#### **CRUISE REPORT**

Cruise Number: MF-01-06 FOCI Number: none Ship: Miller Freeman

Area of Operations: Bering Sea and Aleutian Islands

#### **Itinerary**:

Dutch Harbor - May 12, 2001

Dutch Harbor (touch and go) - May 14, 2001

Dutch Harbor - May 22, 2001

# **Participating Organizations:**

NOAA Pacific Marine Environmental Laboratory University of Alaska Fairbanks

#### **Chief Scientist:**

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#### Personnel:

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# **Objectives of Cruise:**

- 1. Conduct CTD survey of southeastern Bering Sea basin, slope and shelf
- Recover and deploy moorings in support of NMFS Crab Research Program, Southeast Bering Sea Carrying Capacity, Pollock Conservation Program, and Steller Sea Lion Research Program

## **Operations:**

CTD casts	31
Bongos, 60 cm	3
Mooring deployments	18
Mooring recoveries	4

Satellite-tracked buoy deployments 4

## Samples Collected:

Chlorophyll samples 24
Nutrient samples 72
Plankton samples 3

### **Summary of Cruise:**

The first two days of the cruise (devoted to objective 1: CTD survey) were cancelled because of a storm that kept the ship in Dutch Harbor and the scientific party for that part of the cruise unable to fly to Dutch Harbor from Anchorage. Refer to Table 1, a schedule of operations, and Fig. 1, a map of operations, for summary information about MF-01-06.

Shortly after departing Dutch Harbor at 1400 ADT (2200 GMT) on 14 May, the ship's complement deployed the northern Akutan Pass mooring and conducted a calibration CTD afterward. Because we were unable to locate the current meter for this mooring so soon into the cruise, the hardware and instrumentation (ADCP) for AKP-2, the southern Akutan Pass mooring, were used instead.

After successful interrogation and release the KC-01 crab mooring failed to surface, probably because of excessive marine growth. The ship successfully dragged for the mooring, and it was recovered with only about 90 minutes lost. Figure 2 shows the recovered mooring hardware. The second crab mooring recovery and deployment went smoothly.

We conducted three bongo tows for euphausiids at mooring site 2 and two nearby stations. Diatoms were abundant in the shallowest sample. The subsurface mooring was recovered and a surface mooring (Fig. 3) deployed in its place. Then a second sediment trap mooring was deployed. The shelf was still cold. Surface water ranged from 3 to 4 deg C. The upper layer was about 20-40 m deep. Temperature below was on the order of 2 deg C.

During the night, we conducted a 6-station CTD survey of the 70-m isobath between sites 2 and 4. Water samples for analysis of nutrients and chlorophyll were collected at multiple depths.

At site 4, we recovered the subsurface mooring and deployed a replacement. Then we steamed to Seguam Pass, deploying four Argo floats en route. Early reports from Argo headquarters are that these floats are functioning well. They will sink to the ocean bottom, then rise and report again every ten days. These floats will contribute to a worldwide oceanographic network that will revolutionize the field of physical oceanography in the same way the radiosonde network revolutionized meteorology in the last century.

At Seguam Pass, two moorings were deployed, the second with a nutrient meter.

Due to hardware problems, there was no CTD after deployment of SMP-1.

Four upward looking ADCP moorings were deployed across Unimak Pass. One mooring (AMP-4) sustained minor damage when the syntactic float containing the ADCP (Fig. 4) accidentally struck the ship during deployment. The float was recovered, the ADCP tested, then redeployed. Calibration CTDs completed each mooring operation.

In deploying the Alaska Stream moorings (GS-1 through GS-5), we first located the 1000-m isobath along the survey line using the echo sounder, then deployed GS-1 and completed its CTD. We then surveyed the bottom depth southward along the line. The deepest bottom depth we could discern with the echo sounder was about 5100 m. The deepest mooring was designed for 6000 m. It was decided to modify the deepest mooring for 5100 m and the next deepest mooring for 3500 m instead of its designed depth of 4500 m. This gave better horizontal spacing versus depth. All moorings were deployed successfully, and water conditions were documented by CTD casts.

In the remaining time, we elected to complete the six southernmost CTD stations along the line from mooring site #6 to mooring site #3. This is a significant fraction of the work that was lost to the storm at the beginning of the cruise. Results will permit estimation of the strength of the Aleutian North Slope Current

Our final sea day saw the deployment of the southern Akutan Pass mooring and its accompanying CTD cast.

We feel most fortunate to have accomplished all of the mooring deployments and recoveries during this cruise. Despite the initial poor weather that kept us from completing the CTD survey, the excellent weather after we sailed and the skill of the ship's complement allowed us to complete all the scheduled work and even complete some of that missed early in the cruise. Our thanks go out to the capable men and women of the NOAA Ship *Miller Freeman* under the leadership of Captain Dean Smehil. We especially recognize the effort expended by Chief Boatswain Rick Pietrusiak and the entire deck department who spent many long hours on mooring deployments and recoveries. We thank Chief Survey Technician Greg Kaufmann and all of the bridge watchstanders for their tireless assistance in completing the scientific objectives of this cruise.

