaching 155 W $m^{-2}$. Why, exactly, did this happen? These were not separate low and high pressure systems passing in a matter of days. Rather, the isobar images suggest the approach of a strong low pressure system with isobars tightly packed. This system stalled as it approached the mountains of the Antarctic Peninsula and sort of squirted through the passes, breaking up and reforming. It looks like these offspring passed over us in succession, with the final low pressure system being the most extreme in a series of bizarre, difficult to predict, weather patterns. Thereafter, we experienced three days of colder temperatures (YD 226.5-229.5), with a maximum temperature of -20°C and an average of -24.2°C, which hindered some of the science onboard. The weak southerly winds were then finally broken by some northerlies which brought some relative warmth and moisture.

For the remainder of the cruise we experienced a continuation of poorly behaved low pressure systems, which interacted with the land in a difficult to predict fashion. The southerly winds following a low pressure system bring dry cold air off the continent and cause large heat losses in the ocean. Table 3 gives surface heat flux statistics for the entire period in the SO GLOBEC study region.

Table 3. Heat flux statistics for entire period.

| Variable | Mean | STD | MIN | MAX |
|---|---|---|---|---|
| $Q_{net}$ | 247 | 181 | -830 | -80 |
| $Q_{sw}$ | 9 | 20 | 0 | 182 |
| $Q_{lw}$ | -92 | 46 | -313 | -5 |
| $Q_{sen}$ | -114 | 107 | -508 | 48 |
| $Q_{lat}$ | -175 | 35 | -175 | 35 |

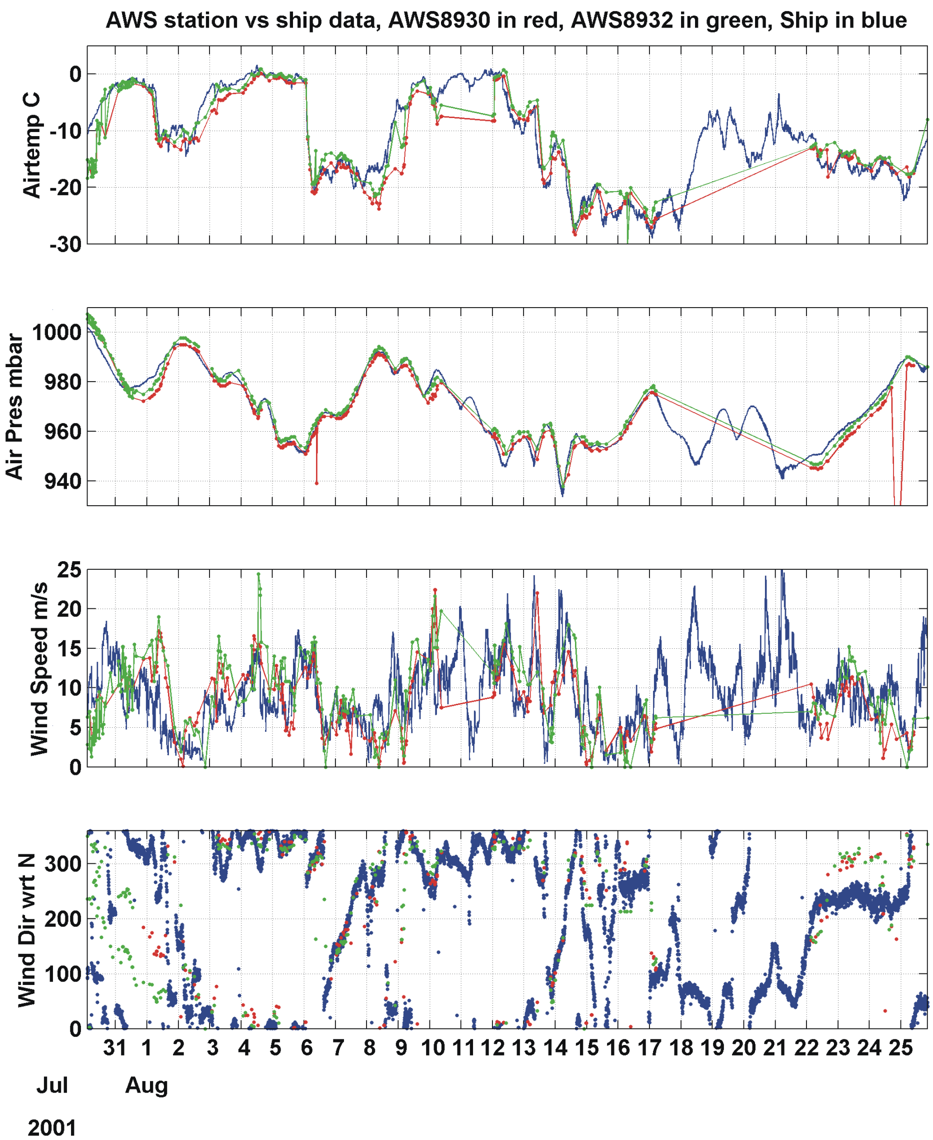



Figure 10. Preliminary comparison of the unprocessed automatic weather station data received via email versus shipboard meteorological measurements.

*2.6 Automated Weather Station Report*
*(Jason Hyatt and Bob Beardsley)*

Two Automated Weather Stations (AWSs) were deployed within Marguerite Bay during NBP01-03. Each AWS measures wind speed and direction, air temperature and pressure, and relative humidity, using sensors mounted on a 10-foot mast. The propeller anemometer is centered at an approximate height of 3.4 m above ground, the air temperature and relative humidity sensors at 3.1 m, and the barometer at 1.5 m. A data logger collects data from the various sensors and sends reformed data to an ARGOS satellite transmitter. The AWS is powered by lead acid batteries that are recharged using a solar panel mounted on the mast oriented north. The AWS units were supplied by Dr. Charles Sterns and George Weidner at the University of Wisconsin, Antarctic Meteorological Research Center (AMRC), who receive the ARGOS AWS data and transmit the pre-quality controlled data to the ship twice daily.

AWS 8930 was installed on the main island in the Kirkwood Islands group on 25 May 2001. AWS 8932 was installed on a small rocky island just east of Dismal Island in the Faure Island group in Marguerite Bay on 27 May 2001. See the NBP01-03 cruise report for a summary of the two stations.

The stations showed good agreement with the ship's onboard MET sensors (Figure 10). However, a quantitative analysis of the AWS weather station data should wait until the AMRC team does quality control on the entire data set. For future cruises, it would be desirable to organize beforehand receipt of the AWS data via email for a few days prior to departure, and during the crossing of the Drake Passage. However, once in the study area, the data is of less use, and should only be checked to verify that the sensors are working and do not need attention.

**3.0 Nutrients**

Kent A. Fanning [PI not present on cruise], Robert T. Masserini Jr., Yulia Serebrennikova

*3.1 Introduction*

It is reasonable to state that, after temperature and salinity, dissolved inorganic nutrients (nitrate, nitrite, phosphate, ammonia, and silica) are central to understanding the circulation of waters in and around Marguerite Bay. Deeper water upwelling to shallower regions close to the Antarctic Peninsula should be traceable by higher nutrient signatures. Nutrient concentrations nearer to the sea surface are important to physical/chemical modeling of the fate of plankton in the region that sustain krill, both as "targets" to be explained by nowcasting and as starting points for forecasting.

*3.2 Methods*

Analytical methods used for silica, phosphate, nitrite, and nitrate follow the recommendations of Gordon *et al.* (1993) for the WOCE WHP project. The analytical system we employ is a five-channel Technicon Autoanalyzer II upgraded with new heating baths, proportional pumps, colorimeters, improved optics, and an analog to digital conversion system (New Analyzer Program v. 2.40 by Labtronics, Inc.) This Technicon is designed for shipboard as well as laboratory use. Silica is determined by forming the heteropoly acid of dissolved orthosilicic acid and ammonium molybdate, reducing it with stannous chloride, and then measuring its optical transmittance. Phosphate is determined by creating the phosphomolybdate heteropoly acid in much the same way as with the silica method. However, its reducing agent is dihydrazine sulfate, after which its transmittance is also measured. A heating bath is required to maximize the color yield. Nitrite is determined essentially by the Bendschneider and Robinson (1952) technique in which nitrite is reacted with sulfanilamide (SAN) to form a diazotized derivative that is then reacted with a substituted ethylenediamine compound (NED) to form a rose pink azo dye which is measured colorimetrically. Nitrate is determined by difference after a separate aliquot of a sample is passed through a cadmium reduction column to covert its nitrate to nitrite, followed by the measurement of the "augmented" nitrite concentration using the same method as in the nitrite analysis.

In the analytical ammonia method, ammonium reacts with alkaline phenol and hypochlorite to form indophenolblue. Sodium nitroferricyanide intensifies the blue color formed, which is then measured in a colorimeter of our nutrient-analyzer. Precipitation of calcium and magnesium hydroxides is eliminated by the addition of sodium citrate complexing reagent. A heating bath is required. Our version of this technique is based on modifications of published methods such as the article by F. Koroleff in Grasshoff (1976). These modifications were made at Alpkem (now Astoria-Pacific International, Inc.) and at L. Gordon's nutrient laboratory at Oregon State University.

### *3.3 Data*

Nitrate, nitrite, phosphate, ammonia, and silica were measured from every Niskin bottle tripped from all hydrocasts on this cruise. These data are available on the cruise CD-ROM.

### *3.4 Preliminary Results*

Nutrient data show considerable structure along and across the west Antarctic Peninsula continental shelf within the SO GLOBEC study region. Regions of upwelling and downwelling are clearly evident in the nitrate and silicate distributions. The ratio of silicate to nitrate was used to track the upwelling of Upper Circumpolar Deep Water within the study area. The utility of nutrients as water mass tracers was demonstrated in hydrographic features seen during this cruise. Within the mixed layer the ammonia concentration was significantly lower associated with the coastal current around Adelaide Island. It may be that ammonia can be used as a conservative water mass tracer during periods of extremely low primary productivity in this region, as was the case during this cruise. Also, a bolus of water with a lower silica signature was seen during the first occupation of station 16. This bolus of water is associated with what is believed to be a recent intrusion of warm oceanic water onto the shelf.

High ammonia concentrations were observed at stations closer to land and further south along the shelf region. Highest ammonia values, greater than 2.26 μmol, were measured from stations within Marguerite Bay. This region of high ammonia was consistent with the findings on the first U.S. SO GLOBEC survey cruise, NBP01-03. However, these ammonia concentrations are essentially 50% of what was found on this cruise. Reduced nitrate and nitrite values were also associated with the stations mentioned above. Since all of these components are in dynamic balance moderated by microorganisms, the answer to why ammonia is so abundant could relate to its production rate being enhanced, possibly by large krill populations, or its consumption rate slowing down. The two most likely ways that ammonia is consumed are uptake by primary producers, maybe low now that it's almost winter, and nitrification, in which bacteria oxidize ammonia to nitrite and nitrate. Final analysis of krill distribution patterns, along with nitrifying bacteria studies, during NBP01-04 are essential in determining processes contributing to the high ammonia measured.

### *3.5 References*

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Grasshoff, K. 1976. Methods of Seawater Analysis, Verlag Chemie, Weinheim, Germany, and New York, NY, 317 pp.

## 4.0 Primary Production

(Wendy Kozlowski, Erin Macri, and Maria Vernet [PI not present on cruise])

### *4.1 Introduction*

The estimation of primary production has three main objectives: (1) estimation of primary productivity rates during fall and winter in the area of study as a possible source of food for krill and other zooplanktors; (2) understanding the meso-scale patterns of phytoplankton distribution with respect to physical, chemical and biological processes; and (3) obtaining insight into the over-wintering dynamics of phytoplankton, including their interaction with sea ice communities. For this purpose, primary production was measured with two methods during this cruise: Photosynthesis versus Irradiance (PI) curves to estimate potential primary production and information on the dynamics of light adaptation; and finally, profiles with a Fast Repetition Rate Fluorometer (FRRF), with the aim to increase resolution in the sampling of phytoplankton activity, and the expectation of modeling primary production with this method using $^{14}C$ experiments as comparison. A third approach, that of estimating daily net production with simulated *in situ* (SIS) experiments, was seldom performed as low irradiance levels precluded any positive carbon uptake rates. Additionally, measurements of chlorophyll and particulate carbon (POC) were taken for estimates of phytoplankton biomass, and irradiance collected from surface and profiling Photosynthetically Available Radiation (PAR) sensors.

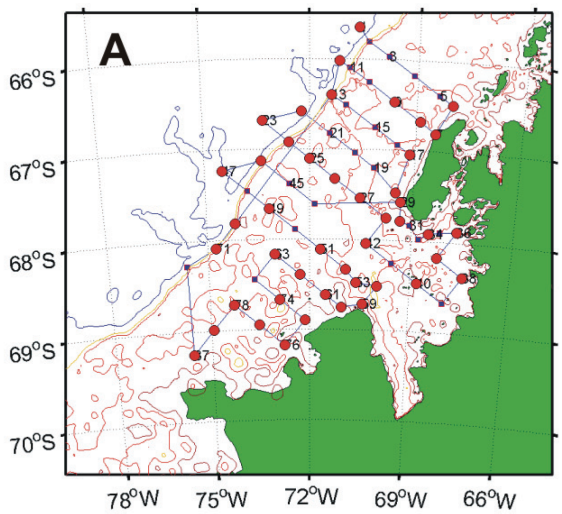
### *4.2 Methods*

#### 4.2.1 Sampling Locations

See Figure 11A for a map of the stations where PI experiments were run. SIS experiments were done approximately once every other day, until the incubator became unusable due to the buildup of frozen seawater on 12 August after a run of extremely cold temperatures. The FRRF was deployed at all production stations where the depth was 500 meters or less. Chlorophylls were sampled from all stations where the CTD/Rosette was deployed.

#### 4.2.2 Depths

For the PI curves, water was collected from the Niskin bottle that corresponded most closely to a depth of 5 meters. For the SIS experiments, water was collected at what was called the primary depths: surface, and at 5, 10, 15, 20, and 30 m. The FRRF was deployed as part of the CTD/Rosette, with a descent rate of only 10-15 m $min^{-1}$ in the first 50 m, somewhat slower than the deeper section of the standard CTD casts. POC samples were collected from the surface, 5, 10, 15, 20, and 30 m. Chlorophylls were collected at the same depths as those for the SIS experiments, plus additional standard depths of 50 and 100 m. Occasionally, additional samples were taken at depths between 100 and 500 m to check for deep water chlorophyll presence that might have been seen in krill gut contents.



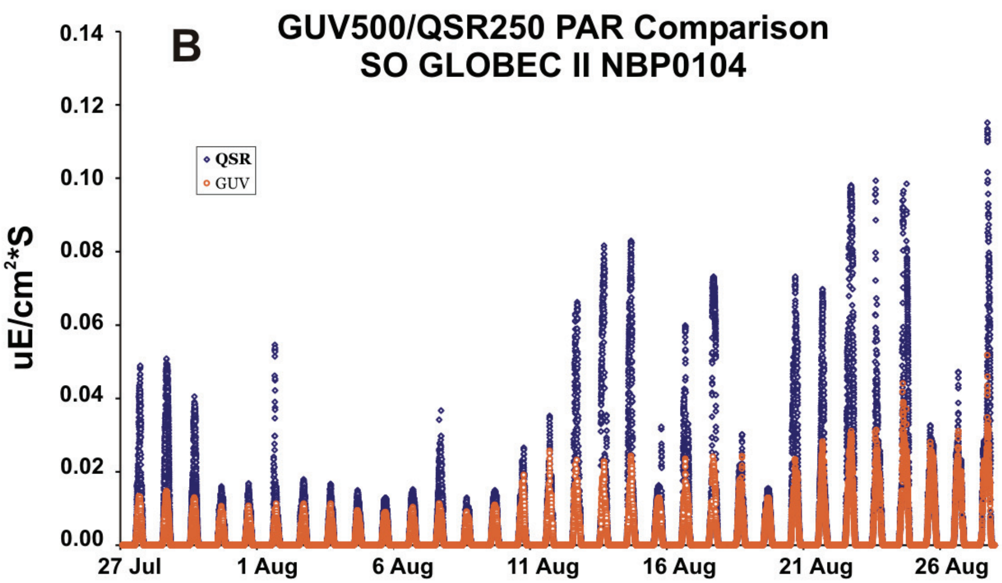




Figure 11. A) Map of all CTD stations sampled (small blue squares), with overlay of those stations where primary production was measured (red dots). B) Plot of comparison of Biospherical Instruments QSR-240 and GUV 500 Photosynthetically Active Radiation (400-700 nm) measurements over the course of NBP01-04.

4.2.3 Ice Sampling

See Appendix 10 for sampling design and methods for sea ice collection. Sub-samples were taken from those sea ice cores, which showed the most color during chlorophyll filtration. Table 4 contains information on cores where primary production was run.

Table 4. Summary of sea ice primary production samples, including preliminary estimates of maximum production levels based on PI curves, in mg Carbon per unit chlorophyll per hour. Note that at some stations, production was below the limit of detection (BLD) for our methods.

| sample | core section sampled | date collected | grid station | sta. | cor. CTD | 2ml PIs | 15 ml PIs | µg chl /l original sample | mgC/ chl/h |
|---|---|---|---|---|---|---|---|---|---|
| 9 | 0.42-0.59 | 08/04 | 341.220 | 25 | 25 | 2 | 0 | 0.810 | 0.10 |
| 10 | 0.85-0.95 | 08/04 | 342.220 | 25 | 25 | 2 | 0 | 0.434 | BLD |
| 11 | 0.45-.055 | 08/04 | 341.220 | 25 | 25 | 2 | 0 | 0.458 | BLD |
| 12 | brine | 08/07 | 331.-003 | 38 | 33 | 2 | 0 | 0.216 | 2.21 |
| 15 | 0-0.25 | 08/07 | 331-.003 | 38 | 33 | 2 | 0 | 0.321 | 0.14 |
| 17a | 1.40-1.49 | 08/11 | 261.295 | 47 | 46 | 2 | 0 | 22.614 | 0.26 |
| 22 | 0.24-.67 | 08/13 | 261.140 | 51 | 50 | 2 | 0 | 1.465 | 0.14 |
| 24 | brine | 08/15 | 256.080 | 53 | 52 | 1 | 1 | 0.068 | BLD |
| 26 | brine | 08/16 | 268.057 | 54 | 53 | 1 | 1 | 0.037 | BLD |
| 27a | 0.13-0.35 | 08/18 | 181.140 | 74 | 60 | 1 | 1 | 1.399 | 0.14 |
| 28a | 0-0.16 | 08/20 | 101.180 | 83 | 65 | 2 | 0 | 2.332 | 0.12 |
| 28b | 0.75-1.21 | 08/20 | 101.180 | 83 | 65 | 1 | 1 | 1.272 | 0.16 |
| 29 | 0-0.24 | 08/20 | 101.180 | 83 | 65 | 1 | 1 | 4.870 | 0.12 |
| 32 | 0-0.18 | 08/23 | 181.241 | 71 | 68 | 1 | 1 | 1.506 | 0.12 |
| 33 | 0-0.16 | 08/23 | 181.241 | 71 | 68 | 1 | 1 | 0.023 | BLD |
| 34 | 0.28-0.47 | 08/25 | 421.145 | 16 | 73 | 1 | 1 | 18.583 | 0.26 |

4.2.4 Equipment

Chlorophylls were measured using a Turner Designs Digital 10-AU-05 Fluorometer, serial number 5333-FXXX, calibrated using a chlorophyll a standard from Sigma Chemicals, dissolved in 90% acetone. The "Fast Tracka" Fast Repetition Rate Fluorometer, serial number 182037, is made by Chelsea Instruments, and was outfitted with independent depth and PAR sensors. All data was recorded internally to the instrument, and data was downloaded directly to computer after every few casts. Incubations for the SIS experiments were done in Plexiglas tubes, shaded to simulate collection light levels with window screening, incubated in an on-deck Plexiglas tank, which was outfitted with running seawater in order to maintain in situ temperatures. PI curves were done in custom built incubators, designed to hold 7 ml vials, irradiated at light levels between zero and 460 $\mu E\ m^{-2}\ s^{-1}$, and were attached to water baths to maintain *in situ* collection temperatures. Additional PI curves were run at a selection of stations using similar incubators, designed to hold 20 ml vials (15 ml sample volume). Irradiances in these incubators were similar to those in the 7 ml, with light levels ranging from zero to 600 $\mu E\ m^{-2}\ s^{-1}$. POC samples will be analyzed upon return to the United States. Light data was collected using a Biospherical Instruments GUV Radiometer, serial number 9250, mounted on the science mast, configured with a PAR channel, as well as channels for 305, 320, 340 and 380 nm wavelengths. Additional PAR data was collected using a Biospherical Instruments QSR-240 sensor, serial number 6357, also mounted on the science mast.

*4.3 Data Collected*

Over the course of the 31 science days of this trip, a total of 100 PI experiments were done at 46 of the 72 stations sampled. An additional 32 PI curves were done on 16 sea ice core sections from 10 coring locations (Table 4). A total of only 6 SIS experiments were completed, due to freezing of the on deck incubator, and the FRRF was deployed a total of 26 times.

For estimations of biomass (standing carbon stocks), both POC and chlorophyll samples were taken. A total of 256 POC samples were taken (plus blanks), and 677 chlorophyll samples were taken from the 72 CTD stations.

Surface PAR data was taken on all days that primary production experiments were done. GUV data were collected at two-minute intervals and logged directly to computer (see Figure 11B for daily measured light levels). QSR PAR data were collected as part of the JGOFS meteorological data set. A comparison of the two instruments was done to continue to monitor differences between the two types (scalar vs. cosine) of sensor (Table 5). PAR data were also collected during each daylight CTD cast using a profiling PAR sensor, as well as on the FRRF, and will be used in conjunction with surface PAR data for the analysis of water column production.

*4.4 Preliminary Results*

Final analysis is yet to be completed on the majority of the data collected on this cruise. There appears to be similar north-south and onshore-offshore trend in the chlorophyll levels as was seen in the first U.S. SO GLOBEC survey cruise, NBP01-03, with slightly higher levels seen on the northern, outside part of the grid. Chlorophyll values ranged from 0.01 µg $l^{-1}$ down to 0.03 µg $l^{-1}$ in the top 30 m throughout the grid, with a maximum integrated value seen at consecutive station three (3.7 µg $m^{-2}$ integrated to 100m), and a minimum at consecutive station 87 (1.0 µg $m^{-2}$). Water column primary production was extremely low throughout the grid, with only a few stations (consecutive stations 15, 16, 22, 27, 28, 30, 51, 52, 59, 62, 66 and 71) with measurable production levels. Additionally, there were several sea ice core sections that were photosynthetically active, and preliminary estimates of maximum production ($P_{max}$) for these stations are listed in Table 4. Note that with the exception Brine 12 and Samples 17 and 34 which had considerably higher chlorophyll, most of the cores exhibited similar $P_{max}$ values, regardless of the original samples' chlorophyll levels.

Table 5. PAR (Photosynthetically Available Radiation, 400 - 700 nm) data, from BSI GUV500 mounted on Science Mast. Day lengths and daily irradiance values are calculated using PAR values above 0.0 $\mu E\ cm^{-2}\ s^{-1}$.

| Date | Sunrise | Sunset | Day Length (hrs) | $\mu E\ cm^{-2}$ |
|---|---|---|---|---|
| 27-Jul | 13:04 | 20:30 | 7:26 | 167.05 |
| 28-Jul | 12:50 | 20:20 | 7:30 | 189.10 |
| 29-Jul | 12:59 | 20:31 | 7:32 | 167.54 |
| 30-Jul | 13:05 | 20:35 | 7:30 | 127.50 |
| 31-Jul | 13:10 | 20:22 | 7:12 | 115.12 |
| 1-Aug | 13:10 | 20:24 | 7:14 | 110.50 |
| 2-Aug | 13:07 | 20:33 | 7:26 | 135.05 |
| 3-Aug | 13:16 | 20:28 | 7:12 | 119.20 |
| 4-Aug | 13:21 | 20:37 | 7:16 | 118.48 |
| 5-Aug | 13:14 | 20:26 | 7:12 | 121.18 |
| 6-Aug | 12:57 | 20:29 | 7:32 | 129.37 |
| 7-Aug | 12:48 | 20:40 | 7:52 | 144.58 |
| 8-Aug | 12:51 | 20:39 | 7:48 | 107.77 |
| 9-Aug | 12:59 | 20:51 | 7:52 | 159.07 |
| 10-Aug | 13:02 | 21:08 | 8:06 | 203.83 |
| 11-Aug | 13:01 | 21:07 | 8:06 | 212.85 |
| 12-Aug | 12:52 | 21:04 | 8:12 | 233.29 |
| 13-Aug | 12:39 | 20:53 | 8:14 | 255.98 |
| 14-Aug | 12:36 | 21:04 | 8:28 | 267.36 |
| 15-Aug | 12:29 | 21:07 | 8:38 | 211.51 |
| 16-Aug | 12:27 | 21:07 | 8:40 | 256.52 |
| 17-Aug | 12:37 | 21:23 | 8:46 | 301.79 |
| 18-Aug | 12:39 | 21:21 | 8:42 | 244.54 |
| 19-Aug | 12:34 | 21:18 | 8:44 | 200.63 |
| 20-Aug | 12:30 | 21:34 | 9:04 | 322.20 |
| 21-Aug | 12:35 | 21:41 | 9:06 | 345.20 |
| 22-Aug | 12:28 | 21:54 | 9:26 | 463.26 |
| 23-Aug | 12:14 | 21:52 | 9:38 | 426.33 |
| 24-Aug | 11:50 | 21:46 | 9:56 | 549.50 |
| 25-Aug | 11:46 | 21:36 | 9:50 | 456.88 |
| 26-Aug | 11:41 | 21:33 | 9:52 | 430.17 |
| 27-Aug | 11:08 | 21:28 | 10:20 | 542.93 |

## 5.0 Microplankton studies

(Scott Gallager, Philip Alatalo, Gareth Lawson, Karen Fisher)

### *5.1 Objectives*

1. To provide an additional perspective on the microplankton prey field utilized by larval and adult krill by quantifying abundance and motion characteristics, (i.e., swimming behavior) in relation to particle size distribution;

2. To determine the vertical and horizontal distribution of microplankton including pelagic ciliates and heterotrophic dinoflagellates along the western Antarctic Peninsula during austral autumn and winter;
3. To relate microplankton distributions to vertical gradients in density, salt, mixing intensity, and light distribution, and horizontal gradients in water mass distribution and surface currents; and
4. In collaboration with Kendra Daly *et al*., to determine experimental feeding rates of larval krill feeding on microplankton and detritus.

*5.2 Methods*

Standard microplankton sampling: Ten-liter Niskin bottle samples were taken from 65 of the 75 CTD stations along a grid extending about 20 nm both north and south of Marguerite Bay and 20 nm offshore. Stations actually sampled are indicated in Appendix 6. Bottle depths for microplankton sampling were chosen keeping the following vertical regions of the water column in mind: the upper mixed layer, a fresher water lens (if present usually <20 m), the halocline beneath the mixed layer, chlorophyll maxima and minima, and usually a near-bottom deep sample. Four samples were taken at each CTD station while more were taken if specific regions or strata seemed interesting based on the CTD data or data from the BIOMAPER-II and the VPR. Samples were removed from the top of the Niskin bottles by gently siphoning through wide bore tubing. This procedure has been shown to minimize damage during sample transfer particularly to large protists and aggregates (marine snow) (Gallager *et al*. 1996). Each sample depth was processed by preserving 200 ml in 2% Acid Lugol's fixative and by observing swimming behavior on live, unconcentrated samples by the technique of Gallager *et al*. (1996). For the purpose of distinguishing between heterotrophs and autotrophs, 200 ml samples were fixed in 10% buffered formalin at stations where the chlorophyl maximum was particularly marked. In addition, 1-liter samples were taken at a number of stations and processed by filtration on to 0.8 μm black polycarbonate filters and stained with DAPI. A DAPI stock with 1% formalin was made to 1 mg DAPI per ml deionized water. A 50 μl stock was added per ml of sample after concentration in the filter tower to 10 ml or less. Slides were made with immersion oil and subsequently frozen for shipment to Woods Hole Oceanographic Institution (many thanks go to Frank Stewart for donation of the DAPI stain). Some slides were held at 0°C in the dark for a few hours until observed under fluorescence microscopy using a DAPI filter set on a Zeiss Axiophot upright microscope with 20x and 40x objectives. Digital images were saved for further counting and processing of 30 fields along a grid line on each filter. Large heterotrophic protists appeared blue with white nuclei using this procedure, while diatoms, autotrophic dinoflagellates, auto and mixotrophic and other pigment-containing cells appeared also to contain some low level of orange or red fluorescence.

Live samples were siphoned directly into 250 ml tissue culture flasks and then placed into a refrigerated incubator at 1°C. Each flask was placed sequentially in a recording box with a dark field illumination source and video camera equipped with a macro lens. The fiber optic light source was filtered to about 700 nm with a dark red filter. About 4 to 10 minute video records were made for each sample. All records were recorded on SVHS recording tape while some were processed in real time (see below).

The fully automated particle tracking of microplankton from video data requires capturing a 30-second video sequence at 30 frames per second into an AVI file, followed by importing the AVI into Matlab one frame at a time. Each frame is binerized against a threshold and each particle's centroid, maximum and minimum axes are recorded in a matrix. The next frame is imported and a second matrix of pixel locations is produced. A simple nearest-neighbor algorithm is then used to determine if there are particles within a certain displacement window between matrix one and matrix two. If the centroids are within the window, a particle path is created. After all paths have been created the ensemble mean velocity vector for all particles in each frame is subtracted from the instantaneous velocity vector of each particle in the field. This process removes any common mode movement associated with ship roll. The result of the processing is a table of data for each particle in the field for calibrated diameter, displacement, speed, motion vector, NGDR (net to gross displacement), and energy dissipation (calculated by the Lagrangian integral length scale technique). These statistics are used as characteristics in a discriminant analysis to determine associations between the swimming behavior of micro-plankton. The result is a description of the prey field from the perspective of the energy and frequency of motion and size distribution.

*5.3 Time Course Feeding Experiments (completed in collaboration with Kendra Daly)*

Ten time course feeding experiments were completed with furcilia krill collected by divers under the direction of Kendra Daly. Krill were held without food in 10 l buckets for some period of time before used in an experiment.

5.3.1 Experiment 1: 8/11/01

*Purpose:* To get an idea as to how many particles furcilia consume and over what time period as a pilot to more extensive experimentation.

Furcilia collected by divers at station 35. Water sample from station 50 bucket sample.

*Treatments:* 3 control flasks, 3 flasks with 1 krill, 3 flasks with 2 krill, 3 flasks with 4 krill.

Sampled: 0, 8, 17, and 38 hours

*Processing :* At each time interval, each flask was placed into the recording system and about 5 minutes of video was recorded. In addition, a 3-minute AVI file was created using a visual basic program and Matrox capture board. The AVI file was immediately processed in Matlab using the following routine: bugsdiam.m, which calls initializebugiam.m, and newbugtrackdiamonly.m, These programs calculate the diameter of each particle in the field and plots a frequency histogram with time. The output is a plot of frequency and the change in mean diameter over time in addition to a file called filename_hist. The hist file contains the statistics for the time point which is then submitted to plothistexp1.m. This concatenates all the time points into a single matrix and does some plotting. The m file selectexp1.m then is used to pull out controls and experimental data an runs a two-way analysis of variance (ANOVA).

*Results:* Particles in the size bins between 50 and 100 μm decreased relative to the controls in the 4 furcilia treatments only, and only after 17 h. Variability was very high in the controls. It was decided to repeat the experiment using 4 animals and approximately 8-hour time points.

5.3.2 Experiment 2: 8/14/01

*Purpose:* To observe particle ingestion directly through staining particles with Acridine Orange (AO) and then introducing furcilia.

Furcilia collected at station 35. 3 flasks as control with AO, 3 flasks with 4 krill each.

Add 500 μl AO stock in sea water to each experimental flask. Remove all krill after 6 hours and mount on slide. Flasks were recorded at $T_o$ (start time) and $T_f$ (end time). Filter contents of all flasks and observe/freeze under epifluorescence at $T_f$.

*Results:* Furcilia consumed numerous small particles of solid AO suspended in seawater. Guts were jammed with non-fluorescing AO. Gut lining was highly fluorescent with AO suggesting AO particles were being ingested and then the AO dissolved into the gut walls. Photographs were taken and slides were frozen for analysis at Woods Hole Oceanographic Institution. It was clear that AO should be dissolved in a non-polar solvent along with water. We dried and reconstituted the AO in 10% acetone.

5.3.3 Experiment 3: 8/14/01

*Purpose:* To follow up on experiment 1 to evaluate particle clearance as a function of size and abundance.

Furcilia collected at station 35. 5 flasks as controls, 5 flasks with 4 furcilia each. Water collected en route to station 28 by bucket sample.

*Times sampled:* 0, 7, 12, 24, 48 hours. Data file produced: exp3all.mat

*Results:* About 50% of the particles available less than 200 μm were ingested over 24 h. 100% of available particles greater than 500 μm were ingested. There appeared to be a feeding rhythmicity on order 7 h where feeding would cease and defecation and particle production increased. Data show ingestion of particles between 50 and 200 μm is directly proportional to particle concentration through the concentrations of this experiment.

5.3.4 Experiment 4: 8/15/01

*Purpose:* To follow up on experiment 2 with AO dissolved in 10% acetone

Furcilia collected at station 35. 3 flasks with 10% acetone and AO. Water from bucket sampled at station 52.

*Results:* Fluorescent microplankton clearly observed in gut lumen. No attempt was made to quantify, just a series of photographs of a variety of animals all at 3-h time point.

5.3.5 Experiment 6: 8/17/01

*Purpose:* To follow up on experiment 3 with a full blown particle depletion experiment with water from two depths. What made this experiment interesting was that furcilia were concentrated in a thick layer between 80 and 100 m and at the surface as observed with the ROV. Therefore, this was a natural experiment to see where the furcilia would do better, at depth or at the surface.

Furcilia were collected at station 26, dive 4. Water was collected at station 60 and taken from both surface and 100 m.

Five flasks as controls without animals and 5 flasks with 4 furcilia each. In addition to video taping each flask, a $T_o$ and $T_f$ sample were collected and processed by filtration and stained with DAPI.

*Sample times:* 0, 8, 24, 36, 48 hours. Contents of each flask was recorded for 5 minutes at each time point.

*Results:* Compared with the control containers, the particle concentration in containers with experimental animals decreased rapidly within the first 8 hours in all size bins between 50 and 100 μm (Figure 12A). Some evidence of particle production appears in this time series at 35 h. This coincides with visual observations of fecal pellet production. Less, but a detectable loss, was observed for particles in the 150 and 200 μm size bins. This result was also clear in the flasks with water from 100 m. When particle ingestion was plotted as a percentage of available particles to take into account the prevailing size spectrum of particles present in the water, ingestion and fecal production varied as a function of time (Figure 13). Eighty-five to 90% of available particles 25 to 100 μm in size were ingested by furcilia within the first 8 hours in both surface and 100 m water treatments. Between 8 and 24 h both treatments showed signs of fecal pellet production in the 100 μm size bins but continue feeding between 25 and 75 μm. Where larger particles were available in the 100 m treatments, they were completely consumed. By 24 to 36 hours, fecal production increased in the surface water treatment while decreasing in the 100 m treatment. Once again feeding increased between 36 and 48 hours in the surface treatment but not in the 100 m treatment.

Together these preliminary results suggest that furcilia are capable of feeding efficiently (85-90%) on particles in the size range of 25 to 200 μm and may undergo some digestive rhythm between ingestion, processing in the gut, and defecation. Ingestion rates (particles $ind^{-1}$ $hr^{-1}$) as a function of particle size and concentration also support these conclusions (data not shown). From these data we will be able to construct a traditional “Holling” functional response curve with ingestion or particle clearance as a function of particle concentration at a variety of particle bin sizes. These data will be useful in construction of energy budgets and modeling studies.

5.3.6 Experiment 7: 8/18/01

*Purpose:* To determine if adult krill feed on particulate matter as do furcilia.
5 control flasks, 5 experimental flasks each with one adult krill.
Water collected from station 61, 100 m depth
*Results:* This experiment has not been processed as yet but it did not appear as though particle concentration decreased substantially in the experimental flasks.

5.3.7 Experiment 8: 8/22/01

*Purpose:* To repeat experiment 7, but give the adult krill a bit more breathing room in larger containers (buckets).
Water collected from a 90-m CTD sample. 3 adult krill in 2 l of water in buckets.
*Results:* experiment not processed as yet.

5.3.8 Experiment 9: 8/22/01

*Purpose:* To follow up on the AO staining experiment conducted last week (Exp 4) with AO dissolved in deionized water rather than acetone.
5 flasks each with 5 furcilia, water collected from 90 m at station 87 where observations showed many protozooplankton. 500 µl AO in deionized water to each flask (250 ml).
Sampled at 0, 7, 24 hours.
*Results:* Furcilia were removed at each time point and mounted on a microscope slide. Animals were viewed with the FITC filter set only because the ship did not have the set for AO. Fluorescent material was clearly seen in the foregut region, the digestive gland, and lining the gut lumen (Figure 12B). Non-fluorescent material was in the hind gut and being processed into fine faecal threads. Photographs were taken and the slides frozen to await processing at Woods Hole Oceanographic Institution.

5.3.9 Experiment 10: 8/23/01

*Purpose:* To complete a particle staining experiment using DAPI instead of AO since DAPI will allow differentiation of living and dead particulates.
Water collected from station 71 from the 0-m bottle, distributed into 5 flasks. 200 ml stock DAPI was added to each flask and held at 0°C and in the dark.
*Results:* Experiment is ongoing at time of this writing but it appears that furcilia feed extensively on particulates stained with DAPI and survive for extended periods of time.

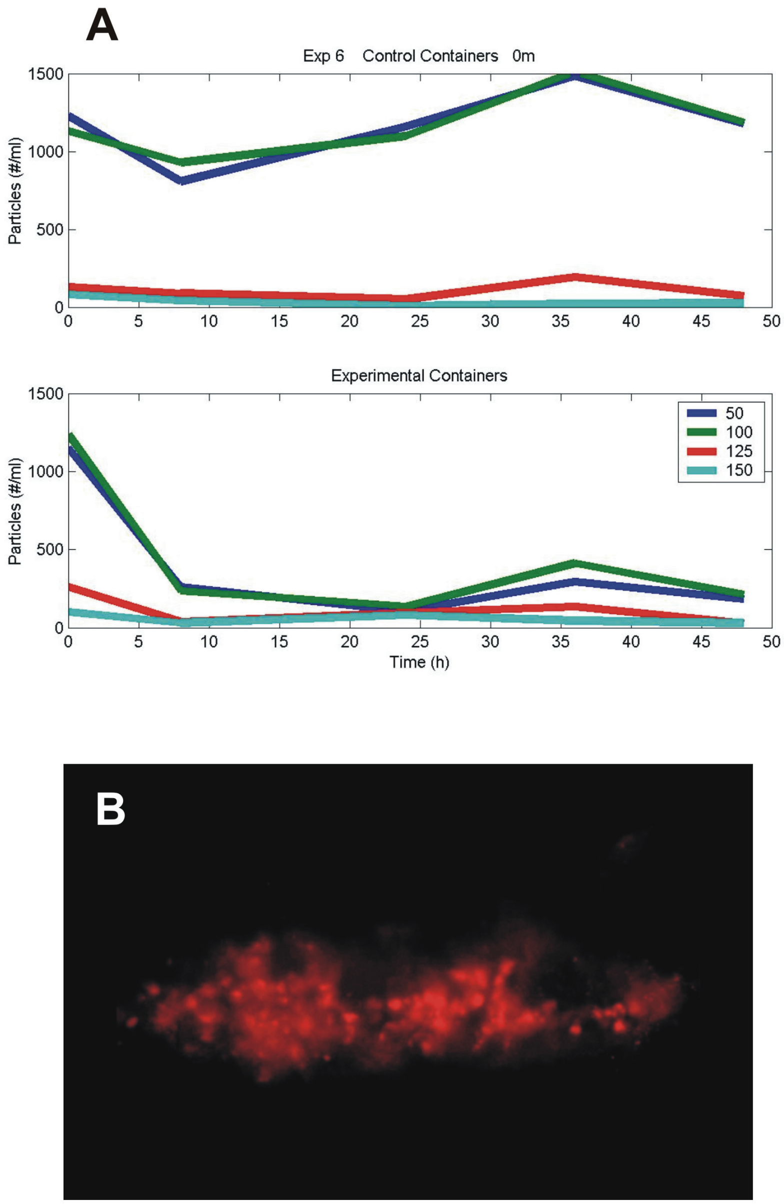



Figure 12. A) Time course of particle depletion in control (top) and experimental (bottom) containers with four furcilia each. Colors represent particle size bins. Values are the mean of five replicates. Note that smaller particles are virtually depleted in the experimental flasks by the 8-h time point. B) Intestinal lumen of a furcilia filled with microplankton and particles stained with AO after feeding on suspension of natural particulates collected from 90 m at station 87.

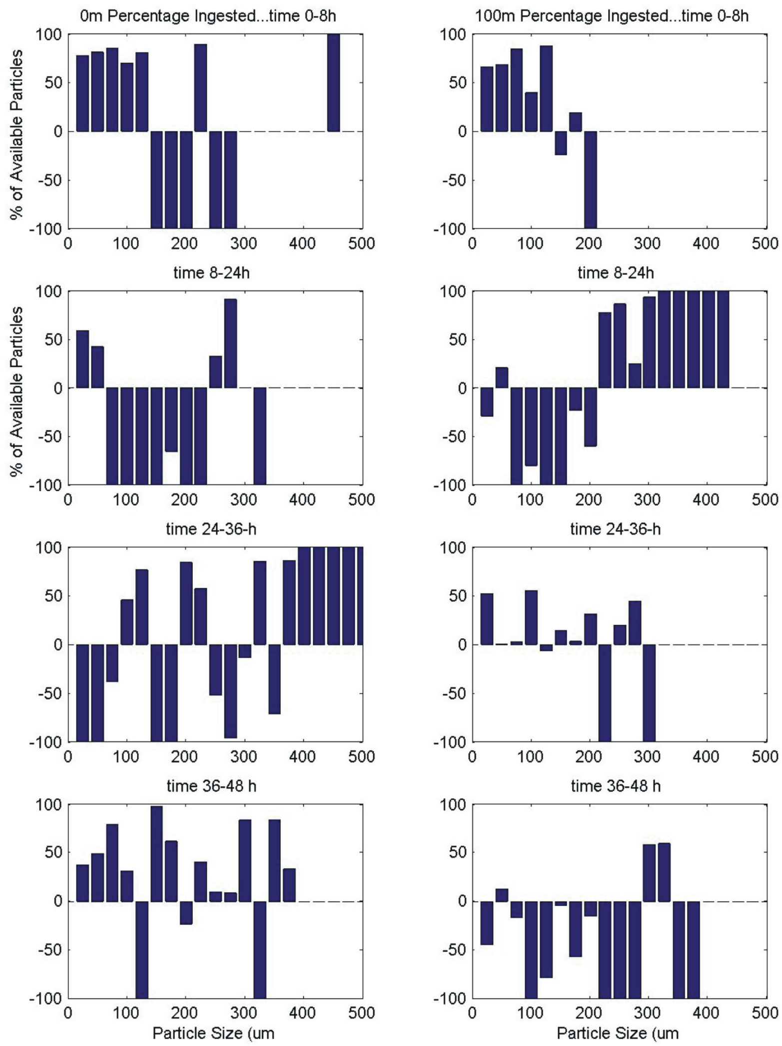



Figure 13. Particle ingestion expressed as a percentage of available particles in each size bin at each time point measured. Treatments are water collected from surface sample (left) and from a depth of 100 m (right). Negative values indicate a net production of particles rather than ingestion. Note that ingestion was high and positive on small particles early in the experiment, but then shifted towards particle production of both small and large particles within 24 hours.

*5.4 Brief Summary of Results for Standard CTD Stations*

Standard CTD samples: Microplankton in the size range of 20 to 100 µm were divided into four functional groups: *Mesodinium* sp., tintinnids, oligotrichs (includes *Strombidium*, *Strobilidium*, *Lohmaniella*, and *Laboea*), and dinoflagellates. Observations discussed here are based on viewing the video of swimming behavior for each station and taking a quick look at slides prepared for epifluorescence microscopy. A full description will await processing all video data, settling and counting of Lugol's samples, and quantifying slides.

There was a marked difference between NBP01-04 and NBP01-03 in microplankton distribution and abundance. On the present cruise (NBP01-04), abundances were orders of magnitude less than previously observed. Only occasionally at the surface or at the very top of the pycnocline were large oligotrichous ciliates seen. No tintinnids were observed anywhere. Unlike on the last cruise (NBP01-03), *Mesodinium* was rare and only seen at a few stations. The most abundant motile protist was most likely heterotrophic dinoflaglates which appeared at most stations and were most abundant at the pycnocline. DAPI stained slides at a variety of stations and particularly the complete series done at station 16 gave the impression of an environment predominated by non-living detrital material with the occasional living organism between 20 and 100 µm at a concentration of 1 to 10 per $l^{-1}$. Cells containing chlorophyll were very rare and consisted of large centric and penate diatoms.

As food for furcilia, the particulate environment at this time of the year is indeed sparse. Furcilia must compensate for such a sparse environment through a number of adaptations including reduced metabolic rates, increased digestion efficiency, scavenging particulates of any composition and based only on size. Complete analyses of these experiments will provide insights into unique overwintering strategies used by both larval and adult krill as well as a description of the microplankton community prevailing during the cold and bleak winter months in Antarctica.

**6.0 Zooplankton Studies**

(Peter Wiebe, Carin Ashjian, Scott Gallager, Cabell Davis [PI not present on cruise])

The winter distribution and abundance of the Antarctic krill population throughout the western Antarctic Peninsula continental shelf study area are poorly known, yet this population is hypothesized to be an especially important overwintering site for krill in this geographical region of the Antarctic ecosystem. Thus, the principal objectives of this component of the program are to determine the broad-scale distribution of larval, juvenile, and adult krill throughout the study area, to relate and compare their distributions to the distributions of the other members of the zooplankton community, to contribute to relating their distributions to mesoscale and regional circulation and seasonal changes in sea ice cover, food availability, and predators, and to determine the small-scale distribution of larval krill in relation to physical structure of sea ice. To accomplish these objectives, the same three instrument platforms that were used on NBP01-03, were used on this cruise. A 1-$m^2$ MOCNESS equipped on this cruise with an OPC was used to sample the zooplankton at a selected series of stations distributed throughout the survey station grid. A towed body, BIOMAPER-II was towyoed along the trackline between stations to collect acoustic data, video images, and environmental data between the surface and bottom in much of the survey area. A ROV was used to sample under the sea ice and to collect video images of krill living in association with the ice under surface, environmental data, and current data. This section of the cruise report will detail the various methods used with each of the instrument systems or in the case of BIOMAPER-II, its sub-systems.

### *6.1 Zooplankton Sampling with the 1-$m^2$ MOCNESS Net System*

(Carin Ashjian, Peter Wiebe, Scott Gallager, Cabell Davis [PI not present on cruise])

#### 6.1.1 Introduction

The 1-$m^2$ MOCNESS sampling of zooplankton had two main objectives. The first was to sample the vertical distribution, abundance, and population structure (size, life stage) of the plankton at selected locations across the broad-scale survey grid. The second objective was to collect information on the size distribution of the plankton, especially the krill, in order to ground-truth the acoustic and video data collected using the BIOMAPER-II multi-frequency acoustic and video plankton recorder system. Using the size distribution of planktonic taxa from different depths and locations, the acoustic intensity resulting from insonification of that water parcel will be calculated to check and ground-truth the acoustic backscatter from the BIOMAPER-II. The dominant species of the taxa enumerated using the VPR also will be identified.

#### 6.1.2 Methods and Approach

Sampling was conducted using a 1-$m^2$ MOCNESS (Multiple Opening/Closing Net and Environmental Sensing System) equipped with 335 $\mu$m mesh nets and a suite of environmental sensors including temperature, conductivity, fluorescence, and light transmission probes (Figure 14A). The MOCNESS also was equipped with a strong strobe light, which flashed at 2-second intervals. Because krill are strong swimmers and likely can see slow moving nets such as the MOCNESS, krill frequently avoid capture by net systems. The rationale behind the strobe system was to shock or blind the krill temporarily so that the net would not be perceived and avoided. For most of the tows, an OPC was mounted on the MOCNESS. Considerable difficulty in configuring the MOCNESS and OPC was encountered because of interference between the two systems. The OPC sampling will be described in a separate section.

Tows were conducted at 17 locations (Figure 14B). Oblique tows were conducted from near bottom to the surface, sampling the entire water column on the down cast and selected depths on the up cast with the remaining eight nets. Typically, the upper 100 m was sampled at 25 m intervals, with 50 m intervals in the intermediate depth ranges and greater intervals (150, 200 m) in the deepest depth ranges. Samples were preserved upon recovery in 4% formalin, except for the first net (water column sample) which was preserved in ethanol to be utilized for genetic analyses.

Towing in the near-total sea ice cover was difficult. Two situations in particular resulted in dangerous towing conditions. 1) During the tow, ice floes in the wake of the ship would become trapped under the tow wire. This resulted in the wire being dragged out and along the surface of the water as the ship moved forward, rapidly pulling the MOCNESS from depth to, ultimately, the surface either under or over the sea ice. This particular situation can have drastic consequences as was demonstrated during tow 2. The MOCNESS was smashed against the underside of the sea ice, dragged across the sea ice, and then fell through the water column to the seafloor, resulting in deformation of frame structural components and loss of communication with the net. Fortunately, damage to the sensors was minimal and the MOCNESS was restored to a useable, somewhat battered, configuration. Vigilant monitoring of the cable by direct human observation (standing on deck or in aft control) and indirect human observation (monitoring with a pan/tilt zoom video camera focused on the wire) alleviated the problem somewhat since immediate identification of a “snag” could produce quick action on the part of the ship operator to bring the ship to a halt. Also, slower towing speeds (1.8 kts) than normal and raising the A-frame to bring the block closer to the transom resulted in the tow wire entering the water close to the stern of the ship where there were fewer ice floes. Despite these strategies, sufficiently heavy sea ice conditions with a rapidly closing ship wake prevented use of the MOCNESS at several locations. 2) Contact with the seafloor was a very real possibility, both during stops for sea ice snags as described above and also when the ship would slow and halt due to heavy sea ice conditions. Deploying no more cable than the water column depth during each tow alleviated this problem, so that the net could not contact the bottom even if the wire were to hang straight down. This strategy limited the maximum sampling depth somewhat since ~1.4 times more wire than sampling depth is required to reach a target depth. Greater sampling depths were achieved by deploying the maximum safe length of wire and then slowing the ship from the regular towing speed of 1.8 kts to a crawl so that the net sank deeper in the water column. Once the maximum depth was reached, the first net was tripped and the ship speed was gradually brought back up to the regular towing speed. The wire then was hauled back at normal recovery speeds.

Difficulties also were encountered with the instrumentation on the MOCNESS. For much of the cruise (tows 1-13), the fluorometer and transmissometer were wired incorrectly through the underwater cables provided with the net system. Very low fluorescence (from the CTD) in the study region prevented observation of this problem, since very low values were displayed as fluorescence data. The cold air temperatures caused the pressure sensor to "freeze" (because of water in the pressure tube) and be non-functioning until the net had been deployed to depths where the water temperature was greater than 0°C. The OPC was equipped also with a pressure sensor, which did not freeze while the instrument was on deck, so that the depth of the net could be monitored using the OPC pressure sensor until the MOCNESS sensor was functioning.

For the first 11 tows, Net 1 was equipped with 500 µm mesh. This net was removed prior to tow 12 and replaced with a 335 µm mesh net. During tow 12, Net 0 was torn beyond easy repair and was replaced with the 500 µm mesh net. All other nets were equipped with 335 µm mesh.

#### 6.1.3 Findings

Overall, abundances were much reduced relative to those observed during the April-May 2001 (NBP01-03) cruise. Very few furcilia or adult krill were seen. The high abundances of large copepods observed at depth during April-May also were usually not seen in the samples collected during the present cruise. Only two locations appeared to have abundant zooplankton; Tow 9, located within Marguerite Bay near the mouth of Laubeuf Fjord, where high biomass and abundances of krill and furcilia were observed and tows 14 and 15, located on the southern end of the shelf, where high abundances of copepods were seen at depth. Locations off of the shelf were characterized by high diversity, but low abundances. Especially low abundances of furcilia were seen on the shelf at locations in the northern edge of the survey regions (tows 3-6). Sampling volumes were comparable between the two cruises, so it is likely that these qualitative observations represent relative plankton abundances on the shelf.

#### 6.1.4 Acknowledgments

Many people assisted with the MOCNESS tows and their assistance is gratefully acknowledged. Special thanks to Romeo LaRiviere, Jay Petersen, Mari Butler, the marine technicians (Jay, Jenny, and Christian), and the bridge crew of the *N.B. Palmer* (Capt. Joe, Val, Dave, Marty, and Jesse).

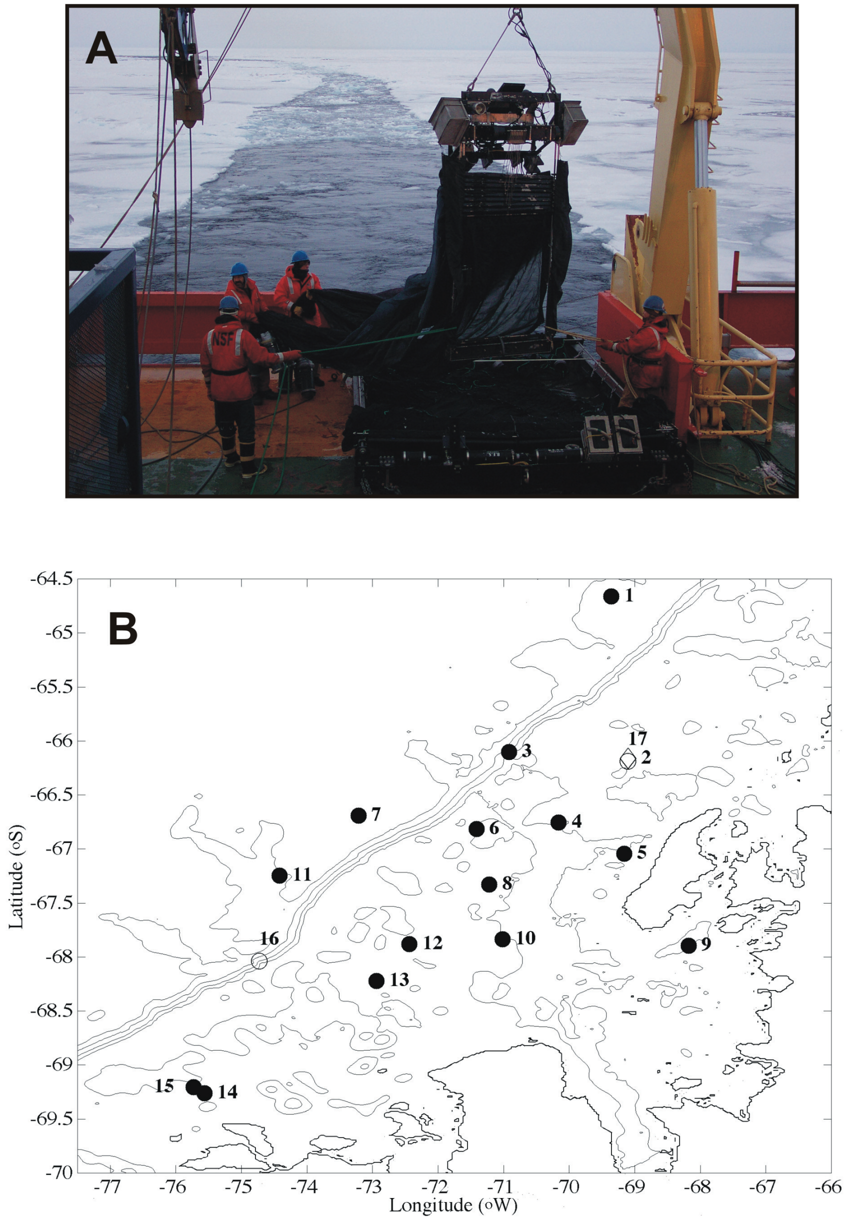



Figure 14. A) The 1-$m^2$ MOCNESS being launched for a tow at station 26 over the 10-$m^2$ MOCNESS. Note the OPC on top of the frame and the strobe light to the left next to one of the two aluminum battery boxes. B) Location of the 1-$m^2$ MOCNESS tows. Net tow numbers are shown next to the symbols. Filled circles indicate locations where the water column was sampled at eight different depth intervals. The open circle indicated the location where only surface to bottom integrated samples were obtained because communication with the net was lost at depth. The open triangle indicates the location where the MOCNESS crashed into the underside of the ice (tow #2); this location was sampled successfully at the end of the cruise (tow #17).

*6.2 BIOMAPER-II Survey*

The BIO-Optical Multi-frequency Acoustical and Physical Environmental Recorder or BIOMAPER-II is a towed system capable of conducting quantitative surveys of the spatial distribution of coastal and oceanic plankton/nekton. The system consists of a multi-frequency sonar, a video plankton recorder system (VPR), and an environmental sensor package (CTD, fluorometer, transmissometer). Also included are an electro-optic tow cable, a winch with slip rings, and van that holds the electronic equipment for real-time data processing and analysis. The towbody is capable of operating to a depth of 300 m at 4 to 6 kts. The system can be operated in a surface towed down-looking mode, in a vertical oscillatory "towyo" mode, or in a sub-surface up/down looking horizontal mode. All three modes were used to some extent on NBP01-04. To enhance the performance and utility of BIOMAPER II in high sea states, a winch, slack tensioner, and over-boarding sheave/docking assembly are used, but on this cruise, the extensive sea ice and lack of sea surface motion made the slack tensioner unnecessary.

As on the first U.S. SO GLOBEC broad-scale cruise (NBP01-03), BIOMAPER-II could be deployed from the stern of the *RVIB N. B. Palmer*. Attached to the starboard side of the A-frame on the *Palmer* was a stiff arm, designed and constructed at the Woods Hole Oceanographic Institution (WHOI), to lower the over-boarding sheave/docking assembly to a level that would minimize the distance that BIOMAPER-II needed to be hauled up to be docked and still clear the stern rail when the A-frame was boomed in. It was shackled at two points to pad eyes on the top of the A-frame. The over boarding sheave articulated and was equipped with a hydraulic ram, so that its position could be adjusted to keep the docking mechanism vertical during launch and recovery, and to move it inboard of the wire when towing.

This system including the hydraulics worked very well under all the conditions experienced during the cruise, including the coldest temperatures of around -28°C, albeit slowly in the cold. In anticipation of the high winds, cold temperatures, and wet working conditions on the stern deck of the *Palmer*, a shipping container, modified into a working “garage” for BIOMAPER-II, was located on the starboard side of the vessel centerline. It was sufficiently forward of the stern crane to enable the towed body to be moved over on dollies to a position where it could be picked up by a motor drive hoist suspended from a movable I-beam and moved inside the van. Given the extreme cold temperatures experienced on this cruise, the van, with its high output radiant and fan driven heaters, proved essential in working on the towed body both for maintenance and for repair, or in providing dry warm storage.

The BIOMAPER-II control van was located on the 03 level inside the helicopter hanger. The heated van accommodates three or four individuals and computers for four operations: acoustic data acquisition and processing, VPR data acquisition and processing, Environmental Sensing System (ESS) acquisition, and hardware monitoring. A power supply in the van provides BIOMAPER-II with 260 volts of DC power. A VHF radio base station and two portable units provided communication with the bridge, deck, and labs. Two deck cameras were mounted on an aluminum mast attached to a corner post on the helicopter pad and used for observing the winch and slack tensioner, and for observing launch and recovery of the towed body. A third camera with pan, tilt, zoom, and focus controls was installed about ten days into the cruise on another post about mid-ships on the helicopter pad. This camera was for observing the cables towing BIOMAPER-II and the MOCNESS and for early detection of sea ice snagging the cables. Inputs to the van from the *Palmer's* navigation and bathymetry logging system, included P-code GPS (9600 baud), Aztec GPS (4800 baud), Bathy bottom depth information, and an ethernet connection to the ship’s network.

The electro-optical cable with a diameter of 0.68 inches was used to tow BIOMAPER-II. The tow cable contains three single mode optical fibers and three copper power conductors. Data telemetry occupies one fiber (using two colors), the video the second, and raw acoustic data the third. A cable termination matched to meet the strengths of the towing cable and the towed body's towing bail was designed and built at WHOI.

BIOMAPER-II was electrically incapacitated on several occasions on NBP01-03, the April-May broad-scale cruise, and remedially repaired at sea. Both the VPR and the HTI acoustic system needed more extensive examination and repair back in the United States between the first and second cruises despite the short time between them. The acoustic system arrived back from HTI (Seattle, WA), three days before the scheduled sailing date, and upon setup and testing, it was discovered that the acoustic system would not work. Trouble shooting lead to a new electronics board that replaced one that had failed during NBP01-03 and it was determined to not be functional. The old repaired board was installed instead and it functioned satisfactorily during the cruise.

During the station activities at station 4 on 28 July, BIOMAPER-II's 43 kHz transducers were swapped because the down-looking transducer stopped working due to some as yet undetermined failure in the transducers electronic circuitry.

During the cruise, BIOMAPER-II was damaged on four occasions (once extensively) when the towed body crashed into the pack ice. The first was on the evening of 30 July. BIOMAPER-II was down around 200 m with 480 m of wire out, when a large sea ice cake caught the wire and took it aft at the surface. With the ship's speed at about 5 kts, within a minute or two, the towed body was pulled up from depth and into the bottom of an ice cake. When we got it on board, it was a mess. The tail assembly was gone and the feet too. The VPR support frame was mangled and the cameras damaged. The towing bail was twisted badly. There were a number of electrical cables running around the telemetry bottle that were cut. All of the acoustics, however, were undamaged, as were most of the environmental sensors except for the transmissometer that got destroyed - top lopped off. It took 2.5 days to effect the repairs and get the towed body back into operation.

On 5 August, while towyoing between stations 41 and 40, something collided with the frame while it was below 30 m. It probably happened while the ship was backing and ramming with all four engines running. We surmise that a big chunk of sea ice got thrust down that far and hit the camera frame when the fish came to the top of a towyos (~ 30 m). One camera was knocked 180 degrees out of alignment and when we tried to turn it around by hand, it could not be budged. Some very large force was required to rotate the camera. The camera frame itself had some welds broken, which were repaired.

Right after the towed body was put into the water for the towyo from stations 33 to 31 on 8 August in the early evening, it got slammed by a big sea ice chunk moving under the ship while we were avoiding a very shallow bit of topography about 15 to 20 m below the ship. The VPR cameras gave us the first indication that there had been a hit when they stopped sending images. BIOMAPER-II was brought on board and we found several parts had structural damage. The tail fin had been damaged - fiberglass on the leading edge of the tail was broken and the tail fin split open exposing the balsa wood core. The aluminum rod support fixture was also bent. The heavy metal spacers that sit under the VPR framework and cameras had the 0.5 inch bolts that fasten the spacer to the top of the main tow body frame sheared off (three of them), and the VPR support frame was bent again. Miraculously, the cameras were not damaged seriously; they needed some minor repair and then, realigning and calibration. The tail fin was patched up with Marine Tex and the framework straightened and re-installed.

About 5 nm from station 50 on 12 August, the towing wire again hung up on a piece of sea ice and the towed body was again pulled to the surface and hit the undersurface of the ice before the ship was stopped. Damage this time were to the tail and the VPR camera frame. A new tail was fabricated out of plywood in the ship's shop and the cameras needed calibrating again.

The level wind on the BIOMAPER-II winch stopped functioning on 2 August just after we had deployed the fish and had about 100 m of cable out. After a long trouble shooting effort, Scott Gallager and Jay Ardai found that a junction box, which was supposed to have been water proofed, had leaked and a short had developed that caused the malfunction. There were other electrical problems associated with the telemetry electronics that hampered VPR or ESS data collection, but most were found and fixed in a relatively short time.

6.2.1 Acoustics Data Collection, Processing, and Results
(Peter Wiebe, Gareth Lawson, Carin Ashjian, Scott Gallager, Cabell Davis [not present on Cruise])

*6.2.1.1 Introduction.* The use of high-frequency sound to ensonify the water column and produce echograms that portray the vertical distribution of entities that backscatter sound is one of the few means of visualizing their distribution and gaining some sense of their abundance. Single frequency systems while useful in this regard, are much less capable of providing insight into the taxonomic makeup of the scatterers than is a system with multiple frequencies. Likewise, echo integration provides an estimate of the strength of the backscattering as a function of depth, but does not provide any information about the size range of the entities whose backscattering has been integrated. The echosounder on BIOMAPER-II provides both echo integration data and target strength data on four of the five pairs of transducers and as a result, in combination with the ground truthing data obtained with the 1-$m^2$ MOCNESS and the VPR, should be able to provide considerable information about the distribution and abundance of the zooplankton populations along the survey tracklines. On NBP01-04, a large quantity of acoustic data were collected during the 4+ weeks of the survey, in spite of the down time for repairing the towed body. Approximately 160 gigabytes of raw acoustic data were recorded and all of these data were processed in real-time so that echograms could be created and comparisons made of the changes in the backscattering fields as the cruise progressed. Of course, the refinements to the processed data are required before a final analysis can be done, but a preliminary look at the data presented below provides insight into the patterns that were observed and the changes that took place between the two SO GLOBEC broad-scale cruises.

*6.2.1.2 Methods.* BIOMAPER-II collects acoustic backscatter echo integration data from a total of ten echosounders (five pairs of transducers with center frequencies of 43 kHz, 120 kHz, 200 kHz, 420 kHz, and 1 MHz). Half of the transducers are mounted on the top of the tow-body looking upward, while the other half are mounted on the bottom looking downward. This arrangement enables acoustic scattering data to be collected for much of the water column as the instrument is towyoed, lowered and raised vertically between a near surface depth and some deeper depth as the ship steams at about 5 kts through the survey track. Due to differences in absorption of acoustic energy by seawater, the range limits of the transducers are different. The lower frequencies (43 and 120 kHz) collect data up to 300 m away from the instrument (in 1.5 m range bins), while the higher frequencies (all with 1 m range bins) have range limits of (150, 100, and 35 m respectively).

There were two transducer configurations used on this cruise. The original (and standard) configuration and MUX assignments were used until the down looking 43 kHz transducer failed and it was swapped positions with its upward looking mate. Most the data acquired on this cruise was with the second configuration.

The acoustic data were recorded by HTI software and stored as .INT, .BOT and .RAW files on a computer hard drive (Appendix 7). Data were compressed (using the PIZIP utility) and transferred to CDs. They were also archived on removable 40 gigabyte hard drives. The .INT and .BOT files were further post-processed using a series of MATLAB files contained in the HTI2MAT toolbox (written by Joe Warren, Andy Pershing and Peter Wiebe) to combine the information from the upward and downward looking transducers. The acoustic backscatter data from the HTI system were then integrated with environmental data from the ESS onboard

BIOMAPER-II. These latter data included depth of the towed body, salinity, temperature, fluorescence, transmittance, and other parameters.

The integrated acoustic and environmental data were concatenated into typically half-day (a.m. or p.m.) chunks and used to make maps of acoustic backscatter throughout the entire water column (or at least to the range limits of the transducers). Larger files (of the entire survey track for instance) are possible, but become unwieldy to plot due to file and memory size. Files were saved as d_am_sv.mat and d_am_sv_w.mat, and a tiff image of a plot of the acoustic data from all five frequencies was also saved. The d_am_sv.mat files are in the correct format for looking at environmental information and can be plotted using the pretty_pic* series of m-files. The data in d_am_sv_w.mat are in New Wiebe format and can be viewed using the curtainnf.m program.

The .RAW files were processed to look at target strength data collected from individual scatterers in the water column. In addition, information about the three-dimensional position of BIOMAPER-II (pitch, roll, yaw) and data from the winch (tension, wire out, wire speed) were recorded.

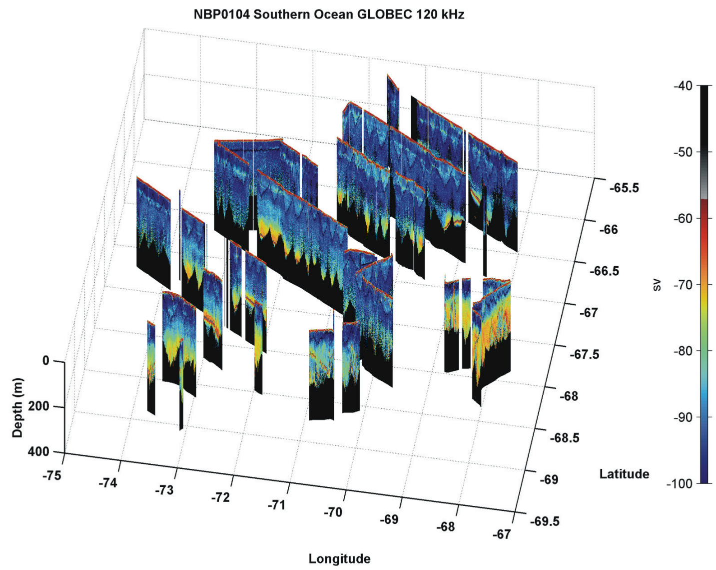
*6.2.1.3 Results.* For the purpose of this report, analysis of the acoustic data collected with BIOMAPER-II is limited to qualitative descriptions of overall patterns. Future quantitative analyses and examinations of the distributions of particular taxa will await the incorporation of the acoustic data with information derived from net tows and the VPR.

The dominant features evident in the acoustic backscattering record include a persistent shallow layer visible at 120, 200, and 420 kHz, located at varying depths across the survey grid, but generally near the top of the pycnocline at ca. 50 to 110 m (Figure 15A). Scattering intensity in the layer was variable, and generally quite weak. This layer tended to be present in both offshore and nearshore areas. On one occasion, during the run between stations 23 and 24, the layer was partitioned into tall and narrow columns, which were most intense near their base, and had the outward appearance of Langmuir circulation cells. Of course, Langmuir cells are wind driven and this area is covered with sea ice, so the structure may have been the result of some kind of thermohaline circulation generated by the freezing of sea water and the resulting increased salinity causing the water to sink.

Also evident was a highly dense bottom layer, varying in thickness from 25 m to as much as 300 m (Figure 15A). This layer was visible primarily at 120 kHz, due to the greater range of this frequency, but was also observed at higher frequencies as the towed body neared the bottom. The bottom layer was barely evident along the two northernmost broad-scale transects, other than in the deep canyon at their eastern ends near Adelaide Island. On the more southerly transects, the bottom layer was particularly pronounced on the outer shelf. The highest scattering observed during the cruise was in Marguerite Bay around the mouth of Laubeuf Fjord (Figure 15B) and at the northern end of Alexander Island, where the bottom layer was as much as 300 m thick. At times, the bottom layer showed clear and interesting associations with bathymetry—increasing dramatically in intensity on one side of a bathymetric feature, then decreasing on the other.

On the two transects (numbers 4 and 5) where the ship transited well past the shelf break into offshore waters, there was a strong decrease in scattering at 200 kHz from nearshore to offshore waters, occurring quite abruptly near the shelf break (Figure 16).

It is also noteworthy that very little scattering at 43 kHz was observed anywhere in the survey grid. Different organisms scatter sound at particular frequencies with varying efficiencies, and in general, smaller organisms scatter more weakly at lower frequencies. These data may therefore suggest that larger organisms (on the order of tens of cm in length) are relatively rare.



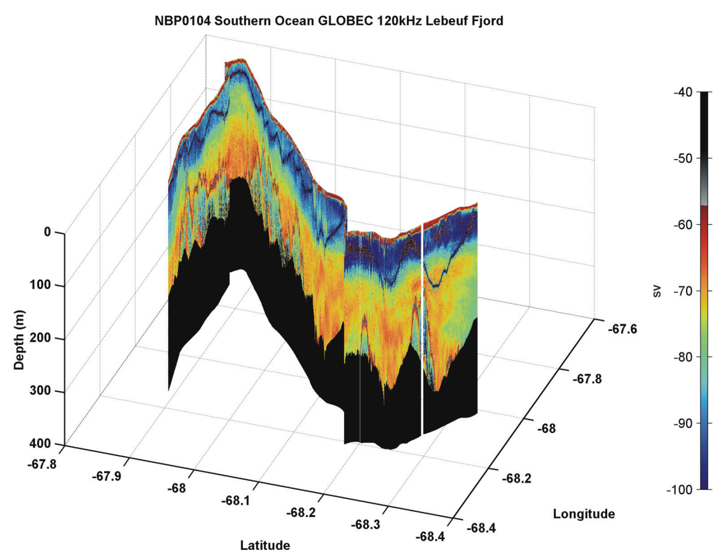




Figure 15. A) Backscattering (dB) measured by BIOMAPER-II 120 kHz echosounders over the entire survey grid. B) Backscattering (dB) measured at 120 kHz along the eastern end of broad-scale transect 5, in Marguerite Bay at the mouth of Laubeuf Fjord.

Overall, substantially less scattering was observed during the present cruise than on NBP01-03. Furthermore, very few observations were made of the large and distinct patches of the sort observed frequently during the last cruise. Such observations were limited during NBP01-04 mostly to the northern end of Alexander Island. There was some occasional evidence of diurnal vertical movement of scattering layers in the present cruise, but much less so than in the previous cruise.

Unique to this cruise was the presence of extremely strong noise spikes in the acoustic records at 43 and 120 kHz, associated with the ship's breaking through thick sea ice. Analysis of the data from these frequencies during those times that the ship was in thick sea ice will require some careful filtering, and it is conceivable that much of the 43 kHz data will be simply too noisy to be of use.

Ground-truthing the specific composition of the scattering layers observed acoustically will be made possible as the MOCNESS and other net tow samples are processed, as well as the VPR images examined. Preliminary comparisons of VPR images to acoustic data suggest that the shallow scattering layer is variable in composition, but typically comprises at least some of krill furcilia, pteropods, polychaete worms, and copepods. On numerous occasions, particularly while in nearshore areas, the BIOMAPER-II watch undertook to pass the body through the bottom scattering layer in an attempt to obtain VPR images of the constituent organisms. On these occasions, as the body approached the layer, the layer became deeper, and if the body reached sufficient depths, the layer reformed above it. Virtually no VPR images were obtained, other than of a very few copepods. This apparent avoidance behavior would imply that the layer is composed, at least in part, of organisms of sufficient size to be able to avoid an oncoming object moving at approximately 10 m $min^{-1}$. Furthermore, backscattering intensity in the bottom layer was very high at 120 and 200 kHz, consistent with the presence of densely packed organisms of a reasonable size, such as adult krill.

On the final day of scientific work, an *in situ* calibration was undertaken of the down-looking transducers (exclusive of the 1 MHz). This calibration suggested that the 43 kHz transducer is functioning properly, the 120 kHz is a few decibels too weak, the 200 kHz a few too strong, and the 420 kHz quite variable. More detailed analyses of these calibration data, in conjunction with the *ex situ* calibration soon to be performed by Hydroacoustic Technology Inc., will be critical to scaling measurements of acoustic backscattering to quantitative estimates of zooplankton abundance.

### 6.2.2 Video Plankton Recorder Studies
(Carin Ashjian, Scott Gallager, Cabell Davis [PI not present on cruise], and Peter Wiebe )

*6.2.2.1 Overview.* The Video Plankton Recorder (VPR) is an underwater video microscope that images and identifies plankton and seston in the size range 0.5–25 mm and quantifies their abundances, often in real time. As part of the U.S. SO GLOBEC Program, the goal of the VPR studies is to quantify the abundance of larval krill as well as krill prey, including copepods, large phytoplankton, and marine snow.

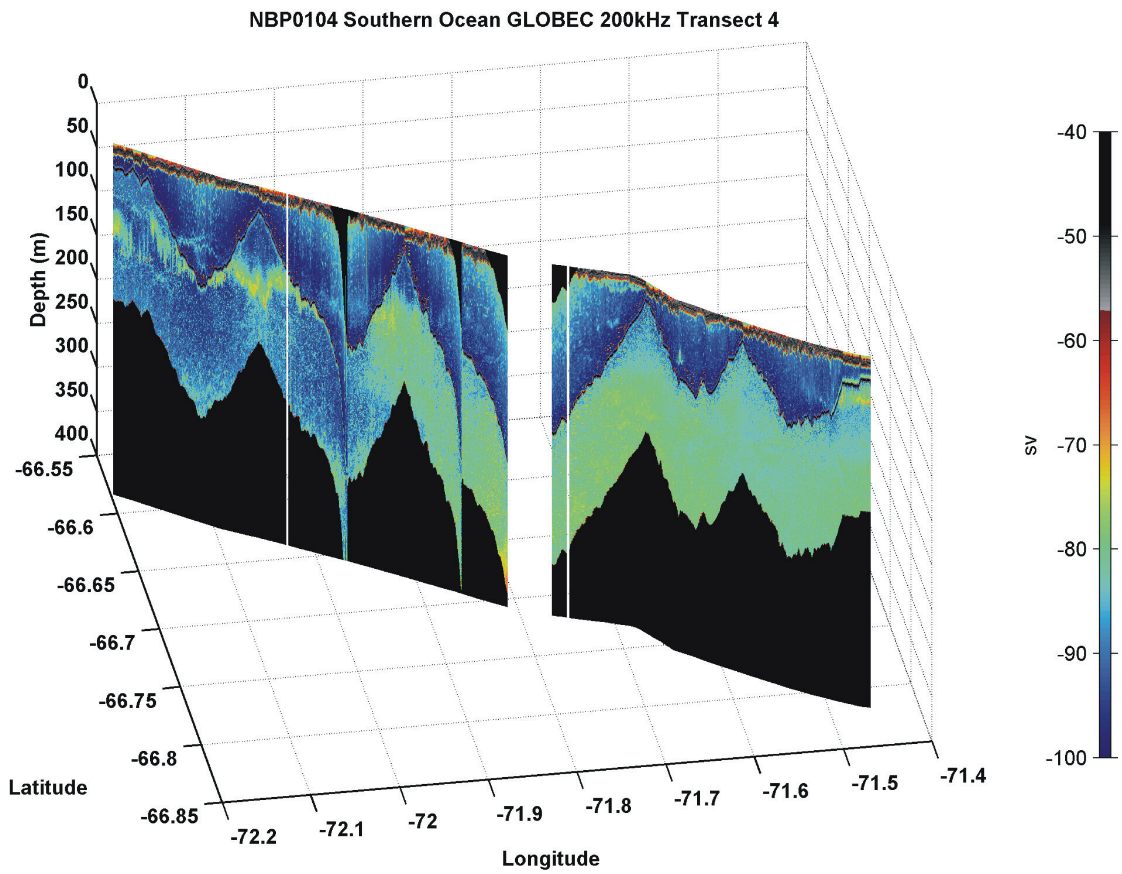



Figure 16. Backscattering (dB) measured at 200 kHz across the shelf break on broad-scale transect 4, showing a decrease in scattering intensity from shelf (on the right) to offshore waters (on the left).

*6.2.2.2 Methods*. For this program, the VPR group (Davis, Gallager, Ashjian) is collaborating with the BIOMAPER-II group (Wiebe *et al.*) by using BIOMAPER-II as a platform for deployment of the VPR. In this way, the VPR video data are augmented by high-resolution acoustical backscatter data that better quantifies abundance patterns of adult krill. The two systems together allow high-resolution data to be obtained on adult and larval krill and their prey. The range-gated acoustical data provides distributional data at a higher horizontal resolution than is possible with the towyoed VPR sled, while the video data provides high-resolution taxa-specific abundance patterns along the towpath of the VPR. In addition to generating high-resolution taxa-specific distributional patterns, the VPR allows for direct identification, enumeration, and sizing of objects in acoustic scattering layers, so that the VPR data are used to calibrate the acoustical data. The BIOMAPER-II sled also includes a standard suite of environmental sensors (CTD, fluorometer, transmissometer, PAR sensors).

*6.2.2.3 The VPR system.* Cameras and strobe: A two-camera VPR was mounted on the BIOMAPER-II towfish for this cruise. (Previous BIOMAPER-II cruises employed a single-camera VPR, but a second, higher-magnification, camera was added for the present cruise.) The cameras and strobe were mounted on top of BIOMAPER-II, forward of the tow point. The cameras are synchronized at 60 Hz with a 16-watt strobe.

Calibration: The two cameras were calibrated to determine the field of views (width and height of the video field) of the imaged volumes for each camera, which are determined using a translucent grid placed at the center of focus. Because multiple camera alignments were utilized during the cruise, as a result of impact with sea ice by the cameras, multiple fields of view were obtained. Generally, the field width and height of the high magnification camera was 8.4 and 6.5 mm, respectively, while the low magnification camera had a field of view of 23 x 18 mm for the first portion of the cruise and 18 x 15 mm for the latter portion. The depth of field of the imaged volume can be quantified by videotaping a tethered copepod as it is moved into and out of focus along the camera-strobe axis using a micropositioner, while recording (on audio track) the distance traveled by the copepod in mm. Although this procedure is usually performed for each alignment and imaged volume the new configurations will have minimal affect on depth of field since the f-stop was not changed from the original configuration. Some differences in lighting intensity across the field may change the depth of field of the image at the corners but care was taken to minimize this during each reconfiguration. The final configuration will be fully calibrated at the laboratory as a cross-check.

Video Recording and Processing: The analog video signals (NTSC) from the two cameras were sent from the fiber optic modulator (receiver) in the winch drum through coaxial slip rings and a deck cable to the BIOMAPER-II van. The incoming video was stamped with VITC and LTC time code using a Horita Inc. model GPS time code generator. Horita character inserters were used to burn the time code directly on the visible portion of the video near the bottom of the screen. The two video streams with time code then were recorded on two Panasonic AG1980 SVHS recorders and looped through these recorders to two image processing computers (Appendix 7).

The software package *Visual Plankton* (WHOI developed and licensed) was used to process the VPR video streams. This software is a combination of Matlab and C++ code and consists of several components including focus detection, manual sorting of a training set of in-focus images, neural net training, image feature extraction, and classification. *Visual Plankton* was run on two Dell Inc. Pentium 4 1.4GHZ computers (Windows 2000 operating system) containing Matrox Inc. Meteor II NTSC video capture cards. The two video streams (=camera outputs) were processed simultaneously using the two computers (one stream per computer).

The focus detection program written in C++ was executed as a stand-alone unit. The focus detection program interfaces with the Matrox Meteor II board using calls to the Mil-Lite software written by Matrox Inc. The incoming analog video stream first was digitized by the Meteor II frame grabber at field rates (i.e. 60 fields per second). Each field was digitized at 640 by 207 pixels, cropping out the lower portion of the field to remove the burned-in time code. The digitized image then was normalized for brightness and segmented (binarized) at a threshold (150) so that the pixels above the threshold were set to 255 and ones below the threshold were set to 0. The program then ran a connectivity routine that stepped through each scan line of the video field and to determine which of the "on" pixels (those having a value of 255) in the field were connected to each other. Once these clusters, termed "blobs", were found, it was determined whether they were above the minimum size threshold, and if so, they were sent to the edge detection routine to determine the mean Sobel edge value of the blob. If the Sobel value was above the focus threshold, the region of interest (ROI) containing the blob was expanded by a specified constant and saved to the hard disk as a TIFF image using the time of capture as the name of the file. The digitized video, as well as the segmented image, Sobel subimages, and final ROIs were all displayed on the computer monitor as processing took place. The ROI files were saved in hourly subdirectories contained in Julian day directories.

Once a sufficient number of ROIs were written to hourly directories, a subset of the ROIs was copied to another directory for manual sorting of the images into taxa-specific folders using an image-sorting program (Compupic). Another program was run to extract the features and sizes from these sorted ROIs and set up the necessary files for training the neural network classifier. At this point the training program was executed which built the neural network classifier. Once the classifier was built, the feature extraction and classification programs processed all the ROIs collected thus far.

These automatic identification results were written to taxa-specific directories containing hourly files, the latter comprising lists of times when individuals of a taxon were observed.

Distributional Data: Distributional plots of plankton were produced by binning the times when specific plankton were observed into the time bins (4-second intervals) of the navigational and physical data from the environmental sensors. The number of animals observed during each 4-second interval was divided by the volume imaged during that period to produce a concentration at that time/depth in number of individuals $l^{-1}$. Color curtain plots were generated for the environmental data by mapping the data to a regular grid (using NCAR ZGRID routine).

*6.2.2.4 Sampling Methods.* Video Plankton Recorder data were collected along the survey grid between CTD stations as the BIOMAPER-II was towyoed between depths of 20-30 m and 250 m or to within what was deemed a safe distance from the bottom and the under-ice surface. The bottom was largely uncharted and irregular in many places with shoals that rose several hundred meters over a few kilometers. The upper depths of the sampling range were somewhat deeper than usually used with the BIOMAPER-II in order to avoid collisions between sea ice chunks and the vehicle. The ship steamed at 5 kts during the grid sampling.

Sampling in an ice covered sea produced multiple challenges, the most notable being the dangers associated with snagging the cable on ice floes in the wake of the ship and the ship coming to a halt to back and ram because of heavy sea ice conditions. Snagging the cable on ice floes produced an extremely dangerous situation where the cable would be pulled from depth to the surface around the pivot point of the ice floe by the forward motion of the ship, resulting in a rapid and catastrophic ascent of the towed vehicle to the sea surface or the underside or surface of the sea ice adjacent to the ship track. Monitoring the cable position closely using a video camera and direct visual observation identified potential ice floe snags; the ship was halted as soon as the cable became suspended over an ice floe. The ship then would back up towards the offending ice floe and blow ice chunks away with the wake from the screws until the cable became free. Multiple snags during a tow resulted in termination of that tow. The second situation, backing and ramming, resulted in the cable hanging directly downwards below the A-frame while the ship backed up towards the edge of an ice free region in order to gain sufficient room to accelerate for a ram. It was necessary to pay out less cable than the bottom depth at all times in order to avoid impact with the seafloor when the ship was halted. Furthermore, the position of the cable during backing was monitored closely to avoid the ship backing over the cable and potentially tangling the cable in the starboard screw. Multiple back and ram situations also resulted in termination of the tow.

*6.2.2.5 Results and Discussion.* Overall, the cruise was more successful with regard to VPR sampling than the April-May U.S. SO GLOBEC cruise. The system noise that was present during the previous cruise because of the design of the BIOMAPER-II telemetry system was eliminated by reconfiguration of the telemetry system. However, multiple impacts with sea ice and the severe vibration imparted to the cable and the towed vehicle by the ship breaking through sea ice and by turbulence and ice chunks in the ship's wake resulted in deterioration of the video signal for both cameras, most significantly for the high magnification camera. In addition, the very low abundances of animals in the water column resulted in very few images being captured. The heavy sea ice encountered over much of the grid and the time devoted to repairing the BIOMAPER-II following sea ice impact or vibration damage resulted in coverage of the sampling grid by BIOMAPER-II being less extensive than had been hoped.

Multiple re-alignments of the cameras occurred during the cruise as a result of damage sustained from collisions between the cameras/vehicle and sea ice. Some re-alignments resulted in new focus detection parameters for the image extraction program. Because the lighting, and hence the character of the images, changed between some re-alignments, several classification algorithms were developed for the cameras during the period of the cruise (Appendix 8).

6.2.2.5.1 Collisions, Re-alignments, and Other Problems. The images from the low magnification camera became very poor during sampling of the first transect of the grid, probably because of some impact while the fish was near the surface. The camera housing flooded and the camera was re-aligned during repairs. After completing the first two transects of the grid, we experienced a serious crash during tow 7 on 30 July as a result of snagging the cable on an ice floe and impacting the vehicle on the underside of the sea ice (Appendix 8). This resulted in a 72-hour repair period, with realignment of the VPR cameras. The damage to the system imparted a high level of noise in the images from the high magnification camera that precluded acquisition of suitable images from the high-magnification camera for image analysis (using the software available on-board) for the next six tows (tows 8-13). An attempt will be made to analyze the high-magnification videotapes in the laboratory if funding permits. Attempts to rectify the situation resulted in a new alignment following tow 10. Sea ice impacted the cameras also during tow 13, again resulting in re-alignment of the cameras during repairs. The noise experienced during tows 8-13 in the signal from the high magnification camera was eliminated during these repairs, however both cameras then exhibited a periodic loss of synch. This overloaded the image extraction program and precluded extraction of images from the high magnification camera for tows 14-34; strangely, the image extraction program could continue to extract images from the low magnification camera. During tow 17, the vehicle again impacted either sea ice chunks or the seafloor when the ship mistakenly ventured into 9 m of water. Although the vehicle itself ultimately was brought up to 5 m total depth, there is a possibility that collision with the seafloor may have occurred when the vehicle was at 11 m depth. The rise of the seafloor to 9 m was dramatically recorded and displayed in the acoustic record collected by the BIOMAPER-II. Repairs from this latest collision resulted in yet another re-alignment of the cameras. Unfortunately, the periodic synch loss experienced by the high magnification camera could not be eliminated during these repairs.

