

FINAL CRUISE INSTRUCTIONS

FOCI

Miller Freeman, MF-02-05
April 21 – May 11, 2002
Chief Scientist: Carol DeWitt

1.0 FINAL CRUISE INSTRUCTIONS

1.1 **Cruise Title** – Fisheries-Oceanography Coordinated Investigations (FOCI).

1.2 **Cruise Number** – MF-02-05

1.3 **Cruise Dates**

1.3.1 **Departure** – Depart Seattle, Washington, at 1000 on Sunday, April 21, 2002

1.3.2 **Touch-and-Go** – Dutch Harbor, Alaska, Sunday, April 28, 2002

1.3.3 **Arrival** – Arrive Dutch Harbor, Alaska, at 1200 on Saturday, May 11, 2002

2.0 CRUISE OVERVIEW

2.1 **Cruise Objectives** – The main objective of this cruise is to recover and deploy moorings at the following sites:

- Akutan – Two recoveries and two deployments,
- Alaska Stream – Five recoveries,
- Amukta Pass – Four recoveries and four deployments,
- Seguam Pass – Two recoveries and three deployments,
- Tenaga Pass – Two deployments,
- Site 2 – Three recoveries and four deployments, including a surface mooring deployment,
- Site 3 – Mooring dragging operations, and
- Site 4 – One recovery and one deployment.

In addition, as time and weather allows, the following may be included in the cruise:

- CTD/Water samples (SOI 3.2.1),
- Marine Assessment Monitoring and Prediction (MARMAP) Bongo tows (SOI 3.2.2),
- ARGOS Satellite-Tracked Drifter Buoy deployments (SOI 3.2.11), and
- PALACE float deployments.

2.2 **Applicability** – These instructions, with **FOCI Standard Operating Instructions for NOAA Ship MILLER FREEMAN**, dated February 4, 2002, present complete information for this cruise.

2.3 **Operating Area** – Bering Sea/Aleutian Islands.

2.4 Participating Organizations

NOAA – Pacific Marine Environmental Laboratory (PMEL)
7600 Sand Point Way N.E., Seattle, Washington 98115-6439

NOAA – Alaska Fisheries Science Center (AFSC)
7600 Sand Point Way N.E., Seattle, Washington 98115-0070

University of Alaska – Fairbanks (UAF)
Institute of Marine Science
200 O’Neill, Fairbanks, Alaska 99775-1080

2.5 Personnel

2.5.1 Chief Scientist

Name	Gender	Affiliation	E-mail Address
Carol DeWitt (206) 526-6808	Female	PMEL	Carol.Dewitt@noaa.gov

2.5.2 Participating Scientists

2.5.2.1 Seattle – Dutch Harbor Transit

Name	Gender	Affiliation	E-mail Address
Drew Hamilton	Male	PMEL	Drew.C.Hamilton@noaa.gov
James Johnson	Male	PMEL	James.E.Johnson@noaa.gov

2.5.2.2 Dutch Harbor – Dutch Harbor

Name	Gender	Affiliation	E-mail Address
Carol DeWitt	Female	PMEL	Carol.Dewitt@noaa.gov
William Floering	Male	PMEL	William.Floering@noaa.gov
Sang Heon Lee	Male	UAF	shlee@ims.uaf.edu
Rick Miller	Male	PMEL	Hendrick.V.Miller@noaa.gov
Stacy Smith	Female	UAF	sstacy33@ims.uaf.edu
Sarah Thornton	Female	UAF	ftsjt@aurora.uaf.edu
David Wisegarver	Male	PMEL	David.Wisegarver@noaa.gov
TBA (OERD1)	Male	PMEL	

2.6 Administrative

2.6.1 Ship Operations

Marine Operations Center, Pacific
1801 Fairview Avenue East, Seattle, Washington 98102-3767
Telephone: (206) 553-4548, Fax: (206) 553-1109

Commander Timothy B. Wright, NOAA
Chief, Operations Division (MOP1)
Telephone: (206) 553-8705, Cellular: (206) 390-7527
E-mail: Timothy.Wright@noaa.gov

Larry Mordock
Deputy Chief, Operations Division (MOP1x1)
Telephone – Work: (206) 553-4764, Home: (206) 365-3567
Cellular: (206) 465-9316, E-mail: Larry.Mordock@noaa.gov

2.6.2 Scientific Operations

Dr. Phyllis J. Stabeno, PMEL
Telephone: (206) 526-6453
E-mail: Phyllis.Stabeno@noaa.gov

Dr. Jeffrey Napp, AFSC
Telephone: (206) 526-4148
E-mail: Jeff.Napp@noaa.gov

3.0 OPERATIONS

3.1 Data To Be Collected

3.1.1 Scientific Computer System (SCS) – The ship's SCS shall operate throughout the cruise, acquiring and logging data from navigation, meteorological, oceanographic, and fisheries sensors. See ***FOCI Standard Operating Instructions for NOAA Ship MILLER FREEMAN*** (SOI 5.2) for specific requirements.

3.2 Staging Plan – The bulk of the PMEL mooring hardware and miscellaneous equipment will be loaded on **NOAA Ship MILLER FREEMAN** prior to the ship's departure from Seattle, Washington, on Sunday, April 21, 2002. Tentatively, PMEL would like to schedule heavy loading to start on Tuesday, April 16 through Thursday, April 18, 2002; however, PMEL will coordinate any scheduling requirements with the ship during the Seattle in port period in the beginning of April. During the cruise, we will utilize the Fish Processing Lab, the Rough Lab, and the Ocean Chemistry Lab for mooring equipment preparation. In these three labs, we would like to have as much cabinet and counter space as possible. Data Plot will be used for CTD operations and mooring interrogations. The UAF hardware and hazardous materials will be loaded on the ship in Seattle, Washington, before the ship's departure on Sunday, April 21, 2002. This will include sediment trap and nutrient meter mooring hardware.