## Specifics of operations:

2001 Date (GMT)	Time (GMT)	N Latitude (deg min)				ID number	Operation	Depth (m)	Comments
05/15	0023	54	04.02	166 17.83		AKP-01-1	Deploy mooring	82.5	mooring 2 (ADCP) deployed in north position in pass

05/45	00.42	54	02.77	166	17.07	CTD004	CTD	83.2	At AKP-2
05/15	0043	1	03.77	166	17.07	CTD001			
05/15	2222	56	25.09	160	12.80	CTD002	CTD	23.0	At crab
2 = / / 2						1/0 00 /	_		mooring 1
05/16	0030	56	24.86	160	13.33	KC-00-1	Recover	23.1	After dragging
							mooring		operation
05/16	0130	56	25.04	160	12.97	KC-01-1	Deploy	23.6	
							mooring		
05/16	0144	56	25.28	160	13.31	CTD003	CTD	24.2	At KC-1
05/16	0421	56	30.03	161	00.18	CTD004	CTD	67.2	At KC-2
05/16	0442	56	29.88	160	59.85	KC-00-2	Recover	66.1	
							mooring		
05/16	0458	56	29.90	160	59.92	KC-01-2	Deploy	66.3	
							mooring		
05/16	0511	56	30.07	161	00.15	CTD005	CTD	66.9	At KC-2
05/16	1345	56	59.54	163	46.96	Bongo01	Bongo	69.8	Station Z
05/16	1508	56	52.65	164	03.07	Bongo02	Bongo	73.3	Site #2
05/16	1531	56	52.94	164	02.83	CTD006	CTD	73.0	
05/16	1634	56	52.19	164	03.98	BS-2	Recover	72.4	Subsurface
00, 10			02		00.00		mooring		mooring
05/16	2152	56	52.99	164	03.50	BSM-2	Deploy	72.8	"Peggy"
00/10	2102	00	02.00	104	00.00	BOW 2	mooring	72.0	ı cggy
05/16	2326	56	52.99	164	03.20	BSST-2	Deploy	72.7	Sediment trap
03/10	2320	30	32.33	104	03.20	D001-2	mooring	12.1	Sediment trap
05/16	2348	56	53.20	164	02.98	CTD007	CTD	72.8	Site #2
									Υ
05/17	0146	56	46.11	164	19.60	Bongo03	Bongo	75.0	
05/17	0444	57	06.93	164	60.00	CTD008	CTD	70.3	AA
05/17	0757	57	24.89	165	51.97	CTD009	CTD	68.4	AB
05/17	1056	57	32.15	166	43.86	CTD010	CTD	70.3	AC
05/17	1403	57	37.97	167	36.14	CTD011	CTD	70.9	AD
05/17	1702	57	45.98	168	28.12	CTD012	CTD	71.8	AE
05/17	1837	57	51.33	168	52.16	CTD013	CTD	72.5	Site #4
05/17	1932	57	50.53	168	52.65	BS-4	Recover	72.1	BS-4
							mooring		
05/17	2249	57	51.18	168	52.16	BS-4	Deploy	72.4	BS-4
							mooring		
05/17	2303	57	51.34	168	52.00	CTD014	CTD	72.4	Site #4
05/18	1220	55	29.96	170	30.14	Argo 464	Deploy	3179	Argo float 1
							satellite		
							drifter		
05/18	1608	54	50.10	170	58.05	Argo 470	Deploy	3179	Argo float 2
							satellite		
							drifter		
05/18	1946	54	10.09	171	25.96	Argo 503	Deploy	3279	Argo float 3
							satellite		
							drifter		
05/18	2328	53	30.11	171	54.02	Argo 507	Deploy	2661	Argo float 4
	1						satellite		
							drifter		
05/19	0637	52	15.98	172	45.04	SM-1	Deploy	159.6	Seguam Pass
							mooring		
05/19	0846	52	08.07	172	25.19	SM-2	Deploy	167.7	
							mooring		
	1	·	1	1	I	I			ı

0=/10	000=		00.00	470	0.4.00	OTD 0.45	OTD	400 =	
05/19	0905	52	08.29	172	24.88	CTD015	CTD	168.5	
05/19	1119	52	22.91	172	07.05	AMP-4	Deploy	370.0	Amukta Pass,
							mooring		damaged on
									deployment,
									sensor OK
05/19	1140	52	23.16	172	06.85	CTD016	CTD	360.7	
05/19	1249	52	24.00	171	55.08	AMP-3	Deploy	308.6	
							mooring		
05/19	1308	52	24.23	171	54.98	CTD017	CTD	307.6	
05/19	1434	52	24.98	171	39.93	AMP-2	Deploy	458.6	
							mooring		
05/19	1500	52	25.24	171	39.81	CTD018	CTD	477.9	
05/19	1607	52	26.00	171	27.04	AMP-1	Deploy	414.0	
							mooring		
05/19	1628	52	26.11	171	26.49	CTD019	CTD	392.9	
05/20	0052	52	23.81	169	44.78	GS-1	Deploy	986.1	Alaska Stream
00/20	0002	02	20.01	.00	0		mooring	000.1	(mooring
							mooning		position and
									anchor drop
									position are
									the same
05/20	0157	52	23.69	169	44.80	CTD020	CTD	1090	the same
05/20	1257	51	43.11	169	22.38	GS-5	Deploy	5100	Anchor
03/20	1237	31	40.11	103	22.50	00-0	mooring	3100	dropped at
							mooning		51 43.69 N,
									169 22.69 W
05/20	1348	51	44.19	169	22.84	CTD021	CTD	4670	109 22.09 VV
05/20	1825	51	59.00	169	31.00	GS-4	Deploy	3500	Anchor
03/20	1023	31	39.00	109	31.00	GG-4	mooring	3300	dropped at
							mooning		51 59.39 N,
									169 31.22 W
05/20	2002	51	59.05	169	30.91	CTD022	CTD	3492	109 31.22 VV
05/20	0300	52	10.78	169	37.05	GS-3			Anchor
05/21	0300	52	10.76	169	37.05	GS-3	Deploy	3000	
							mooring		dropped at
									52 11,05 N,
05/04	0254	F2	44.07	160	27.00	CTDOOO	CTD	2057	169 37.31 W
05/21	0351	52	11.37	169	37.99	CTD023	CTD	2957	Anghar
05/21	0608	52	16.05	169	40.12	GS-2	Deploy	2000	Anchor
							mooring		dropped at
									52 16.23 N,
05/04	0654	F2	15.00	160	20.07	CTD004	CTD	2040	169 40.23 W
05/21	0651	52	15.98	169	39.97	CTD024	CTD	2040	Ctout C O
05/21	1433	53	22.19	168	43.88	CTD025	CTD	291	Start 6-3
05/04	4507	F0	00.04	400	40.00	OTDOOR	OTD	4005	survey, A
05/21	1537	53	26.21	168	46.00	CTD026	CTD	1085	B, site #6
05/21	1729	53	31.12	168	53.76	CTD027	CTD	1758	С
05/21	1927	53	36.14	169	02.82	CTD028	CTD	1767	D
05/21	2202	53	46.93	169	16.19	CTD029	CTD	1542	E
05/22	0058	54	02.36	169	34.37	CTD030	CTD	1810	F
05/22	1358	53	56.02	165	55.00	AKP-01-2	Deploy	90.7	AKP-2 with
							mooring		RCM-9
05/22	1412	53	56.24	165	54.73	CTD031	CTD	100.0	