The images from both cameras collected prior to the tow 7 crash were classified utilizing classification algorithms for each camera (low mag: nbp0104_c2_0810_v3_5_t15; high mag: nbp0104_cam4_0802_try2). No classification of images for the high magnification camera could be attempted for tows 8-34 because of the poor quality of the images (tows 8-13) and the inability of the image processing system to overcome the periodic loss of synch (tows 14-34). Despite the multiple re-alignments of the cameras that were done during tows 8-34, the images obtained from the low magnification camera were sufficiently similar that only two additional classification algorithms were developed (Appendix 8). The first classification (nbp0104_ c2_0813_8plus_t5), identifying 5 categories (fuzzy, copepods, other, worms, euphausiids) was used to classify images from 7 tows. The second classification added the category of "static" to the classifier in order to eliminate the multiple noisy reorganizations of the burned in time code that were captured as ROIs during the loss of synch episodes. The remaining tows (tows 8-34) were classified using this second classification algorithm (nbp0104_c2_0819_8plus_t6). During tows 12-15, the strength of the time code signal that was sent to the image extraction computers was reduced so that the computers could no longer "grab" the time code from the incoming signal at the initiation of the image extraction program. As a result, the starting time of these tows, and hence the times of the ROIs, were identified as being at some unidentified starting time during hour 7. The tapes from these tows were re-run through the image extraction program to re-extract the ROIs with the correct times.

Despite these problems, we were able to obtain good data from the low magnification camera for most of the survey. In total, 158 2-hour videotapes were collected during the cruise. Plankton classification was accomplished for all data collected using the low magnification camera.

6.2.2.5.2 Planktonic Taxa Observed with the VPR. Very low abundances of all plankton were observed in the study region during the cruise. This low abundance was the most marked feature of the plankton distributions. For the low magnification camera, the dominant taxa were copepods, euphausiids (furcilia and larger), and tomopterid worms. These taxa were identified in the plankton distributional data using the automated classification system. In contrast to the April-May cruise, reliable identification of different copepod types by human observers was not consistently possible, however, it appeared that the copepods were dominated by quite small forms and the large calanoid forms and *Metridia* that had been observed previously were not abundant (this observation was confirmed by qualitative assessment of the MOCNESS samples). Additional taxa observed in low abundance included pteropods, ctenophores, and medusae as well as marine snow. These taxa were classified as "other" in the plankton classification system. No large phytoplankton were observed. In the high magnification camera, only copepods were observed in sufficient abundances to be classified using the plankton identification system. Very few furcilia or larger krill were seen with that camera.

*6.2.2.6 Discussion*

6.2.2.6.1 Plankton Distributions. The most striking observation from the VPR, and also from MOCNESS and acoustic backscatter data, was that plankton abundances were very low in the water column at all locations across the shelf and in Marguerite Bay. Distributions were very patchy, with few occurrences of elevated abundances. Because of the very low abundances, it is difficult to discern clear patterns in the distributions. The data will be most useful when considered in concert with the acoustic backscatter data to identify the organisms producing the acoustic signal.

As for the April-May cruise, euphausiids were present at most locations across the shelf and in Marguerite Bay (Figure 17A). Prior krill studies in the Southern Ocean have, for the most part, been carried out during summer. These prior studies found that adult krill spawn offshore during late summer, and that when the research resumed the following spring, the juvenile krill were found near the coast. Thus the question was: How do the krill larvae move from offshore to near the coast during the winter? The working hypothesis of the SO GLOBEC program is that the larval krill migrate under the sea ice toward shore during the winter months reaching the coast as young adults by spring. After completion of the two U.S. SO GLOBEC surveys (fall and winter), it is clear from the VPR data that late stage krill larvae are already distributed broadly throughout the region from the shelf edge to the coast. Abundances were much lower in the water column during the winter cruise (July-August) than during the fall cruise (April-May). However, larval krill were observed just under the sea ice surface using an ROV (see ROV section of data report), suggesting that krill furcilia preferentially seek the under sea ice surface during the winter months. Overall, however, abundances in the water column were notably lower during the winter period, leading to a hypothesis that the population of krill on the shelf region in Marguerite Bay may not be capable of re-populating the region and that immigration from the outside is necessary to re-establish krill populations in this region. Alternatively, high abundances of krill may be found in the near shore fjord regions or under sea ice. Elevated abundances of plankton were observed in a MOCNESS tow obtained in Laubeuf Fjord. Copepods (and tomopterid worms, not shown) likewise were found at most locations throughout the study region (Figure 17B). The high magnification camera documented the distribution of very small copepods across the first two transects of the survey (not shown); these copepods were found distributed throughout the water column.

6.2.2.6.2 Distributional Patterns of Environmental Data. The standard VPR plotting software (developed in Matlab) was used to generate real-time 3-dimensional plots of the environmental data from the sensors on BIOMAPER-II. The survey data reveal that the water column was sharply stratified in both temperature and salinity throughout the study area (Figures 18 and 19). The penetration of Upper Circumpolar Deep Water (warm, salty) onto the shelf is seen in the lower portions of the water column in the northerly transects. This water extended quite far into Marguerite Bay in the deep trough that intersects the shelf. Note the diminished effect of UCDW across transects in the southern portion of the survey. Lowest salinity was found in coastal currents near the coast in Laubeuf Fjord (upper Marguerite Bay), in southern Marguerite Bay, off of Alexander Island, and near the coast in the northeastern portion. Density patterns were most similar to the distribution of salinity.

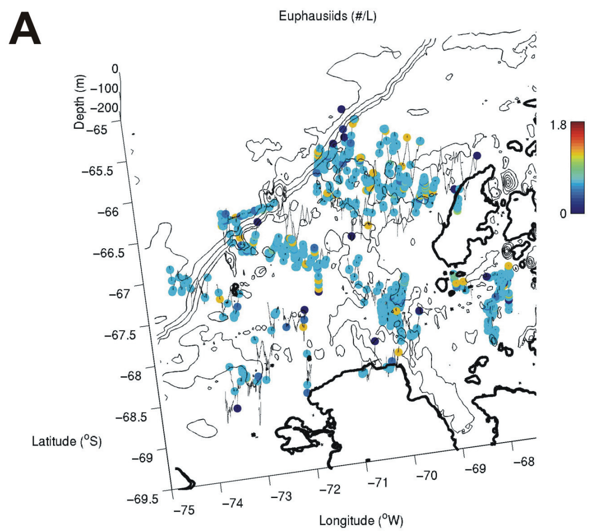
Fluorescence values were very low throughout the region, although slightly higher values were observed in the southwestern portion of the survey (Figure 19). Elevated fluorescence also was seen at the western/oceanic ends of the transects in the upper portion of the water column; these values do not show in the curtain plots. Little vertical stratification of fluorescence was observed, although fluorescence above the pycnocline was slightly elevated relative to that below.

*6.3 ROV Observations of Juvenile Krill Distribution, Abundance, and Behavior*
(Scott Gallager, Cabell Davis [PI not present on cruise], Carin Ashjian, Peter Wiebe)

6.3.1 Objective and Methods

The objective of the ROV studies is to observe and quantify the distribution, abundance, behavior and size distribution of larval krill in association with the underside ice surface and sea surface hydrography. The WHOI SeaRover was equipped with a variety of physical and biological sensors including a stereo camera system with a field of view of 1 $m^3$, synchronized strobe, CTD, Imagenix 881a 630 kHz-1 MHz sector scanning sonar, up-looking DVL Navigator 1200kHz ADCP, and the standard forward looking pan and tilt color camera. A Trackpoint II navigational beacon was also mounted on the frame. The navigational transponder was mounted on a 10-m pole off the starboard side of the *Palmer*. Although the Trackpoint was used on NPB01-03, extensive sea ice cover and difficulties in positioning the ship precluded its use on NBP01-04.

The ROV was deployed through the starboard A-frame and 120 m of tether paid out with a 50 pound clump weight at a depth of 20 m (Figure 20A) The ROV first dropped to 20 m and traveled at least 10 m away from the ship. The ROV then ascended to about 5 m depth or until the underside of the ice was observed in the pan and tilt camera. A trackline was established extending radially away from the ship out to a distance of approximately 100 m. As the ROV traveled the trackline at a speed of about 2-10 cm $s^{-1}$, the stereo camera was used to image the under sea ice surface and associated organisms. Precise positioning and sizing of the target within the 1 $m^3$ will be established through post-processing using a sterogrammetry algorithm. The forward speed of the ROV will be established with data from the ADCP and used in conjunction with the image volume to calculate volume sampled per unit time. For example, at a forward speed of 10 cm $s^{-1}$, a new 1 $m^3$ will be imaged every 10 seconds. The ADCP will also provide distance to the under sea ice surface and backscatter intensity. The sector scanning sonar is being used to evaluate distance from the sea ice and for locating krill swarms. The CTD provides backup data on ROV depth and documentation of hydrography. In addition to larval distribution, swimming behavior will also be quantified. Stereogrammetry will be used to measure swim speeds and direction to obtain a vector for each individual every 1/30 s. To correct for background motion, the instantaneous vector for all particles in the field of view are ensemble averaged and subtracted from each organism at 1/30 s intervals. Thus the swimming speed, direction and body posture, angle of attach, etc. will be quantified as a function of body size and stage.



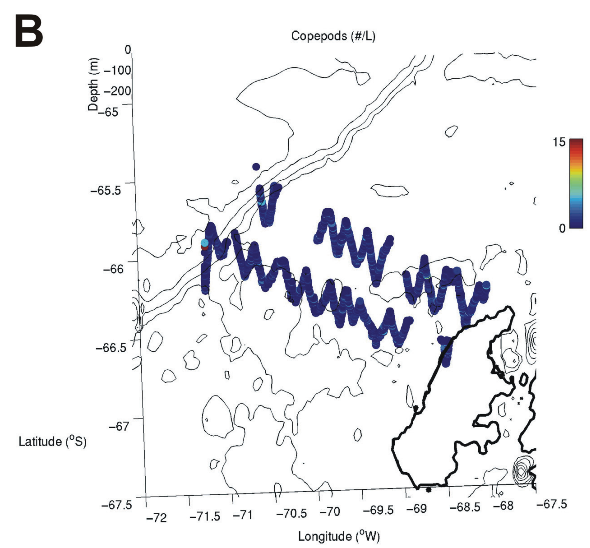




Figure 17. A) Preliminary distribution of euphausiids from data collected using the low magnification camera of the Video Plankton Recorder mounted on the BIOMAPER-II. Each dot indicates a depth-position location where euphausiids were observed; the color of each dot represents the concentration of euphausiids at that depth/position location. The path of the BIOMAPER-II through the water column is shown as the thin black line. Some high abundances observed at shallow depths resulted from multiple images of the same individual being collected while the vehicle was suspended near the surface (20-30 m) as the ship was stationary at CTD stations; these elevated abundances will be removed during further refinement of the data. B) Preliminary distribution of copepods from data collected using the low magnification camera of the Video Plankton Recorder mounted on the BIOMAPER-II. Representation of data as in part A.

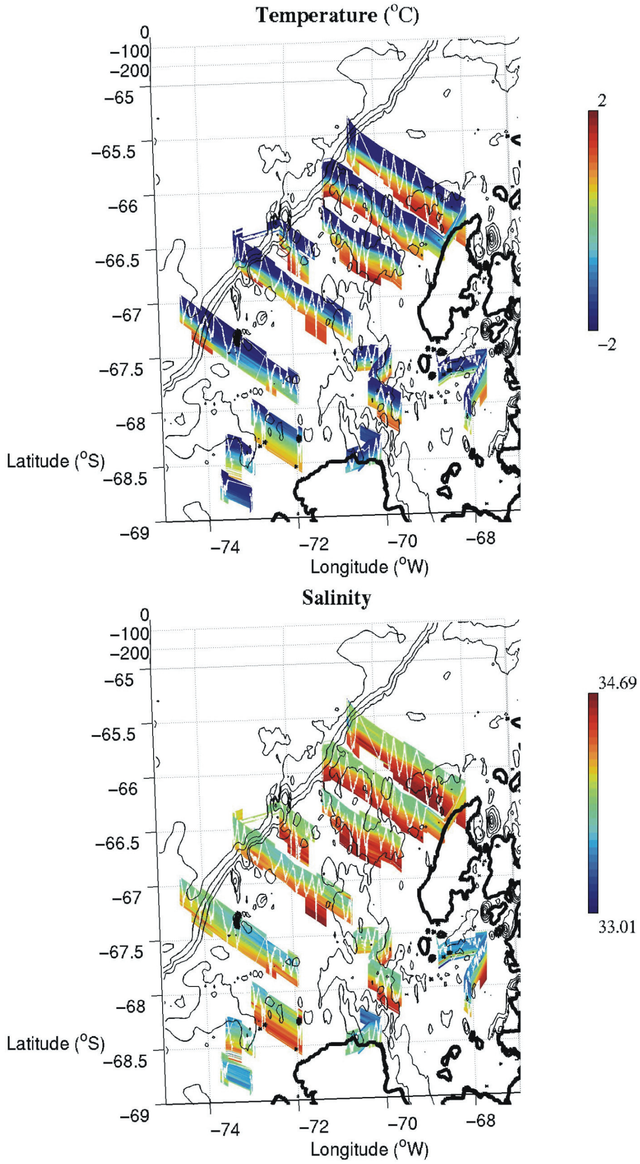



Figure 18. Vertical and horizontal distribution of temperature and salinity from all BIOMAPER-II deployments. The towyo path of the vehicle through the water column is shown as the white line overlain on the contoured data.

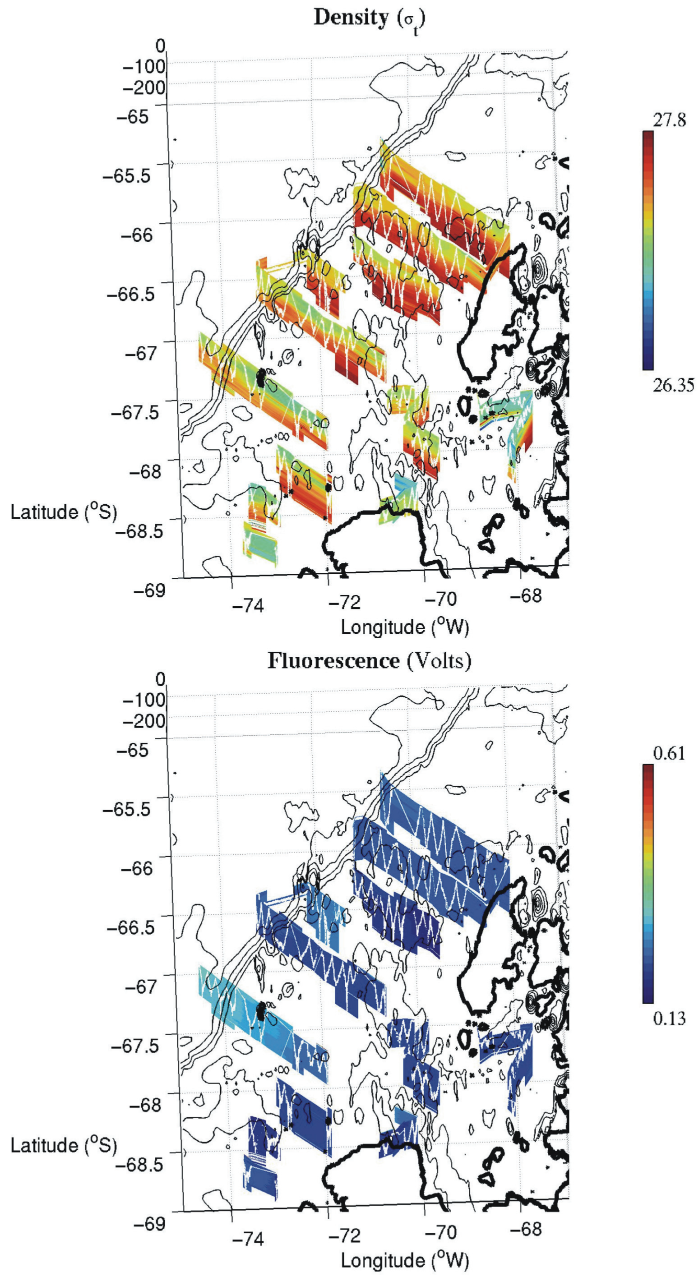



Figure 19. Vertical and horizontal distribution of density and fluorescence from all BIOMAPER-II deployments. The towyo path of the vehicle through the water column is shown as the white line overlain on the contoured data.

6.3.2 Results

We completed 16 successful deployments of SeaRover (Table 7). In general, larval krill on the order of 8 to 15 mm in length appear common along the under-ice surface in association with crevasses and cracks in the sea ice. In addition, when the ROV bumped the sea ice, small numbers of furcilia appeared by swimming down and away from the under sea ice surface. A brief description of each deployment follows.

Table 7. SeaRover deployments on NBP01-04

| Deployment | Station | Date | Latitude (°S) | Longitude (°W) | Time in (Local) | Time out (Local) |
|---|---|---|---|---|---|---|
| ROV 1 | 0 | 27 July | 64 77.08 | 69 43.99 | 1929 | 2030 |
| ROV 2 | 4 | 28 July | 66 09.238 | 69 06.384 | 0205 | 0315 |
| ROV 3 | 11 | 30 July | 66 05.04 | 70 50.89 | 0215 | 0340 |
| ROV 4 | 17 | 1 Aug | 67 03.094 | 9 05.247 | 0115 | 0330 |
| ROV 5 | 40 | 6 Aug | 68 27.898 | 68 46.262 | 0610 | 0810 |
| ROV 6 | 35 | 8 Aug | 67 53.40 | 68 19.80 | 0439 | 0620 |
| ROV 7 | 43 | 9 Aug | 67 48.34 | 71 03.62 | 1755 | 1940 |
| ROV 8 | 47 | 11 Aug | 67 14.75 | 74 24.74 | 0655 | 0903 |
| ROV 9 | 49 | 12 Aug | 67 43.14 | 73 08.19 | 0312 | 0519 |
| ROV 10 | 59 | 16 Aug | 68 42.76 | 70 23.24 | 1543 | 1700 |
| ROV 11 | 63 | 17 Aug | 68 09.90 | 73 02.90 | 1650 | 1850 |
| ROV 12 | 75 | 19 Aug | 68 49.14 | 72 20.47 | 0543 | 0752 |
| ROV 13 | 78 | 20 Aug | 68 44.256 | 74 16.703 | 1030 | 1215 |
| ROV 14 | 87 | 22 Aug | 69 14.30 | 75 41.60 | 0030 | 0235 |
| ROV 15 | 71 | 23 Aug | 68 4.700 | 74 57.60 | 0536 | 0733 |
| ROV 16 | 16 | 25 Aug | 66 2.150 | 69 22.64 | 1430 | 1630 |

ROV 1: Test deployment north of the sampling grid. ROV operation was normal, maneuverability with the stereo camera bar was good. However, the strobe on the stereo camera system was flickering. The CTD needed batteries. Replaced bulb and batteries after this run.

ROV 2: This mid shelf station consisted of heavy first year pack ice. Ice varied between 8 and 10/10ths coverage and consisted of cakes, floes, and new gray ice. The ROV made four transects from the ship extending out about 80 m sequentially from the bow to the stern. Many clouds of furcilia aggregated under the ice in crevasses and cracks. This was the first time we had been able to spend an hour or more just watching furcilia swarm in large numbers. Good surveys were completed which will allow quantification of distribution.

ROV 3: This station had solid and heavy pack ice. The ROV was piloted along 3 transects extending between smooth surface sea ice and sea ice with highly three-dimensional topography, particularly along ridges. Most the survey was completed under smooth sea ice conditions, which may explain the observation of just a few scattered furcilia swimming between 1 to 2 m below the sea ice surface.

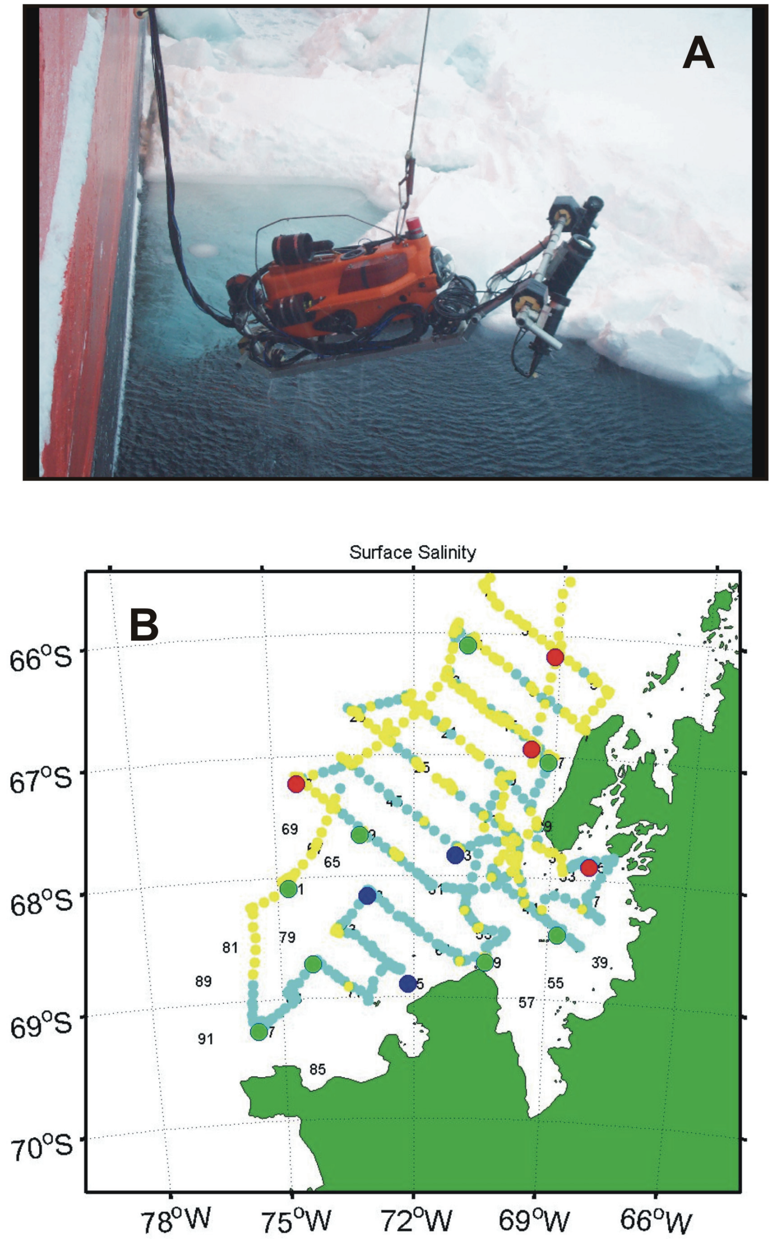



Figure 20. A) Deployment of the SeaRover ROV with stereo VPR looking up under sea ice at about 45°. B) Sea surface salinity and ROV deployments. Large circles indicate stations where the SeaRover was deployed, while the color indicates relative abundance of under sea ice furcilia (red: high; blue: moderate; green: low). Colors for along-track surface salinity were cyan (33 to 33.7 psu) and yellow (33.71 to 35 psu).

ROV 4: Sea ice conditions were loosely packed nilas, pancake, and fast ice which was very smooth along bottom. Very few furcilia but those that were present were in cracks and crevasses.

ROV 5: Sea ice conditions were primarily vast floes of consolidated smaller floes and cakes with new snow covering them. There were also pressure ridges forming where floes were colliding and being forced together. While sea ice coverage was rather complete, there were long, thin leads (several kms long, 100 m wide) at regular intervals throughout the transit. The deployment was in a region of vast floes with smooth undersurfaces. Very few furcilia were observed along the 3, 80-m transects. One concern which is becoming more realistic is the washing away of larvae by the ship's propeller during positioning. After discussions with bridge personnel, a strategy was devised in which the ship would penetrate the sea ice at high speed and then swing such that the starboard side was exposed to the wind. When the wind was above 20 kts (which was most of the time), the ship would slowly slide sideways allowing a small ice-free pool to open next to the A-frame. This technique was used with variable success in future deployments. Just before the ROV was scheduled to go into the water, a broken circuit board in the hand controller was found after aborted ROV 5 two days previous was repaired.

ROV 6: The ship was positioned in an ice floe about 3 nm in diameter in a region of open water and consolidated brash. The bridge was fairly certain that they minimized wash in the aft area. Abundant furcilia were observed in numerous aggregations which were most plentiful as the ROV surveyed towards the bow.

ROV 7: Sea ice conditions were 10/10 with vast snow covered floes and very few ice over pools. Transects extended from smooth undersurfaces to subridges. Furcilia were mostly scattered, but plentiful. Some very dense aggregations associated with under sea ice topography in the area of ridges was noted.

ROV 8: Sections of pack ice when overturned showed significant algal coloration so we anticipated finding dense krill populations. Unfortunately, we lost the port thruster just before going into the water. We decided to try the deployment anyway thinking that the lateral thruster would allow us to reposition and turn as necessary. This did work well until the end of the tether was reached. We found numerous aggregations of very small furcilia swarming around crevasses and creases in the sea ice. Larvae appeared to be attached to crevasses and working along the undersurface. Some relatively long sequences will allow behavior to be extracted.

ROV 9: Sea ice cover was 10/10 with vast snow covered floes punctuated by 1 m high ridges. This was an area where we expected to find large numbers of krill just based on the extensive habitat. However, there were very few drifting furcilia, and no aggregations were observed during the 1.5 h deployment. We continued to work on replacing the port thruster, but found that we did not have working spare parts necessary to replace the blown unit (2 hall effect transistors). They are not present in the spares box.

ROV 10: Brash ice, unconsolidated. Few drifting furcilia but no aggregations

ROV 11: Sea ice coverage was 10/10 with vast foes and extensive network of high ridges and some new frozen leads. The port thruster was modified to vector towards port in an attempt to straighten forward the ROV's motion. There were scattered furcilia but no heavy aggregations.

ROV 12: Considerable effort was required by the bridge to position the ship in the heavy, fast ice without washing away the krill community. After opening a small hole, the ship backed next to the opening using its forward thruster only. This allowed access to a virtually undisturbed sea ice edge. SeaRover went into the water at 0943 and was recovered at 1133 UTC. In an attempt to minimize the effect of the blown starboard thruster, the port thruster had been repositioned onto the dorsal surface just aft of the vertical thruster giving the only means of forward propulsion. This worked reasonably well allowing three straight transects originating from the deployment location at the starboard a frame away from the ship. Transect 1 extended 35 m towards the stern 45° relative to the ship axis. Transect 2 extended 60 m directly perpendicular to the ship, and transect 3 extended 40 m at about 130° towards the bow. Pressure ridges were observed to a height of 1 to 1.5 m above the ice surface while extending to 3 to 4 m below the surface. Under ice topography was relatively smooth to cuspate between ridges, while jagged and extremely three-dimensional along subsurface ridges. Transect 1 ran along one ridge at a depth of 3 m followed by excursions onto the more smooth surface of the fast ice. Larval krill were observed to be scattered with observations every few seconds along the smooth surface and in relatively dense aggregations along the ridge. Aggregations were not as numerous or intense in concentration as observed at previous stations offshore, but present nonetheless. Transect 2 began under smooth sea ice and crossed a ridge perpendicularly about 20 m from the ship. Along the smooth fast ice, scattered furcilia were observed drifting within 1 m of the under ice surface but not at the sea ice interface. Aggregations were first encountered as the ROV descended 2 m to cross below the ridge. Ten to 20 furcilia per aggregation was typical. Aggregations occurred immediately below a sea ice feature, usually a block that had been extruded downward as a function of horizontal compression forces. Transect 3 was composed entirely of smooth sea ice with no ridges. Just a few furcilia were observed as the ROV traversed 2 m below the sea ice interface.

ROV 13: Bright sunshine. Sea ice very thin and new. Few furcilia noted under this sea ice until the ROV was re-positioned for a transect into thicker sea ice to the north. Larvae were still few but aggregated into crevasses.

ROV 14: Because of the tremendous pressure on the pack ice in this area, the ship required extra time to get into position. Four transects were completed and surveyed under smooth sea ice and two ridges which crossed in the center of the survey area. This area was dominated by ctenophores with a new sighting every few seconds. Furcilia were isolated and few.

ROV 15: Temperature –16°C, winds 20-25 kts, skies partly cloudy, good visibility. Sea ice conditions were 9/10 medium and large floes, some broken rubble. Open water in consistent and persistent leads. Floes were flatter with less pressure than to the south or east. Furcilia were observed but not in tremendous numbers. Small groups to scattered individuals were seen between 1 and 2 m below the ice undersurface.

ROV 16: Temperature -15°C, wind 30 kts, heavy snowfall, limited visibility. The CTD cast showed a mixed layer to 85 m and a pycnocline from 100 to 250 m with a temperature maximum at 280 m of 1.77°C. Simrad 120 and 200 kHz showed scattering layer at 50-90 m and one centered on 375 m. Deployment went smoothly after the ship was backed up about 10 m to an open lead. The ROV was still operating on a single forward thruster mounted amid ships, so turning was performed by a series of reversals and tugging on the tether. Transect 1 began 45° relative to the ship and progressed forward 80 m before the 1.2 kt current began swinging the ROV towards the stern. Open water was reached and the ROV retrieved via the tether. Transect 2 was similar to the first but extended about 60 m before swinging aft. Transect 3 was considerably longer as the direction of the current with the axis of the vehicle was balanced as best could be. All three transects showed varying topography with smooth sections meters in length mixed in with deep ridges and blocks jutting 3 to 4 m deep. This was an area of consolidated brash ice, which had refrozen perhaps weeks ago.

Furcilia were found immediately after deployment and throughout the transects both drifting freely 1 to 2 m deeper than the under sea ice surface and in association with cracks and crevasses. Much excitement was generated as the cameras zoomed in on swarms of furcilia allowing swimming behavior and larval densities to be estimated. One estimate of densities ranged between 50 and 100 individuals per swarm. Smaller organisms tended to be associated in swarms with apparently random motion much like a swarm of gnats at a light bulb. Larger animals were either isolated or formed groups of 10 to 20 individuals, which appeared to be swimming and changing direction as a school. Sizes and three-dimensional positions will be extracted from the stereo tapes.

6.3.3 Discussion

When furcilia were present but in low numbers they were scattered under smooth sea ice and concentrated into small aggregations under ridges. When furcilia were abundant, large aggregations under rough surfaces were common with over 100 individuals per group. A rough estimate of concentration where intense aggregations occurred is on the order of 1000 individuals $m^{-3}$, extending to about 1 m below the sea ice undersurface. At stations where furcilia were very abundant such as stations 4, 35, 47, and 16 this represents over $6x10^9$ furcilia within a 20 nm radius of each station. What this kind of estimate really means must await comparison with an integrated value for abundance of animals in the water column.

Sea surface data were extracted from the JGOFS data set on RVDAS and parsed into a mat file called NBP0104_uwmet which were put under Neptune\science\gallager\. It was found that salinity (Figure 20B), temperature (Figure 21A), and fluorescence (Figure 21B) data were extremely noisy with spurious values exceeding a factor of 10 in both data sets. Data were lowpass filtered and fit with a one minute running median in an attempt to minimize these artifacts. The file containing the smoothed data is called NBP0104_uwmet_smooth. Still, these data are of questionable value without further scrutiny. The distribution of furcilia in comparison with surface temperature, salinity, and fluorescence was inconclusive. High abundance was to the northern part of the grid and in Marguerite Bay with lower abundance towards the southern part of the grid. One offshore station along the shelf break was particularly high. Stations with high abundance may be associated with fresher water, but further analysis is necessary. Deployments were conducted both during day and night time hours but no discernable pattern emerges in furcilia distribution as a function of time of day. Indeed, the station with far greater abundance that any other was station 16, which was sampled at 1430 in the afternoon. Thus vertical migration behavior appears not to be active in these larval stages.

It is hoped that the ADCP record from the ROV will shed some light on the under sea ice water currents which, potentially, could be inducing formation of eddies in association with sea ice features. Water motion within such eddies in combination with specific swimming behaviors and under sea ice feeding, could explain why aggregations occur only under feature-rich conditions. Motion of ice floes measured by ice buoys could also be used to estimate transport of furcilia assuming they remain near the under sea ice surface irrespective of time of day. Offshore to onshore transport of furcilia as a premise to the governing SO GLOBEC hypothesis will need to be addressed from the perspective of wind-driven surface currents and sea ice transport.

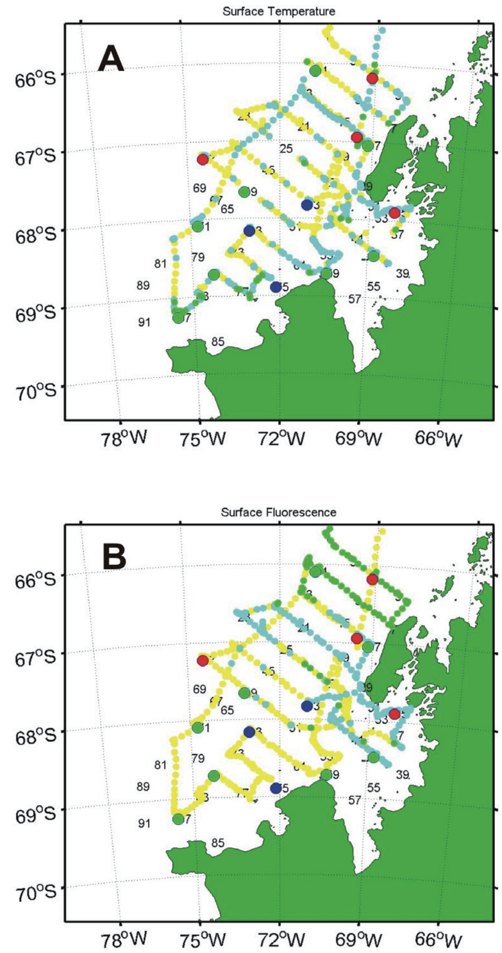



Figure 21. A) Sea surface temperature and ROV deployments. Large circles indicate stations where the SeaRover was deployed, while the color indicates relative abundance of under sea ice furcilia (red: high; blue: moderate; green: low). Colors for along-track surface temperature are yellow (-2°C to -1.8°C), cyan (-1.81°C to -1.7°C), and green (-1.71°C to -1.5°C). B) Sea surface fluorescence and ROV deployments. Large circles indicate stations where the SeaRover was deployed, while the color indicates relative abundance of under sea ice furcilia (red: high; blue: moderate; green: low). Colors for along-track surface fluorescence were yellow (0 to 2.0 v), cyan (0.21 to 0.3 v), and green (o.31 to 0.5 v).

### *6.4 Simrad EK500 Studies of volume backscatter on NBP01-04*
(Karen Fisher and Scott Gallager)

#### 6.4.1 Introduction
The Simrad EK500 has three hull mounted transducers: 38, 120, and 200 kHz. At the beginning of NBP01-03, very little was known about the system other than it was useful for estimating bottom depth. The system was not set up to record or print data in any way. The legend goes that after the system was installed in 1993, the Simrad was unable to be calibrated due to interference possibly emanating from the ship or enhanced by the protective coverings over the transducers. The system has not seen much use even though a few investigators have tried in vain to establish decent echograms.

After playing around with the settings on the display and reading the manual a few times, we were able to come up with a configuration that clearly showed scattering layers. These layers were highly correlated with layers observed on the same frequencies when BIOMAPER-II was in the water. The VPR on BIOMAPER-II indicated when a particular plankton patch was dominated by copepods, larval krill, or adult krill. Simrad settings were tweaked to match the output of BIOMAPER-II as closely as possible. However, a full calibration by Simrad will be necessary if investigators are interested in quantifying biomass of scattering layers. The main problem on NBP01-04 was extensive noise injection due to sea ice moving under the hull. Only when the ship was sitting on station or waiting for a blizzard to blow over did we collect data with acceptable noise levels. These times are given in the event log.

6.4.2 Description

Simrad menus are independent. This means that changes you make to the display are not reflected in the printer or serial communications port output. You must go into each submenu and change the settings appropriately. The most important change we found necessary to visualize scattering layers was to increase the background noise margin under the main menu to at least 8 dB and then decrease the thresholds for target strength color minimum and target strength color minimum to very low values. Details of each setting found most appropriate may be found in the Simrad binder on the shelf in the ship's main laboratory, but a brief example of what seemed to work is given below.

•Operation menu: noise margin 8 dB

•Display menu: set echogram to 1&2&3 to get all three frequencies displayed. Target strength and Sv as follows for each frequency:

| | 38 | 120 | 200 kHz |
|---|---|---|---|
| Ts | -65 | -100 | -100 |
| Sv | -95 | -100 | -89 |

Depth range may be set to desired choices, but we found that 38 kHz @ 1000 m, 120 and 200 kHz @ 250 m produced a very nice echogram of both surface waters and deep scattering layers of larger organisms.

The printer is set up on the HP PaintJet, but the *Palmer* is very low on ink. A refill kit was purchased and left with the printer. Settings on the printer menu should be set identically to those on the display unless the user has a specific reason not to.

•Transceiver menu: The best combination of pulse length and bandwidth was found to be a long pulse length and a narrow bandwidth for all three transducers.

•Ethernet menu: We did not set this up with an IP address, but there is no reason why the electronics technician could not do this if desired.

•Serial Com port menu: We logged the entire three channel echogram at a ping rate of 4 $s^{-1}$ at 19.2 kbaud directly to a laptop and to the ship's data logger on RVDAS. Although it is not indicated in the manual, the newer software upgrade includes the ability to send out the echogram out the com port in either ASCII or binary. We sent it in both modes to test software for processing. The entire cruise NBP0104 was logged in ASCII on RVDAS and processed as indicated below.

•Annotation menu: set 10 minutes if you would like time recorded on the display and printer.

The Simrad was used effectively to observe scattering layers during MOCNESS tows and Plummet net deployments. We also conducted numerous time series when the ship needed to be motionless for some period of time.

6.4.3 Overview of data processing

The three channel echogram was logged at 19.2 kbaud on RVDAS for the entire cruise. In the telegram sent to the logging computer each ping has a header consisting of time, depth, and a variety of other information. The echogram for each channel begins with Q1 for the 43 kHz, Q2 for the 120 kHz and Q3 for the 200 kHz transducers. This makes it convenient to search and parse by the Q values in the header. A set of three PERL scripts was devised to create navigated daily files. The first script writes six daily files, three with the data from the three transducers, and three with the time stamps. The next script strips the ship's PCOD down to decimal time, latitude, and longitude. The final script merges the three time files from each day with the ship GPS data. A Matlab script controls the execution of the PERL scripts, plots the matrices as images, and creates daily (unfiltered) jpg files. All four script files are available from kef10@cornell.edu to any interested parties. The four sets of data files (PCOD.dat, SIMfDAYfreq.dat, SIMfDAYtime.dat, and SIMfllt.dat) will be saved on a CDROM in gzipped tar format, along with uncompressed daily JPG files.

6.4.4 Preliminary look at the data

Three daily images are presented in Figure 22, to demonstrate both the potential, and the drawbacks of the hull mounted SIMRAD system. The severe noise bands indicate the ship passing through sea ice. Interludes within the noisy segments were quiet sections where the ship is backing (prior to ramming difficult ice ridges). Long quiet segments were usually collected during CTD casts (Figure 22A, the 38 kHz image from Day 213 where several CTD's are visible). In some images, clear avoidance-like behaviors were evident in the stronger backscatter layers, particularly the layers centered near 100 m. In the Day 213 image (Figure 22A), the CTD at 1600 seemed to disperse the deep scatter layer. The long segment on Day 237 showed the bathymetry following behavior of the approximately 300 m scattering layer (Figure 22C).

While the 38 kHz seemed to provide the clearest images overall, interesting layer structure was evident in the higher frequencies as well, particularly on the 200 kHz (see 200 kHz image from Day 218 - Figure 22B). Layers evident on the high frequencies were observed to occur in low scattering layers on the 38 kHz on more than one occasion.

*6.5 Stable Isotope Analysis*

(Karen Fisher)

Samples were taken for natural abundance stable isotope analysis at the CoBSIL facility at Cornell University. Zooplankton and particulate samples will be analyzed on a mass spectrometer to determine the ratio of $^{15}N$ to $^{14}N$, and $^{13}C$ to $^{12}C$. Particulate samples were taken from 4-9 depths of the CTD at stations 87, 71, 13, 15, and 16, and filtered onto precombusted 25 mm GFC filters. An additional bucket sample was obtained by the zodiac in Paradise Harbor, and filtered the same way. All zooplankton samples were picked or sieved from buckets, then frozen in cryovials or on petrislides in a -80°C freezer. At station 87, a wide variety of zooplankton samples were obtained from Net 8 (a net not fished, but closed at the surface in slush-ice) and Net 0, the downward integrated net of the 1-m$^2$ meter MOCNESS, the Plummet net, and the Tucker Trawl. The station 87 samples isolated included chaetognaths, ctenophores, copepods, cladocerans, polychaetes, pteropods, amphipods, and krill furcilia. At station 71, the MOCNESS net 0 sample was split, with lively copepods kept in a beaker of ambient water for 4 days before freezing, while the remainder was immediately frozen. The immediate and delayed samples will be compared to see if there is any difference in isotopic composition that may be attributable to the composition of the surface water the animals were kept in over this short period.

The goal of this sampling is to determine whether there are detectable shifts in stable isotope composition relative to the baseline stable isotope compositions obtained on the fall cruise (NBP01-03). Phytoplankton exposed to deep water sources of nutrients tend to become lighter (depleted in the heavy isotope $^{15}N$ relative to $^{14}N$) when compared to ambient levels. These variations then travel up the food chain. Predators generally are heavier than their prey, allowing construction of rough trophic relationship diagrams amongst the zooplanktors. Spatial or temporal variation within a species is potentially useful as an indicator of changes in prey fields. As animals tend to integrate their food sources into body mass in a variety of ways, they represent tracers of varying duration. This study hopes to contribute baseline values for a number of species, examine the relationships of whole community stable isotope composition in light of the composition of individual contributors, and determine whether spatial or temporal variation is detectable within the study grid. This project is funded by a grant from the Research Training Grant in Biogeochemistry at Cornell University, and is being jointly carried out with M.S.

student, Jennifer Whiteis, and B.S. student, David Rosenberg. Logistical assistance from Wendy Kozlowski and Ari Friedlaender is gratefully acknowledged.

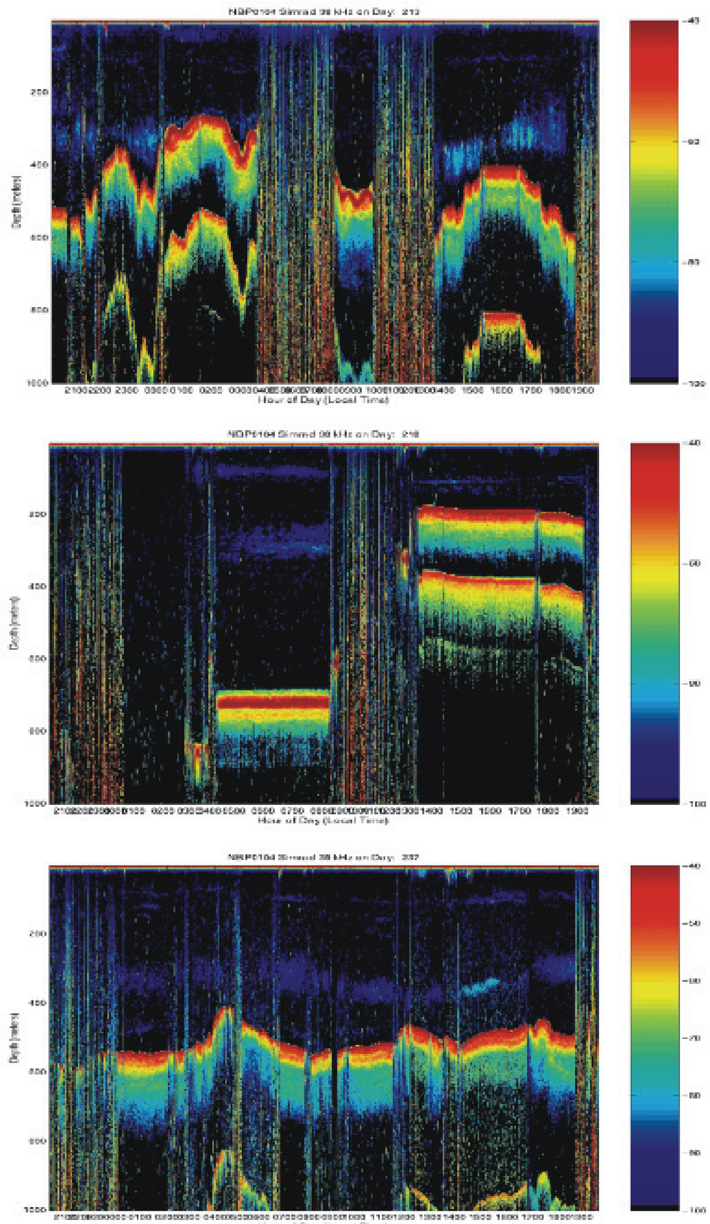



Figure 22. Echograms made with the Simrad EK500 echosounder. See text for details.

## 7.0 Optical Plankton Counter and ADCP Studies of Zooplankton

(Jay Peterson and Meng Zhou [Project PI, not present on cruise])

### *7.1 Introduction*

The overall objective of our research is to determine the distribution of meso- and macro-zooplankton, especially the larval, juvenile, and adult krill, in relation to meso-scale and regional circulation. Additionally, we will estimate *in situ* rate measurements of both specific and population growth and mortality for zooplankton in the study region.

In order to obtain the distribution and rate measurements during this survey cruise, we focused on gathering broad-scale circulation measurements across the entire transect, combining the use of an Optical Plankton Counter [Herman *et al*., 1993] at selected stations to gather high resolution plankton size and distribution data.

### *7.2 Methods*

Broad-scale circulation measurements were obtained using a narrow-band Acoustic Doppler Current Profiler (ADCP; RD Instruments) attached to the hull of the ship. Single-ping data were collected continuously throughout the cruise and processed using the CODAS software package.

The finer scale plankton surveys were conducted using an Optical Plankton Counter (OPC; Focal Technologies) attached to a 1-$m^2$ MOCNESS. The OPC was mounted on the center, forward section of the frame and tilted at a 45° angle to maximize flow through the tunnel at the average/optimal MOCNESS towing angle. Flow through the OPC was calculated based on the MOCNESS flow meter readings. The OPC gathered particle size and distribution data continuously on both the down and up-cast of the MOCNESS. The zooplankton detected by the OPC are initially grouped into roughly 3200 size categories between 250 µm and 14 mm equivalent spherical diameter (ESD). The term ESD describes the size of the sphere that blocks the same amount of light as the particle that passed through the detection beam in the OPC and unless the animal is spherical it does not represent the true length of the animal. For statistical analyses the 3200 size categories are re-grouped into 50 classes and vertically integrated into depth bins of typically 1 or 2 m (Huntley *et al*., 1994; Zhou & Huntley, 1997).

Echo intensity data from the ADCP will be used to estimate the krill mean volume backscattering strength, while the second moment of a Doppler spectrum directly provides the measurement of mean random swimming speed of krill in the aggregation.

### *7.3 Results*

Data from the ADCP will be processed after the completion of the cruise. Interference from heavy sea ice cover introduced a significant amount of noise, which will need to be filtered in order to look at broad-scale circulation patterns.

The OPC was affixed and operational during 15 of the 17 MOCNESS casts, missing the first 2 due to cross-talk problems (see Figure 14B of MOCNESS locations).

The measurements of the number of zooplankters $m^{-3}$ showed that the highest abundance of zooplankton (2250 $m^{-3}$) occurred around the southern tip of Adelaide Island at station 35. The next highest abundances were found on the shelf, but had a north-south gradient with highest values (1250 $m^{-3}$) in the south at station 63, decreasing to ~ 750 $m^{-3}$ near station 15. The lowest average value (550 $m^{-3}$) was found offshore at grid station 23.

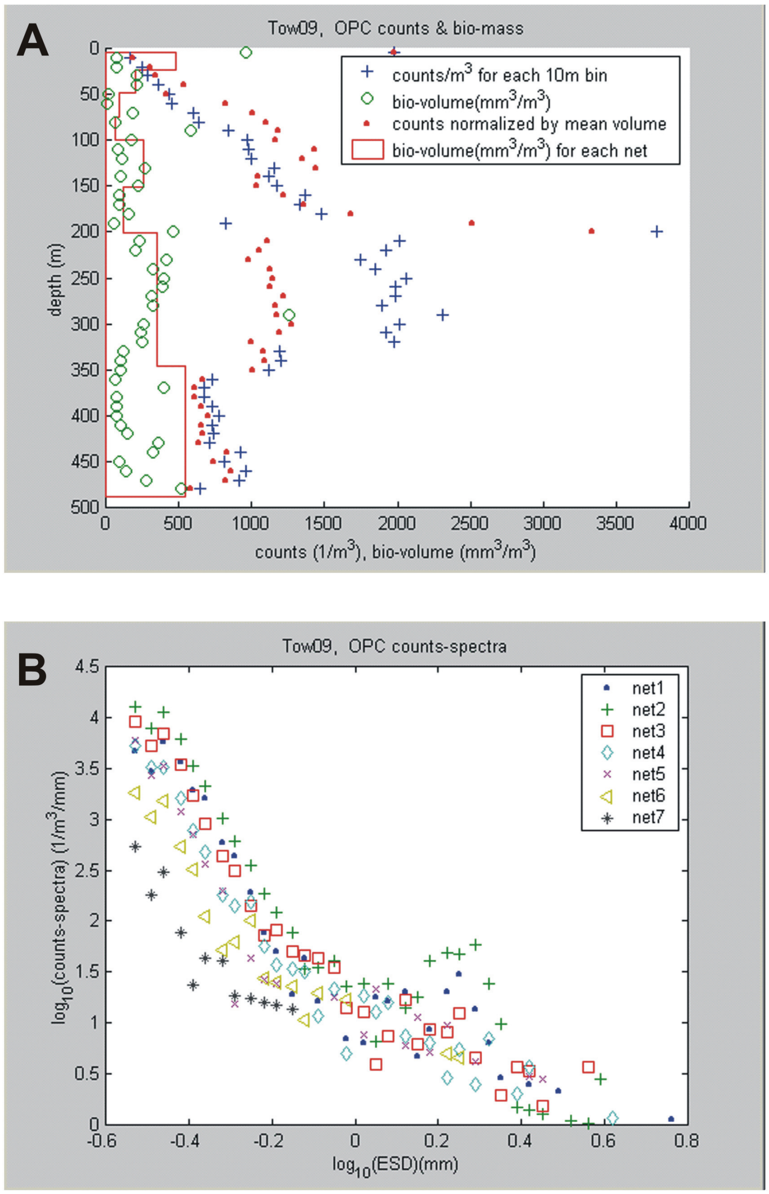



Figure 23. A) Normalized vertical distribution of zooplankton counts for station 35. Results were grouped into 10-m depth bins and bio-volume is calculated for each interval sampled by the 1-m MOCNESS. See MOCNESS tow 9 for details on the specific intervals sampled by each net. B) Counts-spectra for grid station 35. The change in slope centered around 0.2 ESD is most apparent for net 1 (350-500 m) and net 2 (200-350 m). The 0.2 ESD size range corresponds to body sizes of small furcilia and large copepods. The top of the depth range for nets 3-7 are 150 m, 100 m, 75 m, 47 m, and 25 m, respectively.

Located in the northern end of Marguerite Bay, station 35 had the highest abundance of zooplankton measured by the OPC. The vertical distribution of normalized counts (Figure 23A) at this station indicates a linear increase in abundance with depth down to ~ 300 m, decreasing with depth below this level. The counts-spectra within the maxima (200 – 350 m) has a peak around 0.25 mm ESD, the size range of small furcilia and large copepods (Figure 23B), indicating a concentration of these zooplankters at this depth. These findings were also supported by visual observations of the contents of the MOCNESS cod-ends.

In contrast to the northern end of Marguerite Bay, offshore station 23 (see MOCNESS locations) had the least abundance of zooplankton detected by the OPC. The vertical distribution of normalized counts (Figure 24A) showed a relatively homogeneous distribution of plankton in the upper 450 m, decreasing with depth below this. Limitations in the pressure sensor of the OPC did not allow immediate processing of data gathered below 600 m.

The counts-spectra for station 23 (Figure 24B) show a typical linear decrease in abundance with increase in body size. Results from the surface net (net 8) are somewhat obscured by the presence of fragmented sea ice in the upper 7-10 m and likely do not accurately represent the size and abundance of zooplankton in this surface layer (0 – 25 m).

### *7.4 References*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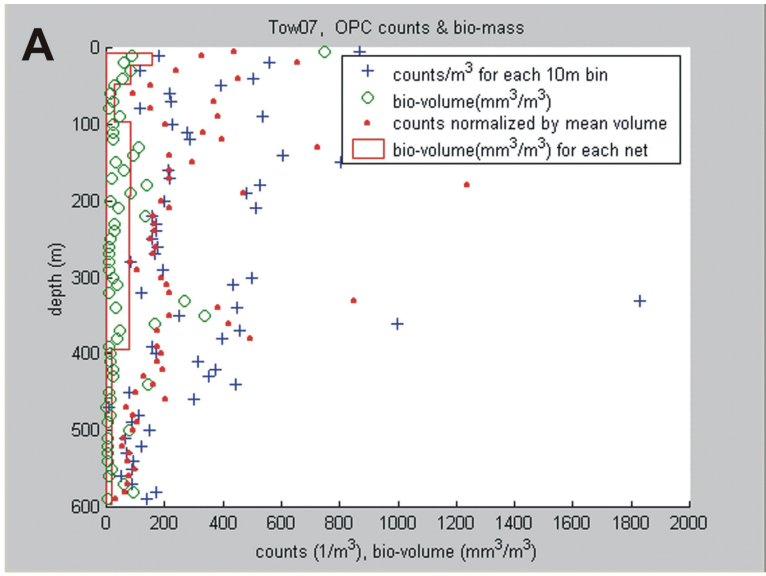
## 8.0 Seabird and Crabeater Seal Distribution in the Marguerite Bay Area

(Investigators: Christine Ribic, Erik Chapman)

### *8.1 Introduction*

The association of seabirds with physical oceanographic features has had a long history. For example, seabirds have been found to be associated with temperature, water masses, currents, and the ice pack. Evidence for the association of seabirds with biological features has not been as strong. Veit *et al*. (1994), working during the breeding season at South Georgia, was not able to find a small-scale association of seabird distributions and krill patches. Only at a very large scale was there some evidence that there were more seabirds in the vicinity of krill patches than elsewhere. This may be due to the patchiness of the krill and the inability of seabirds to track these patches at small scales. Therefore, in the Antarctic system, seabirds may associate with physical features that have a higher probability of containing krill than associating with krill patches directly.

The primary objective of the seabird project is to determine the distribution of seabirds and seals in the Marguerite Bay area and to investigate their associations with physical and biological features.



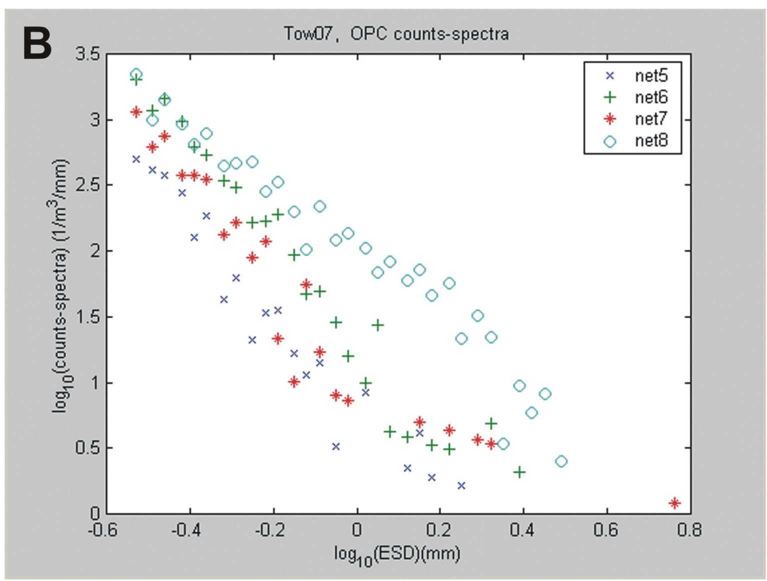




Figure 24. A) The normalized vertical distribution of zooplankton counts for station 23, located in deepwater off the shelf break. Counts $m^{-3}$ for each 10-m bin are evenly distributed in the upper 450 m of the water column, with counts decreasing below this depth. B) Counts-spectra for grid station 23. Results from the upper 200 m show a near-linear decrease in abundance with increase in body size (ESD) of the zooplankton. Depth intervals for nets 5 to 8 are 200-100 m; 100-50 m; 50-25 m, and 25-10 m, respectively.

*8.2 Methods*

Seabird and seal distributions within the SO GLOBEC study area were investigated using daytime and nighttime (using night vision viewers) surveys. Nighttime surveys were designed to complement daytime surveys. A summary of daytime and nighttime surveys are outlined separately below.

<u>8.2.1 Daytime Surveys</u>

*8.2.1.1 Methods.* Strip transects were conducted simultaneously at 300 m and 600 m widths for birds and seals. Surveys were conducted continuously while the ship was underway within the study area and when visibility was >300 m. For strip transects, two observers continuously scanned a 90° area extending the transect distance (300 m and 600 m) to the side and forward along the transect line. Binoculars of 10X and 7X magnification were used to confirm species identifications. The 7X pair of binoculars also included a laser range finder. Ship-following birds were noted at first occurrence. Ship followers will be down-weighted in the analyses because these individuals may have been attracted to the ship from habitats at a distance from the ship. For each sighting, transect (300 m or 600 m), species, number, behavior, flight direction, and any association with visible physical features, such as sea ice, were recorded. Distances were measured either by a range finder device as suggested by Heinneman (1981) or by the laser distance finder (when in the sea ice).

Surveys were conducted from an outside observation post located on the port bridge wing of the *RVIB N.B. Palmer*. When it was not feasible to conduct surveys from this observation post, we surveyed from the inside port bridge wing.

*8.2.1.2 Preliminary Results*

Total Survey Time: 99 hours, 18 minutes.
Distance (km): 828.6
Boat Speed (knots): 4.9 (1.8 SD)
True Wind Speed (knots): 7.7 (4.7 SD)

Total survey distance was 828.6 km, which was 110 km less than achieved on the first U.S. SO GLOBEC survey cruise (the April-May cruise). This was due to additional station work added to the second U.S. SO GLOBEC survey cruise, which significantly reduced the amount of time spent transiting during the day.

The presence of pack ice throughout the survey grid had a dramatic influence on the abundance and distribution of birds during the second U.S. SO GLOBEC survey cruise. We no longer found Southern Fulmars (*Fulmarus glacialoides*), Cape Petrels (Daption capense) or Blue Petrels (*Halobaena caerulea*); species that were abundant on the first U.S. SO GLOBEC survey cruise and are typically found in open water. During this cruise, we found species typically associated with pack ice, including Snow Petrels, Antarctic Petrels, Southern Giant Petrels, as well as Adélie and Emperor penguins. The primary species of seal seen was the crabeater seal. Results for the major species of interest are discussed separately below. The list of species observed during the survey are found in Table 8.

<u>Snow Petrel (*Pagrodoma nivea*):</u>

The Snow Petrel was the most abundant species on the survey grid and their distribution appeared to be even throughout the study area. Snow Petrels were observed throughout the study area and were typically associated with any open water in the pack ice. In contrast, during the first U.S. SO GLOBEC survey cruise, this species was clustered in apparent association with a cold, coastal current south of Adelaide Island and north and west of Alexander Island.

Table 8. Summary of sightings of birds and crabeater seals during daytime survey effort within the SO GLOBEC study area during cruise NBP01-04.

| Species | Number |
|---|---|
| Snow Petrel (*Pagrodoma nivea*) | 428 |
| Antarctic Petrel (*Thalassoica antarctica*) | 45 |
| Southern Giant Petrel (*Macronectes giganteus*) | 41 |
| Adélie Penguin (*Pygoscelis adeliae*) | 175 |
| Emperor Penguin (*Aptenodytes forsteri*) | 18 |
| Black Browed Albatross (*Diomedea melanophris*) | 1 |
| Crabeater Seal (*Lobodon carcinophagus*) | 187 |

Adélie Penguin (*Pygoscelis adeliae*):

Adélie penguins were observed in the pack ice in the water (i.e., in leads) and hauled out on sea ice primarily adjacent to leads. Most of the birds appeared to be clustered within and outside the mouth of Marguerite Bay (Figure 25A). Overall, we did not observe large numbers of Adélie penguins and most commonly saw individuals or groups of less than 4 birds. After leaving the survey grid, we surveyed near the ice edge over the continental shelf and did not observe groups of Adélie penguins. We did make incidental observations of large groups of 100 to 200 birds hauled out in several areas during our transit to Paradise Harbor, east of Anvers Island. It may be that areas inland of the survey grid where there is some open water are important areas for Adélie penguins during the winter. We did not observe Adélie penguins when doing surveys during the first U.S. SO GLOBEC survey cruise when there was very little sea ice in the survey area.

Emperor Penguin (*Aptenodytes forsteri*):

We saw 21 Emperor penguins during this cruise and locations of these birds are shown in Figure 25B. Emperor penguins are probably never common birds in Marguerite Bay; Dion Island being the northern extent of their breeding distribution on the Antarctic Peninsula. The individuals we observed were likely females, as breeding males are incubating eggs at this time of year. Emperor penguins are deep diving birds and were mainly seen at the mouth of Marguerite Bay and toward the shelf, just south of Marguerite Bay (Figure 25B). We did not see Emperor penguins during the first U.S. SO GLOBEC survey cruise.

Crabeater Seal (*Lobodon carcinophagus*):

Crabeater seals were seen primarily within the pack ice in the water and hauled out on the sea ice. Crabeater seals appeared to be most common within and just south of Marguerite Bay (Figure 25C). Their distribution appeared to be centered in areas where satellite-tagged crabeater seals appeared to be concentrating their activity.

8.2.2 Seabird Nighttime Surveys

*8.2.2.1 Methods.* ITT 200/210 Binocular Night Vision Viewers were used during one half-hour survey periods while on the survey grid. Surveys were a minimum of an hour apart. Observations were made from the port bridge wing. Observers scanned back and forth looking for birds. Species and behavior were recorded for each observation. Observations were not conducted when visibility with the night vision viewer was less than 100 m from the ship.

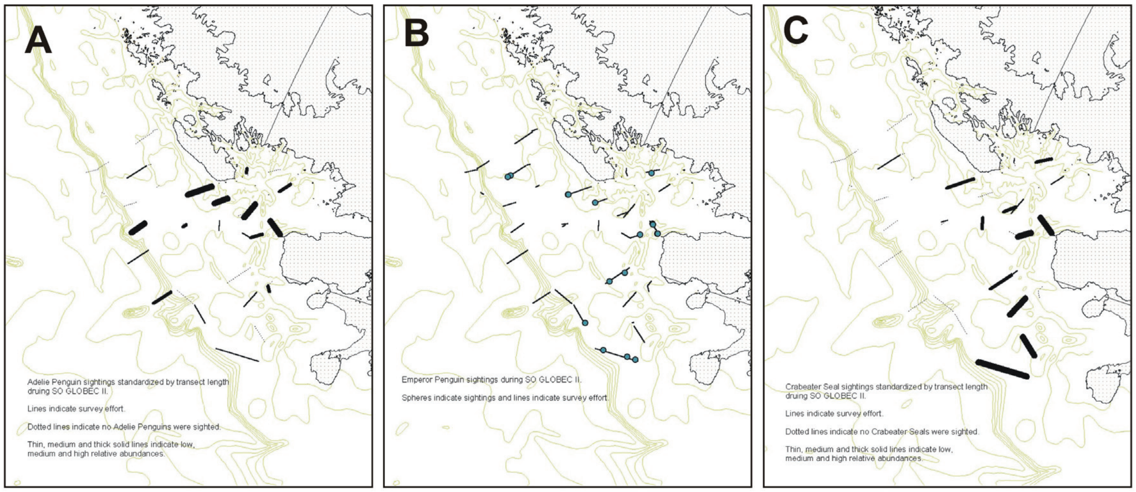



Figure 25. A) Adélie penguin distribution in SO GLOBEC study area during NBP01-04. B) Emperor penguin sightings in SO GLOBEC study area during NBP01-04. C) Crabeater seal distribution in SO GLOBEC study area during NBP01-04.

*8.2.2.2 Preliminary Results.*

Total Survey Time: 24 hours, 30 minutes
Distance (km): 267.0
Boat Speed (knots): 5.1 (1.5 SD)
True Wind Speed (knots): 8.3 (4.3 SD)

More effort was expended during this cruise to collect data at night compared to the first U.S. SO GLOBEC survey cruise when the method was being developed. One hundred seventeen more kilometers were surveyed on this cruise compared to the first cruise.

Species seen during night surveys are listed in Table 9. During the night surveys, we mostly saw Snow Petrels and results typically supported those from daytime surveys in the same area. While we saw mainly ship followers at night during SO GLOBEC I, during this cruise we saw few ship followers at night and often saw birds take off from the surface of the sea ice in front of the ship.

Table 9. Summary of bird and crabeater seal sightings during nighttime survey effort within the SO GLOBEC study area during cruise NBP01-04.

| Species | Number |
|---|---|
| Snow Petrel (*Pagrodoma nivea*) | 106 |
| Antarctic Petrel (*Thalassoica antarctica*) | 2 |
| Adélie Penguin (*Pygoscelis adeliae*) | 10 |
| Crabeater Seal (*Lobodon carcinophagus*) | 1 |

*8.3 References*

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Veit, R.R., E.D. Silverman, R.P. Hewitt, and D.A. Demer. 1994. Spatial and behavioral responses by foraging seabirds to Antarctic krill swarms. *Antarctic Journal of the United States*. 29(5): 164-166.

**9.0 International Whaling Commission Cetacean Visual Survey and Biopsy**
(Ari S. Friedlaender and Rebecca Pirzl)

*9.1 Introduction*

Recently, the International Whaling Commission (IWC) developed proposals for collaborative work in the Southern Ocean with the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) and the International Global Ocean Ecosystem Dynamics (GLOBEC) program under the IWC Southern Ocean Whale Ecosystem Research (SOWER) program. This research program has the long-term aim to "*define how spatial and temporal variability in the physical and biological environment influence cetacean species in order to determine those processes in the marine ecosystem which best predict long-term changes in cetacean distribution, abundance, stock structure, extent and timing of migrations and fitness.*"

This objective is being pursued through collaboration with SO GLOBEC and CCAMLR using a multidisciplinary ecosystem approach to data collection, analysis, and modeling. The IWC also recognizes that it lacks the data to determine baseline patterns of distribution (and the biological and physical processes responsible for such patterns) of baleen whales from which to judge the potential effects of climate change. Therefore, three further objectives have been defined by the Commission. They are: 1) to characterize foraging behavior and movements of individual baleen whales in relation to prey characteristics and physical environment; 2) to relate distribution, abundance and biomass of baleen whale species to same for krill in a large area in a single season; and 3) to monitor interannual variability in whale distribution and abundance in relation to physical environment and prey characteristics.

The SO GLOBEC studies provide the ideal platform for such long-term studies, where scientists from a range of disciplines can conduct intensive focussed studies, within the framework of long term data synthesis and planning. Given the shared objectives among the IWC, SO GLOBEC and CCAMLR, the IWC has determined that the most effective means of investigating these ecological issues is to focus a considerable body of cetacean research within the framework provided by these programs (taken from D. Thiele).

The first of the "Predator Science Questions" in SO GLOBEC has been formulated as: How does winter distribution and foraging ecology of top predators relate to the distribution and characteristics of the physical environment and prey (krill) (taken from J.A. van Franeker).

*9.2 Methods*

Standard IWC methodology for multidisciplinary studies will be used throughout all SO GLOBEC collaborative cruises. This will involve experienced cetacean researchers conducting line transect sighting surveys throughout daylight hours in acceptable weather conditions. Data are recorded on a laptop based tracking program (Wincruz), and photographic and video records are also obtained for species identification, group size verification, feeding (and other behavior), sea ice habitat use, and individual identification (taken from D. Thiele).

During this cruise, observations were made from the ice tower or the bridge level of the *RVIB Nathaniel B. Palmer* by two observers (Ari Friedlaender and Rebecca Pirzl). When conditions permitted, the observer was outside along the catwalk of the ice tower, otherwise, observations were made from inside. Effort was focused 45° to port and starboard of the bow ahead of the vessel, while also scanning to cover the full 180° ahead of the vessel. In sea ice, the method was adjusted to include searching to the beam and behind the vessel track as well, in order that cetaceans and seals hidden by sea ice would be detected more readily. The observers used a combination of eye and binocular (7x50 Fujinon) searching. Effort commenced when the following conditions allowed: appropriate daylight, winds less than 20 kts or Beaufort Sea State less than or equal to 5, visibility greater than 1 mile (measured in the distance a minke whale blow could be seen with the naked eye as judged by the observer), and the ship was actually steaming.

Observation effort and sightings were recorded on a laptop computer based Wincruz Antarctic program. This program logs GPS position, course, ship speed continuously as well as a suite of other environmental and sighting conditions described by the observers (Beaufort sea state, sighting conditions, visibility, cloud cover, sea ice coverage). Visual observations were made both during the station-transect portion of the trip, as well as during transit. When possible, photographic and/or video documentation was made of each sighting for later use in individual identification, species confirmation, and habitat description.

A second component to the marine mammal work is biopsy sampling from small boats. On the occasion that weather conditions, daylight, timing, and whales were present, biopsy sampling was attempted from Zodiacs. Samples were obtained with a Barnett Wildcat Crossbow equipped with custom made floating bolts, and screw-on hollow point biopsy plugs. The bolts are designed to penetrate the skin and blubber (depending on the size of the plug; either 1 inch or 0.5 inches) to the end of the plug, where the float begins, and bounce out of the whale, securing a sample with three small barbs inside the plug. Skin samples are preserved in dimethyl sulfoxide solution and will be sent to the National Marine Fisheries Service, Southwest Fisheries Science Center, La Jolla, CA for genetic analysis. Blubber samples will be frozen for later use in contaminant, pesticide, heavy metal, etc. analysis.

### *9.3 Results*

#### 9.3.1 Sightings

Generally, sighting conditions were good during the cruise. The appropriate combination of environmental and ship conditions did not lend to long transit times for surveys, however, nearly 110 hours (108:35 hours total, 107:09 hours in the survey grid) of sighting effort were made during the entire cruise (Figure 26A). This is an improvement over the the last cruise, when only 79:33 hours of observation time were logged.

A total of 15 cetacean sightings of 27 animals were made during this trip (Figure 26A, Table 10). In Antarctic waters (south of 60°S), 11 cetacean sightings of 18 animals were made (Figure 26B). These include 9 sightings of 14 minke whales, *Balaenoptera acutorostrata*, 1 sighting of 1 unidentified whale, and 1 sighting of 3 killer whales (*Orcinus orca*) (Table 11).

All of the sightings south of 60°S, except the killer whales, were from within the study area as defined by the survey grid (Figure 26C). The frist cue seen for all of the sightings within the survey grid was a "blow". The entire study area was covered in pack ice ranging between 5-10/10ths coverage, and thus, there was not a lot of open water in which whales could be seen. As the case was, the whales were surfacing in smaller leads, less than 50 m across, in areas where the sea ice was not flat, but rather contained pressure ridges. This made seeing the body of a surfacing animal difficult. As air temperatures were constantly well below freezing, the blows of warmed air would freeze quickly and hang suspended for several seconds before dissipating, giving the observers time to sight them. This was confounded a bit in that when there were larger areas of open water, there would often times be sea smoke. This fog, or vapor, of warmer ocean water meeting the cold ambient air made it difficult to distinguish a blow. This is one potential bias to our sighting effort that had not previously been discussed.

During the transit to the study area, one remarkable group of sightings took place. On 24 July (1800 UTC) a group of 3 killer whales were seen 600 m off the bow of the ship, porpoising from port to starboard. After they passed the starboard beam, they were seen porpoising through moderate swell towards 2 sperm whales that recently surfaced 500 m beyond the killer whales. The pattern of the sperm whales surfacing and the killer whales chasing lasted until the animals were out of sight, 15 minutes later. Soon thereafter, another 2 killer whales swam close by the ship across the bow. A single mature male (as evidenced by its large size and extremely high dorsal fin) remained near the ship (100 m) for several seconds in full view. The whales then sped off towards the previous group.

Later on that day (1945 UTC) 2 southern bottlenose whales (*Hyperoodon ampluattus*) surfaced 50 m off the starboard bow. The animals were easily recognized by their size (approximately 7 m), the slate gray coloration on their backs, the large bulbous melon that was visible when the animals surfaced (also scarred white), and the placement and shape of a triangular, falcate dorsal fin well back on the body.

9.3.2 Biopsy No biopsy sampling was attempted during the voyage.

*9.4 Preliminary Findings/Discussion*

As stated earlier, a primary research objective of the cetacean studies within SO GLOBEC is to determine the winter distribution and foraging ecology of baleen whales in relation to the characteristics of the environment and the distribution of their prey. Sightings data from this cruise showed only minke (*Balaenoptera acutorostrata*) whales present in the study region in the late austral winter. Sighting numbers of minke whales were lower than last cruise despite the increased survey time. Coupled with the lack of humpback whales seen during this cruise, it may be stated that minke whales are the only species of cetacean (Mysticeti) to over-winter around Marguerite Bay.

From the last cruise (NBP01-03), correlation of cetacean distributions with concurrent hydrographic distributions showed whales associated with: 1) the southern boundary of the Antarctic Circumpolar Current, 2) the frontal boundary between intrusions of warm Upper Circumpolar Deep Water and continental shelf water, and 3) the frontal boundary between inner shelf coastal current and continental shelf waters (E. Hofmann, pers. comm.; see also Figure 2 in the Hydrography Report for NBP01-03). Cetacean sightings were particularly numerous along the frontal boundary formed as the coastal current exits the southern end of Marguerite Bay. Humpback whales were associated with all three frontal boundaries while minke whales were found only along the continental shelf and coastal frontal boundaries. The correspondence between the cetacean sightings and hydrographic features suggests that the early austral winter distribution of cetaceans along the west Antarctic Peninsula is not random, but rather is determined by the structure of the physical environment, which in turn determines prey distribution. The hydrographic processes described on this cruise (see Hydrography, Section 1.0) are different than those of the previous cruise. However, some statements about winter cetacean distribution relative to the hydrography of Marguerite Bay can be made. It appears that the northern and eastern most minke whale sightings occur along the intrusion path for oceanic water towards Marguerite Bay. This is represented as plume features in surface salinity and ammonia, as well as subpycnocline temperature and silicate values (as described in Section 1.0).

Alternatively, the western and southernmost sightings of minke whales were made over the continental shelf break, while the inner sightings described above, occur in deep water in the Marguerite Trough. Thus, late winter distribution of minke whales may be influenced by water depth around Marguerite Bay. As well, the estimated circulation cell boundaries of water around

Marguerite Bay, based on water density at 300 m, also show a qualitative correlation to the minke whale sightings.

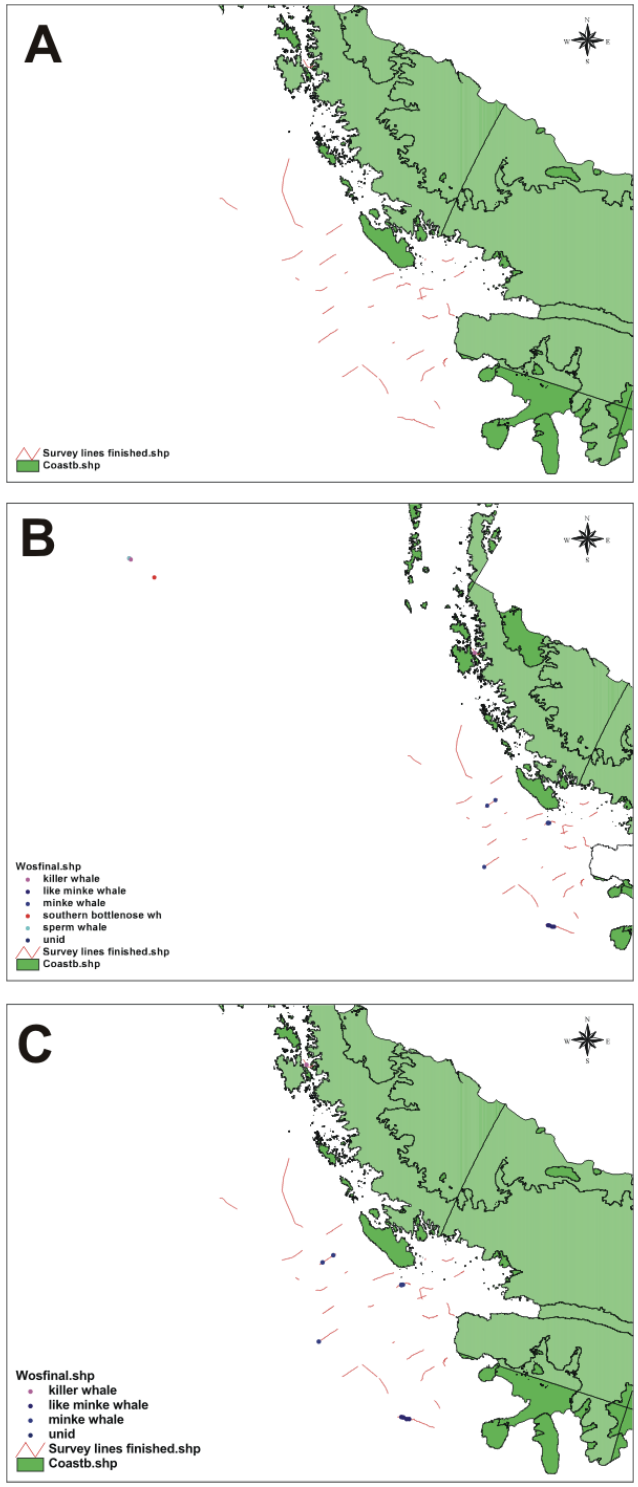


Figure 26. A) GIS image of Marguerite Bay survey area. Track lines indicate where sighting effort took place. B) GIS image of Marguerite Bay survey area with survey track lines and all cetacean sightings made during the cruise. C) GIS image of Marguerite Bay survey area with track lines and all cetacean sightings made in Antarctic waters (south of 60°S).

The most remarkable difference between this cruise and last, save the lack of humpback whales, was the sea ice coverage. The entire study region was ice covered to some extent. Throughout the study region sea ice conditions varied in percent coverage as well as thickness and ice type. Generally, sea ice conditions were less dense and consolidated to the west and north of the survey grid. Sea ice conditions inside the Bay and to the south were generally very dense with very few leads, or areas of open water. However, all of the sightings made in the survey area were made in 9-10/10ths ice coverage. Sightings were also restricted to small leads. On one occasion, whales were seen surfacing on either side of a large pool of open water, and even traveling towards the open water, but were never seen to venture out of the thin surrounding cracks. The most absolute factor limiting the distribution of whales in the study area, and in most of Antarctica during winter time, is the ability to find open areas to breathe. Brief examination of the satellite images of sea ice cover though, revealed that even in areas of complete sea ice coverage and high pressure, there appeared to be veins of open water, or at least thinner sea ice, that streaked throughout the study area from southwest to northeast, and may offer avenues of entrance and exit for whales. Further assessment of the sea ice condition data is necessary before further statements about its correlation to whale distribution can be made.

However, it is noteworthy that humpback whales were sighted in relative frequency last cruise in open water areas that during this cruise were covered in sea ice. One supposition is that the humpback whales move or migrate north as the winter pack ice develops from south of Marguerite Bay. We tried to test this hypothesis by steaming through an ice-free area where humpback whales are seen in great numbers in the summer time, the Gerlache Strait. This plan, however, did not come to worthwhile fruition, as we were only steaming through this area for 86 minutes during daylight hours. However, sonobuoys activated during this transit did not record any humpback whales (see sonobuoy report, Section 10.0).

What is clear from the data collected during the first year of the U.S. SO GLOBEC study is that whales can be found in Marguerite Bay throughout the winter. Species diversity, numbers of animals, and distribution patterns all differ from the sea ice-free early winter to the deep, sea ice-covered winter habitat that we observed during this cruise. Understanding the changes that occurred from the first cruise to the second, will greatly enhance our understanding of the environmental conditions that are critical to cetacean habitat during austral winter in Marguerite Bay. Continued analyses and collection of cetacean sightings data in conjunction with concurrent prey and hydrographic distributions will allow determination of the causal relationships underlying austral winter cetacean distributions in the Antarctic Peninsula region.

Table 10. All cetacean sightings made during U.S. SO GLOBEC survey cruise, NBP01-04

| Date | Time (UTC) | | Latitude (°S) | Longitude (°W) | Species | No. animals |
|---|---|---|---|---|---|---|
| 24/7/01 | 1800 | 1 | 57.212 | 65.861 | killer whale | 3 |
| 24/7/01 | 1800 | 2 | 57.212 | 65.861 | sperm whale | 2 |
| 24/7/01 | 1815 | 3 | 57.255 | 65.879 | killer whale | 2 |
| 24/7/01 | 1946 | 4 | 57.857 | 66.144 | southern bottlenose whale | 2 |
| 29/07/01 | 1650 | 5 | 66.434 | 69.727 | minke whale | 1 |
| 29/07/01 | 1916 | 6 | 66.305 | 70.167 | minke whale | 1 |
| 3/8/01 | 1350 | 7 | 66.662 | 73.392 | minke whale | 3 |
| 14/08/01 | 1718 | 8 | 67.709 | 69.887 | minke whale | 2 |
| 14/08/01 | 1743 | 9 | 67.684 | 69.913 | unid | 1 |
| 14/08/01 | 1745 | 10 | 67.683 | 69.914 | minke whale | 1 |
| 22/08/01 | 1728 | 11 | 68.485 | 75.624 | like minke whale | 1 |
| 22/08/01 | 1754 | 12 | 68.442 | 75.654 | like minke whale | 2 |
| 22/08/01 | 1833 | 13 | 68.382 | 75.620 | like minke whale | 2 |
| 22/08/01 | 1854 | 14 | 68.347 | 75.627 | like minke whale | 1 |
| 27/08/01 | 2100 | 15 | 64.736 | 63.071 | killer whale | 3 |

Table 11. All cetacean sightings made in Antarctic waters (South of 60°S).

| Species | Sightings | Animals |
|---|---|---|
| Minke Whale (*Balaenoptera acutorostrata*) | 5 | 8 |
| Like Minke Whale | 4 | 6 |
| Killer Whale (*Orcinus orca*) | 1 | 3 |
| Unidentified Whale | 1 | 1 |

**10.0 Passive Listening**
(Ana Sirovic)

*10.1 Introduction*

The primary goal of this project is to determine minimum population estimates, distribution, and seasonality of mysticete whales within the west Antarctic Peninsula (WAP) region. These data will allow the rates of whale predation on krill to be modeled for the study area. Since the calls of most baleen whales are unique and easily recognizable, it is possible to distinguish among various species using passive acoustic techniques. Furthermore, blue whales show geographic variation in their low frequency, regularly repeated "broadcast" calls, which might prove useful in determining the origin of the stock found in the WAP region. At the very least, it is hoped that an acoustic detection baseline can be established from which future changes in relative abundance can be measured.

The main species of interest is the blue whale (*Balaenoptera musculus*), followed by fin (*B. physalus*) and humpback (*Megaptera novaeangliae*) whales. Minke (*B. acutorostrata*) and sperm whale (*Physeter macrocephalus* – an odontocete) calls may be detected, but are expected to be so infrequent as to make population density estimates unreliable. The Antarctic blue whale population is now so low that it is virtually impossible to obtain statistically significant encounter rates for population estimates during visual surveys. For this reason, these estimates currently vary from 500 to 5000 individuals.

*10.2 Methods*

The key component of this study is a series of 8 acoustic recording packages (ARPs) that were deployed during the LMG01-03 Cruise (18 March–13 April 2001). They are bottom mounted and have a hydrophone component floating 5 m above the mooring. Each ARP will record continuously at 500 samples per second for 13 months and the data are stored on 36 gigabyte hard disks. The low frequency (~ 20 Hz) calls of blue and fin whales can be recorded out to a 20 km radius providing more contacts in a 1-year deployment than would be possible even from an extensive visual survey, assuming whales call roughly 10 to 50 percent of the time.

During the NBP01-04 cruise, sonobuoys were deployed opportunistically in order to supplement the information that will be gathered from the seafloor recorders. Sonobuoys are expendable underwater listening devices. The sonobuoy has 4 main components – a float, a radio transmitter, a saltwater battery, and a hydrophone. The hydrophone is an underwater sensor that converts the pressure waves from underwater sounds into electrical voltages that get amplified and sent up a wire (length of released wire can be set to 90, 400, or 1000 feet) to the radio transmitter that is housed in the surface float. The radio signal is picked up by an antenna and a radio receiver on the ship, then reviewed and simultaneously recorded onto a digital audiotape. Sonobuoys can transmit for a maximum of 8 hours before scuttling and sinking.

There are 2 types of sonobuoys. Omnidirectional sonobuoys have hydrophones that can register signals up to 20 kHz, but they cannot determine the location of the sound source.

DIrectional Fixing And Ranging (DiFAR) sonobuoys also have an omnidirectional hydrophone for recording sound, but it is limited to frequencies lower than 2.5 kHz. However, DiFARs also have 2 pairs of direction sensors, which along with an internal compass can determine the exact bearing of the sound relative to the sonobuoy. With 3 or more sonobuoys in the water it is possible to pinpoint the exact location of the sound source. This can then be correlated to visual observations of the species of marine mammal in that location, along with behavior and grouping information.

Two antennas were used during the cruise: a Yagi directional antenna and a Sinclair omnidirectional antenna. The maximum range for the radio transmission during this cruise was 17 miles on the Yagi and 12 nm on the Sinclair. The Yagi did not prove to be a good option under heavy sea ice conditions when a lot of backing and ramming was necessary to pass through the sea ice, resulting in non-straight track line. Also, even though the maximum range obtained on the Sinclair was 12 nm, sea ice had a big impact on sonobuoy transmission and a more typical range for a sonobuoy deployed in heavy pack ice was 4 nm. The noise levels from the *RVIB Nathaniel B. Palmer* and sea ice breaking greatly affected the quality of recordings, making for a lot of very noisy data.

There were a couple of reasons for sonobuoy deployments. Firstly, they provide recordings that can be compared to the seafloor data. This will provide a calibration on content as well as detection ranges. Secondly, they are a means of getting recordings outside of the seafloor array range.

*10.3 Data Collected*

Sonobuoys were deployed when marine mammals were visually detected and randomly throughout the cruise. A total of 54 sonobuoys were deployed: 6 omnidirectional and 48 DiFAR (12 DiFAR buoys failed, this is a fairly large proportion, but most of the failures can be attributed to the sea ice). Locations of all the deployments as well as a preliminary summary of the buoys on which calls were heard can be seen in the complete (Figure 27A) and close-up (Figure 27B) maps of the study area. Further analysis of the recordings is needed to double check for calls that were possibly not detected during the preliminary review. Other data noted for each deployment were: 1) the reason for the deployment, and 2) when known, sonobuoy range. Full information on each deployed sonobuoy is given in Appendix 9.

*10.4 Preliminary Results*

No baleen whales were heard on any of the deployed sonobuoys. Seals were heard on 7 sonobuoys. These were mostly Weddell seals, but also a crabeater and a leopard seal were heard on 1 sonobuoy each. Most of the calls were heard on the southern portion of the survey area (on or south of the 260 line). A few possible killer whale calls were recorded in Paradise Harbor, after visual sighting of a group of 3 killer whales. Although 17 minke whales were visually detected during the cruise (Friedlaender) and sonobuoys were deployed whenever possible after these sightings, no minke whale calls were heard.

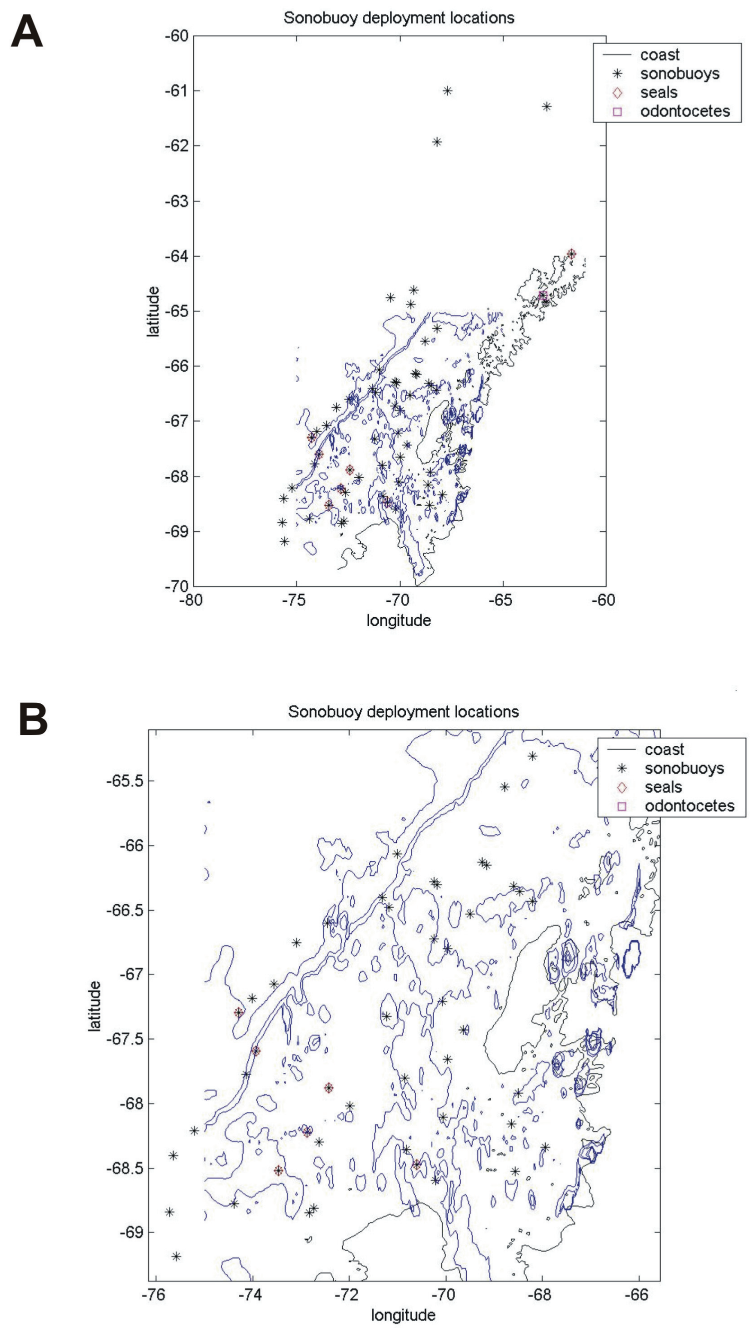


Figure 27. A) Locations of sonobuoy deployment with seal and odontocete calls marked. B) Close-up of the study area with sonobuoy deployment and call locations marked.