3.3 De-staging Plan – Upon arrival in Dutch Harbor, Alaska, recovered mooring gear will be off-loaded. Scientific personnel will have made prior arrangements for shipment back to Seattle. University of Alaska equipment and HAZMAT will also be off-loaded in Dutch Harbor by UAF cruise participants at the end of the cruise.

3.4 Cruise Plan – The order of all mooring operations will be dependent on weather and maximizing daylight-working hours. Unforeseen events, such as possible mooring searches, gear failures, etc., will also affect the order of events. The following cruise plan is provided as a general guide, but will undoubtedly be altered during the course of operations to optimize the success of the cruise.

Depart Dutch Harbor, Alaska, on Sunday, April 28, 2002, heading towards the mooring site at Akutan Pass. At Akutan Pass, we will recover and deploy two moorings.

Continue to the southernmost Alaska Stream site to begin mooring operations. There are five mooring recoveries at the Alaska Stream operations area.

If time permits, we will do the four CTDs across Amukta Pass during the night. We will then be able to complete the four mooring recoveries and four mooring deployments across Amukta Pass during the day. After mooring deployments are completed, the CTD line will be completed once more.

Next, there are two recovery and three mooring deployments at Segum Pass. We will continue along the Aleutian chain to Tenaga Pass. There will be two mooring deployments at Tenaga Pass.

The ship will then head towards Site 4 and the four surrounding CTD/Bongo sites. There will be one mooring recovery and one mooring deployment. The order of operations will be based on providing daylight hours for the mooring operations and minimizing time expenditures. We will then complete four CTD sites between Sites 4 and 2.

Like Site 4, mooring Site 2 includes four surrounding CTD/Bongo sites. At the middle site, we will recover three moorings:

1. A sediment trap mooring,
2. A RDI ADCP mooring, and
3. A multi-instrumented mooring.

Additionally, we will deploy four moorings:

1. A sediment trap mooring,
2. Two profiler moorings, and
3. A multi-instrumented surface mooring.

The mooring operations will take most of the day. After mooring operations are completed, CTD/Bongo sampling surrounding Site 2 will resume. Next, the four CTD stations between Site 2 and Site 3 will be completed.

The ship will then proceed to mooring Site 3 to conduct a search for F-00BS-3W. Search operations for F-00BS-3W have been scheduled for eight hours; however, due to the value of the data and instrumentation, if sufficient time is available PMEL may opt to extend the search operations. If the mooring is located, we will attempt to recover the mooring by dragging for the mooring. There are also four CTD/Bongo sites surrounding site 3.

If time permits, we will complete a CTD transect. The transect will begin west of Site 3; continue offshore, and then head south towards the Aleutian chain.

3.5 Station Locations – A list of the proposed order of stations and operations is provided in Section **9.3 Tables**. A chart of the proposed cruise track can be found in Section **9.4 Figures**.

3.6 Station Operations – The following station operations are to be conducted on this cruise. The procedures for these operations are listed in the ***FOCI Standard Operating Instructions for NOAA Ship MILLER FREEMAN*** (SOI). Operations not addressed in the SOI and changes to standard procedures are addressed below.

- CTD/Water Sample Operations (SOI 3.2.1),
- MARMAP Bongo Tows (SOI 3.2.2),
- Chlorophyll Sampling Operations (SOI 3.2.10), and
- ARGOS Satellite-Tracked Drifter Buoy Deployments (SOI 3.2.11).

At all mooring sites during this cruise, a CTD will be completed before mooring recoveries and after mooring deployments. The maximum depth of any CTD cast will be 1,500 meters, regardless of water depth. There is only one surface mooring during this cruise, which is a mooring deployment that occurs at Site 2. All other moorings are subsurface.

3.7 Underway Operations – The following underway operations are to be conducted during this cruise. The procedures for these operations are listed in the ***FOCI Standard Operating Instructions for NOAA Ship MILLER FREEMAN*** (SOI).

- Acoustic Doppler Current Profiler (ADCP) Operations (SOI 3.2.13),
- Radiometer Operations (SOI 3.2.14),
- Scientific Computer System (SCS) Data Acquisition (SOI 5.2),
- Fluorometer Monitoring (SOI 5.3), and
- Thermosalinograph Monitoring (SOI 5.3).

3.8 Applicable Restrictions – None.

3.9 Small Boat Operations – We would like to have the option of using a small boat during mooring operations.

4.0 FACILITIES

4.1 Equipment and Capabilities Provided by Ship

- Oceanographic winch with slip rings and 3-conductor cable terminated for CTD,
- Manual wire-angle indicator,
- Oceanographic winch with slip rings and 3-conductor cable terminated for the SBE SEACAT, for net tow operations,
- Sea-Bird Electronics' SBE 911*plus* CTD system with stand, each CTD system should include underwater CTD, weights, and pinger. There should be one deck unit and tape recorder for the two systems,
- 10-liter Niskin sampling bottles for use with rosette (10 plus 4 spares),
- AUTOSAL salinometer, for CTD field corrections,
- Sea-Bird Electronics' SBE-19 SEACAT system,
- Meter block for plankton tows,
- Wire speed indicators and readout for quarterdeck, Rowe, and Marco winches,

- For meteorological observations: 2 anemometers (one R. M. Young system interfaced to the SCS), calibrated air thermometer (wet-and dry-bulb) and a calibrated barometer and/or barograph,
- Freezer space for storage of biological and chemical samples (blast and storage freezers, indicate desired temperatures),
- SIMRAD EQ-50 echosounder,
- JRC JFV-200R color sounder recorder,
- RD Instruments' ADCP written to Iomega Zip drive,
- Bench space in DataPlot for PCs, monitor, and printer,
- Use of Pentium PC in DataPlot for data analysis,
- Scientific Computer System (SCS),
- Removable stern platform in place,
- Laboratory space with exhaust hood, sink, lab tables and storage space,
- Sea-water hoses and nozzles to wash nets on the quarterdeck and aft deck,
- Adequate deck lighting for night-time operations,
- Navigational equipment including GPS and radar,
- Safety harnesses for working on quarterdeck and fantail, and
- Ship's crane(s) used for loading and/or deploying.