# **Attachments:**

Table 1. Schedule of operations

Figure 1. Map of operations

Figure 2. Photograph of recovered hardware from KC-1.

Figure 3. Photograph of surface float of BSM-2.

Figure 4. Photograph of syntactic float with ADCP.

Table 1. Schedule of operations

Deptox   Math   Deptox   De			No Lati			/est gitude	Distance	Ship Speed	Transit Time	Water Depth	CTD Depth	CTD Time	Add-On Time	Arrive (Local)	Depart	Cum. Time	Cum. Time
Deploy/CTD	Operation	Site	deg	min	deg	min	nm	kt	hr	m	m	min	min	Date / Time	Date / Time	hr	d
CTD	Begin	Dutch Harbor	53	54.50	166	30.90									5/14/01 14:00		
Deploy/CTD	Deploy/CTD	AKP-1	54	4.00	166	18.00	12.2	11.0	1.1	83	73	19	85	5/14/01 15:06	5/14/01 16:50	2.8	0.1
CTD/recover   CC-2   56 29 90 160 59 90   22   4 11.0   2.4   60   50   18   10   5715/01 2025   5715/01 2050   30.8   13	CTD/recover	KC-1	56	25.00	160	13.00	251.2	12.0	20.9	25	15	16	190	5/15/01 13:46	5/15/01 17:12	27.2	1.1
Deploy/CTD   RC-2   56 29.90 160 59.90   0.0 11.0   0.0 60 50 18   0.5 15/16/10.250 5/15/01.21:18   31.3   3.1	Deploy/CTD	KC-1	56	25.00	160	13.00	0.0	11.0	0.0	25	15	16	30	5/15/01 17:12	5/15/01 17:58	28.0	1.2
Bengin	CTD/recover	KC-2	56	29.90	160	59.90	26.4	11.0	2.4	60	50	18	10	5/15/01 20:22	5/15/01 20:50	30.8	1.3
Bongo/CTD/recover   BS-2   56 52.90   164   3.50   11.3   11.0   10   73   63   19   90   67/6/01 0.652   57/6/01 0.614   42.7   1.8	Deploy/CTD	KC-2	56	29.90	160	59.90	0.0	11.0	0.0	60	50	18	10	5/15/01 20:50	5/15/01 21:18	31.3	1.3
Deploy	Bongo	Z	56	59.80	163	47.00	96.4	12.0	8.0	65	55	0	30	5/16/01 05:20	5/16/01 05:50	39.8	1.7
Bestrace   Bestrace   See 52.80 164 3.50   0.0   11.0   0.0   7.2   62   19   11.0   5.716/01 14.41 57/46/01 16.50   50.8   2.1	Bongo/CTD/recover	BS-2	56	52.90	164	3.50	11.3	11.0	1.0	73	63	19	90	5/16/01 06:52	5/16/01 08:41	42.7	1.8
Part	Deploy	BSM-2	56	52.80	164	3.50	0.1	11.0	0.0	72	0	0	360	5/16/01 08:41	5/16/01 14:41	48.7	2.0
CTD AB 57 7.00 165 0.00 30.3 11.0 2.8 70 60 19 0 5/16/01 20.42 5/16/01 21.01 55.0 2.3 CTD AB 57 25.00 165 52.00 33.4 11.0 3.0 70 60 19 0 5/17/01 0.023 5/17/01 0.025 5/17/01 0.031 5/17/	Deploy/CTD	BSST-2	56	52.80	164	3.50	0.0	11.0	0.0	72	62	19	110	5/16/01 14:41	5/16/01 16:50	50.8	2.1
CTD AB 57 25.00 165 52.00 33.4 11.0 3.0 70 60 19 0 5/17/01 00:03 5/17/01 00:02 58.4 2.4 CTD AD 57 32.00 166 44.00 28.8 11.0 2.6 70 60 19 0 5/17/01 02:59 5/17/01 03:15 64.3 2.6 CTD AD 57 38.00 167 37.00 29.0 11.0 2.6 70 60 19 0 5/17/01 03:55 5/17/01 03:15 64.3 2.7 CTD AE 57 46.00 168 28.00 28.4 11.0 2.6 70 60 19 0 5/17/01 03:55 5/17/01 03:15 64.3 2.7 CTD AE 57 46.00 168 28.00 28.4 11.0 2.6 70 60 19 0 5/17/01 03:55 5/17/01 03:15 64.3 2.7 CTD AE 57 46.00 168 28.00 28.4 11.0 2.6 70 60 19 0 5/17/01 03:55 5/17/01 10:23 5/17/01 12.23 5/18/01 12.23 5	Bongo	Υ	56	46.00	164	20.00	11.3	13.0	0.9	70	0	0	15	5/16/01 17:42	5/16/01 17:57	52.0	2.2
CTD AC 57 32.00 166 44.00 28.8 11.0 2.6 70 60 19 0 5,171/01 02:59 5,171/01 03:18 61.3 2.6 CTD AD 57 38.00 167 37.00 29.0 11.0 2.6 70 60 19 0 5,171/01 03:56 5,171/01 03:18 61.3 2.6 CTD AE 57 46.00 168 28.00 28.4 11.0 2.6 70 60 19 0 5,171/01 08:56 5,171/01 08:15 64.3 2.7 CTD AE 57 51.00 168 52.00 0.1 11.0 1.2 72 62 19 100 5,171/01 08:56 5,171/01 02:08 67.1 2.8 CTD/recover AF (BS-4) 57 51.00 168 52.00 0.0 11.0 0.0 72 62 19 100 5,171/01 10:23 5,171/01 12:22 70.4 2.9 Deploy/CTD BS-4 57 51.00 168 52.00 0.0 11.0 0.0 72 62 19 100 5,171/01 12:25 5,171/01 12:25 71/01 12:25 71/01 03:00 0.0 10.0 11.0 0.0 72 62 19 100 5,171/01 12:25 5,171/01 12:01 73.0 3.0 Deploy float Argo float 1 55 30.00 170 30.00 150.9 11.4 13.2 31.79 0 0 0 5 5,181/01 08:00 5,181/01 08:00 89.1 3.8 Deploy float Argo float 2 54 50.00 170 58.00 43.1 11.6 3.7 31.79 0 0 0 5 5,181/01 08:00 5,181/01 08:00 89.1 3.8 Deploy float Argo float 4 53 30.00 171 54.00 43.3 11.9 3.6 200 0 0 5 5,181/01 13:25 5,181/01 11:42 5,181/01 11:42 5,181/01 11:42 5,181/01 11:42 5,181/01 11:42 5,181/01 11:43 5,18	CTD	AA	57	7.00	165	0.00	30.3	11.0	2.8	70	60	19	0	5/16/01 20:42	5/16/01 21:01	55.0	2.3
