

CRUISE REPORT
MF-06-10 LEG 2
NOAA SHIP MILLER FREEMAN

Area or Operation: Bering Sea, Dutch Harbor to 60 miles south of St. Lawrence Island.

Itinerary: 23-24 Sept. 2006, load equipment and prepare for cruise.
25 Sept. Depart Dutch Harbor.
8 Oct. Arrive Dutch Harbor.

Participating Organizations: NOAA/PMEL/OERD2
NOAA/AFSC/FOCI
University of Alaska Fairbanks
U.S. Fish and Wildlife Service Anchorage
NMML Newport Oregon

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Cruise Objectives: To recover and deploy a number of oceanographic instrumentation moorings in the Bering Sea. To sample the physical and biological properties of the Bering Sea along the 70 meter isobath and at areas near the mooring sites. Completing CTD casts with chlorophyll and nutrient sampling, Bongo net plankton tows, CalVet net plankton tows and several U-Tow transects. Bird observations for diversity and population estimates were completed during daylight hours. Marine mammal voice recording Haruphones were recovered and deployed at 3 sites.

Summary of Operations:

60/20 cm bongo tows	47
60 cm bongo tows	2
CalVet net tows	12
SeaCat profiles	61
CTD casts	114
U-Tow transects	14

Samples Collected:

Surface mooring recovery	1
Subsurface mooring recovery	9
Subsurface mooring deployment	9

Samples Collected (cont.)	SeaCat temperature and salinity profiles	61
	Quantitative plankton samples	120
	Seabird 9/11 plus temp. and salinity profiles	114
	CTD salinity samples	140
	PMEL nutrient samples	728
	Univ. of AK Fairbanks nutrient samples	168
	Oxygen samples for CTD calibration	112
	Particulate Organic Carbon samples	28
	Urea samples	102
	Fluorescence on CTD casts	110
	PAR on CTD casts	17
	Extracted Chlorophyll	595
	Bacteria samples	55

Cruise Summary:

The oceanographic moorings and associated scientific equipment were shipped to Dutch Harbor in advance of the vessels arrival. FTS in Dutch Harbor off loaded the two shipped containers and delivered the equipment to the Miller Freeman on the 23rd and 24th of Sept. Equipment was set up and secured for the ship's departure at 1300 on Sept. 25th. The Miller Freeman was undergoing their annual fleet inspection during this import in Dutch Harbor. To accommodate the underway portion of the fleet inspection we returned to the Dutch Harbor pier to disembark the inspectors, leaving for mooring site BS-2 at approximately 1800 hours on Sept. 25th.

We arrived at mooring site BS-2 at 1800 GMT 26 Sept. and quickly completed 2 CTD casts for instrument calibration, chlorophyll and nutrient sampling. The CTD casts were followed by 3 CalVet tows and a Bongo tow. 06-BST-2A was the first mooring recovered. This was the real time data transfer and Tapps acoustic plankton sampling mooring. The surface mooring, 06-BSM-2A was the second mooring recovered. The Eco-Fluorometers on this mooring failed due to failed seals and water leakage. The NAS nutrient meter failed due to a faulty colorimeter. Following the recoveries, mooring 06-BS-2C and a test mooring (06-BSP-2D) were deployed at this site. The test mooring is a 600 Khz ADCP manufactured by Aanderaa and scheduled to be recovered on our way south near the completion of the cruise. Following mooring recoveries and deployments 2 calibration and water sampling CTDs were taken at site BS-2.

We traveled north along the 70 meter isobath toward mooring site BS-4. Approximately 3 hours from BS-2 we stopped for a pre U-Tow CTD cast. Following the CTD cast the U-Tow was deployed and towed in a northerly direction for 3 hours along the 70 meter isobath. Another calibration CTD cast was completed after the U-Tow was recovered and on deck. We experienced some data drops and computer lock ups running the U-Tow and the LOPC data up the line real time. The U-Tow also seems to lose track of the settings for the dive fins so the fins have to be zeroed and set for maximum dive angle before each tow.