4.2 Equipment and Capabilities Provided by Scientists

- Sea-Bird Electronics' SBE 911*plus* CTD system to be used with PMEL stand,
- PMEL PC with SEASOFT software for CTD data collection and processing,
- Fluorometer and light meter to be mounted on CTD,
- CTD stand modified for attachment of fluorometer,
- Conductivity and temperature sensor package to provide dual sensors on the primary CTD,
- CTD rosette sampler,
- IAPSO standard water,
- 60-cm Bongo sampling arrays,
- 20 cm Bongo arrays,
- Flow meters for Bongos,
- Spare wire angle indicator,
- Surface moorings (FOCI biophysical platforms),
- Subsurface moorings,
- ARGOS tracked drifter buoys,
- PALACE floats,
- Miscellaneous scientific sampling and processing equipment, and
- Scientific ultra-cold freezer.

5.0 DISPOSITION OF DATA AND REPORTS

5.1 The following data products will be included in the cruise data package:

- **NOAA Form 77-13d – Deck Log – Weather Observation Sheets,**
- Electronic Marine Operations Abstracts,
- SCS backup – recordable compact diskette (CD-R),
- Calibration Sheets for all ship's instruments used,
- PMEL CTD Weather Observation Logs,
- CTD VHS videocassettes,

- CTD Cast Information/Rosette Log,
- Autosalinometer Logs,
- ADCP Log Sheets,
- ADCP Iomega Zip and/or recordable compact diskette (CD-R),
- Electronic Navigation suite's export files on diskette, and
- Ultra-cold Freezer Temperature Daily Log (SOI 5.4).

5.2 Pre- and Post-cruise Meetings – Cruise meetings may be held in accordance with **FOCI Standard Operating Instructions for NOAA Ship MILLER FREEMAN** (SOI 5.5). PMEL will coordinate a date and time for a pre-cruise meeting with the ship after arriving in Seattle at the beginning of April. This will enable the command the opportunity to determine a suitable time around the ship's in port schedule.

6.0 ADDITIONAL PROJECTS

6.1 Definition – Ancillary and piggyback projects are secondary to the objectives of the cruise and should be treated as additional investigations. The difference between the two types of secondary projects is that an ancillary project does not have representation aboard and is accomplished by the ship's force.

6.2 Ancillary Projects – Any ancillary work done during this project will be accomplished with the concurrence of the Chief Scientist and on a not-to-interfere basis with the programs described in these instructions and in accordance with the **NOAA Fleet Standing Ancillary Instructions**.

6.3 Piggyback Projects –

6.3.1 Dimethylsulfide (DMS) in Surface Seawater (Dr. Timothy Bates).

DMS is biologically produced in the surface ocean and is the major natural source of sulfur to the atmosphere. In the atmosphere, DMS is transformed into sulfate aerosol particles, which scatter solar radiation back to space and alter the properties and lifetimes of clouds. Our goal is to deploy an automated underway DMS sampling/analysis system to quantify the concentration of DMS in the surface seawater of the Bering Sea and adjacent waters over a seasonal cycle. These data will be used to quantify the climatic impact of DMS emissions to the atmosphere.

This piggyback project will be the second field test of our new underway DMS sampling/analysis system. The instrumentation will require six feet of space (bench top and space below the bench) in the Rough Lab and two 15-amp, 110-volt circuits. We will need to run a polyethylene line from the ship's clean seawater system to our instrument. This line will be continuously flushed with seawater at approximately 10 Liters per minute and discharged overboard. Periodically we will draw 5-ml from this flow for analysis. We would also like to connect to the ship's compressed air source (120-psi, 2-cfm).

6.3.1.1 Participating Scientists

<u>Name</u>	<u>Gender</u>	<u>Affiliation</u>	<u>E-mail Address</u>
Drew Hamilton	Male	PMEL	Drew.C.Hamilton@noaa.gov
James Johnson	Male	PMEL	James.E.Johnson@noaa.gov

6.3.1.2 Hazardous Materials – None.

6.3.1.3 Miscellaneous – The equipment will be loaded aboard and installed during the Seattle inport. Dr. James Johnson and Drew Hamilton will embark in Seattle and disembark in Dutch. During the transit North, the equipment will be setup and tested. At the end of this cruise, the equipment will remain in place and be operated while underway for the remainder of FY 2002. It is estimated that the instrument will require less than 30 minutes per day of attention by the Survey Department. A short checklist will be prepared and provided to the survey department to record flows and temperatures. To monitor the operation of the instrument, Dr. Bates would like to have the Survey Department email the previous day's data file to PMEL each day. The distilled water reservoir will need to be filled approximately every two days. If the equipment malfunctions, plans will be made to have a scientist meet the ship at the next port.

6.3.1.4 Contact Person

Dr. Timothy S. Bates
 NOAA/Pacific Marine Environmental Laboratory
 7600 Sand Point Way NE, Bldg. 3, Seattle, Washington 98115
 Telephone: (206) 526-6248, Facsimile: (206) 526-6744
 E-mail: Tim.Bates@noaa.gov

7.0 HAZARDOUS MATERIALS

7.1 Inventory – See Section **9.2 HAZMAT Inventory**.

7.2 Material Safety Data Sheet (MSDS) – Submitted separately.

8.0 MISCELLANEOUS

8.1 Communications – Specific information on how to contact the NOAA Ship *MILLER FREEMAN* and all other fleet vessels can be found at:

<http://www.pmc.noaa.gov/phone.htm>

8.2 Important Telephone and Facsimile Numbers and E-mail Addresses**8.2.1 Pacific Marine Environmental Laboratory (PMEL):**