CTD AE 57 38.00 167 37.00 29.0 11.0 2.6 70 60 19 0 5/17/01 05:56 5/17/01 06:15 64.3 2.7 CTD/recover AF (BS-4) 57 46.00 168 52.00 13.7 11.0 2.6 70 60 19 100 5/17/01 08:50 5/17/01 10:22 70.4 2.9 Deploy/CTD BS-4 57 51.00 168 52.00 13.7 11.0 0.0 72 62 19 100 5/17/01 10:23 5/17/01 12:22 70.4 2.9 Deploy/CTD BS-4 Argo float 1 55 30.00 170 30.00 150.9 11.4 13.2 31.79 0 0 5 5/18/01 04.15 5/18/01 04.20 86.3 3.6 Deploy float Argo float 2 54 50.00 170 88.00 43.1 11.6 3.7 31.79 0 0 5 5/18/01 04.15 5/18/01 04.20 86.3 3.6 Deploy float Argo float 3 54 10.00 171 26.00 43.2 12.1 3.6 32.79 0 0 5 5/18/01 08.03 5/18/01 08.08 90.1 3.8 Deploy float Argo float 4 53 30.00 170 58.00 80.1 12.0 6.7 160 0 0 5 5/18/01 11.42 5/18/01 11.47 93.8 3.9 Deploy float Argo float 4 53 30.00 171 54.00 43.3 11.9 3.6 32.70 0 0 5 5/18/01 11.52 5/18/01 11.47 93.8 3.9 Deploy GMP-1 S2 16.00 172 45.00 80.1 12.0 6.7 160 0 0 0 60 5/18/01 11.52 5/18/01 13.30 97.5 4.1 Deploy/CTD MMP-2 52 8.00 172 50.00 18.6 11.0 1.3 100 90 21 13 5/19/01 03.31 5/19/01 03.30 10.95 10.1 4.5 Deploy/CTD AMP-4 52 23.00 172 7.00 18.6 11.0 1.3 100 90 21 13 5/19/01 03.35 5/19/01 03.40 10.97 4.6 Deploy/CTD AMP-3 52 24.00 171 40.00 9.2 11.0 0.8 40.0 390 38 10 5/19/01 04.26 5/19/01 03.40 10.97 4.6 Deploy/CTD AMP-1 52 26.00 171 27.00 8.0 11.0 0.7 400 390 38 12 5/19/01 06:55 5/1	CTD	AB	57	25.00	165	52.00	33.4	11.0	3.0	70	60	19	0	5/17/01 00:03	5/17/01 00:22	58.4	2.4
CTD AE ST 46.00 168 28.00 28.4 11.0 2.6 70 60 19 0 5/17/01 08:50 5/11/01 09:08 67.1 2.8 CTD/recover AF (BS-4) 57 51.00 168 52.00 13.7 11.0 1.2 72 62 19 100 5/17/01 10:23 5/17/01 12:22 70.4 2.9 Deploy/CTD BS-4 57 51.00 168 52.00 0.0 11.0 0.0 72 62 19 140 5/17/01 10:23 5/17/01 12:22 70.4 2.9 Deploy/CTD Argo float 1 55 30.00 170 30.00 150.9 11.4 13.2 3179 0 0 0 5 5/18/01 04:15 5/18/01 04:20 86.3 3.6 Deploy float Argo float 2 54 50.00 170 58.00 43.1 11.6 3.7 3179 0 0 5 5/18/01 04:15 5/18/01 04:20 86.3 3.6 Deploy float Argo float 3 54 10.00 171 26.00 43.3 11.9 3.6 2000 0 0 5 5/18/01 11:42 5/18/01 11:47 93.8 3.9 Deploy float Argo float 3 54 10.00 171 26.00 43.3 11.9 3.6 2000 0 0 5 5/18/01 11:42 5/18/01 11:47 93.8 3.9 Deploy float Argo float 4 53 30.00 171 24.500 80.1 12.0 6.7 16.0 0 0 0 60 5/18/01 22:15 5/18/01 13:31 105.2 4.4 Deploy/CTD SMP-1 52 16.00 172 45.00 80.1 12.0 6.7 16.0 0 0 0 60 5/18/01 22:15 5/18/01 13:31 105.2 4.4 Deploy/CTD AMP-2 52 30.00 172 7.00 18.6 11.0 1.7 40.0 390 38 10 5/19/01 02:46 5/19/01 03:05 107.1 4.5 Deploy/CTD AMP-3 52 24.00 171 55.00 7.4 11.0 0.7 400 390 38 10 5/19/01 02:46 5/19/01 03:05 107.1 4.6 Deploy/CTD AMP-2 52 25.00 171 40.00 9.2 11.0 0.8 400 390 38 10 5/19/01 02:46 5/19/01 03:05 107.1 4.6 Deploy/CTD AMP-2 52 26.00 171 40.00 9.2 11.0 0.8 400 390 38 10 5/19/01 03:05 5/19/01 03:05 11.1 4.6 Deploy/CTD AMP-1 52 26.00 171 77.00 8.0 11.0 0.7 40.0 390 38 10 5/19/01 03:05 5/19/01 03:05 11.1 4.8 Deploy/CTD AMP-1 52 25.00 171 40.00 9.2 11.0 0.8 400 390 38 22 5/19/01 03:05 5/19/01 03:05 11.1 4.6 Deploy/CTD AMP-1 52 25.00 171 40.00 9.2 11.0 0.8 400 390 38 22 5/19/01 03:05 5/19/01 03:05 11.1 4.8 Deploy/CTD AMP-1 52 23.81 169 44.78 62.4 10.5 5.9 10.00 990 67 15.0 5/19/01 18:15 5/19/01 03:05 11.3 4.4 Beploy/CTD AMP-1 52 23.81 169 44.78 62.4 10.5 5.9 10.00 990 67 15.0 5/19/01 18:15 5/19/01 18:15 5/19/01 18:15 5/19/01 18:15 5/19/01 18:15 5/19/01 18:15 5/19/01 18:15 5/19/01 18:15 5/19/01 18:15 5/19/01 18:15 5/19/01 18:15 5/19/01 18:15 5/19/01 18:15 5/19/01 18:15 5/19/01 18:15 5/19/01 18:15 5/19/01 1	CTD	AC	57	32.00	166	44.00	28.8	11.0	2.6	70	60	19	0	5/17/01 02:59	5/17/01 03:18	61.3	2.6
DeployCTD   Depl	CTD	AD	57	38.00	167	37.00	29.0	11.0	2.6	70	60	19	0	5/17/01 05:56	5/17/01 06:15	64.3	2.7
Deploy/CTD	CTD	AE	57	46.00	168	28.00	28.4	11.0	2.6	70	60	19	0	5/17/01 08:50	5/17/01 09:08	67.1	2.8