We continued along the 70 meter isobath arriving at mooring site BS-4 at approximately 2000 hours GMT on Sept. 27th. A calibration CTD was completed at this site followed

by a bongo two and 3 CalVet tows. Due to large bands of ice present in early May 2006 these moorings were deployed just ahead of the ice 3 miles south of the historical BS-4 location. The first mooring to be recovered was 06-BS-4A. The top two temperature sensors (5 and 8 meters) were missing from this mooring. Because the top two sensors are very shallow they were designed to break away if hit by a ship, ice or commercial fishing gear. Considering the proximity and extent of the ice flows present when these moorings were deployed (May 2006) it's reasonable to assume they were captured and removed by the ice. The second mooring to be recovered at this site was 06-BSP-4A. Mooring 06-BSP-4B was deployed along with mooring 06-BS-4B. A single calibration CTD cast was completed following the mooring work at site BS-4.

Along the 70 meter isobath, a few hours north of site BS-4 we stopped for a pre U-Tow CTD cast. Following the CTD the U-Tow was deployed and was towed for 3 hours along the 70 meter isobath line north toward mooring site BS-5. A CTD cast was completed at the end of the U-Tow transect and the ship continued north to historical mooring site BS-5 arriving at 0930 on Sept. 28th.

Two calibration CTD casts were conducted at mooring site BS-5, followed by 3 CalVet tows and a Bongo Tow. Mooring 06-BS-5A was recovered along with mooring 06-BSP-5A. We were unable to approach site BS-5 in May 2006 due to ice, these moorings were deployed on a subsequent AFSC cruise aboard the Miller Freeman in June 2006. With this later deployment there was no damage to the shallow 5 and 8 meter temperature sensors as observed at site BS-4. Two post deployment calibration CTD casts were performed at site BS-5 before heading north along the 70 meter isobath toward mooring location BS-8.

A few hours north of site BS-5 we again stopped for a pre U-Tow CTD cast and deployed the U-Tow for a 3 hour transect traveling north toward site BS-8 along the 70 meter line. At the end of the transect a post U-Tow CTD cast was completed before continuing on to mooring site BS-8. Due to ice conditions in May 2006 this was our first opportunity to visit mooring site BS-8 since Sept. of 2005.

We arrived at mooring site BS-8 on Sept. 29th at 1800 hours GMT. Two pre recovery calibration CTD casts were completed followed by a Bongo tow and 3 CalVet tows. The first mooring recovered at site BS-8 was 05-BS-8A followed by the recovery of mooring 05-BSP-8A. Mooring 06-BSP-8A and mooring 06-BS-8A were deployed. A post deployment CTD cast was completed and a second CTD cast marked the beginning of the series of sampling at and around the mooring site referred to as the box around BS-8. At the center near the moorings and at 4 corners around the mooring site a series of one CTD cast and one Bongo tow completed the 5 stations or "box" around site BS-8.

At approximately 1100 on Sept. 30th we started the series of CTD/Bongo stations along the 70 meter isobath working south toward mooring site BS-5. The stations are approximately 9 miles apart with a CTD at each station and a Bongo tow at every third station. Nutrient, chlorophyll and dissolved oxygen samples were collected from the CTD rosette all along the 70 meter isobath. At 1600 hours on Oct. 1st we finished the 70

meter line between BS-8 and BS-5 and began the east corner of the “box” around mooring site BS-5.

At 0015 hours Oct. 2nd we finished the box around site BS-5 and began sampling the 70 meter depth line between site BS-5 and BS-4. As before we completed a CTD cast approximately every 9 miles and a Bongo tow every third station. We arrived at the north corner station of the box at site BS-4 at 2200 hours on Oct. 2nd. The box of 4 corner stations (CTD cast and Bongo Tow) and the center station at site BS-4 were completed on 3 Oct. at 0500 hours GMT. From the southern box station at BS-4 we began sampling the 70 meter depth contour running between BS-4 and BS-2. Once again the stations are approximately 9 miles apart with the CTD at each station and a Bongo tow every third station.

At 0430 GMT on 4 Oct. we finished the line of stations between site BS-4 and BS-2 along the 70 meter depth contour. The winds were approaching 40 knots and the seas had been building for some time. We suspended operations for 14 hours starting back up again at 1830 GMT on Oct. 4th with a Bongo tow at the east corner station at site BS-2. At 0430 GMT on Oct. 5th we completed the box of stations around site BS-2 with the Bongo/CTD combination at the north corner of BS-2. From here we traveled north approximately 3 hours to repeat our first U-Tow transect along the 70 meter isobath between sites BS-2 and BS-4. A pre-tow CTD cast was completed prior to launching the U-Tow.