FOCI – Ocean Environmental Research Division (OERD2):

- (206) 526-4700 (voice)
- (206) 526-6485 (fax)

Administration:

- (206) 526-6810 (voice)
- (206) 526-6815 (fax)

E-Mail: FirstName.LastName@noaa.gov

8.2.2 Alaska Fisheries Science Center (AFSC):

FOCI – Resource Assessment and Conservation Engineering (RACE):

- (206) 526-4171 (voice)
- (206) 526-6723 (fax)

E-Mail: FirstName.LastName@noaa.gov

8.2.3 NOAA Ship MILLER FREEMAN – Telephone methods listed in order of increasing expense:

Homeport – Seattle, Washington:

- (206) 553-4589
- (206) 553-4581
- (206) 553-8344

Cellular:

- (206) 660-7167

INMARSAT Mini-M

- 011-872-761-267-346 (voice/PBX)
- 011-872-761-267-347 (voice)
- 011-872-761-267-348 (fax)

INMARSAT B

- 011-872-330-394-113 (voice)
- 011-872-330-394-114 (fax)

E-Mail: NOAA.Ship.Miller.Freeman@noaa.gov (mention the person's name in SUBJECT field)

8.2.4 Marine Operations Center, Pacific (MOP):

Operations Division (MOP1)

- (206) 553-4548 (voice)
- (206) 553-1109 (facsimile)

E-Mail: FirstName.LastName@noaa.gov

E-Mail to Radio Room: Radio.Room@noaa.gov

9.0 APPENDICES

9.1 Equipment Inventory

<u>Equipment</u>	<u>QTY</u>	<u>Weight (lbs)</u>	<u>Subtotal</u>
Anchors	4	1300	5200
Anchors	6	1600	9600
Anchors	1	2000	2000
Anchor	1	2125	2125
Anchor	1	2400	2400
Anchor	1	2500	2500
Anchor, 6' dome	1	4100	4100
Anchor	1	4800	4800
Floats, 41"	5	250	1250
Floats, 30"	2	50	100
Floats, 28"	4	50	200
Floats, 37", syntactic foam float on stand	2	400	800
3" buoy with tower and bridle	1	1500	1500
reels, wire rope	2	200	400
hardware box, 2'x3'x2'	1	200	200
hardware box, 4'x4'x3'	1	800	800
hardware box, 4'x4'x3'	1	2800	2800
hardware box, 4'x4'x2.5'	2	150	300
instruments	1	3000	3000
	TOTAL		44075

9.2 HAZMAT Inventory

<u>Chemical</u>	<u>Number of Vials</u>	<u>Total Amount</u>	<u>Neutralizer</u>	<u>Respondee</u>
Ammonium Molybdate	10 x 2.3g	23.0-g	Spill Kit	Wisegarver
Ammonium Molybdate	10 x 10.8g	108.0-g	Spill Kit	Wisegarver
Antimony Potassium Tartrate	2 x 3.0-g	6.0-g	Spill Kit	Wisegarver
Ascorbic Acid	10 x 5.0-g	50.0-g	Spill Kit	Wisegarver
Brij	1 x 250-ml	250-ml	Baking Soda	Wisegarver
Cadmium	2 x 20.0-g	40.0-g	Spill Kit	Wisegarver
Copper Sulfate	4 x 20.0-g	80.0-g	Spill Kit	Wisegarver
Dowfax	1 x 200-ml	200-ml	See Note 1	Wisegarver
Hydrochloric Acid	6 x 500-ml	3,000-ml	Baking Soda	Wisegarver
Imidazole	11 x 13.6-g	149.6-g	Spill Kit	Wisegarver
Magnesium Sulfate	1 x 160.0-g	160.0-g	Spill Kit	Wisegarver
Methanol	2 x 500-ml	1,000-ml	Baking Soda	Wisegarver

Chemical	Number of Vials	Total Amount	Neutralizer	Respondee
N-1-Hapthylethylenediamine Dihydrochloride	14 x 1.0-g	14.0-g	Spill Kit	Wisegarver
Nitric Acid	6 x 30-ml	180-ml	Baking Soda	Wisegarver
Nitrogen, Compressed Gas	1 x 30-cft	30-cft	Ventilate	Wisegarver
Potassium Nitrate	8 x 3.5-g	28.0-g	Spill Kit	Wisegarver
Potassium Phosphate	6 x 0.5-g	3.0-g	Spill Kit	Wisegarver
Sodium Bicarbonate	1 x 3.0-g	3.0-g	Spill Kit	Wisegarver
Sodium Chloride	1 x 600.0-g	600.0-g	Spill Kit	Wisegarver
Sodium Fluorosilicate	6 x 0.4-g	2.4-g	Spill Kit	Wisegarver
Sodium Hydroxide, 10N	1 x 500-ml	500-ml	Baking Soda	Wisegarver
Sodium Nitrite	10 x 0.1-g	1.0-g	Spill Kit	Wisegarver
Stannous Chloride	10 x 10.0-g	100-g	Spill Kit	Wisegarver
Sulfanilamide	16 x 10.0-g	160-g	Spill Kit	Wisegarver
Sulfuric Acid	2 x 500-ml	1,000-ml	Baking Soda	Wisegarver
Tartaric Acid	5 x 150.0-g	750-g	Spill Kit	Wisegarver
Lead Acid Batteries	1	1	Baking Soda	DeWitt
Lithium Batteries				DeWitt/Smith
Mercuric Chloride	<2-g	<2.0-g	Spill Kit	Smith
Sulfamic Acid	1 x 500.0g	500.0-g	Baking Soda	Smith
Tributyltin Oxide	<10-oz	<10-oz		DeWitt