Deploy float   Argo float 1   55   30.00   170   30.00   150.9   11.4   13.2   3179   0   0   5   5/18/01 04:15   5/18/01 04:20   86.3   3.6     Deploy float   Argo float 2   54   50.00   170   58.00   43.1   11.6   3.7   3179   0   0   5   5/18/01 08:03   5/18/01 08:08   90.1   3.8     Deploy float   Argo float 3   54   10.00   171   26.00   43.2   12.1   3.6   3279   0   0   5   5/18/01 08:03   5/18/01 08:08   90.1   3.8     Deploy float   Argo float 4   53   30.00   171   54.00   43.2   12.1   3.6   3279   0   0   5   5/18/01 11:125   5/18/01 11:147   93.8   3.9     Deploy float   Argo float 4   53   30.00   171   54.00   43.2   12.1   3.6   2000   0   0   5   5/18/01 15:25   5/18/01 15:30   97.5   4.1     Deploy SMP-1   52   16.00   172   45.00   80.1   12.0   6.7   16.0   0   0   0   5   5/18/01 12:21   5/18/01 15:30   97.5   4.1     Deploy/CTD   SMP-2   52   8.00   172   25.00   14.6   11.0   1.3   100   90   21   13   5/19/01 00:31   5/19/01 00:31   5/19/01 00:40   107.1   4.5     Deploy/CTD   AMP-4   52   23.00   172   7.00   18.6   11.0   1.7   400   390   38   16   5/19/01 04:26   5/19/01 03:40   107.1   4.6     Deploy/CTD   AMP-3   52   25.00   171   40.00   9.2   11.0   0.8   400   390   38   22   5/19/01 04:26   5/19/01 03:40   111.1   4.6     Deploy/CTD   AMP-2   52   25.00   171   40.00   9.2   11.0   0.8   400   390   38   22   5/19/01 05:58   5/19/01 05:58   5/19/01 06:58   13.1   4.7   4.8     Deploy/CTD   AMP-1   52   23.81   169   44.78   0.0   11.5   0.0   1000   900   67   150   5/19/01 18:15   5/19/01 18:15   124.3   5.2     Start bottom survey   Ak Stream   52   23.81   169   44.78   0.0   11.5   0.0   1000   900   67   130   5/19/01 18:15   5/19/01 18:15   124.3   5.2     Deploy/CTD   GS-3   52   13.11   169   22.38   43.0   11.5   0.0   1500   92   90   5/20/01 00:09   5/20/01 00:09   5/20/01 00:09   5/20/01 00:09   5/20/01 00:09   5/20/01 00:09   5/20/01 00:09   5/20/01 00:09   5/20/01 00:09   5/20/01 00:09   5/20/01 00:09   5/20/01 00:09   5/20/01 00:09   5/20/01 00:09   5/20/01 00	CTD/recover	AF (BS-4)	57	51.00	168	52.00	13.7	11.0	1.2	72	62	19	100	5/17/01 10:23	5/17/01 12:22	70.4	2.9
Deploy float Argo float 2 54 50.00 170 58.00 43.1 11.6 3.7 3179 0 0 0 5 5/18/01 08:03 5/18/01 08:08 90.1 3.8 beloploy float Argo float 3 54 10.00 171 26.00 43.2 12.1 3.6 3279 0 0 0 5 5/18/01 11:42 5/18/01 11:47 93.8 3.9 Deploy float Argo float 4 53 30.00 171 54.00 43.3 11.9 3.6 2000 0 0 5 5/18/01 15:25 5/18/01 11:47 93.8 3.9 Deploy SMP-1 52 16.00 172 45.00 80.1 12.0 6.7 16.0 0 0 0 5 5/18/01 15:25 5/18/01 11:45 07.8 4.1 Deploy/CTD SMP-2 52 8.00 172 25.00 14.6 11.0 1.3 100 90 21 13 5/19/01 00:31 5/19/01 00:31 105.2 4.4 Deploy/CTD AMP-3 52 25.00 172 7.00 18.6 11.0 1.7 400 390 38 16 5/19/01 00:31 5/19/01 00:34 109.7 4.6 Deploy/CTD AMP-3 52 25.00 171 40.00 9.2 11.0 0.8 400 390 38 16 5/19/01 05:58 5/18/01 13.0 4.7 Deploy/CTD AMP-2 52 25.00 171 40.00 9.2 11.0 0.8 400 390 38 22 5/19/01 05:58 5/19/01 05:58 113.0 4.7 Deploy/CTD AMP-1 52 25.00 171 40.00 9.2 11.0 0.8 400 390 38 22 5/19/01 05:58 5/19/01 05:58 113.0 4.7 Deploy/CTD AMP-1 52 25.00 171 40.00 9.2 11.0 0.8 400 390 38 22 5/19/01 05:58 5/19/01 05:58 113.0 4.7 Deploy/CTD AMP-1 52 25.00 171 47.00 8.0 11.0 0.7 400 390 38 22 5/19/01 05:58 5/19/01 05:58 113.0 4.7 Deploy/CTD AMP-1 52 25.00 171 47.00 8.0 11.0 0.7 400 390 38 22 5/19/01 05:58 5/19/01 05:58 113.0 4.7 Deploy/CTD AMP-1 52 25.00 171 47.00 8.0 11.0 0.7 400 390 38 22 5/19/01 05:58 5/19/01 05:58 113.0 4.7 Deploy/CTD AMP-1 52 25.00 171 47.00 8.0 11.0 0.0 1000 0 0 0 0 0 5/19/01 18:15 5/19/01 18:15 124.3 5.2 Deploy/CTD AMP-1 52 25.00 171 47.00 8.0 11.0 0.0 10.0 0 0 0 0 0 5/19/01 18:15 5/19/01 18:15 124.3 5.2 Deploy/CTD AMP-1 52 25.00 169 31.00 16.5 10.0 11.5 0.0 1000 0 0 0 0 0 5/19/01 18:15 5/19/01 18:15 124.3 5.2 Deploy/CTD GS-5 51 43.11 169 22.38 43.0 11.5 3.7 6000 0 0 0 0 0 5/19/01 18:15 5/19/01 18:15 124.3 5.2 Deploy/CTD GS-3 52 10.78 149 37.05 12.4 11.0 11.5 3500 3000 165 300 5/20/01 00:9 5/20/01 16:28 145.5 6.1 Deploy/CTD GS-3 52 10.78 149 37.05 12.4 11.0 11.5 15.0 15.0 1500 92 90 5/20/01 10:25 5/20/01 16:32 14:55 6.1 Deploy/CTD GS-3 52 10.0 168 46.00 4.2 11.5 0.4 10.0 0.5 1500 92 90 5/20/01 10:48 5/20/01 16:32	Deploy/CTD	BS-4	57	51.00	168	52.00	0.0	11.0	0.0	72	62	19	140	5/17/01 12:22	5/17/01 15:01	73.0	3.0
Deploy float   Argo float 3	Deploy float	Argo float 1	55	30.00	170	30.00	150.9	11.4	13.2	3179	0	0	5	5/18/01 04:15	5/18/01 04:20	86.3	3.6
Deploy float	Deploy float	Argo float 2	54	50.00	170	58.00	43.1	11.6	3.7	3179	0	0	5	5/18/01 08:03	5/18/01 08:08	90.1	3.8
Deploy/CTD	Deploy float	Argo float 3	54	10.00	171	26.00	43.2	12.1	3.6	3279	0	0	5	5/18/01 11:42	5/18/01 11:47	93.8	3.9
