Cruise Report
NOAA Ship MILLER FREEMAN Cruise MF-92-04
E.D. Cokelet NOAA/PMEL, Chief Scientist
4 June 1993

Cruise Dates: 12-28 April 1992

FOCI Cruise: 2MF92

Itinerary and Area: Kodiak to Kodiak, AK, with two scheduled touch-and-go landings in Dutch Harbor to transfer scientific personnel and one unscheduled touch-and-go in Dutch Harbor to disembark the Chief Scientist whose father died. The scientific work concentrated on three geographic areas (Fig. 1):

(1) the Gulf of Alaska where current-meter moorings were recovered,
(2) the Bering Sea basin where a mooring was deployed and samples taken, and
(3) near Amukta Pass for two CTD/ADCP transects.

Participating Organizations: NOAA Pacific Marine Environmental Laboratory (PMEL), Alaska Fisheries Science Center (AFSC) and University of Alaska.

Scientific Personnel: E.D. Cokelet (Chief Scientist), Carol DeWitt, Kevin Kinsey and David Zimmerman (PMEL). William Rugen (Acting Chief Scientist), Miriam Doyle and William Flerx (AFSC). Nicola Hillgruber and Judy McDonald (University of Alaska). Carol Lee (Our World Underwater Fellow).

Goal: To understand the biological and physical processes that cause variability of recruitment to commercially valuable walleye pollock (*Theragra chalcogramma*) stocks in the Bering Sea. This work is part of the Bering Sea FOCI program (Fisheries Oceanography Coordinated Investigations) funded by NOAA's Coastal Ocean Program.

Objectives:

1. To deploy Peggy Bering Sea (Fig. 2) - a PROTEUS mooring (PROfile TElemetry of Upper ocean currentS),
2. To conduct a survey of larval pollock for use in estimating distribution and drift,
3. To collect samples of larval pollock for studies on growth and condition and genetic analysis,
4. To conduct CTD and ADCP transects in areas of interest to transport studies,
5. To collect zooplankton and microzooplankton samples in support of modelling and other biological studies, and
6. To continue acquisition of long-term biological and physical time series.

Mooring Recovery: Two subsurface current-meter moorings were recovered in the Gulf of Alaska and CTD casts CM1 and CM2 were taken for calibration purposes (Fig.1 and Table 1).

Mooring Deployment: It was planned to deploy the PROTEUS mooring, Peggy Bering Sea, at 54°14.5'N, 168°44.4'W in 2200 m of water. However upon arriving on site to survey the area we found two problems. First, this site had heavy ship traffic because it is on a great-circle route between Seattle-Vancouver and Tokyo. This would put the buoy in danger of being run over. Second, the bottom was very rough with depth changes of 20-40 m in a few hundred meters of horizontal distance. This would give too much uncertainty in cutting the mooring line to within 20 m of its proper length. Therefore, we decided to move the mooring location northwest to another site of comparable depth and within an area previously surveyed for larval pollock.

After surveying in a less-traveled area over a flatter bottom we deployed Peggy Bering Sea (Fig. 2) at 0309 17 April 1992 UTC. It settled at 54°47.53'N, 168°33.89'W in 2219 m of water (Fig. 1) and began transmitting data back to the lab via satellite.

Bongo Tows: A grid of 36 stations, 10 nm apart (Fig. 3 and Table 2), was sampled for larval pollock using a 60-cm bongo with 333-µm mesh nets and hard plastic codends. The nets were deployed at 40 m/min usually to 100 m, stopped for 30 s, and retrieved at 20 m/min. A Seacat was attached to the bongo to measure pressure, temperature and conductivity. Larval rough counts were made on-board after each tow, and they ranged between 1 and 67 when divided by the flowmeter difference and multiplied by 1000. Figure 4 shows 2 larval patches, one at the northern corner of the grid with a maximum value of 54 and a second midway along the southwestern side whose maximum was 67.

In total, 48 bongo tows were made with a few of the grid stations reoccupied and a few isolated tows elsewhere in the basin (Fig. 3).

MOCNESS Tows: Fourteen sampling and one test MOCNESS tows were made (Fig. 3 and Table 1).

Three tows were V-tows (M1, M10, M11) in which the MOCNESS descended usually to 400 m with a 505-µm mesh on net 1 whose sample was discarded. 153-µm mesh nets 2-6 fished depth ranges 400-300, 300-200, 200-100, 100-50 and 50-0 m. Net 7 was opened at the surface during retrieval, and its 505-µm sample was discarded.

Five MOCNESS's were W-tows (M2, M3, M7-M9) in which 505-µm mesh net 1 was sent down open to the designated depth, usually 450 m, and its sample later discarded. 153-µm mesh nets 2-3 fished the lower and upper half of the depth range. Then the MOCNESS was

sent back down to 150 m with net 4 open, its sample being later discarded. 505-μm mesh nets 5-9 each fished one-fifth of the depth range on ascent.