9.3 Tables

Activity	Latitude	Longitude	Dist. (nm)	Spd (kts)	Trans (hrs)	Approx Bottom Depth (m)	On Sta (hrs)	Arrive (Local) Date/Time	Depart (Local) Date/Time
Depart Dutch Harbor	53° 54.500' N	166° 30.900' W							28-Apr 12:00
Waypoint	54° 00.000' N	166° 25.000' W	6.5	10	0.7	986	0.0	28-Apr 12:39	28-Apr 12:39
CTD at 01AKP-1B	54° 04.017' N	166° 17.995' W	5.7	10	0.6	75	0.4	28-Apr 13:13	28-Apr 13:38
Recovery 01AKP-1B	54° 04.017' N	166° 17.995' W	0.0	10	0.0	75	1.0	28-Apr 13:38	28-Apr 14:38
Deployment 02AKP-1A	54° 04.017' N	166° 17.995' W	0.0	10	0.0	75	2.0	28-Apr 14:38	28-Apr 16:38
CTD at 02AK-2B	53° 56.022' N	165° 54.998' W	15.7	10	1.6	91	0.4	28-Apr 18:12	28-Apr 18:38
Recovery 01AK-2B	53° 56.022' N	165° 54.998' W	0.0	10	0.0	91	1.0	28-Apr 18:38	28-Apr 19:38
Deployment 02AK-2A	53° 56.022' N	165° 54.998' W	0.0	10	0.0	91	2.0	28-Apr 19:38	28-Apr 21:38
CTD at 01GSP-5A	51° 43.110' N	169° 22.380' W	182.6	10	18.3	5100	2.3	29-Apr 15:54	29-Apr 18:12
Recovery 01GSP-5A	51° 43.110' N	169° 22.380' W	0.0	10	0.0	5100	3.0	29-Apr 18:12	29-Apr 21:12
CTD at 01GSP-4A	51° 59.000' N	169° 31.000' W	16.8	10	1.7	4000	2.3	29-Apr 22:53	30-Apr 01:11
CTD at 01GSP-3A	52° 10.780' N	169° 37.050' W	12.4	10	1.2	3000	2.3	30-Apr 02:25	30-Apr 04:43
CTD at 01GSP-2A	52° 16.050' N	169° 40.120' W	5.6	10	0.6	2000	1.8	30-Apr 05:16	30-Apr 07:03
CTD at 01GSP-1A	52° 23.510' N	169° 44.780' W	8.0	10	0.8	986	1.1	30-Apr 07:51	30-Apr 08:55
Recovery 01GSP-1A	52° 23.510' N	169° 44.780' W	0.0	10	0.0	986	1.0	30-Apr 08:55	30-Apr 09:55
Recovery 01GSP-2A	52° 16.050' N	169° 40.120' W	8.0	10	0.8	2000	1.0	30-Apr 10:43	30-Apr 11:43
Recovery 01GSP-3A	52° 10.780' N	169° 37.050' W	5.6	10	0.6	3000	2.0	30-Apr 12:16	30-Apr 14:16
Recovery 01GSP-4A	51° 59.000' N	169° 31.000' W	12.4	10	1.2	4000	3.0	30-Apr 15:30	30-Apr 18:30

Activity	Latitude	Longitude	Dist. (nm)	Spd (kts)	Trans (hrs)	Approx Bottom Depth (m)	On Sta (hrs)	Arrive (Local) Date/Time	Depart (Local) Date/Time
CTD at 01AMP-4A	52° 23.014' N	172° 06.973' W	98.6	10	9.9	362	0.6	01-May 04:22	01-May 04:59
CTD at 01AMP-3A	52° 24.000' N	171° 55.000' W	7.4	10	0.7	310	0.6	01-May 05:44	01-May 06:19
CTD at 01AMP-2A	52° 25.003' N	171° 40.006' W	9.2	10	0.9	459	0.7	01-May 07:14	01-May 07:56
CTD at 01AMP-1A	52° 26.003' N	171° 27.039' W	8.0	10	0.8	414	0.7	01-May 08:44	01-May 09:23
Recovery 01AMP-1A	52° 26.003' N	171° 27.039' W	0.0	10	0.0	414	1.0	01-May 09:23	01-May 10:23
Recovery 01AMP-2A	52° 25.003' N	171° 40.006' W	8.0	10	0.8	459	1.0	01-May 11:11	01-May 12:11
Recovery 01AMP-3A	52° 24.000' N	171° 55.000' W	9.2	10	0.9	310	1.0	01-May 13:06	01-May 14:06
Recovery 01AMP-4A	52° 23.014' N	172° 06.973' W	7.4	10	0.7	362	1.0	01-May 14:51	01-May 15:51
Deployment 02AMP-4A	52° 23.014' N	172° 06.973' W	0.0	10	0.0	362	1.0	01-May 15:51	01-May 16:51
Deployment 02AMP-3A	52° 24.000' N	171° 55.000' W	7.4	10	0.7	310	1.0	01-May 17:35	01-May 18:35
Deployment 02AMP-2A	52° 25.000' N	171° 40.006' W	9.2	10	0.9	459	1.0	01-May 19:30	01-May 20:30
Deployment 02AMP-1A	52° 26.003' N	171° 27.039' W	8.0	10	0.8	414	1.0	01-May 21:18	01-May 22:18
CTD at 02AMP-1A	52° 26.003' N	171° 27.039' W	0.0	10	0.0	414	0.7	01-May 22:18	01-May 22:58
CTD at 02AMP-2A	52° 25.000' N	171° 40.006' W	8.0	10	0.8	459	0.7	01-May 23:45	02-May 00:27
CTD at 02AMP-3A	52° 24.000' N	171° 55.000' W	9.2	10	0.9	310	0.6	02-May 01:22	02-May 01:58
CTD at 02AMP-4A	52° 23.014' N	172° 06.973' W	7.4	10	0.7	362	0.6	02-May 02:42	02-May 03:19
CTD at 01SM-1B	52° 15.990' N	172° 45.000' W	24.3	10	2.4	154	0.5	02-May 05:45	02-May 06:15
Recover 01SM-1B	52° 15.990' N	172° 45.000' W	0.0	10	0.0	154	4.0	02-May 06:15	02-May 10:15
Deployment 02SM-1A	52° 15.990' N	172° 45.000' W	0.0	10	0.0	154	2.0	02-May 10:15	02-May 12:15