## 11.0 Behavioral and Physiological Overwintering Strategies of Krill

(Kendra Daly)

### *11.1 Introduction*

The objective of my research is to evaluate the behavioral and physiological overwintering strategies used by different life history stages of the Antarctic krill, *Euphausia superba*. These strategies may include feeding on sea ice biota on the undersurface of sea ice, carnivory, body shrinkage, utilization of sequestered lipids, and seasonal metabolic reduction. The ability of larvae to survive over winter strongly influences the level of juvenile recruitment during spring. In addition, the ability of adults to obtain food during winter may affect reproductive capacity in the following summer. Thus it is important to understand which overwintering strategies dominate under different environmental conditions in order to understand the annual population dynamics of krill in the Southern Ocean.

### *11.2 Methods*

Krill were routinely collected with several types of nets and by divers for identification of species, stage, and size, for dry weight and carbon/nitrogen (CN) measurements, for physiological measurements, and for assessment of sexual maturity. Larval and adult krill were collected at 10 stations with a 1.5-$m^2$ Tucker trawl, having a 1/4 inch mesh graded down to a 707 µm mesh with protected cod ends (Figure 28A). A downward-fishing 1-$m^2$ Plummet net with a 333 µm mesh net was used at 8 stations where sea ice conditions prevented trawling behind the ship (Figure 28B). The diving operations were done in collaboration with Jose Torres. Larval krill were collected by divers (see Section 12.0) at 7 stations (Figure 28C). Under sea ice samples were collected by divers in areas where larval krill were feeding at all dive sites except station 77. These samples will be analyzed for chlorophyll and particulate organic carbon and nitrogen concentrations and sea ice biota will be assessed by Scott Gallager. During the re-occupation of station 16, we used a diaphragm pump through an ice core hole to obtain samples from the ice/water interface as weather conditions were too marginal to dive. In addition, krill were removed from several MOC-1 (stations 26, 35, and 87) and MOC-10 (stations 34 and 42) net tows to assess gut pigment and dry weights/CN measurements of individuals distributed at different depths of the water column (Figure 28D). Some krill were frozen for Rodger Harvey on the *Gould* to provide him with additional spatial coverage for his analyses of krill growth.

Chlorophyll and particulate organic carbon (POC) and nitrogen (PON) concentrations were determined as a measure of the food available to krill for most experiments. Chlorophyll and POC/N concentrations also were determined for GF/F -1, 1-5, 5-20, and > 20 µm size fractions. In addition, we collected surface seawater from the ship's flow through system to correlate the fluorescence voltage output with chlorophyll concentration.

The Hydroacoustic Technology Inc. (HTI) system only was used at station 87 due to heavy sea ice concentrations throughout the study area. At this station the towed body was deployed over the side in a stationary mode during the vertical Plummet net tows. Acoustic backscattering strength was assessed using both 38 and 120 kHz frequencies. The system was calibrated with a standard target sphere in Paradise Harbor at the end of the cruise.

Feeding rates of krill were determined by: (1) gut fluorescence, (2) omnivory container experiments, and (3) mass-balance of carbon and nitrogen budgets. Omnivory experiments measured adult feeding on copepods. Larval and adult krill feeding on microplankton and detritus was assessed in collaboration with Scott Gallager. For carbon/nitrogen budgets we measured growth, molting, and egestion rates and assimilation efficiency for different life history stages of krill. Respiration rates measured by Jose Torres and excretion rates assessed in collaboration with Kent Fanning will be used to complete the budget analyses. The results of these measurements will be assessed in relation to environmental factors and the abundance and distribution of krill in different life history stages to evaluate feeding strategies. A lipid biomarker uptake experiment also was completed and will be analyzed in collaboration with Rodger Harvey.

*11.3 Preliminary Results*

Near-surface chlorophyll concentrations were very low ranging from 0.017 to 0.040 µg $L^{-1}$, corresponding to fluorescence of 0.449 to 0.600 volts. Total chlorophyll, including phaeopigments, ranged between 0.059 to 0.038 µg $L^{-1}$ with phaeopigments being 33-56% of the total pigment. There was a poor correlation between fluorescence voltage and chlorophyll concentration most likely due to the narrow range in the study area. Low chlorophyll concentrations (0.135-0.026 µg $L^{-1}$) were typical for all water collected from different depths for krill experiments, as well as samples collected from the under ice surface where larval krill were feeding.

Larval krill were observed at every dive site, with the highest concentrations at stations 5 and 26. At stations where larval concentrations were relatively low, ctenophores and medusae often were more abundant (ca. 1 $m^{-3}$). One ctenophore had about 7 larval krill in its gut. Large krill were not observed near the undersurface of sea ice.

Larval krill also occurred in the water column and were present in almost every Tucker trawl and Plummet net tow, although only stations 13 and 14 had relatively high abundances. Adult krill were collected in the upper 100 m at stations 51 and 87 where acoustic echograms indicated a swarm was present.

Larval *E. superba* were 6.5 to 14.25 mm in length. The dominant stage was Furcilia 6 (F6), with some larvae in stages F4 and F5. A small number of first year juveniles also were present. Based on preliminary observations, all *Euphausia superba* greater than 25 mm were immature adults. Individuals ranged in size from 28 to 61 mm with a mode at 50 mm. Second year juvenile krill appeared to be absent in net samples and relatively few krill < 40 mm were collected, similar to our observations during the April-May U.S. SO GLOBEC cruise. Another smaller euphausiid, *E. crystallorophias*, was common in the study area and closely resembles juvenile krill. Microscopic examination of medium sized euphausiids indicated that they were almost entirely *E. crystallorophias*.

Both larval and adult *E. superba* continued to molt during winter. Some F6 larvae developed into juveniles when they molted, but many remained in the F6 stage. Larvae molted about every 23 to 31 days, while adults molted about every 38 days. Neither larvae nor adults showed evidence of growth during the study period.

Based on container experiments, adult krill ingested copepods (*Calanoides acutus* C5), which were relatively abundant in deeper water, while larval krill readily ingested microzooplankton and detritus (see Section 5 of this report). Microzooplankton and detritus are likely to be important food sources during winter when phytoplankton are scarce and sea ice algae are not abundant at the sea ice interface.

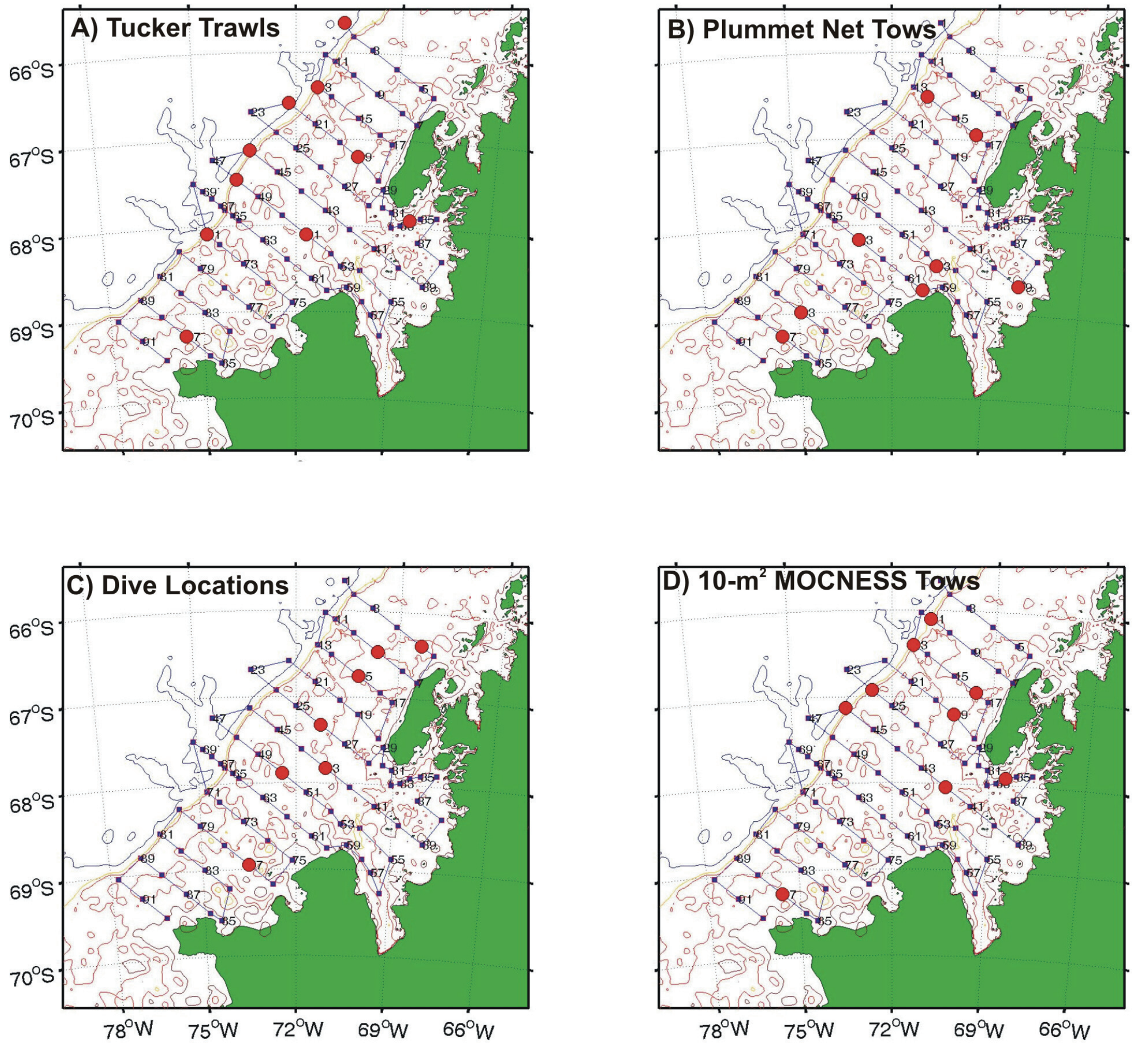


Figure 28. A) Station locations of Tucker Trawl tows on NBP01-04. B) Station locations of Plummet Net tows. C) Station locations of sea ice dives. D) Station locations of 10-$m^2$ MOCNESS tows.

## 12.0 Krill Predator Distribution and Krill Under Ice Distribution and Physiology

(Jose Torres)

### *12.1 Introduction*

The objectives of our program were three-fold. First was to describe the distribution and abundance of larger size classes of krill and micronektonic species likely to prey on krill, primarily fishes. Second was to describe the distribution and abundance of krill larvae underneath sea ice at various locations within the survey grid, to collect larvae for physiological manipulation, and to collect samples of the under-ice surface to assess food availability for larval krill. This objective was a collaborative effort with the Daly program. Third was to describe the respiration, excretion, and physiological condition of all size classes of krill within the survey area, and to make similar measurements on other important micronektonic and zooplanktonic species as opportunities arose.

*12.2 Materials and Methods*

Micronekton was sampled using a 3 mm mesh, 10 $m^2$ mouth area, multiple opening closing net and environmental sampling system (MOC-10) towed at a speed of 1.5 to 2 kts, sea ice conditions permitting. The MOCNESS-10 was equipped with a strobe device to enhance catchability of highly mobile species. Vertical strata sampled during the course of the survey depended on bottom depth. For stations greater than 1000 m in depth, strata sampled were: 1000-500 m, 500-200 m, 200-100 m, 100-50 m, 50-0 m. For stations greater than 500 m in depth, depth strata sampled were 500-300 m, 300-200 m, 200-100 m, 100-50 m, 50-0 m. Sample depths for shallower bottoms were adjusted to make best use of the 5 sample nets. MOCNESS-10 samples were collected at survey stations 12, 13, 16, 19, 24, 34, 42, 46, and 87 (Figure 28D)

Krill furcilia were sampled underneath pack ice using SCUBA at stations 5, 9, 15, 26, 43, 50, and 75 (Figure 28C). Furcilia concentrations were estimated using videography along a 10-m transect line anchored at each end with ice screws. Furcilia were collected with hand-held nets for physiological manipulation (Figure 29). The under ice surface was sampled using a suction collector (see Section 11.0). Standard blue water diving techniques were used to maximize diver safety.

Oxygen consumption rates were measured on individuals using sealed vessel respirometry. To measure excretion rates, samples of incubation water were removed after each run for analysis of ammonia concentration. For measurements of condition, individuals were frozen for analysis of metabolic enzyme concentration, RNA/DNA, and proximate composition at our home laboratory. A list of respiration runs and frozen specimens collected during the course of the cruise is provided in Table 12.

*12.3 Preliminary results*

The four stations sampled at the shelf break contained a typical Antarctic midwater fauna. Examples of the fauna and depth strata they were found in are given below for tow 1, a day tow at the shelf break.

Figure 29. Christian MacDonald collecting krill during an under ice dive on NBP01-04. Photo by Joel Bellucci.

Table 12. List of respiration runs and frozen specimens collected during NBP01-04.

| **Species** | **Stage** | **Frozen** | **Respiration Runs** |
|---|---|---|---|
| *Calanoides acutus* | *CIV* | | *1* |
| | *CV* | *70* | *76* |
| | *F* | *3* | *7* |
| | *M* | | *9* |
| *Calanus propinquus* | *CIV* | | |
| | *CV* | | *17* |
| | *F* | | *13* |
| | *M* | | *5* |
| *Euaugaptilus laticeps* | *F* | | *1* |
| *Euchirella rostromagna* | *F* | | *1* |
| *Lucicutia macrocera* | *F* | | *1* |
| *Metridia gerlachei* | *CV* | | *3* |
| *Metridia gerlachei* | *F* | | *47* |
| *Pareuchaeta spp.* | *CIV* | *1* | |
| *Pareuchaeta spp.* | *CV* | *30* | *28* |
| *Pareuchaeta antarctica* | *F* | *10* | *38* |
| *Pareuchaeta bilobata* | *F* | *1* | |
| *Pareuchaeta erebi* | *F* | | *1* |
| *Pareuchaeta rasa* | *F* | | *1* |
| *Pareuchaeta similis* | *F* | | *1* |
| *Pseudochirella hirsuta* | *F* | | *1* |
| *Rhincalanus gigas* | *CIV* | | |
| | *CV* | | |
| | *F* | | *7* |
| | *M* | | |
| | | | |
| *Bathylagus antarcticus* | | *16* | |
| *Cyclothone microdon* | | *9* | |
| *Electrona antarctica* | | *21* | |
| *Gymnoscopelus braueri* | | *11* | |
| *Lampanyctus achirus* | | *1* | |
| *Pleurogramma antarcticum* | | *2* | *1* |
| *Protomyctophum boleni* | | *3* | |
| | | | |
| *Eucopia australis* | | *2* | |
| *Gennadas spp.* | | *3* | *1* |
| *Pasiphaea scotiae* | | *1* | |
| | | | |
| *Arthromysis sp.* | | *5* | |
| | | | |
| *Euphausia crystallorophias* | | | *6* |
| *Euphausia superba* | *F4* | | |
| | *F5* | | *1* |
| | *F6* | *43* | *113* |
| | *A* | *53* | *66* |
| *Euphausia triacantha* | | *9* | *13* |
| *Thysanoessa macrura* | | *41* | *18* |
| | | | |
| *Cyphocaris anonyx* | | | *3* |

<u>1000-500 m:</u> The fishes *Electrona antarctica*, *Gymnoscopelus braueri*, *Bathylagus antarcticus*; the decapod shrimp *Gennadas* sp; the ostracod *Gigantocypris*; the mysid *Gnathophausia*; and the scyphomedusa *Periphylla*.

<u>500-200 m:</u> The fishes *Electrona antarctica*, *Notolepis coatsi*, and *Cyclothone* sp.; the euphausiids *Euphausia triacantha* and *Thysanoessa macrura*; the amphipods *Eusirus* and *Themisto*, and the scyphomedusa *Atolla*.

<u>200-100 m:</u> The fish *Cyclothone* sp., the euphausiid *Thysanoessa macrura*, the decapod *Pasiphaea scotiae*, and the worm *Tomopterus*

<u>100-50 m:</u> The euphausiid *Thysanoessa macrura*, unidentified cydippid ctenophore.

<u>50-0 m:</u> The fish *Cyclothone* sp., the euphausiid *Thysanoessa macrura*.

MOCNESS-10 stations on the shelf and within Marguerite Bay contained a subset of the oceanic fauna as limited by depth. The dominant lanternfish, *Electrona antarctica*, was present in all tows. Reliable indicators of oceanic influence were the euphausiid, *Euphausia triacantha*, and high abundances of *T. macrura*. Krill adults were captured in the MOCNESS-10 in high numbers only at station 34, within the Bay itself.

SCUBA sampling underneath the pack ice revealed a highly variable distribution of krill furcilia. Highest numbers of larvae were observed and captured at stations 5 and 26, but larvae were present at all dive stations.

Physiological measurements were highly successful in terms of quantity and quality (Table 12), but the results cannot be reported without data reduction at our home institution.

## 13.0 Sea Ice Microbial Communities

(Christian Fritsen [PI not present on cruise] and Frank Stewart)

### *13.1 Introduction*

The goal of BG-235 is to characterize the physical habitat, abundance, composition, and production rates of sea ice microbial communities in the area west of the Antarctic Peninsula and to integrate this characterization into a description of the krill-dominated marine ecosystem. It is hypothesized that algal/microbial communities associated with the under surface of sea ice are a potential food source that enables larval krill to survive over winter. Knowledge of the growth dynamics, biomass, and community structure of sea ice microbes within the physical sea ice habitat is necessary for determining the extent to which sea ice microbial communities are biologically active and capable of transferring energy to higher taxonomic levels, i.e., krill. Ice core sampling at sites visited by the *Nathaniel B. Palmer* along the SO GLOBEC survey grid will provide insight into the response of the sea ice biota to varying sea ice regimes and physical oceanographic processes. Sea ice study along the survey grid will compliment similar work being done at process sites visited for lengthier periods by the *Lawrence M. Gould*.

### *13.2 Methods*

We collected 34 sea ice biology cores from 14 of the 92 grid stations (GS) on the SO GLOBEC survey grid. Stations designated for ice collection, ice stations (IS), were selected in order to establish both an alongshelf (southwest to northeast) and across-shelf (northwest to southeast) sampling gradient, i.e., to form a "cross" within the survey grid. At each station, the sea ice and snow conditions were documented using the terminology/numerical coding specified in the Antarctic Sea ice Processes and Climate (ASPeCt) sea ice observation protocol. An ice floe representing the primary sea ice type (thickest and highest percent concentration over observation area) was accessed via a personnel basket lowered over the side of the ship and 1-5 cores were extracted from sites on the floe having a level sea ice surface, i.e., no ridges or ice blocks, excluding one exception when a coring site was chosen to be on top of a small pressure ridge (IS 14). On two cake ice floes (~20 m diameter) from which we sampled (IS 1 and 2), we collected cores along a short transect that spanned the center and edges of the floe. All other ice stations were characterized by vast floes (>2000 m diameter) with boundaries outside of the observation /sampling area. Core holes were spaced no farther than 30 m apart at any station.

Ice cores were collected using a hand-held Kovacs core barrel. The length of the extracted core was immediately measured and the distances to natural breakage points in the sea ice or to boundaries between sea ice types in a consolidated core segment were noted. Cores were sectioned into sub-samples along natural breakage points, or, in some cases, at predetermined intervals, e.g. the bottom 10 cm of the core. Core sections were separated into plastic containers, diluted with 0.2 υm-filtered sea water at a ratio of 2:1 sea water:core melt-water, and melted in the dark at 4-7ºC until processing. Samples of the brine or the surface water that flooded core holes upon drilling through to the bottom were also collected at each station. Brine samples were stored with core sections until processing.

Melted core sections and brine samples were processed within 20-30 hours of collection. Seventy-three core section samples (multiple depths from 34 cores) and 23 brine samples were collected during the cruise. Fractions of these samples were preserved for later determination (at our home institution) of bacterial biomass and dissolved organic carbon concentration. Algal biomass (as chlorophyll *a* concentration in $\mu g\ l^{-1}$) was measured fluorometrically. Rates of bacterial production in a subset of the total number of samples were measured by uptake of tritiated thymidine over time at -1ºC to 0°C and at 3°C. Samples were incubated in the dark for an average of 4-5 days. Variation in production within size fractions of the bacterial community and in response to potential bacterivory by protists larger than bacteria was analyzed in two experiments. In the first melt-water from segments of core 12, 13, and 14 (IS 5) was fractionated into size classes (<0.7 µm, <5.0 µm, and unfiltered) and incubated for eight days at -1ºC and 4ºC. Time-step sub-samples were killed/preserved at daily intervals. Production in each of the size classes at the two temperatures will be measured directly by changes in cell abundance over time (via epifluorescence microscopy at our home institution). In the second experiment, production in <5.0 µm and unfiltered fractions of core 27 (IS 11) melt-water was measured by thymidine uptake over the course of a 4-day incubation at -1ºC to 0°C. All production rates will later be standardized to bacterial biomass.

Fractions of 13 of the total number of samples were filtered and preserved with lysis buffer for electrophoretic and PCR-based analysis of the taxonomic composition of the sea ice bacterial community. In 16 of the samples, production by the autotrophic component of the sea ice community was measured by the uptake of $^{14}C$ over a range of light levels at -1ºC (photosynthesis vs. irradiance (PI) curves courtesy of W. Kozlowski, E. Macri).

Sea ice observations were made throughout the length of the cruise beginning on JD 206 (25 July 2001). Observations were made on an hourly basis while transiting during the daylight hours and at night when visibility allowed (day observations by K. Claffey, F. Stewart, and A. Friedlander; night observations by K. Claffey). Sea ice concentration (i.e., % coverage), type, topography, thickness, and floe size and snow type and thickness were noted and documented numerically according to guidelines specified in the ASPeCt ice observation protocol.

*13.3 Preliminary results/observations*

The primary sea ice type at most ice stations consisted of vast floes (>2000 m diameter) of first-year sea ice covered with a layer of new snow (Appendix 10). Pressure ridges were not prominent, covering on average less than 10% of the sea ice surface and remaining under a meter in height at most sites. Sea ice thickness ranged from 0.33 m (Core 25, IS 9, GS 53) to 2.45 m (Core 15, IS 5, GS 38) with a mean of 0.84 m amongst core holes. The snow layer overlying core holes ranged in thickness from 0.04 m (Core 33, IS 14, GS 71) to 0.38 m (Core 27, IS 11, GS 74) with a mean of 0.18 m amongst core holes. Freeboard ranged from -0.08 m (Core 22, IS 8, GS 51) to 0.23 m (on top of a small pressure ridge, Core 33, IS 14, GS 71), with a mean of 0.02 m amongst core holes. Depression of the sea ice surface below the water line occurred at 9 of the 31 core sites at which freeboard was measured (Appendix 10).

Algal biomass (as chlorophyll *a* concentration) in sea ice cores varied considerably across the sample grid and at different depths within the core (Appendix 11). The mean chlorophyll *a* concentration was 2.15 $\mu g\ L^{-1}$ amongst core sections (n=74). Peaks of 28.01 $\mu g\ L^{-1}$ and 18.58 $\mu g\ L^{-1}$ occurred in the 0.30-0.60 m depth interval of core 17 (IS 6, GS 47, near the shelf break) and in the 0.28-0.47 m depth interval of core 34 (IS15, GS 16, west of Adelaide Island), respectively. A low of 0.02 $\mu g\ L^{-1}$ was recorded in the 0-0.16 m depth interval of core 33 (IS 14, GS 71, near the shelf break). Aside from the low concentration recorded in the near-surface layer of core 33, algal biomass was generally highest in core sections nearest the sea ice surface (at the top of the core). Algal biomass in brine samples was considerably lower (mean of 0.17 $\mu g\ L^{-1}$) than in core samples, with a peak of 1.76 $\mu g\ L^{-1}$ at core 34 (IS 15, GS 16, west of Adelaide Island) and a low 0.02 $\mu g\ L^{-1}$ at core 27 (IS 11, GS 74, west of Alexander Island).

Bacterial production was generally low, with peaks in core sections having correspondingly high levels of algal biomass, i.e. bacterial production appears loosely correlated with zones of high algal biomass. Among cores with multiple depth sections, production was generally greatest towards the top of the core (Figure 30). Time-series incubations monitoring thymidine uptake reveal an initial lag phase in bacterial growth, suggesting the possibility that most of the bacteria in the ice are not currently synthesizing DNA *in situ*, but can do so after placed into liquid water (Figure 31).

Bacterial growth in both core melt-water and brine samples appears temperature-limited. Incubation of replicates from the same sample at 0°C and ~3°C show greater uptake of thymidine over time in replicates incubated at the higher temperature (Figure 31).

In a size-fractionation incubation, bacterial production was slightly higher in un-filtered samples than in samples filtered through a 5.0 µm in diameter. This suggests that: 1) grazing by protists larger than the pore size is not significantly limiting bacterial production, and 2) that large filamentous or gas vacuolate bacteria, which are conspicuous members of some sea ice microbial communities, may not represent a sizable fraction of the community sampled (Figure 32).

Further information about the composition and biomass of the bacterial community locked up in sea ice will be forthcoming upon analysis of samples at the home institution.

## 14.0 Bathymetry of the Region

(Kathleen Gavahan)

Multibeam sonar data were collected from JD 206 to JD 241 using a SeaBeam 2100. Most of the cruise was in heavy pack ice and because of this, data quality was generally poor. Sea ice tends to get under the transducers and blocks the outgoing and incoming signal. Sometimes, the only bottom returns we recorded were when the ship had to stop, backup, and ram the ice. (The ice affects the other two sonars, Simrad and Bathy2000 in a similar manner.)

Two times we noticed strange returns when traveling along the steeply dipping continental shelf. Nothing wrong could be found with the SeaBeam. The current theory is that the combination of ice and steep slopes was causing anomalous returns. This occurred on JD 215/216 and JD 234/235. These data were severely edited and should be used with caution.

The raw SeaBeam data were logged in approximately hourly files in the standard SeaBeam 2112 format. These raw data files are named NBP0104.dDDD.NN where DDD is the yearday and NN is the file number. NN starts at 00 each day and usually ends on 23. Occasionally, there are fewer than 24 files.

The logged SeaBeam data files were transferred from the real-time area to the data storage area just after the end of each day. The raw hourly data files were made available for manual editing at this time. The science party used mbedit to remove bad data from these files. Some data files were edited with mbnavedit to correct heading or navigational problems. Navigation corrections were made after the files were ping edited. The edited files were checked using the statistics from mbinfo and hourly contour plots. If these checks failed, the files were re-edited.

The edited data were converted to a binary format to improve processing speed and gridded and re-edited as necessary. When the data quality was judged acceptable, page size gridded plots were produced. A larger sized gridded plot was also created including all the U.S. SO GLOBEC survey areas from NBP01-03 and NBP01-04.

The digital data were written using the UNIX tar command to DAT tapes at the end of the cruise. The tapes contain the raw, edited, and processed data for the entire cruise. The processing scripts and gridded data for each survey are included in the processed data directory. Figure 33 shows the SeaBeam data collected during U.S. SO GLOBEC survey cruises NBP01-03 and NBP01-04.

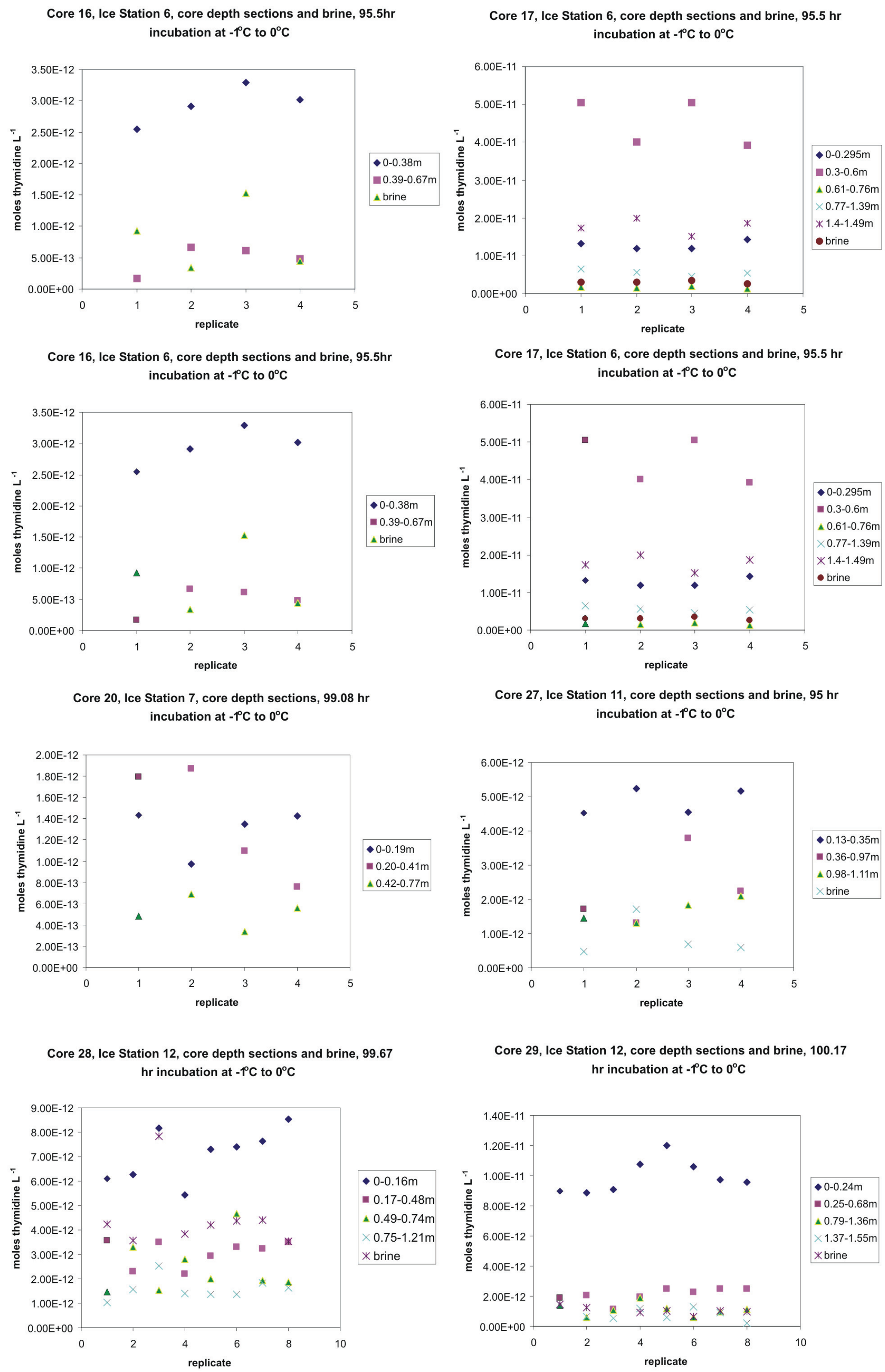


Figure 30. Moles of tritiated thymidine incorporated per liter by bacteria in sea ice core melt-water and brine samples collected at 5 ice stations. Core values have been corrected for production by bacteria in filtered seawater used to melt samples.

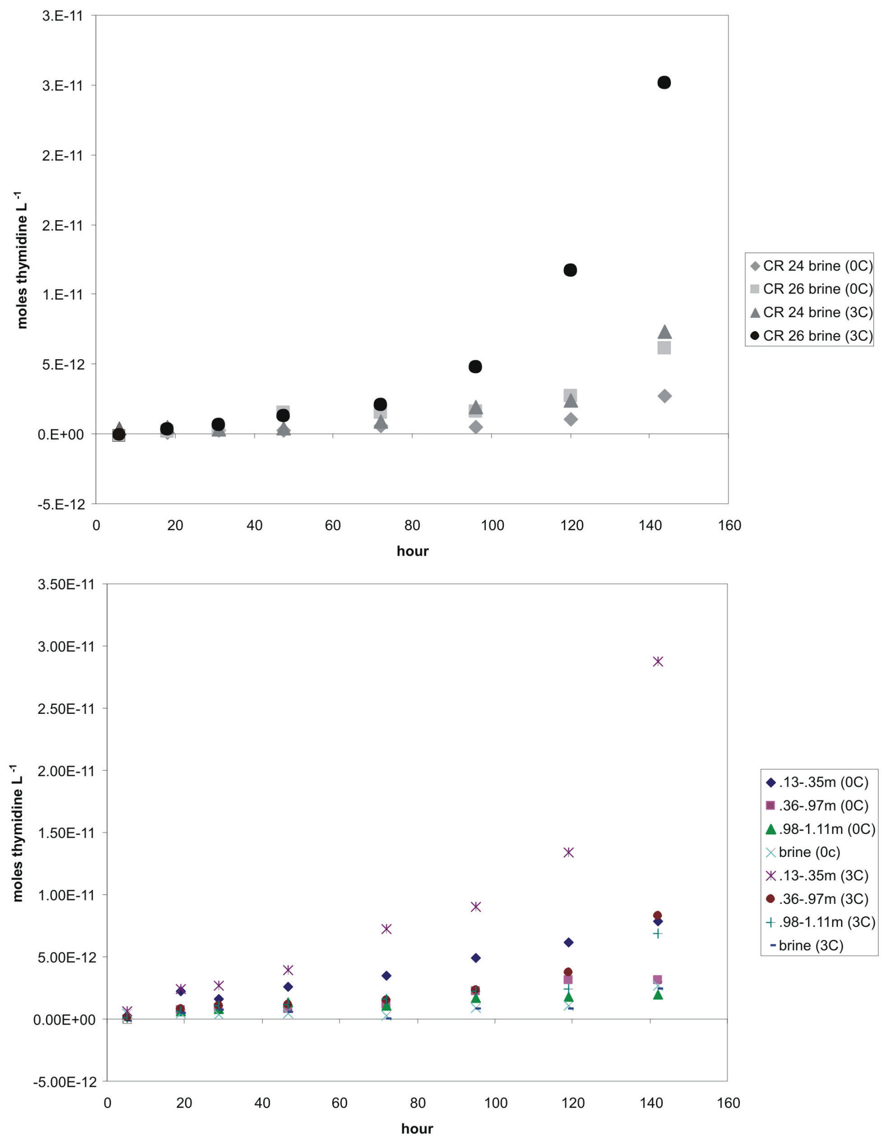


Figure 31. Moles of tritiated thymidine incorporated per liter by bacteria over time in core 24 brine and core 26 brine (top: ice stations 9 and 10) and core melt-water from varying depths of core 27 (bottom: ice station 11) incubated at -1°C to 0°C and ~3°C.

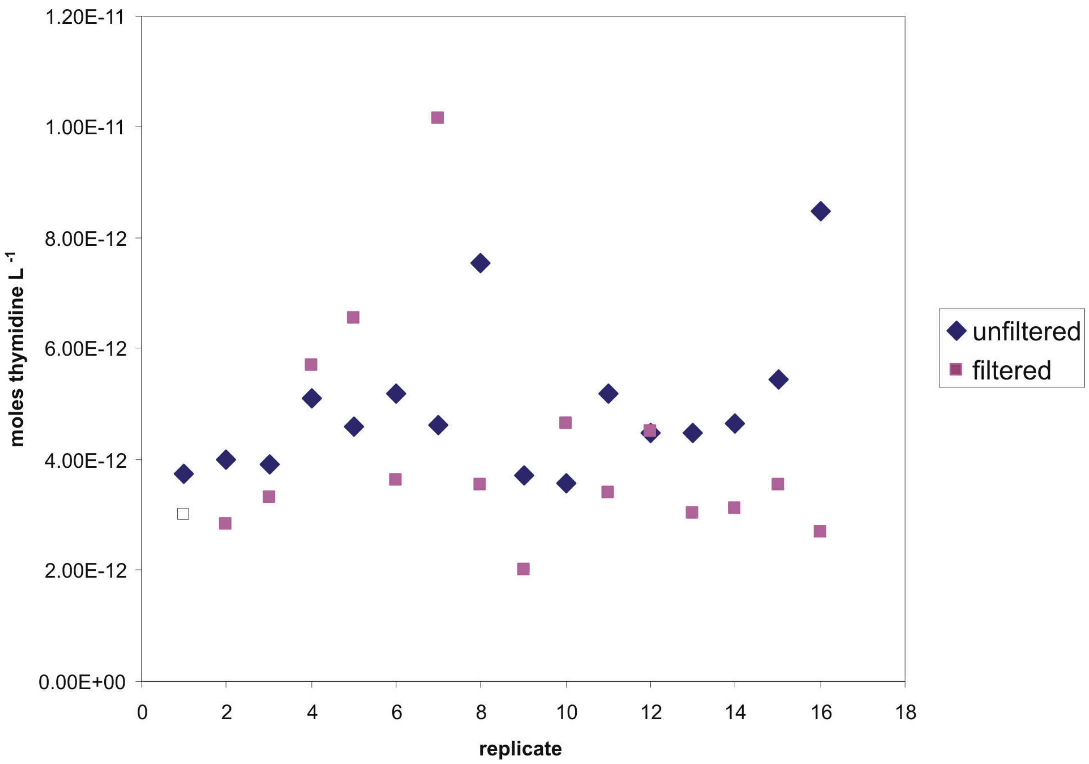


Figure 32. Moles thymidine incorporated per liter by bacteria in 5.0 µm-filtered and unfiltered replicate (16 each) melt-water samples from the 0.13-0.35 m depth section of core 27 (ice station 11). Samples incubated from 96.3 hours at -1°C to 0°C. Mean thymidine incorporated in unfiltered replicates: $4.92 \times 10^{-12}$ moles. Mean thymidine incorporated in filtered replicates: $4.11 \times 10^{-12}$ moles.

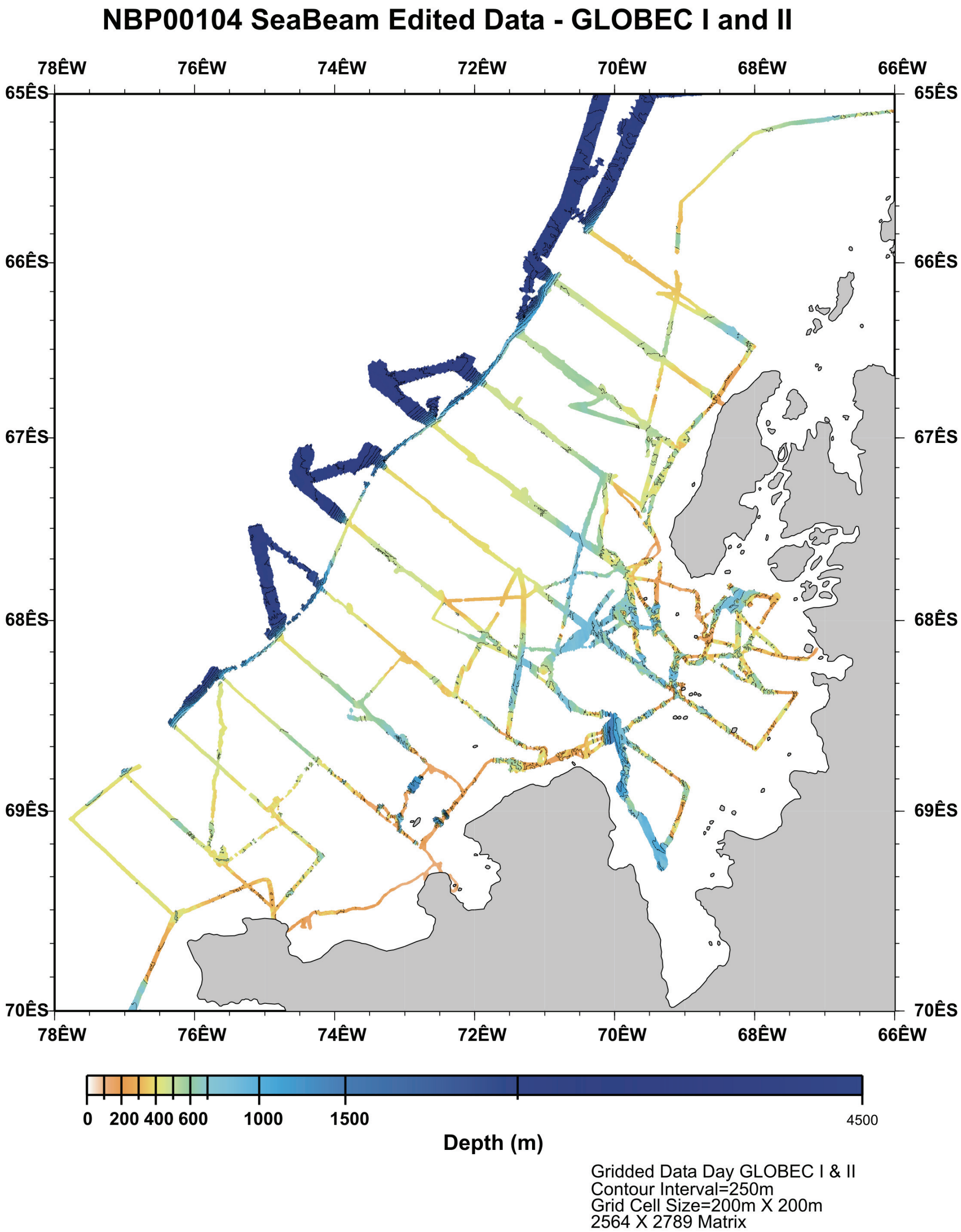


Figure 33. Seabeam bathymetry data collected during NBP01-03 and NBP01-04. Figure produced by Kathleen Gavahan, RPSC.

**CRUISE PARTICIPANTS**

**Science Party** (Name, Institution)

<u>Zooplankton and Krill Survey (BIOMAPER-II, 1-m$^2$ MOCNESS, ROV)</u>

| | |
|---|---|
| Wiebe, Peter | Woods Hole Oceanographic Institution |
| Ashjian, Carin | Woods Hole Oceanographic Institution |
| Gallager, Scott | Woods Hole Oceanographic Institution |
| Alatalo, Philip | Woods Hole Oceanographic Institution |
| Fisher, Karen | Cornell University |
| Lawson, Gareth | Woods Hole Oceanographic Institution |

<u>Krill Distribution, Physiology, and Predation; Copepod Prey Abundance</u>

| | |
|---|---|
| Daly, Kendra | University of South Florida |
| Butler, Mari | University of Rhode Island |
| Scolardi, Kerri | University of South Florida |
| Yam, Emily | University of Virginia |

<u>ADCP/OPC/MOCNESS Studies</u>

| | |
|---|---|
| Peterson, Jay | University of Massachusetts, Boston |

<u>Krill Physiology and Fish Ecology</u>

| | |
|---|---|
| Torres, Jose | University of South Florida |
| Bailey, Thomas | University of South Florida |
| Bellucci, Joel | University of South Florida |
| Burghart, Scott | University of South Florida |

<u>CTD/ADCP</u>

| | |
|---|---|
| Klinck, John | Old Dominion University |
| Kim, Hae Cheol | Old Dominion University |
| Husrevoglu, Sinan | Old Dominion University |
| Hyatt, Jason | Woods Hole Oceanographic Institution |

<u>Nutrients</u>

| | |
|---|---|
| Masserini, Rob | University of South Florida |
| Serebrennikova, Yulia | Univeristy of South Florida |

<u>Productivity Measurements</u>

| | |
|---|---|
| Kozlowski, Wendy | Scripps Institution of Oceanography |
| Macri, Erin | Scripps Institution of Oceanography |

<u>Seabird Survey/Ecology</u>

| | |
|---|---|
| Ribic, Chris | University of Wisconsin |
| Chapman, Erik | University of Wisconsin |

<u>Whale Survey/Active Counting</u>

| | |
|---|---|
| Friedlaender, Ari | International Whaling Commission/Duke University |
| Pirzl, Rebecca | International Whaling Commission/Australia |

<u>Whale Survey/Passive Listening</u>

| | |
|---|---|
| Sirovic, Ana | Scripps Institution of Oceanography |

Distribution, Activity, and Dynamics of Sea Ice Microbiota

| | |
|---|---|
| Stewart, Frank | University of Nevada |
| Kary Claffey | Cold Research Laboratory, New Hampshire (Joined *Palmer* on 13 August from *Gould*) |

**Raytheon Technical Support**

| | |
|---|---|
| Shepherd, Chris | Marine Project Coordinator |
| Ardai, Jay | Marine Technician |
| McDonald, Christian | Marine Technician |
| White, Jennifer | Marine Technician |
| Joynt, Ernest | Information Technology |
| Gavahan, Kathleen | Information Technology |
| Bolmer, Tom | Information Technology |
| Otten, Jeff | Electronics Technician |
| Lariviere, Romeo | Electronics Technician |
| Tuft, Jonnette | Marine Science Technician |

**Ship's Officers and Crew**

| | |
|---|---|
| Borkowski, Joe | Master |
| Repin, Vladimir | Ice Pilot |
| Fahey, David | Chief Mate |
| Galster, Marty | 2nd Mate |
| Gann, Jesse | 3rd Mate |
| Pierce, Johnny | Chief Engineer |
| Ambrocio, Rogelio | 1st Engineer |
| Sykas, Peter | 2nd Engineer |
| Zipperer, Bryan | 3rd Engineer |
| Hanna, George | Oiler |
| Pagdanganan, Rogelio | Oiler |
| Delacruz, Fredor | Oiler |
| Stelly, Ernest | Able Bodied Seaman |
| Garde, Lauro | Able Bodied Seaman |
| Aaron, Bienvenido | Able Bodied Seaman |
| Villanueva, Sam | Able Bodied Seaman |
| Ambrocio, Ruel | Able Bodied Seaman |
| Alvezo, Enrique | Ordinary Seaman |
| Plaza, Danilo | Ordinary Seaman |
| Sandoval, Lorenzo | Ordinary Seaman |
| Carpio, Ronnie | Ordinary Seaman |
| Nestor, Silverio | Ordinary Seaman |
| Borkowski, Amanda | Ordinary Seaman |
| Monje, Alejandra | Ordinary Seaman |