Deploy/CTD	Deploy float	Argo float 4	53	30.00	171	54.00	43.3	11.9	3.6	2000	0	0	5	5/18/01 15:25	5/18/01 15:30	97.5	4.1
Deploy/CTD   SMP-2   52 8.00 172 25.00	Deploy	SMP-1	52	16.00	172	45.00	80.1	12.0	6.7	160	0	0	60	5/18/01 22:11	5/18/01 23:11	105.2	4.4
Deploy/CTD		SMP-2	52	8.00	172	25.00	14.6	11.0	1.3	100	90	21	13	5/19/01 00:31	5/19/01 01:05	107.1	4.5
Deploy/CTD		AMP-4	52	23.00	172	7.00	18.6	11.0	1.7	400	390	38	16	5/19/01 02:46	5/19/01 03:40	109.7	4.6
Deploy/CTD	Deploy/CTD	AMP-3	52	24.00	171	55.00	7.4	11.0	0.7	400	390	38	10	5/19/01 04:20	5/19/01 05:08	111.1	4.6
Deploy/CTD   GS-1   52   23.81   169   44.78   62.4   10.5   5.9   1000   990   67   150   5/19/01   14:38   5/19/01   18:15   124.3   5.2		1	52	25.00	171	40.00	9.2	11.0	0.8	400	390		22	5/19/01 05:58	5/19/01 06:58	113.0	4.7
Deploy/CTD   CS-1   S2 23.81 169 44.78   62.4 10.5   5.9 1000 990 67   150 5/19/01 14:38 5/19/01 18:15 124.3 5.2	Deploy/CTD	AMP-1	52	26.00	171	27.00	8.0	11.0	0.7	400	390	38	22	5/19/01 07:41	5/19/01 08:41	114.7	4.8
Start bottom survey   Ak Stream   52   23.81   169   44.78   0.0   11.5   0.0   1000   0   0   0   0   5/19/01 18:15   5/19/01 18:15   124.3   5.2		GS-1	52	23.81	169	44.78	62.4	10.5	5.9	1000	990	67	150	5/19/01 14:38	5/19/01 18:15	124.3	5.2
Deploy/CTD		Ak Stream	52	23.81	169	44.78	0.0	11.5	0.0	1000	0	0	0	5/19/01 18:15	5/19/01 18:15	124.3	5.2
Deploy/CTD	End bottom survey	Ak Stream	51	43.11	169	22.38	43.0	11.5	3.7	6000	0	0	130	5/19/01 21:59	5/20/01 00:09	130.2	5.4
Deploy/CTD   GS-3   52 10.78 169 37.05   12.4 11.0   1.1 3000 1500 92 140 5/20/01 16:35 5/20/01 20:27 150.5 6.3     Deploy/CTD   GS-2   52 16.05 169 40.12   5.6 11.0   0.5 2000 1500 92 90 5/20/01 20:57 5/20/01 20:359 154.0 6.4     CTD   A   53 22.00 168 44.00 74.2 11.6   6.4 500 370 37   0 5/21/01 06:23 5/21/01 07:02 5/21/01 03:32 162.5 6.8     CTD   B   (M6)   53 26.00 168 44.00   4.2 11.5   0.4 1090 1060 70   0 5/21/01 07:22 5/21/01 03:32 162.5 6.8     CTD   C   53 31.00 168 54.00   6.9 11.5   0.6 1793 1500   62   0 5/21/01 09:08 5/21/01 10:10 164.2 6.8     CTD   D   53 36.00 169 30.0 7.3 11.5   0.6 1793 1500   62   0 5/21/01 10:48 5/21/01 11:08 166.1 6.9     CTD   E   53 47.00 169 16.00 13.4 11.5   1.2 1700 1500 80   0 5/21/01 13:18 5/21/01 11:38 168.6 7.0     CTD   F   54 2.00 169 34.00 18.4 11.5   1.6 1800 1500 80   0 5/21/01 16:14 5/21/01 17:34 171.6 7.1     Waypoint   AKP-1   54 4.00 166 18.00 15.7 11.0 14.4 83   0 0 0   0 5/22/01 03:55 5/22/01 03:55 181.9 7.6     Waypoint   AKP-1   54 4.00 166 18.00 15.7 11.0 14.4 83   0 0 0   0 5/22/01 07:57 5/22/01 07:57 186.0 7.7     Waypoint   AKP-1   54 4.00 166 18.00 15.7 11.0 14.4 83   0 0 0   0 5/22/01 07:57 5/22/01 07:57 186.0 7.7     Waypoint   AKP-1   54 4.00 166 18.00 15.7 11.0 14.4 83   0 0 0   0 5/22/01 07:57 5/22/01 07:57 186.0 7.7     Waypoint   AKP-1   54 4.00 166 18.00 15.7 11.0 14.4 83   0 0 0 0 5/22/01 07:57 5/22/01 07:57 186.0 7.7     Waypoint   AKP-1   54 4.00 166 18.00 15.7 11.0 14.4 83   0 0 0 0 5/22/01 07:57 5/22/01 07:57 186.0 7.7		GS-5	51				0.0	11.0	0.0	5100	1500	92	270	5/20/01 00:09	5/20/01 06:11	136.2	5.7
Deploy/CTD         GS-3         52 10.78 169 37.05         12.4 11.0         1.1 3000 1500         92 140         5/20/01 16:35         5/20/01 20:27         150.5 6.3         6.3 beloy/CTD         GS-2         52 16.05 169 40.12         5.6 11.0         0.5 2000 1500         92 90         5/20/01 10:35         5/20/01 20:27         150.5 6.3         6.4 6.4         6.4 500         370         37         0 5/21/01 00:23         5/21/01 00:23         5/21/01 00:23         5/21/01 00:23         5/21/01 00:23         5/21/01 00:23         5/21/01 00:23         5/21/01 00:23         5/21/01 00:23         6.6 16.0         6.4 6.4         500         370         37         0 5/21/01 00:23         5/21/01 00:23         5/21/01 00:00         6.6 16.0         6.8 6.8         6.8 6.8         6.8 6.8         6.8 6.8         6.8 6.8         6.8 6.8         6.8 6.8         7.0 6.0         7.0 0         5/21/01 00:23         5/21/01 00:00         7.0 16.0         6.8 6.8         6.8 6.8         6.8 6.8         7.0 6.0         7.0 0         6.2 17/01 00:00         5/21/01 10:10         16.2 6.8 6.8         6.8 6.8         7.0 0         7.0 0         7.0 0         7.0 0         7.0 0         7.0 0         7.0 0         7.0 0         7.0 0         7.0 0         7.0 0         7.0 0         7.0 0         7.0 0         7.0 0         7.0		1	51	59.00	169		16.8	11.0	1.5	3500	3000		300				