Activity	Latitude	Longitude	Dist. (nm)	Spd (kts)	Trans (hrs)	Approx Bottom Depth (m)	On Sta (hrs)	Arrive (Local) Date/Time	Depart (Local) Date/Time
CTD at O2SM-1A	52° 15.990' N	172° 45.000' W	0.0	10	0.0	154	0.5	02-May 12:15	02-May 12:45
CTD at O1SMP-2B	52° 07.996' N	172° 25.008' W	14.6	10	1.5	162	0.5	02-May 14:13	02-May 14:44
Recover O1SMP-2B	52° 07.996' N	172° 25.008' W	0.0	10	0.0	162	1.0	02-May 14:44	02-May 15:44
Deployment O2SMP-2A	52° 07.996' N	172° 25.008' W	0.0	10	0.0	162	2.0	02-May 15:44	02-May 17:44
CTD at O2SMP-2A	52° 07.996' N	172° 25.008' W	0.0	10	0.0	162	0.5	02-May 17:44	02-May 18:15
Deployment O2SM-3A	52° 07.996' N	172° 25.008' W	0.0	10	0.0	162	2.0	02-May 18:15	02-May 20:15
CTD at O2SM-3A	52° 07.996' N	172° 25.008' W	0.0	10	0.0	162	0.5	02-May 20:15	02-May 20:46
Deployment O2TG-1A	51° 36.000' N	178° 15.000' W	218.4	11	19.9	160	1.0	03-May 16:37	03-May 17:37
CTD at O2TG-1A	51° 36.000' N	178° 15.000' W	0.0	10	0.0	160	0.5	03-May 17:37	03-May 18:08
Deployment O2TGP-2A	51° 36.000' N	178° 15.000' W	0.0	10	0.0	150	1.0	03-May 18:08	03-May 19:08
CTD at O2TGP-2A	51° 36.000' N	178° 15.000' W	0.0	10	0.0	150	0.5	03-May 19:08	03-May 19:38
CTD - site 4 west	57° 55.600' N	169° 19.300' W	488.7	9.5	51.4	71	0.4	05-May 23:04	05-May 23:29
20/60 bongo - site 4 west	57° 55.600' N	169° 19.300' W	0.0	9.5	0.0	71	0.3	05-May 23:29	05-May 23:45
CTD - site 4 north	58° 04.000' N	168° 43.800' W	20.6	9.5	2.2	71	0.4	06-May 01:55	06-May 02:20
20/60 bongo - site 4 north	58° 04.000' N	168° 43.800' W	0.0	9.5	0.0	71	0.3	06-May 02:20	06-May 02:35
CTD - site 4 east	57° 46.000' N	168° 28.000' W	19.9	9.5	2.1	71	0.4	06-May 04:41	06-May 05:06
20/60 bongo - site 4 east	57° 46.000' N	168° 28.000' W	0.0	9.5	0.0	71	0.3	06-May 05:06	06-May 05:21
CTD - middle site	57° 51.112' N	168° 52.201' W	13.9	9.5	1.5	71	0.4	06-May 06:49	06-May 07:14
20/60 bongo - site 4 middle	57° 51.112' N	168° 52.201' W	0.0	9.5	0.0	71	0.3	06-May 07:14	06-May 07:30