There were 2 horizontal MOCNESS series with 3 tows each (M4-M6, M12-M14). All nets were 505-μm mesh. For each series, 3 MOCNESS tows were made with design depths of 70 & 50, 30 & 20, and 10 & 5 m. The MOCNESS was sent down with net 1 open for later discard. At the first design depth, 3 replicate samples were taken with nets 2-4. Net 5 was open for the transit to the shallower design depth, and its sample later discarded. Upon reaching the shallower design depth, nets 6-8 were opened sequentially for 3 more replicate samples. Net 9 was open for the ascent to the surface, and its sample discarded.

CTD Casts: Thirty-nine CTD casts were taken on this cruise (Fig. 1 and Table 1). There was at least one salinity sample per cast for conductivity calibration. Casts CM1 and CM2 were taken prior to current-meter mooring recovery in the Gulf of Alaska. Casts 1 and 2 were pre- and post-deployment casts to 500 m for calibrating Peggy Bering Sea. Three CTD transects were run: one (stns. 3-8) from northwest to southeast to 1500 m to measure the geostrophic flow through the Peggy site that parallels the Aleutians, one (stns. 22-27) across Amukta Pass to 500 m or the bottom, and one (stns. 28-32) to measure the inside portion of the Alaskan Stream just east of Amukta Pass. Three sets of casts (stns. 9-15, 16-21 and 33-37) to 90 m complemented MOCNESS tows and included water samples for microzooplankton and sometimes chemical tracers and chlorophyll.

ADCP Transects: The RDI 150 kHz Vessel Mounted Acoustic Doppler Current Profiler (VM-ADCP) collected data during the entire cruise. The ensemble length and bin size were 60 s and 8 m, respectively. There were two dedicated ADCP transects, one across Amukta Pass along CTD stations 22-27 and one across the inner Alaskan Stream along CTD stations 28-32 (Fig. 1). One backtrack-L calibration maneuver was performed.

Drifter Deployments: Four satellite-tracked drifters (7221, 7164, 7168, 7214) were deployed in the Bering basin about 15 nm north of Peggy Bering Sea in an anticyclonic (clockwise) eddy.