The U-Tow transect was completed with a ship speed of 9 to 10 knots. After towing for approximately 3 hours north along the 70 meter line we made a wide turn to the west leaving the U-Tow in the water as we lined up on an easterly course to cross our previous track line near center in an X pattern. At the end of this transect we pulled the U-Tow out of the water and completed a CTD cast. From here we drove to the northern most point of the previous south to north transects. A CTD cast was completed and the U-Tow was deployed and towed north to south along the 70 meter contour.

We left the towed vehicle in the water as we traveled south along the 70 meter line to the center of mooring site BS-2. The U-Tow was placed on deck and at 0130 GMT on 6 Oct. mooring 06-BSP-2A was recovered followed by the recovery of the Aanderaa ADCP test mooring, 06-BSP-2D. Mooring 06-BSP-2C was deployed, this concluded our mooring operations for this cruise.

We traveled back north approximately 3 hours to the start of the U-Tow transect area and completed another series of tows in the south to north, west to east and north to south direction. At the conclusion of the U-Tow operations we steamed east to the start of the CTD/Bongo line running between historical site BS-3 and BS-2. CTD casts were taken at each station and a Bongo tow at every other station. We continued this line through site BS-2 and to the shelf break. Our intent was to continue with CTD casts beyond the shelf break completing the “L” line of 1500 meter casts. This plan was cut short due to an approaching storm and at 2330 local time on Oct. 7th we suspended operations and steamed to Dutch Harbor. We arrived in Dutch Harbor at 1000 local time on Oct. 8th, 2006. Running to Dutch Harbor on the 8th and adding the time lost to weather earlier in the cruise brings the total time lost to weather at 2.5 days.

This was the final cruise for the season for the Miller Freeman which allowed us to leave the equipment and samples aboard the vessel for transport to Seattle. The Freeman left Dutch Harbor at 0700 hours on Oct. 10th and arrived in Seattle the morning of Monday Oct. 16th. PMEL samples and equipment were offloaded at the Sand Point NOAA facility dock over the two day period of Oct. 17th and 18th.

Items for Further Consideration:

The SCS electronic station file continues to suffer from event entry errors. Station numbers are entered incorrectly or entered late. Some stations are not entered at all. The survey department on the Miller Freeman spend many hours correcting the electronic MOA.

As equipment was being loaded aboard the ship prior to the cruise a plastic shipping tote was dropped from the flying forks to the deck, a distance of 15 feet or so. The tote was damaged along with a battery back up power supply and a standard sea water holder for the nitrate meter mooring. The ship has offered to cover the majority of the cost for the damaged items, the estimated replacement cost is \$1000.00.

Two NAS nitrate meters failed to collect reliable data. Early assessment indicates the colorimeter failed on both units. The units will be shipped to the vendor for check out complete diagnostics and repair.

The 5 meter and 8 meter temperature sensors deployed at site BS-4 were separated from the rest of the mooring and lost. These were deployed with large ice flows nearby and it's reasonable to assume that they functioned as designed, to break away without causing damage to the rest of the mooring if fouled by ice, a ship or fishing gear.

The U-Tow and LOPC simultaneously send data up the tow wire and through the ship to the computers in data plot. It appears we have a resistance issue in the wires that cause the LOCP computer to lock up and on occasion cause the U-Tow computer to lock up as well. I will work with PMC electronics this winter to upgrade some of the wire runs and hopefully improve the data signal transfer.

Several of the Eco-Fluorometers deployed on the Bering Sea moorings failed due to water leakage. PMEL/FOCI has been in contact with the vendor and the vendor agrees that the current design and the extreme weather conditions is probably the cause of the leaking seals. The equipment was exposed to -10 degree C weather prior to deployment in near freezing water conditions. The vendor is working on a new design to better accommodate cold weather deployments.

In February vessel personnel and PMC electronics were notified that the AutoSal was not working properly. The unit was not removed from the ship for repair until May and was still not available from the vendor for this September cruise. A properly functioning AutoSal is necessary to verify and adjust the CTD data in near real time. Because the AutoSal was not available for this entire field season salinity samples for several cruises

were taken and stored. The quality of the samples degrade with time, those collected earlier in the field season may no longer be viable samples.

Attachments:

Table 1: Station location Excel File.

Figure 1: Map of U-Tow and Mooring locations.

Figure 2: Map of CTD, Bongo and CalVet locations.