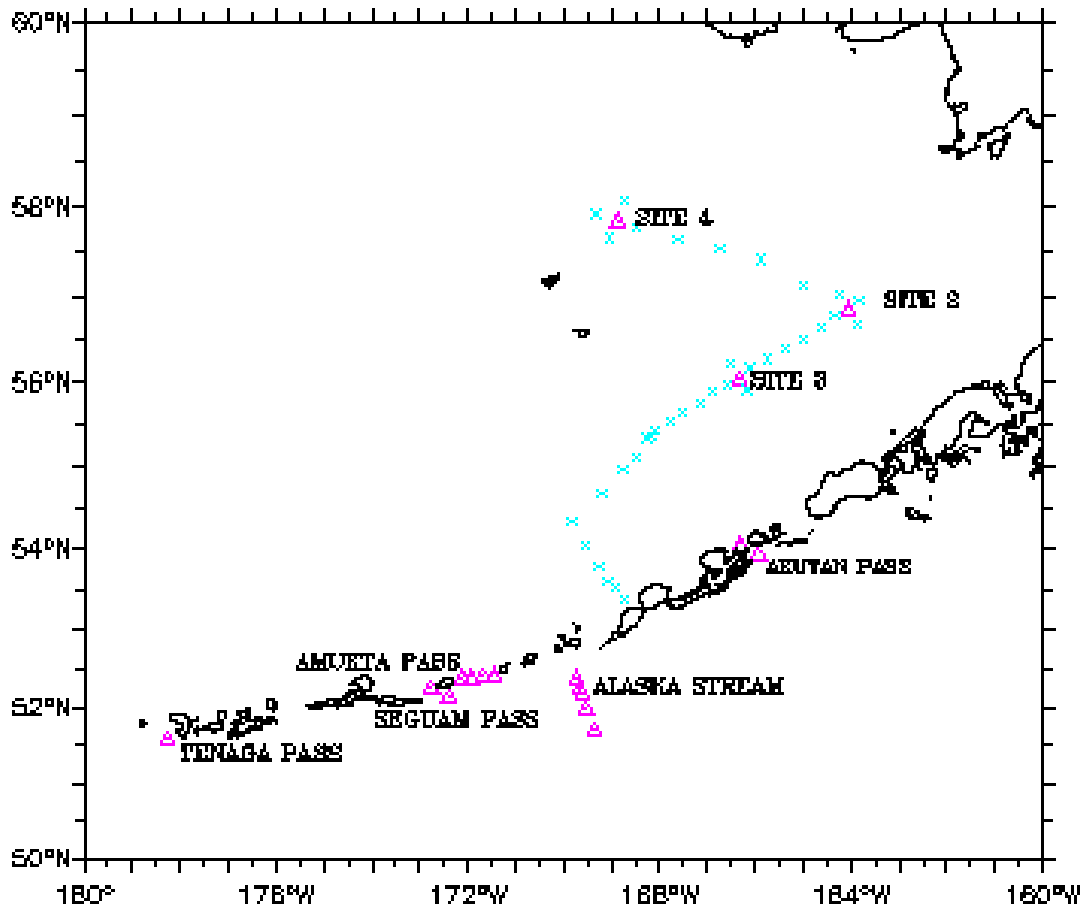
Activity	Latitude	Longitude	Dist. (nm)	Spd (kts)	Trans (hrs)	Approx Bottom Depth (m)	On Sta (hrs)	Arrive (Local) Date/Time	Depart (Local) Date/Time
Recover 01BS-4B	57° 51.112' N	168° 52.201' W	0.0	10	0.0	71	1.0	06-May 07:30	06-May 08:30
Deployment 02BS-4A	57° 51.110' N	168° 52.400' W	0.1	10	0.0	71	2.0	06-May 08:30	06-May 10:30
CTD - middle site	57° 51.110' N	168° 52.400' W	0.0	10	0.0	71	0.4	06-May 10:30	06-May 10:55
CTD - site 4 south	57° 39.200' N	169° 01.200' W	12.8	10	1.3	71	0.4	06-May 12:12	06-May 12:36
20/60 bongo - site 4 south	57° 39.200' N	169° 01.200' W	0.0	10	0.0	71	0.3	06-May 12:36	06-May 12:52
CTD	57° 38.000' N	167° 37.000' W	45.1	10	4.5	70	0.4	06-May 17:23	06-May 17:47
CTD	57° 32.000' N	166° 44.000' W	29.0	10	2.9	70	0.4	06-May 20:42	06-May 21:06
CTD	57° 25.000' N	165° 52.000' W	28.8	10	2.9	70	0.4	06-May 23:59	07-May 00:24
CTD	57° 07.000' N	165° 00.000' W	33.4	10	3.3	70	0.4	07-May 03:44	07-May 04:09
CTD at site 2	56° 52.130' N	164° 02.776' W	34.5	10	3.5	68	0.4	07-May 07:36	07-May 08:01
Recovery 01BS-2C	56° 52.130' N	164° 02.776' W	0.0	10	0.0	68	1.0	07-May 08:01	07-May 09:01
Recovery 01BSP-2B	56° 51.954' N	164° 02.603' W	0.2	10	0.0	69	1.0	07-May 09:02	07-May 10:02
Recovery 01BSST-2C	56° 51.944' N	164° 02.948' W	0.2	10	0.0	68	1.0	07-May 10:03	07-May 11:03
Deployment 02BSM-2A	56° 52.000' N	164° 03.000' W	0.1	10	0.0	72	5.0	07-May 11:03	07-May 16:03
Deployment 02BSP-2A	56° 52.000' N	164° 03.000' W	0.0	10	0.0	72	1.0	07-May 16:03	07-May 17:03
Deployment 02BSP-2B	56° 52.000' N	164° 03.000' W	0.0	10	0.0	72	1.0	07-May 17:03	07-May 18:03
Deployment 02BSST-2A	56° 52.000' N	164° 03.000' W	0.0	10	0.0	72	1.0	07-May 18:03	07-May 19:03

Activity	Latitude	Longitude	Dist. (nm)	Spd (kts)	Trans (hrs)	Approx Bottom Depth (m)	On Sta (hrs)	Arrive (Local) Date/Time	Depart (Local) Date/Time
CTD(Chl4: 0,7,7,7,11,11,11,20,25,25,30,43,43,43,50; Nutr: 0,7,7,7,11,11,11,20,25,25,30,40,43,43,43,50,60,bott; ChlAM) - Middle Domain (M2)	56° 52.000' N	164° 03.000' W	0.0	10	0.0	72	0.4	07-May 19:03	07-May 19:28
20/60 bongo - Middle Domain (M2)	56° 52.350' N	164° 03.330' W	0.4	10	0.0	72	0.3	07-May 19:31	07-May 19:47
CTD(Chl:0,10,20,30,40,50; Nutr: 0,10,20,30,50,bott; ChlAM) site 2/east	56° 56.500' N	163° 50.010' W	8.4	10	0.8	69	0.4	07-May 20:37	07-May 21:02
20/60 bongo - site 2/east	56° 56.500' N	163° 50.000' W	0.0	10	0.0	69	0.3	07-May 21:02	07-May 21:18
CTD(Chl:0,10,20,30,40,50; Nutr: 0,10,20,30,40,50,bott; ChlAM) - site 2/north	57° 01.000' N	164° 13.000' W	13.3	10	1.3	69	0.4	07-May 22:37	07-May 23:02
20/60 bongo - site 2/north	57° 01.000' N	164° 13.001' W	0.0	10	0.0	69	0.3	07-May 23:02	07-May 23:18
CTD(Chl:0,10,20,30,40,50; Nutr: 0,10,20,30,50,bott; ChlAM) - site 2/south	56° 40.000' N	163° 52.000' W	23.9	10	2.4	75	0.4	08-May 01:42	08-May 02:07
20/60 bongo - site 2/south	56° 40.000' N	163° 52.000' W	0.0	10	0.0	75	0.4	08-May 02:07	08-May 02:29
CTD(Chl:0,10,20,30,40,50; Nutr: 0,10,20,30,50,bott; ChlAM) - site 2/west	56° 46.000' N	164° 20.000' W	16.5	10	1.6	75	0.4	08-May 04:08	08-May 04:33
20/60 bongo - site 2/west	56° 46.000' N	164° 20.000' W	0.0	10	0.0	75	0.3	08-May 04:33	08-May 04:49
CTD - Outer Shelf Domain	56° 37.820' N	164° 36.000' W	12.0	10	1.2	79	0.4	08-May 06:01	08-May 06:26
CTD - Outer Shelf Domain	56° 30.630' N	165° 00.000' W	15.1	10	1.5	81	0.4	08-May 07:56	08-May 08:22
CTD - Outer Shelf Domain	56° 23.540' N	165° 23.170' W	14.6	10	1.5	89	0.4	08-May 09:50	08-May 10:16