Table 1: Cruise MF-92-04 Summary. Revised 4 June 93.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
3	FOCI	Ship's	Station	FOCI	Alt	Gear Code	Haul	Net	Date	Time	Bottom	Lat	Lat	Lon	Lon	Purpose	Performance	Samples	Comments
4	cruise #	cruise #	#	Grid #	Sta #		#	#	mmddyyyy	GMT	Depth (m)	Deg	Min	Deg	Min				
5																			
6	2MF92	MF-92-04	M9105		CM1	CTD, S-Cal			4131992	17:18	138	56	21.2	156	55.46	Hydro	good		
7	2MF92	MF-92-04				Lowered centerboard			4131992	17:40	---	56	21.54	156	54.55		good		
8	2MF92	MF-92-04	M9105			Moor 9105			4131992	19:30	132	56	21.85	156	54.84	Moor	good		
9	2MF92	MF-92-04	M9140		CM2	CTD, S-Cal			4141992	1:18	93	55	44.44	158	33.45	Hydro	good		
10	2MF92	MF-92-04	M9140			Moor 9140			4141992	2:09	90	55	44.66	158	33.26	Moor	good		
11	2MF92	MF-92-04				Lowered centerboard			4151992	9:15	179	53	58.69	166	32.06		good		
12	2MF92	MF-92-04	PROTEUS1			First deployment site survey			4151992	15:30	2106	54	13.83	168	37.29	Moor	fail		
13	2MF92	MF-92-04	PROTEUS1			Abort survey of PROTEUS site			4151992	20:15	2015	54	12.9	168	48.31	Moor	fail		
14	2MF92	MF-92-04	PROTEUS2		1	CTD, S-Cal			4161992	0:09	2068	54	47.04	168	32.87	Hydro	good		
15	2MF92	MF-92-04	PROTEUS2			Second deployment site survey			4161992	0:30	2210	54	46.7	168	32.95	Moor	good		
16	2MF92	MF-92-04	G001A		M1	MOCNESS			4161992	4:14	2237	54	47.61	168	31.56	SpE	good		For larval vert. dist for bongo grid
17	2MF92	MF-92-04	G002A			60Bon, Cat			4161992	6:46	1989	54	39.65	168	19.26	larv	good		otoliths
18	2MF92	MF-92-04	G003A			60Bon, Cat			4161992	8:42	1579	54	44.76	168	5.2	larv	good		otoliths
19	2MF92	MF-92-04	G004A			60Bon, Cat			4161992	10:28	1981	54	53.1	168	13.08	larv	good		otoliths
20	2MF92	MF-92-04	G005A			60Bon, Cat			4161992	12:17	2018	55	2.16	168	21.5	larv	good		otoliths
21	2MF92	MF-92-04	PROTEUS2			Begin PEGGY Bering Sea deployment			4161992	21:30	2130	54	43.71	168	24.48	Moor	good		
22	2MF92	MF-92-04	PROTEUS2			Deployed PEGGY Bering Sea			4171992	3:09	2245	54	47.66	168	33.89	Moor	good		
23	2MF92	MF-92-04			2	CTD, S-Cal			4171992	3:58	2225	54	47.05	168	31.07	Hydro	good		
24	2MF92	MF-92-04	G006A			60Bon, Cat			4171992	5:39	2187	54	48.57	168	28.15	larv	good		RNA/DNA,;otolith
25	2MF92	MF-92-04	G007A			60Bon, Cat			4171992	7:53	1293	54	36.13	167	57.08	larv	good		otolith
26	2MF92	MF-92-04	G008A			60Bon, Cat			4171992	9:07	962	54	27.7	167	48.91	larv	good		otolith
27	2MF92	MF-92-04	G009A			60Bon, Cat			4171992	10:27	900	54	18.92	167	40.03	larv	good		otolith
28	2MF92	MF-92-04	G010A			60Bon, Cat			4171992	11:40	1243	54	13.83	167	54.94	larv	good		Otolith;seacat not functioning, wire out based on other tows