Deploy/CTD         GS-2         52         16.05         169         40.12         5.6         11.0         0.5         2000         1500         92         90         5/20/01 20:57         5/20/01 23:59         15.40         6.4           CTD         A         53         22.00         168         44.00         74.2         11.6         6.4         500         370         37         0         5/21/01 06:23         5/21/01 07:00         161.0         6.7           CTD         B (M6)         53         26.00         168         46.00         4.2         11.5         0.6         1793         1500         62         0         5/21/01 09:08         5/21/01 10:10         164.2         6.8           CTD         C         53         36.00         169         3.00         7.3         11.5         0.6         1793         1500         62         0         5/21/01 09:08         5/21/01 10:10         164.2         6.8           CTD         D         53         36.00         169         3.00         7.3         11.5         0.6         1500         1490         80         0         5/21/01 10:48         5/21/01 11:01         164.2         6.8           CTD		GS-3	52	10.78	169	37.05	12.4	11.0	1.1	3000	1500	92	140	5/20/01 16:35	5/20/01 20:27	150.5	6.3
CTD A 53 22.00 168 44.00 74.2 11.6 6.4 500 370 37 0 5/21/01 06:23 5/21/01 07:00 161.0 6.7 CTD B (M6) 53 26.00 168 46.00 4.2 11.5 0.4 1090 1060 70 0 5/21/01 07:22 5/21/01 08:32 162.5 6.8 CTD C 53 31.00 168 54.00 6.9 11.5 0.6 1700 1500 62 0 5/21/01 07:22 5/21/01 08:32 162.5 6.8 CTD D 53 36.00 169 3.00 7.3 11.5 0.6 1500 1490 80 0 5/21/01 10:14 5/21/01 11:01 164.2 6.8 CTD E 53 47.00 169 16.00 13.4 11.5 1.2 1700 1500 80 0 5/21/01 10:14 5/21/01 11:03 168.6 7.0 CTD F 54 2.00 169 34.00 18.4 11.5 1.6 1800 1500 80 0 5/21/01 16:14 5/21/01 11:34 171.6 7.1 Waypoint AKP-1 54 4.00 166 18.00 155.0 15.7 11.0 1.4 83 0 0 0 5/22/01 07:57 5/22/01 06:32 184.5 7.7 Waypoint AKP-1 54 4.00 166 18.00 15.7 11.0 1.4 83 0 0 0 5/22/01 07:57 5/22/01 07:57 186.0 7.7																	
CTD B (M6) 53 26.00 168 46.00 4.2 11.5 0.4 1090 1060 70 0 5/21/01 07:22 5/21/01 08:32 16.25 6.8 CTD C 53 31.00 168 54.00 6.9 11.5 0.6 1793 1500 62 0 5/21/01 09:08 5/21/01 10:10 164.2 6.8 CTD D 53 36.00 169 30.0 7.3 11.5 0.6 1500 1490 80 0 5/21/01 10:48 5/21/01 11:08 166.1 6.9 CTD E 53 47.00 169 16.00 13.4 11.5 1.2 1700 1500 80 0 5/21/01 13:18 5/21/01 11:38 168.6 7.0 CTD F 54 2.00 169 34.00 18.4 11.5 1.6 1800 1500 80 0 5/21/01 16:14 5/21/01 17:34 171.6 7.1 Waypoint AKP-1 54 4.00 166 18.00 15.1 11.1 10.4 83 0 0 0 5/22/01 03:56 5/22/01 03:56 5/22/01 03:56 181.9 7.6 Waypoint AKP-1 53 56.00 165 55.00 15.7 11.0 1.4 70 60 19 51 5/22/01 07:52 5/22/01 07:57 186.0 7.7 Waypoint AKP-1 54 4.00 166 18.00 15.7 11.0 1.4 83 0 0 0 5/22/01 07:57 5/22/01 07:57 186.0 7.7		1															
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Waypoint         AKP-1         54         4.00         166         18.00         115.1         11.1         10.4         83         0         0         0         5/22/01         03:56         5/22/01         03:56         181.9         7.6           Deploy/CTD         AKP-2         53         56.00         165         55.00         15.7         11.0         1.4         70         60         19         51         5/22/01         05:22         5/22/01         06:32         184.5         7.7           Waypoint         AKP-1         54         4.00         166         18.00         15.7         11.0         1.4         83         0         0         0         5/22/01         07:57         5/22/01         07:57         186.0         7.7		F															
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Terminate Dutch Harbor 53 54.50 166 30.90 12.2 11.0 1.1 0 0 0 0 5/22/01 09:04 5/22/01 09:04 187.1 7.8	Terminate	Dutch Harbor					12.2	11.0	1.1	0.0	0	0	0		5/22/01 09:04	187.1	7.8