Activity	Latitude	Longitude	Dist. (nm)	Spd (kts)	Trans (hrs)	Approx Bottom Depth (m)	On Sta (hrs)	Arrive (Local) Date/Time	Depart (Local) Date/Time
CTD - Outer Shelf Domain	56° 16.480' N	165° 46.320' W	14.6	10	1.5	96	0.4	08-May 11:43	08-May 12:10
Mooring search/drag ops - site 3	56° 02.922' N	166° 19.861' W	23.1	10	2.3	121	8.0	08-May 14:28	08-May 22:28
CTD (site 3/west)	55° 59.000' N	166° 35.000' W	9.3	10	0.9	120	0.5	08-May 23:24	08-May 23:52
20/60 bongo (site 3/west)	55° 59.000' N	166° 35.000' W	0.0	10	0.0	120	0.6	08-May 23:52	09-May 00:28
CTD (site 3/north)	56° 12.500' N	166° 30.000' W	13.8	10	1.4	120	0.5	09-May 01:51	09-May 02:19
20/60 bongo (site 3/north)	56° 12.500' N	166° 30.000' W	0.0	10	0.0	120	0.6	09-May 02:19	09-May 02:55
CTD (site 3/east)	56° 10.000' N	166° 06.000' W	13.6	10	1.4	120	0.5	09-May 04:17	09-May 04:45
20/60 bongo (site 3/east)	56° 10.000' N	166° 06.000' W	0.0	10	0.0	120	0.4	09-May 04:45	09-May 05:07
CTD (site 3/south)	55° 55.000' N	166° 10.000' W	15.2	10	1.5	120	0.5	09-May 06:38	09-May 07:06
20/60 bongo (site 3/south)	55° 55.000' N	166° 10.000' W	0.0	10	0.0	120	0.4	09-May 07:06	09-May 07:29
CTD - Outer Shelf Domain	55° 54.000' N	166° 54.000' W	24.7	10	2.5	120	0.5	09-May 09:57	09-May 10:25
CTD - Outer Shelf Domain	55° 46.000' N	167° 10.000' W	12.0	10	1.2	120	0.5	09-May 11:37	09-May 12:05
CTD - Outer Shelf Domain	55° 39.000' N	167° 30.020' W	13.3	10	1.3	120	0.5	09-May 13:25	09-May 13:53
CTD - Outer Shelf Domain	55° 33.000' N	167° 46.000' W	10.8	10	1.1	120	0.5	09-May 14:58	09-May 15:26
CTD(Chl: 0,10,20,30,40,50; Nut:0,10,20,30,50,75,100, 150,bott - Shelf Break (200m) DEPTH DEPENDENT	55° 25.700' N	168° 04.400' W	12.7	10	1.3	200	0.5	09-May 16:42	09-May 17:13
20/60 bongo - Shelf Break (200m)	55° 25.700' N	168° 04.400' W	0.0	10	0.0	200	0.6	09-May 17:13	09-May 17:49
CTD - Shelf Break (500m) DEPTH DEPENDENT	55° 22.300' N	168° 10.500' W	4.9	10	0.5	500	0.7	09-May 18:18	09-May 19:01

Activity	Latitude	Longitude	Dist. (nm)	Spd (kts)	Trans (hrs)	Approx Bottom Depth (m)	On Sta (hrs)	Arrive (Local) Date/Time	Depart (Local) Date/Time
CTD - Shelf Break (1000m) DEPTH DEPENDENT	55° 20.500' N	168° 15.200' W	3.2	10	0.3	1000	1.1	09-May 19:21	09-May 20:25
CTD (max cast depth = 1500 m)	55° 07.000' N	168° 29.000' W	15.6	10	1.6	1000	1.1	09-May 21:59	09-May 23:03
CTD (max cast depth = 1500 m)	54° 58.000' N	168° 45.000' W	12.8	10	1.3	300	0.6	10-May 00:20	10-May 00:55
CTD (max cast depth = 1500 m)	54° 40.000' N	169° 12.000' W	23.8	10	2.4	985	1.1	10-May 03:18	10-May 04:22
CTD (max cast depth = 1500 m)	54° 20.000' N	169° 50.000' W	29.8	10	3.0	1900	1.7	10-May 07:20	10-May 09:03
CTD (max cast depth = 1500 m)	54° 02.000' N	169° 34.000' W	20.3	10	2.0	1850	1.7	10-May 11:05	10-May 12:45
CTD (max cast depth = 1500 m)	53° 47.000' N	169° 16.000' W	18.4	10	1.8	1575	1.5	10-May 14:35	10-May 16:04
CTD (max cast depth = 1500 m)	53° 36.000' N	169° 04.000' W	13.1	10	1.3	1800	1.6	10-May 17:23	10-May 19:01
CTD (max cast depth = 1500 m)	53° 31.000' N	168° 55.000' W	7.3	10	0.7	1500	1.4	10-May 19:45	10-May 21:10
CTD (max cast depth = 1500 m)	53° 22.000' N	168° 42.000' W	11.9	10	1.2	340	0.6	10-May 22:21	10-May 22:58
Arrive Dutch Harbor	53° 54.500' N	166° 30.900' W	84.2	10	8.4	69	0.0	11-May 07:23	11-May 07:23

9.4 Figures



MF-02-05