29	2MF92	MF-92-04	G011A			60Bon, Cat			4171992	12:51	2303	54	8.93	168	9.64	larv	good		otolith
30	2MF92	MF-92-04	G012A			60Bon, Cat			4171992	14:09	2194	54	3.81	168	24.27	larv	good		otolith
31	2MF92	MF-92-04	G013A			60Bon, Cat			4171992	15:20	-------	53	58.94	168	39.07	larv	good		otolith
32	2MF92	MF-92-04	G014A			60Bon, Cat			4171992	16:31	2500	53	54	168	54.15	larv	good		otolith
33	2MF92	MF-92-04	G015A			60Bon, Cat			4171992	17:42	2025	54	2.71	169	2.33	larv	good		otolith
34	2MF92	MF-92-04	G016A			60Bon, Cat			4171992	18:50	2000	54	7.58	168	47.57	larv	good		otolith;RNA/DNA
35	2MF92	MF-92-04	G017A			60Bon, Cat			4171992	20:01	2200	54	12.44	168	32.31	larv	good		otolith
36	2MF92	MF-92-04	G018A			60Bon, Cat			4171992	21:43	1563	54	17.4	168	18.45	larv	good		otolith
37	2MF92	MF-92-04	G019A			60Bon, Cat			4171992	22:54	984	54	22.6	168	3.44	larv	good		otolith;RNA/DNA
38	2MF92	MF-92-04	G020A			60Bon, Cat			4181992	0:01	1645	54	31.05	168	11.7	larv	good		otolith;RNA/DNA
39	2MF92	MF-92-04	G021A			60Bon, Cat			4181992	1:02	1261	54	26	168	26.13	larv	good		otolith;RNA/DNA
40	2MF92	MF-92-04	G022A			60Bon, Cat			4181992	2:06	1737	54	21.23	168	41.23	larv	good		otolith;RNA/DNA
41	2MF92	MF-92-04	G023A			60Bon, Cat			4181992	3:14	2141	54	16.3	168	55.93	larv	good		otolith;RNA/DNA
42	2MF92	MF-92-04	G024A			60Bon, Cat			4181992	5:09	2200	54	11.24	169	10.99	larv	good		otolith
43	2MF92	MF-92-04	G025A			60Bon, Cat			4181992	6:21	2390	54	20.07	169	19.19	larv	good		otolith;RNA/DNA
44	2MF92	MF-92-04	G026A			60Bon, Cat			4181992	7:29	1800	54	24.86	169	4.55	larv	good		otolith
45	2MF92	MF-92-04	G027A			60Bon, Cat			4181992	8:42	1500	54	30.09	168	49.86	larv	good		otolith;RNA/DNA
46	2MF92	MF-92-04	G028A			60Bon, Cat			4181992	9:51	1500	54	34.73	168	34.86	larv	good		otolith
47	2MF92	MF-92-04	G029A			60Bon, Cat			4181992	11:02	2004	54	43.41	168	43.15	larv	good		otolith
48	2MF92	MF-92-04	G030A			60Bon, Cat			4181992	12:17	1625	54	38.5	168	58	larv	good		
49	2MF92	MF-92-04	G031A			60Bon, Cat			4181992	13:29	1833	54	33.68	169	12.9	larv	good		otolith
50	2MF92	MF-92-04	G032A			60Bon, Cat			4181992	14:45	2535	54	28.57	169	27.62	larv	good		otolith
51	2MF92	MF-92-04	G033A			60Bon, Cat			4181992	15:54	2400	54	37.08	169	36.25	larv	good		
52	2MF92	MF-92-04	G034A			60Bon, Cat			4181992	17:02	2000	54	42.21	169	21.41	larv	good		otolith
53	2MF92	MF-92-04	G035A			60Bon, Cat			4181992	18:09	1800	54	47.2	169	6.54	larv	good		otolith
54	2MF92	MF-92-04	G036A			60Bon, Cat			4181992	19:16	2400	54	52.26	168	51.56	larv	good		otolith;seacat died
55	2MF92	MF-92-04	G037A			60Bon, Cat			4181992	20:33	2225	54	57.25	168	36.22	larv	good		otolith