Appendix 1. Event Log for NBP01-04

| | | | Consec. | Standard | Local Time | | | Event | Univ. Coor. Time (UCT) | | | Latitude (°S) | Longitude (°W) | Water | Cast | Scientific | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **eventno** | **event** | **cast** | **Station** | **Station** | **Mth** | **Day** | **hhmm** | **s/e** | **Mth** | **Day** | **hhmm** | **Deg. Min.** | **Deg. Min.** | **Depth** | **Depth** | **Invest.** | **Comments** |
| NBP20301.001 | departure | | | | 7 | 22 | 1802 | s | 7 | 22 | 2202 | 53 10.214 | 70 54.361 | | | Klinck | |
| NBP20301.002 | bmp | 0 | | | 7 | 22 | 2207 | s | 7 | 23 | 207 | 52 40.27 | 69 58.79 | 30 | 15 | Wiebe | test tow |
| NBP20301.003 | bmp | 0 | | | 7 | 22 | 2233 | e | 7 | 23 | 233 | 52 39.82 | 69 55.66 | 30 | 15 | Wiebe | test tow |
| NBP20601.001 | XBT | 1 | 1 | | 7 | 25 | 0:27 | s | 7 | 25 | 4:27 | 59 21.071 | 66 50.163 | 3445 | | Klinck | No Good |
| NBP20601.002 | XBT | 2 | 1 | | 7 | 25 | 0:37 | s | 7 | 25 | 4:37 | 59 23.39 | 66 51.37 | 3445 | 1300 | Klinck | |
| NBP20601.003 | XBT | 3 | 2 | | 7 | 25 | 1:46 | s | 7 | 25 | 5:46 | 59 34.87 | 66 56.78 | 3532 | 1300 | Klinck | |
| NBP20601.004 | XBT | 4 | 3 | | 7 | 25 | 2:41 | s | 7 | 25 | 6:41 | 59 43.797 | 67 01.380 | 3703 | 1300 | Klinck | |
| NBP20601.005 | XBT | 5 | 4 | | 7 | 25 | 3:41 | s | 7 | 25 | 7:41 | 59 53.900 | 67 06.415 | 3710 | 1300 | Klinck | |
| NBP20601.006 | XBT | 6 | 5 | | 7 | 25 | 4:39 | s | 7 | 25 | 8:39 | 60 03.614 | 67 11.178 | 3670 | 1300 | Klinck | |
| NBP20601.007 | XBT | 7 | 6 | | 7 | 25 | 5:39 | s | 7 | 25 | 9:39 | 60 13.102 | 67 16.030 | 3278 | 1300 | Klinck | |
| NBP20601.008 | XBT | 8 | 7 | | 7 | 25 | 6:32 | s | 7 | 25 | 10:32 | 60 22.632 | 67 21.079 | 3440 | 1300 | Klinck | |
| NBP20601.009 | XBT | 9 | 8 | | 7 | 25 | 7:35 | s | 7 | 25 | 11:35 | 60 32.851 | 67 26.446 | 3375 | 1300 | Klinck | |
| NBP20601.010 | XBT | 10 | 9 | | 7 | 25 | 8:34 | s | 7 | 25 | 12:34 | 60 41.993 | 67 31.202 | 3949 | 1300 | Klinck | |
| NBP20601.011 | XBT | 11 | 10 | | 7 | 25 | 9:33 | s | 7 | 25 | 13:33 | 60 51.49 | 67 36.237 | 4220 | 1300 | Klinck | |
| NBP20601.012 | sonobuoy | 1 | - | | 7 | 25 | 10:30 | s | 7 | 25 | 14:30 | 60 59.723 | 67 40 440 | 4032 | 1300 | Sirovic | |
| NBP20601.013 | XBT | 12 | 11 | | 7 | 25 | 10:42 | s | 7 | 25 | 14:42 | 61 01.719 | 67 41.598 | 3553 | 1300 | Klinck | |
| NBP20601.014 | XBT | 13 | 12 | | 7 | 25 | 11:46 | s | 7 | 25 | 15:46 | 61 12.060 | 67 47.065 | 3879 | 1300 | Klinck | |
| NBP20601.015 | XBT | 14 | 13 | | 7 | 25 | 12:45 | s | 7 | 25 | 16:45 | 61 21.177 | 67 52.126 | 3873 | 1300 | Klinck | |
| NBP20601.016 | sonobuoy | 1 | - | | 7 | 25 | 12:51 | e | 7 | 25 | 16:51 | | | | | Sirovic | |
| NBP20601.017 | XBT | 15 | 14 | | 7 | 25 | 13:44 | s | 7 | 25 | 17:44 | 61 30.57 | 67 57.486 | 3844 | 1300 | Klinck | |
| NBP20601.018 | XBT | 16 | 15 | | 7 | 25 | 14:46 | s | 7 | 25 | 18:46 | 61 39.875 | 68 2.569 | 4064 | 1300 | Klinck | |
| NBP20601.019 | XBT | 17 | 16 | | 7 | 25 | 15:50 | s | 7 | 25 | 19:51 | 61 49.707 | 68 8.169 | 3851 | 1300 | Klinck | |
| NBP20601.020 | sonobuoy | 2 | - | | 7 | 25 | 16:28 | s | 7 | 25 | 20:28 | 61 55.55 | 68 11.05 | | | Sirovic | |
| NBP20601.021 | XBT | 18 | 17 | | 7 | 25 | 16:54 | s | 7 | 25 | 20:54 | 61 59.467 | 68 13.814 | 3897 | 1300 | Klinck | |
| NBP20601.022 | XBT | 19 | 18 | | 7 | 25 | 18:00 | s | 7 | 25 | 22:00 | 62 9.441 | 68 19.615 | 3832 | 1300 | Klinck | |
| NBP20601.023 | XBT | 20 | 19 | | 7 | 25 | 19:00 | s | 7 | 25 | 23:00 | 62 18.747 | 68 24.856 | 4068 | 1300 | Klinck | |
| NBP20601.024 | sonobuoy | 2 | - | | 7 | 25 | 18:06 | e | 7 | 25 | 22:06 | | | | | Sirovic | |
| NBP20701.001 | XBT | 21 | 20 | | 7 | 25 | 20:03 | s | 7 | 26 | 0:03 | 62 29.354 | 68 29.324 | 3496 | 1300 | Klinck | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NBP20701.002 | XBT | 22 | 21 | | 7 | 25 | 21:01 | s | 7 | 26 | 1:01 | 62 39.547 | 68 32.978 | 3908 | 1300 | Klinck | |
| NBP20701.003 | XBT | 23 | 22 | | 7 | 25 | 22:07 | s | 7 | 26 | 2:07 | 62 49.932 | 68 36.751 | 3895 | 1300 | Klinck | |
| NBP20701.004 | XBT | 24 | 23 | | 7 | 25 | 23:20 | s | 7 | 26 | 3:20 | 62 59.600 | 68 40.737 | 3834 | | Klinck | bad probe |
| NBP20701.005 | XBT | 25 | 23 | | 7 | 25 | 23:21 | s | 7 | 26 | 3:21 | 62 59.600 | 68 40.737 | 3834 | 900 | Klinck | |
| NBP20701.006 | XBT | 26 | 24 | | 7 | 26 | 0:29 | s | 7 | 26 | 4:29 | 63 9.407 | 68 44.409 | 3682 | | Klinck | bad probe |
| NBP20701.007 | XBT | 27 | 24 | | 7 | 26 | 0:32 | s | 7 | 26 | 4:32 | 63 10.110 | 68 44.651 | 3679 | 1600 | Klinck | |
| NBP20701.008 | XBT | 28 | 25 | | 7 | 26 | 1:36 | s | 7 | 26 | 5:36 | 63 19.517 | 68 48.175 | 3618 | | Sinan | bad probe |
| NBP20701.009 | XBT | 29 | 25 | | 7 | 26 | 1:39 | s | 7 | 26 | 5:39 | 63 19.517 | 68 48.175 | 3618 | | Sinan | bad probe |
| NBP20701.010 | XBT | 30 | 25 | | 7 | 26 | 1:41 | s | 7 | 26 | 5:41 | 63 20.02 | 68 48.294 | 3618 | 775 | Sinan | |
| NBP20701.011 | XBT | 31 | 26 | | 7 | 26 | 3:06 | s | 7 | 26 | 7:06 | 63 29.764 | 68 52.170 | 3502 | | Klinck | bad probe |
| NBP20701.012 | XBT | 32 | 26 | | 7 | 26 | 3:08 | s | 7 | 26 | 7:08 | 63 29.764 | 68 52.170 | 3489 | | Klinck | bad probe |
| NBP20701.013 | XBT | 33 | 26 | | 7 | 26 | 3:08 | s | 7 | 26 | 7:08 | 63 29.764 | 68 52.170 | 3489 | 1000 | Klinck | |
| NBP20701.014 | XBT | 34 | 27 | | 7 | 26 | 4:29 | s | 7 | 26 | 8:29 | 63 38.629 | 68 55.524 | 3332 | | Sinan | bad probe |
| NBP20701.015 | XBT | 35 | 27 | | 7 | 26 | 4:31 | s | 7 | 26 | 8:31 | 63 38.942 | 68 55.639 | 3336 | 100 | Sinan | wire broke |
| NBP20701.016 | XBT | 36 | 27 | | 7 | 26 | 4:33 | s | 7 | 26 | 8:33 | 63 39.115 | 68 55.727 | 3335 | 250 | Sinan | wire broke |
| NBP20701.017 | XBT | 37 | 28 | | 7 | 26 | 5:49 | s | 7 | 26 | 9:49 | 63 48.421 | 68 59.576 | 3222 | 1830 | Klinck | |
| NBP20701.018 | XBT | 38 | 29 | | 7 | 26 | 7:12 | s | 7 | 26 | 11:12 | 63 58.773 | 69 03.609 | 3042 | | Sinan | ice interf. |
| NBP20701.019 | XBT | 39 | 30 | | 7 | 26 | 7:32 | s | 7 | 26 | 11:32 | 64 1.382 | 69 4.647 | 3177 | 1175 | Sinan | |
| NBP20701.020 | XBT | 40 | 31 | | 7 | 26 | 10:19 | s | 7 | 26 | 14:19 | 64 20.842 | 69 8.429 | 3103 | | Klinck | bad |
| NBP20701.021 | XBT | 41 | 31 | | 7 | 26 | 10:20 | s | 7 | 26 | 14:20 | 64 20.842 | 69 8.429 | 3103 | 800 | Klinck | |
| NBP20701.022 | XBT | 42 | 32 | | 7 | 26 | 12:26 | s | 7 | 26 | 16:26 | 64 35.810 | 69 18.921 | 2765 | 800 | Klinck | T_7 Probe |
| NBP20701.023 | sonobuoy | 3 | - | | 7 | 26 | 12:28 | s | 7 | 26 | 16:28 | 64 35.957 | 69 18.982 | | | Sirovic | |
| NBP20701.024 | CTD | 0 | 0 | 0 | 7 | 26 | 12:59 | s | 7 | 26 | 16:59 | 64 38.79 | 69 19.89 | 2706 | 500 | Kim | Test |
| NBP20701.025 | ice obs | 1 | | | 7 | 26 | 10:00 | s | 7 | 26 | 14:00 | 64 19 | 69 10 | | | Stewart | |
| NBP20701.026 | moc 1 | 1 | 0 | | 7 | 26 | 15:58 | s | 7 | 26 | 19:58 | 64 39.8 | 69 21.4 | 2700 | 250 | Ashjian | |
| NBP20701.027 | ice obs | 1 | | | 7 | 26 | 16:00 | e | 7 | 26 | 20:00 | 64 39.86 | 69 21.56 | | | Stewart | |
| NBP20701.028 | sonobuoy | 3 | - | | 7 | 26 | 16:20 | e | 7 | 26 | 20:20 | - | - | | | Sirovic | |
| NBP20701.029 | moc 1 | 1 | 0 | | 7 | 26 | 17:13 | e | 7 | 26 | 21:13 | 64 41.295 | 69 25.76 | 2700 | 250 | Ashijan | Test |
| NBP20701.030 | rov | 1 | 0 | | 7 | 26 | 19:29 | s | 7 | 26 | 23:29 | 64 77.08 | 69 43.99 | | 10 | Gallager | |
| NBP20701.031 | rov | 1 | 0 | | 7 | 26 | 20:30 | e | 7 | 27 | 0:30 | 65 77.08 | 70 44.99 | | 10 | Gallager | |
| NBP20801.001 | XBT | 43 | 33 | | 7 | 26 | 21:19 | s | 7 | 26 | 1:19 | 64 53.978 | 69 25.514 | 2186 | 330 | Klinck | T_7 |
| NBP20801.002 | sonobuoy | 4 | - | | 7 | 26 | 22:32 | s | 7 | 27 | 2:32 | 64 59.41 | 69 28.79 | | | Sirovic | |
| NBP20801.003 | XBT | 44 | 34 | | 7 | 26 | 22:55 | s | 7 | 27 | 2:55 | 65 0.93 | 69 31.429 | 3109 | 350 | Klinck | T_7 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NBP20801.004 | sonobuoy | 4 | - | | 7 | 26 | 22:32 | e | 7 | 27 | 2:32 | - | - | | | Sirovic | |
| NBP20801.005 | ring net | 1 | 1 | 507.271 | 7 | 27 | 604 | s/e | 7 | 27 | 1004 | 65 38.802 | 70 37.752 | 3122 | 30 | Macri | |
| NBP20801.006 | CTD | 1 | 1 | 507.271 | 7 | 27 | 6:17 | s | 7 | 27 | 10:17 | 65 38.607 | 70 37.57 | 3122 | 1000 | Sinan | |
| NBP20801.007 | CTD | 1 | 1 | 507.271 | 7 | 27 | 7:26 | e | 7 | 27 | 11:26 | 65 37.853 | 70 37.037 | 3145 | | Sinan | |
| NBP20801.008 | ice obs | 2 | 1 | 507.271 | 7 | 27 | 900 | s | 7 | 27 | 13:00 | 65 38.67 | 70 38.87 | | | Stewart | |
| NBP20801.009 | bird obs | 1 | 1 | 507.271 | 7 | 27 | 9:24 | s | 7 | 27 | 13:24 | 65 38.915 | 70 38.87 | 3150 | | Chapman | |
| NBP20801.010 | bmp | 1 | 1 | 507.271 | 7 | 27 | 9:25 | s | 7 | 27 | 13:25 | 65 38.915 | 70 37.92 | 3150 | 250 | Wiebe | |
| NBP20801.011 | whale obs | 1 | 1 | 507.271 | 7 | 27 | 9:30 | s | 7 | 27 | 13:30 | 65 39.120 | 70 37.554 | 3150 | | Friedlaender | |
| NBP20801.012 | sonobuoy | 5 | 2 | 507.271 | 7 | 27 | 11:15 | s | 7 | 27 | 15:15 | 65 44.96 | 70 28.02 | | | Sirovic | |
| NBP20801.013 | tucker trawl | 1 | 1 | 507.271 | 7 | 27 | 8:05 | s | 7 | 27 | 12:05 | 65 37.7 | 70 38.4 | | 400 | Torres | |
| NBP20801.014 | tucker trawl | 1 | 1 | 507.271 | 7 | 27 | 8:46 | e | 7 | 27 | 12:46 | 65 38.4 | 70 39.2 | | 400 | Torres | |
| NBP20801.015 | sonobuoy | 5 | 2 | 500.251 | 7 | 27 | 12:01 | e | 7 | 27 | 16:01 | 65 48.16 | 70 22.91 | | | Sirovic | |
| NBP20801.016 | whale obs | 1 | 2 | 500.252 | 7 | 27 | 12:05 | e | 7 | 27 | 16:05 | 65 48.326 | 70 22.534 | 700 | | Friedlaender | |
| NBP20801.017 | bird obs | 1 | 2 | 500.253 | 7 | 27 | 12:05 | e | 7 | 27 | 16:05 | 65 48.326 | 70 22.534 | 700 | | Chapman | |
| NBP20801.018 | CTD | 2 | 2 | 500.251 | 7 | 27 | 12:25 | s | 7 | 27 | 1605 | 65 48.255 | 70 22.47 | 767 | 760 | Hyatt | |
| NBP20801.019 | bird obs | 2 | 2 | 500.252 | 7 | 27 | 13:20 | s | 7 | 27 | 17:20 | 65 47.873 | 70 22.025 | 749 | | Chapman | |
| NBP20801.020 | whale obs | 2 | 2 | 500.253 | 7 | 27 | 13:20 | s | 7 | 27 | 17:20 | 65 47.873 | 70 22.025 | 749 | | Friedlaender | |
| NBP20801.021 | CTD | 2 | 2 | 500.251 | 7 | 27 | 13:31 | e | 7 | 27 | 1731 | 65 48.255 | 70 22.47 | | | Hyatt | |
| NBP20801.022 | bmp | 1 | 2 | 500.251 | 7 | 27 | 13:34 | e | 7 | 27 | 17:34 | 65 47.782 | 70 21.88 | 750 | 250 | Wiebe | |
| NBP20801.023 | bmp | 2 | 2 | 500.251 | 7 | 27 | 15:42 | s | 7 | 27 | 19:42 | 65 54.27 | 70 0.919 | | | Wiebe | |
| NBP20801.024 | ice obs | 2 | 2 | 500.251 | 7 | 27 | 16:00 | e | 7 | 27 | 20:00 | 65 55.03 | 69 58.48 | | | Stewart | |
| NBP20801.025 | whale obs | 2 | to 3 | | 7 | 27 | 16:00 | e | 7 | 27 | 20:00 | 65 55.03 | 69 58.48 | | | Friedlaender | |
| NBP20801.026 | bird obs | 2 | to 3 | | 7 | 27 | 16:15 | e | 7 | 27 | 20:15 | 65 55.953 | 69 55.634 | | | Chapman | |
| NBP20801.027 | CTD | 3 | 3 | 501.220 | 7 | 27 | 17:07 | s | 7 | 27 | 21:07 | 65 57.997 | 68 48.220 | 340 | 326 | Hyatt | |
| NBP20801.028 | CTD | 3 | 3 | 501.220 | 7 | 27 | 17:48 | e | 7 | 27 | 21:48 | 65 57.997 | 69 48.220 | 335 | 326 | Hyatt | |
| NBP20801.029 | bird night obs | 3 | 3 to 4 | | 7 | 27 | 18:53 | s | 7 | 27 | 22:53 | 66 01.098 | 69 38.069 | | | Chapman | |
| NBP20901.001 | bird night obs | 3 | 4 to 4 | | 7 | 27 | 21:07 | e | 7 | 28 | 1:07 | 66 07.795 | 69 15.205 | | | Chapman | |
| NBP20901.002 | sonobuoy | 6 | 4 | 501.180 | 7 | 27 | 21:11 | s | 7 | 28 | 1:11 | 66 07.93 | 69 14:726 | 337 | | Sirovic | |
| NBP20901.003 | sonobuoy | 7 | 4 | 501.181 | 7 | 27 | 21:00 | s | 7 | 28 | 1:40 | 66 09.158 | 69 09.852 | 346 | | Sirovic | |
| NBP20901.004 | sonobuoy | 6 | 4 | 501.182 | 7 | 27 | 22:08 | e | 7 | 28 | 2:08 | - | - | | | Sirovic | |
| NBP20901.005 | bmp | 2 | 4 | 501.183 | 7 | 27 | 22:12 | e | 7 | 27 | 2:12 | 66 10.409 | 69 06.062 | 347 | 250 | Wiebe | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NBP20901.006 | CTD | 4 | 4 | 501.184 | 7 | 27 | 22:32 | s | 7 | 28 | 232 | 66 10.289 | 69 5.773 | 346 | 330 | Hyatt | |
| NBP20901.007 | CTD | 4 | 4 | 501.185 | 7 | 27 | 23:10 | e | 7 | 28 | 310 | 66 9.891 | 69 5.457 | 344 | 330 | Hyatt | |
| NBP20901.008 | moc 1 | 2 | 4 | 501.186 | 7 | 28 | 10 | s | 7 | 28 | 405 | 66 9.784 | 69 06.02 | 350 | 300 | Ashjian | |
| NBP20901.009 | moc 1 | 2 | 4 | 501.187 | 7 | 28 | 130 | e | 7 | 28 | 530 | 66 9.956 | 69 8.449 | 350 | 300 | Ashjian | |
| NBP20901.010 | rov | 2 | 4 | 501.188 | 7 | 28 | 314 | s | 7 | 28 | 7:14 | 66 09.254 | 69 06.373 | | 10 | Gallager | |
| NBP20901.011 | rov | 2 | 4 | 501.189 | 7 | 28 | | e | 7 | 28 | | | | | 10 | Gallager | |
| NBP20901.012 | ice coring | 1 | 4 | 501.190 | 7 | 28 | 530 | s | 7 | 28 | 930 | 66 09.118 | 69 06.084 | | | Stewart | |
| NBP20901.013 | ice coring | 1 | 4 | 501.191 | 7 | 28 | | e | 7 | 28 | 1130 | 66 09.118 | 69 06.084 | | | Stewart | |
| NBP20901.014 | bmp | 3 | 4 | 501.192 | 7 | 28 | 8:39 | s | 7 | 28 | 12:39 | 66 10.577 | 69 5.702 | | 250 | Wiebe | |
| NBP20901.015 | ice obs | 3 | 4 to 5 | | 7 | 28 | 9:02 | s | 7 | 28 | 13:02 | 66 11.71 | 69 01.857 | 356 | | Stewart | |
| NBP20901.016 | whale obs | 3 | 4 to 5 | | 7 | 28 | 9:02 | s | 7 | 28 | 13:02 | 66 11.71 | 69 01.857 | 356 | | Friedlaender | |
| NBP20901.017 | bird obs | *4* | 4 to 5 | | 7 | 28 | 9:02 | s | 7 | 28 | 13:02 | 66 11.71 | 69 01.857 | 356 | | Chapman | |
| NBP20901.018 | sonobuoy | 8 | 5 | 501.140 | 7 | 28 | 11:39 | s | 7 | 28 | 15:39 | 66 18.965 | 68 36.241 | | | Sirovic | |
| NBP20901.019 | sonobuoy | 7 | 5 | 501.141 | 7 | 28 | 3:32 | e | 7 | 28 | 7:32 | - | - | | | Sirovic | |
| NBP20901.020 | sonobuoy | 9 | 5 | 501.142 | 7 | 28 | 12:25 | s | 7 | 28 | 16:25 | 66 21.439 | 68 28.231 | | | Sirovic | |
| NBP20901.021 | XBT | 45 | 5 | 501.143 | 7 | 28 | 12:40 | s | 7 | 28 | 16:40 | 66 22.197 | 68 25.237 | | | Otten | |
| NBP20901.022 | sonobuoy | 8 | 5 | 501.144 | 7 | 28 | 12:40 | e | 7 | 28 | 16:40 | - | - | | | Sirovic | |
| NBP20901.023 | bird obs | 4 | 5 | 501.145 | 7 | 28 | 13:10 | e | 7 | 28 | 17:10 | 66 22.699 | 68 21.420 | | | Chapman | |
| NBP20901.024 | diving | 1 | 5 | 501.146 | 7 | 28 | 1322 | s | 7 | 28 | 1722 | 66 22.623 | 68 21.355 | | | Torres | |
| NBP20901.025 | CTD | 5 | 5 | 501.147 | 7 | 28 | 13:35 | s | 7 | 28 | 17:35 | 66 22.559 | 68 21.292 | 717 | 701 | Hyatt | |
| NBP20901.026 | whale obs | 3 | 5 | 501.148 | 7 | 28 | 13:22 | e | 7 | 28 | 17:22 | 66 22.623 | 68 21.355 | 716 | | Friedlaender | |
| NBP20901.027 | CTD | 5 | 5 | 501.149 | 7 | 28 | 14:33 | e | 7 | 28 | 18:33 | 66 22.189 | 68 20.981 | 717 | 701 | Hyatt | |
| NBP20901.028 | bird obs | 5 | 5 to 6 | | 7 | 28 | 15:18 | s | 7 | 28 | 19:18 | 66 20.448 | 68 20.448 | 707 | | Chapman | |
| NBP20901.029 | sonobuoy | 9 | 5 | 501.149 | 7 | 28 | 13:26 | e | 7 | 28 | 17:26 | - | - | | | Sirovic | |
| NBP20901.030 | sonobuoy | 10 | to 6 | | 7 | 28 | 16:19 | s | 7 | 28 | 20:19 | 66 25.893 | 68 12.939 | 734 | | Sirovic | |
| NBP20901.031 | bird obs | 5 | 5 to 6 | | 7 | 28 | 1628 | e | 7 | 28 | 2028 | 66 26.348 | 68 10.050 | | | Chapman | |
| NBP20901.032 | bmp | 3 | 6 | 501.120 | 7 | 28 | 17:28 | e | 7 | 28 | 21:28 | 66 24.96 | 68 0.498 | 241 | 250 | Wiebe | |
| NBP20901.033 | CTD | 6 | 6 | 501.120 | 7 | 28 | 17:40 | s | 7 | 28 | 21:40 | 66 29.036 | 68 0.355 | 288 | 293 | Sinan | |
| NBP20901.034 | CTD | 6 | 6 | 501.120 | 7 | 28 | 18:24 | e | 7 | 28 | 22:24 | 67 29.036 | 69 0.355 | | | Sinan | |
| NBP20901.035 | sonobuoy | 10 | to 6 | | 7 | 28 | 18:24 | e | 7 | 28 | 22:24 | - | - | | | Sirovic | |
| NBP20901.036 | ring net | 2 | 6 | 501.120 | 7 | 28 | 1826 | s | 7 | 28 | 2226 | 66 28.866 | 68 0.365 | 298 | 30 | Kozlowski | |
| NBP20901.037 | bird night obs | 6 | 6 to 7 | | 7 | 28 | 18:53 | s | 7 | 28 | 22:53 | 66 29.573 | 68 02.033 | 376 | | Chapman | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NBP21001.001 | bmp | 4 | to 7 | | 7 | 28 | 22:32 | s | 7 | 29 | 2:32 | 66 45.774 | 68 30.993 | | | Wiebe | |
| NBP21001.002 | bird night obs | 6 | 6 to 7 | | 7 | 28 | 22:33 | e | 7 | 29 | 2:33 | 66 45.865 | 68 31.094 | 230 | | Chapman | |
| NBP21001.003 | krill cam | 1 | 7 | 460.115 | 7 | 28 | 2230 | s | 7 | 29 | 231 | 66 45.774 | 68 02.033 | 370 | surf | Gallager | |
| NBP21001.004 | CTD | 7 | 7 | 460.115 | 7 | 28 | 23:36 | s | 7 | 29 | 3:36 | 66 48.616 | 68 27.304 | 120 | 106 | Hyatt | |
| NBP21001.005 | CTD | 7 | 7 | 460.115 | 7 | 29 | 0:09 | e | 7 | 29 | 4:09 | 66 48.604 | 68 27.201 | 119 | | Hyatt | |
| NBP21001.006 | bmp | 4 | 7 | 460.115 | 7 | 29 | 100 | e | 7 | 29 | 500 | 66 46.946 | 68 35.109 | | | Wiebe | |
| NBP21001.007 | bmp | 5 | | | 7 | 29 | 245 | s | 7 | 29 | 645 | 66 41.16 | 68 58.71 | 300 | | Wiebe | |
| NBP21001.008 | CTD | 8 | 8 | 460.115 | 7 | 29 | 3:21 | s | 7 | 29 | 7:21 | 66 40.242 | 68 54.326 | 340 | 327 | Sinan | |
| NBP21001.009 | CTD | 8 | 8 | 460.115 | 7 | 29 | 4:05 | e | 7 | 29 | 8:05 | 66 40.274 | 68 54.492 | 340 | 327 | Sinan | |
| NBP21001.010 | ring net | 3 | 8 | 460.116 | 7 | 29 | 4:05 | s/e | 7 | 29 | 8:05 | 67 40.274 | 69 54.492 | 340 | 30 | Macri | |
| NBP21001.011 | bird night obs | 7 | to 9 | | 7 | 29 | 5:21 | s | 7 | 29 | 9:21 | 66 40.329 | 68 56.707 | | | Ribic | |
| NBP21001.012 | bird night obs | 7 | to 9 | | 7 | 29 | 7:31 | e | 7 | 29 | 11:31 | 66 33.66 | 69 18.078 | | | Ribic | |
| NBP21001.013 | sonobuoy | 11 | to 9 | | 7 | 29 | 8:37 | s | 7 | 29 | 12:37 | 66 31.822 | 69 30.021 | 486 | 30 | Sirovic | |
| NBP21001.014 | ice obs | 4 | | | 7 | 29 | 990 | s | 7 | 29 | 1300 | 66 31.14 | 69 31.864 | | | Stewart | |
| NBP21001.015 | bird obs | 8 | | | 7 | 29 | 848 | s | 7 | 29 | 1248 | 66 31.06 | 69 31.864 | 502 | | Ribic | |
| NBP21001.016 | diving | 2 | 9 | | 7 | 29 | 10-12:30 | s/e | 7 | 29 | 14-16:30 | 66 28.083 | 69 37.750 | 508 | 2 | Torres | |
| NBP21001.017 | ring net | 4 | 9 | 461.180 | 7 | 29 | 10:15 | s/e | 7 | 29 | 1415 | 66 28.08 | 69 37.773 | 516 | 30 | Macri | |
| NBP21001.018 | CTD | 9 | 9 | 461.180 | 7 | 29 | 10:37 | s | 7 | 29 | 14:37 | 66 28.083 | 69 37.750 | 508 | 496 | Sinan | |
| NBP21001.019 | CTD | 9 | 9 | 461.180 | 7 | 29 | 11:24 | e | 7 | 29 | 15:24 | 66 28.076 | 69 37.803 | 509 | | Sinan | |
| NBP21001.020 | whale obs | 4 | to 10 | | 7 | 29 | 12:10 | s | 7 | 29 | 16:10 | 66 28.08 | 69 37.743 | 528 | | Friedlaender | |
| NBP21001.021 | sonobuoy | 11 | 9 | | 7 | 29 | 13:33 | e | 7 | 29 | 17:33 | - | - | | | Sirovic | |
| NBP21001.022 | sonobuoy | 12 | 10 | | 7 | 29 | 15:19 | s | 7 | 29 | 19:19 | 66 18.1 | 70 10.8 | | | Sirovic | |
| NBP21001.023 | sonobuoy | 12 | 10 | | 7 | 29 | 15:35 | e | 7 | 29 | 19:35 | - | - | | | Sirovic | |
| NBP21001.024 | sonobuoy | 13 | 10 | | 7 | 29 | 15:40 | s | 7 | 29 | 19:40 | 66 16.9 | 70 14.5 | | | Sirovic | |
| NBP21001.025 | whale obs | 4 | 10 | | 7 | 29 | 16:15 | e | 7 | 29 | 20:15 | 66 15.238 | 70 20.212 | 455 | | Friedlaender | |
| NBP21001.026 | ice obs | 4 | | | 7 | 29 | 1600 | e | 7 | 29 | 2000 | 66 15.92 | 70 18.05 | | | Stewart | |
| NBP21001.027 | CTD | 10 | 10 | 461.220 | 7 | 29 | 1630 | s | 7 | 29 | 2030 | 66 15.22 | 70 20.66 | 462 | 459 | Hyatt | |
| NBP21001.028 | bird obs | 8 | 10 | | 7 | 29 | 16:15 | e | 7 | 29 | 20:15 | 66 15.238 | 70 20.212 | 455 | | Chapman | |
| NBP21001.029 | sonobuoy | 13 | 10 | | 7 | 29 | 18:22 | e | 7 | 29 | 22:22 | - | - | | | Sirovic | |
| NBP21001.030 | bird night obs | 9 | to 11 | | 7 | 29 | 18:47 | s | 7 | 29 | 22:47 | 66 11.593 | 70 33.127 | 477 | | Chapman | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NBP21001.031 | CTD | 10 | 10 | 461.220 | 7 | 29 | 17:26 | e | 7 | 29 | 2126 | | | | | Hyatt | ashtech problem |
| NBP21101.001 | bird night obs | 9 | to 11 | | 7 | 29 | 20:20 | e | 7 | 30 | 0:29 | 66 7.137 | 70 48.965 | 486 | | Chapman | |
| NBP21101.002 | bmp | 5 | 11 | | 7 | 29 | 20:47 | e | 7 | 30 | 0:47 | 66 05.991 | 70 53.09 | | 250 | Wiebe | |
| NBP21101.003 | CTD | 11 | 11 | 460.250 | 7 | 29 | 2109 | s | 7 | 30 | 109 | 66 5.943 | 70 5.720 | 980 | 978 | Hyatt | |
| NBP21101.004 | CTD | 11 | 11 | 460.250 | 7 | 29 | 2223 | e | 7 | 30 | 223 | 66 6.163 | 70 54.515 | | | Hyatt | |
| NBP21101.005 | moc1/opc | 3 | 11 | 460.250 | 7 | 29 | 2328 | s | 7 | 30 | 326 | 66 6.168 | 70 55.069 | 910 | 600 | Ashjian | |
| NBP21101.006 | moc1/opc | 3 | 11 | 460.250 | 7 | 30 | 135 | e | 7 | 30 | 535 | 66 4.247 | 70 47.226 | | | Ashjian | |
| NBP21101.007 | rov | 3 | 11 | 460.250 | 7 | 30 | 2:15 | s | 7 | 30 | 6:15 | 66 05.04 | 70 50.89 | 865 | 10 | Gallager | |
| NBP21101.008 | rov | 3 | 11 | 460.250 | 7 | 30 | | e | 7 | 30 | | 66 05.04 | 70 50.89 | | 10 | Gallager | |
| NBP21101.009 | bmp | 6 | 11 | 460.250 | 7 | 30 | 403 | s | 7 | 30 | 803 | 66 5.51 | 70 54.80 | | | Wiebe | |
| NBP21101.010 | bird night obs | 10 | to 12 | | 7 | 30 | 4:18 | s | 7 | 30 | 8:18 | 66 4.56 | 70 58.175 | | | Ribic | |
| NBP21101.011 | sonobuoy | 14 | to 12 | | 7 | 30 | 4:35 | s | 7 | 30 | 8:18 | 66 3.805 | 71 1.078 | 857 | 300 | Sirovic | |
| NBP21101.012 | bird night obs | 10 | to 12 | | 7 | 30 | 4:58 | e | 7 | 30 | 8:58 | 66 2.752 | 71 4.986 | | | Ribic | |
| NBP21101.013 | bmp | 6 | 12 | | 7 | 30 | 557 | e | 7 | 30 | 957 | 66 5.505 | 70 54.80 | 3090 | 250 | Wiebe | |
| NBP21101.014 | CTD | 12 | 12 | 459.265 | 7 | 30 | 6:32 | s | 7 | 30 | 10:32 | 66 1.3927 | 71 11.700 | 3090 | 3138 | Sinan | |
| NBP21101.015 | ice obs | 5 | | | 7 | 30 | 900 | s | 7 | 30 | 1300 | 66 2.49 | 71 13.8 | | | Stewart | |
| NBP21101.016 | CTD | 12 | 12 | 459.265 | 7 | 30 | 9:14 | e | 7 | 30 | 0:00 | 66 1.3927 | 71 11.700 | 3090 | | Sinan | |
| NBP21101.017 | sonobuoy | 14 | 12 | 459.265 | 7 | 30 | 9:52 | e | 7 | 30 | 13:52 | - | - | | | Sirovic | |
| NBP21101.018 | bird obs | 11 | 12 | 459.265 | 7 | 30 | 14:12 | s | 7 | 30 | 18:12 | 65 57.509 | 71 07.236 | 2990 | | Ribic | |
| NBP21101.019 | whale obs | 5 | 12 | 459.265 | 7 | 30 | 14:12 | s | 7 | 30 | 18:12 | 65 57.509 | 71 07.236 | 2990 | | Friedlaender | |
| NBP21101.020 | bird obs | 11 | 12 | | 7 | 30 | 16:09 | e | 7 | 30 | 20:09 | 66 1.492 | 71 09.172 | 3839 | | Ribic | |
| NBP21101.021 | whale obs | 5 | 12 | | 7 | 30 | 16:09 | e | 7 | 30 | 20:09 | 66 1.492 | 71 09.172 | 3839 | | Friedlaender | |
| NBP21101.022 | bmp | 7 | | | 7 | 30 | 1623 | s | 7 | 30 | 2023 | 66 2.08 | 71 9.799 | 1786 | | Wiebe | |
| NBP21101.023 | ice obs | 6 | | | 7 | 30 | 1600 | e | 7 | 30 | 2000 | | | | | Stewart | |
| NBP21101.024 | bird night obs | 12 | to 13 | | 7 | 30 | 18:53 | s | 7 | 30 | 22:53 | 66 09.804 | 71 14.760 | 2852 | | Chapman | |
| NBP21101.025 | bmp | 7 | | | 7 | 30 | 18:54 | e | 7 | 30 | 2254 | 66 10.35 | 71 15.03 | | | Wiebe | hit ice |
| NBP21101.026 | bird night obs | 12 | 13 | | 7 | 30 | 21:52 | e | 7 | 31 | 1:52 | 66 23.383 | 71 21.480 | | | Chapman | |
| NBP21101.027 | tucker trawl | 2 | 13 | 420.247 | 7 | 30 | 21:52 | s | 7 | 31 | 1:52 | 66 23.999 | 71 22.6305 | 844 | 500 | Torres | |
| NBP21101.028 | tucker trawl | 2 | 13 | 420.247 | 7 | 30 | 23:59 | e | 7 | 31 | 3:59 | 66 23.999 | 71 22.6305 | 844 | 500 | Torres | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NBP21201.001 | ring net | 5 | 13 | 420.247 | 7 | 31 | 0:05 | s/e | 7 | 31 | 405 | 66 24.000 | 71 22.631 | 844 | 30 | Kozlowski | |
| NBP21201.002 | CTD | 13 | 13 | 420.247 | 7 | 31 | 0:49 | s | 7 | 31 | 4:49 | 66 23.999 | 71 22.6305 | 844 | 797 | Sinan | |
| NBP21201.003 | CTD | 13 | 13 | 420.247 | 7 | 31 | 1:51 | e | 7 | 31 | 5:51 | 66 24.242 | 71 21.845 | 758 | | Sinan | |
| NBP21201.004 | CTD | 14 | 14 | 421.225 | 7 | 31 | 4:14 | s | 7 | 31 | 8:14 | 66 30.300 | 70 58.667 | 525 | 520 | Sinan | |
| NBP21201.005 | CTD | 14 | 14 | 421.225 | 7 | 31 | 5:00 | e | 7 | 31 | 9:00 | 66 30.300 | 70 58.667 | 525 | | Sinan | |
| NBP21201.006 | bird night obs | 13 | to 15 | | 7 | 31 | 523 | s | 7 | 31 | 923 | 66 31.129 | 70 57.039 | | | Ribic | |
| NBP21201.007 | bird night obs | 13 | to 15 | | 7 | 31 | 732 | e | 7 | 31 | 1132 | 66 38.484 | 70 32.392 | | | Ribic | |
| NBP21201.008 | ice obs | 7 | | | 7 | 31 | 900 | s | 7 | 31 | 1300 | 66 42.78 | 70 17.45 | | | Stewart | |
| NBP21201.009 | bird obs | 14 | to 15 | | 7 | 31 | 8:54 | s | 7 | 31 | 12:54 | 66 42.899 | 70 17.137 | 525 | | Ribic | |
| NBP21201.010 | whale obs | 6 | to 15 | | 7 | 31 | 8:54 | s | 7 | 31 | 12:54 | 66 42.899 | 70 17.137 | 525 | | Friedlaender | |
| NBP21201.011 | sonobuoy | 15 | 15 | | 7 | 31 | 9:09 | s | 7 | 31 | 13:09 | 66 43.549 | 70 15.052 | 500 | 100 | Sirovic | |
| NBP21201.012 | bird obs | 14 | 15 | | 7 | 31 | 9:45 | e | 7 | 31 | 13:45 | 66 45.304 | 70 09.240 | 513 | | Ribic | |
| NBP21201.013 | whale obs | 6 | 15 | | 7 | 31 | 9:45 | e | 7 | 31 | 13:45 | 66 45.304 | 70 09.240 | 513 | | Friedlaender | |
| NBP21201.014 | moc1/opc | 4 | 15 | 421.180 | 7 | 31 | 949 | s | 7 | 31 | 1349 | 66 45.182 | 70 9.636 | 501 | 409 | Ashjian | |
| NBP21201.015 | moc1/opc | 4 | 15 | 421.180 | 7 | 31 | 1127 | e | 7 | 31 | 1527 | 66 42.265 | 70 10.92 | 501 | 409 | Ashjian | |
| NBP21201.016 | CTD | 15 | 15 | 421.180 | 7 | 31 | 1310 | s | 7 | 31 | 1710 | 66 44.79 | 70 07.12 | 510 | 515 | Hyatt | |
| NBP21201.017 | sonobuoy | 15 | 15 | 421.180 | 7 | 31 | 13:30 | e | 7 | 31 | 17:30 | - | - | | | Sirovic | |
| NBP21201.018 | CTD | 15 | 15 | 421.180 | 7 | 31 | 1429 | e | 7 | 31 | 1829 | 66 45.088 | 70 5.597 | 534 | 514 | Hyatt | |
| NBP21201.019 | ice coring | 2 | | 421.189 | 7 | 31 | 1430 | s | 7 | 31 | 1830 | 66 45.09 | 70 5.59 | | | Stewart | |
| NBP21201.020 | ice coring | 2 | | 421.180 | 7 | 31 | 1610 | e | 7 | 31 | 2010 | 66 45.09 | 70 5.59 | | | Stewart | |
| NBP21201.021 | sonobuoy | 16 | to 16 | | 7 | 31 | 16:44 | s | 7 | 31 | 20:44 | 66 48.061 | 69 58.362 | 510 | 300 | Sirovic | |
| NBP21201.022 | ice obs | 7 | | | 7 | 31 | 1600 | e | 7 | 31 | 2000 | 66 45.09 | 70 5.59 | | | Stewart | |
| NBP21201.023 | sonobuoy | 16 | to 16 | | 7 | 31 | 16:52 | e | 7 | 31 | 20:52 | - | - | | | Sirovic | |
| NBP21201.024 | bird night obs | 16 | 16 | | 7 | 31 | 18:48 | s | 7 | 31 | 22:48 | 66 55.328 | 69 34.765 | 462 | | Chapman | |
| NBP21201.025 | CTD | 16 | 16 | 421.145 | 7 | 31 | 1916 | s | 7 | 31 | 2316 | 66 56.67 | 69 30.65 | 512 | 506 | Hyatt | |
| NBP21201.026 | CTD | 16 | 16 | 421.145 | 7 | 31 | 2046 | e | 7 | 31 | 47 | | | | | Hyatt | |
| NBP21201.027 | bird night obs | 15 | to 17 | | 7 | 31 | 22:34 | e | 8 | 1 | 2:34 | 67 02.238 | 69 10.569 | 363 | | Chapman | |
| NBP21201.028 | moc1/opc | 5 | 17 | 421.145 | 7 | 31 | 2221 | s | 8 | 1 | 221 | 67 2.708 | 69 9.756 | 393 | 255 | Ashjian | |
| NBP21201.029 | moc1/opc | 5 | 17 | 421.145 | 7 | 31 | 2343 | e | 8 | 1 | 343 | 67 0.7308 | 69 13.38 | 350 | | Ashjian | |
| NBP21301.001 | ring net | 6 | 17 | 421.125 | 8 | 1 | 0:30 | s/e | 8 | 1 | 430 | 67 2.899 | 69 7.255 | 346 | 30 | Macri | |
| NBP21301.002 | CTD | 17 | 17 | 421.125 | 8 | 1 | 0:45 | s | 8 | 1 | 4:45 | 67 2.968 | 69 6.985 | 298 | 287 | Sinan | |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NBP21301.003 | CTD | 17 | 17 | 421.125 | 8 | 1 | 1:21 | e | 8 | 1 | 5:31 | 67 3.161 | 69 6.237 | 270 | | Sinan | |
| NBP21301.004 | rov | 4 | 17 | 421.125 | 8 | 1 | 1:15 | s | 8 | 1 | 5:15 | 67 03.094 | 69 05.247 | 263 | 10 | Gallager | |
| NBP21301.005 | rov | 4 | 17 | 421.125 | 8 | 1 | 3:30 | e | 8 | 1 | 7:33 | 67 03.094 | 69 05.247 | | | Gallager | |
| NBP21301.006 | bird night obs | 16 | 17 | 421.125 | 8 | 1 | 4:49 | s | 8 | 1 | 8:49 | 67 9.468 | 69 14.630 | | | Ribic | |
| NBP21301.007 | bird night obs | 16 | 17 | 421.125 | 8 | 1 | 7:01 | e | 8 | 1 | 11:01 | 67 20.781 | 69 27.483 | | | Ribic | |
| NBP21301.008 | ring net | 7 | 18 | 373.110 | 8 | 1 | 8:35 | s/e | 8 | 1 | 12:35 | 67 29.577 | 69 31.516 | 480 | 30 | Macri | |
| NBP21301.009 | CTD | 18 | 18 | 373.110 | 8 | 1 | 8:42 | s | 8 | 1 | 12:42 | 67 29.495 | 69 31.491 | 480 | 494 | Sinan | |
| NBP21301.010 | ice obs | 8 | | | 8 | 1 | 900 | s | 8 | 1 | 1300 | 67 29.467 | 69 31.489 | | | Stewart | |
| NBP21301.011 | bird obs | 17 | to 19 | | 8 | 1 | 9:05 | s | 8 | 1 | 13:05 | 67 29.577 | 69 31.51 | 459 | | Ribic | |
| NBP21301.012 | whale obs | 7 | to 19 | | 8 | 1 | 9:30 | s | 8 | 1 | 13:30 | 67 29.577 | 69 31.51 | 459 | | Friedlaender | |
| NBP21301.013 | CTD | 18 | 18 | 373.110 | 8 | 1 | 9:35 | e | 8 | 1 | 13:35 | 67 29.577 | 69 31.516 | 460 | | Sinan | |
| NBP21301.014 | sonobuoy | 17 | 18 | | 8 | 1 | 10:33 | s | 8 | 1 | 14:33 | 67 25.65 | 69 38.60 | | 300 | Sirovic | |
| NBP21301.015 | sonobuoy | 17 | 18 | | 8 | 1 | 11:30 | e | 8 | 1 | 15:30 | - | - | | | Sirovic | |
| NBP21301.016 | bird obs | 17 | 19 | | 8 | 1 | 13:47 | e | 8 | 1 | 17:47 | 67 17.246 | 70 7.174 | 575 | | Chapman | |
| NBP21301.017 | whale obs | 7 | 19 | | 8 | 1 | 13:47 | e | 8 | 1 | 17:47 | 67 17.246 | 70 7.174 | 575 | | Friedlaender | |
| NBP21301.018 | tucker trawl | 3 | 19 | 381.150 | 8 | 1 | 1348 | s | 8 | | 17:48 | 67 17.265 | 70 06.879 | 562 | | Daly | |
| NBP21301.019 | tucker trawl | 3 | 19 | 381.150 | 8 | 1 | 1401 | e | 8 | 1 | 18:01 | 67 12.43 | 70 05.25 | 530 | | Daly | aborted/ice |
| NBP21301.020 | tucker trawl | 4 | 19 | 381.150 | 8 | 1 | 1406 | s | 8 | 1 | 18:06 | 67 12.43 | 70 05.25 | 530 | | Daly | |
| NBP21301.021 | sonobuoy | 18 | 19 | 381.150 | 8 | 1 | 14:21 | s | 8 | 1 | 18:21 | 67 12.464 | 70 4.186 | | 300 | Sirovic | |
| NBP21301.022 | tucker trawl | 4 | 19 | 381.150 | 8 | 1 | 1417 | e | 8 | 1 | 18:17 | 67 12.4 | 70 04.5 | 530 | | Daly | |
| NBP21301.023 | CTD | 19 | 19 | 381.150 | 8 | 1 | 15:44 | s | 8 | 1 | 19:44 | 67 12.699 | 69 59.027 | 401 | 397 | Kim | |
| NBP21301.024 | CTD | 19 | 19 | 381.150 | 8 | 1 | 16:37 | e | 8 | 1 | 20:37 | 67 12.699 | 69 59.027 | 401 | 397 | Kim | |
| NBP21301.025 | ice obs | 8 | | | 8 | 1 | 0:00 | e | 8 | 1 | 0:00 | 67 12.75 | 69 58.95 | | | Stewart | |
| NBP21301.026 | moc 10 | 2 | 19 | 381.150 | 8 | 1 | 0:00 | s | 8 | 1 | 0:00 | 67 12.86 | 70 0.12 | 433 | 300 | Torres | |
| NBP21301.027 | sonobuoy | 18 | 19 | 381.150 | 8 | 1 | 17:24 | e | 8 | 1 | 21:24 | - | - | | | Sirovic | |
| NBP21301.028 | bird night obs | 18 | to 20 | | 8 | 1 | 18:51 | s | 8 | 1 | 22:51 | 67 11.158 | 70 12.457 | | | Chapman | |
| NBP21301.029 | CTD | 20 | 20 | 381.180 | 8 | 1 | 21:29 | s | 8 | 2 | 1:29 | 67 02.391 | 70 42.783 | 493 | 480 | Kim | |
| NBP21301.030 | bird night obs | 18 | 20 | | 8 | 1 | 22:16 | e | 8 | 2 | 2:16 | 67 2.388 | 70 43.016 | | | Chapman | |
| NBP21301.031 | CTD | 20 | 20 | 381.180 | 8 | 1 | 22:40 | e | 8 | 2 | 2:40 | 67 02.391 | 70 42.783 | 493 | 480 | Kim | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NBP21301.032 | tucker trawl | 5 | 20 | 381.180 | 8 | 1 | 22:45 | s | 8 | 2 | 2:45 | 67 12.4 | 70 04.5 | 493 | 400 | Torres | |
| NBP21301.033 | tucker trawl | 5 | 20 | 381.180 | 8 | 1 | 23:50 | e | 8 | 2 | 3:50 | 67 12.4 | 70 04.5 | 493 | 400 | Torres | |
| NBP21401.001 | moc1/opc | 6 | 21 | 381.220 | 8 | 2 | 2:18 | s | 8 | 2 | 6:18 | 66 48.875 | 71 24.89 | 475 | 333 | Ashjian | |
| NBP21401.002 | moc1/opc | 6 | 21 | 381.220 | 8 | 2 | 3:54 | e | 8 | 2 | 7:54 | 66 46.572 | 71 20.66 | 475 | 333 | Ashjian | |
| NBP21401.003 | CTD | 21 | 21 | 381.220 | 8 | 2 | 4:51 | s | 8 | 2 | 8:51 | 66 48.825 | 71 24.863 | 472 | 460 | Sinan | |
| NBP21401.004 | CTD | 21 | 21 | 381.220 | 8 | 2 | 5:39 | e | 8 | 2 | 9:39 | 66 48.813 | 71 24.639 | 472 | | Sinan | |
| NBP21401.005 | bmp | 8 | 21 | 381.220 | 8 | 2 | 6:50 | s | 8 | 2 | 10:50 | 66 48.9 | 71 28.0 | 472 | 250 | Wiebe | |
| NBP21401.006 | bird obs | 19 | to 22 | | 8 | 2 | 8:16 | s | 8 | 2 | 12:16 | 66 45.342 | 71 38.563 | | | Ribic | |
| NBP21401.007 | whale obs | 8 | to 22 | | 8 | 2 | 8:16 | s | 8 | 2 | 12:16 | 66 45.342 | 71 38.563 | | | Friedlaender | |
| NBP21401.008 | ice obs | 9 | | | 8 | 2 | 900 | s | 8 | 2 | 1300 | 66 43.42 | 71 43.76 | | | Stewart | |
| NBP21401.009 | bmp | 8 | 22 | | 8 | 2 | 1213 | e | 8 | 2 | 1613 | 66 43.916 | 72 12.247 | | | Wiebe | |
| NBP21401.010 | ring net | 8 | 22 | 381.264 | 8 | 2 | 1230 | s/e | 8 | 2 | 1630 | 66 34.95 | 72 12.683 | 3326 | 30 | Kozlowski | |
| NBP21401.011 | CTD | 22 | 22 | 381.264 | 8 | 2 | 12:40 | s | 8 | 2 | 16:40 | 66 34.94 | 72 12.69 | 3329 | 3312 | Kim | |
| NBP21401.012 | whale obs | 8 | 22 | | 8 | 2 | 12:40 | e | 8 | 2 | 16:40 | 66 34.950 | 72 12.683 | 3326 | | Friedlaender | |
| NBP21401.013 | bird obs | 19 | 22 | | 8 | 2 | 12:40 | e | 8 | 2 | 16:40 | 66 34.950 | 72 12.683 | 3326 | | Ribic | |
| NBP21401.014 | CTD | 22 | 22 | 381.264 | 8 | 2 | 15:56 | e | 8 | 2 | 19:56 | 66 34.94 | 72 12.69 | 3329 | 3312 | Kim | |
| NBP21401.015 | ice obs | 9 | | | 8 | 2 | 1600 | e | 8 | 2 | 2000 | | | | | Stewart | |
| NBP21401.016 | tucker trawl | 7 | 22 | 381.264 | 8 | 2 | 1606 | s | 8 | 2 | 2006 | 66 33.4 | 72 09.6 | | | Daly | |
| NBP21401.017 | tucker trawl | 7 | 22 | 381.264 | 8 | 2 | 1612 | e | 8 | 2 | 2012 | 66 33.4 | 72 09.6 | | | Daly | aborted/ice |
| NBP21401.018 | tucker trawl | 8 | 22 | 381.264 | 8 | 2 | 1637 | s | 8 | 2 | 2037 | 66 33.3 | 72 09.5 | | | Daly | |
| NBP21401.019 | tucker trawl | 8 | 22 | 381.264 | 8 | 2 | 1648 | e | 8 | 2 | 2048 | 66 35.2 | 72 09.3 | | | Daly | |
| NBP21401.020 | tucker trawl | 9 | 22 | 381.264 | 8 | 2 | 1700 | s | 8 | 2 | 2100 | 66 35.1 | 72 9.2 | | | Torres | |
| NBP21401.021 | tucker trawl | 9 | 22 | 381.264 | 8 | 2 | 1905 | e | 8 | 2 | 2305 | 66 32.22 | 72 4.30 | | | Torres | |
| NBP21401.022 | bird night obs | 20 | to 23 | | 8 | 2 | 19:55 | s | 8 | 2 | 23:55 | 66 33.830 | 72 11.361 | | | Chapman | |
| NBP21401.023 | bmp | 9 | 23 | | 8 | 2 | 1950 | s | 8 | 2 | 2350 | 66 34.734 | 72 17.375 | 2700 | 250 | Wiebe | |
| NBP21401.024 | sonobuoy | 19 | to 23 | | 8 | 2 | 21:25 | s | 8 | 3 | 1:25 | 66 36.173 | 72 28.628 | | 300 | Sirovic | |
| NBP21401.025 | bird night obs | 20 | to 23 | | 8 | 2 | 22:29 | e | 8 | 3 | 2:29 | 66 37.348 | 72 39.935 | | | Chapman | |
| NBP21401.026 | sonobuoy | 19 | to 23 | | 8 | 2 | 22:32 | e | 8 | 3 | 2:32 | - | - | | | Sirovic | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NBP21501.001 | ring net | 9 | 23 | 341.295 | 8 | 3 | 230 | s/e | 8 | 3 | 430 | 66 41. 134 | 73 18.732 | 3583 | 30 | Macri | |
| NBP21501.002 | CTD | 23 | 23 | 341.295 | 8 | 3 | 2:38 | s | 8 | 3 | 6:38 | 66 41.1342 | 73 18.7321 | 3583 | 3639 | Sinan | |
| NBP21501.003 | CTD | 23 | 23 | 341.295 | 8 | 3 | 6:25 | e | 8 | 3 | 10:25 | 66 41.1342 | 73 18.7321 | 3583 | | Sinan | |
| NBP21501.004 | bmp | 9 | 23 | 341.296 | 8 | 3 | 621 | e | 8 | 3 | 1021 | 66 41.450 | 73 13.950 | 3583 | 330 | Wiebe | |
| NBP21501.005 | moc1/opc | 7 | 23 | 341.297 | 8 | 3 | 655 | s | 8 | 3 | 1055 | 66 41.442 | 73 12.897 | 3553 | | Ashjian | |
| NBP21501.006 | ice obs | 10 | | | 8 | 3 | 900 | s | 8 | 3 | 1300 | 66 40.40 | 73 20.10 | | | Stewart | |
| NBP21501.007 | bird obs | 21 | 23 | | 8 | 3 | 9:30 | s | 8 | 3 | 13:30 | 66 39.996 | 73 22.272 | | | Chapman | |
| NBP21501.008 | whale obs | 9 | to 24 | | 8 | 3 | 1010 | e | 8 | 3 | 14:10 | 66 39.401 | 73 25.01 | | | Friedlaender | |
| NBP21501.009 | moc1/opc | 7 | 23 | | 8 | 3 | 1010 | e | 8 | 3 | 14:10 | 66 39.401 | 73 25.01 | | | Ashjian | |
| NBP21501.010 | bmp | 10 | 23 | | 8 | 3 | 1045 | s | 8 | 3 | 1445 | 66 40.876 | 73 20.497 | | 250 | Wiebe | |
| NBP21501.011 | sonobuoy | 20 | to 24 | | 8 | 3 | 12:25 | s | 8 | 3 | 16:25 | 66 45.3 | 73 5.6 | | 300 | Sirovic | |
| NBP21501.012 | sonobuoy | 20 | to 24 | | 8 | 3 | 13:40 | e | 8 | 3 | 17:40 | - | - | | | Sirovic | |
| NBP21501.013 | whale obs | 9 | 24 | | 8 | 3 | 15:30 | e | 8 | 3 | 19:30 | 66 54.153 | 72 37.249 | 1077 | | Friedlaender | |
| NBP21501.014 | bird obs | 21 | 24 | | 8 | 3 | 15:30 | e | 8 | 3 | 19:30 | 66 54.153 | 72 37.249 | 1077 | | Chapman | |
| NBP21501.015 | bmp | 10 | 24 | | 8 | 3 | 15:30 | e | 8 | 3 | 19:30 | 66 53.98 | 72 32.10 | 1200 | 230 | Wiebe | |
| NBP21501.016 | ice obs | 10 | | | 8 | 3 | 0:00 | e | 8 | 3 | 0:00 | 66 53.38 | 72 36.90 | | | Stewart | |
| NBP21501.017 | ring net | 10 | 24 | 341.253 | 8 | 3 | 21:30 | s/e | 8 | 4 | 130 | 66 55.300 | 72.35.207 | 600 | 30 | Kozlowski | |
| NBP21501.018 | CTD | 24 | 24 | 341.253 | 8 | 3 | 21:36 | s | 8 | 4 | 1:36 | 66 55.32 | 72 35.16 | 506 | 503 | Hyatt | |
| NBP21501.019 | CTD | 24 | 24 | 341.253 | 8 | 3 | 22:30 | e | 8 | 4 | 2:30 | 66 56.438 | 72 31.722 | | | Hyatt | |
| NBP21501.020 | bmp | 11 | 24 | 341.253 | 8 | 3 | 23:17 | s | 8 | 4 | 3:17 | 66 54.24 | 72 29.089 | | 230 | Wiebe | |
| NBP21501.021 | moc 10 | 3 | 24 | 341.253 | 8 | 3 | 1653 | s | 8 | 3 | 1953 | 66 53.74 | 72 36.88 | 1200 | | Torres | |
| NBP21601.001 | ice coring | 3 | 25 | 341.220 | 8 | 4 | 225 | s | 8 | 4 | 625 | 67 6.73 | 71 58.76 | | | Stewart | |
| NBP21601.002 | ice coring | 3 | 25 | 341.220 | 8 | 4 | 400 | e | 8 | 4 | 800 | 67 6.73 | 71 58.76 | | | Stewart | |
| NBP21601.003 | ring net | 11 | 25 | 341.220 | 8 | 4 | 4:13 | s/e | 8 | 4 | 815 | 67 7.434 | 71 58.132 | 420 | 30 | Macri | |
| NBP21601.004 | CTD | 25 | 25 | 341.220 | 8 | 4 | 4:33 | s | 8 | 4 | 8:33 | 67 7.434 | 71 58.132 | 420 | 415 | Sinan | |
| NBP21601.005 | CTD | 25 | 25 | 341.220 | 8 | 4 | 5:25 | e | 8 | 4 | 9:25 | 67 7.434 | 71 58.132 | 420 | | Sinan | |
| NBP21601.006 | bird night obs | 22 | to 25 | | 8 | 4 | 5:50 | s | 8 | 4 | 9:50 | 67 9.013 | 71 54.629 | | | Ribic | |
| NBP21601.007 | bird night obs | 22 | to 25 | | 8 | 4 | 8:02 | e | 8 | 4 | 12:02 | 67 14.599 | 71 32.121 | | | Ribic | |
| NBP21601.008 | bird obs | 23 | to 25 | | 8 | 4 | 8:38 | s | 8 | 4 | 12:38 | 67 16.030 | 71 27.322 | | | Ribic | |
| NBP21601.009 | whaleobs | 10 | to 25 | | 8 | 4 | 8:38 | s | 8 | 4 | 12:38 | 67 16.030 | 71 27.322 | | | Friedlaender | |
| NBP21601.010 | bird obs | 23 | 25 | | 8 | 4 | 9:57 | e | 8 | 4 | 13:57 | 66 19.946 | 71 14.311 | | | Ribic | |
| NBP21601.011 | whaleobs | 10 | 25 | | 8 | 4 | 9:57 | e | 8 | 4 | 13:57 | 66 19.946 | 71 14.311 | | | Friedlaender | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NBP21601.012 | bmp | 11 | 26 | | 8 | 4 | 9:53 | e | 8 | 4 | 13:53 | 67 19.869 | 71.14.65 | 477 | 260 | Wiebe | |
| NBP21601.013 | diving | 3 | 26 | | 8 | 4 | 1030 | s | 8 | 4 | 1430 | 67 20.180 | 71 13.71 | | | Torres | |
| NBP21601.014 | ring net | 12 | 26 | 341.180 | 8 | 4 | 10:35 | s/e | 8 | 4 | 1435 | 67 20.18 | 71 13.71 | 480 | 30 | Macri | |
| NBP21601.015 | CTD | 26 | 26 | 341.180 | 8 | 4 | 10:49 | s | 8 | 4 | 14:49 | 67 20.18 | 71 13.71 | 485 | 466 | Sinan | |
| NBP21601.016 | CTD | 26 | 26 | 341.180 | 8 | 4 | 11:37 | e | 8 | 4 | 15:37 | 67 20.18 | 71 13.71 | 485 | | Sinan | |
| NBP21601.017 | moc1/opc | 8 | 26 | 341.181 | 8 | 4 | 13:06 | s | 8 | 8 | 17:06 | 67 19.733 | 71 13.10 | 470 | 382 | Ashjian | |
| NBP21601.018 | sonobuoy | 21 | 26 | 341.181 | 8 | 4 | 13:14 | s | 8 | 4 | 17:14 | 67 19.615 | 71 13.233 | | 30 | Sirovic | |
| NBP21601.019 | moc1/opc | 8 | 26 | 341.181 | 8 | 4 | 14:52 | e | 8 | 4 | 19:52 | 68 16.81 | 72 17.2 | | | Ashjian | |
| NBP21601.020 | bird obs | 24 | to 27 | | 8 | 4 | 15:01 | s | 8 | 4 | 19:01 | 67 16.666 | 71 18.161 | | | Ribic | |
| NBP21601.021 | whale obs | 10 | to 27 | | 8 | 4 | 15:01 | s | 8 | 4 | 19:01 | 67 16.666 | 71 18.161 | | | Friedlaender | |
| NBP21601.022 | bmp | 12 | 26 | | 8 | 4 | 1535 | s | 8 | 4 | 1935 | 67 18.88 | 71 16.207 | | | Wiebe | |
| NBP21601.023 | bird obs | 24 | to 27 | | 8 | 4 | 16:22 | e | 8 | 4 | 20:22 | 67 21.590 | 71 09.182 | | | Ribic | |
| NBP21601.024 | whale obs | 10 | to 27 | | 8 | 4 | 16:22 | e | 8 | 4 | 20:22 | 67 21.590 | 71 09.182 | | | Friedlaender | |
| NBP21601.025 | ice obs | 11 | | | 8 | 4 | 1600 | e | 8 | 4 | 2000 | 67 26.20 | 71 13.11 | | | Stewart | |
| NBP21601.026 | sonobuoy | 21 | 26 | | 8 | 4 | 17:10 | e | 8 | 4 | 21:10 | - | - | | | Sirovic | |
| NBP21601.027 | bird obs | 25 | to 27 | | 8 | 4 | 19:02 | s | 8 | 4 | 23:02 | 67 29.40 | 70 42.182 | | | Chapman | |
| NBP21601.028 | CTD | 27 | 27 | 341.140 | 8 | 4 | 21:14 | s | 8 | 5 | 1:14 | 67 32.49 | 70 31.96 | 768 | 758 | Kim | |
| NBP21601.029 | bmp | 12 | 26-27 | | 8 | 4 | 1924 | e | 8 | 4 | 2324 | 67 29.856 | 70 41.076 | | 250 | Wiebe | |
| NBP21601.030 | CTD | 27 | 27 | 341.140 | 8 | 4 | 22:13 | e | 8 | 5 | 2:13 | 67 32.49 | 70 31.96 | 768 | | Kim | |
| NBP21601.031 | ring net | 13 | 27 | 341.140 | 8 | 4 | 22:20 | s/e | 8 | 5 | 220 | 67 32.821 | 70 31.661 | 769 | 30 | Kozlowski | |
| NBP21601.032 | bird obs | 25 | to 27 | | 8 | 4 | 23:57 | e | 8 | 5 | 3:57 | 67 36.137 | 70 15.761 | | | Chapman | |
| NBP21701.000 | bmp | 13 | 28-42 | | 8 | 5 | 2:10 | s | 8 | 5 | 6:10 | 68 15.48 | 69 33.75 | | | Wiebe | |
| NBP21701.001 | ring net | 14 | 28 | 341.100 | 8 | 5 | 2:50 | s/e | 8 | 5 | 650 | 66 44.929 | 68 47.934 | 369 | 30 | Macri | |
| NBP21701.002 | CTD | 28 | 28 | 341.100 | 8 | 5 | 3:03 | s | 8 | 5 | 7:03 | 67 44.929 | 69 47.934 | 369 | 365 | Sinan | |
| NBP21701.003 | CTD | 28 | 28 | 341.100 | 8 | 5 | 4:55 | e | 8 | 5 | 8:55 | 67 44.929 | 69 47.934 | 369 | | Sinan | |
| NBP21701.004 | bird night obs | 26 | 28 | | 8 | 5 | 422 | s | 8 | 5 | 822 | 67 44.308 | 69 48.182 | | | Ribic | |
| NBP21701.005 | bird night obs | 26 | 28 | | 8 | 5 | 802 | e | 8 | 5 | 1202 | 67 58.899 | 70 18.924 | | | Ribic | |
| NBP21701.006 | bmp | 13 | 42 | | 8 | 5 | 849 | e | 8 | 5 | 1249 | 68 02.516 | 70 19.644 | 777 | 250 | Wiebe | |
| NBP21701.007 | CTD | 29 | 42 | 301.100 | 8 | 5 | 9:50 | s | 8 | 5 | 13:50 | 68 3.0883 | 70 19.3951 | 765 | 709 | Sinan | |
| NBP21701.008 | ring net | 15 | 42 | 301.100 | 8 | 5 | 9:35 | s/e | 8 | 5 | 13:35 | 69 3.0883 | 71 19.3951 | 765 | 30 | Macri | |
| NBP21701.009 | CTD | 29 | 42 | 301.100 | 8 | 5 | 10:45 | e | 8 | 5 | 14:45 | 68 3.0883 | 70 19.3951 | 765 | | Sinan | |
| NBP21701.010 | bird obs | 27 | 42 | | 8 | 5 | 1113 | s | 8 | 5 | 1513 | 68 2.608 | 70 19.737 | | | Chapman | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NBP21701.011 | moc 10 | 4 | 42 | 301.100 | 8 | 5 | 1125 | s | 8 | 5 | 1525 | 68 2.16 | 70 19.8 | 830 | 500 | Torres | |
| NBP21701.012 | whale obs | 11 | | | 8 | 5 | 1410 | s | 8 | 5 | 1810 | 68 1.583 | 70 14.110 | | | Friedlaender | |
| NBP21701.013 | bmp | 14 | 42-41 | | 8 | 5 | 1405 | s | 8 | 5 | 1805 | 68 1.209 | 70 14.855 | | | Wiebe | |
| NBP21701.014 | sonobuoy | 22 | to 41 | | 8 | 5 | 15:28 | s | 8 | 5 | 19:28 | 68 6.420 | 70 3.612 | | | Sirovic | |
| NBP21701.015 | sonobuoy | 22 | to 41 | | 8 | 5 | 15:52 | e | 8 | 5 | 19:52 | - | - | | | Sirovic | |
| NBP21701.016 | bird obs | 27 | | | 8 | 5 | 16:15 | e | 8 | 5 | 20:15 | 68 9.071 | 69 56.645 | | | Chapman | |
| NBP21701.017 | whale obs | 11 | | | 8 | 5 | 16:15 | e | 8 | 5 | 20:15 | 68 9.071 | 69 56.645 | | | Friedlaender | |
| NBP21701.018 | bmp | 14 | 41 | | 8 | 5 | 1815 | e | 8 | 5 | 2215 | 68 15.48 | 69 33.75 | | | Wiebe | |
| NBP21701.019 | CTD | 30 | 41 | 301.060 | 8 | 5 | 18:38 | s | 8 | 5 | 22:38 | 68 15.62 | 69 33.84 | 670 | 660 | Kim | |
| NBP21701.020 | CTD | 30 | 41 | 301.060 | 8 | 5 | 19:30 | e | 8 | 5 | 23:30 | 68 15.62 | 69 33.84 | 670 | | Kim | |
| NBP21701.021 | bird obs | 28 | to 40 | | 8 | 5 | 19:43 | s | 8 | 5 | 23:43 | 68 16.50 | 69 31.836 | | | Chapman | |
| NBP21701.022 | bird obs | 28 | to 40 | | 8 | 5 | 22:10 | e | 8 | 6 | 2:10 | 68 21.722 | 69 11.601 | | | Chapman | |
| NBP21801.001 | ice coring/argos buoy | 4 | 40 | 301.020 | 8 | 6 | 30 | s | 8 | 6 | 430 | 68 27.86 | 68 44.57 | | | Stewart | |
| NBP21801.002 | ice coring/argos buoy | 4 | 40 | 301.020 | 8 | 6 | 230 | e | 8 | 6 | 630 | 68 27.86 | 68 44.57 | | | Stewart | |
| NBP21801.003 | CTD | 31 | 40 | 301.020 | 8 | 6 | 4:30 | s | 8 | 6 | 8:30 | 68 27.893 | 68 46.271 | 704 | 709 | Sinan | |
| NBP21801.004 | CTD | 31 | 40 | 301.020 | 8 | 6 | 5:30 | e | 8 | 6 | 9:30 | 68 27.893 | 68 46.271 | 704 | | Sinan | |
| NBP21801.005 | rov | 5 | 40 | 301.020 | 8 | 6 | 6:10 | s | 8 | 6 | 10:10 | 68 27.898 | 68 46.262 | 700 | 42 | Gallager | |
| NBP21801.006 | rov | 5 | 40 | 301.020 | 8 | 6 | 8:10 | e | 8 | 6 | 12:10 | 68 27.898 | 68 46.262 | 700 | 42 | Gallager | |
| NBP21801.007 | bird obs | 29 | to 39 | | 8 | 6 | 8:37 | s | 8 | 6 | 12:37 | 68 28.199 | 68 45.408 | | | Chapman | |
| NBP21801.008 | whale obs | 12 | to 39 | | 8 | 6 | 8:37 | s | 8 | 6 | 12:37 | 68 28.199 | 68 45.408 | | | Friedlaender | |
| NBP21801.009 | ice obs | 12 | | | 8 | 6 | 900 | e | 8 | 6 | 1300 | 68 28.52 | 68 44.20 | | | Stewart | |
| NBP21801.010 | sonobuoy | 23 | to 39 | | 8 | 6 | 9:59 | s | 8 | 6 | 13:59 | 68 31.591 | 68 33.970 | | 300 | Sirovic | |
| NBP21801.011 | sonobuoy | 23 | to 39 | | 8 | 6 | 959 | s | 8 | 6 | 1359 | 68 31.591 | 68 33.970 | | | Sirovic | |
| NBP21801.012 | bird obs | 29 | 39 | | 8 | 6 | 12:44 | e | 8 | 6 | 16:44 | 68 35.65 | 68 17.529 | | | Chapman | |
| NBP21801.013 | whale obs | 12 | 39 | | 8 | 6 | 12:44 | e | 8 | 6 | 16:44 | 68 35.65 | 68 17.529 | | | Friedlaender | |
| NBP21801.014 | ring net | 16 | 39.5 | 323.-036 | 8 | 6 | 13:30 | s/e | 8 | 6 | 17:30 | 68 35.356 | 68 19.615 | 185 | 30 | Kozlowski | |
| NBP21801.015 | CTD | 32 | 39 | 301.-020 | 8 | 6 | 13:40 | s | 8 | 6 | 17:40 | 68 35.34 | 68 35.33 | 188 | 176 | Kim | not on site |
| NBP21801.016 | CTD | 32 | 39 | 301.-020 | 8 | 6 | 14:17 | e | 8 | 6 | 18:17 | 68 35.34 | 68 35.33 | 188 | 176 | Kim | not on site |
| NBP21801.017 | plummet net | 1 | 39 | 301.-020 | 8 | 6 | 1509 | s | 8 | 6 | 1909 | 68 35.34 | 68 35.33 | 188 | 25 | Daly | aborted |
| NBP21801.018 | plummet net | 1 | 39 | 301.-020 | 8 | 6 | 1511 | e | 8 | 6 | 1911 | 68 35.34 | 68 35.33 | 188 | 25 | Daly | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NBP21801.019 | plummet net | 2 | 39 | 301.-020 | 8 | 6 | 1520 | s | 8 | 6 | 1920 | 68 35.34 | 68 35.33 | 188 | 25 | Daly | successful |
| NBP21801.020 | plummet net | 2 | 39 | 301.-020 | 8 | 6 | 1523 | e | 8 | 6 | 1923 | 68 35.34 | 68 35.33 | 188 | 25 | Daly | |
| NBP21801.021 | plummet net | 3 | 39 | 301.-020 | 8 | 6 | 1554 | s | 8 | 6 | 1954 | 68 35.34 | 68 35.33 | 188 | 50 | Daly | successful |
| NBP21801.022 | plummet net | 3 | 39 | 301.-020 | 8 | 6 | 1557 | e | 8 | 6 | 1957 | 68 35.34 | 68 35.33 | 188 | 50 | Daly | |
| NBP21801.023 | plummet net | 4 | 39 | 301.-020 | 8 | 6 | 1605 | s | 8 | 6 | 2005 | 68 35.34 | 68 35.33 | 188 | 75 | Daly | aborted |
| NBP21801.024 | plummet net | 4 | 39 | 301.-020 | 8 | 6 | 1606 | e | 8 | 6 | 2006 | 68 35.34 | 68 35.33 | 188 | 75 | Daly | |
| NBP21801.025 | plummet net | 5 | 39 | 301.-020 | 8 | 6 | 1610 | s | 8 | 6 | 2010 | 68 35.34 | 68 35.33 | 188 | 75 | Daly | successful |
| NBP21801.026 | plummet net | 5 | 39 | 301.-020 | 8 | 6 | 1614 | e | 8 | 6 | 2014 | 68 35.34 | 68 35.33 | 188 | 75 | Daly | |
| NBP21801.027 | plummet net | 6 | 39 | 301.-020 | 8 | 6 | 1628 | s | 8 | 6 | 2028 | 68 35.34 | 68 35.33 | 188 | 100 | Daly | aborted |
| NBP21801.028 | plummet net | 6 | 39 | 301.-020 | 8 | 6 | 1633 | e | 8 | 6 | 2033 | 68 35.34 | 68 35.33 | 188 | 100 | Daly | |
| NBP21801.029 | plummet net | 7 | 39 | 301.-020 | 8 | 6 | 1639 | s | 8 | 6 | 2039 | 68 35.34 | 68 35.33 | 188 | 100 | Daly | successful |
| NBP21801.030 | plummet net | 7 | 39 | 301.-020 | 8 | 6 | 1646 | e | 8 | 6 | 2046 | 68 35.34 | 68 35.33 | 188 | 100 | Daly | |
| NBP21801.031 | plummet net | 8 | 39 | 301.-020 | 8 | 6 | 1654 | s | 8 | 6 | 2054 | 68 35.34 | 68 35.33 | 188 | 150 | Daly | successful |
| NBP21801.032 | plummet net | 8 | 39 | 301.-020 | 8 | 6 | 1703 | e | 8 | 6 | 2103 | 68 35.34 | 68 35.33 | 188 | 150 | Daly | |
| NBP21801.033 | plummet net | 9 | 39 | 301.-020 | 8 | 6 | 1709 | s | 8 | 6 | 2109 | 68 35.34 | 68 35.33 | 188 | 185 | Daly | successful |
| NBP21801.034 | plummet net | 9 | 39 | 301.-020 | 8 | 6 | 1720 | e | 8 | 6 | 2120 | 68 35.34 | 68 35.33 | 188 | 185 | Daly | |
| NBP21901.001 | ice coring | 5 | | | 8 | 7 | 830 | s | 8 | 7 | 1230 | 68 21.79 | 67 52.83 | | | Stewart | |
| NBP21901.002 | ice coring | 5 | | | 8 | 7 | 1020 | e | 8 | 7 | 1420 | 69 21.79 | 68 52.83 | | | Stewart | |
| NBP21901.003 | CTD | 33 | 38 | 341.-020 | 8 | 7 | 10:35 | s | 8 | 7 | 14:35 | 68 21.784 | 67 52.796 | 426 | 434 | Sinan | not on site |
| NBP21901.004 | bird obs | 30 | to 37 | | 8 | 7 | 10:49 | s | 8 | 7 | 14:49 | 68 21.785 | 67 52.788 | | | Chapman | |
| NBP21901.005 | whale obs | 13 | to 37 | | 8 | 7 | 10:49 | s | 8 | 7 | 14:49 | 68 21.785 | 67 52.788 | | | Friedlaender | |
| NBP21901.006 | CTD | 33 | 38 | 341.-020 | 8 | 7 | 11:30 | e | 8 | 7 | 15:30 | 68 21.785 | 67 52.788 | 426 | | Sinan | |
| NBP21901.007 | ring net | 17 | 38 | 341.-020 | 8 | 7 | 11:30 | s/e | 8 | 7 | 15:30 | 68 21.785 | 67 52.788 | 426 | 30 | Macri | |
| NBP21901.008 | sonobuoy | 24 | 38 | | 8 | 7 | 12:12 | s | 8 | 7 | 16:12 | 68 20.082 | 67 57.070 | | | Sirovic | |
| NBP21901.009 | bmp | 15 | 38-37 | | 8 | 7 | 1235 | s | 8 | 7 | 1635 | 68 19.93 | 68 00.39 | | | Wiebe | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NBP21901.010 | sonobuoy | 24 | 38 | | 8 | 7 | 14:52 | e | 8 | 7 | 18:52 | - | - | | | Sirovic | |
| NBP21901.011 | bird obs | 30 | 37 | | 8 | 7 | 15:17 | e | 8 | 7 | 19:17 | 68 10.842 | 68 12.396 | | | Chapman | |
| NBP21901.012 | whale obs | 13 | 37 | | 8 | 7 | 15:17 | e | 8 | 7 | 19:17 | 68 10.842 | 68 12.396 | | | Friedlaender | |
| NBP21901.013 | ring net | 18 | 37 | 341.020 | 8 | 7 | 15:15 | s/e | 8 | 7 | 19:15 | 69 10.842 | 69 12.396 | 555 | 30 | Kozlowski | |
| NBP21901.014 | CTD | 34 | 37 | 341.020 | 8 | 7 | 15:22 | s | 8 | 7 | 19:22 | 68 10.84 | 68 12.36 | 555 | 553 | Kim | |
| NBP21901.015 | CTD | 34 | 37 | 341.020 | 8 | 7 | 16:17 | e | 8 | 7 | 20:17 | 68 10.87 | 68 12.07 | 555 | | Kim | |
| NBP21901.016 | bird obs 31 | 31 | to 36 | | 8 | 7 | 18:52 | s | 8 | 7 | 22:52 | 68 01.441 | 67 55.232 | | | Chapman | |
| NBP21901.017 | ring net | 19 | 36 | 381.020 | 8 | 7 | 21:25 | s/e | 8 | 7 | 1:25 | 67 51.275 | 67 40.89 | 325 | 30 | Kozlowski | |
| NBP21901.018 | CTD | 35 | 36 | 381.020 | 8 | 7 | 21:33 | s | 8 | 7 | 1:33 | 67 51.27 | 67 40.89 | 333 | 325 | Kim | |
| NBP21901.019 | bird obs 31 | 31 | 36 | | 8 | 7 | 22:16 | e | 8 | 8 | 2:16 | 67 51.107 | 67 40.855 | | | Chapman | |
| NBP21901.020 | CTD | 35 | 36 | 381.020 | 8 | 7 | 22:14 | e | 8 | 7 | 2:14 | 67 51.10 | 67 40.85 | 355 | 325 | Kim | |
| NBP22001.001 | bmp | 15 | 35 | 381.020 | 8 | 8 | 118 | e | 8 | 8 | 518 | 67 53.3 | 68 8.26 | | | Wiebe | |
| NBP22001.002 | moc1/opc | 9 | 35 | 381.020 | 8 | 8 | 215 | s | 8 | 8 | 615 | 67 53.74 | 68 10.82 | 600+ | 500 | Ashjian | |
| NBP22001.003 | moc1/opc | 9 | 35 | 381.020 | 8 | 8 | 3:45 | e | 8 | 8 | 746 | 67 54.2 | 68 19.03 | | | Ashjian | |
| NBP22001.004 | rov | 6 | 35 | 381.020 | 8 | 8 | 4:39 | s | 8 | 8 | 8:39 | 67 53.4 | 68 19.8 | 600 | 40 | Gallager | |
| NBP22001.005 | rov | 6 | 35 | 381.020 | 8 | 8 | 6:20 | e | 8 | 8 | 10:20 | 67 53.4 | 68 19.8 | 600 | 40 | Gallager | |
| NBP22001.006 | CTD | 36 | 35 | 368.036 | 8 | 8 | 7:09 | s | 8 | 8 | 11:09 | 67 53.456 | 68 19.915 | 761 | 752 | Sinan | |
| NBP22001.007 | CTD | 36 | 35 | 368.036 | 8 | 8 | 8:11 | e | 8 | 8 | 12:11 | 67 53.456 | 68 19.915 | 761 | | Sinan | |
| NBP22001.008 | bird obs 31 | 32 | to 34 | | 8 | 8 | 8:49 | s | 8 | 8 | 12:49 | 67 54.264 | 68 23.462 | | | Chapman | |
| NBP22001.009 | bmp | 16 | 35 | | 8 | 8 | 8:33 | s | 8 | 8 | 12:33 | 67 53.816 | 68 20.692 | 859 | 100 | Wiebe | |
| NBP22001.010 | bmp | 16 | 34 | | 8 | 8 | 9:23 | e | 8 | 8 | 13:23 | 67 54.948 | 68 30.13 | 651.8 | 146 | Wiebe | |
| NBP22001.011 | sonobuoy | 25 | 34 | | 8 | 8 | 0:00 | s | 8 | 8 | 0:00 | 67 54.996 | 68 30.271 | | | Sirovic | |
| NBP22001.012 | moc 10 | 5 | 34 | 358.046 | 8 | 8 | 10:02 | s | 8 | 8 | 14:02 | 66 55 23 | 68 31 00 | 650 | 500 | Torres | |
| NBP22001.013 | moc 10 | 5 | 34 | 358.046 | 8 | 8 | 11:37 | e | 8 | 8 | 15:37 | 67 54.42 | 68 24.37 | 650 | 500 | Torres | |
| NBP22001.014 | tucker trawl | 9 | 34 | 358.046 | 8 | 8 | 1204 | s | 8 | 8 | 1604 | 67 54.5 | 68 23.5 | 588 | | Daly | |
| NBP22001.015 | tucker trawl | 9 | 34 | 358.046 | 8 | 8 | 1323 | e | 8 | 8 | 1723 | 67 55.2 | 68 30.9 | 588 | | Daly | |
| NBP22001.016 | ring net | 20 | 34 | 358.046 | 8 | 8 | 13:30 | s/e | 8 | 8 | 17:30 | 67 55.549 | 68 32.541 | 600 | 30 | Kozlowski | |
| NBP22001.017 | CTD | 37 | 34 | 358.046 | 8 | 8 | 1344 | s | 8 | 8 | 1744 | 67 55.49 | 67 59.97 | 577 | 594 | Kim | |
| NBP22001.018 | CTD | 37 | 34 | 358.046 | 8 | 8 | 1449 | e | 8 | 8 | 1849 | 68 32.31 | 68 33.96 | 577 | 594 | Kim | |
| NBP22001.019 | bird obs 33 | 33 | to 33 | | 8 | 8 | 14:55 | s | 8 | 8 | 18:55 | 67 56.010 | 68 34.080 | 587 | | Ribic | |
| NBP22001.020 | whale obs | 14 | to 33 | | 8 | 8 | 14:55 | s | 8 | 8 | 18:55 | 67 56.010 | 68 34.080 | 587 | | Friedlaender | |
| NBP22001.021 | bmp | 17 | to 33 | | 8 | 8 | 15:34 | s | 8 | 8 | 19:34 | 67 55.735 | 68 31.860 | | | Wiebe | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NBP22001.022 | bird obs 33 | 33 | to 33 | | 8 | 8 | 16:03 | e | 8 | 8 | 20:03 | 67 57.159 | 68 37.139 | | | Ribic | |
| NBP22001.023 | whale obs | 14 | to 33 | | 8 | 8 | 16:03 | e | 8 | 8 | 20:03 | 67 57.159 | 68 37.139 | | | Friedlaender | |
| NBP22001.024 | CTD | 38 | 33 | 345.052 | 8 | 8 | 17:08 | s | 8 | 8 | 21:08 | 67 58.85 | 68 46.56 | 144 | 136 | Kim | |
| NBP22001.025 | sonobuoy | 25 | 34 | | 8 | 8 | 16:24 | e | 8 | 8 | 20:24 | - | - | | | Sirovic | |
| NBP22001.026 | CTD | 38 | 33 | 345.052 | 8 | 8 | 17:32 | e | 8 | 8 | 21:32 | 67 58.95 | 68 46.89 | 144 | 136 | Kim | |
| NBP22001.027 | CTD | 39 | 31 | 352.071 | 8 | 8 | 20:22 | s | 8 | 9 | 0:27 | 67 49.87 | 67 49.96 | 156 | 134 | Kim | |
| NBP22001.028 | CTD | 39 | 31 | 352.071 | 8 | 8 | 20:55 | e | 8 | 9 | 0:55 | 69 3.22 | 69 2.86 | 156 | 134 | Kim | |
| NBP22001.029 | bird obs 34 | 34 | to 31 | | 8 | 8 | 19:09 | s | 8 | 8 | 23:09 | 67 55.56 | 62 31.728 | | | Chapman | |
| NBP22001.030 | CTD | 40 | 30 | 349.084 | 8 | 8 | 22:40 | s | 8 | 9 | 2:40 | 67 47.17 | 69 20.64 | 169 | 161 | Hyatt | |
| NBP22001.031 | ring net | 21 | 30 | 349.084 | 8 | 8 | 22:30 | s/e | 8 | 9 | 230 | 66 47.17 | 68 20.64 | 169 | 30 | Kozlowski | |
| NBP22001.032 | bird obs 34 | 34 | to 31 | | 8 | 8 | 19:39 | e | 8 | 8 | 23:39 | 67 55.908 | 68 35.502 | | | Ribic | |
| NBP22001.033 | bmp | 17 | 31-30 | | 8 | 8 | 18:50 | e | 8 | 8 | 22:50 | 67 53.46 | 68 48.569 | 30 | 70 | Wiebe | |
| NBP22001.034 | CTD | 40 | 30 | 349.084 | 8 | 8 | 23:09 | e | 8 | 9 | 3:09 | 67 47.17 | 69 20.64 | 169 | | Hyatt | |
| NBP22101.001 | ring net | 22 | 29 | 368.098 | 8 | 9 | 142 | s/e | 8 | 9 | 5:41 | 67 34.87 | 69 23.412 | 178 | 30 | Kozlowski | |
| NBP22101.002 | CTD | 41 | 29 | 368.098 | 8 | 9 | 1:50 | s | 8 | 9 | 5:50 | 67 34.883 | 69 23.417 | 182 | 164 | Sinan | |
| NBP22101.003 | CTD | 41 | 29 | 368.098 | 8 | 9 | 2:30 | e | 8 | 9 | 6:30 | 67 34.883 | 69 23.417 | 182 | | Sinan | |
| NBP22101.004 | bird obs 35 | 35 | to 43 | | 8 | 9 | 6:24 | s | 8 | 9 | 10:25 | 67 45.554 | 70 7.306 | | | Ribic | |
| NBP22101.005 | bmp | 18 | | | 8 | 9 | 6:24 | s | 8 | 9 | 10:24 | 67 47.963 | 70 50.016 | | | Wiebe | |
| NBP22101.006 | bird obs 35 | 35 | to 43 | | 8 | 9 | 7:23 | e | 8 | 9 | 10:23 | 67 44.772 | 70 18.292 | | | Ribic | |
| NBP22101.007 | bird obs | 36 | | | 8 | 9 | 825 | s | 8 | 9 | 1225 | 67 44.503 | 70 30.946 | | | Chapman | |
| NBP22101.008 | ice obs | 13 | | | 8 | 9 | 900 | s | 8 | 9 | 1300 | | | | | Stewart | |
| NBP22101.009 | sonobuoy | 26 | to 43 | | 8 | 9 | 10:18 | s | 8 | 9 | 14:18 | 67 48.097 | 70 51.064 | | | Sirovic | |
| NBP22101.010 | bmp | 18 | to43 | | 8 | 9 | 10:06 | e | 8 | 9 | 14:06 | 67 47.963 | 70 50.016 | 600 | 200 | Wiebe | |
| NBP22101.011 | sonobuoy | 26 | to43 | | 8 | 9 | 10:54 | e | 8 | 9 | 14:54 | - | - | | | Sirovic | |
| NBP22101.012 | bird obs 36 | 36 | 43 | | 8 | 9 | 11:33 | e | 8 | 9 | 15:33 | 67 49.625 | 71 3.815 | | | Ribic | |
| NBP22101.013 | diving | 5 | 43 | 301.140 | 8 | 9 | 1200 | s | 8 | 9 | 1600 | 67 49.73 | 71 3.18 | | | Torres | |
| NBP22101.014 | CTD | 42 | 43 | 301.140 | 8 | 9 | 1215 | s | 8 | 9 | 1615 | 67 49.73 | 71 3.18 | 476 | 464 | Hyatt | |
| NBP22101.015 | CTD | 42 | 43 | 301.140 | 8 | 9 | 1317 | e | 8 | 9 | 1712 | 67 49.87 | 71 2.30 | 476 | 464 | Hyatt | |
| NBP22101.016 | diving | 5 | 43 | 301.140 | 8 | 9 | 1400 | e | 8 | 9 | 1800 | 67 49.87 | 71 2.30 | | | Torres | |
| NBP22101.017 | moc1/opc | 10 | 43 | 301.140 | 8 | 9 | 15:02 | s | 8 | 9 | 10:02 | 67 50.07 | 71 01.06 | 462 | 416 | Ashjian | |
| NBP22101.018 | moc1/opc | 10 | 43 | 301.140 | 8 | 9 | 17:03 | e | 8 | 9 | 17:03 | 67 48.999 | 71 7.48 | 462 | 416 | Ashjian | |
| NBP22101.019 | CTD | 43 | 44 | 301.180 | 8 | 9 | 23:24 | s | 8 | 10 | 3:24 | 67 36.38 | 71 49.40 | 399 | 387 | Hyatt | |
| NBP22101.020 | bird obs 37 | 37 | 44 | | 8 | 9 | 20:14 | s | 8 | 10 | 0:14 | 67 47.245 | 71 10.189 | | | Chapman | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NBP22101.021 | bird obs 37 | 37 | 44 | | 8 | 9 | 22:38 | e | 8 | 10 | 2:38 | 67 38.445 | 71 44.871 | | | Chapman | |
| NBP22101.022 | rov | 7 | 43 | 301.140 | 8 | 9 | 17:55 | s | 8 | 9 | 21:55 | 67 48.34 | 71 03.62 | 470 | 42 | Gallager | |
| NBP22201.001 | CTD | 43 | 44 | 301.180 | 8 | 10 | 0:06 | e | 8 | 10 | 4:06 | 67 36.05 | 71 49.24 | 399 | | Hyatt | |
| NBP22201.002 | CTD | 44 | 45 | 301.220 | 8 | 10 | 4:04 | s | 8 | 10 | 8:04 | 67 23.055 | 72 34.068 | 384 | 373 | Sinan | |
| NBP22201.003 | CTD | 44 | 45 | 301.220 | 8 | 10 | 4:46 | e | 8 | 10 | 8:46 | 67 23.055 | 72 34.068 | 384 | | Sinan | |
| NBP22201.004 | bird obs 38 | 38 | 45 | | 8 | 10 | 5:10 | s | 8 | 10 | 9:10 | 67 22.232 | 72 36.629 | | | Ribic | |
| NBP22201.005 | bird obs 38 | 38 | 45 | | 8 | 10 | 7:18 | e | 8 | 10 | 11:18 | 67 14.037 | 73 3.009 | | | Ribic | |
| NBP22201.006 | ice obs | 14 | | | 8 | 10 | 840 | s | 8 | 10 | 1240 | 67 8.87 | 73 19.39 | | | Stewart | |
| NBP22201.007 | ring net | 23 | 46 | 301.265 | 8 | 10 | 9:00 | s/e | 8 | 10 | 1300 | 65 7.783 | 71 22.177 | 1980 | 30 | Macri | sample lost |
| NBP22201.008 | ring net | 24 | 46 | 301.266 | 8 | 10 | 9:10 | s/e | 8 | 10 | 1310 | 66 7.783 | 72 22.177 | 1980 | 30 | Macri | |
| NBP22201.009 | CTD | 45 | 46 | 301.265 | 8 | 10 | 9:26 | s | 8 | 10 | 13:26 | 67 7.783 | 73 22.177 | 1980 | 1931 | Sinan | |
| NBP22201.010 | CTD | 45 | 46 | 301.265 | 8 | 10 | 11:32 | e | 8 | 10 | 15:32 | 67 7.783 | 73 22.177 | 1980 | | Sinan | |
| NBP22201.011 | moc 10 | 6 | 46 | 301.265 | 8 | 10 | 1205 | s | 8 | 10 | 1605 | 67 7.86 | 73 19.51 | 1890 | | Torres | |
| NBP22201.012 | sonobuoy | 27 | 46 | 301.266 | 8 | 10 | 15:28 | s | 8 | 10 | 19:28 | 67 4.457 | 73 33.341 | 3334 | 300 | Sirovic | |
| NBP22201.013 | sonobuoy | 27 | 46 | 301.267 | 8 | 10 | 16:47 | e | 8 | 10 | 20:47 | - | - | | | Sirovic | |
| NBP22201.014 | moc 10 | 6 | 46 | 301.265 | 8 | 10 | 16:15 | e | 8 | 10 | 20:15 | 67 03.77 | 73 33.54 | 3330 | | Torres | |
| NBP22201.015 | tucker trawl | 11 | 46 | 301.265 | 8 | 10 | 17:03 | s | 8 | 10 | 21:03 | 67 4.144 | 73 33.111 | 3330 | 500 | Daly | |
| NBP22201.016 | tucker trawl | 11 | 46 | 301.265 | 8 | 10 | 18:40 | e | 8 | 10 | 21:40 | 67 6.35 | 73 26.37 | | 500 | Daly | |
| NBP22201.017 | bird obs 39 | 39 | to 47 | | 8 | 10 | 20:38 | s | 8 | 10 | 0:38 | 67 09.431 | 73 40.928 | | | Chapman | |
| NBP22201.018 | sonobuoy | 28 | to 47 | | 8 | 10 | 22:15 | s | 8 | 11 | 2:15 | 67 11.253 | 74 01.136 | 3186 | 300 | Sirovic | |
| NBP22201.019 | bird obs 39 | 39 | to 47 | | 8 | 10 | 22:59 | e | 8 | 11 | 2:59 | 67 12.165 | 74 11.324 | | | Chapman | |
| NBP22201.020 | sonobuoy | 28 | to 47 | | 8 | 10 | 23:15 | e | 8 | 11 | 3:15 | - | - | | | Sirovic | |
| NBP22301.001 | ice coring | 6 | 47 | 261.295 | 8 | 11 | 30 | s | 8 | 11 | 430 | 67 13.49 | 74 28.46 | | | Stewart | |
| NBP22301.002 | ice coring | 6 | 47 | 261.296 | 8 | 11 | 200 | e | 8 | 11 | 600 | 68 13.49 | 75 28.46 | | | Stewart | |
| NBP22301.003 | bmp | 19 | 47 | 261.297 | 8 | 11 | 2:41 | s | 8 | 11 | 6:41 | 67 13.091 | 74 28.753 | 2927 | 30 | Wiebe | |
| NBP22301.004 | bmp | 19 | 47 | 261.298 | 8 | 11 | 2:49 | e | 8 | 11 | 6:49 | 67 13.091 | 74 28.753 | 2927 | 30 | Wiebe | |
| NBP22301.005 | CTD | 46 | 47 | 261.295 | 8 | 11 | 3:08 | s | 8 | 11 | 7:08 | 67 13.082 | 74 28.835 | 2927 | 2958 | Sinan | |
| NBP22301.006 | CTD | 46 | 47 | 261.295 | 8 | 11 | 5:58 | e | 8 | 11 | 9:48 | 67 13.577 | 74 28.869 | 2927 | | Sinan | |
| NBP22301.007 | ring net | 25 | 47 | 261.295 | 8 | 11 | 5:50 | s/e | 8 | 11 | 9:50 | 67 13.577 | 74 28.869 | 2927 | 30 | Macri | |
| NBP22301.008 | rov | 8 | 47 | 261.295 | 8 | 11 | 6:55 | s | 8 | 11 | 10:55 | 67 14.542 | 74 25.707 | 2917 | 40 | Gallager | |
| NBP22301.009 | rov | 8 | 47 | 261.295 | 8 | 11 | 9:03 | e | 8 | 11 | 13:03 | 67 14.54 | 74 25.7 | 2917 | 40 | Gallager | |
| NBP22301.010 | moc1/opc | 11 | 47 | 261.295 | 8 | 11 | 9:18 | s | 8 | 11 | a | 67 14.667 | 74 25.266 | 2917 | 1000 | Ashjian | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NBP22301.011 | null | | | | | | | | | | | | | | | | |
| NBP22301.012 | null | | | | | | | | | | | | | | | | |
| NBP22301.013 | null | | | | | | | | | | | | | | | | |
| NBP22301.014 | bird obs 40 | 40 | to 48 | | 8 | 11 | 11:52 | s | 8 | 11 | 15:52 | 67 12.613 | 74 34.705 | | | Ribic | |
| NBP22301.015 | whale obs | 15 | to 48 | | 8 | 11 | 11:52 | s | 8 | 11 | 15:52 | 67 12.613 | 74 34.705 | | | Friedlaender | |
| NBP22301.016 | moc1/opc | 11 | 47 | | 8 | 11 | 12:01 | e | 8 | 11 | 16:01 | 67 12.336 | 74 34.242 | 2917 | 1000 | Ashjian | |
| NBP22301.017 | bmp | 20 | 47-48 | | 8 | 11 | 12:33 | s | 8 | 11 | 16:33 | 67 13.035 | 74 31.707 | 3000 | 135 | Wiebe | |
| NBP22301.018 | sonobuoy | 29 | to 48 | | 8 | 11 | 14:05 | s | 8 | 11 | | 67 17.853 | 74 17.396 | | | Sirovic | |
| NBP22301.019 | sonobuoy | 29 | to 48 | | 8 | 11 | | e | 8 | 11 | | | | | | Sirovic | |
| NBP22301.020 | bird obs 40 | 40 | to 47 | | 8 | 11 | 18:49 | e | 8 | 11 | 22:49 | 67 25.541 | 73 54.326 | | | Ribic | |
| NBP22301.021 | whale obs | 15 | to 47 | | 8 | 11 | 18:49 | e | 8 | 11 | 22:49 | 67 25.541 | 73 54.326 | | | Friedlaender | |
| NBP22301.022 | bmp | 20 | 48 | | 8 | 11 | 17:14 | e | 8 | 11 | 21:14 | 67 27.89 | 73 47.30 | | | Wiebe | |
| NBP22301.023 | CTD | 47 | 48 | 261.255 | 8 | 11 | 17:32 | s | 8 | 11 | 21:32 | 67 28.09 | 73 46.53 | 390 | 380 | Kim | |
| NBP22301.024 | tucker trawl | 12 | 48 | 261.255 | 8 | 11 | 18:22 | s | 8 | 11 | 22:22 | 67 28.92 | 73 44.08 | | 250 | Daly | |
| NBP22301.025 | CTD | 47 | 48 | 261.255 | 8 | 11 | 18:06 | e | 8 | 11 | 22:06 | 67 28.09 | 73 46.53 | 390 | 380 | Kim | |
| NBP22301.026 | tucker trawl | 12 | 48 | 261.255 | 8 | 11 | 19:07 | e | 8 | 11 | 23:07 | 67 29.59 | 73 42.03 | | 250 | Daly | |
| NBP22301.027 | bird obs 41 | 41 | to 49 | | 8 | 11 | 20:10 | s | 8 | 12 | 0:10 | 67 32.329 | 73 33.283 | | | Chapman | |
| NBP22301.028 | bmp | 21 | 48-49 | | 8 | 11 | 1946 | s | 8 | 11 | 2346 | 67 31.06 | 73 37.2 | 390 | | Wiebe | |
| NBP22301.029 | bird obs 41 | 41 | to 49 | | 8 | 11 | 22:10 | e | 8 | 12 | 2:10 | 67 38.667 | 73 13.015 | | | Chapman | |
| NBP22301.030 | bmp | 21 | 49 | | 8 | 11 | 22:35 | e | 8 | 12 | 2:35 | 67 40.141 | 73 08.608 | 505 | 160 | Wiebe | |
| NBP22301.031 | ice coring/argos buoy | 7 | 49 | 261.220 | 8 | 11 | 2300 | s | 8 | 12 | 235 | 67 41.05 | 73 7.96 | | | Stewart | |
| NBP22301.032 | ice coring | 7 | 49 | 261.220 | 8 | 11 | 23:00 | s | 8 | 12 | 235 | 68 41.05 | 74 7.96 | | | Stewart | |
| NBP22401.001 | ice coring | 7 | 49 | 261.220 | 8 | 11 | 1:15 | e | 8 | 12 | 515 | 69 41.05 | 75 7.96 | | | Stewart | |
| NBP22401.002 | CTD | 48 | 49 | 261.220 | 8 | 12 | 1:43 | s | 8 | 12 | 5:43 | 67 41.614 | 73 7.614 | 486 | 477 | Sinan | |
| NBP22401.003 | CTD | 48 | 49 | 261.221 | 8 | 12 | 2:36 | e | 8 | 12 | 6:36 | 67 41.614 | 73 7.614 | 486 | | Sinan | |
| NBP22401.004 | rov | 9 | 49 | 261.220 | 8 | 12 | 3:12 | s | 8 | 12 | 7:12 | 67 43.147 | 73 06.660 | 479 | 30 | Galllager | |
| NBP22401.005 | rov | 9 | 49 | 261.220 | 8 | 12 | 5:19 | e | 8 | 12 | 9:19 | 67 44.075 | 73 08.198 | 479 | 30 | Gallager | |
| NBP22401.006 | bmp | 22 | 49-50 | | 8 | 12 | 7:55 | s | 8 | 12 | 11:55 | 67 48.9 | 72 39.6 | 450 | 200 | Wiebe | |
| NBP22401.007 | bmp | 22 | 50 | | 8 | 12 | 9:41 | e | 8 | 12 | 13:44 | 67 53.149 | 72 25.163 | 302 | 200 | Wiebe | |
| NBP22401.008 | CTD | 49 | 50 | 261.180 | 8 | 12 | 10:17 | s | 8 | 12 | 14:17 | 67 53.575 | 72 23.550 | 302 | 289 | Sinan | |
| NBP22401.009 | CTD | 49 | 50 | 261.180 | 8 | 12 | 10:55 | e | 8 | 12 | 14:55 | 67 53.575 | 72 23.550 | 302 | | Sinan | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NBP22401.010 | moc1/opc | 12 | 50 | 261.180 | 8 | 12 | 1453 | s | 8 | 12 | 1855 | 67 52.83 | 72 26.32 | 365 | 290 | Ashjian | |
| NBP22401.011 | moc1/opc | 12 | 50 | 261.180 | 8 | 12 | 1623 | e | 8 | 12 | 2023 | 67 50.44 | 72 28.55 | | | Ashjian | |
| NBP22401.012 | sonobuoy | 30 | to 51 | | 8 | 12 | 17:03 | s | 8 | 12 | 21:03 | 67 52.351 | 72 25.351 | 305 | | Sirovic | |
| NBP22401.013 | sonobuoy | 30 | to 51 | | 8 | 12 | 17:46 | e | 8 | 12 | 21:46 | - | - | | | Sirovic | |
| NBP22401.014 | bird obs 42 | 42 | to 51 | | 8 | 12 | 18:42 | s | 8 | 12 | 22:42 | 67 57.666 | 72 11.062 | | | Chapman | |
| NBP22401.015 | sonobuoy | 31 | to 51 | | 8 | 12 | 19:49 | s | 8 | 12 | 23:49 | 68 01.08 | 71 59.69 | 420 | 300 | Sirovic | |
| NBP22401.016 | bmp | 23 | to 51 | | 8 | 12 | 17:30 | s | 8 | 12 | 21:30 | 67 54.59 | 72 21.198 | | | Wiebe | |
| NBP22401.017 | bmp | 23 | to 51 | | 8 | 12 | 20:59 | e | 8 | 13 | 0:59 | 68 2.264 | 71 55.94 | | | Wiebe | |
| NBP22401.018 | bird obs 42 | 42 | to 51 | | 8 | 12 | 21:55 | e | 8 | 13 | 1:55 | 68 04.388 | 71 48.755 | | | Chapman | |
| NBP22401.019 | sonobuoy | 31 | to 51 | | 8 | 12 | 22:11 | e | 8 | 13 | 2:11 | - | - | | | Sirovic | |
| NBP22401.020 | tucker trawl | 12 | 51 | 261.140 | 8 | 12 | 22:00 | s | 8 | 13 | 2:00 | 67 50.44 | 72 28.55 | 365 | 250 | Torres | |
| NBP22401.021 | tucker trawl | 12 | 51 | 261.140 | 8 | 12 | 22:45 | e | 8 | 13 | 2:45 | 68 6.3 | 71 42.4 | | | Torres | |
| NBP22401.022 | ice coring | 8 | 51 | 261.140 | 8 | 12 | 23:00 | s | 8 | 13 | 2:45 | 68 7.27 | 71 40.56 | | | Stewart | |
| NBP22501.001 | ice coring | 8 | 51 | 261.140 | 8 | 13 | 0:40 | e | 8 | 13 | 4:40 | 68 7.27 | 71 40.56 | | | Stewart | |
| NBP22501.002 | CTD | 50 | 51 | 261.140 | 8 | 13 | 1:12 | s | 8 | 13 | 5:12 | 68 7.608 | 71 40.296 | 518 | 553 | Sinan | |
| NBP22501.003 | CTD | 50 | 51 | 261.140 | 8 | 13 | 2:13 | e | 8 | 13 | 6:13 | 68 7.608 | 71 40.296 | 560 | | Sinan | |
| NBP22501.004 | bird obs 43 | 43 | to Gould | | 8 | 13 | 8:33 | s | 8 | 13 | 12:33 | 68 7.968 | 70 18.544 | | | Chapman | |
| NBP22501.005 | whale obs | 16 | to Gould | | 8 | 13 | 8:33 | s | 8 | 13 | 12:33 | 68 7.968 | 70 18.544 | | | friedlaender | |
| NBP22501.006 | sonobuoy | 32 | to Gould | | 8 | 13 | 12:37 | s/e | 8 | 13 | 16:37 | 68 9.585 | 69 38.695 | | | Sirovic | failed |
| NBP22501.007 | bird obs 43 | 43 | to Gould | | 8 | 13 | 16:21 | e | 8 | 13 | 20:21 | 68 0.616 | 69 49.791 | | | Chapman | |
| NBP22501.008 | whale obs | 16 | to Gould | | 8 | 13 | 16:21 | e | 8 | 13 | 20:21 | 68 0.616 | 69 49.791 | | | Friedlaender | |
| NBP22601.001 | bird obs 44 | 44 | to 28 | | 8 | 14 | 10:24 | s | 8 | 14 | 14:24 | 67 50.152 | 69 45.162 | | | Ribic | |
| NBP22601.002 | whale obs | 17 | to 28 | | 8 | 14 | 10:24 | s | 8 | 14 | 14:24 | 67 50.152 | 69 45.162 | | | Friedlaender | |
| NBP22601.003 | sonobuoy | 33 | to ? | | 8 | 14 | 14:34 | s/e | 8 | 14 | 18:34 | 67 39.440 | 69 58.118 | | | Sirovic | failed |
| NBP22601.004 | bird obs | 44 | to 28 | | 8 | 14 | 10:24 | s | 8 | 14 | 14:24 | 67 50.152 | 69 45.162 | | | Ribic | |
| NBP22601.005 | whale obs | 17 | to 29 | | 8 | 14 | 10:24 | s | 8 | 14 | 14:24 | 67 50.152 | 69 45.162 | | | Friedlaender | |
| NBP22601.006 | XBT | 46 | 19 | | 8 | 14 | 22:18 | s/e | 8 | 15 | 2:18 | 67 12.846 | 70 10.717 | 625 | | Kim | LMG request |
| NBP22701.001 | bird night obs 45 | 45 | to 52 | | 8 | 15 | 4:21 | s | 8 | 15 | 8:21 | 67 47.354 | 70 36.238 | | | Ribic | |
| NBP22701.002 | bird night obs 45 | 45 | to 52 | | 8 | 15 | 7:26 | e | 8 | 15 | 11:26 | 68 5.605 | 70 46.615 | | | Ribic | |
| NBP22701.003 | bird obs 46 | 46 | to 52 | | 8 | 15 | 8:13 | s | 8 | 15 | 12:13 | 68 9.713 | 70 49.941 | | | Ribic | |
| NBP22701.004 | whale obs | 18 | to 52 | | 8 | 15 | 8:13 | s | 8 | 15 | 12:13 | 68 9.713 | 70 49.941 | | | Friedlaender | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NBP22701.005 | CTD | 51 | 52 | 261.100 | 8 | 15 | 11:31 | s | 8 | 15 | 15:31 | 68 19.48 | 70 54.83 | 499 | 490 | Sinan | |
| NBP22701.006 | CTD | 51 | 52 | 261.100 | 8 | 15 | 12:25 | e | 8 | 15 | 16:25 | 68 19.41 | 70 54.94 | 507 | | Sinan | |
| NBP22701.007 | ring net | 26 | 52 | 261.100 | 8 | 15 | 1229 | s/e | 8 | 15 | 1629 | 68 19.405 | 70 54.938 | 509 | 30 | Kozlowski | |
| NBP22701.008 | sonobuoy | 34 | to 53 | | 8 | 15 | 14:11 | s | 8 | 15 | 18:11 | 68 21.4 | 70 49.5 | | | Sirovic | |
| NBP22701.009 | sonobuoy | 34 | to 53 | | 8 | 15 | 15:21 | e | 8 | 15 | 19:21 | - | - | | | Sirovic | |
| NBP22701.010 | whale obs | 18 | to 53 | | 8 | 15 | 16:30 | e | 8 | 15 | 20:30 | 68 25 25.80 | 70 41.09 | | | Friedlaender | |
| NBP22701.011 | bird obs 46 | 46 | to 53 | | 8 | 15 | 17:02 | e | 8 | 15 | 21:02 | 68 27.445 | 70 37.888 | | | Ribic | |
| NBP22701.012 | CTD | 52 | 53 | 256.080 | 8 | 15 | 1757 | s | 8 | 15 | 2157 | 68 28.36 | 70 36.29 | 656 | 663 | Hyatt | |
| NBP22701.013 | CTD | 52 | 53 | 256.080 | 8 | 15 | 1848 | e | 8 | 15 | 2248 | 68 28.41 | 70 36.39 | 681 | | Hyatt | |
| NBP22701.014 | ice coring | 9 | 53 | 256.080 | 8 | 15 | 19:30 | s | 8 | 15 | 23:30 | 68 28.31 | 70 36.16 | | | Stewart | |
| NBP22701.015 | ice coring | 9 | 53 | 256.080 | 8 | 15 | 21:30 | e | 8 | 16 | 1:30 | 68 28.31 | 70 36.16 | | | Stewart | |
| NBP22701.016 | sonobuoy | 35 | 53 | 256.081 | 8 | 15 | 20:19 | s | 8 | 15 | 0:19 | 68 28.255 | 70 36.510 | 666 | 300 | Sirovic | |
| NBP22701.017 | bmp | 24 | 53 | 256.082 | 8 | 15 | 22:40 | s | 8 | 16 | 2:41 | 68 28.179 | 70 35.129 | 624 | 100 | Wiebe | |
| NBP22701.018 | plummet net | 10 | 53 | 256.080 | 8 | 15 | 22:56 | s | 8 | 16 | 2:56 | 68 28.01 | 70 34.88 | 621 | 100 | Daly | rinse ice off net |
| NBP22701.019 | plummet net | 10 | 53 | 256.080 | 8 | 15 | 23:02 | e | 8 | 16 | 3:02 | 68 28.01 | 70 34.88 | 621 | 100 | Daly | |
| NBP22701.020 | plummet net | 11 | 53 | 256.080 | 8 | 15 | 23:03 | s | 8 | 16 | 3:03 | 68 28.01 | 70 34.88 | 621 | 110 | Daly | |
| NBP22701.021 | plummet net | 11 | 53 | 256.080 | 8 | 15 | 23:09 | e | 8 | 16 | 3:09 | 68 28.01 | 70 34.88 | 621 | 110 | Daly | |
| NBP22701.022 | plummet net | 12 | 53 | 256.080 | 8 | 15 | 23:19 | s | 8 | 16 | 3:19 | 68 28.01 | 70 34.88 | 621 | 40 | Daly | |
| NBP22701.023 | plummet net | 12 | 53 | 256.080 | 8 | 15 | 23:22 | e | 8 | 16 | 3:22 | 68 28.01 | 70 34.88 | 621 | 40 | Daly | |
| NBP22701.024 | plummet net | 13 | 53 | 256.080 | 8 | 15 | 23:36 | s | 8 | 16 | 3:36 | 68 28.01 | 70 34.88 | 621 | 110 | Daly | |
| NBP22701.025 | plummet net | 13 | 53 | 256.080 | 8 | 15 | 23:42 | e | 8 | 16 | 3:42 | 68 28.01 | 70 34.88 | 621 | 110 | Daly | |
| NBP22701.026 | plummet net | 14 | 53 | 256.080 | 8 | 15 | 23:52 | s | 8 | 16 | 3:52 | 68 28.01 | 70 34.88 | 621 | 600 | Daly | net did not trip |
| NBP22701.027 | plummet net | 14 | 53 | 256.080 | 8 | 16 | 00:24 | e | 8 | 16 | 4:24 | 68 28.01 | 70 34.88 | 621 | 600 | Daly | |
| NBP22701.028 | plummet net | 15 | 53 | 256.080 | 8 | 16 | 00:38 | s | 8 | 16 | 4:38 | 68 28.01 | 70 34.88 | 621 | 400 | Daly | |
| NBP22701.029 | plummet net | 15 | 53 | 256.080 | 8 | 16 | 01:00 | e | 8 | 16 | 5:00 | 68 28.01 | 70 34.88 | 621 | 400 | Daly | |
| NBP22701.030 | bmp | 24 | 54 | 268.057 | 8 | 16 | 1:39 | e | 8 | 16 | 5:39 | 68 27.93 | 70 34.83 | 624 | 100 | Wiebe | |
| NBP22801.001 | bird night | 47 | | | 8 | 16 | 4:14 | s | 8 | 16 | 8:14 | 68 29.657 | 70 12.761 | | | Ribic | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | obs 47 | | | | | | | | | | | | | | | | |
| NBP22801.002 | bird night obs 47 | 47 | | | 8 | 16 | 4:56 | e | 8 | 16 | 8:56 | 68 29.826 | 70 3.922 | | | Ribic | |
| NBP22801.003 | ice coring | 10 | 54 | 268.057 | 8 | 16 | 5:30 | s | 8 | 16 | 9:30 | 68 36.46 | 69 59.32 | | | Stewart | |
| NBP22801.004 | ice coring | 10 | 54 | 268.057 | 8 | 16 | 7:30 | e | 8 | 16 | 11:30 | 68 36.46 | 69 59.32 | | | Stewart | |
| NBP22801.005 | CTD | 53 | 54 | 268.057 | 8 | 16 | 8:06 | s | 8 | 16 | 12:06 | 68 30.427 | 69 59.635 | 1142 | 1129 | Sinan | |
| NBP22801.006 | bird obs 48 | 48 | to 59 | | 8 | 16 | 8:14 | s | 8 | 16 | 12:14 | 68 30.427 | 69 59.635 | | | Ribic | |
| NBP22801.007 | whale obs | 19 | to 59 | | 8 | 16 | 8:14 | s | 8 | 16 | 12:14 | 68 30.427 | 69 59.635 | | | Friedlaender | |
| NBP22801.008 | CTD | 53 | 54 | 268.057 | 8 | 16 | 9:25 | e | 8 | 16 | 13:25 | 68 30.427 | 69 59.635 | 1142 | | Sinan | |
| NBP22801.009 | bmp | 25 | 54-59 | | 8 | 16 | 1021 | s | 8 | 16 | 1421 | 68 33.51 | 70 5.294 | | | Wiebe | |
| NBP22801.010 | sonobuoy | 35 | 54 | | 8 | 16 | 4:36 | e | 8 | 16 | 8:36 | - | - | | | Sirovic | |
| NBP22801.011 | sonobuoy | 36 | 54 | | 8 | 16 | 11:16 | s | 8 | 16 | 15:16 | 68 35.623 | 70 12.969 | | | Sirovic | |
| NBP22801.012 | bmp | 25 | 54-59 | | 8 | 16 | 1245 | e | 8 | 16 | 1645 | 68 37.54 | 70 23.56 | | | Wiebe | |
| NBP22801.013 | sonobuoy | 36 | 54 | | 8 | 16 | 13:56 | e | 8 | 16 | 17:56 | - | - | | | Sirovic | |
| NBP22801.014 | bird obs | 48 | 59 | | 8 | 16 | 1415 | e | 8 | 16 | 1815 | 68 42.75 | 70 23.31 | | | Ribic | |
| NBP22801.015 | whale obs | 19 | 59 | | 8 | 1 | 1415 | e | 8 | 16 | 1815 | 68 42.75 | 70 23.31 | | | Friedlaender | |
| NBP22801.016 | ring net | 27 | 59 | 240.057 | 8 | 16 | 1420 | s/e | 8 | 16 | 1820 | 68 42.763 | 70 23.239 | 399 | 30 | Kozlowski | |
| NBP22801.017 | CTD | 54 | 59 | 240.057 | 8 | 16 | 14:27 | s | 8 | 16 | 18:27 | 68 42.76 | 70 23.23 | 400 | 394 | Kim | |
| NBP22801.018 | CTD | 54 | 59 | 240.058 | 8 | 16 | 15:16 | e | 8 | 16 | 19:16 | 68 42.76 | 70 23.24 | 400 | 394 | Kim | |
| NBP22801.019 | rov | 10 | 59 | | 8 | 16 | | s | 8 | 16 | | | | | | Gallager | |
| NBP22801.020 | rov | 10 | 59 | | 8 | 16 | | e | 8 | 16 | | | | | | Gallager | |
| NBP22801.021 | bmp | 26 | 59 | | 8 | 16 | 17:01 | s | 8 | 16 | 21:01 | 68 42.96 | 70 27.91 | 120 | | Wiebe | |
| NBP22801.022 | bird obs 49 | 49 | to 60 | | 8 | 16 | 18:21 | s | 8 | 16 | 22:21 | 68 43.653 | 70 43.931 | | | Chapman | |
| NBP22801.023 | bmp | 26 | to 60 | | 8 | 16 | 19:53 | e | 8 | 16 | 23:53 | 68 44.937 | 70 55.175 | 205 | | Wiebe | |
| NBP22801.024 | ring net | 28 | 60 | 221.075 | 8 | 16 | 21:05 | s/e | 8 | 17 | 1:05 | 68 44.971 | 71 00.293 | 295 | 30 | Kozlowski | |
| NBP22801.025 | CTD | 55 | 60 | 221.075 | 8 | 16 | 2111 | s | 8 | 17 | 111 | 68 44.97 | 71 0.30 | 294 | 283 | Hyatt | |
| NBP22801.026 | CTD | 55 | 60 | 221.075 | 8 | 16 | 2151 | e | 8 | 17 | 151 | 68 44.97 | 71 0.32 | 291 | 283 | Hyatt | |
| NBP22801.027 | plummet net | 16 | 60 | 221.075 | 8 | 16 | 22:16 | s | 8 | 17 | 2:16 | 68 44.96 | 71 00.33 | 296 | 175 | Daly | |
| NBP22801.028 | plummet net | 16 | 60 | 221.075 | 8 | 16 | 22:25 | e | 8 | 17 | 2:25 | 68 44.96 | 71 00.33 | 296 | 175 | Daly | |
| NBP22801.029 | plummet net | 17 | 60 | 221.075 | 8 | 16 | 22:33 | s | 8 | 17 | 2:33 | 68 44.96 | 71 00.33 | 296 | 175 | Daly | |
| NBP22801.030 | plummet net | 17 | 60 | 221.075 | 8 | 16 | 22:43 | e | 8 | 17 | 2:43 | 68 44.96 | 71 00.33 | 296 | 175 | Daly | |
| NBP22801.031 | bird obs 49 | 49 | 60 | 221.075 | 8 | 16 | 22:15 | e | 8 | 17 | 2:15 | 68 44.966 | 71 0.311 | | | Chapman | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NBP22801.032 | plummet net | 18 | 60 | 221.075 | 8 | 16 | 22:50 | s | 8 | 17 | 2:50 | 68 44.96 | 71 00.33 | 296 | 200 | Daly | |
| NBP22801.033 | plummet net | 18 | 60 | 221.075 | 8 | 16 | 23:01 | e | 8 | 17 | 3:01 | 68 44.96 | 71 00.33 | 296 | 200 | Daly | |
| NBP22901.001 | ring net | 29 | 61 | 221.100 | 8 | 17 | 4:00 | s/e | 8 | 17 | 8:00 | 67 37.09 | 70 29.07 | 206 | 30 | Macri | |
| NBP22901.002 | CTD | 56 | 61 | 221.100 | 8 | 17 | 4:13 | s | 8 | 17 | 8:13 | 68 37.09 | 71 29.07 | 206 | 197 | Sinan | |
| NBP22901.003 | CTD | 56 | 61 | 221.100 | 8 | 17 | 4:43 | e | 8 | 17 | 8:43 | 68 37.09 | 71 29.07 | 206 | | Sinan | |
| NBP22901.004 | bird obs 50 | 50 | to 62 | | 8 | 17 | 4:53 | s | 8 | 17 | 8:53 | 68 36.723 | 71 30.616 | | | Ribic | |
| NBP22901.005 | bmp | 27 | to 62 | | 8 | 17 | 6:41 | s | 8 | 17 | 10:41 | 68 31.224 | 71 50.548 | | | Wiebe | |
| NBP22901.006 | bird obs 50 | 50 | to 62 | | 8 | 17 | 7:07 | e | 8 | 17 | 11:07 | 68 30.177 | 71 5.181 | | | Ribic | |
| NBP22901.007 | bird obs 51 | 51 | to 62 | | 8 | 17 | 8:14 | s | 8 | 17 | 12:14 | 68 28.307 | 72 01.203 | | | Ribic | |
| NBP22901.008 | whale obs | 20 | to 62 | | 8 | 17 | 8:14 | s | 8 | 17 | 12:14 | 68 28.307 | 72 01.203 | | | Friedlaender | |
| NBP22901.009 | bmp | 27 | to 62 | | 8 | 17 | 7:55 | e | 8 | 17 | 11:55 | 68 29.0 | 71 58.9 | | | Wiebe | |
| NBP22901.010 | ring net | 30 | 62 | 221.140 | 8 | 17 | 9:50 | s/e | 8 | 17 | 13:50 | 68 23.28 | 72 17.45 | 460 | 30 | Macri | |
| NBP22901.011 | CTD | 57 | 62 | 221.140 | 8 | 17 | 10:03 | s | 8 | 17 | 14:03 | 68 23.30 | 72 17.19 | 460 | 436 | Sinan | |
| NBP22901.012 | CTD | 57 | 62 | 221.140 | 8 | 17 | 10:48 | e | 8 | 17 | 14:48 | 68 23.30 | 72 17.19 | 460 | | Sinan | |
| NBP22901.013 | plummet net | 19 | 62 | 221.140 | 8 | 17 | 10:59 | s | 8 | 17 | 14:59 | 68 23.28 | 72 17.45 | 460 | 350 | Daly/Torres | |
| NBP22901.014 | plummet net | 19 | 62 | 221.140 | 8 | 17 | 11:17 | e | 8 | 17 | 15:17 | 68 23.28 | 72 17.45 | 460 | 350 | Daly/Torres | |
| NBP22901.015 | bmp | 28 | 62 | | 8 | 17 | 13:17 | s | 8 | 17 | 17:17 | 68 18.18 | 72 32.24 | | | Wiebe | |
| NBP22901.016 | sonobuoy | 37 | to 62 | | 8 | 17 | 13:22 | s | 8 | 17 | 17:22 | 68 17.908 | 72 37.816 | | | Sirovic | |
| NBP22901.017 | sonobuoy | 37 | to 62 | | 8 | 17 | 14:14 | e | 8 | 17 | 18:14 | - | - | | | Sirovic | |
| NBP22901.018 | sonobuoy | 38 | to 62 | | 8 | 17 | 15:10 | s | 8 | 17 | 19:10 | 68 13.353 | 72 52.441 | | | Sirovic | |
| NBP22901.019 | bmp | 28 | 63 | | 8 | 17 | 16:25 | e | 8 | 17 | 17:17 | 68 18.18 | 72 32.24 | | | Wiebe | |
| NBP22901.020 | rov | 11 | 63 | | 8 | 17 | 16:50 | s | 8 | 17 | 20:50 | 68 9.9 | 73 2.9 | 339 | | Gallager | |
| NBP22901.021 | rov | 11 | 63 | | 8 | 17 | 18:15 | e | 8 | 17 | 22:15 | 68 9.9 | 73 2.9 | 339 | | Gallager | |
| NBP22901.022 | bird obs 51 | 51 | 63 | | 8 | 17 | 17:18 | e | 8 | 17 | 21:18 | 68 10.035 | 73 1.860 | | | Ribic | |
| NBP22901.023 | whale obs | 20 | 63 | | 8 | 17 | 17:18 | e | 8 | 17 | 21:18 | 68 10.035 | 73 1.860 | | | Friedlaender | |
| NBP22901.024 | CTD | 58 | 63 | 221.180 | 8 | 17 | 1833 | s | 8 | 17 | 2233 | 68 9.98 | 73 2.72 | 345 | 331 | Hyatt | |
| NBP22901.025 | CTD | 58 | 63 | 221.180 | 8 | 17 | 1916 | e | 8 | 17 | 2316 | 68 10.01 | 73 3.38 | 340 | 331 | Hyatt | |
| NBP22901.026 | sonobuoy | 38 | to 63 | | 8 | 17 | 19:11 | e | 8 | 14 | 23:11 | - | - | | | Sirovic | |
| NBP22901.027 | ring net | 31 | 63 | 221.180 | 8 | 17 | 19:25 | s/e | 8 | 17 | 23:25 | 68 0.99 | 73 03.62 | 350 | 30 | Kozlowski | |
| NBP22901.028 | moc1/opc | 13 | 63 | | 8 | 17 | 21:17 | s | 8 | 18 | 1:17 | 68 13.212 | 72 56.530 | 325 | 245 | Ashjian | |
| NBP22901.029 | moc1/opc | 13 | 63 | | 8 | 17 | 22:30 | e | 8 | 18 | 2:30 | 68 12.276 | 73 3.031 | | | Ashjian | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NBP22901.030 | bird obs 52 | 52 | to 73 | | 8 | 17 | 22:49 | s | 8 | 18 | 2:49 | 68 12.245 | 73 3.374 | | | Chapman | |
| NBP22901.031 | bird obs 52 | 52 | to 73 | | 8 | 17 | 23:30 | e | 8 | 18 | 3:30 | 68 14.731 | 73 9.811 | | | Chapman | |
| NBP23001.001 | CTD | 59 | 73 | 181.180 | 8 | 18 | 3:10 | s | 8 | 18 | 7:10 | 68 26.799 | 73 40.345 | 540 | 521 | Sinan | |
| NBP23001.002 | CTD | 59 | 73 | 181.180 | 8 | 18 | 3:58 | e | 8 | 18 | 7:58 | 68 26.799 | 73 40.345 | 540 | | Sinan | |
| NBP23001.003 | bird obs 53 | 53 | to 74 | | 8 | 18 | 8:16 | s | 8 | 18 | 12:16 | 68 29.463 | 73 48.199 | | | Ribic | |
| NBP23001.004 | null | | | | | | | | | | | | | | | | |
| NBP23001.005 | bmp | 29 | to 74 | | 8 | 18 | 10:30 | s | 8 | 18 | 14:30 | 68 31.05 | 73 37.05 | | | Wiebe | |
| NBP23001.006 | sonobuoy | 39 | to 74 | | 8 | 18 | 11:15 | s | 8 | 18 | 15:15 | 68 31.118 | 73 27.684 | | | Sirovic | |
| NBP23001.007 | whale obs | | to 74 | | 8 | 18 | 8:30 | s | 8 | 18 | 12:30 | 68 29.463 | 73 48.199 | | | Friedlaender | |
| NBP23001.008 | sonobuoy | 39 | to 74 | | 8 | 18 | 13:47 | e | 8 | 18 | 17:47 | - | - | | | Sirovic | |
| NBP23001.009 | bird obs | 53 | to 74 | | 8 | 18 | 15:07 | e | 8 | 18 | 19:07 | 68 39.846 | 73 56.452 | | | Ribic | |
| NBP23001.010 | whale obs | 21 | to 74 | | 8 | 18 | 15:07 | e | 8 | 18 | 19:07 | 68 39.846 | 73 58.452 | | | Friedlaender | |
| NBP23001.011 | bmp | 29 | 74 | | 8 | 18 | 15:15 | e | 8 | 18 | 19:15 | 68 39.872 | 72 56.485 | | | Wiebe | |
| NBP23001.012 | ice coring/args buy | 11 | 74 | | 8 | 18 | 15:30 | s | 8 | 18 | 19:30 | 68 39.89 | 72 56.51 | | | Stewart | |
| NBP23001.013 | ice coring/args buy | 11 | 74 | | 8 | 18 | 19:15 | e | 8 | 18 | 23:15 | 68 39.89 | 72 56.51 | | | Stewart | |
| NBP23001.014 | krill cam | 2 | 74 | | 8 | 18 | 18:00 | s | 8 | 18 | 22:00 | 68 39.89 | 72 56.51 | | | Gallager | |
| NBP23001.015 | krill cam | 2 | 74 | | 8 | 18 | 18:30 | e | 8 | 18 | 22:30 | 68 39.89 | 72 56.51 | | | Gallager | |
| NBP23001.016 | CTD | 60 | 74 | 181.140 | 8 | 18 | 19:56 | s | 8 | 18 | 23:56 | 68 40.68 | 72 55.02 | 298 | 293 | Kim | |
| NBP23001.017 | CTD | 60 | 74 | 181.140 | 8 | 18 | 20:33 | e | 8 | 19 | 0:33 | 68 40.68 | 72 55.02 | 298 | | Kim | |
| NBP23101.001 | rov | 12 | 75 | 181.140 | 8 | 19 | 5:43 | s | 8 | 19 | 9:43 | 68 49.14 | 72 20.47 | | | Gallager | |
| NBP23101.002 | rov | 12 | 75 | 181.140 | 8 | 19 | 7:52 | e | 8 | 19 | 11:33 | 68 49.14 | 72 20.47 | | | Gallager | |
| NBP23101.003 | CTD | 61 | 75 | 181.100 | 8 | 19 | 7:52 | s | 8 | 19 | 11:52 | 68 49.16 | 72 20.50 | 123 | 123 | Klinck | |
| NBP23101.004 | CTD | 61 | 75 | 181.100 | 8 | 19 | 8:37 | e | 8 | 19 | 12:37 | 68 49.16 | 72 20.50 | 123 | | Klinck | |
| NBP23101.005 | ring net | 32 | 75 | 181.100 | 8 | 19 | 7:35 | s/e | 8 | 19 | 11:35 | 68 49.158 | 72 20.499 | 128 | 30 | Macri | |
| NBP23101.006 | bird obs 54 | 54 | to 76 | | 8 | 19 | 8:49 | s | 8 | 19 | 12:49 | 68 48.571 | 72 21.150 | | | Ribic | |
| NBP23101.007 | sonobuoy | 40 | | | 8 | 19 | 13:37 | s/e | 8 | 19 | 17:37 | 68 48.571 | 72 43.917 | | | Sirovic | failed |
| NBP23101.008 | bird obs 54 | 54 | to 76 | | 8 | 19 | 14:15 | e | 8 | 19 | 18:15 | 68 50.035 | 72 47.576 | | | Ribic | |
| NBP23101.009 | sonobuoy | 41 | | | 8 | 19 | 16:51 | s/e | 8 | 19 | 20:51 | 68 50.859 | 72 49.665 | | | Sirovic | failed |
| NBP23101.010 | bird obs 55 | 55 | to 76 | | 8 | 19 | 18:26 | s | 8 | 19 | 22:26 | 68 56.605 | 72 58.041 | | | Chapman | |
| NBP23101.011 | ring net | 33 | 76 | 141.100 | 8 | 19 | 21:20 | s/e | 8 | 20 | 1:20 | 69 04.741 | 73 05.157 | 266 | 30 | Kozlowski | 9km from station |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NBP23101.012 | CTD | 62 | 76 | 141.100 | 8 | 19 | 21:31 | s | 8 | 20 | 1:31 | 69 04.74 | 73 05.15 | 266 | 274 | Hyatt | 9km from station |
| NBP23101.013 | CTD | 62 | 76 | 141.100 | 8 | 19 | 22:09 | e | 8 | 20 | 2:09 | 69 04.77 | 73 05.15 | 250 | 274 | Hyatt | 9km from station |
| NBP23101.014 | bird obs 55 | 55 | to 77 | | 8 | 19 | 23:35 | e | 8 | 20 | 3:35 | 69 2.039 | 73 3.784 | | | Chapman | |
| NBP23101.015 | bmp | 30 | | | 8 | 19 | 22:52 | s | 8 | 20 | 2:52 | 69 3.976 | 73 6.915 | | | Wiebe | |
| NBP23101.016 | bmp | 30 | | | 8 | 19 | 23:45 | e | 8 | 20 | 3:45 | 69 1.9618 | 73 3.695 | | | Wiebe | |
| NBP23201.001 | CTD | 63 | 77 | 141.140 | 8 | 20 | 2:23 | s | 8 | 20 | 6:23 | 68 57.37 | 73 30.44 | 176 | 154 | Sinan | |
| NBP23201.002 | CTD | 63 | 77 | 141.140 | 8 | 20 | 2:52 | e | 8 | 20 | 6:52 | 68 57.37 | 73 30.44 | 176 | | Sinan | |
| NBP23201.003 | ring net | 34 | 77 | 141.140 | 8 | 20 | 2:55 | s/e | 8 | 20 | 6:55 | 68 57.37 | 73 30.44 | 176 | 30 | Macri | |
| NBP23201.004 | bird obs 56 | 56 | to 78 | | 8 | 20 | 4:50 | s | 8 | 20 | 8:50 | 68 53.276 | 73 43.92 | | | Ribic | |
| NBP23201.005 | bird obs 56 | 56 | to 78 | | 8 | 20 | 5:50 | e | 8 | 20 | 9:50 | 68 51.277 | 73 50.676 | | | Ribic | |
| NBP23201.006 | bird obs 57 | 57 | to 78 | | 8 | 20 | 8:12 | s | 8 | 20 | 12:12 | 68 45.589 | 74 8.811 | | | Ribic | |
| NBP23201.007 | ring net | 35 | 78 | 141.180 | 8 | 20 | 8:50 | s/e | 8 | 20 | 1250 | 68 43.599 | 74 14.387 | 475 | 30 | Macri | |
| NBP23201.008 | CTD | 64 | 78 | 141.180 | 8 | 20 | 9:01 | s | 8 | 20 | 13:01 | 68 43.556 | 74 14.261 | 510 | 506 | Klinck | |
| NBP23201.009 | CTD | 64 | 78 | 141.181 | 8 | 20 | 9:55 | e | 8 | 20 | 13:55 | 69 43.556 | 75 14.261 | 510 | 506 | Klinck | |
| NBP23201.010 | rov | 13 | 78 | | 8 | 20 | 1030 | s | 8 | 20 | 1430 | 68 44.256 | 74 16.703 | 500 | 30 | Gallager | |
| NBP23201.011 | rov | 13 | 78 | | 8 | 20 | 1215 | e | 8 | 20 | 1615 | 68 45.602 | 74 20.149 | 500 | 30 | Gallager | |
| NBP23201.012 | bmp | 31 | | | 8 | 20 | 335 | s | 8 | 20 | 735 | 68 55.297 | 73 36.639 | | | Wiebe | |
| NBP23201.013 | bmp | 31 | | | 8 | 20 | 500 | e | 8 | 20 | 900 | 68 52.8 | 73 45.0 | | | Wiebe | |
| NBP23201.014 | whale obs | 22 | to 79 | | 8 | 20 | 12:30 | s | 8 | 20 | 16:30 | 68 45.602 | 74 20.149 | | | Friedlaender | |
| NBP23201.015 | sonobuoy | 42 | to 83 | | 8 | 20 | 12:46 | s | 8 | 20 | 16:46 | 68 46.544 | 74 22.926 | | | Sirovic | |
| NBP23201.016 | sonobuoy | 42 | to 83 | | 8 | 20 | 13:29 | e | 8 | 20 | 17:29 | - | - | | | Sirovic | |
| NBP23201.017 | ice coring | 12 | 83 | | 8 | 20 | 16:30 | s | 8 | 20 | 20:30 | 68 59.48 | 74 55.32 | | | Stewart | |
| NBP23201.018 | ice coring | 12 | 83 | | 8 | 20 | 18:30 | e | 8 | 20 | 22:30 | 68 59.48 | 74 55.32 | | | Stewart | |
| NBP23201.019 | bird obs | 57 | | | 8 | 20 | 16:40 | e | 8 | 20 | 22:30 | 68 59.197 | 74 53.605 | | | Ribic | |
| NBP23201.020 | whale obs | 22 | | | 8 | 20 | 16:40 | e | 8 | 20 | 22:40 | 68 59.197 | 74 53.605 | | | Friedlaender | |
| NBP23201.021 | CTD | 65 | 83 | 101.180 | 8 | 20 | 18:52 | s | 8 | 20 | 22:52 | 68 59.47 | 74 55.58 | 408 | 393 | Kim | |
| NBP23201.022 | CTD | 65 | 83 | 101.180 | 8 | 20 | 19:33 | e | 8 | 20 | 23:33 | 69 59.47 | 75 55.58 | 408 | 393 | Kim | |
| NBP23201.023 | Ring Net | 36 | 83 | 101.180 | 8 | 20 | 18:40 | s/e | 8 | 20 | 22:40 | 68 59.467 | 74 55.710 | 377 | 30 | Kozlowski | done before CTD |
| NBP23201.024 | Plummet Net | 20 | 83 | 101.140 | 8 | 20 | 23:17 | s | 8 | 21 | 3:17 | 69 01.515 | 74 51.509 | 380 | | Daly/Torres | |
| NBP23201.025 | Plummet Net | 20 | 83 | 101.140 | 8 | 20 | 23:23 | e | 8 | 21 | 3:23 | 69 01.515 | 74 51.509 | 380 | | Daly/Torres | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NBP23201.026 | Plummet Net | 21 | 83 | 101.140 | 8 | 20 | 23:27 | s | 8 | 21 | 3:27 | 69 01.515 | 74 51.509 | 380 | | Daly/Torres | |
| NBP23201.027 | Plummet Net | 21 | 83 | 101.140 | 8 | 20 | 23:35 | e | 8 | 21 | 3:35 | 69 01.515 | 74 51.509 | 380 | | Daly/Torres | |
| NBP23201.028 | Plummet Net | 22 | 83 | 101.140 | 8 | 20 | 23:42 | s | 8 | 21 | 3:42 | 69 01.515 | 74 51.509 | 380 | | Daly/Torres | |
| NBP23301.001 | Plummet Net | 22 | 83 | 101.140 | 8 | 20 | 0:00 | e | 8 | 21 | 4:00 | 69 01.515 | 74 51.509 | 380 | | Daly/Torres | |
| NBP23301.002 | Plummet Net | 23 | 83 | 101.140 | 8 | 20 | 0:11 | s | 8 | 21 | 4:11 | 69 01.515 | 74 51.509 | 380 | | Daly/Torres | |
| NBP23301.003 | Plummet Net | 23 | 83 | 101.140 | 8 | 20 | 0:31 | e | 8 | 21 | 4:31 | 69 01.515 | 74 51.509 | 380 | | Daly/Torres | |
| NBP23301.004 | bird obs 58 | 58 | | | 8 | 21 | 4:52 | s | 8 | 21 | 8:52 | 69 8.723 | 75 7.563 | | | Ribic | |
| NBP23301.005 | bird obs 58 | 58 | | | 8 | 21 | 5:41 | e | 8 | 21 | 9:41 | 69 11.219 | 75 16.654 | | | Ribic | |
| NBP23301.006 | sonobuoy | 43 | 87 | 061.180 | 8 | 21 | 9:56 | s | 8 | 21 | 13:56 | 69 11.165 | 75 35.127 | | | Sirovic | |
| NBP23301.007 | sonobuoy | 43 | 87 | 061.180 | 8 | 21 | 10:25 | e | 8 | 21 | 14:25 | - | - | | | Sirovic | |
| NBP23301.008 | BMP | 32 | 83-87 | | 8 | 21 | 8:51 | s | 8 | 21 | 12:51 | 69 15.360 | 75 32.438 | | | Wiebe | |
| NBP23301.009 | BMP | 32 | 83-87 | | 8 | 21 | 9:26 | e | 8 | 21 | 13:26 | 69 12.94 | 75 33.77 | | | Wiebe | |
| NBP23301.010 | moc1/opc | 14 | 87 | 061.180 | 8 | 21 | 11:36 | s | 8 | 21 | 15:36 | 69 14.6 | 75 36.2 | | | | |
| NBP23301.011 | moc1/opc | 14 | 87 | 061.181 | 8 | 21 | 13:26 | e | 8 | 21 | 17:26 | 69 12.43 | 75 36.35 | | | | |
| NBP23301.012 | moc10 | 7 | 87 | 061.182 | 8 | 21 | 14:54 | s | 8 | 21 | 18:54 | 69 16.33 | 75 38.89 | 340 | 300 | Torres | |
| NBP23301.013 | moc10 | 7 | 87 | 061.183 | 8 | 21 | 16:10 | e | 8 | 21 | 20:10 | 69 14.174 | 75 40.33 | 340 | 300 | Torres | |
| NBP23301.014 | tucker trawl | 13 | 87 | 061.184 | 8 | 21 | 16:45 | s | 8 | 21 | 20:45 | 69 13.91 | 75 39.913 | 392 | | Daly/Torres | |
| NBP23301.015 | tucker trawl | 13 | 87 | 061.185 | 8 | 21 | 17:07 | e | 8 | 21 | 21:07 | 69 13.91 | 75 39.913 | 392 | | Daly/Torres | |
| NBP23301.016 | Plummet Net | 24 | 87 | 061.186 | 8 | 21 | 18:08 | s | 8 | 21 | 22:08 | 69 14.920 | 75 40.808 | 445 | 150 | Daly | |
| NBP23301.017 | Plummet Net | 24 | 87 | 061.187 | 8 | 21 | 18:17 | e | 8 | 21 | 22:17 | 69 14.920 | 75 40.808 | 445 | 150 | Daly | |
| NBP23301.018 | Plummet Net | 25 | 87 | 061.188 | 8 | 21 | 18:23 | s | 8 | 21 | 22:23 | 69 14.920 | 75 40.808 | 445 | 250 | Daly | |
| NBP23301.019 | Plummet Net | 25 | 87 | 061.189 | 8 | 21 | 18:39 | e | 8 | 21 | 22:39 | 69 14.920 | 75 40.808 | 445 | 250 | Daly | |
| NBP23301.020 | Plummet Net | 26 | 87 | 061.190 | 8 | 21 | 18:45 | s | 8 | 21 | 22:45 | 69 14.920 | 75 40.808 | 445 | 250 | Daly | |
| NBP23301.021 | Plummet Net | 26 | 87 | 061.191 | 8 | 21 | 18:58 | e | 8 | 21 | 22:58 | 69 14.920 | 75 40.808 | 445 | 250 | Daly | |
| NBP23301.022 | Plummet Net | 27 | 87 | 061.192 | 8 | 21 | 19:07 | s | 8 | 21 | 23:07 | 69 14.920 | 75 40.808 | 445 | 400 | Daly | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NBP23301.023 | Plummet Net | 27 | 87 | 061.193 | 8 | 21 | 19:28 | e | 8 | 21 | 23:28 | 69 14.920 | 75 40.808 | 445 | 400 | Daly | |
| NBP23301.024 | HTI | 28 | 87 | 061.194 | 8 | 21 | 17:48 | s | 8 | 21 | 21:48 | 69 14.920 | 75 40.808 | 445 | surface | Daly | |
| NBP23301.025 | HTI | 28 | 87 | 061.195 | 8 | 21 | 19:40 | e | 8 | 21 | 23:40 | 69 14.920 | 75 40.808 | 445 | surface | Daly | |
| NBP23301.026 | ice coring | 13 | 87 | 061.196 | 8 | 21 | 20:00 | s | 8 | 22 | 0:00 | 69 14.99 | 75 40.71 | | | Stewart | |
| NBP23301.027 | ice coring | 13 | 87 | 061.197 | 8 | 21 | 22:00 | e | 8 | 22 | 2:00 | 69 14.99 | 75 40.71 | | | Stewart | |
| NBP23301.028 | 60-L Surface water collection | 1 | 87 | 061.180 | 8 | 21 | 21:15 | s/e | 8 | 22 | 1:15 | 69 14.821 | 75 40.903 | 718 | surface | Daly | |
| NBP23301.029 | Ring Net | 37 | 87 | 061.180 | 8 | 21 | 22:10 | s/e | 8 | 22 | 2:10 | 69 14.505 | 75 41.351 | | 30 | Kozlowski | |
| NBP23301.030 | CTD | 66 | 87 | 061.180 | 8 | 21 | 22:17 | s | 8 | 22 | 2:17 | 69 14.54 | 75 41.3 | 400 | 300 | Hyatt | no bathy |
| NBP23301.031 | CTD | 66 | 87 | 061.180 | 8 | 21 | 23:05 | e | 8 | 22 | 3:05 | 69 14.31 | 75 41.6 | 400 | | Hyatt | no bathy |
| NBP23401.001 | rov | 14 | 87 | 061.180 | 8 | 22 | 0:30 | s | 8 | 22 | 4:30 | 69 14.3 | 75 41.60 | | | Gallager | |
| NBP23401.002 | rov | 14 | 87 | 061.180 | 8 | 22 | 2:35 | e | 8 | 22 | 6:35 | 69 14.3 | 75 41.60 | | | Gallager | |
| NBP23401.003 | moc1/opc | 15 | 87 | 061.181 | 8 | 22 | 3:27 | s | 8 | 22 | 7:27 | 69 12.3 | 75 43.9 | 380 | 100 | Ashjian | |
| NBP23401.004 | moc1/opc | 15 | 87 | 061.182 | 8 | 22 | 3:54 | | 8 | 22 | 7:54 | 69 12.9 | 75 45.2 | 300 | 100 | Ashjian | |
| NBP23401.005 | bird obs 59 | 59 | to 80 | | 8 | 22 | 8:12 | s | 8 | 22 | 12:12 | 68 58.184 | 75 43.778 | | | Ribic | |
| NBP23401.006 | sonobuoy | 44 | to 82 | | 8 | 22 | 9:49 | s | 8 | 22 | 13:49 | 68 50.555 | 75 43.134 | | | Sirovic | |
| NBP23401.007 | XBT | 47 | 82 | 101.220 | 8 | 22 | 10:44 | s/e | 8 | 22 | 14:44 | 69 44.99 | 75 39.938 | 460 | 460 | Sinan | |
| NBP23401.008 | XBT | 47 | 82 | 101.220 | 8 | 22 | 10:46 | s/e | 8 | 22 | 14:46 | 69 44.955 | 75 39.911 | 460 | 460 | Sinan | |
| NBP23401.009 | sonobuoy | 44 | to 82 | | 8 | 22 | 11:38 | e | 8 | 22 | 15:38 | - | - | | | Sirovic | |
| NBP23401.010 | sonobuoy | 45 | to 80 | | 8 | 22 | 14:20 | s | 8 | 22 | 18:20 | 68 24.098 | 75 38.482 | | | Sirovic | |
| NBP23401.011 | ring net | 38 | 80 | 141.255 | 8 | 22 | 15:35 | s/e | 8 | 22 | 19:35 | 68 17.204 | 75 40.172 | 1762 | 30 | Kozlowski | |
| NBP23401.012 | CTD | 67 | 80 | 141.255 | 8 | 22 | 15:46 | s | 8 | 22 | 19:46 | 68 17.204 | 75 40.172 | 1850 | 1001 | Kim | |
| NBP23401.013 | bird obs 59 | 59 | 80 | 141.256 | 8 | 22 | 15:36 | e | 8 | 22 | 19:36 | 68 17.247 | 75 40.148 | | | Ribic | |
| NBP23401.014 | CTD | 67 | 80 | 141.255 | 8 | 22 | 16:48 | e | 8 | 22 | 20:48 | 68 17.204 | 75 40.172 | 1850 | 1001 | Kim | |
| NBP23401.015 | whale obs | 23 | to 80 | | 8 | 22 | 8:15 | s | 8 | 22 | 12:15 | 68 58.184 | 75 43.778 | | | Friedlaender | |
| NBP23401.016 | whale obs | 23 | to 80 | | 8 | 22 | 15:30 | e | 8 | 22 | 19:30 | 68 17.247 | 75 40.148 | | | Friedlaender | |
| NBP23401.017 | sonobuoy | 46 | to 71 | | 8 | 22 | 18:37 | s/e | 8 | 22 | 22:37 | 68 12.693 | 75 13.071 | | | Sirovic | failed |
| NBP23401.018 | ice coring | 14 | 71 | 181.241 | 8 | 22 | 21:00 | s | 8 | 23 | 1:00 | 68 4.73 | 74 46.51 | | | Stewart | |
| NBP23401.019 | ice coring | 14 | 71 | 181.242 | 8 | 22 | 23:00 | e | 8 | 23 | 3:00 | 68 4.73 | 74 46.51 | | | Stewart | |
| NBP23401.020 | Ring Net | 39 | 71 | 181.241 | 8 | 22 | 23:20 | s/e | 8 | 22 | 3:20 | 68 03.040 | 74 43.946 | 770 | 30 | Kozlowski | |
| NBP23401.021 | sonobuoy | 45 | to 80 | | 8 | 22 | 17:15 | e | 8 | 22 | 21:15 | - | - | | | Sirovic | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NBP23401.022 | CTD | 68 | 71 | 181.241 | 8 | 22 | 23:33 | s | 8 | 23 | 3:33 | 68 3.10 | 74 43.98 | 785 | 810 | Sinan | |
| NBP23501.001 | CTD | 68 | 71 | 181.241 | 8 | 23 | 0:38 | e | 8 | 23 | 4:38 | 68 3.10 | 74 43.98 | 785 | | Sinan | |
| NBP23501.002 | null event | | | | | | | | | | | | | | | | |
| NBP23501.003 | moc1/opc | 16 | 71 | 181.241 | 8 | 23 | 1:33 | s | 8 | 23 | 5:33 | 68 2.32 | 74 43.85 | >1000 | 650 | Ashjian | |
| NBP23501.004 | moc1/opc | 16 | 71 | 181.241 | 8 | 23 | 3:00 | e | 8 | 23 | 7:00 | 69 3.1 | 75 48 | >1000 | 650 | Ashjian | |
| NBP23501.005 | Tucker trawl | 14 | 71 | 181.241 | 8 | 23 | 0330 | s | 8 | 23 | 0730 | 68 3.1 | 74 48 | 1948 | ~500 | Daly | |
| NBP23501.006 | Tucker trawl | 14 | 71 | 181.241 | 8 | 23 | 0510 | e | 8 | 23 | 0910 | 68 4.7 | 74 57.6 | 2236 | | Daly | |
| NBP23501.007 | bird obs 60 | 60 | to 66 | | 8 | 23 | 8:00 | s | 8 | 23 | 12:00 | 68 3.669 | 74 52.007 | | | Ribic | |
| NBP23501.008 | whale obs | 24 | to 66 | | 8 | 23 | 8:00 | s | 8 | 23 | 12:00 | 68 3.669 | 74 52.007 | | | Friedlaender | |
| NBP23501.009 | bird obs | 60 | 66 | | 8 | 23 | 11:40 | e | 8 | 23 | 15:40 | 67 48.103 | 74 10.819 | | | Ribic | |
| NBP23501.010 | whale obs | 24 | 66 | | 8 | 23 | 11:40 | e | 8 | 23 | 15:40 | 67 48.103 | 74 10.819 | | | Friedlaender | |
| NBP23501.011 | ring net | 40 | 66 | 220.242 | 8 | 23 | 1:50 | s/e | 8 | 23 | 15:50 | 67 47.89 | 74 10.37 | 1210 | 30 | Macri | |
| NBP23501.012 | CTD | 69 | 66 | 220.242 | 8 | 23 | 12:00 | s | 8 | 23 | 16:00 | 67 47.89 | 74 10.37 | 1210 | 1047 | Sinan | |
| NBP23501.013 | CTD | 69 | 66 | 220.242 | 8 | 23 | 13:48 | e | 8 | 23 | 17:48 | 67 47.89 | 74 10.37 | 1210 | | Sinan | |
| NBP23501.014 | whale obs | 25 | to 48 | | 8 | 23 | 13:50 | s | 8 | 23 | 17:50 | 67 47.89 | 74 10.37 | | | Friedlaender | |
| NBP23501.015 | bird obs 61 | 61 | to 48 | | 8 | 23 | 13:50 | s | 8 | 23 | 17:50 | 67 47.89 | 74 10.37 | t | | Ribic | |
| NBP23501.016 | sonobuoy | 47 | to 48 | | 8 | 23 | 13:59 | s/e | 8 | 23 | 17:59 | 67 46.255 | 74 8.458 | | | Sirovic | |
| NBP23501.017 | sonobuoy | 48 | to 48 | | 8 | 23 | 15:52 | s | 8 | 23 | 19:52 | 67 35.705 | 73 56.255 | | | Sirovic | |
| NBP23501.018 | sonobuoy | 48 | to 48 | | 8 | 23 | 17:00 | e | 8 | 23 | 21:00 | - | - | | | Sirovic | |
| NBP23501.019 | XBT | 48 | 48 | | 8 | 23 | 17:19 | s/e | 8 | 23 | 21:19 | 67 27.716 | 73 47.417 | 408 | 408 | Kim | |
| NBP23501.020 | bird obs 61 | 61 | 48 | | 8 | 23 | 17:24 | e | 8 | 23 | 21:24 | 67 27.393 | 73 47.103 | | | Ribic | |
| NBP23501.021 | whale obs | 25 | 48 | | 8 | 23 | 17:24 | e | 8 | 23 | 21:24 | 67 27.393 | 73 47.103 | | | Friedlaender | |
| NBP23501.022 | XBT | 49 | to 46 | | 8 | 23 | 19:46 | s/e | 8 | 23 | 23:46 | 67 15.191 | 73 31.420 | 1216 | 750 | Kim | |
| NBP23501.023 | XBT | 50 | 46 | | 8 | 23 | 21:08 | s/e | 8 | 24 | 1:08 | 67 07.955 | 73 22.529 | 1500 | 750 | Hyatt | |
| NBP23501.024 | XBT | 51 | to 24 | | 8 | 23 | 23:07 | s/e | 8 | 24 | 3:07 | 67 01.526 | 72 59.069 | 877 | 250 | Fisher | |
| NBP23501.025 | XBT | 52 | to 24 | | 8 | 23 | 23:12 | s/e | 8 | 24 | 3:12 | 67 01.421 | 72 58.094 | 831 | 250 | Fisher | |
| NBP23601.001 | XBT | 53 | 24 | | 8 | 24 | 1:03 | s/e | 8 | 24 | 5:03 | 66 54.93 | 72 35.432 | 590 | 200 | Klinck | bad probe |
| NBP23601.002 | XBT | 54 | 24 | | 8 | 24 | 1:04 | s/e | 8 | 24 | 5:04 | 66 54.927 | 72 35.329 | 590 | 200 | Klinck | bad probe |
| NBP23601.003 | XBT | 55 | 24 | | 8 | 24 | 1:06 | s/e | 8 | 24 | 5:06 | 66 54.989 | 72 34.777 | 590 | 590 | Klinck | |
| NBP23601.004 | XBT | 55 | 24-21.5 | | 8 | 24 | 2:55 | s/e | 8 | 24 | 6:55 | 66 47.103 | 72 15.390 | 1378 | 760 | Klinck | |
| NBP23601.005 | XBT | 56 | 21.5 | | 8 | 24 | 4:36 | s/e | 8 | 24 | 8:36 | 66 40.668 | 71 5.590 | 1261 | 760 | Klinck | |
| NBP23601.006 | XBT | 57 | 21.5-13 | | 8 | 24 | 6:17 | s/e | 8 | 24 | 10:17 | 66 32.80 | 71 38.58 | 770 | 250 | Klinck | bad probe |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NBP23601.007 | XBT | 58 | 21.5-13 | | 8 | 24 | 6:19 | s/e | 8 | 24 | 10:19 | 66 32.798 | 71 38.547 | 770 | 760 | Klinck | |
| NBP23601.008 | CTD | 70 | 13 | 420.247 | 8 | 24 | 8:11 | s | 8 | 24 | 12:11 | 66 23.85 | 71 22.04 | 840 | 847 | Sinan | |
| NBP23601.009 | CTD | 70 | 13 | 420.247 | 8 | 24 | 9:19 | e | 8 | 24 | 13:19 | 66 23.85 | 71 22.04 | 845 | | Sinan | |
| NBP23601.010 | moc1/opc0 | 8 | 13 | | 8 | 24 | 9:45 | s | 8 | 24 | 13:45 | 66 23.012 | 71 19.716 | 1000 | 800 | Torres | |
| NBP23601.011 | moc10 | 8 | 13 | | 8 | 24 | 11:40 | e | 8 | 24 | 15:40 | 66 22.16 | 71 21.54 | 1000 | 800 | Torres | |
| NBP23601.012 | bird obs 62 | 62 | to 14 | | 8 | 24 | 12:06 | s | 8 | 24 | 16:06 | 66 21.169 | 71 21.168 | | | Ribic | |
| NBP23601.013 | whale obs | 26 | to 14 | | 8 | 24 | 12:06 | s | 8 | 24 | 16:06 | 66 21.169 | 71 21.168 | | | Friedlaender | |
| NBP23601.014 | sonobuoy | 49 | to 14 | | 8 | 24 | 13:07 | s | 8 | 24 | 17:07 | 66 24.166 | 71 18.868 | | | Sirovic | |
| NBP23601.015 | sonobuoy | 49 | to 14 | | 8 | 24 | 13:11 | e | 8 | 24 | 17:11 | - | - | | | Sirovic | |
| NBP23601.016 | sonobuoy | 50 | to 14 | | 8 | 24 | 14:21 | s | 8 | 24 | 18:21 | 66 28.658 | 71 10.932 | | | Sirovic | |
| NBP23601.017 | whale obs | 26 | 14 | | 8 | 24 | 15:15 | e | 8 | 24 | 19:15 | 66 30.68 | 71 3.60 | | | Friedlaender | |
| NBP23601.018 | bird obs 62 | 62 | 14 | | 8 | 24 | 15:15 | e | 8 | 24 | 19:15 | 66 30.68 | 71 3.60 | | | Ribic | |
| NBP23601.019 | CTD | 71 | 14 | 421.225 | 8 | 24 | 15:21 | s | 8 | 24 | 19:21 | 66 30.68 | 71 3.60 | 530 | 520 | Kim | |
| NBP23601.020 | CTD | 71 | 14 | 421.225 | 8 | 24 | 16:18 | e | 8 | 24 | 20:18 | 66 30.68 | 71 3.60 | 530 | 520 | Kim | |
| NBP23601.021 | Plummet Net | 28 | 14 | 421.225 | 8 | 24 | 16:35 | s | 8 | 24 | 2035 | 66 30.68 | 71 3.60 | 530 | 100 | Daly | abort |
| NBP23601.022 | Plummet Net | 28 | 14 | 421.225 | 8 | 24 | 16:42 | e | 8 | 24 | 2042 | 66 30.68 | 71 3.60 | | | Daly | |
| NBP23601.023 | Plummet Net | 29 | 14 | 421.225 | 8 | 24 | 16:46 | s | 8 | 24 | 2046 | 66 30.68 | 71 3.60 | | 100 | Daly | good |
| NBP23601.024 | Plummet Net | 29 | 14 | 421.225 | 8 | 24 | 16:52 | e | 8 | 24 | 2052 | 66 30.68 | 71 3.60 | | | Daly | |
| NBP23601.025 | Plummet Net | 30 | 14 | 421.225 | 8 | 24 | 17:00 | s | 8 | 24 | 2100 | 66 30.68 | 71 3.60 | | 425 | Daly | good |
| NBP23601.026 | Plummet Net | 30 | 14 | 421.225 | 8 | 24 | 17:24 | e | 8 | 24 | 2124 | 66 30.68 | 71 3.60 | | | Daly | |
| NBP23601.027 | sonobuoy | 50 | to 14 | | 8 | 24 | 18:22 | e | 8 | 24 | 22:22 | - | - | | | Sirovic | |
| NBP23601.028 | bmp | 33 | 13 | | 8 | 24 | 18:16 | s | 8 | 24 | 2216 | 66 46.86 | 70 25.824 | | 280 | Wiebe | |
| NBP23701.001 | CTD | 72 | 15 | 421.180 | 8 | 25 | 0:32 | s | 8 | 25 | 4:32 | 66 46.001 | 70 10.493 | 540 | 538 | Klinck | |
| NBP23701.002 | CTD | 72 | 15 | 421.180 | 8 | 25 | 1:34 | e | 8 | 25 | 5:34 | 66 46.001 | 70 10.493 | 540 | | Klinck | |
| NBP23701.003 | bmp | 33 | 15 | | 8 | 25 | 0:09 | e | 8 | 25 | 4:09 | 66 46.238 | 70 11.30 | 548 | 280 | Wiebe | |
| NBP23701.004 | bmp | 34 | 15 | | 8 | 25 | 2:00 | s | 8 | 25 | 6:00 | 66 45.624 | 70 9.428 | 540 | | Wiebe | |
| NBP23701.005 | XBT | 59 | 15-16 | | 8 | 25 | 3:59 | s/e | 8 | 25 | 7:59 | 66 49.709 | 69 52.353 | 447 | 447 | Klinck | |
| NBP23701.006 | bmp | 34 | 16 | | 8 | 25 | 6:29 | e | 8 | 25 | 10:29 | 66 56.25 | 69 30.62 | | | Wiebe | |
| NBP23701.007 | CTD | 73 | 16 | 421.145 | 8 | 25 | 6:55 | s | 8 | 25 | 10:55 | 66 56.94 | 69 29.83 | 521 | 513 | Sinan | |
| NBP23701.008 | CTD | 73 | 16 | 421.145 | 8 | 25 | 7:39 | e | 8 | 25 | 11:39 | 66 56.94 | 69 29.83 | 521 | | Sinan | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NBP23701.009 | moc 10 | 9 | 16 | | 8 | 25 | 8:18 | s | 8 | 25 | 12:18 | 66 58.159 | 69 24.61 | 546 | 467 | Torres | |
| NBP23701.010 | moc 10 | 9 | 16 | | 8 | 25 | 9:41 | e | 8 | 25 | 13:41 | 66 58.159 | 69 24.61 | 546 | 467 | Torres | |
| NBP23701.011 | Plummet Net | 31 | 16 | | 8 | 25 | 13:55 | s | 8 | 25 | 17:55 | 66 2.153 | 69 22.642 | 510 | 100 | Daly | |
| NBP23701.012 | Plummet Net | 31 | 16 | | 8 | 25 | 14:02 | e | 8 | 25 | 18:02 | 66 2.153 | 69 22.642 | 510 | 100 | Daly | |
| NBP23701.013 | rov | 16 | 16 | | 8 | 25 | | s | 8 | 25 | | | | | | Gallager | |
| NBP23701.014 | rov | 16 | 16 | | 8 | 25 | | e | 8 | 25 | | | | | | Gallager | |
| NBP23701.015 | ice coring | 15 | 16 | | 8 | 25 | 1700 | s | 8 | 25 | 2100 | 67 05.716 | 69 32.04 | | | Stewart | |
| NBP23701.016 | ice coring | 15 | 16 | | 8 | 25 | 1800 | e | 8 | 25 | 2200 | 68 05.716 | 70 32.04 | | | Stewart | |
| NBP23701.017 | Ice Sampling | 1 | 16 | | 8 | 25 | 18:00 | s | 8 | 25 | 22:00 | 67 05.853 | 69 31.243 | | | Daly | |
| NBP23701.018 | Ice Sampling | 1 | 16 | | 8 | 25 | 18:35 | e | 8 | 25 | 22:35 | 67 05.853 | 69 31.243 | | | Daly | |
| NBP23701.019 | krill cam | 2 | 16 | | 8 | 25 | | s/e | 8 | 25 | | | | | | Gallager | |
| NBP23701.020 | XBT | 59 | st16 to ice edge | | 8 | 25 | 22:00 | s/e | 8 | 25 | 2:00 | 66 43.228 | 69 23.32 | 260 | | Kim | Bad probe |
| NBP23701.021 | XBT | 60 | st16 to ice edge | | 8 | 25 | 22:01 | s/e | 8 | 25 | 2:01 | 66 43.196 | 69 23.30 | 260 | 200 | Kim | Surface interesting feature |
| NBP23701.022 | moc1/opc | 17 | 4 | | 8 | 26 | 3:06 | s | 8 | 26 | 7:06 | 66 11.31 | 69 6.212 | 346 | 300 | Ashjian | |
| NBP23701.023 | moc1/opc | 17 | 4 | | 8 | 26 | 4:14 | e | 8 | 26 | 8:14 | 66 12.993 | 69 7.065 | 346 | 300 | Ashjian | |
| NBP23801.001 | bird obs | 63 | to ice edge | | 8 | 26 | 8:12 | s | 8 | 26 | 12:12 | 65 48.118 | 69 5.160 | | | Ribic | |
| NBP23801.002 | whale obs | 27 | to ice edge | | 8 | 26 | 8:12 | s | 8 | 26 | 12:12 | 65 48.118 | 69 5.160 | | | Friedlaender | |
| NBP23801.003 | sonobuoy | 51 | to ice edge | | 8 | 26 | 10:31 | s | 8 | 26 | 14:31 | 65 32.709 | 68 47.218 | | | Sirovic | |
| NBP23801.004 | surface collection | 1 | | | 8 | 26 | 1040 | s/e | 8 | 26 | 1440 | 65 31.379 | 68 43.716 | 381 | 0 | Macri | |
| NBP23801.005 | sonobuoy | 51 | to ice edge | | 8 | 26 | 11:15 | e | 8 | 26 | 15:15 | - | - | | | Sirovic | |
| NBP23801.006 | sonobuoy | 52 | to ice edge | | 8 | 26 | 12:43 | s | 8 | 26 | 16:43 | 65 18.481 | 68 12.309 | | | Sirovic | |
| NBP23801.007 | sonobuoy | 52 | to ice edge | | 8 | 26 | 13:55 | e | 8 | 26 | 17:55 | - | - | | | Sirovic | |
| NBP23801.008 | surface collection | 2 | | | 8 | 26 | 1640 | s/e | 8 | 26 | 2040 | 65 07.879 | 66 37.400 | 923 | 0 | Kozlowski | |
| NBP23801.009 | bird obs | 63 | to ice edge | | 8 | 26 | 15:12 | e | 8 | 26 | 19:12 | 65 9.12 | 67 9.648 | | | Ribic | |
| NBP23901.001 | bmp | CAL | Paradise | | 8 | 27 | 9:33 | s | 8 | 27 | 13:33 | 64 48.837 | 62 55.016 | | | Wiebe | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NBP23901.002 | sonobuoy | 53 | Paradise | | 8 | 27 | 11:43 | s | 8 | 27 | 15:43 | 64 50.056 | 62 53.661 | | | Sirovic | |
| NBP23901.003 | bmp | CAL | Paradise | | 8 | 27 | 9:47 | e | 8 | 27 | 13:47 | 64 48.837 | 62 55.016 | | | Wiebe | |
| NBP23901.004 | bmp | CAL | Paradise | | 8 | 27 | 10:38 | s | 8 | 27 | 14:38 | 64 50.58 | 62 55.93 | | | Wiebe | |
| NBP23901.005 | bmp | CAL | Paradise | | 8 | 27 | 12:30 | e | 8 | 27 | 16:30 | 64 50.58 | 62 55.93 | | | Wiebe | |
| NBP23901.006 | HTI | 2 | Paradise | | 8 | 27 | 1300 | s | 8 | 27 | 1700 | 64 50.5 | 62 56.0 | | 2 | Daly | |
| NBP23901.007 | HTI | 2 | Paradise | | 8 | 27 | 1551 | e | 8 | 27 | 1951 | 64 50.5 | 62 56.0 | | | Daly | |
| NBP23901.008 | sonobuoy | 54 | Paradise | | 8 | 27 | 17:07 | s | 8 | 27 | 21:07 | 64 42.773 | 63 2.406 | | | Sirovic | |
| NBP23901.009 | sonobuoy | 54 | Paradise | | 8 | 27 | 17:45 | e | 8 | 27 | 21:45 | - | - | | | Sirovic | |
| NBP23901.010 | sonobuoy | 53 | Paradise | | 8 | 27 | 18:28 | e | 8 | 27 | 22:28 | - | - | | | Sirovic | |
| NBP23901.011 | sonobuoy | 55 | | | 8 | 27 | 22:22 | s | 8 | 28 | 2:22 | 63 57.322 | 61 40.556 | | | Sirovic | |
| NBP23901.012 | sonobuoy | 55 | | | 8 | 27 | 23:34 | e | 8 | 28 | 3:34 | - | - | | | Sirovic | |
| NBP24001.001 | XBT | 61 | 101 | | 8 | 28 | 4:53 | s/e | 8 | 28 | 8:53 | 62 49.832 | 62 04.286 | 667 | | Klinck | |
| NBP24001.002 | XCTD | 1 | 102 | | 8 | 28 | 7:02 | s/e | 8 | 28 | 11:02 | 62 28.247 | 62 26.895 | 1157 | | Klinck | |
| NBP24001.003 | XBT | 62 | 103 | | 8 | 28 | 7:55 | s/e | 8 | 28 | 11:55 | 62 18.722 | 62 30.482 | 1808 | 760 | Klinck | |
| NBP24001.004 | XBT | 63 | 104 | | 8 | 28 | 8:51 | s/e | 8 | 28 | 12:51 | 62 8.53 | 62 34.261 | 3700 | 760 | Klinck | |
| NBP24001.005 | XBT | 64 | 105 | | 8 | 28 | 9:45 | s/e | 8 | 28 | 13:45 | 61 58.024 | 62 38.337 | 2899 | 760 | Klinck | T5-bad |
| NBP24001.006 | XBT | 65 | 105 | | 8 | 28 | 9:47 | s/e | 8 | 28 | 13:47 | 61 58.024 | 62 38.337 | 2899 | 760 | Klinck | T5-bad |
| NBP24001.007 | XBT | 66 | 105 | | 8 | 28 | 9:51 | s/e | 8 | 28 | 13:51 | 61 56.996 | 62 38.672 | 2899 | 760 | Klinck | T7 |
| NBP24001.008 | XBT | 67 | 106 | | 8 | 28 | 10:36 | s/e | 8 | 28 | 14:36 | 61 47.913 | 62 41.793 | 3802 | 760 | Klinck | T5-semi ok |
| NBP24001.009 | XBT | 68 | 107 | | 8 | 28 | 11:31 | s/e | 8 | 28 | 15:31 | 61 37.237 | 62 46.084 | 3382 | 760 | Klinck | T7 |
| NBP24001.010 | XBT | 69 | 108 | | 8 | 28 | 12:18 | s/e | 8 | 28 | 16:18 | 61 27.969 | 62 49.308 | 3399 | 760 | Klinck | T7 |
| NBP24001.011 | XBT | 70 | 109 | | 8 | 28 | 13:10 | s/e | 8 | 28 | 17:10 | 61 18.158 | 62 52.578 | 3501 | 760 | Kim | T7 |
| NBP24001.012 | sonobuoy | 56 | | | 8 | 28 | 13:18 | s | 8 | 28 | 17:18 | 61 16.780 | 62 53.112 | | | Sirovic | |
| NBP24001.013 | XBT | 71 | 110 | | 8 | 28 | 13:59 | s/e | 8 | 28 | 17:59 | 61 8.765 | 62 56.583 | 3495 | 760 | Kim | T7 |
| NBP24001.014 | sonobuoy | 56 | | | 8 | 28 | 14:36 | e | 8 | 28 | 18:36 | - | - | | | Sirovic | |
| NBP24001.015 | XBT | 72 | 111 | | 8 | 28 | 14:51 | s/e | 8 | 28 | 18:51 | 60 58.804 | 62 59.741 | 3264 | 760 | Kim | T7 |
| NBP24001.016 | XBT | 73 | 112 | | 8 | 28 | 15:47 | s/e | 8 | 28 | 19:47 | 60 48.657 | 63 3.506 | 3848 | 760 | Kim | T7 |
| NBP24001.017 | XBT | 74 | 113 | | 8 | 28 | 16:55 | s/e | 8 | 28 | 20:55 | 60 36.333 | 63 7.846 | 3602 | 760 | Kim | T7 |
| NBP24001.018 | XBT | 75 | 114 | | 8 | 28 | 17:39 | s/e | 8 | 28 | 21:39 | 60 28.378 | 63 10.542 | 3861 | 760 | Kim | T7 |
| NBP24001.019 | XBT | 76 | 115 | | 8 | 28 | 18:35 | s/e | 8 | 28 | 22:35 | 60 18.196 | 63 14.088 | 3736 | 100 | Kim | T7 Bad probe |
| NBP24001.020 | XBT | 77 | 115 | | 8 | 28 | 18:37 | s/e | 8 | 28 | 22:37 | 60 17.812 | 63 14.214 | 3736 | 760 | Kim | T7 |
| NBP24001.021 | XBT | 78 | 116 | | 8 | 28 | 19:29 | s/e | 8 | 28 | 23:29 | 60 8.554 | 63 18.004 | 3855 | 620 | Kim | T7 |
| NBP24001.022 | XBT | 79 | 117 | | 8 | 28 | 20:22 | s/e | 8 | 29 | 0:22 | 59 58.903 | 63 21.057 | 3244 | 760 | Kim | T7 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NBP24001.023 | XBT | 80 | 118 | | 8 | 28 | 21:30 | s/e | 8 | 29 | 1:30 | 59 48.278 | 63 24.662 | 3715 | 760 | Kim | T7 |
| NBP24001.024 | XBT | 81 | 119 | | 8 | 28 | 22:24 | s/e | 8 | 29 | 2:24 | 59 39.076 | 63 27.811 | 3628 | 760 | Klinck | T7 |
| NBP24001.025 | XBT | 82 | 120 | | 8 | 28 | 23:20 | s/e | 8 | 29 | 3:20 | 59 29.29 | 63 31.299 | 3894 | 760 | Klinck | T7 |
| NBP24101.001 | XBT | 83 | 121 | | 8 | 29 | 0:16 | s/e | 8 | 29 | 4:16 | 59 19.425 | 63 34.624 | 3983 | 760 | Klinck | T7 Bad probe |
| NBP24101.002 | XBT | 84 | 122 | | 8 | 29 | 1:14 | s/e | 8 | 29 | 5:14 | 59 9.141 | 63 38.070 | 3825 | 760 | Klinck | T5 |
| NBP24101.003 | XBT | 85 | 122 | | 8 | 29 | 1:16 | s/e | 8 | 29 | 5:16 | 59 8.670 | 63 38.259 | 3825 | 1200 | Klinck | T5 |
| NBP24101.004 | XBT | 86 | 123 | | 8 | 29 | 2:08 | s/e | 8 | 29 | 6:08 | 58 59.344 | 63 41.289 | 3840 | 1300 | Klinck | T5 |
| NBP24101.005 | XBT | 87 | 124 | | 8 | 29 | 3:01 | s/e | 8 | 29 | 7:01 | 58 49.634 | 63 44.646 | 3400 | 100 | Klinck | T5 Bad |
| NBP24101.006 | XBT | 88 | 124 | | 8 | 29 | 3:02 | s/e | 8 | 29 | 7:02 | 58 49.465 | 63 44.699 | 3400 | 1500 | Klinck | T5 |
| NBP24301.001 | Arrival | | | | 8 | 31 | 10:18 | s/e | 8 | 31 | 14:18 | 53 10.214 | 70 54.394 | | | Husrevoglu | |