Figure 1. Map of operations

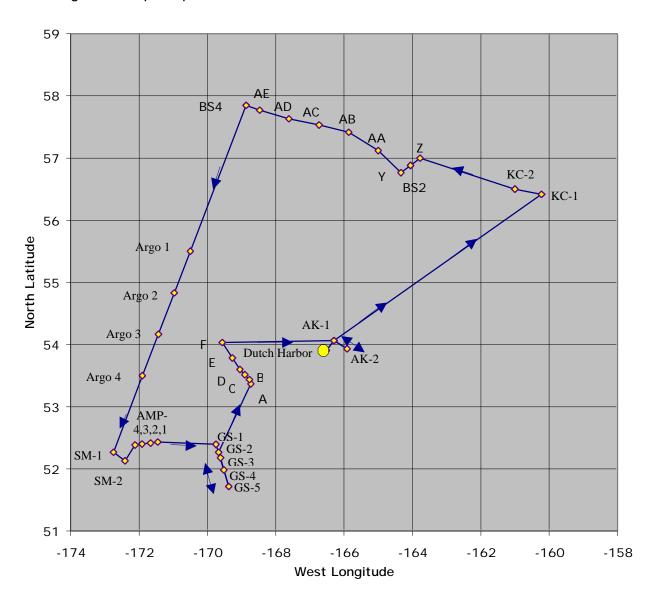


Figure 2. Photograph of recovered hardware from KC-1.



Figure 3. Photograph of surface float of BSM-2 (FOCI-Peggy).



Figure 4. Photograph of syntactic float with ADCP.