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
1						Table 1: Cruise MF-92-04 Summary. Revised 4 June 93.													
2																			
3	FOCI	Ship's	Station	FOCI	Alt	Gear Code	Haul	Net	Date	Time	Bottom	Lat	Lat	Lon	Lon	Purpose	Performance	Samples	Comments
4	cruise #	cruise #	#	Grid #	Sta #		#	#	mmddyyyy	GMT	Depth (m)	Deg	Min	Deg	Min				
5																			
56	2MF92	MF-92-04	G037A		3	CTD, S-Cal			4181992	22:06	2200	54	56.52	168	36.25	Hydro	good		
57	2MF92	MF-92-04	PROTEUS2			verified PEGGY position			4181992	23:40	2227	54	47.32	168	33.85	Moor	good		
58	2MF92	MF-92-04	G006A		4	CTD, S-Cal			4191992	0:54	2185	54	48	168	28.04	Hydro	good		
59	2MF92	MF-92-04	G002A		5	CTD, S-Cal			4191992	2:59	1994	54	39.8	168	19.8	Hydro	good		
60	2MF92	MF-92-04	G020A		6	CTD, S-Cal			4191992	5:05	1535	54	30.55	168	11.74	Hydro	good		
61	2MF92	MF-92-04	G019A		7	CTD, S-Cal			4191992	7:06	1136	54	22.55	168	3.08	Hydro	good		
62	2MF92	MF-92-04	G010A		8	CTD, S-Cal			4191992	9:04	1383	54	13.89	167	54.66	Hydro	good		
63	2MF92	MF-92-04				Lowered centerboard			4191992	21:18	1462	54	12.59	167	46.01		good		
64	2MF92	MF-92-04				Start ADCP			4191992	22:26	1316	54	13.84	167	55.05	ADCP	good		
65	2MF92	MF-92-04				End ADCP			4201992	2:50	2011	54	57.19	168	36.66	ADCP	good		
66	2MF92	MF-92-04	G038A			60Bon, Cat			4201992	3:53	1840	55	2.18	168	21.69	larv	good		
67	2MF92	MF-92-04	G038A			60Bon, Cat			4201992	5:00	1800	55	0.98	168	19.04	larv	good		livetow for brain tissue and RNA/DNA
68	2MF92	MF-92-04	G038A			MOC1/net contamination test			4201992	5:32	1830	55	1.39	168	19.99	SpE	good		test for net contamination
69	2MF92	MF-92-04	G038A		M2	MOC1,W			4201992	9:48	1940	55	0.95	168	20.13	SpE	good		otolith
70	2MF92	MF-92-04	G039A		M3	MOC1,W			4201992	12:30	1942	55	1.18	168	20.13	SpE	good		otolith
71	2MF92	MF-92-04			9	CTD, S-Cal			4201992	14:01	1888	55	0.64	168	18.83	Hydro	good		
72	2MF92	MF-92-04			10	CTD, S-Cal			4201992	15:14	1900	55	0.72	168	18.63	Hydro	good		
73	2MF92	MF-92-04			11	CTD, S-Cal			4201992	15:53	1900	55	0.86	168	18.22	Hydro	good		
74	2MF92	MF-92-04			12	CTD, S-Cal			4201992	16:19	1900	55	0.86	168	19.16	Hydro	good		
75	2MF92	MF-92-04			13	CTD, S-Cal			4201992	16:44	1900	55	0.92	168	18.73	Hydro	good		
76	2MF92	MF-92-04			14	CTD, S-Cal			4201992	17:04	1900	55	0.96	168	18.24	Hydro	good		
77	2MF92	MF-92-04			15	CTD, S-Cal			4201992	17:22	1900	55	0.95	168	18.07	Hydro	good		
78	2MF92	MF-92-04	G040A		M4	Horizontal MOC1			4201992	20:46	1900	55	1.33	168	20.01	SpE	good		
79	2MF92	MF-92-04	G040A		M5	Horizontal MOC1			4201992	22:56	1900	55	1.09	168	20.33	SpE	good		
80	2MF92	MF-92-04	G040A		M6	Horizontal MOC1			4211992	0:58	1938	55	1.09	168	19.96	SpE	good		
81	2MF92	MF-92-04	G041A		M7	MOC1,W			4211992	4:00	1900	55	1.67	168	21.38	SpE	good		otolith
82	2MF92	MF-92-04				Deployed drifter 7221			4211992	5:26	1920	55	0.84	168	18.92	SatBuoy	good		
83	2MF92	MF-92-04				Deployed drifter 7164			4211992	5:45	1920	55	1.94	168	17	SatBuoy	good		
84	2MF92	MF-92-04				Deployed drifter 7168			4211992	6:03	1920	54	59.36	168	18.23	SatBuoy	good		
85	2MF92	MF-92-04				Deployed drifter 7214			4211992	6:23	1900	55	1.27	168	21.58	SatBuoy	good		
86	2MF92	MF-92-04				Raised centerboard			4211992	6:50	2000	54	58.73	168	28.42		good		
87	2MF92	MF-92-04			16	CTD, S-Cal			4211992	18:30	3139	53	49.49	171	34.87	Hydro	good		
88	2MF92	MF-92-04			17	CTD, S-Cal			4211992	20:25	3201	53	50.44	171	32.34	Hydro	good		
89	2MF92	MF-92-04	G042A		M8	MOC1,W			4211992	21:35	3260	53	50.51	171	34.28	SpE	good		otolith;net flaps loose
90	2MF92	MF-92-04			18	CTD, S-Cal			4211992	23:10	3260	53	50.25	171	32.79	Hydro	good		
91	2MF92	MF-92-04			19	CTD, S-Cal			4211992	23:34	3255	53	50.15	171	32.47	Hydro	good		
92	2MF92	MF-92-04	G043A		M9	MOC1,W			4221992	0:26	3235	53	49.98	171	33.81	SpE	good		no larvae
93	2MF92	MF-92-04			20	CTD, S-Cal			4221992	1:34	3151	53	49.26	171	35.89	Hydro	good		
94	2MF92	MF-92-04			21	CTD, S-Cal			4221992	2:00	3151	53	49.07	171	36.08	Hydro	good		
95	2MF92	MF-92-04				Begin ADCP Backtrack-L			4221992	2:30	3155	53	48.91	171	39.92	ADCP	good		
96	2MF92	MF-92-04				End ADCP Backtrack-L			4221992	4:30	3164	53	50.06	171	37.91	ADCP	good		
97	2MF92	MF-92-04	G044A		M10	MOC1			4221992	9:15	3153	53	49.08	171	33.64	SpE	good		
98	2MF92	MF-92-04	G045A		M11	MOC1			4221992	12:00	3264	53	50.23	171	33.53	SpE	good		
99	2MF92	MF-92-04			22	CTD, S-Cal			4221992	20:40	531	52	26.47	171	33	Hydro	good		
100	2MF92	MF-92-04			23	CTD, S-Cal			4221992	21:42	498	52	25.31	171	41.05	Hydro	good		
101	2MF92	MF-92-04			24	CTD, S-Cal			4221992	22:43	295	52	24.14	171	48.33	Hydro	good		
102	2MF92	MF-92-04			25	CTD, S-Cal			4221992	23:47	313	52	22.63	171	57.29	Hydro	good		
103	2MF92	MF-92-04			26	CTD, S-Cal			4231992	0:44	391	52	21.54	172	4.76	Hydro	good		
104	2MF92	MF-92-04			27	CTD, S-Cal			4231992	1:41	337	52	20.21	172	12.86	Hydro	good		
105	2MF92	MF-92-04				Begin ADCP			4231992	2:04	358	52	20.2	172	12.34	ADCP	good		