Appendix 2: Summary of the CTD casts made during the second U.S. Southern Ocean GLOBEC survey cruise, NBP01-04. The casts designated by * are ones on which a Fast Repetition Rate Fluorometer was attached to the Rosette. These casts extended to only 500 m. Latitude and longitude are given in degrees south and west, respectively. Total depth and cast depth are reported in meters. Event numbers for the CTD casts may change pending final checking against the cruise event log.

| STATION NUMBER | CONSECUTIVE STATION NUMBER | CAST NUMBER | EVENT NUMBER | LATITUDE (°S) | LONGITUDE (°W) | DEPTH (m) | CAST DEPTH (m) |
|---|---|---|---|---|---|---|---|
| 0 | | 0 | NBP20701.024 | 64 38.79 | 69 19.89 | 2706 | 500 |
| 1 | 507.271 | 1 | NBP20801.006 | 65 38.607 | 70 37.57 | 3122 | 1000 |
| 2 | 500.251 | 2 | NBP20801.018 | 65 48.255 | 70 22.47 | 767 | 760 |
| 3 | 501.220 | 3 | NBP20801.027 | 65 57.997 | 68 48.220 | 340 | 326 |
| 4 | 501.184 | 4 | NBP20901.006 | 66 10.289 | 69 5.773 | 346 | 330 |
| 5 | 501.147 | 5 | NBP20901.025 | 66 22.559 | 68 21.292 | 717 | 701 |
| *6 | 501.120 | 6 | NBP20901.033 | 66 29.036 | 68 0.355 | 288 | 293 |
| *7 | 460.115 | 7 | NBP21001.004 | 66 48.616 | 68 27.304 | 120 | 106 |
| *8 | 460.115 | 8 | NBP21001.008 | 66 40.242 | 68 54.326 | 340 | 327 |
| *9 | 461.180 | 9 | NBP21001.018 | 66 28.083 | 69 37.750 | 508 | 496 |
| 10 | 461.220 | 10 | NBP21001.027 | 66 15.22 | 70 20.66 | 462 | 459 |
| 11 | 460.250 | 11 | NBP21101.003 | 66 5.943 | 70 5.720 | 980 | 978 |
| 12 | 459.265 | 12 | NBP21101.014 | 66 1.3927 | 71 11.700 | 3090 | 3138 |
| 13 | 420.247 | 13 | NBP21201.002 | 66 23.999 | 71 22.6305 | 844 | 797 |
| 14 | 421.225 | 14 | NBP21201.004 | 66 30.300 | 70 58.667 | 525 | 520 |
| 15 | 421.180 | 15 | NBP21201.016 | 66 44.79 | 70 07.12 | 510 | 515 |
| 16 | 421.145 | 16 | NBP21201.025 | 66 56.67 | 69 30.65 | 512 | 506 |
| *17 | 421.125 | 17 | NBP21301.002 | 67 2.968 | 69 6.985 | 298 | 287 |
| *18 | 373.110 | 18 | NBP21301.009 | 67 29.495 | 69 31.491 | 480 | 494 |
| 19 | 381.150 | 19 | NBP21301.023 | 67 12.699 | 69 59.027 | 401 | 397 |
| 20 | 381.180 | 20 | NBP21301.029 | 67 02.391 | 70 42.783 | 493 | 480 |
| 21 | 381.220 | 21 | NBP21401.003 | 66 48.825 | 71 24.863 | 472 | 460 |
| 22 | 381.264 | 22 | NBP21401.011 | 66 34.94 | 72 12.69 | 3329 | 3312 |
| 23 | 341.295 | 23 | NBP21501.002 | 66 41.1342 | 73 18.7321 | 3583 | 3639 |
| 24 | 341.253 | 24 | NBP21501.018 | 66 55.32 | 72 35.16 | 506 | 503 |
| *25 | 341.220 | 25 | NBP21601.004 | 67 7.434 | 71 58.132 | 420 | 415 |
| *26 | 341.180 | 26 | NBP21601.015 | 67 20.18 | 71 13.71 | 485 | 466 |
| 27 | 341.140 | 27 | NBP21601.028 | 67 32.49 | 70 31.96 | 768 | 758 |
| *28 | 341.100 | 28 | NBP21701.002 | 67 44.929 | 69 47.934 | 369 | 365 |
| 42 | 301.100 | 29 | NBP21701.007 | 68 3.0883 | 70 19.3951 | 765 | 709 |
| 41 | 301.060 | 30 | NBP21701.019 | 68 15.62 | 69 33.84 | 670 | 660 |
| 40 | 301.020 | 31 | NBP21801.003 | 68 27.893 | 68 46.271 | 704 | 709 |
| *39 | 301.-020 | 32 | NBP21801.015 | 68 35.34 | 68 35.33 | 188 | 176 |
| *38 | 341.-020 | 33 | NBP21901.003 | 68 21.784 | 67 52.796 | 426 | 434 |
| 37 | 341.020 | 34 | NBP21901.014 | 68 10.84 | 68 12.36 | 555 | 553 |
| *36 | 381.020 | 35 | NBP21901.018 | 67 51.27 | 67 40.89 | 333 | 325 |
| 35 | 368.036 | 36 | NBP22001.006 | 67 53.456 | 68 19.915 | 761 | 752 |
| 34 | 358.046 | 37 | NBP22001.017 | 67 55.49 | 67 59.97 | 577 | 594 |
| 33 | 345.052 | 38 | NBP22001.024 | 67 58.85 | 68 46.56 | 144 | 136 |
| 31 | 352.071 | 39 | NBP22001.027 | 67 49.87 | 67 49.96 | 156 | 134 |
| *30 | 349.084 | 40 | NBP22001.030 | 67 47.17 | 69 20.64 | 169 | 161 |
| *29 | 368.098 | 41 | NBP22101.002 | 67 34.883 | 69 23.417 | 182 | 164 |
| 44 | 301.180 | 43 | NBP22101.019 | 67 36.38 | 71 49.40 | 399 | 387 |
| 45 | 301.220 | 44 | NBP22201.002 | 67 23.055 | 72 34.068 | 384 | 373 |
| 46 | 301.265 | 45 | NBP22201.009 | 67 7.783 | 73 22.177 | 1980 | 1931 |
| 47 | 261.295 | 46 | NBP22301.005 | 67 13.082 | 74 28.835 | 2927 | 2958 |
| 48 | 261.255 | 47 | NBP22301.023 | 67 28.09 | 73 46.53 | 390 | 380 |
| 49 | 261.220 | 48 | NBP22401.002 | 67 41.614 | 73 7.614 | 486 | 477 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| *50 | 261.180 | 49 | NBP22401.008 | 67 53.575 | 72 23.550 | 302 | 289 |
| 51 | 261.140 | 50 | NBP22501.002 | 68 7.608 | 71 40.296 | 518 | 553 |
| *52 | 261.100 | 51 | NBP22701.005 | 68 19.48 | 70 54.83 | 499 | 490 |
| 53 | 256.080 | 52 | NBP22701.012 | 68 28.36 | 70 36.29 | 656 | 663 |
| 54 | 268.057 | 53 | NBP22801.005 | 68 30.427 | 69 59.635 | 1142 | 1129 |
| *59 | 240.057 | 54 | NBP22801.017 | 68 42.76 | 70 23.23 | 400 | 394 |
| *60 | 221.075 | 55 | NBP22801.025 | 68 44.97 | 71 0.30 | 294 | 283 |
| *61 | 221.100 | 56 | NBP22901.002 | 68 37.09 | 71 29.07 | 206 | 197 |
| *62 | 221.140 | 57 | NBP22901.011 | 68 23.30 | 72 17.19 | 460 | 436 |
| *63 | 221.180 | 58 | NBP22901.024 | 68 9.98 | 73 2.72 | 345 | 331 |
| 73 | 181.180 | 59 | NBP23001.001 | 68 26.799 | 73 40.345 | 540 | 521 |
| 74 | 181.140 | 60 | NBP23001.016 | 68 40.68 | 72 55.02 | 298 | 293 |
| *75 | 181.100 | 61 | NBP23101.003 | 68 49.16 | 72 20.50 | 123 | 123 |
| *76 | 141.100 | 62 | NBP23101.012 | 69 04.74 | 73 05.15 | 266 | 274 |
| *77 | 141.140 | 63 | NBP23201.001 | 68 57.37 | 73 30.44 | 176 | 154 |
| 78 | 141.180 | 64 | NBP23201.008 | 68 43.556 | 74 14.261 | 510 | 506 |
| *83 | 101.180 | 65 | NBP23201.021 | 68 59.47 | 74 55.58 | 408 | 393 |
| *87 | 061.180 | 66 | NBP23301.030 | 69 14.54 | 75 41.3 | 400 | 300 |
| 80 | 141.255 | 67 | NBP23401.012 | 68 17.204 | 75 40.172 | 1850 | 1001 |
| 71 | 181.241 | 68 | NBP23401.022 | 68 3.10 | 74 43.98 | 785 | 810 |
| 66 | 220.242 | 69 | NBP23501.012 | 67 47.89 | 74 10.37 | 1210 | 1047 |
| 13 | 420.247 | 70 | NBP23601.008 | 66 23.85 | 71 22.04 | 840 | 847 |
| 14 | 421.225 | 71 | NBP23601.019 | 66 30.68 | 71 3.60 | 530 | 520 |
| 15 | 421.180 | 72 | NBP23701.001 | 66 46.001 | 70 10.493 | 540 | 538 |
| 16 | 421.145 | 73 | NBP23701.007 | 66 56.94 | 69 29.83 | 521 | 513 |

Appendix 3: Summary of the water samples taken on each CTD cast during the second U.S. Southern Ocean GLOBEC survey cruise, NBP01-04. The depth (m), temperature (°C), salinity (psu), oxygen (ml $L^{-1}$), photosynthetically active radiation (PAR, $\mu E\ cm^2$), transmission (trans, % transmission), and fluorescence (fluor., mg $L^{-1}$) measured by the CTD sensors at the time that the Niskin bottle was tripped is given. Niskin bottles from which water was taken for oxygen and salinity determinations are indicated by *. Water for nutrient samples was taken from every Niskin bottle. Water for chlorophyll determination was taken at standard depths of 100 m, 50 m, 30 m, 20 m, 15 m, 10 m, 5 m, and the surface. Percent transmission is given as a value relative to a full scale value, which needs to be obtained.

| Station: 0/0/0 Latitude: 64 38.79S Longitude: 69 19.89W Depth: 2706 m | | | | | | | |
|---|---|---|---|---|---|---|---|
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 501.900 | 1.8578 | 34.7126 | 4.0785 | 0.0520 | 91.78 | 0.0380 |
| 2 | 502.482 | 1.8579 | 34.7125 | 4.0994 | 0.0519 | 91.77 | 0.0355 |
| * 3 | 350.503 | 1.9353 | 34.6817 | 3.9701 | 0.0521 | 91.77 | 0.0586 |
| 4 | 200.898 | 1.6880 | 34.5774 | 4.0322 | 0.0590 | 91.67 | 0.0195 |
| 5 | 84.931 | -1.8036 | 33.9428 | 7.6627 | 0.4840 | 91.58 | 0.0308 |
| 6 | 50.040 | -1.8262 | 33.9374 | 7.9185 | 1.9950 | 91.58 | 0.0363 |
| 7 | 35.849 | -1.8309 | 33.9362 | 7.9057 | 3.8230 | 91.58 | 0.0798 |
| 8 | 30.382 | -1.8305 | 33.9369 | 7.8799 | 4.7070 | 91.58 | 0.0307 |
| 9 | 20.248 | -1.8311 | 33.9392 | 7.8374 | 7.8810 | 91.53 | 0.0557 |
| 10 | 15.218 | -1.8336 | 33.9376 | 7.8048 | 10.1500 | 91.59 | 0.0448 |
| 11 | 9.844 | -1.8316 | 33.9380 | 7.7784 | 12.5500 | 91.60 | 0.0499 |
| 12 | 5.362 | -1.8283 | 33.9382 | 7.7656 | 17.2600 | 91.47 | 0.0364 |
| 13 | 5.108 | -1.8270 | 33.9383 | 7.7724 | 17.3700 | 91.55 | 0.0811 |
| *14 | 0.573 | -1.8247 | 33.9380 | 7.7503 | 31.6100 | 91.46 | 0.0312 |
| 15 | 0.551 | -1.8254 | 33.9382 | 7.7545 | 32.6900 | 91.45 | 0.0443 |
| 16 | 0.548 | -1.8232 | 33.9381 | 7.7651 | 31.8600 | 91.57 | 0.0696 |
| 17 | 0.550 | -1.8241 | 33.9381 | 7.7627 | 32.0400 | 91.53 | 0.0655 |
| 18 | 0.554 | -1.8242 | 33.9382 | 7.7583 | 32.2000 | 91.53 | 0.0632 |
| 19 | 0.568 | -1.8242 | 33.9381 | 7.7519 | 32.6900 | 91.51 | 0.0582 |
| 20 | 0.580 | -1.8246 | 33.9382 | 7.7666 | 32.6500 | 91.52 | 0.0731 |
| 21 | 0.575 | -1.8264 | 33.9380 | 7.7467 | 31.7100 | 91.43 | 0.0736 |
| 22 | 0.565 | -1.8260 | 33.9380 | 7.7529 | 32.1900 | 91.24 | 0.0675 |
| Station: 507.271/1/1 Latitude: 65 38.607S Longitude: 70 37.57W Depth: 3122 m | | | | | | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 1000.585 | 1.1806 | 34.7281 | 4.5737 | 0.0518 | 91.75 | 0.0347 |
| 2 | 1000.611 | 1.1794 | 34.7283 | 4.5827 | 0.0520 | 91.75 | 0.0460 |
| * 3 | 481.983 | 1.6019 | 34.6630 | 4.0166 | 0.0520 | 91.69 | 0.0219 |
| * 4 | 302.423 | 0.9294 | 34.4937 | 4.3971 | 0.0520 | 91.64 | 0.0295 |
| * 5 | 150.614 | -1.8197 | 33.9598 | 7.5830 | 0.0519 | 91.61 | 0.0323 |
| 6 | 100.524 | -1.8220 | 33.9596 | 7.6185 | 0.0519 | 91.62 | 0.0334 |
| 7 | 50.215 | -1.8334 | 33.9596 | 7.5437 | 0.0537 | 91.62 | 0.0367 |
| 8 | 30.330 | -1.8361 | 33.9604 | 7.5210 | 0.0619 | 91.64 | 0.0257 |
| 9 | 20.080 | -1.8356 | 33.9604 | 7.4964 | 0.0781 | 91.64 | 0.0253 |
| 10 | 15.304 | -1.8375 | 33.9608 | 7.4966 | 0.0979 | 91.63 | 0.0697 |
| 11 | 10.488 | -1.8381 | 33.9608 | 7.4814 | 0.1455 | 91.63 | 0.0229 |
| 12 | 5.554 | -1.8349 | 33.9609 | 7.4683 | 0.2824 | 91.63 | 0.0613 |
| *13 | 1.249 | -1.8321 | 33.9606 | 7.4690 | 0.7650 | 91.49 | 0.0348 |
| 14 | 1.250 | -1.8331 | 33.9607 | 7.4814 | 0.8195 | 91.61 | 0.0345 |
| Station: 500.251/2/2 Latitude: 65 48.255S Longitude: 70 22.47W Depth: 767 m | | | | | | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 790.663 | 1.3412 | 34.7327 | 4.3228 | 0.0520 | 91.74 | 0.0530 |
| 2 | 790.645 | 1.3397 | 34.7328 | 4.3265 | 0.0520 | 91.75 | 0.0417 |
| 3 | 600.922 | 1.5328 | 34.7330 | 4.1608 | 0.0520 | 91.77 | 0.0142 |
| 4 | 601.117 | 1.5324 | 34.7331 | 4.1688 | 0.0521 | 91.76 | 0.0152 |
| * 5 | 400.339 | 1.8293 | 34.7169 | 3.9408 | 0.0521 | 91.80 | 0.0257 |
| * 6 | 220.329 | 1.7944 | 34.6439 | 3.8194 | 0.0542 | 91.75 | 0.0299 |
| 7 | 149.823 | 0.8951 | 34.4735 | 4.3207 | 0.0712 | 91.66 | 0.0212 |
| * 8 | 99.053 | -1.2424 | 34.0722 | 6.5304 | 0.1542 | 91.63 | 0.0694 |
| 9 | 49.780 | -1.8260 | 33.9548 | 7.3334 | 0.9066 | 91.59 | 0.0282 |
| 10 | 30.027 | -1.8283 | 33.9549 | 7.3193 | 2.3900 | 91.59 | 0.0641 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 11 | 20.041 | -1.8297 | 33.9549 | 7.2770 | 4.9390 | 91.59 | 0.0352 |
| 12 | 15.383 | -1.8317 | 33.9546 | 7.2585 | 8.0670 | 91.59 | 0.0255 |
| 13 | 15.377 | -1.8318 | 33.9545 | 7.2386 | 7.9700 | 91.59 | 0.0259 |
| 14 | 10.465 | -1.8319 | 33.9547 | 7.2345 | 14.0400 | 91.60 | 0.0587 |
| 15 | 5.472 | -1.8333 | 33.9545 | 7.2151 | 23.3100 | 91.61 | 0.0355 |
| 16 | 5.459 | -1.8324 | 33.9545 | 7.2197 | 22.7500 | 91.59 | 0.0393 |
| *17 | 0.717 | -1.8320 | 33.9547 | 7.1874 | 48.0000 | 91.61 | 0.0266 |
| 18 | 0.706 | -1.8330 | 33.9546 | 7.2049 | 50.2500 | 91.60 | 0.0271 |
| Station: 501.220/3/3 Latitude: 65 57.997S Longitude: 68 48.220W Depth: 340 m | | | | | | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 326.673 | 1.5511 | 34.7002 | 3.7554 | 0.0519 | 91.08 | 0.0377 |
| 2 | 326.697 | 1.5510 | 34.7003 | 3.7630 | 0.0519 | 91.08 | 0.0361 |
| 3 | 326.775 | 1.5511 | 34.7003 | 3.7658 | 0.0520 | 91.04 | 0.0383 |
| 4 | 150.714 | 0.6180 | 34.4605 | 4.4546 | 0.0520 | 91.58 | 0.0539 |
| 5 | 100.431 | -0.8324 | 34.1663 | 5.9832 | 0.0521 | 91.62 | 0.0261 |
| * 6 | 80.258 | -1.8235 | 33.9713 | 7.5561 | 0.0522 | 91.56 | 0.0627 |
| 7 | 49.961 | -1.8237 | 33.9684 | 7.6010 | 0.0541 | 91.62 | 0.0545 |
| 8 | 30.465 | -1.8250 | 33.9671 | 7.5477 | 0.0615 | 91.61 | 0.0373 |
| 9 | 19.648 | -1.8263 | 33.9672 | 7.5189 | 0.0804 | 91.61 | 0.0342 |
| 10 | 15.309 | -1.8265 | 33.9671 | 7.5082 | 0.1028 | 91.61 | 0.0361 |
| 11 | 10.373 | -1.8276 | 33.9673 | 7.5101 | 0.1469 | 91.61 | 0.0652 |
| 12 | 5.020 | -1.8240 | 33.9673 | 7.5016 | 0.3135 | 91.62 | 0.0337 |
| 13 | 5.021 | -1.8238 | 33.9673 | 7.4960 | 0.3250 | 91.61 | 0.0360 |
| *14 | 0.364 | -1.8216 | 33.9676 | 7.4886 | 0.8995 | 91.55 | 0.0371 |
| 15 | 0.392 | -1.8218 | 33.9675 | 7.4673 | 0.9416 | 91.55 | 0.0420 |
| Station: 501.184/4/4 Latitude: 66 10.289S Longitude: 69 5.773W Depth: 346 m | | | | | | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 330.441 | 1.5488 | 34.7005 | 3.9222 | 0.0519 | 91.20 | 0.0271 |
| 2 | 330.501 | 1.5488 | 34.7005 | 3.9219 | 0.0520 | 91.21 | 0.0374 |
| * 3 | 218.652 | 1.5746 | 34.6486 | 4.0356 | 0.0520 | 91.60 | 0.0527 |
| * 4 | 120.333 | 0.4268 | 34.4175 | 4.7143 | 0.0521 | 91.59 | 0.0166 |
| 5 | 100.119 | -0.5706 | 34.2160 | 5.7125 | 0.0520 | 91.56 | 0.0360 |
| 6 | 50.118 | -1.7614 | 33.9068 | 7.5315 | 0.0534 | 91.20 | 0.0318 |
| 7 | 29.779 | -1.8482 | 33.8598 | 7.6719 | 0.0604 | 91.06 | 0.0616 |
| 8 | 29.791 | -1.8479 | 33.8599 | 7.6706 | 0.0610 | 90.97 | 0.0700 |
| 9 | 20.050 | -1.8484 | 33.8598 | 7.6731 | 0.0782 | 91.06 | 0.0281 |
| 10 | 15.255 | -1.8514 | 33.8586 | 7.6595 | 0.1002 | 91.07 | 0.0453 |
| 11 | 10.159 | -1.8514 | 33.8584 | 7.6453 | 0.1539 | 91.06 | 0.0371 |
| 12 | 5.139 | -1.8509 | 33.8585 | 7.6203 | 0.3171 | 91.06 | 0.0388 |
| 13 | 5.098 | -1.8464 | 33.8581 | 7.6163 | 0.3249 | 91.07 | 0.0296 |
| *14 | 1.172 | -1.8362 | 33.8579 | 7.5979 | 0.7732 | 91.06 | 0.0471 |
| 15 | 1.169 | -1.8236 | 33.8575 | 7.5960 | 0.7949 | 91.06 | 0.0359 |
| Station: 501.147/5/5 Latitude: 66 22.559S Longitude: 68 21.292W Depth: 717 m | | | | | | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 701.142 | 1.3542 | 34.7238 | 4.2881 | 0.0520 | 90.60 | 0.0571 |
| 2 | 701.292 | 1.3541 | 34.7238 | 4.2882 | 0.0519 | 90.76 | 0.0570 |
| * 3 | 300.217 | 1.4628 | 34.6617 | 4.1170 | 0.0521 | 91.54 | 0.0199 |
| 4 | 150.070 | 0.1314 | 34.3569 | 5.0136 | 0.0667 | 91.49 | 0.0617 |
| 5 | 100.256 | -1.4445 | 33.9334 | 7.1737 | 0.1518 | 90.99 | 0.0232 |
| * 6 | 80.047 | -1.6468 | 33.8776 | 7.4868 | 0.2928 | 90.86 | 0.0662 |
| 7 | 50.212 | -1.7725 | 33.8199 | 7.4870 | 1.0580 | 90.60 | 0.0308 |
| 8 | 30.309 | -1.7639 | 33.8167 | 7.4223 | 2.7560 | 90.58 | 0.0209 |
| 9 | 30.295 | -1.7639 | 33.8167 | 7.4118 | 2.7550 | 90.59 | 0.0226 |
| 10 | 30.298 | -1.7639 | 33.8169 | 7.4284 | 2.7580 | 90.59 | 0.0316 |
| 11 | 30.299 | -1.7640 | 33.8169 | 7.4347 | 2.7600 | 90.58 | 0.0359 |
| 12 | 30.328 | -1.7641 | 33.8169 | 7.4325 | 2.7600 | 90.58 | 0.0406 |
| 13 | 20.159 | -1.7643 | 33.8169 | 7.4041 | 4.7730 | 90.58 | 0.0210 |
| 14 | 15.194 | -1.7651 | 33.8165 | 7.3744 | 6.4930 | 90.58 | 0.0468 |
| 15 | 10.198 | -1.7667 | 33.8161 | 7.3558 | 9.0790 | 90.58 | 0.0295 |
| 16 | 5.202 | -1.7575 | 33.8142 | 7.3065 | 14.2600 | 90.58 | 0.0368 |
| *17 | 5.210 | -1.7610 | 33.8145 | 7.3079 | 14.4200 | 90.56 | 0.0547 |
| 18 | 0.431 | -1.7544 | 33.8140 | 7.3090 | 31.1700 | 90.57 | 0.0215 |
| 19 | 0.405 | -1.7548 | 33.8141 | 7.3033 | 32.0100 | 90.56 | 0.0249 |
| Station: 501.120/6/6 Latitude: 66 29.036S Longitude: 68 0.355W Depth: 288 m | | | | | | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 293.857 | 1.3785 | 34.6839 | 4.1855 | 0.0519 | 91.22 | 0.0327 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 2 | 293.771 | 1.3784 | 34.6840 | 4.1834 | 0.0519 | 91.24 | 0.0306 |
| 3 | 241.778 | 1.1542 | 34.5942 | 4.3351 | 0.0520 | 91.13 | 0.0401 |
| 4 | 100.708 | 0.2718 | 34.2670 | 5.4151 | 0.0520 | 90.79 | 0.0255 |
| * 5 | 50.509 | -1.7686 | 33.8589 | 7.2788 | 0.0528 | 90.23 | 0.0359 |
| 6 | 30.706 | -1.8086 | 33.8435 | 7.4577 | 0.0571 | 90.22 | 0.0624 |
| 7 | 20.878 | -1.8042 | 33.8443 | 7.4462 | 0.0702 | 90.24 | 0.0336 |
| 8 | 15.954 | -1.8016 | 33.8461 | 7.4380 | 0.0885 | 90.23 | 0.0324 |
| 9 | 10.913 | -1.8040 | 33.8464 | 7.4177 | 0.1373 | 90.23 | 0.0617 |
| 10 | 5.551 | -1.8065 | 33.8453 | 7.4058 | 0.3174 | 90.23 | 0.0353 |
| 11 | 5.545 | -1.8055 | 33.8452 | 7.3943 | 0.3190 | 90.24 | 0.0263 |
| *12 | 0.722 | -1.8096 | 33.8488 | 7.3907 | 1.0050 | 90.24 | 0.0538 |
| 13 | 0.770 | -1.8094 | 33.8492 | 7.3755 | 1.0410 | 90.23 | 0.0468 |
| Station: 460.115/7/7 Latitude: 66 48.616S Longitude: 68 27.304W Depth: 120 m | | | | | | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 105.965 | 0.3764 | 34.3000 | 5.3523 | 0.0518 | 90.59 | 0.0333 |
| 2 | 106.023 | 0.3798 | 34.3012 | 5.3449 | 0.0518 | 90.58 | 0.0411 |
| 3 | 100.623 | 0.3585 | 34.2918 | 5.3660 | 0.0518 | 90.58 | 0.0290 |
| * 4 | 50.558 | 0.1213 | 34.1924 | 5.7854 | 0.0528 | 90.61 | 0.0565 |
| 5 | 30.048 | -0.8668 | 34.0181 | 6.5977 | 0.0582 | 89.47 | 0.0272 |
| 6 | 25.243 | -1.0014 | 34.0004 | 6.7394 | 0.0622 | 89.57 | 0.0724 |
| 7 | 20.395 | -1.0093 | 33.9985 | 6.7569 | 0.0711 | 89.56 | 0.0241 |
| 8 | 15.234 | -1.0438 | 33.9939 | 6.7887 | 0.0922 | 89.58 | 0.0295 |
| 9 | 10.290 | -1.0181 | 33.9972 | 6.7641 | 0.1466 | 89.56 | 0.0487 |
| 10 | 5.453 | -1.0093 | 33.9974 | 6.7097 | 0.2950 | 89.57 | 0.0235 |
| 11 | 5.374 | -1.0067 | 33.9970 | 6.6963 | 0.3384 | 89.58 | 0.0207 |
| *12 | 1.600 | -1.0188 | 33.9963 | 6.7098 | 0.7194 | 89.59 | 0.0381 |
| 13 | 1.564 | -1.0165 | 33.9956 | 6.7096 | 0.7264 | 89.59 | 0.0345 |
| Station: 460.115/8/8 Latitude: 66 40.242S Longitude: 68 54.326W Depth: 340 m | | | | | | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 327.665 | 1.4031 | 34.6812 | 4.2123 | 0.0518 | 91.04 | 0.0193 |
| 2 | 327.818 | 1.4015 | 34.6806 | 4.2160 | 0.0519 | 91.03 | 0.0232 |
| 3 | 140.945 | 0.3566 | 34.3628 | 5.2115 | 0.0519 | 91.32 | 0.0581 |
| 4 | 101.088 | -0.7777 | 34.0460 | 6.6571 | 0.0520 | 91.21 | 0.0357 |
| * 5 | 81.029 | -1.5252 | 33.8847 | 7.5597 | 0.0519 | 90.96 | 0.0272 |
| 6 | 50.567 | -1.7586 | 33.8393 | 7.7937 | 0.0531 | 90.88 | 0.0358 |
| 7 | 30.676 | -1.7783 | 33.8367 | 7.7761 | 0.0596 | 90.89 | 0.0533 |
| 8 | 20.529 | -1.7813 | 33.8362 | 7.7584 | 0.0743 | 90.88 | 0.0340 |
| 9 | 15.765 | -1.7835 | 33.8361 | 7.7363 | 0.0959 | 90.88 | 0.0452 |
| 10 | 10.652 | -1.7830 | 33.8360 | 7.7351 | 0.1457 | 90.89 | 0.0365 |
| 11 | 5.845 | -1.7816 | 33.8359 | 7.6645 | 0.2976 | 90.88 | 0.0353 |
| 12 | 5.900 | -1.7816 | 33.8360 | 7.6469 | 0.2988 | 90.90 | 0.0433 |
| *13 | 1.454 | -1.7789 | 33.8360 | 7.6303 | 0.7668 | 90.88 | 0.0301 |
| 14 | 1.465 | -1.7786 | 33.8359 | 7.6326 | 0.7685 | 90.87 | 0.0275 |
| Station: 461.180/9/9 Latitude: 66 28.083S Longitude: 69 37.750W Depth: 508 m | | | | | | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 496.817 | 1.3304 | 34.7314 | 4.5100 | 0.0520 | 91.57 | 0.0220 |
| 2 | 496.848 | 1.3303 | 34.7314 | 4.5061 | 0.0520 | 91.57 | 0.0320 |
| * 3 | 300.739 | 1.4938 | 34.6830 | 4.1855 | 0.0522 | 91.57 | 0.0521 |
| 4 | 150.360 | 0.1019 | 34.3747 | 5.1065 | 0.0741 | 91.51 | 0.0230 |
| * 5 | 100.401 | -1.7557 | 33.9916 | 7.3313 | 0.2135 | 91.48 | 0.0669 |
| 6 | 50.647 | -1.7885 | 33.9526 | 7.7172 | 1.7520 | 91.29 | 0.0272 |
| 7 | 30.813 | -1.7714 | 33.9164 | 7.7424 | 4.7480 | 91.18 | 0.0340 |
| 8 | 20.788 | -1.7474 | 33.8594 | 7.7585 | 8.3960 | 91.09 | 0.0622 |
| 9 | 15.542 | -1.7920 | 33.8333 | 7.7871 | 11.7000 | 91.00 | 0.0647 |
| 10 | 10.366 | -1.8088 | 33.8255 | 7.7959 | 16.6300 | 90.97 | 0.0350 |
| 11 | 4.696 | -1.8240 | 33.8168 | 7.7337 | 28.1600 | 90.98 | 0.0281 |
| 12 | 4.775 | -1.8225 | 33.8167 | 7.7341 | 27.8500 | 90.97 | 0.0360 |
| *13 | 0.919 | -1.8223 | 33.8167 | 7.7409 | 50.3700 | 90.95 | 0.0748 |
| 14 | 0.920 | -1.8226 | 33.8168 | 7.7223 | 50.4500 | 90.96 | 0.0645 |
| Station: 461.220/10/10 Latitude: 66 15.22S Longitude: 70 20.66W Depth: 462 m | | | | | | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 459.496 | 1.6167 | 34.7259 | 4.3518 | 0.0520 | 91.51 | 0.0177 |
| 2 | 459.479 | 1.6166 | 34.7259 | 4.3447 | 0.0520 | 91.50 | 0.0257 |
| 3 | 378.555 | 1.7279 | 34.7198 | 4.2990 | 0.0521 | 91.66 | 0.0244 |
| * 4 | 250.425 | 1.7481 | 34.6798 | 4.2023 | 0.0520 | 91.61 | 0.0607 |
| 5 | 149.784 | 0.4825 | 34.4493 | 4.7681 | 0.0520 | 91.44 | 0.0579 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 6 | 98.525 | -0.7795 | 34.2213 | 5.9752 | 0.0519 | 91.45 | 0.0274 |
| 7 | 49.692 | -1.8288 | 33.9135 | 7.5184 | 0.0537 | 91.41 | 0.0328 |
| 8 | 29.547 | -1.8295 | 33.9134 | 7.5284 | 0.0619 | 91.42 | 0.0269 |
| 9 | 20.102 | -1.8300 | 33.9142 | 7.4932 | 0.0784 | 91.43 | 0.0424 |
| 10 | 15.125 | -1.8293 | 33.9134 | 7.5121 | 0.1026 | 91.42 | 0.0294 |
| 11 | 10.233 | -1.8291 | 33.9134 | 7.5023 | 0.1512 | 91.43 | 0.0260 |
| 12 | 5.199 | -1.8286 | 33.9133 | 7.4218 | 0.3266 | 91.43 | 0.0654 |
| 13 | 5.204 | -1.8278 | 33.9130 | 7.4285 | 0.3151 | 91.43 | 0.0696 |
| *14 | 0.689 | -1.8265 | 33.9128 | 7.4060 | 0.9277 | 91.43 | 0.0361 |
| 15 | 0.697 | -1.8262 | 33.9127 | 7.4049 | 0.9645 | 91.43 | 0.0316 |
| Station: 460.250/11/11 Latitude: 66 5.943S Longitude: 70 5.720W Depth: 980 m | | | | | | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 978.156 | 1.0393 | 34.7261 | 4.8258 | 0.0519 | 91.59 | 0.0198 |
| 2 | 978.163 | 1.0395 | 34.7261 | 4.8309 | 0.0518 | 91.60 | 0.0296 |
| 3 | 799.795 | 1.2296 | 34.7314 | 4.7075 | 0.0519 | 91.59 | 0.0244 |
| * 4 | 648.642 | 1.5949 | 34.7309 | 4.4428 | 0.0519 | 91.58 | 0.0582 |
| * 5 | 398.255 | 1.7107 | 34.7029 | 4.2677 | 0.0520 | 91.62 | 0.0226 |
| * 6 | 274.807 | 1.5239 | 34.6343 | 4.2382 | 0.0520 | 91.58 | 0.0256 |
| 7 | 199.997 | 1.0960 | 34.5365 | 4.4506 | 0.0521 | 91.51 | 0.0180 |
| 8 | 150.256 | 0.3574 | 34.3880 | 5.1155 | 0.0520 | 91.52 | 0.0202 |
| 9 | 100.094 | -1.4713 | 34.0601 | 7.0683 | 0.0520 | 91.51 | 0.0254 |
| 10 | 50.363 | -1.8427 | 33.9161 | 7.7696 | 0.0532 | 91.42 | 0.0499 |
| 11 | 30.365 | -1.8431 | 33.9150 | 7.7312 | 0.0609 | 91.41 | 0.0354 |
| 12 | 20.398 | -1.8433 | 33.9153 | 7.7131 | 0.0737 | 91.41 | 0.0321 |
| 13 | 15.217 | -1.8426 | 33.9150 | 7.6672 | 0.0992 | 91.41 | 0.0446 |
| 14 | 10.369 | -1.8438 | 33.9157 | 7.6620 | 0.1437 | 91.41 | 0.0515 |
| 15 | 5.119 | -1.7861 | 33.9181 | 7.5757 | 0.3318 | 91.41 | 0.0242 |
| 16 | 5.107 | -1.7781 | 33.9159 | 7.5733 | 0.3282 | 91.41 | 0.0310 |
| 17 | 1.296 | -1.8175 | 33.9168 | 7.5418 | 0.7363 | 91.40 | 0.0666 |
| *18 | 1.290 | -1.8209 | 33.9164 | 7.5427 | 0.7433 | 91.41 | 0.0680 |
| Station: 459.265/12/12 Latitude: 66 1.3927S Longitude: 71 11.700W Depth: 3090 | | | | | | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 3138.495 | 0.4220 | 34.7091 | 5.2498 | 0.0458 | 0.00 | 0.0189 |
| 2 | 3138.470 | 0.4220 | 34.7090 | 5.2506 | 0.0458 | 0.00 | 0.0142 |
| * 3 | 2897.606 | 0.4136 | 34.7090 | 5.1875 | 0.0458 | 0.00 | 0.0193 |
| * 4 | 1493.434 | 0.9929 | 34.7237 | 4.7579 | 0.0458 | 0.00 | 0.0200 |
| * 5 | 800.886 | 1.4943 | 34.7368 | 4.5221 | 0.0458 | 0.00 | 0.0193 |
| * 6 | 300.292 | 1.8776 | 34.6874 | 4.0992 | 0.0458 | 0.00 | 0.0574 |
| 7 | 150.394 | 0.7858 | 34.4514 | 4.7175 | 0.0458 | 0.00 | 0.0542 |
| * 8 | 101.136 | -1.0019 | 34.1945 | 6.4004 | 0.0458 | 0.00 | 0.0288 |
| 9 | 50.428 | -1.8540 | 33.9111 | 7.8088 | 0.0458 | 0.00 | 0.0509 |
| 10 | 20.637 | -1.8561 | 33.9113 | 7.7661 | 0.0458 | 0.00 | 0.0301 |
| 11 | 15.418 | -1.8559 | 33.9113 | 7.7031 | 0.0458 | 0.00 | 0.0340 |
| 12 | 10.801 | -1.8559 | 33.9115 | 7.6836 | 0.0458 | 0.00 | 0.0348 |
| 13 | 5.066 | -1.8305 | 33.9125 | 7.6373 | 0.0458 | 0.00 | 0.0647 |
| 14 | 5.075 | -1.8319 | 33.9126 | 7.6400 | 0.0458 | 0.00 | 0.0625 |
| *15 | 1.179 | -1.8387 | 33.9120 | 7.6215 | 0.0458 | 0.00 | 0.0422 |
| 16 | 1.226 | -1.8367 | 33.9118 | 7.6027 | 0.0458 | 0.00 | 0.0450 |
| Station: 420.247/13/13 Latitude: 66 23.999S Longitude: 71 22.6305W Depth: 844 | | | | | | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 797.075 | 1.2309 | 34.7319 | 4.7516 | 0.0518 | 91.49 | 0.0392 |
| 2 | 797.087 | 1.2311 | 34.7319 | 4.7487 | 0.0518 | 91.49 | 0.0380 |
| * 3 | 400.999 | 1.4927 | 34.7039 | 4.2474 | 0.0519 | 91.24 | 0.0174 |
| * 4 | 300.932 | 1.2629 | 34.6306 | 4.3041 | 0.0518 | 91.31 | 0.0285 |
| * 5 | 150.776 | -0.1373 | 34.2829 | 5.3689 | 0.0518 | 91.25 | 0.0233 |
| * 6 | 100.856 | -1.6513 | 33.8921 | 7.4166 | 0.0518 | 91.25 | 0.0315 |
| 7 | 50.636 | -1.8011 | 33.8571 | 7.6407 | 0.0525 | 91.27 | 0.0257 |
| 8 | 30.680 | -1.8032 | 33.8536 | 7.5803 | 0.0575 | 91.27 | 0.0279 |
| 9 | 20.640 | -1.8039 | 33.8522 | 7.5205 | 0.0744 | 91.26 | 0.0635 |
| 10 | 15.742 | -1.8045 | 33.8513 | 7.5012 | 0.0952 | 91.27 | 0.0215 |
| 11 | 10.675 | -1.8055 | 33.8535 | 7.4947 | 0.1439 | 91.26 | 0.0383 |
| 12 | 5.653 | -1.8067 | 33.8538 | 7.4805 | 0.2958 | 91.27 | 0.0640 |
| 13 | 5.651 | -1.8075 | 33.8543 | 7.4862 | 0.2889 | 91.27 | 0.0718 |
| *14 | 1.312 | -1.8047 | 33.8541 | 7.4642 | 0.7494 | 91.27 | 0.0294 |
| 15 | 1.311 | -1.8044 | 33.8539 | 7.4647 | 0.7090 | 91.26 | 0.0269 |
| Station: 421.225/14/14 Latitude: 66 30.300S Longitude: 70 58.667W Depth: 525 | | | | | | | |

| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
|---|---|---|---|---|---|---|---|
| * 1 | 520.969 | 1.3280 | 34.7241 | 4.3013 | 0.0519 | 90.95 | 0.0376 |
| 2 | 520.971 | 1.3280 | 34.7242 | 4.3064 | 0.0519 | 90.94 | 0.0321 |
| * 3 | 250.633 | 1.3803 | 34.6615 | 4.2272 | 0.0519 | 91.38 | 0.0408 |
| * 4 | 150.517 | 0.4792 | 34.4517 | 4.6923 | 0.0519 | 91.33 | 0.0308 |
| * 5 | 100.518 | -1.1139 | 34.1035 | 6.5343 | 0.0519 | 91.38 | 0.0373 |
| 6 | 50.387 | -1.8154 | 33.9703 | 7.5664 | 0.0533 | 91.37 | 0.0563 |
| 7 | 30.350 | -1.8312 | 33.9110 | 7.5546 | 0.0610 | 91.17 | 0.0308 |
| 8 | 20.138 | -1.8328 | 33.9078 | 7.5406 | 0.0783 | 91.28 | 0.0613 |
| 9 | 15.392 | -1.8342 | 33.9047 | 7.5400 | 0.0940 | 91.29 | 0.0358 |
| 10 | 10.374 | -1.8342 | 33.9035 | 7.5150 | 0.1402 | 91.29 | 0.0322 |
| 11 | 5.672 | -1.8342 | 33.9034 | 7.4919 | 0.2876 | 91.29 | 0.0552 |
| 12 | 5.672 | -1.8343 | 33.9031 | 7.4848 | 0.2763 | 91.29 | 0.0541 |
| *13 | 1.060 | -1.8303 | 33.9042 | 7.4569 | 0.6720 | 91.22 | 0.0202 |
| 14 | 1.057 | -1.8291 | 33.9043 | 7.4528 | 0.6786 | 91.23 | 0.0213 |
| Station: 421.180/15/15 | Latitude: 66 44.79S | | Longitude: 70 07.12W | | Depth: 510 m | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 514.542 | 1.3758 | 34.7323 | 4.5242 | 0.0519 | 91.37 | 0.0101 |
| 2 | 514.550 | 1.3758 | 34.7323 | 4.5148 | 0.0519 | 91.37 | 0.0179 |
| * 3 | 450.185 | 1.4283 | 34.7338 | 4.5174 | 0.0519 | 91.50 | 0.0144 |
| * 4 | 249.491 | 1.4586 | 34.6720 | 4.2208 | 0.0524 | 91.35 | 0.0345 |
| * 5 | 119.859 | -0.0706 | 34.3344 | 5.1315 | 0.1098 | 91.31 | 0.0200 |
| 6 | 100.056 | -1.1000 | 34.0953 | 6.6270 | 0.1874 | 91.36 | 0.0507 |
| 7 | 50.184 | -1.8328 | 33.9420 | 7.6023 | 1.4710 | 91.31 | 0.0267 |
| 8 | 29.970 | -1.8341 | 33.9420 | 7.5822 | 3.6100 | 91.31 | 0.0297 |
| 9 | 29.982 | -1.8341 | 33.9420 | 7.5776 | 3.5950 | 91.32 | 0.0289 |
| 10 | 19.988 | -1.8343 | 33.9421 | 7.5353 | 6.2940 | 91.32 | 0.0674 |
| 11 | 15.259 | -1.8349 | 33.9421 | 7.5407 | 8.5670 | 91.31 | 0.0236 |
| 12 | 10.298 | -1.8326 | 33.9417 | 7.5094 | 11.7600 | 91.33 | 0.0630 |
| 13 | 5.392 | -1.7393 | 33.9442 | 7.4724 | 17.2000 | 91.32 | 0.0323 |
| 14 | 5.379 | -1.6388 | 33.9382 | 7.4690 | 17.1400 | 91.33 | 0.0344 |
| *15 | 0.490 | -1.8086 | 33.9419 | 7.4762 | 35.3700 | 91.30 | 0.0641 |
| 16 | 0.514 | -1.8077 | 33.9419 | 7.4742 | 35.4600 | 91.29 | 0.0569 |
| Station: 421.145/16/16 | Latitude: 66 56.67S | | Longitude: 69 30.65W | | Depth: 512 m | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 506.797 | 1.3749 | 34.7298 | 4.4516 | 0.0519 | 91.14 | 0.0121 |
| 2 | 506.818 | 1.3769 | 34.7298 | 4.4619 | 0.0520 | 91.14 | 0.0162 |
| 3 | 400.475 | 1.5624 | 34.7128 | 4.2731 | 0.0520 | 91.44 | 0.0393 |
| * 4 | 220.217 | 1.8444 | 34.6665 | 4.1166 | 0.0520 | 91.48 | 0.0190 |
| * 5 | 120.368 | 0.4074 | 34.4121 | 4.9555 | 0.0519 | 91.31 | 0.0387 |
| 6 | 98.459 | 0.2720 | 34.2919 | 5.5957 | 0.0519 | 91.07 | 0.0583 |
| 7 | 50.142 | -1.7822 | 33.9440 | 7.7575 | 0.0531 | 91.13 | 0.0647 |
| 8 | 30.382 | -1.7934 | 33.9311 | 7.8408 | 0.0605 | 91.09 | 0.0488 |
| 9 | 20.479 | -1.7987 | 33.9286 | 7.8328 | 0.0755 | 91.09 | 0.0209 |
| 10 | 14.816 | -1.8008 | 33.9282 | 7.8120 | 0.1066 | 91.09 | 0.0299 |
| 11 | 9.854 | -1.8018 | 33.9280 | 7.7925 | 0.1561 | 91.09 | 0.0329 |
| 12 | 4.837 | -1.7964 | 33.9276 | 7.7794 | 0.3500 | 91.09 | 0.0727 |
| 13 | 4.835 | -1.7956 | 33.9275 | 7.7894 | 0.3290 | 91.08 | 0.0668 |
| *14 | 0.607 | -1.7947 | 33.9276 | 7.7469 | 0.8368 | 91.07 | 0.0285 |
| 15 | 0.591 | -1.7954 | 33.9277 | 7.7569 | 0.8189 | 91.06 | 0.0358 |
| Station: 421.125/17/17 | Latitude: 67 2.968S | | Longitude: 69 6.985W | | Depth: 298 m | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 287.698 | 1.4191 | 34.6802 | 4.1873 | 0.0519 | 91.10 | 0.0209 |
| 2 | 287.700 | 1.4197 | 34.6804 | 4.1923 | 0.0520 | 91.05 | 0.0227 |
| * 3 | 195.029 | 1.1218 | 34.5836 | 4.2883 | 0.0520 | 91.28 | 0.0223 |
| * 4 | 140.833 | 0.3780 | 34.4141 | 4.9064 | 0.0519 | 91.36 | 0.0178 |
| * 5 | 100.665 | -1.0599 | 34.1181 | 6.7064 | 0.0519 | 91.32 | 0.0395 |
| 6 | 50.605 | -1.8275 | 33.9398 | 7.7705 | 0.0536 | 91.21 | 0.0607 |
| 7 | 30.623 | -1.8362 | 33.9297 | 7.7541 | 0.0609 | 91.19 | 0.0248 |
| 8 | 20.604 | -1.8343 | 33.9267 | 7.7216 | 0.0739 | 91.17 | 0.0320 |
| 9 | 15.673 | -1.8342 | 33.9263 | 7.7163 | 0.0942 | 91.18 | 0.0580 |
| 10 | 10.768 | -1.8314 | 33.9190 | 7.6859 | 0.1341 | 91.16 | 0.0558 |
| 11 | 5.788 | -1.8239 | 33.9063 | 7.6737 | 0.2609 | 91.14 | 0.0279 |
| 12 | 5.794 | -1.8238 | 33.9063 | 7.6602 | 0.2629 | 91.14 | 0.0307 |
| *13 | 1.462 | -1.8239 | 33.9129 | 7.6628 | 0.6786 | 91.14 | 0.0433 |
| 14 | 1.466 | -1.8242 | 33.9136 | 7.6675 | 0.6358 | 91.13 | 0.0381 |

| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
|---|---|---|---|---|---|---|---|
| Station: 373.110/18/18 | Latitude: 67 29.495S | | Longitude: 69 31.491W | | Depth: 480 | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 494.857 | 1.3528 | 34.6696 | 4.2150 | 0.0519 | 90.70 | 0.0283 |
| 2 | 494.864 | 1.3535 | 34.6698 | 4.2080 | 0.0519 | 90.69 | 0.0301 |
| * 3 | 420.403 | 1.3349 | 34.6648 | 4.2188 | 0.0520 | 90.76 | 0.0319 |
| * 4 | 250.344 | 1.0314 | 34.5679 | 4.4042 | 0.0519 | 90.95 | 0.0349 |
| * 5 | 150.391 | 0.4202 | 34.3692 | 5.1647 | 0.0525 | 91.02 | 0.0339 |
| 6 | 100.335 | -0.7991 | 34.0785 | 6.7797 | 0.0579 | 90.92 | 0.0231 |
| 7 | 50.053 | -1.6631 | 33.9278 | 7.7327 | 0.1234 | 90.85 | 0.0286 |
| 8 | 30.509 | -1.7254 | 33.9119 | 7.7336 | 0.2432 | 90.88 | 0.0647 |
| 9 | 20.315 | -1.7256 | 33.9119 | 7.7238 | 0.4011 | 90.89 | 0.0355 |
| 10 | 15.628 | -1.7221 | 33.9129 | 7.7069 | 0.5344 | 90.88 | 0.0825 |
| 11 | 10.294 | -1.7266 | 33.9121 | 7.6811 | 0.7811 | 90.89 | 0.0380 |
| 12 | 5.061 | -1.7361 | 33.9102 | 7.6659 | 1.3120 | 90.90 | 0.0637 |
| 13 | 5.058 | -1.7352 | 33.9104 | 7.6705 | 1.3120 | 90.90 | 0.0691 |
| *14 | 0.626 | -1.7327 | 33.9100 | 7.6535 | 2.8070 | 90.89 | 0.0331 |
| 15 | 0.620 | -1.7325 | 33.9102 | 7.6503 | 2.7480 | 90.63 | 0.0232 |
| Station: 381.150/19/19 | Latitude: 67 12.699S | | Longitude: 69 59.027W | | Depth: 401 | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 397.141 | 1.4307 | 34.7189 | 4.3081 | 0.0520 | 90.89 | 0.0188 |
| 2 | 397.147 | 1.4307 | 34.7189 | 4.3064 | 0.0520 | 90.88 | 0.0171 |
| * 3 | 250.485 | 1.4312 | 34.6728 | 4.2133 | 0.0521 | 91.15 | 0.0284 |
| 4 | 160.229 | 0.7633 | 34.5177 | 4.4754 | 0.0534 | 91.15 | 0.0274 |
| * 5 | 120.206 | -0.2326 | 34.2989 | 5.3481 | 0.0573 | 91.15 | 0.0298 |
| 6 | 99.555 | -1.2142 | 34.0953 | 6.6894 | 0.0626 | 91.11 | 0.0711 |
| 7 | 50.056 | -1.8044 | 33.9803 | 7.7418 | 0.1310 | 91.09 | 0.0273 |
| 8 | 30.319 | -1.8037 | 33.9789 | 7.7282 | 0.2385 | 91.09 | 0.0259 |
| 9 | 19.853 | -1.8182 | 33.9734 | 7.7135 | 0.3627 | 91.06 | 0.0613 |
| 10 | 15.189 | -1.8087 | 33.9733 | 7.6980 | 0.4553 | 91.04 | 0.0307 |
| 11 | 10.333 | -1.8098 | 33.9736 | 7.6712 | 0.6115 | 91.04 | 0.0290 |
| 12 | 5.292 | -1.8096 | 33.9725 | 7.6821 | 0.9845 | 91.04 | 0.0591 |
| 13 | 5.295 | -1.8108 | 33.9731 | 7.6847 | 0.9693 | 91.04 | 0.0589 |
| *14 | 0.856 | -1.8126 | 33.9733 | 7.6630 | 2.0460 | 91.01 | 0.0470 |
| 15 | 0.855 | -1.8120 | 33.9733 | 7.6757 | 2.0900 | 91.02 | 0.0388 |
| Station: 381.180/20/20 | Latitude: 67 02.391S | | Longitude: 70 42.783W | | Depth: 493 | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 480.782 | 1.3183 | 34.7219 | 4.2161 | 0.0519 | 90.66 | 0.0231 |
| 2 | 480.784 | 1.3182 | 34.7219 | 4.2171 | 0.0520 | 90.61 | 0.0290 |
| 3 | 350.204 | 1.3843 | 34.7079 | 4.2394 | 0.0520 | 91.23 | 0.0298 |
| * 4 | 225.221 | 1.4475 | 34.6763 | 4.1974 | 0.0521 | 91.17 | 0.0215 |
| 5 | 159.987 | 1.1675 | 34.5915 | 4.2657 | 0.0521 | 91.17 | 0.0209 |
| * 6 | 100.075 | -0.4443 | 34.2441 | 5.8253 | 0.0521 | 91.15 | 0.0520 |
| 7 | 100.083 | -0.4762 | 34.2395 | 5.8844 | 0.0521 | 91.13 | 0.0596 |
| 8 | 50.005 | -1.7836 | 33.9838 | 7.6913 | 0.0538 | 91.11 | 0.0339 |
| 9 | 29.891 | -1.7896 | 33.9832 | 7.6899 | 0.0614 | 91.10 | 0.0368 |
| 10 | 20.338 | -1.7921 | 33.9831 | 7.6942 | 0.0767 | 91.12 | 0.0619 |
| 11 | 14.980 | -1.7922 | 33.9832 | 7.6531 | 0.0973 | 91.12 | 0.0480 |
| 12 | 9.891 | -1.7928 | 33.9830 | 7.6467 | 0.1464 | 91.12 | 0.0359 |
| 13 | 5.137 | -1.7894 | 33.9832 | 7.6503 | 0.2861 | 91.11 | 0.0400 |
| 14 | 5.140 | -1.7888 | 33.9831 | 7.6379 | 0.2936 | 91.12 | 0.0393 |
| *15 | 1.445 | -1.7875 | 33.9831 | 7.6226 | 0.6346 | 91.09 | 0.0711 |
| 16 | 1.444 | -1.7883 | 33.9831 | 7.6139 | 0.6495 | 91.08 | 0.0699 |
| 17 | 1.456 | -1.7891 | 33.9833 | 7.6049 | 0.6780 | 91.07 | 0.0688 |
| Station: 381.220/21/21 | Latitude: 66 48.825S | | Longitude: 71 24.863W | | Depth: 472 | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 459.993 | 1.3320 | 34.7247 | 4.2765 | 0.0520 | 90.72 | 0.0312 |
| 2 | 460.000 | 1.3319 | 34.7248 | 4.2770 | 0.0520 | 90.73 | 0.0333 |
| * 3 | 390.381 | 1.3598 | 34.7079 | 4.0590 | 0.0520 | 91.15 | 0.0531 |
| * 4 | 300.283 | 1.3382 | 34.6831 | 4.1985 | 0.0520 | 91.15 | 0.0404 |
| * 5 | 200.320 | 0.9843 | 34.5827 | 4.2967 | 0.0521 | 91.06 | 0.0224 |
| * 6 | 150.296 | 0.5661 | 34.4690 | 4.5893 | 0.0520 | 91.06 | 0.0567 |
| 7 | 100.077 | -0.8093 | 34.1162 | 6.0976 | 0.0520 | 91.10 | 0.0414 |
| 8 | 50.178 | -1.7913 | 33.9407 | 7.4641 | 0.0534 | 91.07 | 0.0326 |
| 9 | 30.376 | -1.8367 | 33.8842 | 7.5268 | 0.0604 | 91.00 | 0.0318 |
| 10 | 20.392 | -1.8385 | 33.8835 | 7.4899 | 0.0749 | 91.01 | 0.0483 |
| 11 | 15.621 | -1.8385 | 33.8836 | 7.4917 | 0.0940 | 91.01 | 0.0273 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 12 | 10.537 | -1.8055 | 33.8846 | 7.4738 | 0.1394 | 91.01 | 0.0641 |
| 13 | 5.584 | -1.8258 | 33.8843 | 7.4606 | 0.2616 | 91.01 | 0.0485 |
| 14 | 5.587 | -1.8261 | 33.8845 | 7.4683 | 0.2680 | 91.00 | 0.0755 |
| *15 | 1.238 | -1.8281 | 33.8843 | 7.4516 | 0.6578 | 91.00 | 0.0277 |
| 16 | 1.237 | -1.8282 | 33.8843 | 7.4583 | 0.7061 | 91.00 | 0.0314 |
| 17 | 1.242 | -1.8289 | 33.8842 | 7.4599 | 0.7095 | 91.01 | 0.0209 |
| Station: 381.264/22/22 Latitude: 66 34.94S Longitude: 72 12.69W Depth: 3329 m | | | | | | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 3312.955 | 0.3760 | 34.7094 | 5.2410 | 0.0458 | 0.00 | 0.0385 |
| 2 | 3312.965 | 0.3758 | 34.7094 | 5.2411 | 0.0458 | 0.00 | 0.0506 |
| 3 | 2500.418 | 0.5713 | 34.7122 | 5.0352 | 0.0458 | 0.00 | 0.0183 |
| 4 | 2000.763 | 0.8140 | 34.7177 | 4.8782 | 0.0458 | 0.00 | 0.0517 |
| 5 | 1496.106 | 1.1033 | 34.7276 | 4.7041 | 0.0458 | 0.00 | 0.0460 |
| 6 | 1000.739 | 1.4787 | 34.7356 | 4.4922 | 0.0458 | 0.00 | 0.0191 |
| * 7 | 250.240 | 2.0668 | 34.6326 | 4.0377 | 0.0458 | 0.00 | 0.0189 |
| 8 | 100.551 | 1.3104 | 34.3851 | 4.8659 | 0.0458 | 0.00 | 0.0623 |
| 9 | 60.664 | -1.6563 | 33.9964 | 7.6241 | 0.0458 | 0.00 | 0.0382 |
| 10 | 60.670 | -1.6575 | 33.9955 | 7.6610 | 0.0458 | 0.00 | 0.0368 |
| 11 | 60.672 | -1.6584 | 33.9946 | 7.6656 | 0.0458 | 0.00 | 0.0320 |
| 12 | 60.685 | -1.6615 | 33.9931 | 7.6946 | 0.0458 | 0.00 | 0.0403 |
| *13 | 50.250 | -1.8038 | 33.9660 | 7.9522 | 0.0458 | 0.00 | 0.0378 |
| 14 | 50.245 | -1.8011 | 33.9660 | 7.9223 | 0.0458 | 0.00 | 0.0358 |
| 15 | 30.331 | -1.8169 | 33.9632 | 7.9255 | 0.0458 | 0.00 | 0.0565 |
| 16 | 20.555 | -1.8216 | 33.9621 | 7.8711 | 0.0458 | 0.00 | 0.0280 |
| 17 | 15.461 | -1.8231 | 33.9618 | 7.8543 | 0.0458 | 0.00 | 0.0662 |
| 18 | 10.410 | -1.8238 | 33.9614 | 7.7662 | 0.0458 | 0.00 | 0.0568 |
| 19 | 5.364 | -1.8247 | 33.9611 | 7.7485 | 0.0458 | 0.00 | 0.0337 |
| 20 | 5.369 | -1.8239 | 33.9613 | 7.7324 | 0.0458 | 0.00 | 0.0361 |
| *21 | 0.421 | -1.8132 | 33.9609 | 7.7213 | 0.0458 | 0.00 | 0.0367 |
| 22 | 0.419 | -1.8146 | 33.9610 | 7.7331 | 0.0458 | 0.00 | 0.0273 |
| Station: 341.295/23/23 Latitude: 66 41.1342S Longitude: 73 18.7321W Depth: 35 | | | | | | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 3639.789 | 0.3494 | 34.7088 | 5.3812 | 0.0458 | 0.00 | 0.0234 |
| 2 | 3200.522 | 0.3970 | 34.7097 | 5.2382 | 0.0458 | 0.00 | 0.0303 |
| 3 | 2100.357 | 0.7637 | 34.7161 | 4.9114 | 0.0458 | 0.00 | 0.0147 |
| * 4 | 1800.602 | 0.9116 | 34.7210 | 4.8140 | 0.0458 | 0.00 | 0.0294 |
| 5 | 1500.630 | 1.0687 | 34.7264 | 4.7249 | 0.0458 | 0.00 | 0.0411 |
| 6 | 1200.678 | 1.2605 | 34.7320 | 4.6159 | 0.0458 | 0.00 | 0.0225 |
| 7 | 900.615 | 1.4916 | 34.7348 | 4.4700 | 0.0458 | 0.00 | 0.0300 |
| 8 | 600.409 | 1.7361 | 34.7283 | 4.3148 | 0.0458 | 0.00 | 0.0539 |
| * 9 | 300.357 | 1.8089 | 34.6633 | 4.0967 | 0.0458 | 0.00 | 0.0229 |
| 10 | 149.846 | -0.5288 | 34.2683 | 5.9227 | 0.0458 | 0.00 | 0.0214 |
| *11 | 100.471 | -1.8463 | 33.9648 | 7.9596 | 0.0458 | 0.00 | 0.0269 |
| 12 | 50.571 | -1.8521 | 33.9642 | 7.9371 | 0.0458 | 0.00 | 0.0544 |
| 13 | 30.167 | -1.8539 | 33.9648 | 7.9188 | 0.0458 | 0.00 | 0.0304 |
| 14 | 20.350 | -1.8543 | 33.9650 | 7.8727 | 0.0458 | 0.00 | 0.0280 |
| 15 | 15.411 | -1.8545 | 33.9652 | 7.8571 | 0.0458 | 0.00 | 0.0598 |
| 16 | 10.396 | -1.8518 | 33.9652 | 7.8147 | 0.0458 | 0.00 | 0.0207 |
| 17 | 5.450 | -1.8513 | 33.9653 | 7.8012 | 0.0458 | 0.00 | 0.0719 |
| 18 | 5.472 | -1.8513 | 33.9653 | 7.7994 | 0.0458 | 0.00 | 0.0677 |
| *19 | 0.698 | -1.8514 | 33.9654 | 7.7780 | 0.0458 | 0.00 | 0.0309 |
| 20 | 0.696 | -1.8513 | 33.9654 | 7.7774 | 0.0458 | 0.00 | 0.0221 |
| Station: 341.253/24/24 Latitude: 66 55.32S Longitude: 72 35.16W Depth: 506 m | | | | | | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 503.301 | 1.4873 | 34.7144 | 4.3186 | 0.0519 | 90.95 | 0.0446 |
| 2 | 503.270 | 1.4868 | 34.7146 | 4.3187 | 0.0519 | 90.91 | 0.0499 |
| 3 | 400.301 | 1.5178 | 34.7055 | 4.2389 | 0.0519 | 90.97 | 0.0246 |
| * 4 | 300.107 | 1.4368 | 34.6652 | 4.2505 | 0.0519 | 91.01 | 0.0215 |
| 5 | 260.202 | 1.2206 | 34.6155 | 4.2944 | 0.0519 | 90.96 | 0.0251 |
| 6 | 200.354 | 0.7508 | 34.5115 | 4.5210 | 0.0518 | 90.94 | 0.0311 |
| 7 | 150.249 | 0.0605 | 34.3531 | 5.1077 | 0.0519 | 90.92 | 0.0332 |
| * 8 | 100.374 | -1.1649 | 34.0239 | 6.6995 | 0.0519 | 90.93 | 0.0499 |
| 9 | 49.903 | -1.8422 | 33.8345 | 7.7371 | 0.0534 | 90.92 | 0.0293 |
| 10 | 30.268 | -1.8432 | 33.8345 | 7.7300 | 0.0597 | 90.93 | 0.0327 |
| 11 | 20.375 | -1.8433 | 33.8345 | 7.7036 | 0.0739 | 90.93 | 0.0294 |
| 12 | 15.027 | -1.8434 | 33.8345 | 7.6706 | 0.0973 | 90.94 | 0.0308 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 13 | 10.275 | -1.8435 | 33.8345 | 7.6552 | 0.1418 | 90.95 | 0.0573 |
| 14 | 4.988 | -1.8361 | 33.8344 | 7.6132 | 0.3124 | 90.95 | 0.0307 |
| 15 | 4.991 | -1.8336 | 33.8343 | 7.6231 | 0.2927 | 90.95 | 0.0289 |
| *16 | 1.263 | -1.8333 | 33.8346 | 7.6101 | 0.7151 | 90.92 | 0.0509 |
| 17 | 1.271 | -1.8341 | 33.8346 | 7.5937 | 0.7262 | 90.93 | 0.0564 |
| Station: 341.220/25/25 Latitude: 67 7.434S Longitude: 71 58.132W Depth: 420 m | | | | | | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 415.023 | 1.3465 | 32.9545 | 3.0808 | 0.0531 | 88.80 | 0.0736 |
| 2 | 415.063 | 1.3465 | 32.9014 | 3.3660 | 0.0528 | 74.74 | 0.1332 |
| 3 | 300.838 | 1.3420 | 33.8697 | 1.5833 | 0.0530 | 91.02 | 0.0268 |
| * 4 | 200.855 | 1.0964 | 33.8406 | 1.5352 | 0.0531 | 91.02 | 0.0200 |
| 5 | 150.754 | 0.6775 | 33.8794 | 1.5381 | 0.0531 | 91.00 | 0.0231 |
| * 6 | 100.890 | -0.4013 | 33.8449 | 1.5909 | 0.0531 | 91.02 | 0.0279 |
| 7 | 50.400 | -1.8003 | 33.8645 | 1.6599 | 0.0546 | 90.87 | 0.0296 |
| 8 | 30.395 | -1.8389 | 33.5842 | 1.6503 | 0.0616 | 90.77 | 0.0506 |
| 9 | 30.399 | -1.8391 | 33.5806 | 1.6508 | 0.0612 | 90.76 | 0.0628 |
| 10 | 20.539 | -1.8413 | 33.4962 | 1.6234 | 0.0747 | 90.77 | 0.0261 |
| 11 | 15.305 | -1.8416 | 33.4685 | 1.6166 | 0.0974 | 90.77 | 0.0262 |
| 12 | 9.629 | -1.8420 | 33.4505 | 1.6056 | 0.1506 | 90.76 | 0.0539 |
| 13 | 5.596 | -1.8423 | 33.4397 | 1.5873 | 0.2551 | 90.78 | 0.0186 |
| 14 | 5.596 | -1.8421 | 33.4393 | 1.5874 | 0.2633 | 90.77 | 0.0175 |
| *15 | 1.236 | -1.8384 | 33.4282 | 1.5747 | 0.7122 | 90.75 | 0.0610 |
| 16 | 1.254 | -1.8382 | 33.4281 | 1.5747 | 0.7543 | 90.75 | 0.0729 |
| Station: 341.180/26/26 Latitude: 67 20.18S Longitude: 71 13.71W Depth: 485 m | | | | | | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 467.535 | 1.3372 | 34.7163 | 4.0256 | 0.0519 | 90.40 | 0.0463 |
| 2 | 467.582 | 1.3371 | 34.7163 | 4.0163 | 0.0519 | 90.74 | 0.0460 |
| * 3 | 350.623 | 1.3684 | 34.7016 | 4.1943 | 0.0520 | 91.11 | 0.0401 |
| * 4 | 200.207 | 1.1846 | 34.6175 | 4.2304 | 0.0554 | 90.87 | 0.0268 |
| 5 | 150.599 | 0.6801 | 34.4990 | 4.5316 | 0.0738 | 90.97 | 0.0255 |
| 6 | 100.284 | -0.5017 | 34.1928 | 5.9154 | 0.2079 | 90.96 | 0.0676 |
| 7 | 50.394 | -1.6830 | 33.9470 | 7.4267 | 1.3900 | 90.89 | 0.0288 |
| 8 | 30.364 | -1.7741 | 33.8468 | 7.5071 | 3.7110 | 90.72 | 0.0318 |
| 9 | 20.597 | -1.7748 | 33.8466 | 7.4835 | 6.2960 | 90.72 | 0.0590 |
| 10 | 15.522 | -1.7750 | 33.8445 | 7.4559 | 8.8590 | 90.72 | 0.0247 |
| 11 | 10.656 | -1.7744 | 33.8434 | 7.4228 | 13.3500 | 90.73 | 0.0588 |
| 12 | 5.779 | -1.7534 | 33.8435 | 7.4021 | 20.4700 | 90.74 | 0.0203 |
| 13 | 5.770 | -1.7625 | 33.8430 | 7.4090 | 20.6700 | 90.73 | 0.0184 |
| *14 | 0.439 | -1.7658 | 33.8431 | 7.3989 | 39.7600 | 90.70 | 0.0313 |
| 15 | 0.442 | -1.7652 | 33.8430 | 7.4058 | 40.0300 | 90.69 | 0.0324 |
| Station: 341.140/27/27 Latitude: 67 32.49S Longitude: 70 31.96W Depth: 768 m | | | | | | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 758.573 | 1.3024 | 34.7249 | 4.3695 | 0.0519 | 90.17 | 0.0213 |
| 2 | 758.578 | 1.3023 | 34.7249 | 4.3695 | 0.0519 | 90.18 | 0.0236 |
| 3 | 560.183 | 1.3085 | 34.7104 | 4.2389 | 0.0518 | 90.88 | 0.0347 |
| 4 | 400.114 | 1.3447 | 34.6993 | 4.1936 | 0.0519 | 90.86 | 0.0609 |
| * 5 | 250.224 | 1.2565 | 34.6465 | 4.1316 | 0.0519 | 90.93 | 0.0576 |
| 6 | 149.952 | 0.6022 | 34.4759 | 4.5843 | 0.0519 | 90.68 | 0.0451 |
| * 7 | 100.193 | -0.8845 | 34.1142 | 6.4067 | 0.0520 | 90.70 | 0.0287 |
| 8 | 50.121 | -1.7967 | 33.9218 | 7.6251 | 0.0527 | 90.59 | 0.0281 |
| 9 | 29.798 | -1.8034 | 33.9168 | 7.6331 | 0.0584 | 90.58 | 0.0581 |
| 10 | 20.323 | -1.8041 | 33.9168 | 7.5890 | 0.0670 | 90.62 | 0.0149 |
| 11 | 15.862 | -1.8040 | 33.9164 | 7.5727 | 0.0861 | 90.63 | 0.0485 |
| 12 | 10.348 | -1.8043 | 33.9159 | 7.5465 | 0.1513 | 90.60 | 0.0322 |
| 13 | 5.382 | -1.8003 | 33.9154 | 7.5375 | 0.3144 | 90.48 | 0.0278 |
| 14 | 5.542 | -1.8008 | 33.9154 | 7.5557 | 0.3041 | 90.40 | 0.0312 |
| *15 | 0.926 | -1.8022 | 33.9144 | 7.5222 | 1.0470 | 89.54 | 0.0311 |
| 16 | 0.911 | -1.8012 | 33.9144 | 7.5248 | 0.9560 | 89.08 | 0.0249 |
| Station: 341.100/28/28 Latitude: 67 44.929S Longitude: 69 47.934W Depth: 369 | | | | | | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 365.725 | 1.4452 | 34.7040 | 4.2115 | 0.0519 | 90.76 | 0.0289 |
| 2 | 365.723 | 1.4451 | 34.7040 | 4.2216 | 0.0518 | 90.75 | 0.0344 |
| * 3 | 250.633 | 1.3510 | 34.6603 | 4.1899 | 0.0520 | 90.59 | 0.0163 |
| 4 | 150.699 | 0.7933 | 34.5104 | 4.5417 | 0.0519 | 90.85 | 0.0225 |
| 5 | 120.582 | 0.2876 | 34.3692 | 5.1239 | 0.0519 | 90.80 | 0.0186 |
| * 6 | 100.670 | 0.3025 | 34.3176 | 5.4047 | 0.0519 | 90.70 | 0.0293 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 7 | 50.565 | -1.6585 | 33.9338 | 7.5673 | 0.0528 | 90.61 | 0.0465 |
| 8 | 30.406 | -1.7587 | 33.8975 | 7.6414 | 0.0586 | 90.59 | 0.0308 |
| 9 | 20.571 | -1.7701 | 33.8952 | 7.6278 | 0.0748 | 90.60 | 0.0595 |
| 10 | 15.603 | -1.7749 | 33.8950 | 7.6022 | 0.0927 | 90.61 | 0.0289 |
| 11 | 10.419 | -1.7787 | 33.8945 | 7.5847 | 0.1355 | 90.61 | 0.0624 |
| 12 | 5.559 | -1.7780 | 33.8942 | 7.5654 | 0.2794 | 90.63 | 0.0316 |
| 13 | 5.563 | -1.7779 | 33.8941 | 7.5722 | 0.2752 | 90.62 | 0.0316 |
| *14 | 0.867 | -1.7758 | 33.8944 | 7.5560 | 0.8080 | 90.60 | 0.0599 |
| 15 | 0.842 | -1.7756 | 33.8945 | 7.5395 | 0.7876 | 90.61 | 0.0581 |
| Station: 301.100/42/29 Latitude: 68 3.0883S Longitude: 70 19.3951W Depth: 765 | | | | | | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 709.101 | 1.3152 | 34.7233 | 4.3532 | 0.0520 | 90.38 | 0.0230 |
| 2 | 709.080 | 1.3152 | 34.7234 | 4.3404 | 0.0520 | 90.36 | 0.0207 |
| 3 | 600.339 | 1.3269 | 34.7202 | 4.2908 | 0.0519 | 90.73 | 0.0208 |
| 4 | 500.197 | 1.3491 | 34.7120 | 4.2496 | 0.0520 | 90.90 | 0.0175 |
| 5 | 400.092 | 1.3713 | 34.7016 | 4.2090 | 0.0520 | 90.84 | 0.0247 |
| * 6 | 240.143 | 1.3017 | 34.6499 | 4.1810 | 0.0521 | 90.89 | 0.0258 |
| 7 | 150.301 | 0.6614 | 34.4902 | 4.5084 | 0.0562 | 90.92 | 0.0199 |
| * 8 | 100.088 | -0.8296 | 34.1227 | 6.3571 | 0.0838 | 90.89 | 0.0251 |
| 9 | 50.192 | -1.7606 | 33.8964 | 7.7509 | 0.4171 | 90.75 | 0.0268 |
| 10 | 30.265 | -1.8131 | 33.8692 | 7.8119 | 1.3650 | 90.68 | 0.0345 |
| 11 | 20.358 | -1.8368 | 33.8294 | 7.7884 | 3.0690 | 90.60 | 0.0287 |
| 12 | 15.555 | -1.8385 | 33.8269 | 7.7570 | 4.9360 | 90.60 | 0.0370 |
| 13 | 10.411 | -1.8391 | 33.8206 | 7.7367 | 7.8820 | 90.59 | 0.0569 |
| 14 | 5.247 | -1.8351 | 33.8219 | 7.7182 | 11.8300 | 90.57 | 0.0217 |
| 15 | 5.239 | -1.8361 | 33.8231 | 7.7202 | 12.0000 | 90.58 | 0.0202 |
| *16 | 0.557 | -1.8336 | 33.8251 | 7.6883 | 22.0900 | 90.58 | 0.0767 |
| 17 | 0.574 | -1.8339 | 33.8249 | 7.6977 | 22.0500 | 90.58 | 0.0688 |
| Station: 301.060/41/30 Latitude: 68 15.62S Longitude: 69 33.84W Depth: 670 m | | | | | | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 660.857 | 1.3865 | 34.7161 | 4.2816 | 0.0520 | 90.48 | 0.0620 |
| 2 | 660.804 | 1.3868 | 34.7161 | 4.2825 | 0.0520 | 90.47 | 0.0612 |
| 3 | 550.190 | 1.4124 | 34.7104 | 4.2470 | 0.0520 | 90.82 | 0.0252 |
| 4 | 450.347 | 1.4343 | 34.6993 | 4.2295 | 0.0520 | 90.85 | 0.0536 |
| * 5 | 349.944 | 1.3997 | 34.6804 | 4.2135 | 0.0520 | 90.79 | 0.0147 |
| 6 | 250.275 | 1.2662 | 34.6315 | 4.2535 | 0.0520 | 90.86 | 0.0251 |
| 7 | 150.231 | 0.4182 | 34.4228 | 4.8271 | 0.0521 | 90.82 | 0.0381 |
| * 8 | 100.081 | -0.7467 | 34.0985 | 6.4925 | 0.0520 | 90.64 | 0.0423 |
| 9 | 49.602 | -1.7466 | 33.8038 | 7.5945 | 0.0525 | 90.20 | 0.0252 |
| 10 | 30.120 | -1.7701 | 33.7652 | 7.6139 | 0.0577 | 90.15 | 0.0474 |
| 11 | 20.207 | -1.7808 | 33.7598 | 7.5627 | 0.0719 | 90.16 | 0.0425 |
| 12 | 15.058 | -1.7802 | 33.7595 | 7.5515 | 0.0920 | 90.14 | 0.0323 |
| 13 | 10.337 | -1.7824 | 33.7594 | 7.5572 | 0.1385 | 90.16 | 0.0314 |
| 14 | 5.178 | -1.7818 | 33.7594 | 7.5432 | 0.2528 | 90.15 | 0.0356 |
| 15 | 5.168 | -1.7821 | 33.7594 | 7.5230 | 0.2488 | 90.15 | 0.0453 |
| *16 | 0.522 | -1.7796 | 33.7593 | 7.5239 | 0.6657 | 90.16 | 0.0565 |
| 17 | 0.518 | -1.7786 | 33.7593 | 7.5232 | 0.6767 | 90.16 | 0.0498 |
| Station: 301.020/40/31 Latitude: 68 27.893S Longitude: 68 46.271W Depth: 704 | | | | | | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 709.473 | 1.3141 | 34.6707 | 4.1036 | 0.0520 | 88.46 | 0.0480 |
| 2 | 709.497 | 1.3140 | 34.6707 | 4.1038 | 0.0519 | 88.57 | 0.0450 |
| 3 | 600.295 | 1.3069 | 34.6699 | 4.1094 | 0.0520 | 89.23 | 0.0364 |
| * 4 | 480.706 | 1.2900 | 34.6668 | 4.1015 | 0.0520 | 89.48 | 0.0267 |
| 5 | 400.381 | 1.2487 | 34.6568 | 4.0945 | 0.0520 | 90.10 | 0.0245 |
| * 6 | 319.900 | 1.1885 | 34.6367 | 4.0860 | 0.0520 | 89.81 | 0.0186 |
| 7 | 200.077 | 0.7297 | 34.4903 | 4.5849 | 0.0520 | 90.64 | 0.0360 |
| 8 | 150.104 | 0.2858 | 34.3221 | 5.0525 | 0.0519 | 90.57 | 0.0318 |
| * 9 | 100.036 | -0.3280 | 34.0018 | 6.2266 | 0.0520 | 90.09 | 0.0215 |
| 10 | 50.195 | -1.7976 | 33.6189 | 7.9843 | 0.0529 | 89.92 | 0.0312 |
| 11 | 30.004 | -1.7987 | 33.6187 | 7.9805 | 0.0587 | 89.94 | 0.0573 |
| 12 | 20.077 | -1.8038 | 33.6085 | 7.9420 | 0.0726 | 89.92 | 0.0196 |
| 13 | 15.411 | -1.8043 | 33.6085 | 7.9294 | 0.0940 | 89.95 | 0.0243 |
| 14 | 10.254 | -1.8056 | 33.6044 | 7.9279 | 0.1443 | 89.99 | 0.0560 |
| 15 | 5.434 | -1.8039 | 33.6068 | 7.9148 | 0.2785 | 89.93 | 0.0317 |
| 16 | 5.452 | -1.8024 | 33.6072 | 7.9145 | 0.2658 | 89.96 | 0.0258 |
| *17 | 1.040 | -1.8034 | 33.6052 | 7.8986 | 0.7798 | 89.95 | 0.0359 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 18 | 1.046 | -1.8032 | 33.6054 | 7.9173 | 0.7805 | 89.94 | 0.0275 |
| Station: 301.-020/39/32 Latitude: 68 35.34S Longitude: 68 35.33W Depth: 188 m | | | | | | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 176.777 | 0.3494 | 34.3485 | 4.5296 | 0.0520 | 90.27 | 0.0575 |
| 2 | 176.783 | 0.3493 | 34.3485 | 4.5285 | 0.0520 | 90.26 | 0.0483 |
| 3 | 150.317 | 0.1715 | 34.2493 | 4.7561 | 0.0528 | 90.30 | 0.0288 |
| * 4 | 100.448 | -1.1600 | 33.6591 | 7.2992 | 0.0649 | 90.00 | 0.0267 |
| 5 | 50.416 | -1.7833 | 33.5814 | 8.0110 | 0.3071 | 89.96 | 0.0286 |
| 6 | 30.555 | -1.7830 | 33.5806 | 8.0061 | 1.1230 | 89.96 | 0.0621 |
| 7 | 20.482 | -1.7833 | 33.5802 | 8.0159 | 2.8220 | 89.96 | 0.0288 |
| 8 | 14.996 | -1.7818 | 33.5804 | 7.9884 | 5.1280 | 89.97 | 0.0669 |
| 9 | 10.456 | -1.7818 | 33.5804 | 7.9766 | 8.8000 | 89.97 | 0.0303 |
| 10 | 5.507 | -1.7829 | 33.5802 | 7.9883 | 15.6600 | 89.98 | 0.0303 |
| 11 | 5.502 | -1.7826 | 33.5802 | 7.9733 | 15.6800 | 89.95 | 0.0280 |
| 12 | 0.248 | -1.7831 | 33.5808 | 7.9360 | 35.4800 | 89.97 | 0.0749 |
| *13 | 0.253 | -1.7832 | 33.5811 | 7.9628 | 35.3200 | 89.98 | 0.0627 |
| Station: 341.-020/38/33 Latitude: 68 21.784S Longitude: 67 52.796W Depth: 426 | | | | | | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 176.777 | 0.3494 | 34.3485 | 4.5296 | 0.0520 | 90.27 | 0.0575 |
| 2 | 176.783 | 0.3493 | 34.3485 | 4.5285 | 0.0520 | 90.26 | 0.0483 |
| * 3 | 150.317 | 0.1715 | 34.2493 | 4.7561 | 0.0528 | 90.30 | 0.0288 |
| 4 | 100.448 | -1.1600 | 33.6591 | 7.2992 | 0.0649 | 90.00 | 0.0267 |
| 5 | 50.416 | -1.7833 | 33.5814 | 8.0110 | 0.3071 | 89.96 | 0.0286 |
| * 6 | 30.555 | -1.7830 | 33.5806 | 8.0061 | 1.1230 | 89.96 | 0.0621 |
| 7 | 20.482 | -1.7833 | 33.5802 | 8.0159 | 2.8220 | 89.96 | 0.0288 |
| 8 | 14.996 | -1.7818 | 33.5804 | 7.9884 | 5.1280 | 89.97 | 0.0669 |
| 9 | 10.456 | -1.7818 | 33.5804 | 7.9766 | 8.8000 | 89.97 | 0.0303 |
| 10 | 5.507 | -1.7829 | 33.5802 | 7.9883 | 15.6600 | 89.98 | 0.0303 |
| 11 | 5.502 | -1.7826 | 33.5802 | 7.9733 | 15.6800 | 89.95 | 0.0280 |
| 12 | 0.248 | -1.7831 | 33.5808 | 7.9360 | 35.4800 | 89.97 | 0.0749 |
| 13 | 0.253 | -1.7832 | 33.5811 | 7.9628 | 35.3200 | 89.98 | 0.0627 |
| Station: 341.020/37/34 Latitude: 68 10.84S Longitude: 68 12.36W Depth: 555 m | | | | | | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 553.227 | 1.3109 | 34.6693 | 4.1204 | 0.0520 | 89.63 | 0.0222 |
| 2 | 553.224 | 1.3108 | 34.6692 | 4.1223 | 0.0519 | 89.66 | 0.0288 |
| 3 | 450.085 | 1.2412 | 34.6549 | 3.9911 | 0.0520 | 89.39 | 0.0586 |
| 4 | 350.291 | 1.1788 | 34.6405 | 3.8860 | 0.0520 | 90.07 | 0.0285 |
| * 5 | 249.990 | 1.0517 | 34.5981 | 3.8918 | 0.0520 | 90.34 | 0.0369 |
| 6 | 150.153 | 0.0622 | 34.1953 | 4.8168 | 0.0521 | 90.28 | 0.0530 |
| * 7 | 125.114 | -0.3539 | 33.9144 | 5.9874 | 0.0526 | 89.99 | 0.0311 |
| 8 | 100.154 | -1.6174 | 33.6354 | 7.6893 | 0.0544 | 89.55 | 0.0278 |
| 9 | 29.928 | -1.7392 | 33.6082 | 7.9750 | 0.2198 | 89.71 | 0.0261 |
| 10 | 19.973 | -1.7701 | 33.6033 | 7.9886 | 0.3788 | 89.72 | 0.0623 |
| 11 | 14.872 | -1.7784 | 33.6021 | 8.0006 | 0.5142 | 89.83 | 0.0304 |
| 12 | 10.291 | -1.7766 | 33.6025 | 7.9575 | 0.6545 | 89.87 | 0.0272 |
| 13 | 5.147 | -1.7838 | 33.6004 | 7.9566 | 1.2070 | 89.89 | 0.0436 |
| 14 | 5.147 | -1.7806 | 33.6009 | 7.9550 | 1.1950 | 89.91 | 0.0413 |
| *15 | 0.373 | -1.7852 | 33.5999 | 7.9652 | 3.7380 | 89.89 | 0.0509 |
| 16 | 0.379 | -1.7846 | 33.5999 | 7.9627 | 3.6860 | 89.89 | 0.0380 |
| Station: 381.020/36/35 Latitude: 67 51.27S Longitude: 67 40.89W Depth: 333 m | | | | | | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 325.170 | 1.0889 | 34.6123 | 3.6825 | 0.0518 | 88.51 | 0.0376 |
| 2 | 325.180 | 1.0888 | 34.6123 | 3.6801 | 0.0518 | 89.68 | 0.0349 |
| * 3 | 260.340 | 0.9719 | 34.5709 | 3.5582 | 0.0519 | 89.50 | 0.0339 |
| 4 | 150.075 | 0.4686 | 34.3338 | 4.1410 | 0.0519 | 89.75 | 0.0676 |
| * 5 | 120.253 | -0.0058 | 34.1259 | 4.9830 | 0.0519 | 89.86 | 0.0291 |
| 6 | 120.256 | -0.0062 | 34.1257 | 4.9673 | 0.0520 | 89.86 | 0.0328 |
| 7 | 120.257 | -0.0062 | 34.1257 | 4.9869 | 0.0519 | 89.86 | 0.0348 |
| 8 | 120.259 | -0.0058 | 34.1260 | 4.9908 | 0.0519 | 89.77 | 0.0386 |
| 9 | 120.262 | -0.0050 | 34.1265 | 4.9889 | 0.0519 | 89.68 | 0.0459 |
| 10 | 120.264 | -0.0033 | 34.1273 | 4.9771 | 0.0519 | 89.70 | 0.0375 |
| 11 | 120.271 | -0.0027 | 34.1274 | 4.9758 | 0.0519 | 89.62 | 0.0327 |
| 12 | 120.264 | -0.0039 | 34.1269 | 4.9871 | 0.0519 | 89.84 | 0.0372 |
| 13 | 100.145 | -0.3754 | 33.8928 | 6.0605 | 0.0519 | 90.09 | 0.0489 |
| 14 | 50.103 | -1.7607 | 33.5821 | 8.0237 | 0.0537 | 89.89 | 0.0511 |
| 15 | 29.552 | -1.7673 | 33.5767 | 8.0245 | 0.0570 | 89.71 | 0.0148 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 16 | 20.167 | -1.7628 | 33.5670 | 8.0073 | 0.0673 | 89.86 | 0.0296 |
| 17 | 10.456 | -1.7701 | 33.5634 | 7.9760 | 0.1705 | 89.84 | 0.0615 |
| 18 | 10.439 | -1.7701 | 33.5633 | 7.9644 | 0.1683 | 89.85 | 0.0565 |
| 19 | 5.259 | -1.7617 | 33.5640 | 7.9481 | 0.1078 | 89.84 | 0.0235 |
| 20 | 5.239 | -1.7641 | 33.5643 | 7.9558 | 0.1081 | 89.86 | 0.0241 |
| *21 | 1.180 | -1.7612 | 33.5635 | 7.9432 | 0.1899 | 89.51 | 0.0406 |
| 22 | 1.174 | -1.7622 | 33.5635 | 7.9548 | 0.2077 | 89.32 | 0.0331 |
| Station: 368.036/35/36 | | Latitude: 67 53.456S | | Longitude: 68 19.915W | | Depth: 761 | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 752.359 | 1.2617 | 34.6634 | 3.8332 | 0.0519 | 89.74 | 0.0225 |
| 2 | 752.363 | 1.2618 | 34.6634 | 3.8332 | 0.0519 | 89.66 | 0.0214 |
| 3 | 600.169 | 1.2364 | 34.6585 | 3.8638 | 0.0518 | 90.33 | 0.0334 |
| 4 | 500.305 | 1.2105 | 34.6519 | 3.8372 | 0.0518 | 90.38 | 0.0252 |
| 5 | 399.983 | 1.1737 | 34.6414 | 3.8300 | 0.0518 | 90.47 | 0.0292 |
| * 6 | 270.986 | 1.0119 | 34.5870 | 3.7886 | 0.0519 | 90.41 | 0.0699 |
| 7 | 150.337 | 0.4577 | 34.3291 | 4.3328 | 0.0519 | 90.00 | 0.0373 |
| 8 | 120.259 | 0.0104 | 34.0759 | 5.3269 | 0.0518 | 89.31 | 0.0578 |
| 9 | 120.262 | 0.0115 | 34.0764 | 5.3376 | 0.0519 | 89.31 | 0.0615 |
| 10 | 120.266 | 0.0101 | 34.0759 | 5.3534 | 0.0518 | 89.29 | 0.0560 |
| 11 | 120.268 | 0.0083 | 34.0750 | 5.3587 | 0.0519 | 89.30 | 0.0530 |
| 12 | 120.268 | 0.0063 | 34.0742 | 5.3558 | 0.0519 | 89.31 | 0.0539 |
| *13 | 100.249 | -1.4511 | 33.7606 | 6.8619 | 0.0519 | 89.24 | 0.0230 |
| 14 | 50.313 | -1.7411 | 33.6664 | 7.7779 | 0.0527 | 89.39 | 0.0608 |
| 15 | 30.058 | -1.7415 | 33.6542 | 7.7830 | 0.0586 | 89.41 | 0.0267 |
| 16 | 20.282 | -1.7722 | 33.6515 | 7.7951 | 0.0730 | 89.44 | 0.0508 |
| 17 | 15.466 | -1.7695 | 33.6522 | 7.7535 | 0.0949 | 89.45 | 0.0264 |
| 18 | 10.404 | -1.7724 | 33.6517 | 7.7315 | 0.1458 | 89.45 | 0.0713 |
| 19 | 5.301 | -1.7722 | 33.6516 | 7.7351 | 0.3087 | 89.44 | 0.0298 |
| 20 | 5.303 | -1.7720 | 33.6516 | 7.7383 | 0.2925 | 89.45 | 0.0211 |
| *21 | 1.432 | -1.7694 | 33.6519 | 7.7136 | 0.6745 | 89.43 | 0.0676 |
| 22 | 1.423 | -1.7689 | 33.6519 | 7.7151 | 0.6460 | 89.40 | 0.0681 |
| Station: 358.046/34/37 | | Latitude: 67 55.49S | | Longitude: 67 59.97W | | Depth: 577 m | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 594.072 | 1.2463 | 34.6561 | 3.9560 | 0.0518 | 89.70 | 0.0600 |
| 2 | 594.101 | 1.2462 | 34.6560 | 3.9478 | 0.0519 | 89.67 | 0.0606 |
| 3 | 500.229 | 1.2349 | 34.6514 | 4.0182 | 0.0519 | 89.90 | 0.0303 |
| * 4 | 440.384 | 1.2011 | 34.6449 | 3.9319 | 0.0519 | 90.19 | 0.0633 |
| 5 | 300.216 | 1.1429 | 34.6193 | 4.1005 | 0.0519 | 90.26 | 0.0264 |
| 6 | 200.116 | 0.8411 | 34.5213 | 4.0852 | 0.0522 | 90.25 | 0.0185 |
| 7 | 149.815 | 0.4516 | 34.3535 | 4.4753 | 0.0542 | 90.02 | 0.0312 |
| * 8 | 100.359 | -0.2128 | 34.0080 | 5.6918 | 0.0782 | 89.41 | 0.0413 |
| 9 | 49.848 | -1.5032 | 33.6709 | 7.5295 | 0.5909 | 89.15 | 0.0449 |
| 10 | 30.078 | -1.7972 | 33.6325 | 7.9232 | 1.8020 | 89.74 | 0.0252 |
| 11 | 20.268 | -1.7991 | 33.6334 | 7.8986 | 3.2950 | 89.75 | 0.0244 |
| 12 | 14.907 | -1.7944 | 33.6321 | 7.8661 | 4.7270 | 89.76 | 0.0655 |
| 13 | 10.105 | -1.7981 | 33.6329 | 7.8464 | 6.6650 | 89.58 | 0.0322 |
| 14 | 4.894 | -1.7917 | 33.6302 | 7.8290 | 9.7670 | 89.49 | 0.0280 |
| 15 | 4.884 | -1.7915 | 33.6332 | 7.8231 | 9.8860 | 89.59 | 0.0338 |
| *16 | 0.440 | -1.7886 | 33.6333 | 7.8228 | 18.7700 | 89.39 | 0.0299 |
| 17 | 0.435 | -1.7894 | 33.6334 | 7.8030 | 18.7000 | 89.44 | 0.0317 |
| Station: 345.052/33/38 | | Latitude: 67 58.85S | | Longitude: 68 46.56W | | Depth: 144 m | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 136.022 | -0.0445 | 34.2248 | 5.3909 | 0.0517 | 89.57 | 0.0314 |
| 2 | 136.034 | -0.0410 | 34.2256 | 5.3886 | 0.0517 | 89.55 | 0.0423 |
| * 3 | 100.433 | -1.1013 | 33.9839 | 6.7121 | 0.0517 | 89.82 | 0.0241 |
| 4 | 49.887 | -1.6902 | 33.8628 | 7.3117 | 0.0531 | 90.01 | 0.0443 |
| 5 | 29.586 | -1.7177 | 33.8586 | 7.3864 | 0.0592 | 90.03 | 0.0418 |
| 6 | 19.902 | -1.7307 | 33.8573 | 7.3788 | 0.0747 | 90.02 | 0.0570 |
| 7 | 15.403 | -1.7427 | 33.8555 | 7.4114 | 0.0940 | 90.01 | 0.0219 |
| 8 | 10.347 | -1.7507 | 33.8535 | 7.3954 | 0.1394 | 89.96 | 0.0326 |
| 9 | 4.849 | -1.7601 | 33.8492 | 7.4016 | 0.2989 | 89.95 | 0.0565 |
| 10 | 4.860 | -1.7598 | 33.8491 | 7.3799 | 0.3084 | 89.94 | 0.0548 |
| 11 | 0.615 | -1.7622 | 33.8492 | 7.3799 | 0.8568 | 89.97 | 0.0307 |
| *12 | 0.613 | -1.7628 | 33.8492 | 7.3830 | 0.8681 | 89.95 | 0.0265 |
| Station: 352.071/31/39 | | Latitude: 67 49.87S | | Longitude: 67 49.96W | | Depth: 156 m | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| * 1 | 134.296 | 0.6309 | 34.4464 | 4.7912 | 0.0516 | 89.63 | 0.0202 |
| 2 | 134.301 | 0.6284 | 34.4457 | 4.7923 | 0.0516 | 89.62 | 0.0212 |
| * 3 | 100.073 | -1.4744 | 33.9474 | 7.1662 | 0.0518 | 90.11 | 0.0400 |
| 4 | 50.076 | -1.7542 | 33.8996 | 7.5040 | 0.0533 | 90.17 | 0.0303 |
| 5 | 30.202 | -1.7565 | 33.8991 | 7.5029 | 0.0602 | 90.18 | 0.0766 |
| 6 | 20.118 | -1.7533 | 33.8989 | 7.4996 | 0.0755 | 90.22 | 0.0303 |
| 7 | 14.926 | -1.7543 | 33.8989 | 7.5115 | 0.0966 | 90.22 | 0.0282 |
| 8 | 9.910 | -1.7493 | 33.8998 | 7.4983 | 0.0719 | 90.21 | 0.0438 |
| 9 | 4.929 | -1.7478 | 33.8996 | 7.4903 | 0.0991 | 90.20 | 0.0392 |
| 10 | 4.923 | -1.7481 | 33.8995 | 7.4801 | 0.1019 | 90.17 | 0.0317 |
| *11 | 0.528 | -1.7490 | 33.8995 | 7.4704 | 0.7146 | 90.17 | 0.0330 |
| 12 | 0.526 | -1.7498 | 33.8995 | 7.4553 | 0.7435 | 90.19 | 0.0321 |
| 13 | 0.513 | -1.7501 | 33.8995 | 7.4499 | 0.7610 | 90.17 | 0.0298 |
| Station: 349.084/30/40 Latitude: 67 47.17S Longitude: 69 20.64W Depth: 169 m | | | | | | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 161.773 | 0.6644 | 34.4629 | 4.7521 | 0.0517 | 89.96 | 0.0540 |
| 2 | 161.776 | 0.6616 | 34.4632 | 4.7476 | 0.0517 | 89.97 | 0.0541 |
| 3 | 120.089 | 0.0663 | 34.2878 | 5.4420 | 0.0518 | 90.21 | 0.0627 |
| * 4 | 100.165 | -0.4025 | 34.1658 | 6.0622 | 0.0518 | 90.18 | 0.0634 |
| 5 | 50.206 | -1.7622 | 33.9262 | 7.4658 | 0.0529 | 90.42 | 0.0427 |
| 6 | 30.099 | -1.7641 | 33.9137 | 7.4937 | 0.0582 | 90.38 | 0.0351 |
| 7 | 20.486 | -1.7682 | 33.9090 | 7.4734 | 0.0739 | 90.37 | 0.0359 |
| 8 | 15.504 | -1.7701 | 33.9074 | 7.4628 | 0.0971 | 90.37 | 0.0354 |
| 9 | 10.392 | -1.7693 | 33.9064 | 7.4604 | 0.1508 | 90.35 | 0.0291 |
| 10 | 10.393 | -1.7692 | 33.9064 | 7.4599 | 0.1403 | 90.36 | 0.0325 |
| 11 | 4.599 | -1.7674 | 33.9034 | 7.4612 | 0.3213 | 90.36 | 0.0455 |
| 12 | 4.594 | -1.7678 | 33.9037 | 7.4606 | 0.3173 | 90.32 | 0.0349 |
| *13 | 1.156 | -1.7680 | 33.9034 | 7.4535 | 0.6249 | 90.36 | 0.0593 |
| 14 | 1.156 | -1.7697 | 33.9032 | 7.4550 | 0.6962 | 90.36 | 0.0692 |
| Station: 368.098/29/41 Latitude: 67 34.883S Longitude: 69 23.417W Depth: 182 | | | | | | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 164.903 | 0.6196 | 34.4320 | 4.8876 | 0.0517 | 89.58 | 0.0262 |
| 2 | 164.908 | 0.6183 | 34.4318 | 4.8841 | 0.0517 | 89.65 | 0.0227 |
| 3 | 120.444 | 0.1239 | 34.2700 | 5.5493 | 0.0518 | 90.32 | 0.0587 |
| * 4 | 100.461 | -0.6430 | 34.1011 | 6.3932 | 0.0518 | 89.83 | 0.0210 |
| 5 | 50.537 | -1.4171 | 33.9660 | 7.2707 | 0.0525 | 89.89 | 0.0319 |
| 6 | 30.553 | -1.4615 | 33.9430 | 7.2895 | 0.0568 | 89.76 | 0.0284 |
| 7 | 20.495 | -1.5811 | 33.9235 | 7.4147 | 0.0694 | 89.91 | 0.0350 |
| 8 | 15.656 | -1.5630 | 33.9259 | 7.4077 | 0.0924 | 89.87 | 0.0639 |
| 9 | 10.727 | -1.6106 | 33.9226 | 7.4368 | 0.1444 | 89.93 | 0.0299 |
| 10 | 5.724 | -1.7322 | 33.9107 | 7.5839 | 0.2871 | 90.16 | 0.0754 |
| 11 | 5.716 | -1.7230 | 33.9111 | 7.5757 | 0.3011 | 90.14 | 0.0700 |
| *12 | 0.924 | -1.7270 | 33.9117 | 7.5436 | 0.6849 | 89.83 | 0.0314 |
| 13 | 0.948 | -1.7206 | 33.9117 | 7.5427 | 0.6954 | 89.99 | 0.0304 |
| Station: 301.140/43/42 Latitude: 67 49.73S Longitude: 71 3.18W Depth: 476 m | | | | | | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 463.979 | 1.3517 | 34.7072 | 4.1308 | 0.0519 | 89.87 | 0.0282 |
| 2 | 463.986 | 1.3517 | 34.7073 | 4.1388 | 0.0519 | 89.87 | 0.0235 |
| 3 | 350.628 | 1.3336 | 34.6861 | 4.1918 | 0.0519 | 90.76 | 0.0168 |
| * 4 | 250.569 | 1.2601 | 34.6427 | 4.1653 | 0.0520 | 90.68 | 0.0213 |
| 5 | 150.581 | 0.5312 | 34.4423 | 4.6197 | 0.0593 | 90.37 | 0.0650 |
| * 6 | 100.946 | -0.7941 | 34.1006 | 6.1635 | 0.1127 | 90.59 | 0.0603 |
| 7 | 50.514 | -1.7744 | 33.7903 | 7.5982 | 0.8380 | 90.27 | 0.0648 |
| 8 | 30.781 | -1.7731 | 33.7708 | 7.5356 | 2.6370 | 90.26 | 0.0299 |
| 9 | 20.541 | -1.7840 | 33.7642 | 7.4895 | 5.7280 | 90.26 | 0.0246 |
| 10 | 15.497 | -1.7850 | 33.7631 | 7.4477 | 9.1730 | 90.26 | 0.0294 |
| 11 | 10.318 | -1.7881 | 33.7603 | 7.4265 | 15.2300 | 90.26 | 0.0647 |
| 12 | 10.313 | -1.7874 | 33.7608 | 7.4460 | 15.2900 | 90.26 | 0.0698 |
| 13 | 5.213 | -1.7885 | 33.7562 | 7.4007 | 26.4100 | 90.26 | 0.0291 |
| 14 | 5.215 | -1.7878 | 33.7566 | 7.3920 | 26.2900 | 90.26 | 0.0316 |
| *15 | 0.381 | -1.7835 | 33.7567 | 7.3847 | 53.6800 | 90.24 | 0.0229 |
| 16 | 0.393 | -1.7835 | 33.7570 | 7.3892 | 53.3600 | 90.08 | 0.0286 |
| 17 | 0.394 | -1.7814 | 33.7592 | 7.3800 | 53.6600 | 89.77 | 0.0220 |
| Station: 301.180/44/43 Latitude: 67 36.38S Longitude: 71 49.40W Depth: 399 m | | | | | | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 387.347 | 1.3960 | 34.7034 | 4.2038 | 0.0519 | 90.20 | 0.0541 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 2 | 387.365 | 1.3961 | 34.7034 | 4.2047 | 0.0519 | 90.20 | 0.0462 |
| 3 | 300.178 | 1.3377 | 34.6912 | 4.1925 | 0.0519 | 90.37 | 0.0299 |
| 4 | 200.024 | 0.9460 | 34.5749 | 4.3449 | 0.0519 | 90.37 | 0.0205 |
| 5 | 125.413 | 0.2702 | 34.3698 | 4.9540 | 0.0519 | 90.45 | 0.0275 |
| * 6 | 99.994 | -0.4685 | 34.1422 | 5.9423 | 0.0518 | 90.44 | 0.0320 |
| 7 | 50.287 | -1.8283 | 33.7760 | 7.6297 | 0.0527 | 90.25 | 0.0247 |
| 8 | 29.654 | -1.8300 | 33.7513 | 7.6112 | 0.0588 | 90.22 | 0.0529 |
| 9 | 20.408 | -1.8302 | 33.7477 | 7.5572 | 0.0726 | 90.23 | 0.0486 |
| 10 | 15.660 | -1.8303 | 33.7478 | 7.5091 | 0.0887 | 90.24 | 0.0565 |
| 11 | 10.543 | -1.8306 | 33.7476 | 7.5086 | 0.1438 | 90.24 | 0.0341 |
| 12 | 5.530 | -1.8202 | 33.7481 | 7.4821 | 0.2871 | 90.25 | 0.0230 |
| 13 | 5.540 | -1.8238 | 33.7480 | 7.4833 | 0.2766 | 90.24 | 0.0269 |
| *14 | 1.365 | -1.8139 | 33.7478 | 7.4669 | 0.5997 | 90.22 | 0.0557 |
| 15 | 1.379 | -1.8137 | 33.7478 | 7.4546 | 0.6179 | 90.23 | 0.0480 |
| Station: 301.220/45/44 | Latitude: 67 23.055S | | Longitude: 72 34.068W | | | Depth: 384 | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 373.941 | 1.4427 | 34.7009 | 4.1623 | 0.0520 | 90.23 | 0.0216 |
| 2 | 373.937 | 1.4428 | 34.7009 | 4.1621 | 0.0519 | 90.18 | 0.0266 |
| 3 | 373.919 | 1.4427 | 34.7009 | 4.1711 | 0.0520 | 90.20 | 0.0195 |
| 4 | 300.298 | 1.4480 | 34.6872 | 4.1932 | 0.0520 | 90.65 | 0.0371 |
| 5 | 200.641 | 0.9837 | 34.5641 | 4.3927 | 0.0520 | 90.62 | 0.0263 |
| 6 | 200.668 | 0.9850 | 34.5644 | 4.3902 | 0.0520 | 90.63 | 0.0226 |
| 7 | 150.366 | 0.2923 | 34.3911 | 4.8148 | 0.0520 | 90.42 | 0.0556 |
| 8 | 150.376 | 0.2923 | 34.3908 | 4.8203 | 0.0520 | 90.42 | 0.0456 |
| * 9 | 100.379 | -0.2374 | 34.1709 | 5.4444 | 0.0519 | 90.31 | 0.0641 |
| 10 | 50.476 | -1.7461 | 33.7844 | 7.4583 | 0.0533 | 90.38 | 0.0214 |
| 11 | 30.235 | -1.7648 | 33.7738 | 7.4682 | 0.0607 | 90.37 | 0.0382 |
| 12 | 20.254 | -1.7808 | 33.7633 | 7.4016 | 0.0789 | 90.36 | 0.0313 |
| 13 | 15.477 | -1.7817 | 33.7631 | 7.3941 | 0.0946 | 90.36 | 0.0273 |
| 14 | 10.554 | -1.7826 | 33.7633 | 7.3814 | 0.1442 | 90.37 | 0.0322 |
| 15 | 5.425 | -1.7756 | 33.7618 | 7.3317 | 0.3083 | 90.37 | 0.0557 |
| 16 | 5.403 | -1.7802 | 33.7626 | 7.3602 | 0.3009 | 90.37 | 0.0466 |
| *17 | 1.305 | -1.7661 | 33.7618 | 7.3247 | 0.6667 | 90.37 | 0.0361 |
| 18 | 1.306 | -1.7661 | 33.7614 | 7.3221 | 0.6372 | 90.37 | 0.0293 |
| Station: 301.265/46/45 | Latitude: 67 7.783S | | Longitude: 73 22.177W | | | Depth: 1980 | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 1931.083 | 0.5706 | 34.7132 | 5.0237 | 0.0458 | 0.00 | 0.0199 |
| 2 | 1931.108 | 0.5709 | 34.7131 | 5.0276 | 0.0458 | 0.00 | 0.0200 |
| 3 | 1700.126 | 0.7337 | 34.7166 | 4.9084 | 0.0458 | 0.00 | 0.0245 |
| 4 | 1500.145 | 0.8288 | 34.7197 | 4.8416 | 0.0458 | 0.00 | 0.0326 |
| 5 | 1300.053 | 0.9204 | 34.7228 | 4.7698 | 0.0458 | 0.00 | 0.0292 |
| 6 | 1100.239 | 1.0587 | 34.7275 | 4.6859 | 0.0458 | 0.00 | 0.0400 |
| 7 | 899.496 | 1.1980 | 34.7315 | 4.5986 | 0.0458 | 0.00 | 0.0488 |
| 8 | 700.342 | 1.3641 | 34.7340 | 4.4838 | 0.0458 | 0.00 | 0.0156 |
| 9 | 600.264 | 1.4914 | 34.7353 | 4.4475 | 0.0458 | 0.00 | 0.0186 |
| 10 | 500.072 | 1.5862 | 34.7266 | 4.3207 | 0.0458 | 0.00 | 0.0417 |
| 11 | 400.270 | 1.6931 | 34.7156 | 4.2399 | 0.0458 | 0.00 | 0.0214 |
| *12 | 250.147 | 1.7052 | 34.6534 | 4.1208 | 0.0458 | 0.00 | 0.0388 |
| 13 | 150.188 | -0.3275 | 34.3080 | 5.5318 | 0.0458 | 0.00 | 0.0155 |
| *14 | 100.366 | -1.0860 | 34.1181 | 6.3174 | 0.0458 | 0.00 | 0.0235 |
| 15 | 50.320 | -1.8333 | 33.7866 | 7.7568 | 0.0458 | 0.00 | 0.0413 |
| 16 | 30.206 | -1.8349 | 33.7865 | 7.7338 | 0.0458 | 0.00 | 0.0322 |
| 17 | 20.162 | -1.8359 | 33.7874 | 7.7121 | 0.0458 | 0.00 | 0.0333 |
| 18 | 15.536 | -1.8373 | 33.7882 | 7.6995 | 0.0458 | 0.00 | 0.0529 |
| 19 | 10.425 | -1.8370 | 33.7882 | 7.6685 | 0.0458 | 0.00 | 0.0259 |
| 20 | 5.504 | -1.8339 | 33.7887 | 7.6753 | 0.0458 | 0.00 | 0.0380 |
| 21 | 5.514 | -1.8347 | 33.7887 | 7.6607 | 0.0458 | 0.00 | 0.0380 |
| *22 | 0.421 | -1.8318 | 33.7891 | 7.6473 | 0.0458 | 0.00 | 0.0260 |
| 23 | 0.422 | -1.8318 | 33.7891 | 7.6503 | 0.0458 | 0.00 | 0.0225 |
| Station: 261.295/47/46 | Latitude: 67 13.082S | | Longitude: 74 28.835W | | | Depth: 2927 | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 2958.598 | 0.3972 | 34.7100 | 5.1592 | 0.0458 | 0.00 | 0.0242 |
| 2 | 2700.077 | 0.4259 | 34.7102 | 5.0704 | 0.0458 | 0.00 | 0.0201 |
| 3 | 2400.451 | 0.5010 | 34.7116 | 4.9875 | 0.0458 | 0.00 | 0.0526 |
| 4 | 2100.219 | 0.6340 | 34.7139 | 4.8773 | 0.0458 | 0.00 | 0.0193 |
| 5 | 1800.252 | 0.7833 | 34.7178 | 4.7958 | 0.0458 | 0.00 | 0.0382 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 6 | 1500.302 | 0.9538 | 34.7234 | 4.6965 | 0.0458 | 0.00 | 0.0391 |
| 7 | 1200.220 | 1.1369 | 34.7296 | 4.6076 | 0.0458 | 0.00 | 0.0334 |
| 8 | 900.629 | 1.3557 | 34.7345 | 4.4838 | 0.0458 | 0.00 | 0.0155 |
| 9 | 600.507 | 1.5939 | 34.7294 | 4.3008 | 0.0458 | 0.00 | 0.0188 |
| 10 | 500.544 | 1.6853 | 34.7255 | 4.2388 | 0.0458 | 0.00 | 0.0557 |
| 11 | 400.363 | 1.7996 | 34.7172 | 4.1817 | 0.0458 | 0.00 | 0.0543 |
| *12 | 250.218 | 1.7213 | 34.6585 | 4.0982 | 0.0458 | 0.00 | 0.0205 |
| *13 | 100.034 | -1.1170 | 34.2035 | 6.2220 | 0.0458 | 0.00 | 0.0263 |
| 14 | 50.200 | -1.8237 | 33.8701 | 7.6844 | 0.0458 | 0.00 | 0.0303 |
| 15 | 30.356 | -1.8278 | 33.8681 | 7.7329 | 0.0458 | 0.00 | 0.0213 |
| 16 | 30.360 | -1.8279 | 33.8683 | 7.7017 | 0.0458 | 0.00 | 0.0274 |
| 17 | 20.112 | -1.8264 | 33.8679 | 7.6841 | 0.0458 | 0.00 | 0.0380 |
| 18 | 15.311 | -1.8269 | 33.8681 | 7.6635 | 0.0458 | 0.00 | 0.0510 |
| 19 | 10.320 | -1.8132 | 33.8665 | 7.6316 | 0.0458 | 0.00 | 0.0420 |
| 20 | 5.109 | -1.8054 | 33.8659 | 7.6362 | 0.0458 | 0.00 | 0.0205 |
| 21 | 5.115 | -1.8055 | 33.8658 | 7.6468 | 0.0458 | 0.00 | 0.0235 |
| *22 | 0.827 | -1.8198 | 33.8670 | 7.5876 | 0.0458 | 0.00 | 0.0265 |
| 23 | 0.826 | -1.8227 | 33.8683 | 7.5942 | 0.0458 | 0.00 | 0.0279 |
| Station: 261.255/48/47 Latitude: 67 28.09S Longitude: 73 46.53W Depth: 390 m | | | | | | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 379.379 | 1.5826 | 34.7071 | 4.1843 | 0.0517 | 90.63 | 0.0549 |
| 2 | 379.396 | 1.5826 | 34.7071 | 4.1929 | 0.0517 | 90.63 | 0.0551 |
| 3 | 300.306 | 1.7697 | 34.6976 | 4.1820 | 0.0518 | 90.77 | 0.0178 |
| * 4 | 199.936 | 0.3866 | 34.4540 | 4.7423 | 0.0516 | 90.60 | 0.0165 |
| 5 | 100.457 | -1.5769 | 34.0416 | 7.2256 | 0.0517 | 90.65 | 0.0258 |
| 6 | 50.372 | -1.8489 | 33.8958 | 7.8842 | 0.0536 | 90.62 | 0.0423 |
| 7 | 30.370 | -1.8535 | 33.8903 | 7.9036 | 0.0608 | 90.59 | 0.0331 |
| 8 | 20.101 | -1.8541 | 33.8902 | 7.8637 | 0.0747 | 90.63 | 0.0418 |
| 9 | 14.804 | -1.8489 | 33.8903 | 7.8614 | 0.1009 | 90.62 | 0.0290 |
| 10 | 10.371 | -1.8468 | 33.8905 | 7.8398 | 0.1532 | 90.63 | 0.0637 |
| 11 | 5.195 | -1.8472 | 33.8906 | 7.8107 | 0.2867 | 90.63 | 0.0230 |
| 12 | 5.165 | -1.8472 | 33.8906 | 7.8217 | 0.2949 | 90.63 | 0.0283 |
| *13 | 0.412 | -1.8497 | 33.8904 | 7.7940 | 0.8026 | 90.50 | 0.0628 |
| 14 | 0.427 | -1.8488 | 33.8901 | 7.8039 | 0.7561 | 90.63 | 0.0599 |
| Station: 261.220/49/48 Latitude: 67 41.614S Longitude: 73 7.614W Depth: 486 m | | | | | | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 477.542 | 1.4299 | 34.7297 | 4.4030 | 0.0518 | 90.28 | 0.0370 |
| 2 | 477.642 | 1.4295 | 34.7297 | 4.4033 | 0.0519 | 90.28 | 0.0353 |
| 3 | 400.396 | 1.4846 | 34.7167 | 4.2527 | 0.0519 | 90.59 | 0.0362 |
| 4 | 300.571 | 1.5226 | 34.6850 | 4.2115 | 0.0519 | 90.71 | 0.0189 |
| 5 | 200.577 | 0.6736 | 34.5054 | 4.5750 | 0.0518 | 90.63 | 0.0202 |
| 6 | 150.651 | -0.3860 | 34.2958 | 5.4469 | 0.0518 | 90.59 | 0.0143 |
| * 7 | 100.622 | -0.6302 | 34.0469 | 6.0410 | 0.0517 | 90.58 | 0.0249 |
| 8 | 50.494 | -1.8242 | 33.7807 | 7.6320 | 0.0518 | 90.55 | 0.0291 |
| 9 | 30.602 | -1.8247 | 33.7782 | 7.5901 | 0.0522 | 90.55 | 0.0278 |
| 10 | 20.577 | -1.8255 | 33.7766 | 7.5640 | 0.0536 | 90.57 | 0.0641 |
| 11 | 15.765 | -1.8254 | 33.7775 | 7.5462 | 0.1036 | 90.57 | 0.0261 |
| 12 | 10.799 | -1.8257 | 33.7771 | 7.5328 | 0.0690 | 90.57 | 0.0222 |
| 13 | 5.747 | -1.8220 | 33.7760 | 7.5046 | 0.2119 | 90.58 | 0.0524 |
| 14 | 5.762 | -1.8238 | 33.7760 | 7.5119 | 0.2332 | 90.57 | 0.0476 |
| *15 | 0.816 | -1.8161 | 33.7758 | 7.5042 | 0.1911 | 89.99 | 0.0273 |
| 16 | 0.760 | -1.8167 | 33.7758 | 7.4996 | 0.1746 | 90.19 | 0.0284 |
| Station: 261.180/50/49 Latitude: 67 53.575S Longitude: 72 23.550W Depth: 302 | | | | | | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 289.181 | 1.5038 | 34.6928 | 4.1124 | 0.0518 | 90.27 | 0.0233 |
| 2 | 289.257 | 1.5038 | 34.6928 | 4.1177 | 0.0518 | 90.25 | 0.0328 |
| 3 | 200.295 | 1.0811 | 34.5877 | 4.2971 | 0.0525 | 90.57 | 0.0233 |
| 4 | 150.593 | 0.5401 | 34.4659 | 4.6198 | 0.0551 | 90.53 | 0.0449 |
| 5 | 150.617 | 0.5396 | 34.4657 | 4.6151 | 0.0551 | 90.52 | 0.0437 |
| 6 | 110.505 | -0.4904 | 34.2078 | 5.7595 | 0.0649 | 90.54 | 0.0284 |
| 7 | 110.506 | -0.4891 | 34.2088 | 5.7473 | 0.0649 | 90.53 | 0.0320 |
| * 8 | 100.540 | -0.8133 | 34.0814 | 6.2500 | 0.0705 | 90.48 | 0.0585 |
| 9 | 70.341 | -1.4701 | 33.8482 | 7.1418 | 0.1255 | 90.40 | 0.0224 |
| 10 | 70.336 | -1.4607 | 33.8506 | 7.1548 | 0.1258 | 90.41 | 0.0206 |
| 11 | 70.319 | -1.4537 | 33.8517 | 7.1358 | 0.1258 | 90.41 | 0.0251 |
| 12 | 50.123 | -1.8194 | 33.7735 | 7.5264 | 0.2668 | 90.45 | 0.0450 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 13 | 30.210 | -1.8209 | 33.7730 | 7.5232 | 0.8722 | 90.46 | 0.0341 |
| 14 | 20.417 | -1.8228 | 33.7729 | 7.5131 | 2.1930 | 90.47 | 0.0449 |
| 15 | 15.343 | -1.8237 | 33.7729 | 7.5045 | 5.1090 | 90.48 | 0.0136 |
| 16 | 10.463 | -1.8240 | 33.7729 | 7.4949 | 12.3300 | 90.47 | 0.0661 |
| 17 | 5.249 | -1.8221 | 33.7729 | 7.4758 | 30.5000 | 90.48 | 0.0252 |
| 18 | 5.239 | -1.8220 | 33.7730 | 7.4802 | 30.7500 | 90.48 | 0.0275 |
| *19 | 0.374 | -1.8186 | 33.7728 | 7.4465 | 67.5600 | 90.46 | 0.0298 |
| 20 | 0.375 | -1.8192 | 33.7729 | 7.4481 | 67.0700 | 90.45 | 0.0377 |
| 21 | 0.376 | -1.8191 | 33.7729 | 7.4442 | 66.6700 | 90.45 | 0.0432 |
| 22 | 0.394 | -1.8190 | 33.7729 | 7.4433 | 67.8700 | 90.41 | 0.0383 |
| Station: 261.140/51/50 Latitude: 68 7.608S Longitude: 71 40.296W Depth: 518 m | | | | | | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 553.063 | 1.3998 | 34.7108 | 4.2878 | 0.0518 | 90.26 | 0.0203 |
| 2 | 553.065 | 1.3999 | 34.7109 | 4.2876 | 0.0518 | 90.26 | 0.0253 |
| * 3 | 350.421 | 1.3082 | 34.6838 | 4.2158 | 0.0518 | 90.42 | 0.0263 |
| 4 | 200.481 | 0.6416 | 34.4824 | 4.5452 | 0.0518 | 90.19 | 0.0252 |
| * 5 | 103.417 | -0.4410 | 34.0505 | 5.6145 | 0.0517 | 89.92 | 0.0239 |
| * 6 | 0.659 | -1.7828 | 33.6903 | 7.2281 | 1.1300 | 89.01 | 0.0335 |
| 7 | 0.572 | -1.7822 | 33.6898 | 7.2276 | 1.0040 | 88.37 | 0.0310 |
| Station: 261.100/52/51 Latitude: 68 19.48S Longitude: 70 54.83W Depth: 499 m | | | | | | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 489.981 | 1.3369 | 34.7094 | 4.2162 | 0.0518 | 89.57 | 0.0205 |
| 2 | 400.454 | 1.3320 | 34.6945 | 4.2142 | 0.0517 | 89.86 | 0.0291 |
| 3 | 300.543 | 1.2780 | 34.6465 | 4.2396 | 0.0518 | 90.28 | 0.0194 |
| 4 | 200.606 | 0.8821 | 34.5359 | 4.4335 | 0.0525 | 90.17 | 0.0290 |
| 5 | 150.594 | 0.2358 | 34.3484 | 5.1050 | 0.0566 | 90.22 | 0.0234 |
| * 6 | 100.162 | -1.0082 | 34.0033 | 6.8290 | 0.0949 | 90.17 | 0.0418 |
| 7 | 90.572 | -1.3401 | 33.9211 | 7.1828 | 0.1211 | 90.13 | 0.0298 |
| 8 | 90.561 | -1.3220 | 33.9213 | 7.1704 | 0.1212 | 90.11 | 0.0503 |
| 9 | 90.563 | -1.3218 | 33.9238 | 7.1716 | 0.1213 | 90.11 | 0.0488 |
| 10 | 90.560 | -1.3595 | 33.9181 | 7.1654 | 0.1212 | 90.11 | 0.0386 |
| 11 | 90.566 | -1.3886 | 33.9108 | 7.1794 | 0.1213 | 90.11 | 0.0354 |
| 12 | 90.550 | -1.3804 | 33.9132 | 7.1896 | 0.1213 | 90.10 | 0.0469 |
| 13 | 90.560 | -1.4104 | 33.9049 | 7.2585 | 0.1215 | 90.12 | 0.0461 |
| 14 | 50.680 | -1.7256 | 33.8064 | 7.5174 | 0.6339 | 90.06 | 0.0307 |
| 15 | 30.561 | -1.7456 | 33.8020 | 7.5093 | 2.0410 | 90.07 | 0.0637 |
| 16 | 20.603 | -1.7592 | 33.7966 | 7.4961 | 4.9780 | 90.07 | 0.0502 |
| 17 | 15.690 | -1.7506 | 33.7996 | 7.4792 | 7.9810 | 90.08 | 0.0613 |
| 18 | 10.682 | -1.7665 | 33.7942 | 7.4596 | 13.9600 | 90.07 | 0.0256 |
| 19 | 5.689 | -1.7561 | 33.7963 | 7.4529 | 29.9900 | 90.07 | 0.0223 |
| 20 | 5.698 | -1.7577 | 33.7962 | 7.4518 | 29.9100 | 90.07 | 0.0260 |
| *21 | 0.428 | -1.7574 | 33.7959 | 7.4538 | 63.5300 | 89.87 | 0.0548 |
| 22 | 0.425 | -1.7576 | 33.7957 | 7.4548 | 65.2900 | 89.82 | 0.0540 |
| Station: 256.080/53/52 Latitude: 68 28.36S Longitude: 70 36.29W Depth: 656 m | | | | | | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 663.861 | 1.3424 | 34.7161 | 4.2604 | 0.0519 | 89.88 | 0.0285 |
| 2 | 663.869 | 1.3425 | 34.7161 | 4.2526 | 0.0519 | 89.89 | 0.0279 |
| 3 | 550.333 | 1.3664 | 34.7114 | 4.2471 | 0.0519 | 90.35 | 0.0326 |
| 4 | 450.350 | 1.3846 | 34.6979 | 4.2349 | 0.0519 | 90.37 | 0.0160 |
| * 5 | 350.225 | 1.3585 | 34.6701 | 4.2136 | 0.0519 | 90.40 | 0.0210 |
| 6 | 250.175 | 1.0648 | 34.5842 | 4.3166 | 0.0519 | 90.38 | 0.0454 |
| 7 | 200.181 | 0.7056 | 34.4870 | 4.5708 | 0.0519 | 90.22 | 0.0262 |
| * 8 | 150.192 | 0.1163 | 34.2960 | 5.1067 | 0.0519 | 90.14 | 0.0467 |
| 9 | 100.174 | -1.1198 | 33.9549 | 6.7113 | 0.0519 | 90.11 | 0.0368 |
| 10 | 49.974 | -1.6513 | 33.8135 | 7.5383 | 0.0531 | 90.02 | 0.0324 |
| 11 | 30.089 | -1.7368 | 33.7943 | 7.6186 | 0.0523 | 90.01 | 0.0299 |
| 12 | 20.316 | -1.7564 | 33.7889 | 7.6268 | 0.0546 | 90.03 | 0.0367 |
| 13 | 15.093 | -1.7620 | 33.7889 | 7.6087 | 0.0944 | 90.04 | 0.0431 |
| 14 | 10.080 | -1.7609 | 33.7884 | 7.6116 | 0.1832 | 90.04 | 0.0627 |
| 15 | 10.090 | -1.7609 | 33.7882 | 7.6108 | 0.1915 | 90.04 | 0.0531 |
| 16 | 4.819 | -1.7564 | 33.7884 | 7.5811 | 0.0912 | 90.03 | 0.0498 |
| 17 | 4.838 | -1.7571 | 33.7884 | 7.5868 | 0.0946 | 90.04 | 0.0499 |
| *18 | -0.030 | -1.7603 | 33.7881 | 7.5596 | 0.1894 | 90.00 | 0.0250 |
| 19 | -0.038 | -1.7603 | 33.7880 | 7.5846 | 0.1943 | 90.01 | 0.0308 |
| 20 | -0.037 | -1.7601 | 33.7881 | 7.5721 | 0.1915 | 90.01 | 0.0305 |
| Station: 268.057/54/53 Latitude: 68 30.427S Longitude: 69 59.635W Depth: 1142 | | | | | | | |

| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
|---|---|---|---|---|---|---|---|
| * 1 | 1128.869 | 1.3410 | 34.7223 | 4.3275 | 0.0518 | 89.73 | 0.0470 |
| 2 | 1128.925 | 1.3410 | 34.7223 | 4.3257 | 0.0518 | 89.67 | 0.0467 |
| 3 | 900.141 | 1.3407 | 34.7203 | 4.3014 | 0.0521 | 90.19 | 0.0604 |
| 4 | 699.963 | 1.3891 | 34.7161 | 4.2640 | 0.0519 | 90.33 | 0.0347 |
| 5 | 500.162 | 1.3956 | 34.7094 | 4.2176 | 0.0519 | 90.23 | 0.0342 |
| * 6 | 350.101 | 1.4040 | 34.6830 | 4.1840 | 0.0520 | 90.32 | 0.0492 |
| 7 | 200.237 | 0.9866 | 34.5597 | 4.3794 | 0.0520 | 90.41 | 0.0213 |
| 8 | 149.900 | 0.2119 | 34.3575 | 5.1047 | 0.0527 | 90.36 | 0.0225 |
| * 9 | 99.895 | -1.2111 | 33.9626 | 7.0753 | 0.0599 | 90.04 | 0.0292 |
| 10 | 50.147 | -1.7412 | 33.7737 | 7.4689 | 0.1905 | 89.87 | 0.0597 |
| 11 | 30.574 | -1.7658 | 33.7567 | 7.4843 | 0.5809 | 89.86 | 0.0198 |
| 12 | 20.537 | -1.7715 | 33.7526 | 7.4645 | 1.2470 | 89.86 | 0.0296 |
| 13 | 15.261 | -1.7737 | 33.7507 | 7.4487 | 1.8480 | 89.86 | 0.0535 |
| 14 | 10.290 | -1.7754 | 33.7492 | 7.4335 | 2.6980 | 89.86 | 0.0386 |
| 15 | 5.370 | -1.7794 | 33.7412 | 7.4154 | 4.3460 | 89.85 | 0.0261 |
| 16 | 5.376 | -1.7791 | 33.7401 | 7.4101 | 4.3650 | 89.86 | 0.0251 |
| *17 | -0.178 | -1.7780 | 33.7390 | 7.3958 | 9.3530 | 89.80 | 0.0482 |
| 18 | -0.166 | -1.7778 | 33.7383 | 7.3889 | 9.4640 | 89.81 | 0.0530 |
| Station: 240.057/59/54 Latitude: 68 42.76S Longitude: 70 23.23W Depth: 400 m | | | | | | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 393.931 | 1.1148 | 34.6102 | 4.2430 | 0.0518 | 88.76 | 0.0216 |
| 2 | 393.936 | 1.1148 | 34.6102 | 4.2454 | 0.0518 | 88.73 | 0.0196 |
| 3 | 300.576 | 1.0597 | 34.5942 | 4.2783 | 0.0518 | 89.01 | 0.0240 |
| 4 | 200.480 | 0.3277 | 34.3537 | 4.5683 | 0.0532 | 88.71 | 0.0201 |
| * 5 | 100.318 | -0.9132 | 33.9239 | 6.3136 | 0.1475 | 89.46 | 0.0280 |
| 6 | 100.319 | -0.9171 | 33.9232 | 6.3167 | 0.1475 | 89.45 | 0.0254 |
| 7 | 100.322 | -0.9191 | 33.9227 | 6.3284 | 0.1477 | 89.47 | 0.0204 |
| 8 | 100.322 | -0.9232 | 33.9214 | 6.3266 | 0.1478 | 89.47 | 0.0283 |
| 9 | 100.319 | -0.9226 | 33.9210 | 6.3269 | 0.1478 | 89.48 | 0.0299 |
| 10 | 100.315 | -0.9212 | 33.9218 | 6.3268 | 0.1480 | 89.46 | 0.0295 |
| 11 | 100.315 | -0.9209 | 33.9219 | 6.3234 | 0.1482 | 89.47 | 0.0255 |
| 12 | 100.318 | -0.9172 | 33.9224 | 6.3190 | 0.1483 | 89.48 | 0.0288 |
| 13 | 100.320 | -0.9186 | 33.9217 | 6.3269 | 0.1484 | 89.48 | 0.0338 |
| 14 | 50.340 | -1.7527 | 33.7349 | 7.4500 | 1.2140 | 89.51 | 0.0557 |
| 15 | 30.368 | -1.7533 | 33.7356 | 7.4204 | 3.6260 | 89.52 | 0.0580 |
| 16 | 20.363 | -1.7536 | 33.7359 | 7.4061 | 6.4500 | 89.53 | 0.0284 |
| 17 | 15.494 | -1.7535 | 33.7351 | 7.4117 | 8.8800 | 89.53 | 0.0413 |
| 18 | 10.532 | -1.7534 | 33.7353 | 7.3933 | 12.2900 | 89.53 | 0.0310 |
| 19 | 5.566 | -1.7406 | 33.7379 | 7.3741 | 19.6800 | 89.50 | 0.0273 |
| 20 | 5.567 | -1.7415 | 33.7375 | 7.3690 | 19.6500 | 89.49 | 0.0233 |
| *21 | 0.770 | -1.7416 | 33.7371 | 7.3731 | 39.1900 | 89.50 | 0.0392 |
| 22 | 0.766 | -1.7413 | 33.7373 | 7.3647 | 38.4700 | 89.50 | 0.0545 |
| Station: 221.075/60/55 Latitude: 68 44.97S Longitude: 71 0.30W Depth: 294 m | | | | | | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 283.346 | 0.4996 | 34.4099 | 4.3415 | 0.0518 | 85.07 | 0.0558 |
| 2 | 283.345 | 0.4990 | 34.4098 | 4.3359 | 0.0518 | 84.98 | 0.0531 |
| 3 | 200.196 | 0.2464 | 34.3124 | 4.5124 | 0.0518 | 87.87 | 0.0593 |
| 4 | 150.263 | -0.1035 | 34.1761 | 4.7360 | 0.0518 | 87.78 | 0.0514 |
| * 5 | 99.987 | -0.5401 | 34.0213 | 5.2594 | 0.0518 | 89.14 | 0.0581 |
| 6 | 50.385 | -1.5879 | 33.7848 | 6.7880 | 0.0526 | 88.81 | 0.0284 |
| 7 | 30.275 | -1.6253 | 33.7689 | 6.9429 | 0.0570 | 89.10 | 0.0319 |
| 8 | 20.298 | -1.6416 | 33.7621 | 7.0348 | 0.0689 | 89.13 | 0.0410 |
| 9 | 15.438 | -1.6437 | 33.7602 | 7.0260 | 0.0879 | 89.12 | 0.0156 |
| 10 | 10.225 | -1.6531 | 33.7571 | 7.0363 | 0.1444 | 89.14 | 0.0325 |
| 11 | 10.223 | -1.6496 | 33.7580 | 7.0298 | 0.1443 | 89.14 | 0.0296 |
| 12 | 5.210 | -1.6589 | 33.7557 | 7.0268 | 0.3321 | 89.16 | 0.0426 |
| 13 | 5.210 | -1.6600 | 33.7553 | 7.0332 | 0.3326 | 89.15 | 0.0383 |
| 14 | 5.214 | -1.6594 | 33.7553 | 7.0332 | 0.3329 | 89.16 | 0.0378 |
| *15 | 1.558 | -1.6639 | 33.7542 | 7.0486 | 0.7440 | 89.17 | 0.0160 |
| 16 | 1.552 | -1.6639 | 33.7542 | 7.0472 | 0.7439 | 89.17 | 0.0206 |
| 17 | 1.550 | -1.6641 | 33.7541 | 7.0551 | 0.7479 | 89.17 | 0.0246 |
| Station: 221.100/61/56 Latitude: 68 37.09S Longitude: 71 29.07W Depth: 206 m | | | | | | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 197.967 | 0.7243 | 34.4840 | 4.4223 | 0.0516 | 88.52 | 0.0623 |
| 2 | 197.958 | 0.7279 | 34.4856 | 4.4038 | 0.0516 | 88.51 | 0.0611 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 3 | 150.316 | -0.0887 | 34.1802 | 4.9733 | 0.0517 | 89.09 | 0.0288 |
| * 4 | 100.656 | -0.6900 | 33.9909 | 5.8200 | 0.0517 | 89.08 | 0.0303 |
| 5 | 50.123 | -1.7048 | 33.7251 | 7.0062 | 0.0527 | 89.21 | 0.0199 |
| 6 | 30.166 | -1.7326 | 33.7188 | 7.0857 | 0.0590 | 89.22 | 0.0395 |
| 7 | 20.055 | -1.7376 | 33.7179 | 7.0809 | 0.0751 | 89.23 | 0.0263 |
| 8 | 15.561 | -1.7465 | 33.7161 | 7.0954 | 0.0907 | 89.23 | 0.0456 |
| 9 | 10.364 | -1.7492 | 33.7156 | 7.0906 | 0.1373 | 89.23 | 0.0613 |
| 10 | 5.318 | -1.7511 | 33.7150 | 7.0838 | 0.2808 | 89.23 | 0.0222 |
| 11 | 5.257 | -1.7512 | 33.7151 | 7.0824 | 0.2917 | 89.23 | 0.0314 |
| *12 | 1.197 | -1.7512 | 33.7152 | 7.0736 | 0.6668 | 89.22 | 0.0249 |
| 13 | 1.198 | -1.7517 | 33.7150 | 7.0772 | 0.6622 | 89.23 | 0.0263 |
| Station: 221.140/62/57 Latitude: 68 23.30S Longitude: 72 17.19W Depth: 460 m | | | | | | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 436.313 | 1.3503 | 34.7007 | 4.2096 | 0.0520 | 89.40 | 0.0175 |
| 2 | 436.339 | 1.3503 | 34.7007 | 4.2100 | 0.0519 | 89.44 | 0.0277 |
| 3 | 300.282 | 1.2083 | 34.6555 | 4.2364 | 0.0519 | 89.85 | 0.0437 |
| 4 | 200.123 | 0.3051 | 34.4245 | 4.7901 | 0.0522 | 89.84 | 0.0220 |
| * 5 | 160.050 | -0.6307 | 34.2368 | 5.7310 | 0.0532 | 89.87 | 0.0596 |
| * 6 | 100.367 | -0.6354 | 33.9979 | 5.8083 | 0.0758 | 89.32 | 0.0218 |
| 7 | 50.382 | -1.7488 | 33.7165 | 7.0650 | 0.4921 | 89.44 | 0.0423 |
| 8 | 30.185 | -1.7670 | 33.7146 | 7.0884 | 1.9160 | 89.45 | 0.0342 |
| 9 | 20.309 | -1.7718 | 33.7135 | 7.0885 | 4.3320 | 89.46 | 0.0224 |
| 10 | 15.270 | -1.7731 | 33.7134 | 7.0971 | 7.1580 | 89.46 | 0.0268 |
| 11 | 10.144 | -1.7719 | 33.7134 | 7.0546 | 12.8500 | 89.46 | 0.0232 |
| 12 | 5.302 | -1.7694 | 33.7138 | 7.0519 | 20.9500 | 89.44 | 0.0353 |
| 13 | 5.286 | -1.7694 | 33.7138 | 7.0449 | 20.9100 | 89.44 | 0.0324 |
| *14 | 0.276 | -1.7701 | 33.7135 | 7.0376 | 40.4900 | 89.37 | 0.0358 |
| 15 | 0.285 | -1.7696 | 33.7136 | 7.0517 | 40.3900 | 89.39 | 0.0254 |
| Station: 221.180/63/58 Latitude: 68 9.98S Longitude: 73 2.72W Depth: 345 m | | | | | | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 331.967 | 1.3851 | 34.6915 | 4.1497 | 0.0519 | 89.52 | 0.0155 |
| 2 | 331.978 | 1.3852 | 34.6916 | 4.1451 | 0.0518 | 89.52 | 0.0195 |
| 3 | 250.138 | 1.1830 | 34.6303 | 4.2301 | 0.0519 | 89.86 | 0.0250 |
| * 4 | 150.375 | 0.0878 | 34.3728 | 4.9620 | 0.0519 | 89.81 | 0.0289 |
| 5 | 100.426 | -0.9320 | 34.0331 | 6.3045 | 0.0519 | 89.70 | 0.0229 |
| 6 | 65.339 | -1.7276 | 33.7825 | 7.3914 | 0.0518 | 89.72 | 0.0601 |
| 7 | 54.801 | -1.8140 | 33.7626 | 7.4590 | 0.0525 | 89.69 | 0.0179 |
| 8 | 30.084 | -1.8181 | 33.7605 | 7.4331 | 0.0524 | 89.72 | 0.0714 |
| 9 | 20.154 | -1.8187 | 33.7605 | 7.4284 | 0.0582 | 89.72 | 0.0274 |
| 10 | 15.318 | -1.8190 | 33.7605 | 7.4082 | 0.0894 | 89.72 | 0.0260 |
| 11 | 10.549 | -1.8198 | 33.7607 | 7.4021 | 0.1745 | 89.72 | 0.0422 |
| 12 | 5.205 | -1.8142 | 33.7602 | 7.3932 | 0.2351 | 89.67 | 0.0517 |
| 13 | 5.215 | -1.8138 | 33.7602 | 7.3992 | 0.2526 | 89.68 | 0.0452 |
| 14 | 5.254 | -1.8131 | 33.7601 | 7.3938 | 0.2649 | 89.66 | 0.0319 |
| *15 | 1.733 | -1.8145 | 33.7602 | 7.3889 | 0.6194 | 89.58 | 0.0231 |
| 16 | 1.764 | -1.8148 | 33.7603 | 7.3892 | 0.6264 | 89.59 | 0.0236 |
| 17 | 1.773 | -1.8147 | 33.7602 | 7.3980 | 0.6456 | 89.64 | 0.0244 |
| Station: 181.180/73/59 Latitude: 68 26.799S Longitude: 73 40.345W Depth: 540 | | | | | | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 520.975 | 1.3393 | 34.7027 | 4.1989 | 0.0519 | 89.32 | 0.0325 |
| 2 | 520.996 | 1.3393 | 34.7027 | 4.1989 | 0.0519 | 89.33 | 0.0307 |
| 3 | 400.807 | 1.2378 | 34.6622 | 4.2126 | 0.0520 | 89.50 | 0.0255 |
| 4 | 300.533 | 1.0418 | 34.6047 | 4.2974 | 0.0519 | 89.80 | 0.0472 |
| 5 | 200.291 | 0.2713 | 34.4214 | 4.8377 | 0.0520 | 89.87 | 0.0178 |
| 6 | 140.592 | -0.4960 | 34.2310 | 5.4870 | 0.0518 | 89.80 | 0.0251 |
| * 7 | 100.372 | -1.1976 | 33.9643 | 6.6822 | 0.0518 | 89.84 | 0.0370 |
| 8 | 50.423 | -1.8233 | 33.7859 | 7.5974 | 0.0529 | 89.79 | 0.0645 |
| 9 | 30.525 | -1.8221 | 33.7737 | 7.5203 | 0.0584 | 89.76 | 0.0361 |
| 10 | 20.506 | -1.8227 | 33.7662 | 7.4685 | 0.0720 | 89.75 | 0.0272 |
| 11 | 15.473 | -1.8227 | 33.7664 | 7.4543 | 0.0884 | 89.74 | 0.0462 |
| 12 | 10.509 | -1.8230 | 33.7662 | 7.4418 | 0.1344 | 89.75 | 0.0167 |
| 13 | 5.512 | -1.8223 | 33.7665 | 7.4380 | 0.2568 | 89.75 | 0.0324 |
| 14 | 5.513 | -1.8224 | 33.7665 | 7.4270 | 0.2508 | 89.75 | 0.0540 |
| *15 | 0.765 | -1.8192 | 33.7657 | 7.4192 | 0.7205 | 89.68 | 0.0300 |
| 16 | 0.766 | -1.8177 | 33.7656 | 7.4131 | 0.7006 | 89.71 | 0.0280 |
| Station: 181.140/74/60 Latitude: 68 40.68S Longitude: 72 55.02W Depth: 298 m | | | | | | | |

| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
|---|---|---|---|---|---|---|---|
| * 1 | 293.144 | 0.8755 | 34.5513 | 4.3492 | 0.0518 | 89.16 | 0.0307 |
| 2 | 293.115 | 0.8765 | 34.5516 | 4.3489 | 0.0518 | 89.16 | 0.0337 |
| 3 | 200.449 | 0.6306 | 34.4760 | 4.5132 | 0.0518 | 89.18 | 0.0300 |
| * 4 | 100.127 | -1.3972 | 33.7866 | 6.7822 | 0.0518 | 89.29 | 0.0242 |
| 5 | 90.440 | -1.4849 | 33.7668 | 7.0016 | 0.0518 | 89.30 | 0.0409 |
| 6 | 50.408 | -1.7816 | 33.7136 | 7.2211 | 0.0529 | 89.37 | 0.0323 |
| 7 | 30.369 | -1.7897 | 33.7107 | 7.1889 | 0.0602 | 89.39 | 0.0619 |
| 8 | 20.294 | -1.7901 | 33.7108 | 7.1765 | 0.0587 | 89.40 | 0.0282 |
| 9 | 15.140 | -1.7944 | 33.7094 | 7.1816 | 0.0629 | 89.39 | 0.0337 |
| 10 | 10.440 | -1.7921 | 33.7090 | 7.1623 | 0.0712 | 89.36 | 0.0272 |
| 11 | 5.302 | -1.7945 | 33.7092 | 7.1452 | 0.2673 | 89.37 | 0.0381 |
| 12 | 5.305 | -1.7923 | 33.7088 | 7.1519 | 0.2717 | 89.37 | 0.0329 |
| *13 | 0.574 | -1.7922 | 33.7087 | 7.1534 | 0.7673 | 89.32 | 0.0368 |
| 14 | 0.521 | -1.7931 | 33.7087 | 7.1327 | 0.6701 | 89.34 | 0.0331 |
| Station: 181.100/75/61 | Latitude: 68 49.16S | | Longitude: 72 20.50W | | Depth: 123 m | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 119.625 | -0.5074 | 34.0399 | 5.7766 | 0.0516 | 88.14 | 0.0242 |
| 2 | 119.574 | -0.5354 | 34.0356 | 5.7713 | 0.0516 | 88.19 | 0.0191 |
| 3 | 101.219 | -1.1255 | 33.8623 | 6.3510 | 0.0517 | 88.56 | 0.0202 |
| 4 | 101.411 | -1.1226 | 33.8625 | 6.3691 | 0.0516 | 88.56 | 0.0201 |
| 5 | 101.576 | -1.1171 | 33.8640 | 6.3776 | 0.0517 | 88.54 | 0.0212 |
| 6 | 101.762 | -1.1040 | 33.8666 | 6.3962 | 0.0517 | 88.54 | 0.0270 |
| 7 | 102.014 | -1.0981 | 33.8700 | 6.3977 | 0.0517 | 88.54 | 0.0302 |
| 8 | 102.048 | -1.0975 | 33.8679 | 6.4056 | 0.0517 | 88.54 | 0.0289 |
| 9 | 102.051 | -1.1035 | 33.8669 | 6.4080 | 0.0517 | 88.54 | 0.0460 |
| 10 | 102.050 | -1.1036 | 33.8657 | 6.4065 | 0.0517 | 88.50 | 0.0558 |
| 11 | 102.048 | -1.1035 | 33.8650 | 6.4090 | 0.0518 | 88.55 | 0.0591 |
| 12 | 102.061 | -1.1108 | 33.8655 | 6.4226 | 0.0517 | 88.53 | 0.0475 |
| 13 | 49.578 | -1.6882 | 33.7241 | 7.0598 | 0.0540 | 88.77 | 0.0472 |
| 14 | 29.925 | -1.7377 | 33.7126 | 7.0802 | 0.0598 | 88.80 | 0.0247 |
| 15 | 19.715 | -1.7379 | 33.7118 | 7.0968 | 0.0992 | 88.79 | 0.0311 |
| 16 | 14.668 | -1.7387 | 33.7116 | 7.0749 | 0.0906 | 88.78 | 0.0612 |
| 17 | 9.640 | -1.7405 | 33.7101 | 7.1038 | 0.1073 | 88.79 | 0.0233 |
| 18 | 4.849 | -1.7430 | 33.7095 | 7.0726 | 0.6672 | 88.80 | 0.0271 |
| 19 | 4.841 | -1.7431 | 33.7095 | 7.0781 | 0.6033 | 88.81 | 0.0267 |
| 20 | 4.830 | -1.7429 | 33.7095 | 7.0783 | 0.5875 | 88.80 | 0.0239 |
| *21 | 0.527 | -1.7411 | 33.7091 | 7.0681 | 1.6020 | 88.76 | 0.0320 |
| 22 | 0.549 | -1.7416 | 33.7091 | 7.0683 | 1.5960 | 88.74 | 0.0260 |
| Station: 141.100/76/62 | Latitude: 69 04.74S | | Longitude: 73 05.15W | | Depth: 266 m | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 274.323 | 0.9198 | 34.5683 | 4.2503 | 0.0517 | 88.29 | 0.0168 |
| 2 | 274.324 | 0.9190 | 34.5676 | 4.2512 | 0.0517 | 88.32 | 0.0186 |
| * 3 | 200.140 | 0.5549 | 34.4372 | 4.4600 | 0.0518 | 88.40 | 0.0274 |
| 4 | 150.237 | -0.9209 | 33.9607 | 6.0061 | 0.0518 | 88.72 | 0.0316 |
| 5 | 100.401 | -1.5818 | 33.7848 | 7.1256 | 0.0518 | 88.89 | 0.0222 |
| 6 | 50.450 | -1.7613 | 33.7281 | 7.2546 | 0.0525 | 88.99 | 0.0254 |
| 7 | 30.274 | -1.7395 | 33.7237 | 7.2213 | 0.0579 | 88.98 | 0.0323 |
| 8 | 20.720 | -1.7099 | 33.7135 | 7.1649 | 0.0718 | 89.02 | 0.0355 |
| 9 | 14.919 | -1.7157 | 33.7036 | 7.1437 | 0.0912 | 89.05 | 0.0246 |
| 10 | 10.426 | -1.7478 | 33.6705 | 7.1322 | 0.1441 | 89.20 | 0.0282 |
| 11 | 10.427 | -1.7606 | 33.6502 | 7.1223 | 0.1428 | 89.21 | 0.0435 |
| 12 | 5.397 | -1.7940 | 33.6004 | 7.0268 | 0.2779 | 89.25 | 0.0252 |
| 13 | 5.394 | -1.7909 | 33.6045 | 7.0128 | 0.2607 | 89.25 | 0.0247 |
| 14 | 5.388 | -1.7996 | 33.5850 | 7.0104 | 0.2727 | 89.24 | 0.0239 |
| *15 | 1.070 | -1.8045 | 33.5660 | 6.9866 | 0.7106 | 89.25 | 0.0357 |
| 16 | 1.073 | -1.8055 | 33.5616 | 6.9793 | 0.6958 | 89.25 | 0.0481 |
| 17 | 1.070 | -1.8052 | 33.5594 | 6.9863 | 0.7211 | 89.25 | 0.0533 |
| Station: 141.140/77/63 | Latitude: 68 57.37S | | Longitude: 73 30.44W | | Depth: 176 m | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 154.320 | -0.3823 | 34.0949 | 5.5925 | 0.0516 | 88.78 | 0.0328 |
| 2 | 154.324 | -0.3838 | 34.0945 | 5.5951 | 0.0516 | 88.79 | 0.0307 |
| 3 | 100.424 | -1.3057 | 33.8533 | 6.4407 | 0.0518 | 88.96 | 0.0699 |
| 4 | 50.663 | -1.7774 | 33.7720 | 7.1537 | 0.0527 | 89.07 | 0.0261 |
| 5 | 30.587 | -1.7591 | 33.7690 | 7.1459 | 0.0591 | 89.04 | 0.0652 |
| 6 | 20.663 | -1.7588 | 33.7684 | 7.1269 | 0.0765 | 89.13 | 0.0582 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 7 | 15.722 | -1.7636 | 33.7677 | 7.1139 | 0.1011 | 89.13 | 0.0330 |
| 8 | 10.799 | -1.7661 | 33.7673 | 7.1085 | 0.1539 | 89.13 | 0.0277 |
| 9 | 5.622 | -1.7588 | 33.7660 | 7.1056 | 0.3014 | 89.05 | 0.0380 |
| 10 | 5.626 | -1.7554 | 33.7655 | 7.0958 | 0.2837 | 89.07 | 0.0373 |
| 11 | 5.632 | -1.7528 | 33.7652 | 7.1038 | 0.3042 | 89.09 | 0.0423 |
| *12 | 1.266 | -1.7534 | 33.7657 | 7.0907 | 0.7896 | 89.08 | 0.0275 |
| 13 | 1.266 | -1.7547 | 33.7663 | 7.1065 | 0.7895 | 89.09 | 0.0325 |
| 14 | 1.264 | -1.7550 | 33.7657 | 7.0929 | 0.7884 | 89.10 | 0.0369 |
| Station: 141.180/78/64 Latitude: 68 43.556S Longitude: 74 14.261W Depth: 510 | | | | | | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 507.082 | 1.3032 | 34.6853 | 4.1832 | 0.0519 | 89.22 | 0.0269 |
| 2 | 507.128 | 1.3033 | 34.6853 | 4.1800 | 0.0519 | 89.22 | 0.0271 |
| 3 | 449.715 | 1.2881 | 34.6804 | 4.1894 | 0.0520 | 89.32 | 0.0198 |
| * 4 | 349.936 | 1.2126 | 34.6559 | 4.2207 | 0.0519 | 89.48 | 0.0284 |
| 5 | 250.080 | 0.8981 | 34.5639 | 4.3603 | 0.0521 | 89.62 | 0.0311 |
| * 6 | 150.046 | -1.0329 | 34.2057 | 6.1058 | 0.0565 | 89.85 | 0.0377 |
| 7 | 99.945 | -1.6168 | 33.9813 | 7.3884 | 0.0894 | 89.80 | 0.0268 |
| 8 | 50.073 | -1.8350 | 33.8204 | 7.6471 | 0.5400 | 89.77 | 0.0296 |
| 9 | 29.909 | -1.8357 | 33.8183 | 7.6319 | 1.8230 | 89.76 | 0.0377 |
| 10 | 19.843 | -1.8360 | 33.8175 | 7.6116 | 4.1160 | 89.77 | 0.0222 |
| 11 | 14.974 | -1.8362 | 33.8174 | 7.5925 | 7.0940 | 89.77 | 0.0318 |
| 12 | 9.981 | -1.8364 | 33.8170 | 7.5780 | 12.0000 | 89.78 | 0.0483 |
| 13 | 4.850 | -1.8263 | 33.8175 | 7.5613 | 19.7300 | 89.65 | 0.0240 |
| 14 | 4.863 | -1.8276 | 33.8175 | 7.5608 | 20.3600 | 89.66 | 0.0196 |
| 15 | 4.877 | -1.8261 | 33.8173 | 7.5550 | 20.7600 | 89.58 | 0.0319 |
| *16 | 0.835 | -1.8263 | 33.8171 | 7.5366 | 47.2900 | 89.67 | 0.0595 |
| 17 | 0.811 | -1.8297 | 33.8174 | 7.5455 | 49.0700 | 89.51 | 0.0532 |
| Station: 101.180/83/65 Latitude: 68 59.47S Longitude: 74 55.58W Depth: 408 m | | | | | | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 393.959 | 1.1802 | 34.6508 | 4.1500 | 0.0519 | 84.54 | 0.0213 |
| 2 | 393.980 | 1.1802 | 34.6507 | 4.1529 | 0.0518 | 89.05 | 0.0248 |
| 3 | 300.276 | 1.0896 | 34.6240 | 4.1933 | 0.0519 | 89.42 | 0.0187 |
| 4 | 200.140 | 0.5890 | 34.4845 | 4.4892 | 0.0519 | 89.57 | 0.0280 |
| * 5 | 100.217 | -0.8511 | 34.0142 | 6.1450 | 0.0520 | 89.59 | 0.0274 |
| 6 | 50.541 | -1.8053 | 33.7355 | 7.4869 | 0.0526 | 89.49 | 0.0539 |
| 7 | 30.496 | -1.8088 | 33.7352 | 7.4766 | 0.0562 | 89.49 | 0.0229 |
| 8 | 20.386 | -1.8108 | 33.7355 | 7.4617 | 0.0889 | 89.51 | 0.0477 |
| 9 | 15.379 | -1.8100 | 33.7352 | 7.4475 | 0.0634 | 89.53 | 0.0246 |
| 10 | 10.414 | -1.8105 | 33.7355 | 7.4310 | 0.0732 | 89.52 | 0.0561 |
| 11 | 5.179 | -1.8104 | 33.7359 | 7.4257 | 0.1134 | 89.52 | 0.0305 |
| 12 | 5.174 | -1.8109 | 33.7358 | 7.4359 | 0.1088 | 89.50 | 0.0241 |
| 13 | 5.194 | -1.8099 | 33.7359 | 7.4382 | 0.1073 | 89.48 | 0.0250 |
| *14 | 0.536 | -1.8079 | 33.7360 | 7.4056 | 0.5549 | 89.45 | 0.0589 |
| 15 | 0.558 | -1.8081 | 33.7362 | 7.3973 | 0.5982 | 89.45 | 0.0516 |
| Station: 061.180/87/66 Latitude: 69 14.54S Longitude: 75 41.3W Depth: 400 m | | | | | | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 300.640 | 0.9927 | 34.5983 | 4.2110 | 0.0518 | 89.41 | 0.0252 |
| 2 | 300.646 | 0.9956 | 34.5991 | 4.2139 | 0.0518 | 89.36 | 0.0217 |
| 3 | 300.673 | 0.9890 | 34.5969 | 4.2281 | 0.0518 | 89.43 | 0.0322 |
| 4 | 200.133 | 0.6801 | 34.5016 | 4.3738 | 0.0520 | 89.52 | 0.0607 |
| * 5 | 150.258 | -0.0677 | 34.2185 | 5.1204 | 0.0519 | 89.44 | 0.0238 |
| 6 | 100.370 | -1.4843 | 33.7829 | 7.0116 | 0.0519 | 89.40 | 0.0706 |
| 7 | 90.692 | -1.5305 | 33.7728 | 7.1858 | 0.0519 | 89.40 | 0.0234 |
| 8 | 90.696 | -1.5467 | 33.7685 | 7.1841 | 0.0519 | 89.40 | 0.0270 |
| 9 | 90.708 | -1.5885 | 33.7627 | 7.1807 | 0.0518 | 89.40 | 0.0220 |
| 10 | 50.219 | -1.7953 | 33.7206 | 7.4636 | 0.0525 | 89.42 | 0.0406 |
| 11 | 30.365 | -1.7958 | 33.7204 | 7.4636 | 0.0586 | 89.43 | 0.0260 |
| 12 | 20.108 | -1.7950 | 33.7203 | 7.4366 | 0.0814 | 89.43 | 0.0637 |
| 13 | 15.330 | -1.7926 | 33.7194 | 7.4133 | 0.0630 | 89.43 | 0.0317 |
| 14 | 10.690 | -1.7907 | 33.7186 | 7.4126 | 0.0687 | 89.43 | 0.0211 |
| 15 | 10.690 | -1.7900 | 33.7182 | 7.4117 | 0.0699 | 89.43 | 0.0255 |
| 16 | 5.230 | -1.7861 | 33.7177 | 7.3831 | 0.1392 | 89.40 | 0.0463 |
| 17 | 5.237 | -1.7859 | 33.7177 | 7.3768 | 0.1358 | 89.40 | 0.0362 |
| 18 | 5.259 | -1.7852 | 33.7177 | 7.3746 | 0.1392 | 89.38 | 0.0447 |
| *19 | 1.026 | -1.7874 | 33.7187 | 7.3880 | 0.6195 | 89.40 | 0.0343 |
| 20 | 1.011 | -1.7873 | 33.7188 | 7.3880 | 0.5902 | 89.39 | 0.0348 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 21 | 1.011 | -1.7873 | 33.7186 | 7.3730 | 0.6106 | 89.40 | 0.0349 |
| 22 | 1.000 | -1.7877 | 33.7190 | 7.3836 | 0.6182 | 89.37 | 0.0352 |
| Station: 141.255/80/67 Latitude: 68 17.204S Longitude: 75 40.172W Depth: 1850 | | | | | | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 1001.269 | 1.0960 | 34.7287 | 4.7486 | 0.0518 | 89.82 | 0.0314 |
| 2 | 1001.291 | 1.0952 | 34.7288 | 4.7561 | 0.0518 | 89.82 | 0.0243 |
| 3 | 550.352 | 1.4682 | 34.7323 | 4.4392 | 0.0519 | 89.84 | 0.0204 |
| 4 | 420.509 | 1.5854 | 34.7207 | 4.3169 | 0.0519 | 89.86 | 0.0155 |
| * 5 | 300.106 | 1.5101 | 34.6710 | 4.2274 | 0.0521 | 89.83 | 0.0309 |
| * 6 | 200.009 | 0.2445 | 34.4350 | 4.8288 | 0.0569 | 89.82 | 0.0332 |
| 7 | 100.263 | -1.8382 | 34.1029 | 7.5518 | 0.1897 | 89.80 | 0.0325 |
| 8 | 50.431 | -1.8414 | 34.1004 | 7.5050 | 0.9448 | 89.84 | 0.0514 |
| 9 | 30.262 | -1.8474 | 34.0901 | 7.4707 | 2.1470 | 89.82 | 0.0260 |
| 10 | 19.966 | -1.8488 | 34.0885 | 7.4674 | 3.3950 | 89.82 | 0.0372 |
| 11 | 14.711 | -1.8499 | 34.0879 | 7.4415 | 4.5150 | 89.82 | 0.0384 |
| 12 | 10.222 | -1.8377 | 34.0852 | 7.4381 | 6.0810 | 89.78 | 0.0205 |
| 13 | 5.270 | -1.8359 | 34.0857 | 7.3966 | 8.6580 | 89.72 | 0.0526 |
| 14 | 5.270 | -1.8358 | 34.0854 | 7.3969 | 8.5710 | 89.80 | 0.0405 |
| 15 | 5.264 | -1.8358 | 34.0855 | 7.4024 | 8.4200 | 89.23 | 0.0407 |
| *16 | 0.345 | -1.8428 | 34.0872 | 7.3871 | 18.1600 | 89.78 | 0.0282 |
| 17 | 0.360 | -1.8427 | 34.0872 | 7.4040 | 18.4600 | 89.80 | 0.0291 |
| 18 | 0.366 | -1.8415 | 34.0868 | 7.3904 | 18.4300 | 89.81 | 0.0270 |
| Station: 181.241/71/68 Latitude: 68 3.10S Longitude: 74 43.98W Depth: 785 m | | | | | | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 809.554 | 1.1931 | 34.7309 | 4.6663 | 0.0519 | 89.82 | 0.0323 |
| 2 | 809.539 | 1.1932 | 34.7309 | 4.6704 | 0.0520 | 89.82 | 0.0322 |
| 3 | 600.532 | 1.4217 | 34.7263 | 4.4480 | 0.0519 | 89.81 | 0.0295 |
| 4 | 375.637 | 1.6617 | 34.7021 | 4.2272 | 0.0519 | 89.87 | 0.0398 |
| 5 | 300.505 | 1.7074 | 34.6809 | 4.1864 | 0.0520 | 89.87 | 0.0338 |
| * 6 | 150.692 | -1.4105 | 34.1819 | 6.7804 | 0.0519 | 89.83 | 0.0588 |
| 7 | 100.454 | -1.7685 | 34.1328 | 7.4591 | 0.0518 | 89.87 | 0.0245 |
| 8 | 50.460 | -1.8156 | 34.1244 | 7.4375 | 0.0523 | 89.87 | 0.0250 |
| 9 | 30.344 | -1.8230 | 34.1232 | 7.3988 | 0.0556 | 89.77 | 0.0293 |
| 10 | 20.620 | -1.8233 | 34.1234 | 7.3604 | 0.0892 | 89.87 | 0.0626 |
| 11 | 15.661 | -1.8250 | 34.1231 | 7.3721 | 0.1106 | 89.87 | 0.0222 |
| 12 | 15.663 | -1.8249 | 34.1232 | 7.3729 | 0.1174 | 89.87 | 0.0240 |
| 13 | 10.717 | -1.8270 | 34.1228 | 7.3471 | 0.1541 | 89.88 | 0.0423 |
| 14 | 5.665 | -1.7670 | 34.1219 | 7.3115 | 0.2931 | 89.87 | 0.0271 |
| 15 | 5.662 | -1.7644 | 34.1226 | 7.3126 | 0.2957 | 89.88 | 0.0318 |
| 16 | 5.655 | -1.7732 | 34.1223 | 7.3049 | 0.2962 | 89.89 | 0.0321 |
| *17 | 1.001 | -1.8206 | 34.1228 | 7.3077 | 0.6178 | 89.84 | 0.0307 |
| 18 | 1.010 | -1.8207 | 34.1230 | 7.3146 | 0.6021 | 89.82 | 0.0291 |
| 19 | 0.997 | -1.8209 | 34.1230 | 7.3244 | 0.6151 | 89.84 | 0.0272 |
| Station: 220.242/66/69 Latitude: 67 47.89S Longitude: 74 10.37W Depth: 1210 m | | | | | | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 1048.413 | 0.9510 | 34.7242 | 4.8028 | 0.0519 | 89.85 | 0.0189 |
| 2 | 1048.199 | 0.9509 | 34.7241 | 4.8110 | 0.0519 | 89.85 | 0.0162 |
| 3 | 850.232 | 1.0371 | 34.7270 | 4.6971 | 0.0520 | 89.87 | 0.0188 |
| 4 | 650.780 | 1.1650 | 34.7309 | 4.6262 | 0.0519 | 89.89 | 0.0138 |
| * 5 | 450.232 | 1.4194 | 34.7024 | 4.2728 | 0.0519 | 89.68 | 0.0295 |
| 6 | 251.524 | 0.8454 | 34.5285 | 4.5095 | 0.0533 | 89.87 | 0.0259 |
| 7 | 120.354 | -1.8243 | 34.0960 | 7.5726 | 0.1552 | 89.87 | 0.0238 |
| * 8 | 100.463 | -1.8357 | 34.0893 | 7.5501 | 0.2708 | 89.87 | 0.0253 |
| 9 | 50.773 | -1.8587 | 34.0729 | 7.5217 | 2.3500 | 89.87 | 0.0389 |
| 10 | 30.631 | -1.8650 | 34.0618 | 7.5092 | 8.0890 | 89.87 | 0.0347 |
| 11 | 20.181 | -1.8663 | 34.0596 | 7.5095 | 17.5300 | 89.86 | 0.0314 |
| 12 | 20.173 | -1.8663 | 34.0593 | 7.5038 | 17.4600 | 89.87 | 0.0220 |
| 13 | 15.686 | -1.8662 | 34.0593 | 7.4985 | 24.3100 | 89.87 | 0.0521 |
| 14 | 10.702 | -1.8659 | 34.0598 | 7.4818 | 34.2000 | 89.87 | 0.0302 |
| 15 | 5.615 | -1.8544 | 34.0603 | 7.4809 | 50.4000 | 89.86 | 0.0281 |
| 16 | 5.614 | -1.8557 | 34.0604 | 7.4816 | 50.5900 | 89.86 | 0.0284 |
| 17 | 5.610 | -1.8573 | 34.0603 | 7.4769 | 50.6600 | 89.87 | 0.0293 |
| *18 | 0.030 | -1.8627 | 33.9860 | 6.9696 | ******* | 89.84 | 0.0251 |
| 19 | 0.054 | -1.8628 | 34.0593 | 7.0690 | ******* | 89.84 | 0.0298 |
| 20 | 0.065 | -1.8629 | 34.0595 | 7.2217 | ******* | 89.82 | 0.0318 |
| Station: 420.247/13/70 Latitude: 66 23.85S Longitude: 71 22.04W Depth: 840 m | | | | | | | |

| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
|---|---|---|---|---|---|---|---|
| * 1 | 847.911 | 1.0594 | 34.7274 | 4.7512 | 0.0519 | 89.83 | 0.0128 |
| 2 | 847.810 | 1.0602 | 34.7274 | 4.7411 | 0.0520 | 89.82 | 0.0153 |
| 3 | 600.955 | 1.3242 | 34.7330 | 4.5373 | 0.0519 | 89.86 | 0.0236 |
| * 4 | 413.623 | 1.4069 | 34.6915 | 4.1832 | 0.0520 | 89.62 | 0.0227 |
| 5 | 200.935 | 0.3677 | 34.4422 | 4.7287 | 0.0546 | 89.76 | 0.0201 |
| * 6 | 100.420 | -1.7871 | 34.0213 | 7.5939 | 0.2016 | 89.82 | 0.0641 |
| 7 | 49.858 | -1.7708 | 33.9735 | 7.5735 | 1.2850 | 89.82 | 0.0496 |
| 8 | 30.295 | -1.8171 | 33.8787 | 7.4499 | 3.4260 | 89.74 | 0.0233 |
| 9 | 20.158 | -1.8248 | 33.8460 | 7.3754 | 5.9060 | 89.70 | 0.0577 |
| 10 | 15.140 | -1.8249 | 33.8458 | 7.3576 | 7.7190 | 89.70 | 0.0231 |
| 11 | 10.590 | -1.8295 | 33.8449 | 7.3336 | 9.7390 | 89.70 | 0.0307 |
| 12 | 10.612 | -1.8296 | 33.8449 | 7.3450 | 9.6660 | 89.70 | 0.0361 |
| 13 | 5.620 | -1.8078 | 33.8445 | 7.3058 | 13.4800 | 89.68 | 0.0631 |
| 14 | 5.612 | -1.8106 | 33.8447 | 7.3048 | 13.4300 | 89.69 | 0.0585 |
| 15 | 5.608 | -1.8026 | 33.8445 | 7.3090 | 13.4300 | 89.69 | 0.0594 |
| *16 | 1.264 | -1.8180 | 33.8450 | 7.3099 | 23.4600 | 89.60 | 0.0270 |
| 17 | 1.266 | -1.8181 | 33.8451 | 7.3134 | 23.3600 | 89.59 | 0.0232 |
| 18 | 1.265 | -1.8180 | 33.8452 | 7.3253 | 23.1800 | 89.59 | 0.0236 |
| Station: 421.225/14/71 Latitude: 66 30.68S Longitude: 71 3.60W Depth: 530 m | | | | | | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 520.518 | 1.1148 | 34.7298 | 4.6736 | 0.0520 | 89.63 | 0.0349 |
| 2 | 520.528 | 1.1147 | 34.7298 | 4.6604 | 0.0519 | 89.68 | 0.0358 |
| 3 | 450.435 | 1.1865 | 34.7260 | 4.5661 | 0.0519 | 89.77 | 0.0324 |
| 4 | 400.443 | 1.3610 | 34.7137 | 4.3666 | 0.0519 | 89.51 | 0.0258 |
| * 5 | 300.139 | 1.3298 | 34.6697 | 4.1907 | 0.0520 | 89.64 | 0.0173 |
| 6 | 200.287 | 0.8596 | 34.5443 | 4.3396 | 0.0540 | 89.65 | 0.0373 |
| * 7 | 99.996 | -0.5755 | 34.1754 | 5.8752 | 0.1666 | 89.74 | 0.0225 |
| 8 | 75.249 | -1.7861 | 33.8223 | 7.2637 | 0.4214 | 89.55 | 0.0607 |
| 9 | 75.261 | -1.7875 | 33.8215 | 7.2913 | 0.4218 | 89.55 | 0.0693 |
| 10 | 50.139 | -1.7991 | 33.8173 | 7.3582 | 1.4500 | 89.58 | 0.0264 |
| 11 | 30.184 | -1.7973 | 33.8166 | 7.3389 | 4.3930 | 89.59 | 0.0415 |
| 12 | 30.181 | -1.7967 | 33.8165 | 7.3429 | 4.3980 | 89.60 | 0.0324 |
| 13 | 20.699 | -1.7977 | 33.8166 | 7.3327 | 7.6060 | 89.60 | 0.0377 |
| 14 | 15.212 | -1.8010 | 33.8169 | 7.3240 | 10.7600 | 89.61 | 0.0295 |
| 15 | 10.122 | -1.8029 | 33.8171 | 7.3110 | 15.2000 | 89.61 | 0.0401 |
| 16 | 5.250 | -1.7977 | 33.8169 | 7.2850 | 25.4200 | 89.60 | 0.0435 |
| 17 | 5.248 | -1.7981 | 33.8169 | 7.2962 | 24.4700 | 89.57 | 0.0414 |
| 18 | 5.253 | -1.7990 | 33.8170 | 7.2959 | 25.4200 | 89.60 | 0.0299 |
| *19 | 0.587 | -1.7989 | 33.8169 | 7.2918 | 76.1300 | 89.38 | 0.0240 |
| 20 | 0.583 | -1.7978 | 33.8168 | 7.3015 | 80.1100 | 89.54 | 0.0234 |
| 21 | 0.580 | -1.7976 | 33.8169 | 7.2817 | 82.9500 | 89.53 | 0.0207 |
| Station: 421.180/15/72 Latitude: 66 46.001S Longitude: 70 10.493W Depth: 540 | | | | | | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 538.938 | 1.0997 | 34.7272 | 4.6642 | 0.0520 | 89.60 | 0.0245 |
| 2 | 538.970 | 1.0990 | 34.7273 | 4.6667 | 0.0520 | 89.59 | 0.0211 |
| 3 | 499.973 | 1.1444 | 34.7283 | 4.6269 | 0.0520 | 89.66 | 0.0287 |
| 4 | 399.966 | 1.4470 | 34.7157 | 4.2469 | 0.0520 | 89.56 | 0.0300 |
| 5 | 299.929 | 1.7212 | 34.7174 | 4.2502 | 0.0520 | 89.57 | 0.0217 |
| * 6 | 239.939 | 1.7624 | 34.7027 | 4.1899 | 0.0521 | 89.87 | 0.0215 |
| * 7 | 150.013 | 0.7775 | 34.5125 | 4.4955 | 0.0521 | 89.63 | 0.0249 |
| 8 | 99.934 | -0.1098 | 34.3025 | 5.2376 | 0.0520 | 89.65 | 0.0599 |
| 9 | 69.947 | -1.6559 | 33.9317 | 7.1652 | 0.0521 | 89.66 | 0.0304 |
| 10 | 50.083 | -1.8187 | 33.8893 | 7.3149 | 0.0542 | 89.68 | 0.0287 |
| 11 | 29.911 | -1.8218 | 33.8886 | 7.2962 | 0.0557 | 89.69 | 0.0294 |
| 12 | 20.013 | -1.8216 | 33.8886 | 7.2667 | 0.0853 | 89.70 | 0.0598 |
| 13 | 14.985 | -1.8221 | 33.8888 | 7.2522 | 0.0632 | 89.70 | 0.0286 |
| 14 | 9.956 | -1.8223 | 33.8888 | 7.2482 | 0.0742 | 89.70 | 0.0437 |
| 15 | 4.868 | -1.8161 | 33.8875 | 7.2298 | 0.2495 | 89.71 | 0.0266 |
| 16 | 4.870 | -1.8192 | 33.8883 | 7.2106 | 0.2615 | 89.71 | 0.0323 |
| 17 | 4.857 | -1.8224 | 33.8889 | 7.2410 | 0.2685 | 89.71 | 0.0231 |
| *18 | 1.333 | -1.8139 | 33.8877 | 7.2409 | 0.8624 | 89.70 | 0.0617 |
| 19 | 1.331 | -1.8098 | 33.8865 | 7.2291 | 0.8722 | 89.70 | 0.0514 |
| Station: 421.145/16/73 Latitude: 66 56.94S Longitude: 69 29.83W Depth: 521 m | | | | | | | |
| Bottle no. | Depth | Temp | Salinity | Oxygen | PAR | Trans | Fluor |
| * 1 | 513.052 | 1.2536 | 34.7272 | 4.5256 | 0.0519 | 89.56 | 0.0225 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 2 | 513.054 | 1.2537 | 34.7274 | 4.5251 | 0.0520 | 89.56 | 0.0150 |
| 3 | 430.321 | 1.4470 | 34.7194 | 4.2877 | 0.0519 | 89.69 | 0.0302 |
| 4 | 340.674 | 1.4734 | 34.7024 | 4.2203 | 0.0519 | 89.75 | 0.0178 |
| * 5 | 260.622 | 1.5057 | 34.6779 | 4.2027 | 0.0520 | 89.74 | 0.0219 |
| 6 | 150.306 | 0.5880 | 34.4772 | 4.5920 | 0.0520 | 89.68 | 0.0615 |
| * 7 | 100.516 | -0.2546 | 34.2411 | 5.4130 | 0.0526 | 89.66 | 0.0121 |
| 8 | 80.404 | -1.7436 | 33.9712 | 7.2782 | 0.0536 | 89.68 | 0.0288 |
| 9 | 80.408 | -1.7436 | 33.9712 | 7.2882 | 0.0535 | 89.68 | 0.0299 |
| 10 | 50.062 | -1.8124 | 33.9612 | 7.3495 | 0.0600 | 89.71 | 0.0318 |
| 11 | 29.888 | -1.8190 | 33.9605 | 7.3539 | 0.0787 | 89.72 | 0.0315 |
| 12 | 29.884 | -1.8192 | 33.9605 | 7.3389 | 0.0785 | 89.72 | 0.0276 |
| 13 | 20.284 | -1.8223 | 33.9607 | 7.3311 | 0.1054 | 89.74 | 0.0534 |
| 14 | 15.115 | -1.8233 | 33.9610 | 7.3046 | 0.1409 | 89.74 | 0.0180 |
| 15 | 10.250 | -1.8228 | 33.9611 | 7.3044 | 0.1870 | 89.74 | 0.0204 |
| 16 | 4.937 | -1.8224 | 33.9612 | 7.2854 | 0.3920 | 89.75 | 0.0666 |
| 17 | 4.912 | -1.8222 | 33.9613 | 7.3091 | 0.4021 | 89.74 | 0.0707 |
| 18 | 4.925 | -1.8221 | 33.9613 | 7.2887 | 0.3712 | 89.75 | 0.0684 |
| *19 | 1.465 | -1.8218 | 33.9611 | 7.2641 | 0.8140 | 89.74 | 0.0280 |
| 20 | 1.460 | -1.8218 | 33.9611 | 7.2691 | 0.7122 | 89.74 | 0.0284 |
| 21 | 1.461 | -1.8218 | 33.9611 | 7.2750 | 0.7236 | 89.75 | 0.0280 |

Appendix 4: Summary of oxygen titration from bottle samples on NBP01-04.

| CTD ST. | Sample ID | CAST | Depth | Run Date | Sample Date | $O_2$, ml/L | Comment |
|---|---|---|---|---|---|---|---|
| 0 | Test Station | 0 | 500 | 7/27/2001 | | N/A | Failure |
| 0 | Test Station | 0 | 500 | 7/27/2001 | | 4.20 | |
| 0 | Test Station | 0 | 350 | 7/27/2001 | | 4.07 | |
| 0 | Test Station | 0 | 0 | 7/27/2001 | | 7.86 | |
| 0 | Test Station | 0 | 0 | 7/27/2001 | | 7.95 | |
| 1 | 507.271 | 1 | 1000 | 7/27/2001 | | 4.54 | |
| 1 | 507.271 | 1 | 1000 | 7/27/2001 | | N/A | Failure |
| 1 | 507.271 | 1 | 481 | 7/27/2001 | | 4.13 | |
| 1 | 507.271 | 1 | 301 | 7/27/2001 | | 4.46 | |
| 1 | 507.271 | 1 | 150 | 7/27/2001 | | 7.62 | |
| 1 | 507.271 | 1 | 0 | 7/27/2001 | | 7.65 | |
| 1 | 507.271 | 1 | 0 | 7/27/2001 | | 7.64 | |
| 2 | 500.251 | 2 | 790 | 7/28/2001 | | 4.42 | |
| 2 | 500.251 | 2 | 790 | 7/28/2001 | | 4.43 | |
| 2 | 500.251 | 2 | 400 | 7/28/2001 | | 4.13 | |
| 2 | 500.251 | 2 | 220 | 7/28/2001 | | 4.00 | |
| 2 | 500.251 | 2 | 99 | 7/28/2001 | | 6.73 | |
| 2 | 500.251 | 2 | 0 | 7/28/2001 | | 7.58 | |
| 2 | 500.251 | 2 | 0 | 7/28/2001 | | 7.56 | |
| 3 | 501.220 | 3 | 326 | 7/28/2001 | | 3.88 | |
| 3 | 501.220 | 3 | 326 | 7/28/2001 | | 3.88 | |
| 3 | 501.220 | 3 | 80 | 7/28/2001 | | 7.76 | |
| 3 | 501.220 | 3 | 0 | 7/28/2001 | | 7.82 | |
| 3 | 501.220 | 3 | 0 | 7/28/2001 | | 7.72 | |
| 4 | 501.180 | 4 | 330 | 7/28/2001 | | 4.01 | |
| 4 | 501.180 | 4 | 330 | 7/28/2001 | | 3.96 | |
| 4 | 501.180 | 4 | 218 | 7/28/2001 | | 4.05 | |
| 4 | 501.180 | 4 | 120 | 7/28/2001 | | 4.73 | |
| 4 | 501.180 | 4 | 0 | 7/28/2001 | | 7.72 | |
| 4 | 501.180 | 4 | 0 | 7/28/2001 | | 7.39 | |
| 5 | 501.140 | 5 | 701 | 7/29/2001 | | 4.16 | |
| 5 | 501.140 | 5 | 701 | 7/29/2001 | | 4.16 | |
| 5 | 501.140 | 5 | 300 | 7/29/2001 | | 3.41 | |
| 5 | 501.140 | 5 | 80 | 7/29/2001 | | 7.49 | |
| 5 | 501.140 | 5 | 0 | 7/29/2001 | | 7.44 | |
| 5 | 501.140 | 5 | 0 | 7/29/2001 | | 7.46 | |
| 6 | 501.120 | 6 | 293 | 7/29/2001 | | 4.17 | |
| 6 | 501.120 | 6 | 293 | 7/29/2001 | | 4.15 | |
| 6 | 501.120 | 6 | 50 | 7/29/2001 | | 7.17 | |
| 6 | 501.120 | 6 | 0 | 7/29/2001 | | 7.49 | |
| 6 | 501.120 | 6 | 0 | 7/29/2001 | | 7.49 | |
| 7 | 460.115 | 7 | 106 | 7/29/2001 | | 5.34 | |
| 7 | 460.115 | 7 | 106 | 7/29/2001 | | 5.35 | |
| 7 | 460.115 | 7 | 50 | 7/29/2001 | | 5.68 | |
| 7 | 460.115 | 7 | 0 | 7/29/2001 | | 6.75 | |
| 7 | 460.115 | 7 | 0 | 7/29/2001 | | 6.74 | |
| 8 | 461.140 | 8 | 327 | 7/29/2001 | | 4.12 | |
| 8 | 461.140 | 8 | 327 | 7/29/2001 | | 4.12 | |
| 8 | 461.140 | 8 | 82 | 7/29/2001 | | 7.37 | |
| 8 | 461.140 | 8 | 0 | 7/29/2001 | | 7.67 | |
| 8 | 461.140 | 8 | 0 | 7/29/2001 | | 7.65 | |
| 9 | 461.180 | 9 | 496 | 7/30/2001 | | 4.36 | |
| 9 | 461.180 | 9 | 496 | 7/30/2001 | | 4.35 | |
| 9 | 461.180 | 9 | 300 | 7/30/2001 | | 4.08 | |

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|---|---|---|---|---|---|---|---|
| 9 | 461.180 | 9 | 100 | 7/30/2001 | | 7.16 | |
| 9 | 461.180 | 9 | 0 | 7/30/2001 | | 7.74 | |
| 9 | 461.180 | 9 | 0 | 7/30/2001 | | 7.71 | |
| 10 | 461.220 | 10 | 459 | 7/30/2001 | | 4.16 | |
| 10 | 461.220 | 10 | 459 | 7/30/2001 | | 3.83 | |
| 10 | 461.220 | 10 | 250 | 7/30/2001 | | 4.01 | |
| 10 | 461.220 | 10 | 0 | 7/30/2001 | | 7.34 | |
| 10 | 461.220 | 10 | 0 | 7/30/2001 | | 7.37 | |
| 11 | 460.250 | 11 | 978 | 7/30/2001 | | 4.56 | |
| 11 | 460.250 | 11 | 978 | 7/30/2001 | | 4.53 | |
| 11 | 460.250 | 11 | 649 | 7/30/2001 | | 4.23 | |
| 11 | 460.250 | 11 | 398 | 7/30/2001 | | 4.08 | |
| 11 | 460.250 | 11 | 275 | 7/30/2001 | | 4.04 | |
| 11 | 460.250 | 11 | 0 | 7/30/2001 | | 7.43 | |
| 11 | 460.250 | 11 | 0 | 7/30/2001 | | 7.48 | |
| 12 | 459.265 | 12 | 3138 | 7/31/2001 | | 4.83 | |
| 12 | 459.265 | 12 | 3138 | 7/31/2001 | | 4.82 | |
| 12 | 459.265 | 12 | 2897 | 7/31/2001 | | 4.81 | |
| 12 | 459.265 | 12 | 1500 | 7/31/2001 | | 4.57 | |
| 12 | 459.265 | 12 | 800 | 7/31/2001 | | 4.37 | |
| 12 | 459.265 | 12 | 300 | 7/31/2001 | | 4.05 | |
| 12 | 459.265 | 12 | 100 | 7/31/2001 | | 6.14 | |
| 12 | 459.265 | 12 | 0 | 7/31/2001 | | 7.59 | |
| 12 | 459.265 | 12 | 0 | 7/31/2001 | | 7.59 | |
| 13 | 420.247 | 13 | 796 | 7/31/2001 | | N/A | Failure |
| 13 | 420.247 | 13 | 796 | 7/31/2001 | | 4.44 | |
| 13 | 420.247 | 13 | 400 | 7/31/2001 | | 4.05 | |
| 13 | 420.247 | 13 | 300 | 7/31/2001 | | 4.10 | |
| 13 | 420.247 | 13 | 150 | 7/31/2001 | | 5.05 | |
| 13 | 420.247 | 13 | 100 | 7/31/2001 | | 6.94 | |
| 13 | 420.247 | 13 | 0 | 7/31/2001 | | 7.36 | |
| 13 | 420.247 | 13 | 0 | 7/31/2001 | | 7.33 | |
| 14 | 421.225 | 14 | 520 | 7/31/2001 | | 4.09 | |
| 14 | 421.225 | 14 | 520 | 7/31/2001 | | 4.09 | |
| 14 | 421.225 | 14 | 250 | 7/31/2001 | | 4.04 | |
| 14 | 421.225 | 14 | 150 | 7/31/2001 | | 4.48 | |
| 14 | 421.225 | 14 | 100 | 7/31/2001 | | 5.47 | |
| 14 | 421.225 | 14 | 0 | 7/31/2001 | | 7.34 | |
| 14 | 421.225 | 14 | 0 | 7/31/2001 | | 7.30 | |
| 15 | 421.180 | 15 | 513 | 7/31/2001 | | 4.33 | |
| 15 | 421.180 | 15 | 513 | 7/31/2001 | | 4.34 | |
| 15 | 421.180 | 15 | 450 | 7/31/2001 | | 4.30 | |
| 15 | 421.180 | 15 | 250 | 7/31/2001 | | 4.07 | |
| 15 | 421.180 | 15 | 120 | 7/31/2001 | | 4.92 | |
| 15 | 421.180 | 15 | 0 | 7/31/2001 | | 7.25 | |
| 15 | 421.180 | 15 | 0 | 7/31/2001 | | 7.31 | |
| 16 | 421.145 | 16 | 506 | 8/1/2001 | | 4.30 | |
| 16 | 421.145 | 16 | 506 | 8/1/2001 | | 4.26 | |
| 16 | 421.145 | 16 | 220 | 8/1/2001 | | 3.98 | |
| 16 | 421.145 | 16 | 120 | 8/1/2001 | | 4.68 | |
| 16 | 421.145 | 16 | 0 | 8/1/2001 | | 7.53 | |
| 16 | 421.145 | 16 | 0 | 8/1/2001 | | 7.55 | |
| 17 | 421.125 | 17 | 287 | 8/1/2001 | | 4.09 | |
| 17 | 421.125 | 17 | 287 | 8/1/2001 | | 3.83 | |
| 17 | 421.125 | 17 | 195 | 8/1/2001 | | 4.17 | |
| 17 | 421.125 | 17 | 140 | 8/1/2001 | | 4.61 | |
| 17 | 421.125 | 17 | 100 | 8/1/2001 | | 5.76 | |
| 17 | 421.125 | 17 | 0 | 8/1/2001 | | 7.58 | |

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|---|---|---|---|---|---|---|---|---|
| 17 | 421.125 | 17 | 0 | 8/1/2001 | | 7.58 | | |
| 18 | 373.110 | 18 | 494 | 8/1/2001 | | 4.04 | | |
| 18 | 373.110 | 18 | 494 | 8/1/2001 | | 4.05 | | |
| 18 | 373.110 | 18 | 420 | 8/1/2001 | | 4.05 | | |
| 18 | 373.110 | 18 | 250 | 8/1/2001 | | 4.25 | | |
| 18 | 373.110 | 18 | 150 | 8/1/2001 | | 4.94 | | |
| 18 | 373.110 | 18 | 0 | 8/1/2001 | | 7.54 | | |
| 18 | 373.110 | 18 | 0 | 8/1/2001 | | 7.53 | | |
| 19 | 381.150 | 19 | 397 | 8/1/2001 | | 4.17 | | |
| 19 | 381.150 | 19 | 397 | 8/1/2001 | | 4.15 | | |
| 19 | 381.150 | 19 | 250 | 8/1/2001 | | 4.05 | | |
| 19 | 381.150 | 19 | 120 | 8/1/2001 | | 4.93 | | |
| 19 | 381.150 | 19 | 0 | 8/1/2001 | | 7.52 | | |
| 19 | 381.150 | 19 | 0 | 8/1/2001 | | 7.51 | | |
| 20 | 381.180 | 20 | 480 | 8/2/2001 | | 4.06 | | |
| 20 | 381.180 | 20 | 480 | 8/2/2001 | | 4.05 | | |
| 20 | 381.180 | 20 | 225 | 8/2/2001 | | 4.10 | | |
| 20 | 381.180 | 20 | 100 | 8/2/2001 | | 5.39 | | |
| 20 | 381.180 | 20 | 0 | 8/2/2001 | | 7.47 | | |
| 20 | 381.180 | 20 | 0 | 8/2/2001 | | 7.47 | | |
| 21 | 381.220 | 21 | 460 | 8/2/2001 | | 4.14 | | |
| 21 | 381.220 | 21 | 460 | 8/2/2001 | | 4.11 | | |
| 21 | 381.220 | 21 | 390 | 8/2/2001 | | 3.92 | | |
| 21 | 381.220 | 21 | 300 | 8/2/2001 | | 4.05 | | |
| 21 | 381.220 | 21 | 200 | 8/2/2001 | | 4.15 | | |
| 21 | 381.220 | 21 | 150 | 8/2/2001 | | 4.48 | | |
| 21 | 381.220 | 21 | 0 | 8/2/2001 | | 7.36 | | |
| 21 | 381.220 | 21 | 0 | 8/2/2001 | | 7.35 | | |
| 22 | 381.264 | 22 | 3312 | 8/3/2001 | | 4.84 | | |
| 22 | 381.264 | 22 | 3312 | 8/3/2001 | | 4.85 | | |
| 22 | 381.264 | 22 | 250 | 8/3/2001 | | 3.93 | | |
| 22 | 381.264 | 22 | 50 | 8/3/2001 | | 7.55 | | |
| 22 | 381.264 | 22 | 0 | 8/3/2001 | | 7.67 | | |
| 22 | 381.264 | 22 | 0 | 8/3/2001 | | 7.70 | | |
| 23 | 341.295 | 23 | 3639 | 8/3/2001 | | 4.88 | | |
| 23 | 341.295 | 23 | 3639 | 8/3/2001 | | 4.87 | | |
| 23 | 341.295 | 23 | 1800 | 8/3/2001 | | 4.60 | | |
| 23 | 341.295 | 23 | 300 | 8/3/2001 | | 3.97 | | |
| 23 | 341.295 | 23 | 100 | 8/3/2001 | | 7.70 | | |
| 23 | 341.295 | 23 | 0 | 8/3/2001 | | 7.68 | | |
| 23 | 341.295 | 23 | 0 | 8/3/2001 | | 7.70 | | |
| 24 | 341.253 | 24 | 503 | 8/4/2001 | | 4.14 | | |
| 24 | 341.253 | 24 | 503 | 8/4/2001 | | 4.13 | | |
| 24 | 341.253 | 24 | 300 | 8/4/2001 | | 4.09 | | |
| 24 | 341.253 | 24 | 100 | 8/4/2001 | | 6.11 | | |
| 24 | 341.253 | 24 | 0 | 8/4/2001 | | 7.51 | | |
| 24 | 341.253 | 24 | 0 | 8/4/2001 | | 7.52 | | |
| 25 | 341.220 | 25 | 415 | 8/4/2001 | | 3.92 | | |
| 25 | 341.220 | 25 | 415 | 8/4/2001 | | 3.93 | | |
| 25 | 341.220 | 25 | 200 | 8/4/2001 | | 4.11 | | |
| 25 | 341.220 | 25 | 100 | 8/4/2001 | | 5.49 | | |
| 25 | 341.220 | 25 | 0 | 8/4/2001 | | 7.43 | | |
| 25 | 341.220 | 25 | 0 | 8/4/2001 | | 7.42 | | |
| 26 | 341.180 | 26 | 466 | 8/4/2001 | | 3.89 | | |
| 26 | 341.180 | 26 | 466 | 8/4/2001 | | 3.86 | | |
| 26 | 341.180 | 26 | 350 | 8/4/2001 | | 4.08 | | |
| 26 | 341.180 | 26 | 200 | 8/4/2001 | | 4.09 | | |
| 26 | 341.180 | 26 | 0 | 8/4/2001 | | 7.27 | | |

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|---|---|---|---|---|---|---|---|
| 26 | 341.180 | 26 | 0 | 8/4/2001 | | 7.26 | |
| 27 | 341.140 | 27 | 758 | 8/5/2001 | | 4.18 | |
| 27 | 341.140 | 27 | 758 | 8/5/2001 | | 4.20 | |
| 27 | 341.140 | 27 | 250 | 8/5/2001 | | 4.02 | |
| 27 | 341.140 | 27 | 100 | 8/5/2001 | | 6.15 | |
| 27 | 341.140 | 27 | 0 | 8/5/2001 | | 7.39 | |
| 27 | 341.140 | 27 | 0 | 8/5/2001 | | 7.43 | |
| 28 | 341.100 | 28 | 364 | 8/5/2001 | | 4.08 | |
| 28 | 341.100 | 28 | 364 | 8/5/2001 | | 4.07 | |
| 28 | 341.100 | 28 | 250 | 8/5/2001 | | 4.06 | |
| 28 | 341.100 | 28 | 100 | 8/5/2001 | | 5.09 | |
| 28 | 341.100 | 28 | 0 | 8/5/2001 | | 7.45 | |
| 28 | 341.100 | 28 | 0 | 8/5/2001 | | 7.44 | |
| 42 | 301.100 | 29 | 709 | 8/5/2001 | | 4.15 | |
| 42 | 301.100 | 29 | 709 | 8/5/2001 | | 4.17 | |
| 42 | 301.100 | 29 | 240 | 8/5/2001 | | 4.06 | |
| 42 | 301.100 | 29 | 100 | 8/5/2001 | | 6.05 | |
| 42 | 301.100 | 29 | 0 | 8/5/2001 | | 7.59 | |
| 42 | 301.100 | 29 | 0 | 8/5/2001 | | 7.60 | |
| 41 | 301.060 | 30 | 660 | 8/5/2001 | | 4.18 | |
| 41 | 301.060 | 30 | 660 | 8/5/2001 | | 4.09 | |
| 41 | 301.060 | 30 | 350 | 8/5/2001 | | 4.07 | |
| 41 | 301.060 | 30 | 100 | 8/5/2001 | | 6.17 | |
| 41 | 301.060 | 30 | 0 | 8/5/2001 | | 7.35 | |
| 41 | 301.060 | 30 | 0 | 8/5/2001 | | 7.37 | |
| 40 | 301.020 | 31 | 709 | 8/6/2001 | | 3.92 | |
| 40 | 301.020 | 31 | 709 | 8/6/2001 | | 3.94 | |
| 40 | 301.020 | 31 | 480 | 8/6/2001 | | 3.95 | |
| 40 | 301.020 | 31 | 320 | 8/6/2001 | | 3.93 | |
| 40 | 301.020 | 31 | 100 | 8/6/2001 | | 6.15 | |
| 40 | 301.020 | 31 | 0 | 8/6/2001 | | 7.76 | |
| 40 | 301.020 | 31 | 0 | 8/6/2001 | | 7.77 | |
| 39 | 281.000 | 32 | 176 | 8/6/2001 | | 4.43 | |
| 39 | 281.000 | 32 | 176 | 8/6/2001 | | 4.43 | |
| 39 | 281.000 | 32 | 100 | 8/6/2001 | | 6.55 | |
| 39 | 281.000 | 32 | 0 | 8/6/2001 | | 7.86 | |
| 39 | 281.000 | 32 | 0 | 8/6/2001 | | N/A | Failure |
| 38 | 341.-020 | 33 | 434 | 8/8/2001 | | 3.70 | |
| 38 | 341.-020 | 33 | 434 | 8/8/2001 | | 3.68 | |
| 38 | 341.-020 | 33 | 293 | 8/8/2001 | | 3.67 | |
| 38 | 341.-020 | 33 | 100 | 8/8/2001 | | 6.49 | |
| 37 | 341.020 | 34 | 553 | 8/8/2001 | | 3.96 | |
| 37 | 341.020 | 34 | 553 | 8/8/2001 | | 3.98 | |
| 37 | 341.020 | 34 | 250 | 8/8/2001 | | 3.71 | |
| 37 | 341.020 | 34 | 125 | 8/8/2001 | | 5.90 | |
| 37 | 341.020 | 34 | 0 | 8/8/2001 | | 7.83 | |
| 36 | 381.020 | 35 | 325 | 8/8/2001 | | 3.57 | |
| 36 | 381.020 | 35 | 325 | 8/8/2001 | | 3.58 | |
| 36 | 381.020 | 35 | 60 | 8/8/2001 | | 3.45 | |
| 36 | 381.020 | 35 | 120 | 8/8/2001 | | 4.63 | |
| 36 | 381.020 | 35 | 0 | 8/8/2001 | | 7.78 | |
| 36 | 381.020 | 35 | 0 | 8/8/2001 | | 7.79 | |
| 35 | 368.036 | 36 | 752 | 8/9/2001 | | 3.66 | |
| 35 | 368.036 | 36 | 752 | 8/9/2001 | | 3.67 | |
| 35 | 368.036 | 36 | 271 | 8/9/2001 | | 3.63 | |
| 35 | 368.036 | 36 | 100 | 8/9/2001 | | 6.38 | |
| 35 | 368.036 | 36 | 0 | 8/9/2001 | | 7.66 | |
| 35 | 368.036 | 36 | 0 | 8/9/2001 | | 7.63 | |

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|---|---|---|---|---|---|---|---|
| 34 | 358.046 | 37 | 594 | 8/9/2001 | | 3.81 | |
| 34 | 358.046 | 37 | 594 | 8/9/2001 | | 3.82 | |
| 34 | 358.046 | 37 | 440 | 8/9/2001 | | 3.83 | |
| 34 | 358.046 | 37 | 100 | 8/9/2001 | | 5.45 | |
| 34 | 358.046 | 37 | 0 | 8/9/2001 | | 7.79 | |
| 34 | 358.046 | 37 | 0 | 8/9/2001 | | 7.80 | |
| 33 | 345.052 | 38 | 136 | 8/9/2001 | | 5.37 | |
| 33 | 345.052 | 38 | 136 | 8/9/2001 | | 5.36 | |
| 33 | 345.052 | 38 | 100 | 8/9/2001 | | 6.66 | |
| 33 | 345.052 | 38 | 0 | 8/9/2001 | | 7.33 | |
| 33 | 345.052 | 38 | 0 | 8/9/2001 | | 7.33 | |
| 31 | 352.071 | 39 | 134 | 8/9/2001 | | 4.90 | |
| 31 | 352.071 | 39 | 134 | 8/9/2001 | | 4.88 | |
| 31 | 352.071 | 39 | 100 | 8/9/2001 | | 7.13 | |
| 31 | 352.071 | 39 | 0 | 8/9/2001 | | 7.42 | |
| 31 | 352.071 | 39 | 0 | 8/9/2001 | | 7.41 | |
| 30 | 349.084 | 40 | 161 | 8/9/2001 | | 4.67 | |
| 30 | 349.084 | 40 | 161 | 8/9/2001 | | 4.67 | |
| 30 | 349.084 | 40 | 100 | 8/9/2001 | | 5.87 | |
| 30 | 349.084 | 40 | 0 | 8/9/2001 | | 7.36 | |
| 30 | 349.084 | 40 | 0 | 8/9/2001 | | 7.36 | |
| 29 | 368.098 | 41 | 164 | 8/9/2001 | | 4.81 | |
| 29 | 368.098 | 41 | 164 | 8/9/2001 | | 4.82 | |
| 29 | 368.098 | 41 | 100 | 8/9/2001 | | 6.27 | |
| 29 | 368.098 | 41 | 0 | 8/9/2001 | | 7.45 | |
| 29 | 368.098 | 41 | 0 | 8/9/2001 | | 7.46 | |
| 43 | 301.140 | 42 | 464 | 8/10/2001 | | 4.07 | |
| 43 | 301.140 | 42 | 464 | 8/10/2001 | | 4.07 | |
| 43 | 301.140 | 42 | 250 | 8/10/2001 | | 4.05 | |
| 43 | 301.140 | 42 | 100 | 8/10/2001 | | 6.04 | |
| 43 | 301.140 | 42 | 0 | 8/10/2001 | | 7.32 | |
| 43 | 301.140 | 42 | 0 | 8/10/2001 | | 7.33 | |
| 44 | 301.180 | 43 | 387 | 8/10/2001 | | 4.08 | |
| 44 | 301.180 | 43 | 387 | 8/10/2001 | | 4.07 | |
| 44 | 301.180 | 43 | 100 | 8/10/2001 | | 5.65 | |
| 44 | 301.180 | 43 | 0 | 8/10/2001 | | 7.38 | |
| 44 | 301.180 | 43 | 0 | 8/10/2001 | | 7.36 | |
| 45 | 301.220 | 44 | 373 | 8/10/2001 | | 4.05 | |
| 45 | 301.220 | 44 | 373 | 8/10/2001 | | 4.02 | |
| 45 | 301.220 | 44 | 100 | 8/10/2001 | | 5.25 | |
| 45 | 301.220 | 44 | 0 | 8/10/2001 | | 7.21 | |
| 45 | 301.220 | 44 | 0 | 8/10/2001 | | 7.21 | |
| 46 | 301.265 | 45 | 1931 | 8/10/2001 | | 4.82 | |
| 46 | 301.265 | 45 | 1931 | 8/10/2001 | | 4.76 | |
| 46 | 301.265 | 45 | 250 | 8/10/2001 | | 4.06 | |
| 46 | 301.265 | 45 | 100 | 8/10/2001 | | 6.26 | |
| 46 | 301.265 | 45 | 0 | 8/10/2001 | | 7.56 | |
| 46 | 301.265 | 45 | 0 | 8/10/2001 | | 7.56 | |
| 47 | 261.295 | 46 | 2958 | 8/11/2001 | | 4.95 | |
| 47 | 261.295 | 46 | 2958 | 8/11/2001 | | 4.86 | |
| 47 | 261.295 | 46 | 250 | 8/11/2001 | | 4.03 | |
| 47 | 261.295 | 46 | 100 | 8/11/2001 | | 6.07 | |
| 47 | 261.295 | 46 | 0 | 8/11/2001 | | 7.52 | |
| 47 | 261.295 | 46 | 0 | 8/11/2001 | | 7.52 | |
| 48 | 261.255 | 47 | 380 | 8/12/2001 | | 4.07 | |
| 48 | 261.255 | 47 | 380 | 8/12/2001 | | 4.08 | |
| 48 | 261.255 | 47 | 200 | 8/12/2001 | | 4.60 | |
| 48 | 261.255 | 47 | 0 | 8/12/2001 | | 7.63 | |

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| 48 | 261.255 | 47 | 0 | 8/12/2001 | | 7.71 | |
| 49 | 261.220 | 48 | 477 | 8/12/2001 | | 4.25 | |
| 49 | 261.220 | 48 | 477 | 8/12/2001 | | 4.26 | |
| 49 | 261.220 | 48 | 100 | 8/12/2001 | | 5.81 | |
| 49 | 261.220 | 48 | 0 | 8/12/2001 | | 7.46 | |
| 49 | 261.220 | 48 | 0 | 8/12/2001 | | 7.45 | |
| 50 | 261.180 | 49 | 289 | 8/12/2001 | | 4.05 | |
| 50 | 261.180 | 49 | 289 | 8/12/2001 | | 4.04 | |
| 50 | 261.180 | 49 | 100 | 8/12/2001 | | 5.99 | |
| 50 | 261.180 | 49 | 0 | 8/12/2001 | | 7.33 | |
| 50 | 261.180 | 49 | 0 | 8/12/2001 | | 7.34 | |
| 51 | 261.140 | 50 | 553 | 8/13/2001 | | N/A | Failure |
| 51 | 261.140 | 50 | 553 | 8/13/2001 | | 4.16 | |
| 51 | 261.140 | 50 | 350 | 8/13/2001 | | 4.10 | |
| 51 | 261.140 | 50 | 103 | 8/13/2001 | | 5.59 | |
| 51 | 261.140 | 50 | 0 | 8/13/2001 | | 7.10 | |
| 51 | 261.140 | 50 | 0 | 8/13/2001 | | 7.11 | |
| 52 | 261.100 | 51 | 490 | 8/16/2001 | | 4.06 | |
| 52 | 261.100 | 51 | 490 | 8/16/2001 | | 4.03 | |
| 52 | 261.100 | 51 | 100 | 8/16/2001 | | 6.79 | |
| 52 | 261.100 | 51 | 0 | 8/16/2001 | | 7.36 | |
| 52 | 261.100 | 51 | 0 | 8/16/2001 | | 7.36 | |
| 53 | 256.080 | 52 | 663 | 8/16/2001 | | 4.08 | |
| 53 | 256.080 | 52 | 663 | 8/16/2001 | | 4.07 | |
| 53 | 256.080 | 52 | 350 | 8/16/2001 | | 4.07 | |
| 53 | 256.080 | 52 | 150 | 8/16/2001 | | 4.96 | |
| 53 | 256.080 | 52 | 0 | 8/16/2001 | | 7.47 | |
| 53 | 256.080 | 52 | 0 | 8/16/2001 | | 7.44 | |
| 54 | 268.057 | 53 | 1129 | 8/16/2001 | | 4.13 | |
| 54 | 268.057 | 53 | 1129 | 8/16/2001 | | N/A | Failure |
| 54 | 268.057 | 53 | 350 | 8/16/2001 | | 4.10 | |
| 54 | 268.057 | 53 | 100 | 8/16/2001 | | 7.05 | |
| 54 | 268.057 | 53 | 0 | 8/16/2001 | | 7.36 | |
| 54 | 268.057 | 53 | 0 | 8/16/2001 | | 7.34 | |
| 59 | 240.057 | 54 | 394 | 8/17/2001 | | 4.13 | |
| 59 | 240.057 | 54 | 394 | 8/17/2001 | | 4.11 | |
| 59 | 240.057 | 54 | 100 | 8/17/2001 | | 6.15 | |
| 59 | 240.057 | 54 | 0 | 8/17/2001 | | 7.30 | |
| 59 | 240.057 | 54 | 0 | 8/17/2001 | | 7.31 | |
| 60 | 221.075 | 55 | 283 | 8/17/2001 | | 4.28 | |
| 60 | 221.075 | 55 | 283 | 8/17/2001 | | 4.25 | |
| 60 | 221.075 | 55 | 100 | 8/17/2001 | | 4.97 | |
| 60 | 221.075 | 55 | 0 | 8/17/2001 | | 6.97 | |
| 60 | 221.075 | 55 | 0 | 8/17/2001 | | 6.97 | |
| 61 | 221.100 | 56 | 197 | 8/17/2001 | | 4.36 | |
| 61 | 221.100 | 56 | 197 | 8/17/2001 | | 4.34 | |
| 61 | 221.100 | 56 | 100 | 8/17/2001 | | 5.72 | |
| 61 | 221.100 | 56 | 0 | 8/17/2001 | | 6.96 | |
| 61 | 221.100 | 56 | 0 | 8/17/2001 | | 6.95 | |
| 62 | 221.140 | 57 | 436 | 8/17/2001 | | 4.12 | |
| 62 | 221.140 | 57 | 436 | 8/17/2001 | | 4.09 | |
| 62 | 221.140 | 57 | 160 | 8/17/2001 | | 5.46 | |
| 62 | 221.140 | 57 | 100 | 8/17/2001 | | 5.71 | |
| 62 | 221.140 | 57 | 0 | 8/17/2001 | | 6.90 | |
| 62 | 221.140 | 57 | 0 | 8/17/2001 | | 6.91 | |
| 63 | 221.180 | 58 | 331 | 8/18/2001 | | 4.06 | |
| 63 | 221.180 | 58 | 331 | 8/18/2001 | | 4.04 | |
| 63 | 221.180 | 58 | 150 | 8/18/2001 | | 4.81 | |

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|---|---|---|---|---|---|---|---|
| 63 | 221.180 | 58 | 0 | 8/18/2001 | | 7.26 | |
| 63 | 221.180 | 58 | 0 | 8/18/2001 | | 7.25 | |
| 73 | 181.180 | 59 | 521 | 8/18/2001 | | 4.09 | |
| 73 | 181.180 | 59 | 521 | 8/18/2001 | | 4.08 | |
| 73 | 181.180 | 59 | 100 | 8/18/2001 | | 6.16 | |
| 73 | 181.180 | 59 | 0 | 8/18/2001 | | 7.30 | |
| 73 | 181.180 | 59 | 0 | 8/18/2001 | | 7.31 | |
| 74 | 181.140 | 60 | 293 | 8/19/2001 | | 4.25 | |
| 74 | 181.140 | 60 | 293 | 8/19/2001 | | 4.28 | |
| 74 | 181.140 | 60 | 100 | 8/19/2001 | | 6.75 | |
| 74 | 181.140 | 60 | 0 | 8/19/2001 | | 7.06 | |
| 74 | 181.140 | 60 | 0 | 8/19/2001 | | 7.08 | |
| 75 | 181.100 | 61 | 127 | 8/19/2001 | | 5.67 | |
| 75 | 181.100 | 61 | 127 | 8/19/2001 | | 5.62 | |
| 75 | 181.100 | 61 | 0 | 8/19/2001 | | 7.01 | |
| 75 | 181.100 | 61 | 0 | 8/19/2001 | | 7.01 | |
| 76 | 141.100 | 62 | 274 | 8/20/2001 | | 4.16 | |
| 76 | 141.100 | 62 | 274 | 8/20/2001 | | 4.15 | |
| 76 | 141.100 | 62 | 200 | 8/20/2001 | | 4.39 | |
| 76 | 141.100 | 62 | 0 | 8/20/2001 | | 6.87 | |
| 76 | 141.100 | 62 | 0 | 8/20/2001 | | 6.93 | |
| 77 | 141.140 | 63 | 154 | 8/20/2001 | | 5.53 | |
| 77 | 141.140 | 63 | 154 | 8/20/2001 | | 5.53 | |
| 77 | 141.140 | 63 | 0 | 8/20/2001 | | 7.02 | |
| 77 | 141.140 | 63 | 0 | 8/20/2001 | | 7.02 | |
| 78 | 141.180 | 64 | 506 | 8/20/2001 | | 4.06 | |
| 78 | 141.180 | 64 | 506 | 8/20/2001 | | 4.03 | |
| 78 | 141.180 | 64 | 350 | 8/20/2001 | | 4.10 | |
| 78 | 141.180 | 64 | 150 | 8/20/2001 | | 5.87 | |
| 78 | 141.180 | 64 | 0 | 8/20/2001 | | 7.47 | |
| 78 | 141.180 | 64 | 0 | 8/20/2001 | | 7.46 | |
| 83 | 101.180 | 65 | 393 | 8/21/2001 | | 4.12 | |
| 83 | 101.180 | 65 | 393 | 8/21/2001 | | 4.07 | |
| 83 | 101.180 | 65 | 100 | 8/21/2001 | | 5.99 | |
| 83 | 101.180 | 65 | 0 | 8/21/2001 | | 7.30 | |
| 83 | 101.180 | 65 | 0 | 8/21/2001 | | 7.28 | |
| 87 | 061.180 | 66 | 300 | 8/22/2001 | | 4.26 | |
| 87 | 061.180 | 66 | 300 | 8/22/2001 | | 4.15 | |
| 87 | 061.180 | 66 | 150 | 8/22/2001 | | 4.97 | |
| 87 | 061.180 | 66 | 0 | 8/22/2001 | | 7.31 | |
| 87 | 061.180 | 66 | 0 | 8/22/2001 | | 7.32 | |
| 80 | 141.255 | 67 | 1001 | 8/23/2001 | | 4.52 | |
| 80 | 141.255 | 67 | 1001 | 8/23/2001 | | 4.55 | |
| 80 | 141.255 | 67 | 300 | 8/23/2001 | | 4.11 | |
| 80 | 141.255 | 67 | 200 | 8/23/2001 | | 4.71 | |
| 80 | 141.255 | 67 | 0 | 8/23/2001 | | 7.27 | |
| 80 | 141.255 | 67 | 0 | 8/23/2001 | | 7.28 | |
| 71 | 181.241 | 68 | 810 | 8/23/2001 | | N/A | Failure |
| 71 | 181.241 | 68 | 810 | 8/23/2001 | | 4.49 | |
| 71 | 181.241 | 68 | 150 | 8/23/2001 | | 5.71 | |
| 71 | 181.241 | 68 | 0 | 8/23/2001 | | 7.27 | |
| 71 | 181.241 | 68 | 0 | 8/23/2001 | | 7.25 | |
| 66 | 220.242 | 69 | 1047 | 8/23/2001 | | 4.61 | |
| 66 | 220.242 | 69 | 1047 | 8/23/2001 | | 4.60 | |
| 66 | 220.242 | 69 | 450 | 8/23/2001 | | 4.13 | |
| 66 | 220.242 | 69 | 100 | 8/23/2001 | | 7.40 | |
| 66 | 220.242 | 69 | 0 | 8/23/2001 | | 7.45 | |
| 66 | 220.242 | 69 | 0 | 8/23/2001 | | 7.49 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 13 | 420.247 | 70 | 847 | 8/23/2001 | | 4.63 | |
| 13 | 420.247 | 70 | 847 | 8/23/2001 | | 4.61 | |
| 13 | 420.247 | 70 | 413 | 8/23/2001 | | 4.06 | |
| 13 | 420.247 | 70 | 100 | 8/23/2001 | | 7.42 | |
| 13 | 420.247 | 70 | 0 | 8/23/2001 | | 7.22 | |
| 13 | 420.247 | 70 | 0 | 8/23/2001 | | 7.22 | |
| 14 | 421.225 | 71 | 520 | 8/25/2001 | | 4.55 | |
| 14 | 421.225 | 71 | 520 | 8/25/2001 | | 4.50 | |
| 14 | 421.225 | 71 | 300 | 8/25/2001 | | 4.07 | |
| 14 | 421.225 | 71 | 100 | 8/25/2001 | | 5.75 | |
| 14 | 421.225 | 71 | 0 | 8/25/2001 | | 7.15 | |
| 14 | 421.225 | 71 | 0 | 8/25/2001 | | 7.15 | |
| 15 | 421.180 | 72 | 538 | 8/25/2001 | | 4.53 | |
| 15 | 421.180 | 72 | 538 | 8/25/2001 | | 4.49 | |
| 15 | 421.180 | 72 | 240 | 8/25/2001 | | 4.11 | |
| 15 | 421.180 | 72 | 150 | 8/25/2001 | | 4.37 | |
| 15 | 421.180 | 72 | 0 | 8/25/2001 | | 7.14 | |
| 15 | 421.180 | 72 | 0 | 8/25/2001 | | 7.15 | |
| 16 | 421.145 | 73 | 513 | 8/25/2001 | | 4.39 | |
| 16 | 421.145 | 73 | 513 | 8/25/2001 | | 4.37 | |
| 16 | 421.145 | 73 | 260 | 8/25/2001 | | N/A | Failure |
| 16 | 421.145 | 73 | 100 | 8/25/2001 | | 5.22 | |
| 16 | 421.145 | 73 | 0 | 8/25/2001 | | 7.06 | |
| 16 | 421.145 | 73 | 0 | 8/25/2001 | | 7.08 | |

Appendix 5: Summary of the expendable bathythermograph (XBT) and expendable conductivity-temperature-depth (XCTD) drops made during the second U.S. Southern Ocean GLOBEC survey cruise, NBP01-04. Latitude and longitude are given in degrees south and west, respectively. Total depth and cast depth are given in meters. The event numbers for the XBT probe drops may change pending final checking against the cruise event log.

| CAST NUMBER | EVENT NUMBER | PROBE TYPE | LATITUDE (S) | LONGITUDE (W) | DEPTH (m) | CAST DEPTH (m) | DATA QUALITY |
|---|---|---|---|---|---|---|---|
| 1 | NBP20601.001 | T5 | 59 21.071 | 66 50.163 | 3445 | 1300 | Good |
| 2 | NBP20601.002 | T5 | 59 23.39 | 66 51.37 | 3445 | 1300 | Good |
| 3 | NBP20601.003 | T5 | 59 34.87 | 66 56.78 | 3532 | 1300 | Good |
| 4 | NBP20601.004 | T5 | 59 43.797 | 67 01.380 | 3703 | 1300 | Good |
| 5 | NBP20601.005 | T5 | 59 53.900 | 67 06.415 | 3710 | 1300 | Good |
| 6 | NBP20601.006 | T5 | 60 03.614 | 67 11.178 | 3670 | 1300 | Good |
| 7 | NBP20601.007 | T5 | 60 13.102 | 67 16.030 | 3278 | 1300 | Good |
| 8 | NBP20601.008 | T5 | 60 22.632 | 67 21.079 | 3440 | 1300 | Good |
| 9 | NBP20601.009 | T5 | 60 32.851 | 67 26.446 | 3375 | 1300 | Good |
| 10 | NBP20601.010 | T5 | 60 41.993 | 67 31.202 | 3949 | 1300 | Good |
| 11 | NBP20601.011 | T5 | 60 51.49 | 67 36.237 | 4220 | 1300 | Good |
| 12 | NBP20601.013 | T5 | 61 01.719 | 67 41.598 | 3553 | 1300 | Good |
| 13 | NBP20601.014 | T5 | 61 12.060 | 67 47.065 | 3879 | 1300 | Good |
| 14 | NBP20601.015 | T5 | 61 21.177 | 67 52.126 | 3873 | 1300 | Good |
| 15 | NBP20601.017 | T5 | 61 30.57 | 67 57.486 | 3844 | 1300 | Good |
| 16 | NBP20601.018 | T5 | 61 39.875 | 68 2.569 | 4064 | 1300 | Good |
| 17 | NBP20601.019 | T5 | 61 49.707 | 68 8.169 | 3851 | 1300 | Good |
| 18 | NBP20601.021 | T5 | 61 59.467 | 68 13.814 | 3897 | 1300 | Good |
| 19 | NBP20601.022 | T5 | 62 9.441 | 68 19.615 | 3832 | 1300 | Good |
| 20 | NBP20601.023 | T5 | 62 18.747 | 68 24.856 | 4068 | 1300 | Good |
| 21 | NBP20701.001 | T5 | 62 29.354 | 68 29.324 | 3496 | 1300 | Good |
| 22 | NBP20701.002 | T5 | 62 39.547 | 68 32.978 | 3908 | 1300 | Good |
| 23 | NBP20701.003 | T5 | 62 49.932 | 68 36.751 | 3895 | 1300 | Good |
| 24 | NBP20701.004 | T5 | 62 59.600 | 68 40.737 | 3834 | | Bad probe |
| 25 | NBP20701.005 | T5 | 62 59.600 | 68 40.737 | 3834 | 900 | Good |
| 26 | NBP20701.006 | T5 | 63 9.407 | 68 44.409 | 3682 | | Bad probe |
| 27 | NBP20701.007 | T5 | 63 10.110 | 68 44.651 | 3679 | 1600 | Good |
| 28 | NBP20701.008 | T5 | 63 19.517 | 68 48.175 | 3618 | | Bad probe |
| 29 | NBP20701.009 | T5 | 63 19.517 | 68 48.175 | 3618 | | Bad probe |
| 30 | NBP20701.010 | T5 | 63 20.02 | 68 48.294 | 3618 | 775 | Good |
| 31 | NBP20701.011 | T5 | 63 29.764 | 68 52.170 | 3502 | | Bad probe |
| 32 | NBP20701.012 | T5 | 63 29.764 | 68 52.170 | 3489 | | Bad probe |
| 33 | NBP20701.013 | T5 | 63 29.764 | 68 52.170 | 3489 | 1000 | Good |
| 34 | NBP20701.014 | T5 | 63 38.629 | 68 55.524 | 3332 | | Bad probe |
| 35 | NBP20701.015 | T5 | 63 38.942 | 68 55.639 | 3336 | 100 | Broken wire |
| 36 | NBP20701.016 | T5 | 63 39.115 | 68 55.727 | 3335 | 250 | Broken wire |
| 37 | NBP20701.017 | T5 | 63 48.421 | 68 59.576 | 3222 | 1830 | Good |
| 38 | NBP20701.018 | T5 | 63 58.773 | 69 03.609 | 3042 | | Ice interfer. |
| 39 | NBP20701.019 | T5 | 64 1.382 | 69 4.647 | 3177 | 1175 | Good |
| 40 | NBP20701.020 | T5 | 64 20.842 | 69 8.429 | 3103 | | Good |
| 41 | NBP20701.021 | T5 | 64 20.842 | 69 8.429 | 3103 | 800 | Good |
| 42 | NBP20701.022 | T7 | 64 35.810 | 69 18.921 | 2765 | 800 | Good |
| 43 | NBP20801.001 | T7 | 64 53.978 | 69 25.514 | 2186 | 330 | Good |
| 44 | NBP20801.003 | T7 | 65 0.93 | 69 31.429 | 3109 | 350 | Good |
| 45 | NBP20901.021 | T7 | 66 22.197 | 68 25.237 | | | Test |
| 46 | NBP22601.006 | T7 | 67 12.846 | 70 10.717 | 625 | | Good |
| 47 | NBP23401.007 | T4 | 69 44.99 | 75 39.938 | 460 | 460 | Good |
| 47 | NBP23401.008 | T4 | 69 44.955 | 75 39.911 | 460 | 460 | Good |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 48 | NBP23501.019 | T4 | 67 27.716 | 73 47.417 | 408 | 408 | Good |
| 49 | NBP23501.022 | T7 | 67 15.191 | 73 31.42 | 1216 | 750 | Good |
| 50 | NBP23501.023 | T7 | 67 07.955 | 73 22.529 | 1500 | 750 | Good |
| 51 | NBP23501.024 | T7 | 67 1.526 | 72 59.069 | 877 | 250 | Good |
| 52 | NBP23501.025 | T7 | 67 1.421 | 72 58.094 | 831 | 250 | Good |
| 53 | NBP23601.001 | T7 | 66 54.93 | 72 35.432 | 590 | 200 | Bad probe |
| 54 | NBP23601.002 | T7 | 66 54.927 | 72 35.329 | 590 | 200 | Bad probe |
| 55 | NBP23601.003 | T7 | 66 54.989 | 72 34.777 | 590 | 590 | Good |
| 55 | NBP23601.004 | T7 | 66 47.103 | 72 15.390 | 1378 | 760 | Good |
| 56 | NBP23601.005 | T7 | 66 40.668 | 71 5.590 | 1261 | 760 | Good |
| 57 | NBP23601.006 | T7 | 66 32.80 | 71 38.58 | 770 | 250 | Bad probe |
| 58 | NBP23601.007 | T7 | 66 32.798 | 71 38.547 | 770 | 760 | Good |
| 59 | NBP23701.005 | T4 | 66 49.709 | 69 52.353 | 447 | 447 | Good |
| 59 | NBP23701.020 | T4 | 66 43 228 | 69 23.32 | 260 | | Bad probe |
| 60 | NBP23701.021 | T4 | 66 43.196 | 69 23.30 | 260 | 200 | Good |
| 61 | NBP24001.001 | T7 | 62 49.832 | 62 04.286 | 667 | 667 | Good |
| 1 | NBP24001.002 | XCTD | 62 28.247 | 62 26.895 | 1157 | 1000 | Good |
| 62 | NBP24001.003 | T5 | 62 18.722 | 62 30.482 | 1808 | 760 | Good |
| 63 | NBP24001.004 | T7 | 62 8.53 | 62 34.261 | 3700 | 760 | Good |
| 64 | NBP24001.005 | T5 | 61 58.024 | 62 38.337 | 2899 | | Bad probe |
| 65 | NBP24001.006 | T5 | 61 58.024 | 62 38.337 | 2899 | | Bad probe |
| 66 | NBP24001.007 | T7 | 61 56.996 | 62 38.672 | 2899 | 760 | Good |
| 67 | NBP24001.008 | T5 | 61 47.913 | 62 41.793 | 3802 | 760 | Spiky |
| 68 | NBP24001.009 | T7 | 61 37.237 | 62 46.084 | 3382 | 760 | Good |
| 69 | NBP24001.010 | T7 | 61 27.969 | 62 49.308 | 3399 | 760 | Good |
| 70 | NBP24001.011 | T7 | 61 18.158 | 62 52.578 | 3501 | 760 | Good |
| 71 | NBP24001.013 | T7 | 61 8.765 | 62 56.583 | 3495 | 760 | Good |
| 72 | NBP24001.015 | T7 | 60 58.804 | 62 59.741 | 3264 | 760 | Good |
| 73 | NBP24001.016 | T7 | 60 48.657 | 63 3.506 | 3848 | 760 | Good |
| 74 | NBP24001.017 | T7 | 60 36.333 | 63 7.846 | 3602 | 760 | Good |
| 75 | NBP24001.018 | T7 | 60 28.378 | 63 10.542 | 3861 | 760 | Good |
| 76 | NBP24001.019 | T7 | 60 18.196 | 63 14.088 | 3736 | 100 | Good |
| 77 | NBP24001.020 | T7 | 60 17.812 | 63 14.214 | 3736 | 760 | Good |
| 78 | NBP24001.021 | T7 | 60 8.554 | 63 18.004 | 3855 | 620 | Good |
| 79 | NBP24001.022 | T7 | 59 58.903 | 63 21.057 | 3244 | 760 | Good |
| 80 | NBP24001.023 | T7 | 59 48.278 | 63 24.662 | 3715 | 760 | Good |
| 81 | NBP24001.024 | T7 | 59 39.076 | 63 27.811 | 3628 | 760 | Good |
| 82 | NBP24001.025 | T7 | 59 29.29 | 63 31.299 | 3894 | 760 | Good |
| 83 | NBP24101.001 | T7 | 59 19.425 | 63 34.624 | 3983 | 760 | Good |
| 84 | NBP24101.002 | T7 | 59 9.141 | 63 38.070 | 3825 | 760 | Good |
| 85 | NBP24101.003 | T5 | 59 8.670 | 63 38.259 | 3825 | 1200 | Good |
| 86 | NBP24101.004 | T5 | 58 59.344 | 63 41.289 | 3840 | 1300 | Good |
| 87 | NBP24101.005 | T5 | 58 49.634 | 63 44.646 | 3400 | 100 | Good |
| 88 | NBP24101.006 | T5 | 58 49.465 | 63 44.699 | 3400 | 1500 | Good |