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
1						Table 1: Cruise MF-92-04 Summary. Revised 4 June 93.													
2																			
3	FOCI	Ship's	Station	FOCI	Alt	Gear Code	Haul	Net	Date	Time	Bottom	Lat	Lat	Lon	Lon	Purpose	Performance	Samples	Comments
4	cruise #	cruise #	#	Grid #	Sta #		#	#	mmddyyyy	GMT	Depth (m)	Deg	Min	Deg	Min				
5																			
106	2MF92	MF-92-04				End ADCP			4231992	4:13	525	52	26.55	171	32.62	ADCP	good		
107	2MF92	MF-92-04			28	CTD, S-Cal			4231992	6:02	502	52	21.36	171	11.89	Hydro	good		
108	2MF92	MF-92-04			29	CTD, S-Cal			4231992	7:18	836	52	16.43	171	8.66	Hydro	good		
109	2MF92	MF-92-04			30	CTD, S-Cal			4231992	9:13	1530	52	11.12	171	7.19	Hydro	good		
110	2MF92	MF-92-04			31	CTD, S-Cal			4231992	11:12	2845	52	7.22	171	3.73	Hydro	good		
111	2MF92	MF-92-04			32	CTD, S-Cal			4231992	13:04	3592	52	2	171	1.99	Hydro	good		
112	2MF92	MF-92-04				Begin ADCP			4231992	13:58	3612	52	2.03	171	1.05	ADCP	good		
113	2MF92	MF-92-04				End ADCP			4231992	15:46	531	52	21.04	171	11.58	ADCP	good		
114	2MF92	MF-92-04	G046A			60Bon, Cat			4231992	23:09	266	53	10.26	169	47.66	larv	good		Checking for larvae for horz. MOC series
115	2MF92	MF-92-04	G047A			60Bon, Cat			4241992	1:54	577	53	2.15	169	9.34	larv	good		Checking for larvae for horz. MOC series
116	2MF92	MF-92-04	G048A			60Bon, Cat			4241992	3:55	483	53	11.37	168	56.86	larv	good		Checking for larvae for horz. MOC series
117	2MF92	MF-92-04	G049A			60Bon, Cat			4241992	5:47	90	53	23.87	168	34.03	larv	good		Checking for larvae for horz. MOC series
118	2MF92	MF-92-04	G050A			60Bon, Cat			4241992	9:26	1145	53	58.83	168	2.68	larv	good		Checking for larvae for horz. MOC series
119	2MF92	MF-92-04	G051A			60Bon, Cat			4241992	13:44	1937	54	24.67	169	5.1	larv	good		Checking for larvae for horz. MOC series
120	2MF92	MF-92-04	G052A			60Bon, Cat			4241992	15:50	--------	54	38.81	168	57.51	larv	good		Checking for larvae for horz. MOC series
121	2MF92	MF-92-04	G053A			60Bon, Cat			4241992	17:55	1800	54	49.7	168	52.66	larv	good		Checking for larvae for horz. MOC series
122	2MF92	MF-92-04	G054A			60Bon, Cat			4241992	19:20	------	55	1.5	168	45.38	larv	good		Checking for larvae for horz. MOC series
123	2MF92	MF-92-04	G053A		M12	Horizontal MOC1			4241992	21:12	2050	54	49.6	168	53.35	SpE	good		
124	2MF92	MF-92-04			33	CTD, S-Cal			4241992	22:44	2039	54	46.5	168	57.14	Hydro	good		
125	2MF92	MF-92-04	G053A		M13	Horizontal MOC1			4241992	23:51	2035	54	46.33	168	57.13	SpE	good		
126	2MF92	MF-92-04			34	CTD, S-Cal			4251992	0:49	2043	54	46.73	168	57.05	Hydro	good		
127	2MF92	MF-92-04			35	CTD, S-Cal			4251992	1:18	2043	54	46.27	168	57.68	Hydro	good		
128	2MF92	MF-92-04	G053A		M14	Horizontal MOC1			4251992	1:57	2043	54	46.06	168	57.97	SpE	good		
129	2MF92	MF-92-04			36	CTD, S-Cal			4251992	3:12	2043	54	46.24	168	56.98	Hydro	good		
130	2MF92	MF-92-04			37	CTD, S-Cal			4251992	3:34	2043	54	46.01	168	57.31	Hydro	good		
131	2MF92	MF-92-04	G053A			60Bon, Cat			4251992	3:53	2043	54	45.89	168	57.4	larv	good		
132	2MF92	MF-92-04				Begin ADCP			4251992	4:51	2196	54	53.03	168	55.5	ADCP	good		
133	2MF92	MF-92-04				End ADCP			4251992	8:39	150	55	40.06	168	39.57	ADCP	good		
134	2MF92	MF-92-04				Raised centerboard			4251992	8:39	150	55	40.06	168	39.57		good		