Appendix 7. BIOMAPER-II data file and tape log.

| TOW | Stn. | DATE | | TIME | | LAT | | LON | | DAT | ACOUSTICS | ESS | BM | VIDEO TAPES | | VPR | VPR | BS | Event | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | GMT | EDT | GMT | EDT | °S | min | °W | min | TAPE | FILENAME | FILENAME | DAY | CAM 2 | CAM 4 | FILENAME | DAY | Trans | Log √ | |
| Noise | Test | | | | 1650 | Punta Arenas Dock | | | | | N2031650 | | 203 | | | | 202 | | | File in: C:\HTI\DEP\NBP0103 |
| Noise | Test2 | | | | 2200 | 57 | 40.317 | 69 | 59.321 | | N2032204 | BT702207 | 203 | | | 07230217.01 | 202 | | | |
| Noise | Test3 | | | | 2206 | see handwritten log | | | | | N2032206 | | 203 | | | | 202 | | | |
| 0 | | | | | 2233 | see handwritten log | | | | | P2032219 | | 203 | | | | 202 | | | |
| N1 | | | | 11120 | 720 | | | | | | P2080720 | | 208 | | | | 207 | | | |
| 1 | 1 | 27-Jul | 27-Jul | 1325 | 925 | 65 | 38.915 | 70 | 37.920 | 1 | P2080932 | B7270929 | 208 | 1 | 2 | 07271340.01 | 207 | 1 | √ | Launch Tow 1 |
| 1 | 1 | 27-Jul | 27-Jul | 1542 | 1142 | 65 | 46.852 | 70 | 25.070 | 2 | P2081142 | | 208 | 3 | 4 | | 207 | 1 | | |
| 1 | 2 | 27-Jul | 27-Jul | 1648 | 1248 | 65 | 48.026 | 70 | 22.289 | | P2081247 | | 208 | | | | 207 | 1 | | Spontaneous restart ACC |
| 1 | 2 | 27-Jul | 27-Jul | 1734 | 1334 | 65 | 48.782 | 70 | 21.880 | | | | 208 | | | | 207 | 1 | √ | Recovery, end 1 |
| | | | | | | | | | | | | | | | | | | 1 | | |
| 2 | 2 | 27-Jul | 27-Jul | 1942 | 1542 | 65 | 54.272 | 70 | 0.919 | 3 | P2081546 | B7271544 | 208 | 5 | 6 | 07271950.01 | 207 | 1 | √ | Launch Tow 2 |
| 2 | 2 | 27-Jul | 27-Jul | 2148 | 1748 | 66 | 9.188 | 69 | 9.700 | | P2082138 | | | | | | | | | New Acc File |
| 2 | 3 | 27-Jul | 27-Jul | 2152 | 1752 | | | | | 4 | P2081754 | | 208 | 7 | 8 | | 207 | 1 | | |
| 2 | 3-4 | 27-Jul | 27-Jul | 2357 | 1957 | 66 | 4.308 | 69 | 27.384 | 5 | P2081955 | | 208 | 9 | 10 | 07272053.01 | 207 | 1 | | |
| 2 | 4 | 28-Jul | 27-Jul | 212 | 2212 | 66 | 10.409 | 69 | 6.062 | | | | 208 | | | | 208 | 1 | √ | End Tow2 |
| | | | | | | | | | | | | | | | | | | 1 | | |
| 3 | 4 | 28-Jul | 28-Jul | 1239 | 839 | 66 | 10.577 | 69 | 5.702 | | P2090847 | B728843 | 209 | | | 07281246.01 | 208 | 1 | √ | Start Tow 3 |
| 3 | 4 | 28-Jul | 28-Jul | 1250 | 850 | | | | | 6 | P2090912 | | 209 | 11 | 12 | | 208 | 1 | | |
| 3 | | 28-Jul | 28-Jul | 1320 | 920 | 66 | 12.434 | 68 | 58.857 | | P2090920 | | 209 | | | | 208 | 1 | | |
| 3 | | 28-Jul | 28-Jul | 1452 | 1052 | 66 | 16.751 | 68 | 43.800 | 7 | P2091053 | | 209 | 13 | 14 | | 208 | 1 | | |
| 3 | 5 | 28-Jul | 28-Jul | 1654 | 1254 | 66 | 22.600 | 68 | 22.940 | 8 | P2091254 | | 209 | 15 | 16 | | 208 | 1 | | |
| 3 | 5 | 28-Jul | 28-Jul | 1853 | 1453 | 66 | 22.100 | 68 | 20.800 | 9 | P2091456 | | 209 | 17 | 18 | | 208 | 1 | | |
| 3 | 6 | 28-Jul | 28-Jul | 2056 | 1656 | | | | | 10 | | | 209 | 19 | 20 | | 208 | 1 | | |
| 3 | | 28-Jul | 28-Jul | 2128 | 1728 | 66 | 24.960 | 68 | 0.498 | | | | 209 | | | | 208 | 1 | √ | End Tow 3 |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | 6-7 | 29-Jul | 28-Jul | 231 | 2231 | 66 | 45.735 | 68 | 30.933 | 11 | P2092234 | B7282231 | 209 | 21 | 22 | 07290238.01 | 209 | 1-2 | √ | Start Tow 4 |
| 4 | 7 | 29-Jul | 29-Jul | 413 | 13 | 66 | 48.659 | 68 | 27.011 | 11 | | B7290013 | 210 | | | 07290414.01 | 209 | 2 | | restart |
| 4 | 7 | 29-Jul | 29-Jul | 455 | 55 | 66 | 45.681 | 68 | 37.642 | | | | 210 | | | | 209 | 2 | √ | End Tow 4 |
| | | | | | | | | | | | | | | | | | | | | |
| 5 | | 29-Jul | 29-Jul | 645 | 245 | 66 | 41.101 | 68 | 58.714 | | P2100251 | B7290249 | 210 | 23 | 24 | 07290652.01 | 209 | 2 | √ | Start Tow 5 |
| 5 | | 29-Jul | 29-Jul | 810 | 410 | | | | | | | | 210 | | | 07290810.01 | 209 | 2 | | |
| 5 | 8 | 29-Jul | 29-Jul | 908 | 508 | 66 | 40.572 | 68 | 54.745 | 13 | P2100516 | | 210 | 25 | 26 | | 209 | 2 | | In Water Again |
| 5 | | 29-Jul | 29-Jul | 1111 | 711 | 66 | 34.730 | 69 | 14.750 | 14 | P2100710 | | 210 | 27 | 28 | | 209 | 2 | | |
| 5 | 8-9 | 29-Jul | 29-Jul | 1313 | 913 | 66 | 29.152 | 69 | 34.240 | 15 | P2100913 | | 210 | 29 | 30 | | 209 | 2 | | |
| 5 | 9 | 29-Jul | 29-Jul | 1420 | 1020 | 66 | 28.087 | 69 | 37.774 | | P2101020 | | 210 | | | | 209 | 2 | | New Acoustic file |
| 5 | 9 | 29-Jul | 29-Jul | 1515 | 1115 | 66 | 28.068 | 69 | 37.790 | 16 | P2101116 | | 210 | 31 | 32 | | 209 | 2 | | At Station 9 |
| 5 | 9-10 | 29-Jul | 29-Jul | 1718 | 1318 | 66 | 24.330 | 69 | 48.880 | 17 | P2101317 | | 210 | 33 | 34 | | 209 | 2 | | |
| 5 | 9-10 | 29-Jul | 29-Jul | 1909 | 1509 | 66 | 18.627 | 70 | 8.866 | | P2101507 | | 210 | | | | 209 | 2 | | Spontaneous restart ACC |
| 5 | 9-10 | 29-Jul | 29-Jul | 1922 | 1522 | 66 | 17.930 | 70 | 11.270 | 18 | | | 210 | 35 | 36 | | 209 | 2 | | |
| 5 | 10-11 | 29-Jul | 29-Jul | 2126 | 1726 | 66 | 15.590 | 70 | 21.460 | 19 | P2101727 | | 210 | 37 | 38 | | 209 | 2 | | |
| 5 | 10-11 | 29-Jul | 29-Jul | 2148 | 1748 | 66 | 14.920 | 70 | 23.480 | | P2101753 | | 210 | | | 07292147.01 | 209 | 2 | | Spontaneous restart ACC |
| 5 | 10-11 | 29-Jul | 29-Jul | 2330 | 1930 | 66 | 9.470 | 70 | 40.600 | 20 | P2101933 | | 210 | 39 | 40 | | 210 | 2 | | |
| 5 | 11 | 30-Jul | 29-Jul | 47 | 2047 | 66 | 5.991 | 70 | 53.090 | 21 | | | 210 | | | 07300041.01 | 210 | 2 | √ | End Tow 5 |
| | | | | | | | | | | | | | | | | | | | | |
| 6 | 11 | 30-Jul | 30-Jul | 757 | 357 | 66 | 5.506 | 70 | 54.800 | 21 | P2110401 | B7300357 | 211 | 41 | 42 | 07300759.01 | 210 | 2 | √ | Start tow 6 |
| 6 | 11-12 | | | | | | | | | | | | 211 | | | 07300818.01 | 210 | 2 | | |
| 6 | 12 | 30-Jul | 30-Jul | 957 | 557 | 66 | 1.448 | 71 | 9.845 | | | | 211 | | | | 210 | 2 | √ | End tow 6 |
| | | | | | | | | | | | | | | | | | | | | |
| 7 | 12 | 30-Jul | 30-Jul | 2018 | 1618 | 66 | 1.685 | 71 | 9.408 | 22 | P2111626 | B7302022 | 211 | 43 | 44 | 07302036.01 | 210 | 2-3 | √ | Start Tow 7 |
| 7 | 12-13 | 30-Jul | 30-Jul | 2253 | 1853 | 66 | 10.600 | 71 | 15.190 | | | | 211 | | | | 210 | 2-3 | √ | End Tow 7 |
| | | | | | | | | | | | | | | | | | | | | |
| 8 | 21 | 2-Aug | 2-Aug | 1050 | 650 | 66 | 48.900 | 71 | 28.000 | 23 | P2140645 | B8020653 | 214 | 45 | 46 | 08021051.01 | 213 | 4 | √ | Start Tow 8 |
| 8 | 21-22 | 2-Aug | 2-Aug | 1300 | 900 | 66 | 43.195 | 71 | 44.991 | 24 | P2140900 | | 214 | 47 | 48 | | 213 | 4 | | |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 21-22 | 2-Aug | 2-Aug | 1308 | 908 | | | | | | P2140908 | | 214 | | | | 213 | 4 | | Spontaneous restart ACC |
| 8 | 21-23 | 2-Aug | 2-Aug | 1329 | 1329 | | | | | | P2140929 | | 214 | | | | 213 | 4 | | Spontaneous restart ACC |
| 8 | 21-22 | 2-Aug | 2-Aug | 1502 | 1102 | 66 | 38.377 | 72 | 1.538 | 25 | P2141103 | | 214 | 49 | 50 | | 213 | 4 | | |
| 8 | 22 | 2-Aug | 2-Aug | 1613 | 1213 | 66 | 34.916 | 72 | 12.247 | | | | 214 | | | | 213 | 4 | √ | End Tow 8 |
| | | | | | | | | | | | | | | | | | | | | |
| 9 | 22 | 2-Aug | 2-Aug | 2350 | 1950 | 66 | 33.634 | 72 | 9.954 | 26 | P2141952 | B8021948 | 214 | 51 | 52 | 08022357.01 | 213 | 4-5 | √ | start tow 9 |
| 9 | 22 | 3-Aug | 2-Aug | 154 | 2154 | 66 | 36.694 | 72 | 33.377 | 27 | P2142155 | | 214 | 53 | 54 | | 214 | 4-5 | | |
| 9 | 22-23 | 3-Aug | 2-Aug | 233 | 2233 | | | | | | P2142233 | | 214 | | | | 214 | 4-5 | | Spontaneous restart ACC |
| 9 | 22-23 | 3-Aug | 2-Aug | 328 | 2328 | | | | | | P2142328 | | 214 | | | | 214 | 4-5 | | Spontaneous restart ACC |
| 9 | 22-23 | 3-Aug | 2-Aug | 356 | 2356 | 66 | 38.778 | 72 | 55.799 | 28 | P2142356 | | 214 | 55 | 56 | | 214 | 4-5 | | |
| 9 | 22-23 | 3-Aug | 3-Aug | 558 | 158 | 66 | 40.840 | 73 | 18.952 | 29 | P2150159 | | 215 | 57 | 58 | | 214 | 4-5 | | |
| 9 | 23 | 3-Aug | 3-Aug | 606 | 206 | 66 | 40.978 | 73 | 19.261 | | | | 215 | | | | 214 | 5 | | At station 23 |
| 9 | 23 | 3-Aug | 3-Aug | 758 | 358 | 66 | 41.470 | 73 | 17.190 | 30 | P2150358 | | 215 | 59 | 60 | | 214 | 5 | | |
| 9 | 23 | 3-Aug | 3-Aug | 1002 | 602 | 66 | 41.481 | 73 | 14.241 | 31 | P2150603 | | 215 | 61 | 62 | | 214 | 5 | | |
| 9 | 23 | 3-Aug | 3-Aug | 1021 | 621 | 66 | 41.450 | 73 | 13.950 | | | | 215 | | | | 214 | 5 | √ | End Tow 9 |
| | | | | | | | | | | | | | | | | | | | | |
| 10 | 23 | 3-Aug | 3-Aug | 1445 | 1045 | 66 | 40.876 | 73 | 20.497 | 32 | P2151057 | B8031051 | 215 | 63 | 64 | 08031456.01 | 214 | 5 | √ | Start Tow 10 |
| 10 | 23-24 | 3-Aug | 3-Aug | 1704 | 1304 | 66 | 47.442 | 72 | 59.470 | 33 | P2151305 | | 215 | 65 | 66 | | 214 | 5 | | |
| 10 | 24 | 3-Aug | 3-Aug | 1907 | 1507 | 66 | 53.792 | 72 | 39.680 | | | | 215 | | | | 214 | 5 | | tapes ended |
| 10 | 24 | 3-Aug | 3-Aug | 1930 | 1530 | 66 | 53.980 | 72 | 37.100 | | | | 215 | | | | 214 | 5 | √ | End Tow 10 |
| | | | | | | | | | | | | | | | | | | | | |
| 11 | 24 | 4-Aug | 3-Aug | 317 | 2317 | 66 | 57.240 | 72 | 29.089 | 34 | P2152321 | B8032318 | 215 | 67 | 68 | 08040340.01 | 215 | 5 | √ | Start Tow 11 |
| 11 | 24-25 | 4-Aug | 4-Aug | 630 | 230 | 67 | 5.977 | 72 | 0.516 | 35 | P2160231 | | 216 | 69 | 70 | | 215 | 5 | | attempt to restart acc |
| 11 | 25 | 4-Aug | 4-Aug | 643 | 243 | | | | | | P2160241 | | 216 | | | | 215 | 5 | | Restart acoustics |
| 11 | 25 | 4-Aug | 4-Aug | 716 | 316 | 67 | 6.321 | 71 | 59.803 | | P2160315 | | 216 | | | | 215 | 5 | | Restart acc |
| 11 | 25 | 4-Aug | 4-Aug | 729 | 329 | 67 | 6.428 | 71 | 59.583 | 36 | | | 216 | 71 | 72 | | 215 | 5 | | |
| 11 | 25-26 | 4-Aug | 4-Aug | 930 | 330 | 67 | 8.075 | 71 | 57.280 | 37 | P2160532 | | 216 | 73 | 74 | | 215 | 5 | | |
| 11 | 25-26 | 4-Aug | 4-Aug | 1130 | 730 | | | | | 38 | | | 216 | 75 | 76 | | 215 | 5 | | |
| 11 | 26 | 4-Aug | 4-Aug | 1353 | 953 | 67 | 19.869 | 71 | 14.650 | | | | 216 | | | | 215 | 5 | √ | End Tow 11 |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 26 | 4-Aug | 4-Aug | 1935 | 1535 | 67 | 18.880 | 71 | 16.207 | 39 | P2161539 | B8041535 | 216 | 77 | 78 | 08041942.01 | 215 | 5 | √ | Start Tow 12 |
| 12 | 26-27 | 4-Aug | 4-Aug | 2148 | 1748 | 67 | 25.888 | 70 | 54.519 | 40 | P2161747 | | 216 | 79 | 80 | 08042150.01 | 215 | 5 | | |
| 12 | 26-27 | 4-Aug | 4-Aug | 2324 | 1924 | 67 | 29.856 | 70 | 41.076 | | | | | | | | | 5 | √ | End Tow 12 |
| | | | | | | | | | | | | | | | | | | | | |
| 13 | 27-28 | 4-Aug | 4-Aug | 616 | 216 | 67 | 43.700 | 69 | 49.773 | 41 | P2170221 | B8040216 | 217 | 81 | 82 | 08050618.01 | 215 | 5 | √ | Start Tow 13 |
| 13 | 28-42 | 5-Aug | 5-Aug | 815 | 415 | | | | | 42 | | | 217 | 83 | 84 | | 216 | NS | | |
| 13 | 28-42 | 5-Aug | 5-Aug | 1026 | 626 | 67 | 53.129 | 70 | 7.800 | 43 | P2170626 | | 217 | 85 | 86 | | 216 | NS | | |
| 13 | 28-42 | 5-Aug | 5-Aug | 1225 | 825 | 68 | 0.918 | 70 | 21.332 | 44 | P2170825 | | 217 | 87 | 88 | | 216 | NS | | |
| 13 | 42 | 5-Aug | 5-Aug | 1249 | 849 | 68 | 2.516 | 70 | 19.644 | | | | | | | | | 6 | √ | End Tow 13 |
| | | | | | | | | | | | | | | | | | | | | |
| 14 | 42-41 | 5-Aug | 5-Aug | 1804 | 1404 | 68 | 1.269 | 70 | 14.855 | 45 | P2171410 | B8051407 | 217 | 89 | 90 | 08051809.01 | 216 | 6 | √ | Start Tow 14 |
| 14 | 42-42 | 5-Aug | 5-Aug | 2015 | 1615 | 68 | 9.077 | 69 | 56.620 | 46 | P2171616 | | 217 | 91 | 92 | | 216 | 6 | | |
| 14 | 41 | 5-Aug | 5-Aug | 2215 | 1815 | 68 | 15.480 | 69 | 33.750 | | | | 217 | | | | 216 | 6 | √ | End Tow 14 |
| | | | | | | | | | | | | | | | | | | | | |
| 15 | 38 | 7-Aug | 7-Aug | 1632 | 1232 | 68 | 19.929 | 68 | 0.390 | 47 | P2191234 | B8071233 | 219 | 93 | 94 | 08071635.01 | 218 | MBay | √ | Start Tow 15 |
| 15 | 38-37 | 7-Aug | 7-Aug | 1726 | 1326 | | | | | 47 | P2191326 | | 219 | | | | 218 | MBay | | Spontaneous Restart ACC |
| 15 | 38-37 | 7-Aug | 7-Aug | 1838 | 1438 | 68 | 11.911 | 68 | 11.601 | 48 | P2191438 | | 219 | 95 | 96 | | 218 | MBay | | |
| 15 | 37-36 | 7-Aug | 7-Aug | 2044 | 1644 | 68 | 10.085 | 68 | 9.581 | 49 | P2191642 | | 219 | 97 | 98 | | 218 | MBay | | Raw ESS file named 'RAW" |
| 15 | 37-36 | 7-Aug | 7-Aug | 2243 | 1843 | 68 | 2.154 | 67 | 56.511 | 50 | P2191842 | | 219 | 99 | 100 | | 218 | MBay | | |
| 15 | 37-36 | 8-Aug | 7-Aug | 42 | 2042 | 67 | 53.811 | 67 | 41.860 | 51 | P2192042 | | 219 | 101 | 102 | 08070101.01 | 219 | MBay | | |
| 15 | 37 | 8-Aug | 7-Aug | 245 | 2245 | 67 | 51.086 | 67 | 40.842 | 52 | | | 219 | 103 | 104 | | 219 | MBay | | |
| 15 | 37 | 8-Aug | 7-Aug | 303 | 2303 | 67 | 51.112 | 67 | 40.880 | | P2192303 | | 219 | | | | 219 | MBay | | ESS File Change |
| 15 | 37 | 8-Aug | 8-Aug | 438 | 38 | 67 | 52.600 | 68 | 3.900 | 53 | | | 220 | 105 | 106 | | 219 | MBay | | |
| 15 | 35 | 8-Aug | 8-Aug | 518 | 118 | 67 | 53.300 | 68 | 8.260 | | | | 220 | | | | 219 | MBay | √ | End Tow 15 |
| 16 | 35-24 | 8-Aug | 8-Aug | 1233 | 833 | 67 | 53.816 | 68 | 20.692 | 54 | P2200839 | B8080834 | 220 | 107 | 108 | 08081236.01 | 219 | MBay | √ | Start Tow 16 |
| 16 | 34 | 8-Aug | 8-Aug | 1323 | 923 | 67 | 54.9 | 68 | 30.1 | | | | 220 | | | | 219 | MBay | √ | End Tow 16 |
| 17 | 34-33 | 8-Aug | 8-Aug | 1934 | 1534 | 67 | 55.735 | 68 | 31.860 | 55 | P2201541 | B8081537 | 220 | 109 | 110 | 08081939.01 | 219 | MBay | √ | Start Tow 17 |
| 17 | 33 | 8-Aug | 8-Aug | 2117 | 1717 | 67 | 58.873 | 68 | 46.730 | | P2201716 | | 220 | | | | 219 | MBay | | New ACC File |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17 | 33-31 | 8-Aug | 8-Aug | 2144 | 1744 | 67 | 58.375 | 68 | 47.304 | 56 | P2201744 | | 220 | 111 | 112 | | 219 | MBay | | |
| 17 | 31-30 | 8-Aug | 8-Aug | 2250 | 1850 | 67 | 53.400 | 68 | 48.539 | | | | | | | | 219 | MBay | √ | End Tow 17 |
| 18 | 29-43 | 9-Aug | 9-Aug | 1024 | 624 | 67 | 45.558 | 70 | 7.161 | 57 | P2210622 | B08090620 | 221 | 113 | 114 | 08091019.01 | 220 | NS | √ | Start Tow 18 |
| 18 | 29-43 | 9-Aug | 9-Aug | 1225 | 825 | 67 | 44.501 | 70 | 31.039 | 58 | P2210827 | | 221 | 115 | 116 | | 220 | NS | | |
| 18 | 29-43 | 9-Aug | 9-Aug | 1342 | 942 | | | | | | P2210940 | | 221 | | | | 220 | NS | | |
| 18 | 29-43 | 9-Aug | 9-Aug | 1406 | 1006 | 67 | 47.963 | 70 | 50.016 | | | | 221 | | | | 220 | NS | √ | End Tow 18 |
| 19 | 47 | 11-Aug | 11-Aug | 641 | 241 | 67 | 13.011 | 74 | 28.753 | 59 | P2230241 | B08110244 | 223 | 117 | 118 | 08110644.01 | 222 | 7 | √ | Start Tow 19 - Dunk Test |
| 19 | 47 | 11-Aug | 11-Aug | 649 | 249 | 67 | 13.011 | 74 | 28.753 | | | | 223 | | | | 222 | 7 | √ | End Tow 19 |
| 20 | 47-48 | 11-Aug | 11-Aug | 1633 | 1233 | 67 | 13.035 | 74 | 31.707 | 60 | P2231235 | B8111233 | 223 | 119 | 120 | 08111635.01 | 222 | 7 | √ | Start Tow 20 |
| 20 | 47-48 | 11-Aug | 11-Aug | 1836 | 1436 | 67 | 19.660 | 74 | 12.440 | 61 | P2231438 | | 223 | 121 | 122 | | 222 | 7 | | |
| 20 | 47-48 | 11-Aug | 11-Aug | 2039 | 1639 | 67 | 26.170 | 73 | 52.500 | 62 | P2231640 | | 223 | 123 | 124 | | 222 | 7 | | |
| 20 | 47-48 | 11-Aug | 11-Aug | 2053 | 1653 | 67 | 26.900 | 73 | 50.320 | | N2231652 | | 223 | | | | 222 | 7 | | Underway Noise Test |
| 20 | 48 | 11-Aug | 11-Aug | 2114 | 1714 | 67 | 27.890 | 73 | 47.300 | | | | 223 | | | | 222 | 7 | √ | End Tow 20 |
| 21 | 48-49 | 11-Aug | 11-Aug | 2346 | 1946 | 67 | 31.060 | 73 | 37.200 | 63 | P2231945 | B8111944 | 223 | 125 | 126 | 08112345.01 | 222 | 7 | √ | Start Tow 21 |
| 21 | 48-49 | 12-Aug | 11-Aug | 149 | 2149 | 67 | 37.520 | 73 | 16.680 | 64 | P2232149 | | 223 | 127 | 128 | | 222 | 7 | | |
| 21 | 49-49 | 12-Aug | 11-Aug | 223 | 2223 | | | | | | P2232223 | | 223 | | | | 222 | 7 | | Transducer Disabled File |
| 21 | 49 | 12-Aug | 12-Aug | 235 | 2235 | 67 | 40.141 | 73 | 8.608 | | | | 223 | | | | 222 | 7 | √ | End Tow 21 |
| 22 | 49-50 | 12-Aug | 12-Aug | 1155 | 755 | 67 | 48.900 | 72 | 39.600 | 65 | P2240758 | B8120757 | 224 | 129 | 130 | 08121200.01 | 223 | 7 | √ | Start Tow 22 |
| 22 | 50 | 12-Aug | 12-Aug | 1341 | 941 | 67 | 53.149 | 72 | 25.163 | | | | 224 | | | | 223 | 7 | √ | End Tow 22 |
| 23 | 50-51 | 12-Aug | 12-Aug | 2130 | 1730 | 67 | 54.590 | 72 | 21.198 | 66 | P2241735 | B8121731 | 224 | 131 | 132 | 08122132.01 | 223 | 7 | √ | Start Tow 23 |
| 23 | 50-51 | 12-Aug | 12-Aug | 2339 | 1939 | 68 | 0.592 | 72 | 1.258 | 67 | P2241939 | | 224 | 133 | 134 | | 223 | 7 | | |
| 23 | 50-51 | 13-Sep | 12-Aug | 16 | 2016 | | | | | | P2242016 | | 224 | | | | 224 | 7 | | |
| 23 | 50-51 | 13-Aug | 12-Aug | 59 | 2059 | 68 | 2.262 | 71 | 65.940 | | | | 224 | | | | 224 | 7 | √ | End Tow 23 |
| 24 | 53 | 16-Aug | 15-Aug | 240 | 2240 | 68 | 28.354 | 70 | 35.641 | None | P2272240 | B8152041 | 227 | 135 | 136 | 08160243.01 | 227 | 7 | √ | Start Tow 24 |
| 24 | 53 | 16-Aug | 16-Aug | 405 | 5 | 68 | 28.174 | 70 | 35.115 | 68 | | | 228 | | | | 227 | 7 | | Start Dat Tape |
| 24 | 53 | 16-Aug | 16-Aug | 447 | 47 | 68 | 28.075 | 70 | 34.940 | 69 | P2280050 | | 228 | 137 | 138 | | 227 | 7 | | |
| 24 | 53 | 16-Aug | 16-Aug | 523 | 123 | 68 | 28.000 | 70 | 34.870 | | P2280122 | | 228 | | | | 227 | 7 | | ACC computer craps out |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24 | 53 | 16-Aug | 16-Aug | 539 | 139 | 68 | 27.930 | 70 | 34.830 | | | | 228 | | | | 227 | 7 | √ | End tow 24 |
| 25 | 54-59 | 16-Aug | 16-Aug | 1421 | 1021 | 68 | 33.513 | 70 | 5.294 | 70 | P2281026 | B8161022 | 228 | 139 | 140 | 08161424.01 | 227 | NS | √ | Start Tow 25 |
| 25 | 54-59 | 16-Aug | 16-Aug | 1645 | 1245 | 68 | 37.540 | 70 | 23.960 | | | | 228 | | | | 227 | NS | √ | End Tow 25 |
| 26 | 59-60 | 16-Aug | 16-Aug | 2101 | 1701 | 68 | 42.960 | 70 | 27.910 | 71 | P2281714 | B8161701 | 228 | 141 | 142 | 08162105.01 | 227 | 8 | √ | Start Tow 26 |
| 26 | 59-60 | 16-Aug | 16-Aug | 2317 | 1917 | 68 | 44.416 | 70 | 52.354 | 72 | P2281917 | | 228 | 143 | 144 | | 227 | 8 | | |
| 26 | 59-60 | 16-Aug | 16-Aug | 2353 | 1953 | 68 | 44.937 | 70 | 55.175 | | | | 228 | | | | 227 | 8 | √ | End Tow 26 |
| 27 | 61-62 | 17-Aug | 17-Aug | 1041 | 641 | 68 | 31.227 | 71 | 50.548 | 73 | P2290638 | B8170636 | 229 | 145 | 146 | 08171039.01 | 228 | 8 | √ | Start Tow 27 |
| 27 | 61-62 | 17-Aug | 17-Aug | 1155 | 755 | 68 | 29.000 | 71 | 58.900 | | | | 229 | | | | 228 | 8 | √ | End Tow 27 |
| 28 | 62-63 | 17-Aug | 17-Aug | 1717 | 1317 | 68 | 18.180 | 72 | 32.240 | 74 | P2291320 | B8171319 | 229 | 147 | 148 | 08171721.01 | 228 | 8 | √ | Start Tow 28 |
| 28 | 62-63 | 17-Aug | 17-Aug | 1926 | 1526 | 68 | 12.387 | 72 | 55.181 | 75 | P2291527 | | 229 | 149 | 150 | | 228 | 8 | | |
| 28 | 63 | 17-Aug | 17-Aug | 2006 | 1606 | 68 | 10.467 | 73 | 0.345 | | | | | | | | | 8 | | Recording Stopped |
| 28 | 63 | 17-Aug | 17-Aug | 2025 | 1625 | 68 | 10.127 | 73 | 1.423 | | | | | | | | | 8 | √ | End Tow 28 |
| 29 | to 74 | 18-Aug | 18-Aug | 1430 | 1030 | 68 | 31.050 | 73 | 37.075 | 76 | P2301036 | B8181033 | 230 | 151 | 152 | 08181436.01 | 229 | 9 | √ | Start Tow29 |
| 29 | to 74 | 18-Aug | 18-Aug | 1639 | 1239 | 68 | 33.770 | 73 | 14.170 | 77 | P2301240 | B8181033 | 230 | 153 | 154 | | 229 | 9 | | |
| 29 | to 74 | 18-Aug | 18-Aug | 1844 | 1444 | 68 | 39.197 | 72 | 58.060 | | | | | | | | | 9 | | Stop Recording |
| 29 | to 74 | 18-Aug | 18-Aug | 1915 | 1515 | 68 | 39.870 | 72 | 56.490 | | | | | | | | | 9 | √ | End Tow29 |
| 30 | 76-77 | 20-Aug | 19-Aug | 250 | 2250 | 69 | 3.975 | 73 | 6.916 | | P2312252 | B8192231 | 231 | | | 08200251.01 | 230 | 10 | √ | Start Tow30 |
| 30 | 76-77 | 20-Aug | 19-Aug | 300 | 2300 | 69 | 1.964 | 73 | 3.699 | 78 | | | 231 | 155 | 156 | | 230 | 10 | | Tapes Started |
| 30 | 76-77 | 20-Aug | 19-Aug | 345 | 2345 | 69 | 1.603 | 73 | 5.682 | | | | 231 | | | | 230 | 10 | | End Tow30 |
| 31 | 77-78 | 20-Aug | 20-Aug | 735 | 335 | 68 | 55.297 | 73 | 36.639 | 79 | P2320345 | B8200342 | 232 | 157 | 158 | 08200744.01 | 231 | 10 | | Start Tow31 |
| 31 | 77-78 | 20-Aug | 20-Aug | 814 | 414 | | | | | | | | 232 | | | | 231 | 10 | | DAT tape started |
| 31 | 77-78 | 20-Aug | 20-Aug | 900 | 500 | 68 | 52.800 | 73 | 45.000 | | | | 232 | | | | 231 | 10 | √ | End Tow 31 |
| 32 | 83-87 | 21-Aug | 21-Aug | 1251 | 851 | 69 | 15.360 | 75 | 32.438 | | | | 233 | | | | 232 | | √ | Start Tow 32; BM Broken |
| 32 | 83-87 | 21-Aug | 21-Aug | 1326 | 926 | 69 | 12.940 | 75 | 33.770 | | | | 233 | | | | 232 | | √ | End Tow 32 |
| 33 | 13-14 | 24-Aug | 24-Aug | 1746 | 1346 | 66 | 26.649 | 71 | 15.807 | 80 | P2361359 | B8241351 | 236 | 159 | 160 | 08241753.01 | 235 | 3 | √ | Start Tow 33 |
| 33 | 14 | 24-Aug | 24-Aug | 2004 | 1604 | 66 | 30.337 | 71 | 3.443 | 81 | P2361612 | | 236 | 161 | 162 | | 235 | 3 | | |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 33 | 14-15 | 24-Aug | 24-Aug | 2208 | 1808 | 66 | 32.565 | 70 | 58.582 | 82 | P2361808 | | 236 | 163 | 164 | | 235 | 3 | | |
| 33 | 14-15 | 24-Aug | 24-Aug | 2341 | 1941 | 66 | 36.937 | 70 | 43.521 | | P2361941 | | 236 | | | | 235 | 3 | | ACC spontaneous restart |
| 33 | 14-15 | 25-Aug | 24-Aug | 11 | 2011 | 66 | 38.211 | 70 | 41.981 | 83 | | | 236 | 165 | 166 | | 235 | 3 | | |
| 33 | 14-15 | 25-Aug | 24-Aug | 216 | 2216 | 66 | 42.860 | 70 | 25.824 | 85 | P2362216 | | 236 | 167 | 168 | | 235 | 3 | | |
| 33 | 15 | 25-Aug | 25-Aug | 409 | 9 | 66 | 46.238 | 70 | 11.300 | | | | 236 | | | | 235 | 3 | √ | End Tow 33 |
| 34 | 15 | 25-Aug | 25-Aug | 600 | 200 | 66 | 45.624 | 70 | 8.428 | | | B8240200 | 237 | 169 | 170 | 08250600.01 | 236 | 3 | √ | Start Tow 34 |
| 34 | 15-16 | 25-Aug | 25-Aug | 631 | 231 | 66 | 45.830 | 70 | 4.852 | 86 | P2370230 | | 237 | | | | 236 | 3 | | Finally got AC started |
| 34 | 15-16 | 25-Aug | 25-Aug | 807 | 407 | 66 | 49.922 | 69 | 50.913 | 87 | P2370407 | | 237 | 171 | 172 | | 236 | 3 | | |
| 34 | 15-16 | 25-Aug | 25-Aug | 847 | 447 | 66 | 50.889 | 69 | 44.048 | | N2370446 | | 237 | | | | 236 | 3 | | Noise Test Start |
| 34 | 15-16 | 25-Aug | 25-Aug | 855 | 455 | 66 | 51.370 | 69 | 43.067 | | P2370453 | | 237 | | | | 236 | 3 | | Noise Test End |
| 34 | 15-16 | 25-Aug | 25-Aug | 1007 | 607 | 66 | 55.089 | 69 | 33.321 | 88 | P2370607 | | 237 | 173 | 174 | | 236 | 3 | | |
| 34 | 16 | 25-Aug | 25-Aug | 1029 | 629 | 66 | 56.260 | 69 | 30.620 | | | | 237 | | | | 236 | 3 | √ | End Tow 34 |
| CAL | | 27-Aug | 27-Aug | 1333 | 933 | 64 | 49.837 | 62 | 55.016 | 89 | P2390935 | B8270931 | 239 | 175 | 176 | 08271355.01 | 238 | | √ | Start Acoustic Calibration 1 |
| CAL | | 27-Aug | 27-Aug | 1347 | 947 | 64 | 49.837 | 62 | 55.016 | | | | | | | | | | √ | End Acoustic Calibration 1 |
| CAL | | 27-Aug | 27-Aug | 1438 | 1038 | 64 | 50.583 | 62 | 55.926 | | P2391038 | B8270931 | 239 | 175 | 176 | 08271355.01 | 238 | | √ | Start Acoustic Calibration 2 |
| CAL | | 27-Aug | 27-Aug | 1512 | 1112 | | | | | | P2391112 | | | | | | | | | New Fish Orientation |
| CAL | | 27-Aug | 27-Aug | 1538 | 1138 | 64 | 50.509 | 62 | 55.860 | | P2391138 | | | | | | | | | Changed Strata Definitions |
| CAL | | 27-Aug | 27-Aug | 1630 | 1230 | 64 | 50.529 | 62 | 55.926 | | | | | | | | | | √ | End Acoustic Calibration 2 |

Appendix 8. Summary of VPR image processing and classification parameters for all tows during which VPR data were collected. For each tow, yearday (Jan. 1 = 0) and hours for which data were collected are shown. For each camera, tows and hours for which ROIs were extracted are designated as an 'x'; hours for which ROIs were re-extracted from tape are designated as 'xx'; tows, and hours for which ROIs could not be extracted are indicated by noting the relevant problem (e.g., sync loss, noise). For camera 2, the classification algorithm utilized for each tow and hour is shown. For camera 4, plankton could be identified only for images collected during the first 7 tows. For both cameras, the ROI extraction program settings used to extract the ROIs and the fields of view (if available) are shown. The timing of significant events relative to the sequence of tows also is noted (e.g., crash).

| Tow | Day | Hours | ROIS Extracted | | Cam2 Class. | Cam4 Class. | |
|---|---|---|---|---|---|---|---|
| | | | Cam2 | Cam4 | | | FOV |
| | | | | | | | |
| 1 | 207 | 13-16 | x | x | nbp0104_c2_0810_v3_5_t5 | nbp0104_cam4_0802_try2 | |
| 2 | 207 | 19-25 | x | x | nbp0104_c2_0810_v3_5_t5 | nbp0104_cam4_0802_try2 | |
| 2 | 208 | 1-2 | x | x | nbp0104_c2_0810_v3_5_t5 | nbp0104_cam4_0802_try2 | |
| 3 | 208 | 12-21 | 13, 17 | x | not classified | nbp0104_cam4_0802_try2 | |
| 4 | 209 | 2-4 | x | x | nbp0104_c2_0810_v3_5_t5 | nbp0104_cam4_0802_try2 | |
| 5 | 209 | 6-24 | x | x | nbp0104_c2_0810_v3_5_t5 | nbp0104_cam4_0802_try2 | |
| 5 | 210 | 0 | x | x | nbp0104_c2_0810_v3_5_t5 | nbp0104_cam4_0802_try2 | |
| 6 | 210 | 8-9 | x | x | nbp0104_c2_0810_v3_5_t5 | nbp0104_cam4_0802_try2 | |
| 7 | 210 | 20-21 | x | x | nbp0104_c2_0810_v3_5_t5 | nbp0104_cam4_0802_try2 | |
| CRASH | | | | | | | |
| 8 | 213 | 10-15 | xx | Re-xtract | nbp0104_c2_0813_8plus_t5 | | 23x18 |
| 9 | 214 | 0-10 | x | noise | nbp0104_c2_0813_8plus_t5 | | 24x17.5 |
| 10 | 214 | 14-19 | x | noise | nbp0104_c2_0813_8plus_t5 | | |
| 11 | 215 | 3-13 | x | noise | nbp0104_c2_0813_8plus_t5 | | 23x19 (air) |
| 12 | 215 | 19-23 | xx | noise, re-extract | nbp0104_c2_0819_8plus_t6 | | |
| 13 | 216 | 6-12 | xx | noise, re-extract | nbp0104_c2_0819_8plus_t6 | | |
| ICE IMPACT ON CAMERAS | | | | | | | |
| 14 | 216 | 18-22 | xx | sync loss | nbp0104_c2_0819_8plus_t6 | | |
| 15 | 218 | 16-23 | xx | sync loss | nbp0104_c2_0819_8plus_t6 | | |
| 15 | 219 | 00-05 | xx | sync loss | nbp0104_c2_0819_8plus_t6 | | |
| 16 | 219 | 12-13 | x | sync loss | nbp0104_c2_0819_8plus_t6 | | |
| 17 | 219 | 19-20 | x | sync loss | nbp0104_c2_0813_8plus_t5 | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 17 | 219 | 21 | x (ice crystals) | sync loss | nbp0104_c2_0813_8plus_t5 | | |
| 17 | 219 | 22 | x | sync loss | nbp0104_c2_0813_8plus_t5 | | |
| ICE/BOTTOM IMPACT ON CAMERAS | | | | | | | |
| 18 | 220 | 10-13 | x | sync loss | nbp0104_c2_0819_8plus_t6 | | 18x15 |
| 19 | | None | | | | | |
| 20 | 222 | 16-21 | x | sync loss | nbp0104_c2_0819_8plus_t6 | | |
| 21 | 222 | 23-26 | x | sync loss | nbp0104_c2_0819_8plus_t6 | | |
| 22 | 223 | 12-13 | x | sync loss | nbp0104_c2_0819_8plus_t6 | | |
| 23 | 223 | 21-25 | x | sync loss | nbp0104_c2_0819_8plus_t6 | | |
| 24 | 227 | 2-4 | x | sync loss | nbp0104_c2_0819_8plus_t6 | | |
| 25 | 227 | 14-16 | x | sync loss | nbp0104_c2_0819_8plus_t6 | | |
| 26 | 227 | 21-24 | x | sync loss | nbp0104_c2_0819_8plus_t6 | | |
| 27 | 228 | 10-11 | x | sync loss | nbp0104_c2_0819_8plus_t6 | | |
| 28 | 228 | 17-19 | x | sync loss | nbp0104_c2_0819_8plus_t6 | | |
| 29 | 229 | 14-18 | x | sync loss | nbp0104_c2_0819_8plus_t6 | | |
| 30 | 231 | 2-3 | x (sync loss) | sync loss | nbp0104_c2_0819_8plus_t6 | | |
| 31 | 232 | 7-8 | sync loss | sync loss | | | |
| 32 | no data | no data | no data | no data | | | |
| 33 | 235 | 18-27 | x | sync loss | nbp0104_c2_0819_8plus_t6 | | |
| 34 | 236 | 6-10 | x | sync loss | nbp0104_c2_0819_8plus_t6 | | |

| **Tow** | **Cam2** | | | | | | **Cam4** | | | | | | **Comments** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Seg.Hi** | **Sobel** | **WinX** | **WInY** | **Blob, Growth,** | **FOV** | **Seg.Hi** | **Sobel** | **WinX** | **WInY** | **Blob, Growth,** | **FOV** | |
| | | | | | **Min Dist** | | | | | | **Min Dist** | | |
| 1 | 143 | 1 | 640 | 414 | 99, 100, 199 | | 217 | 48 | 640 | 414 | 55,300,55 | | |
| 2 | 143 | 10 | 640 | 414 | 99, 100, 199 | | 143 | 80 | 640 | 414 | 55,300,55 | | |
| 2 | 143 | 10 | 640 | 414 | 99, 500, 199 | | 143 | 80 | 640 | 414 | 55,300,55 | | |
| 3 | 143 | 10 | 640 | 414 | 99, 500, 199 | | 143 | 80 | 640 | 414 | 55,300,55 | | Camera 2 messed up |
| 4 | 143 | 10 | 640 | 414 | 99, 500, 199 | | 143 | 80 | 640 | 414 | 55,300,55 | | New Lens, alignment Camera 2 |
| 5 | 140 | 15 | 640 | 414 | 99, 500, 199 | | 143 | 80 | 640 | 414 | 55,300,55 | | |
| 5 | 140 | 15 | 640 | 414 | 99, 500, 199 | | 143 | 80 | 640 | 414 | 55,300,55 | | |
| 6 | 140 | 15 | 640 | 414 | 99, 500, 199 | | 143 | 80 | 640 | 414 | 55,300,55 | | |
| 7 | 140 | 15 | 640 | 414 | 99, 500, 199 | | 143 | 80 | 640 | 414 | 55,300,55 | | h22 shows ice crystals from crash |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CRASH | | | | | | | | | | | | | |
| 8 | 150 | 80 | 640 | 414 | 99,300,199 | 23x18 | 143 | 60 | 640 | 414 | 55,300,75 | 8.5x6.5 | |
| 9 | 150 | 60 | 640 | 414 | 99,300,199 | 24x17.5 | 143 | 80 | 640 | 414 | 55,300,75 | 8x6.5 | New Strobe |
| 10 | 150 | 60 | 640 | 414 | 99,300,199 | | 143 | 80 | 640 | 414 | 55,300,75 | | |
| 11 | 150 | 60 | 640 | 414 | 99,300,199 | 23x19 (air) | 143 | 80 | 640 | 414 | 55,300,75 | 9x7 (air) | New Alignment |
| 12 | 150 | 80 | 640 | 414 | 99,300,199 | | 143 | 80 | 640 | 414 | 55,300,75 | | Vol. Down TC, wrong TC |
| 13 | 150 | 60 | 640 | 414 | 99,300,199 | | 143 | 80 | 640 | 414 | 55,300,75 | | Vol. Down TC, wrong TC |
| ICEIMP | 150 | 60 | 640 | 414 | 99,300,199 | | 143 | 80 | 640 | 414 | 55,300,75 | | New Alignment |
| 14 | 150 | 60 | 640 | 414 | 99,300,199 | | 143 | 80 | 640 | 414 | 55,300,75 | | Vol. Down TC, wrong TC |
| 15 | 150 | 80 | 640 | 414 | 99,300,199 | | 143 | 80 | 640 | 414 | 55,300,75 | | Vol. Down TC, wrong TC |
| 15 | 150 | 80 | 640 | 414 | 99,300,199 | | 143 | 80 | 640 | 414 | 55,300,75 | | Vol. Down TC, wrong TC |
| 16 | 150 | 80 | 640 | 414 | 99,300,199 | | 143 | 80 | 640 | 414 | 55,300,75 | | |
| 17 | 150 | 80 | 640 | 414 | 99,300,199 | | 143 | 80 | 640 | 414 | 55,300,75 | | |
| 17 | 150 | 80 | 640 | 414 | 99,300,199 | | 143 | 80 | 640 | 414 | 55,300,75 | | |
| 17 | 150 | 80 | 640 | 414 | 99,300,199 | | 143 | 80 | 640 | 414 | 55,300,75 | | |
| ICE/BOTTOM IMPACT ON CAMERAS | | | | | | | | | | | | | Dramatically New Alignment |
| 18 | 160 | 80 | 640 | 414 | 99,300,199 | 18x15 | 147 | 44 | 640 | 414 | 55,300,75 | 8x6.5 | |
| 19 | | | | | | | | | | | | | Dunk Test |
| 20 | 160 | 80 | 640 | 414 | 99,300,199 | | 147 | 44 | 640 | 414 | 55,300,75 | | |
| 21 | 160 | 80 | 640 | 414 | 99,300,199 | | 147 | 44 | 640 | 414 | 55,300,75 | | |
| 22 | 160 | 80 | 640 | 414 | 99,300,199 | | 147 | 44 | 640 | 414 | 55,300,75 | | |
| 23 | 160 | 80 | 640 | 414 | 99,300,199 | | 147 | 44 | 640 | 414 | 55,300,75 | | |
| 24 | 160 | 80 | 640 | 414 | 99,300,199 | | | | | | | | |
| 25 | 160 | 80 | 640 | 414 | 99,300,199 | | | | | | | | |
| 26 | 160 | 80 | 640 | 414 | 99,300,199 | | | | | | | | |
| 27 | 160 | 80 | 640 | 414 | 99,300,199 | | | | | | | | |
| 28 | 160 | 80 | 640 | 414 | 99,300,199 | | | | | | | | |
| 29 | 160 | 80 | 640 | 414 | 99,300,199 | | | | | | | | |
| 30 | 160 | 80 | 640 | 414 | 99,300,199 | | | | | | | | c2, h3 only has tc/static |
| 31 | | | | | | | | | | | | | Too much synch loss |
| 32 | | | | | | | | | | | | | BM Not working, no data |
| 33 | 160 | 80 | 640 | 414 | 99,300,199 | | | | | | | | |
| 34 | 160 | 80 | 640 | 414 | 99,300,199 | | | | | | | | |

Appendix 9. Sonobuoy deployment information.

| SB # | Date | GMT | Lat deg | Lat min | Latitude | Long deg | Long min | Longitude | Type | Mn | Ba | Bp | Bm | Odont | Seal | Reason | range (nm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 25.07.01 | 14:30 | 60 | 59.94 | -60.999 | 67 | 40.502 | -67.675 | 57B | - | - | - | - | - | - | antenna test | |
| 2 | 25.07.01 | 20:28 | 61 | 55.55 | -61.926 | 68 | 11.05 | -68.184 | 53B | - | - | - | - | - | - | antenna test | 15 |
| 3 | 26.07.01 | 16:28 | 64 | 36.8 | -64.613 | 69 | 19.3 | -69.322 | 53B | - | - | - | - | - | - | tests/location | |
| 4 | 27.07.01 | 2:33 | 64 | 52.41 | -64.874 | 69 | 28.79 | -69.480 | 53B | - | - | - | - | - | - | SIO #3 | |
| 5 | 27.07.01 | 15:11 | 64 | 44.958 | -64.749 | 70 | 28.017 | -70.467 | 57B | - | - | - | - | - | - | station 2 | 3 |
| 6 | 28.07.01 | 1:11 | 66 | 7.93 | -66.132 | 69 | 14.73 | -69.246 | 57B | - | - | - | - | - | - | station 4 | 2 |
| 7 | 28.07.01 | 1:40 | 66 | 9.158 | -66.153 | 69 | 9.852 | -69.164 | 53B | - | - | - | - | - | - | station 4 | |
| 8 | 28.07.01 | 15:39 | 66 | 18.96 | -66.316 | 68 | 36.241 | -68.604 | 57B | - | - | - | - | - | - | transit 4 | |
| 9 | 28.07.01 | 16:25 | 66 | 21.349 | -66.356 | 68 | 28.231 | -68.471 | 53B | - | - | - | - | - | - | station 5 | 3 |
| 10 | 28.07.01 | 20:19 | 66 | 25.893 | -66.432 | 68 | 12.939 | -68.216 | 53B | - | - | - | - | - | - | station 6 | 5 |
| 11 | 29.07.01 | 12:37 | 66 | 31.822 | -66530 | 69 | 30.021 | -69.500 | 53B | - | - | - | - | - | - | SIO #8/st 9 | 12 |
| 12 | 29.07.01 | 19:20 | 66 | 18.1 | -66.302 | 70 | 10.8 | -70.180 | 53B | - | - | - | - | - | - | Ba sighting | failed |
| 13 | 29.07.01 | 19:40 | 66 | 16.9 | -66.282 | 70 | 14.5 | -70.242 | 53B | - | - | - | - | - | - | failed first | >7 on S |
| 14 | 30.07.01 | 8:35 | 66 | 3.805 | -66.063 | 71 | 1.078 | -71.018 | 53B | - | - | - | - | - | - | SIO #4/st 12 | |
| 15 | 31.07.01 | 13:09 | 66 | 43.549 | -66.726 | 70 | 15.052 | -70.251 | 53B | - | - | - | - | - | - | station 15 | |
| 16 | 31.07.01 | 20:44 | 66 | 48.061 | -66.801 | 69 | 58.362 | -69.973 | 53B | - | - | - | - | - | - | transit | failed |
| 17 | 01.08.01 | 14:33 | 67 | 25.65 | -67.428 | 69 | 38.6 | -69.643 | 53B | - | - | - | - | - | - | why not? | 5.5 |
| 18 | 01.08.01 | 18:18 | 67 | 12.4 | -67.207 | 70 | 4.5 | -70.075 | 53B | - | - | - | - | - | - | Ba sighting | |
| 19 | 03.08.01 | 1:25 | 66 | 36.173 | -66.603 | 72 | 27.628 | -72.460 | 53B | - | - | - | - | - | - | SIO #5 | |
| 20 | 03.08.01 | 16:25 | 66 | 45.3 | -66.755 | 73 | 5.6 | -73.093 | 53B | - | - | - | - | - | - | transit | 6.5 |
| 21 | 04.08.01 | 17:14 | 67 | 19.615 | -67.327 | 71 | 13.233 | -71.221 | 53B | - | - | - | - | - | - | station 26 | 12 |
| 22 | 05.08.01 | 19:28 | 68 | 6.42 | -68.107 | 70 | 3.612 | -70.060 | 53B | - | - | - | - | - | - | transit | killed by ice |
| 23 | 06.08.01 | 13:59 | 68 | 31.591 | -68.527 | 68 | 33.97 | -68.566 | 53B | - | - | - | - | - | - | ice-check | 4 |
| 24 | 07.08.01 | 16:12 | 68 | 20.282 | -68.338 | 67 | 57.07 | -67.951 | 57B | - | - | - | - | - | - | lead | 10 |
| 25 | 08.08.01 | 14:10 | 67 | 54.996 | -67.917 | 68 | 30.271 | -68.505 | 53B | - | - | - | - | - | - | Station 34 | scuttled |
| 26 | 09.08.01 | 14:18 | 67 | 48.097 | -67.802 | 70 | 51.064 | -70.851 | 53B | - | - | - | - | - | - | to station 43 | 3.2 |
| 27 | 10.08.01 | 19:28 | 67 | 4.457 | -67.074 | 73 | 33.341 | -73.556 | 53B | - | - | - | - | - | - | station 46 | killed |
| 28 | 11.08.01 | 2:15 | 67 | 11.226 | -67.187 | 74 | 0.775 | -74.013 | 53B | - | - | - | - | - | - | SIO #6 | 6 |
| 29 | 11.08.01 | 18:05 | 67 | 17.853 | -67.298 | 74 | 17.396 | -74.290 | 53B | - | - | - | - | - | X | SIO #6 | 6 |
| 30 | 12.08.01 | 21:03 | 67 | 52.781 | -67.880 | 72 | 25.351 | -72.423 | 53B | - | - | - | - | - | X | transit | strange beh |
| 31 | 12.08.01 | 23:49 | 68 | 1.08 | -68.018 | 71 | 59.69 | -71.995 | 53B | - | - | - | - | - | - | transit | 5.5 |
| 32 | 13.08.01 | 16:34 | 68 | 9.585 | -68.160 | 68 | 38.695 | -68.645 | 53B | - | - | - | - | - | - | transit | failed |
| 33 | 14.08.01 | 18:34 | 67 | 39.44 | -67.657 | 69 | 58.118 | -69.969 | 53B | - | - | - | - | - | - | transit | failed |
| 34 | 15.08.01 | 18:11 | 68 | 21.4 | -68.357 | 70 | 49.5 | -70.825 | 53B | - | - | - | - | - | - | transit | 3 |

| SB # | Date | GMT | Lat deg | Lat min | Latitude | Long deg | Long min | Longitude | Type | Mn | Ba | Bp | Bm | Odont | Seal | Reason | range (nm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 35 | 16.08.01 | 0:19 | 68 | 28.255 | -68.471 | 70 | 36.51 | -70.609 | 53B | - | - | - | - | - | X | station 53 | ? |
| 36 | 16.08.01 | 15:16 | 68 | 35.623 | -68.594 | 70 | 12.969 | -70.216 | 53B | - | - | - | - | - | - | transit | 7.4 |
| 37 | 17.08.01 | 17:22 | 68 | 17.908 | -68.298 | 72 | 37.816 | -72.630 | 53B | - | - | - | - | - | - | transit | 3.3 |
| 38 | 17.08.01 | 19:10 | 68 | 13.353 | -68.223 | 72 | 52.441 | -72.874 | 53B | - | - | - | - | - | X | transit | died |
| 39 | 18.08.01 | 15:18 | 68 | 31.118 | -68.519 | 73 | 27.684 | -73.461 | 53B | - | - | - | - | - | X | transit | 8 |
| 40 | 19.08.01 | 17:37 | 68 | 48.571 | -68.810 | 72 | 43.917 | -72.732 | 53B | - | - | - | - | - | - | transit | failed |
| 41 | 19.08.01 | 20:51 | 68 | 50.859 | -68.848 | 72 | 49.665 | -72.828 | 53B | - | - | - | - | - | - | no idea | failed |
| 42 | 20.08.01 | 16:46 | 68 | 46.544 | -68.776 | 74 | 22.926 | -74.382 | 53B | - | - | - | - | - | - | transit | |
| 43 | 21.08.01 | 13:56 | 69 | 11.165 | -69.186 | 75 | 35.127 | -75.585 | 53B | - | - | - | - | - | - | station 87 | 3.9 |
| 44 | 22.08.01 | 13:47 | 68 | 50.555 | -68.843 | 75 | 43.134 | -75.719 | 53B | - | - | - | - | - | - | transit | 10.5 |
| 45 | 22.08.01 | 18:20 | 68 | 24.098 | -68.402 | 75 | 38.482 | -75.641 | 53B | - | - | - | - | - | - | Ba sighting | 8.2 |
| 46 | 22.08.01 | 22:37 | 68 | 12.693 | -68.212 | 75 | 13.071 | -75.218 | 53B | - | - | - | - | - | - | transit | failed |
| 47 | 23.08.01 | 17:59 | 67 | 46.255 | -67.771 | 74 | 8.458 | -74.141 | 53B | - | - | - | - | - | - | transit | failed |
| 48 | 23.08.01 | 19:52 | 67 | 35.705 | -67.595 | 73 | 56.255 | -73.938 | 53B | - | - | - | - | - | X | transit | 7 |
| 49 | 24.08.01 | 17:07 | 66 | 24.166 | -66.403 | 71 | 18.868 | -71.314 | 53B | - | - | - | - | - | - | transit | failed |
| 50 | 24.08.01 | 18:21 | 66 | 28.658 | -66.478 | 71 | 10.932 | -71.182 | 53B | - | - | - | - | - | - | transit | 6 |
| 51 | 26.08.01 | 14:31 | 65 | 32.709 | -65.545 | 68 | 47.218 | -68.787 | 53B | - | - | - | - | - | - | transit | 8.5 |
| 52 | 26.08.01 | 16:43 | 65 | 18.481 | -65.308 | 68 | 12.309 | -68.205 | 53B | - | - | - | - | - | - | transit | 12 |
| 53 | 27.08.01 | 15:43 | 64 | 50.056 | -64.834 | 62 | 53.661 | -62.894 | 53B | - | - | - | - | - | - | Paradise Har | 17.5 |
| 54 | 27.08.01 | 21:07 | 64 | 42.773 | -64.713 | 63 | 2.406 | -63.040 | 57B | - | - | - | - | X? | - | Oo sighting | 6.3 |
| 55 | 28.08.01 | 2:22 | 63 | 57.322 | -63.955 | 61 | 40.556 | -61.676 | 53B | - | - | - | - | - | X | transit | 13.7 |
| 56 | 28.08.01 | 17:18 | 61 | 16.78 | -61.280 | 62 | 53.112 | -62.885 | 53B | - | - | - | - | - | - | transit | 15 |

Notes: Oo - killer whale (*Orcinus orca*); Mn - humpback (*Megaptera novaeangliae*); Ba - minke whale (*Balaenoptera acutorostrata*); Bp - fin whale (*Balaenoptera physalus*); Bm - blue whale (*Balaenoptera musculus*)

Appendix 10. Log of ice stations and corresponding SO GLOBEC survey grid stations at which sea ice biology cores were collected during NBP01-04. Depths are in reference to the top of the ice surface, i.e., depth 0 m = ice/snow interface.

| Ice Station | grid station | event | latitude (S) | longitude (W) | GMT date | Julian date | ice conditions | Core | snow depth (m) | ice thickness (m) | freeboard (m) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 4 | 20901.01 | 66 09.118 | 69 06.084 | 28-Jul-01 | 209 | first-year cake ice floes (<20m) loosely consolidated with frozen brash/young grey ice; sampled floe: 8.6m long axis, 7.0m width | 1 | 0.15 | 0.8 | NM |
| | | | | | | | | 2 | 0.25 | 1.26 | NM |
| | | | | | | | | 3 | 0.23 | 0.88 | NM |
| 2 | 15 | 21201.02 | 66 45.09 | 70 5.59 | 31-Jul-01 | 212 | pack of small (20-200m dia) and cake first-year floes consolidated at edges by young gray-white and brash ice; consolidated ridges (<0.5m height) over ~5% of surface: sampled floe: roufhly rectangular polygon, 22.5m long axis, 13.8m width | 4 | 0.16 | 1.1 | 0 |
| | | | | | | | | 5 | 0.19 | 0.52 | -0.01 |
| | | | | | | | | 6 | 0.165 | 0.5 | -0.005 |
| 3 | 25 | 21601 | 67 06.73 | 71 58.76 | 4-Aug-01 | 216 | vast (>2000m dia) first-year floes; new ridge coverage <5% over surface area | 7 | 0.1 | 0.55 | 0.05 |
| | | | | | | | | 8 | 0.12 | 0.68 | -0.015 |
| | | | | | | | | 9 | 0.15 | 0.59 | 0.01 |
| | | | | | | | | 10 | 0.12 | 0.9 | 0 |
| | | | | | | | | 11 | 0.19 | 0.55 | 0 |
| 4 | 40 | 21801 | 68 27.86 | 68 44.57 | 6-Aug-01 | 218 | vast first-year floes; new consolidated ridges (~1.5m height) in distance; no ridges in study area | no cores taken, ARGOS ice buoy deployment station | | | |
| 5 | 38 | 21901 | 68 21.79 | 67 52.83 | 7-Aug-01 | 219 | heavily consolidated vast first-year floes with new snow-covered ridges (~1.0m height) over 5% of the ice surface; thick snow cover | 12 | 0.235 | 0.97 | 0 |
| | | | | | | | | 13 | 0.18 | 0.88 | 0.06 |
| | | | | | | | | 14 | 0.12 | 1.51 | 0.075 |
| | | | | | | | | 15 | 0.11 | 2.45 | 0.12 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 6 | 47 | 22301 | 67 13.49 | 74 28.46 | 11-Aug-01 | 223 | vast first-year floes made of consolidated cake and small floes; wind-blown snow and drifts over small (<0.5m height) ridges covering ~5% of ice surface | 16 | 0.23 | 0.61 | 0.005 |
| | | | | | | | | 17 | 0.1 | 1.49 | 0.06 |
| | | | | | | | | 18 | 0.19 | 0.55 | 0.04 |
| 7 | 49 | 22301.03 | 67 41.05 | 73 07.96 | 12-Aug-01 | 224 | vast first-year floe; small (<0.5m height) snow drifts and ridges over ~5% of ice surface | 19 | 0.17 | 0.4 | 0 |
| | | | | | | | | 20 | 0.16 | 0.75 | 0.02 |
| 8 | 51 | 22401.02 | 68 07.27 | 71 40.56 | 13-Aug-01 | 225 | vast first-year floes w/ heavy snow cover (~25cm); no ridging; wet and flooded at base of snow layer | 21 | 0.28 | 0.37 | -0.06 |
| | | | | | | | | 22 | 0.2 | 0.62 | -0.08 |
| | | | | | | | | 23 | 0.24 | 0.67 | -0.07 |
| 9 | 53 | 22701.01 | 68 28.32 | 70 36.16 | 15-Aug-01 | 227-228 | vast first-year floes w/ heavy snow cover (>30cm); small (0-1m height) ice blocks and ridges (some >1.0m height) over ~15-20% of ice surface | 24 | 0.37 | 1.12 | 0.02 |
| | | | | | | | | 25DNA | 0.17 | 0.33 | 0 |
| 10 | 54 | 22801 | 68 30.46 | 69 59.32 | 16-Aug-01 | 228 | flat section of vast first-year floe; ridges (<1.0m height) outside of sampling area; wind-packed crust (~1cm) over light, fluffy snow layer | 26 | 0.12 | 0.42 | 0.02 |
| | | | | | | | | 27DNA | 0.07 | 0.4 | 0.02 |
| 11 | 74 | 23001.01 | 68 39.89 | 72 56.51 | 18-Aug-01 | 230 | vast first-year floes; level surface under thick (25-30cm snow layer); lead off starboard bow | 27 | 0.38 | 1 | -0.01 |
| 12 | 83 | 23201.02 | 68 59.48 | 74 55.32 | 20-Aug-01 | 232 | vast first-year floes; small ridges (~0.5-1.0m height) over 5-10% of ice surface; intermittent ice chunks/over-rafted edges covered w/ snow; evel surface in sampling area | 28 | 0.18 | 1.42 | 0.1 |
| | | | | | | | | 29 | 0.23 | 1.56 | 0.06 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 13 | 87 | 23301.03 | 69 14.99 | 75 40.71 | 22-Aug-01 | 234 | vast first-year floes; ridge coverage <10%; snow drifts around small (<0.5m height) ice chunks; hard level ice surface in sampling area; light, powdery snow underneath thin, hard surface crust | 30 | 0.22 | 0.75 | 0 |
| | | | | | | | | 31 | 0.22 | 0.65 | -0.005 |
| 14 | 71 | 23401.02 | 68 04.732 | 74 46.51 | 23-Aug-01 | 235 | vast first-year floes formed of cake and small floes consolidated together w/ brash; small ridges (<1.0m height) over <10% of ice surface; ice blocks and cake/small floe boundaries covered w/ snow drifts; hard, wind-packed snow layer over ice | 32 | 0.05 | 0.45 | -0.01 |
| | | | | | | | | 33 | 0.04 | 0.73 | 0.23 |
| 15 | 16 | 237.01.016 | 67 05.716 | 69 32.04 | 25-Aug-01 | 237 | vast floes composed of cake (<20m dia) and small (20-200m dia) floes consolidated by frozen brash/thinner sheet ice at floe boundaries; small ridges, snow drifts, and over-rafted ice chunks at floe boundaries; dimensions of sampled floe: roughly rectangular 15.3m X 12.6m | 34 | 0.12 | 1.08 | 0.13 |
| | | | | | | | | | 0.177429 | 0.84314286 | 0.02359375 |

Appendix 11. Chlorophyll *a* concentrations (mg $L^{-1}$) in core depth sections and brine samples collected during NBP01-04

Average CORE SECTION chlorophyll a (mg $l^{-1}$): **2.15 (n=74)** High:**28.01** (Core 17, 0.3-0.6m, Ice station 6, Grid station 47)
Low:**0.02** (Core 33, 0-0.16m, Ice station 14, Grid station 71)

Average BRINE chlorophyll a (mg $l^{-1}$): **0.1709 (n=23)** High:**1.76** (Core 34, Ice station 15, Grid station 16)
Low:**0.02** (Core 27, Ice station 11, Grid station 74)

| Ice Station | grid station | sample type | depth (m) | chlorophyll a mg $L^{-1}$ | Ice Station | grid station | sample type | depth (m) | chlorophyll a mg $L^{-1}$ |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 4 | CR 1 | 0-.39 | 1.41 | 8 | 51 | CR21 | 0-.31 | 0.85 |
| 1 | 4 | CR 1 | 0.54-0.80 | 0.42 | 8 | 51 | CR21 | 32-.53 | 0.78 |
| 1 | 4 | CR1 brine | 0 | 0.06 | 8 | 51 | CR21 brine | | 0.04 |
| 1 | 4 | CR1 brine | 0 | 0.07 | 8 | 51 | CR22 | 0-.23 | 0.62 |
| 1 | 4 | CR2 | 0-.49 | 1.19 | 8 | 51 | CR22 | .24-.67 | 1.46 |
| 1 | 4 | CR2 | .84-1.26 | 0.42 | 8 | 51 | CR23 | 0-.32 | 1.53 |
| 1 | 4 | CR3 | 0-.44 | 0.65 | 8 | 51 | CR23 | 0.33-0.67 | 1.49 |
| 1 | 4 | CR3 | .58-.88 | 0.26 | 9 | 53 | CR24 | 0-.31 | 0.21 |
| 2 | 15 | CR4 | 0-1.02 | 0.56 | 9 | 53 | CR24 brine | 0-.44 | 0.07 |
| 2 | 15 | CR4 brine | | 0.17 | 10 | 54 | CR26 | 0-.13 | 0.43 |
| 2 | 15 | CR4 brine 2 | | 0.09 | 10 | 54 | CR26 | .14-.31 | 0.36 |
| 2 | 15 | CR5 | 0-.59 | 0.50 | 10 | 54 | CR26 | .32-.44 | 0.49 |
| 2 | 15 | CR5 brine | | 0.05 | 10 | 54 | CR26 brine | | 0.04 |
| 2 | 15 | CR6 | 0-0.52 | 0.48 | 11 | 74 | CR27 | 0-.12 | 0.02 |
| 2 | 15 | CR6 brine | | 0.05 | 11 | 74 | CR27 | .13-.35 | 1.40 |
| 3 | 25 | CR 7 | 0-.43 | 0.79 | 11 | 74 | CR27 | .36-.97 | 0.44 |
| 3 | 25 | CR7 | .43-.53 | 0.93 | 11 | 74 | CR27 | .98-1.11 | 0.40 |
| 3 | 25 | CR7 brine | | 0.16 | 11 | 74 | CR27 brine | | 0.02 |
| 3 | 25 | CR8 | 0-.58 | 0.86 | 12 | 83 | CR28 | 0-.16 | 2.33 |
| 3 | 25 | CR8 | .58-.68 | 0.77 | 12 | 83 | CR28 | .17-.48 | 1.78 |
| 3 | 25 | CR9 | 0-.42 | 0.98 | 12 | 83 | CR28 | .49-.74 | 1.96 |
| 3 | 25 | CR9 | .42-.59 | 0.81 | 12 | 83 | CR28 | .75-1.21 | 1.27 |
| 3 | 25 | CR10 | 0-.85 | 0.78 | 12 | 83 | CR28 brine | | 0.34 |
| 3 | 25 | CR10 | .85-.95 | 0.43 | 12 | 83 | CR29 | 0-.24 | 4.87 |
| 3 | 25 | CR11 | 0-.45 | 0.55 | 12 | 83 | CR29 | .25-.68 | 1.73 |
| 3 | 25 | CR11 | .45-.55 | 0.46 | 12 | 83 | CR29 | .79-1.36 | 0.18 |
| 5 | 38 | CR12 | 0-.59 | 0.33 | 12 | 83 | CR29 | 1.37-1.55 | 0.10 |
| 5 | 38 | CR12 | .6-.97 | 0.37 | 12 | 83 | CR29 brine | | 0.05 |
| 5 | 38 | CR12 brine | 0-.9 | 0.22 | 13 | 87 | CR30 | 0-.15 | 1.47 |
| 5 | 38 | CR13 | 0-.52 | 0.32 | 13 | 87 | CR30 | .16-.39 | 0.90 |
| 5 | 38 | CR14 | 0-.31 | 0.35 | 13 | 87 | CR30 | .40-.75 | 0.44 |

| | | | | |
|---|---|---|---|---|
| 5 | 38 | CR14 | .4-.68 | 0.08 |
| 5 | 38 | CR14 | >0.68 | 0.05 |
| 5 | 38 | CR14 brine | 0-.4 | 0.15 |
| 5 | 38 | CR15 | 0-.25 | 0.32 |
| 5 | 38 | CR15 | >.97 | 0.06 |
| 5 | 38 | CR15 brine | 0-.97 | 0.06 |
| 6 | 47 | CR16 | 0-.38 | 1.90 |
| 6 | 47 | CR16 | .39-.67 | 0.98 |
| 6 | 47 | CR16 brine | | 0.05 |
| 6 | 47 | CR17 | 0-.295 | 9.68 |
| 6 | 47 | CR17 | .30-.60 | 28.01 |
| 6 | 47 | CR17 | .61-.76 | 3.23 |
| 6 | 47 | CR17 | .77-1.39 | 3.59 |
| 6 | 47 | CR17 | 1.40-1.49 | 22.61 |
| 6 | 47 | CR17 brine | 0-.81 | 0.22 |
| 6 | 47 | CR18 | 0-.55 | 8.35 |
| 7 | 49 | CR20 | 0-.19 | 1.09 |
| 7 | 49 | CR20 | .20-.41 | 0.73 |
| 7 | 49 | CR20 | .42-.77 | 1.11 |
| 7 | 49 | CR20 brine | | 0.08 |
| 13 | 87 | CR30 brine | | 0.03 |
| 13 | 87 | CR31 | 0-.19 | 2.43 |
| 13 | 87 | CR31 | .20-.38 | 0.35 |
| 13 | 87 | CR31 | .39-.67 | 0.47 |
| 14 | 71 | CR32 | 0-.18 | 1.51 |
| 14 | 71 | CR32 | .19-.45 | 1.29 |
| 14 | 71 | CR32 brine | | 0.05 |
| 14 | 71 | CR 33 | 0-.16 | 0.02 |
| 14 | 71 | CR 33 | .17-.48 | 2.20 |
| 14 | 71 | CR 33 | .49-.72 | 2.78 |
| 14 | 71 | CR 33 brine | | 0.12 |
| 15 | 16 | CR34 | 0-.27 | 3.42 |
| 15 | 16 | CR34 | .28-.47 | 18.58 |
| 15 | 16 | CR34 | .67-1.06 | 2.44 |
| 15 | 16 | CR34 brine | | 1.76 |

**CR** = core section ice sample, **BR** = brine sample

Appendix 6. Stations and Niskin bottle depths sampled for microzooplankton on NBP01-04.

| Sta | Depth (m) | Date | Sta | Depth (m) | Date | Sta | Depth (m) | Date |
|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 7/26/2001 | 15 | 120 | 7/31/2001 | 28 | 365 | 8/5/2001 |
| 0 | 50 | 7/26/2001 | 15 | 515 | 7/31/2001 | 42 | 0 | 8/5/2001 |
| 0 | 200 | 7/26/2001 | 16 | 0 | 7/31/2001 | 42 | 50 | 8/5/2001 |
| 1 | 0 | 7/27/2001 | 16 | 50 | 7/31/2001 | 42 | 150 | 8/5/2001 |
| 1 | 50 | 7/27/2001 | 16 | 98 | 7/31/2001 | 42 | 709 | 8/5/2001 |
| 1 | 150 | 7/27/2001 | 16 | 400 | 7/31/2001 | 41 | 0 | 8/5/2001 |
| 1 | 481 | 7/27/2001 | 17 | 0 | 8/1/2001 | 41 | 50 | 8/5/2001 |
| 3 | 0 | 7/27/2001 | 17 | 30 | 8/1/2001 | 41 | 150 | 8/5/2001 |
| 3 | 50 | 7/27/2001 | 17 | 100 | 8/1/2001 | 41 | 660 | 8/5/2001 |
| 3 | 150 | 7/27/2001 | 17 | 287 | 8/1/2001 | 40 | 0 | 8/6/2001 |
| 3 | 326 | 7/27/2001 | 18 | 0 | 8/1/2001 | 40 | 50 | 8/6/2001 |
| 4 | 0 | 7/28/2001 | 18 | 5 | 8/1/2001 | 40 | 150 | 8/6/2001 |
| 4 | 50 | 7/28/2001 | 18 | 50 | 8/1/2001 | 40 | 709 | 8/6/2001 |
| 4 | 120 | 7/28/2001 | 18 | 150 | 8/1/2001 | 39 | 0 | 8/6/2001 |
| 4 | 330 | 7/28/2001 | 18 | 494 | 8/1/2001 | 39 | 30 | 8/6/2001 |
| 5 | 0 | 7/28/2001 | 19 | 0 | 8/1/2001 | 39 | 100 | 8/6/2001 |
| 5 | 50 | 7/28/2001 | 19 | 100 | 8/1/2001 | 39 | 150 | 8/6/2001 |
| 5 | 150 | 7/28/2001 | 19 | 160 | 8/1/2001 | 39 | 176 | 8/6/2001 |
| 5 | 701 | 7/28/2001 | 19 | 397 | 8/1/2001 | 38 | 30 | 8/6/2001 |
| 6 | 0 | 7/28/2001 | 20 | 0 | 8/2/2001 | 38 | 100 | 8/6/2001 |
| 6 | 30 | 7/28/2001 | 20 | 100 | 8/2/2001 | 38 | 150 | 8/6/2001 |
| 6 | 100 | 7/28/2001 | 20 | 160 | 8/2/2001 | 38 | 176 | 8/6/2001 |
| 6 | 295 | 7/28/2001 | 20 | 480 | 8/2/2001 | 37 | 0 | 8/7/2001 |
| 7 | 0 | 7/29/2001 | 21 | 0 | 8/2/2001 | 37 | 30 | 8/7/2001 |
| 7 | 30 | 7/29/2001 | 21 | 100 | 8/2/2001 | 37 | 125 | 8/7/2001 |
| 7 | 50 | 7/29/2001 | 21 | 150 | 8/2/2001 | 37 | 553 | 8/7/2001 |
| 7 | 106 | 7/29/2001 | 21 | 460 | 8/2/2001 | 36 | 0 | 8/7/2001 |
| 8 | 0 | 7/29/2001 | 22 | 0 | 8/2/2001 | 36 | 30 | 8/7/2001 |
| 8 | 50 | 7/29/2001 | 22 | 60 | 8/2/2001 | 36 | 100 | 8/7/2001 |
| 8 | 100 | 7/29/2001 | 22 | 100 | 8/2/2001 | 36 | 120 | 8/7/2001 |
| 8 | 327 | 7/29/2001 | 22 | 3312 | 8/2/2001 | 36 | 325 | 8/7/2001 |
| 12 | 0 | 7/30/2001 | 23 | 0 | 8/3/2001 | 35 | 0 | 8/8/2001 |
| 12 | 50 | 7/30/2001 | 23 | 149 | 8/3/2001 | 35 | 100 | 8/8/2001 |
| 12 | 300 | 7/30/2001 | 23 | 300 | 8/3/2001 | 35 | 120 | 8/8/2001 |
| 12 | 3138 | 7/30/2001 | 23 | 3639 | 8/3/2001 | 35 | 752 | 8/8/2001 |
| 13 | 0 | 7/31/2001 | 24 | 0 | 8/4/2001 | 33 | 0 | 8/8/2001 |
| 13 | 100 | 7/31/2001 | 24 | 50 | 8/4/2001 | 33 | 30 | 8/8/2001 |
| 13 | 150 | 7/31/2001 | 24 | 150 | 8/4/2001 | 33 | 136 | 8/8/2001 |
| 13 | 300 | 7/31/2001 | 24 | 260 | 8/4/2001 | 31 | 0 | 8/8/2001 |
| 13 | 797 | 7/31/2001 | 25 | 0 | 8/4/2001 | 31 | 50 | 8/8/2001 |
| 14 | 0 | 7/31/2001 | 25 | 50 | 8/4/2001 | 31 | 100 | 8/8/2001 |
| 14 | 30 | 7/31/2001 | 25 | 150 | 8/4/2001 | 31 | 134 | 8/8/2001 |
| 14 | 150 | 7/31/2001 | 25 | 300 | 8/4/2001 | 30 | 0 | 8/8/2001 |
| 14 | 520 | 7/31/2001 | 28 | 0 | 8/5/2001 | 30 | 50 | 8/8/2001 |
| 15 | 0 | 7/31/2001 | 28 | 50 | 8/5/2001 | 30 | 100 | 8/8/2001 |
| 15 | Under ice | 7/31/2001 | 28 | 100 | 8/5/2001 | 30 | 161 | 8/8/2001 |
| 15 | 30 | 7/31/2001 | 28 | 120 | 8/5/2001 | 29 | 0 | 8/9/2001 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 29 | 50 | 8/9/2001 | 54 | 0 | 8/16/2001 | 87 | 90 | 8/21/2001 |
| 29 | 100 | 8/9/2001 | 54 | 50 | 8/16/2001 | 87 | 100 | 8/21/2001 |
| 29 | 120 | 8/9/2001 | 54 | 150 | 8/16/2001 | 87 | 300 | 8/21/2001 |
| 29 | 164 | 8/9/2001 | 54 | 1129 | 8/16/2001 | 80 | 0 | 8/22/2001 |
| 43 | 0 | 8/9/2001 | 59 | 0 | 8/16/2001 | 80 | 50 | 8/22/2001 |
| 43 | 30 | 8/9/2001 | 59 | 30 | 8/16/2001 | 80 | 100 | 8/22/2001 |
| 43 | 150 | 8/9/2001 | 59 | 100 | 8/16/2001 | 80 | 200 | 8/22/2001 |
| 43 | 464 | 8/9/2001 | 59 | 394 | 8/16/2001 | 80 | 1001 | 8/22/2001 |
| 44 | 0 | 8/9/2001 | 60 | 0 | 8/16/2001 | 71 | 0 | 8/23/2001 |
| 44 | 100 | 8/9/2001 | 60 | 100 | 8/16/2001 | 71 | 50 | 8/23/2001 |
| 44 | 125 | 8/9/2001 | 60 | 150 | 8/16/2001 | 71 | 150 | 8/23/2001 |
| 44 | 387 | 8/9/2001 | 60 | 200 | 8/16/2001 | 71 | 375 | 8/23/2001 |
| 45 | 0 | 8/10/2001 | 61 | 0 | 8/17/2001 | 71 | 810 | 8/23/2001 |
| 45 | 50 | 8/10/2001 | 61 | 50 | 8/17/2001 | 13 | 0 | 8/24/2001 |
| 45 | 100 | 8/10/2001 | 61 | 100 | 8/17/2001 | 13 | 50 | 8/24/2001 |
| 45 | 373 | 8/10/2001 | 61 | 197 | 8/17/2001 | 13 | 100 | 8/24/2001 |
| 46 | 0 | 8/10/2001 | 62 | 0 | 8/17/2001 | 13 | 847 | 8/24/2001 |
| 46 | 100 | 8/10/2001 | 62 | 50 | 8/17/2001 | 14 | 0 | 8/24/2001 |
| 46 | 150 | 8/10/2001 | 62 | 100 | 8/17/2001 | 14 | 50 | 8/24/2001 |
| 46 | 250 | 8/10/2001 | 62 | 436 | 8/17/2001 | 14 | 75 | 8/24/2001 |
| 46 | 1931 | 8/10/2001 | 73 | 0 | 8/18/2001 | 14 | 520 | 8/24/2001 |
| 47 | 5 | 8/11/2001 | 73 | 50 | 8/18/2001 | 15 | 0 | 8/25/2001 |
| 47 | 50 | 8/11/2001 | 73 | 100 | 8/18/2001 | 15 | 70 | 8/25/2001 |
| 47 | 100 | 8/11/2001 | 73 | 521 | 8/18/2001 | 15 | 240 | 8/25/2001 |
| 47 | 150 | 8/11/2001 | 74 | 0 | 8/18/2001 | 15 | 534 | 8/25/2001 |
| 47 | 298 | 8/11/2001 | 74 | 50 | 8/18/2001 | 16 | 0 | 8/25/2001 |
| 48 | 0 | 8/11/2001 | 74 | 90 | 8/18/2001 | 16 | 50 | 8/25/2001 |
| 48 | 50 | 8/11/2001 | 74 | 100 | 8/18/2001 | 16 | 80 | 8/25/2001 |
| 48 | 100 | 8/11/2001 | 74 | 200 | 8/18/2001 | 16 | 100 | 8/25/2001 |
| 48 | 300 | 8/11/2001 | 75 | 0 | 8/19/2001 | 16 | 150 | 8/25/2001 |
| 48 | 380 | 8/11/2001 | 75 | 50 | 8/19/2001 | 16 | 260 | 8/25/2001 |
| 49 | 0 | 8/12/2001 | 75 | 100 | 8/19/2001 | 16 | 340 | 8/25/2001 |
| 49 | 100 | 8/12/2001 | 75 | 123 | 8/19/2001 | 16 | 430 | 8/25/2001 |
| 49 | 150 | 8/12/2001 | 76 | 0 | 8/19/2001 | 16 | 513 | 8/25/2001 |
| 49 | 477 | 8/12/2001 | 76 | 50 | 8/19/2001 | 16 | Under-ice | 8/25/2001 |
| 50 | 0 | 8/12/2001 | 76 | 150 | 8/19/2001 | | | |
| 50 | 70 | 8/12/2001 | 76 | 274 | 8/19/2001 | | | |
| 50 | 110 | 8/12/2001 | 77 | 0 | 8/20/2001 | | | |
| 50 | 289 | 8/12/2001 | 77 | 50 | 8/20/2001 | | | |
| 51 | 0 | 8/13/2001 | 77 | 100 | 8/20/2001 | | | |
| 51 | 100 | 8/13/2001 | 77 | 154 | 8/20/2001 | | | |
| 51 | 200 | 8/13/2001 | 78 | 0 | 8/20/2001 | | | |
| 51 | 553 | 8/13/2001 | 78 | 50 | 8/20/2001 | | | |
| 52 | 0 | 8/15/2001 | 78 | 100 | 8/20/2001 | | | |
| 52 | 30 | 8/15/2001 | 78 | 350 | 8/20/2001 | | | |
| 52 | 200 | 8/15/2001 | 83 | 0 | 8/20/2001 | | | |
| 52 | 490 | 8/15/2001 | 83 | 50 | 8/20/2001 | | | |
| 53 | 0 | 8/15/2001 | 83 | 100 | 8/20/2001 | | | |
| 53 | 50 | 8/15/2001 | 83 | 393 | 8/20/2001 | | | |
| 53 | 100 | 8/15/2001 | 87 | 0 | 8/21/2001 | | | |
| 53 | 663 | 8/15/2001 | 87 | 50 | 8/21/2001 | | | |