Table 2. Nominal coordinates of MF-92-04 bongo grid.

	FOCI Grid #	Latitude deg. N	Latitude min. N	Longitude deg. W	Longitude min. W
1	G002A	54	39.79	168	19.85
2	G003A	54	44.77	168	4.90
3	G004A	54	53.43	168	13.15
4	G005A	55	2.08	168	21.45
5	G006A	54	48.45	168	28.15
6	G007A	54	36.12	167	56.65
7	G008A	54	27.47	167	48.43
8	G009A	54	18.82	167	40.24
9	G010A	54	13.84	167	55.02
10	G011A	54	8.87	168	9.78
11	G012A	54	3.89	168	24.51
12	G013A	53	58.91	168	39.21
13	G014A	53	53.94	168	53.87
14	G015A	54	2.59	169	2.33
15	G016A	54	7.56	168	47.61
16	G017A	54	12.54	168	32.86
17	G018A	54	17.54	168	18.08
18	G019A	54	22.49	168	3.27
19	G020A	54	31.14	168	11.55
20	G021A	54	26.41	168	26.41
21	G022A	54	21.19	168	41.24
22	G023A	54	16.22	168	56.04
23	G024A	54	11.24	169	10.81
24	G025A	54	19.89	169	19.32
25	G026A	54	24.87	169	4.50
26	G027A	54	29.84	168	49.64
27	G028A	54	34.82	168	34.76
28	G029A	54	43.48	168	43.11
29	G030A	54	38.50	168	58.05
30	G031A	54	33.53	169	12.95
31	G032A	54	28.55	169	27.83
32	G033A	54	37.20	169	36.40
33	G034A	54	42.18	169	21.47
34	G035A	54	47.15	169	6.51
35	G036A	54	52.13	168	51.53
36	G037A	54	57.10	168	36.51

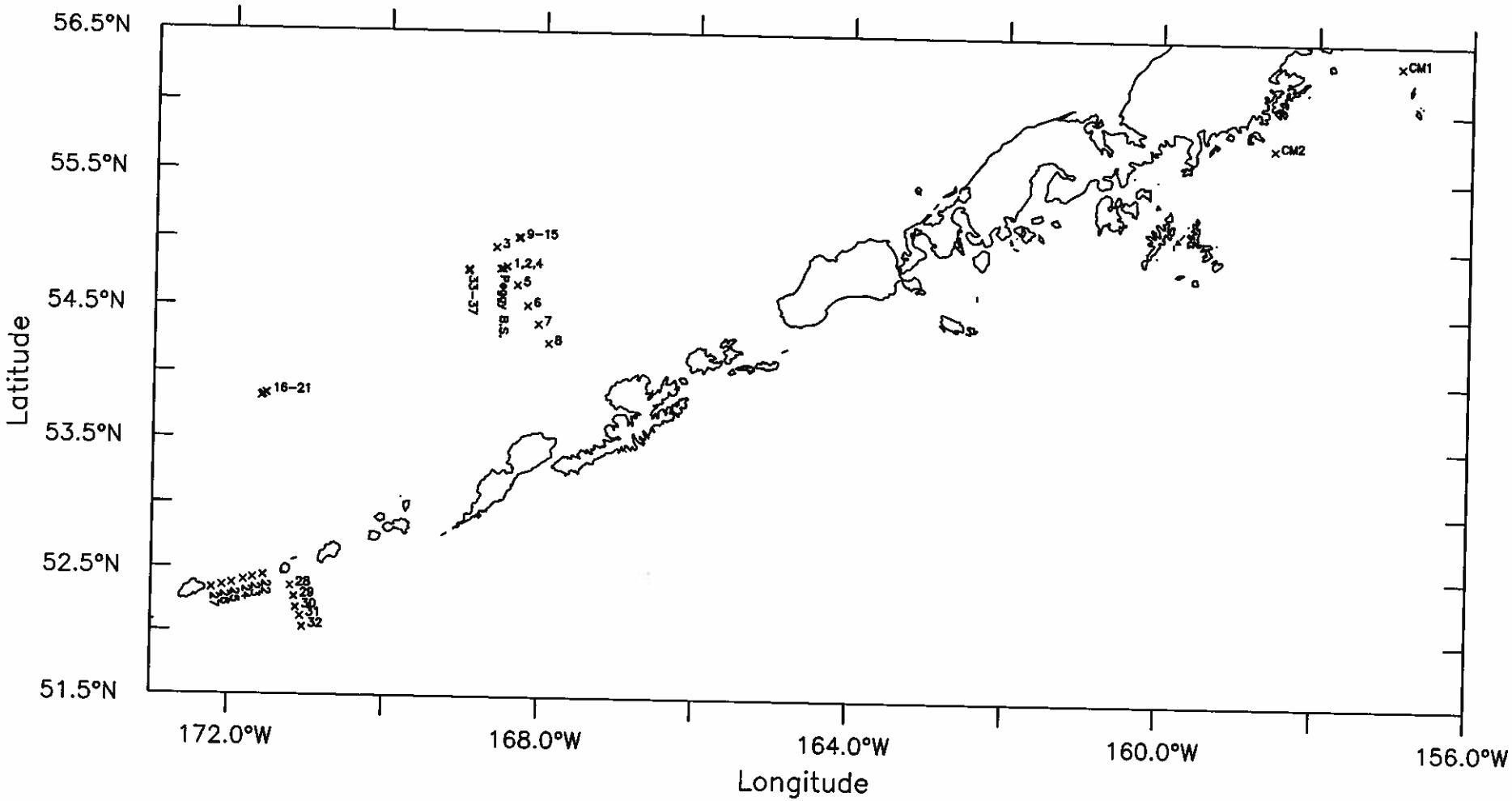

Figure 1. Working area and CTD locations for MF-92-04. Subsurface moorings M9105 and M9140 were recovered at CTD stations CM1 and CM2 in the Gulf of Alaska.

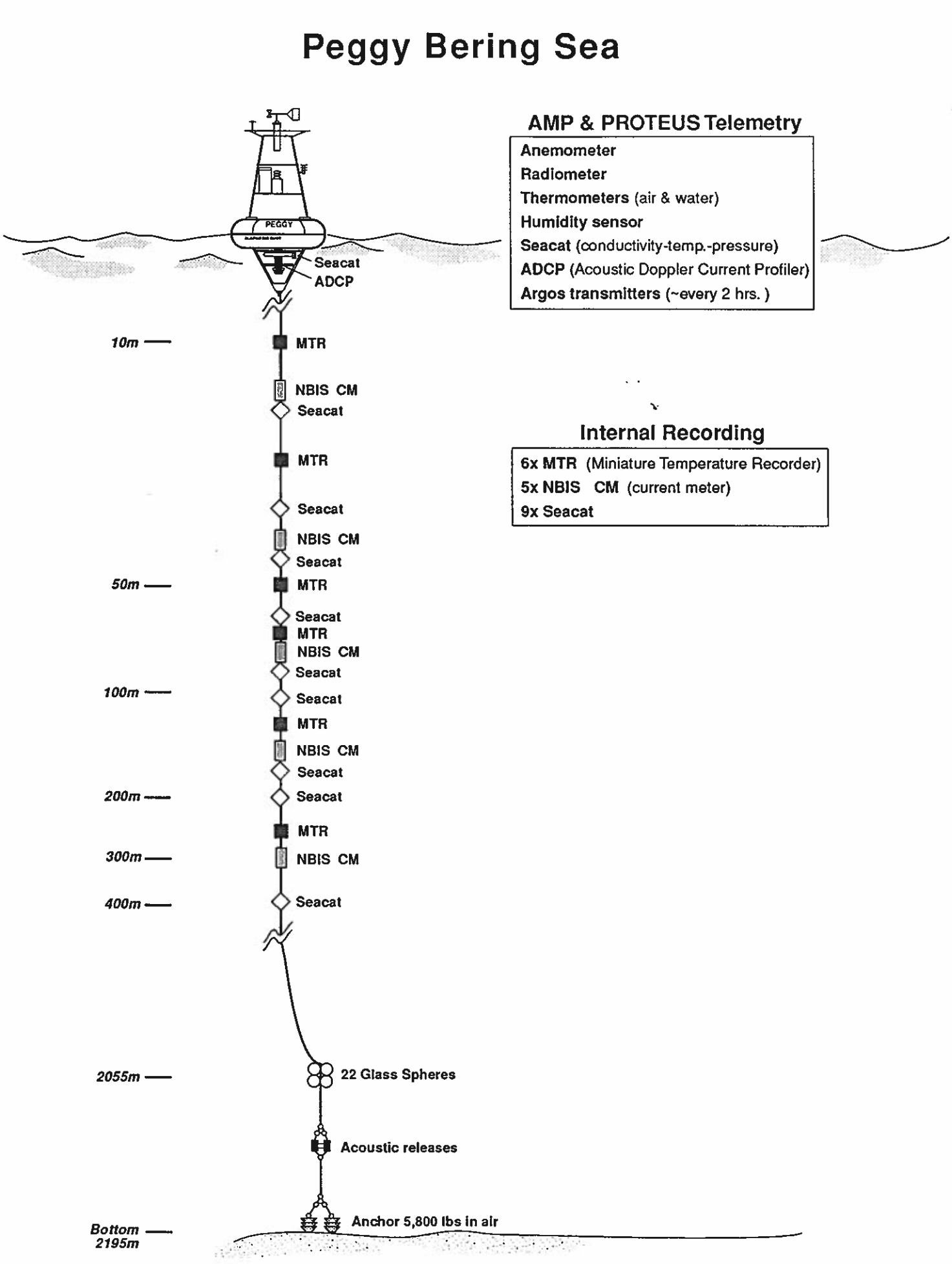

FIGURE 2. Schematic of the Peggy Bering Sea mooring showing instruments. Data are telemetered to PMEL via Service Argos several times each day.

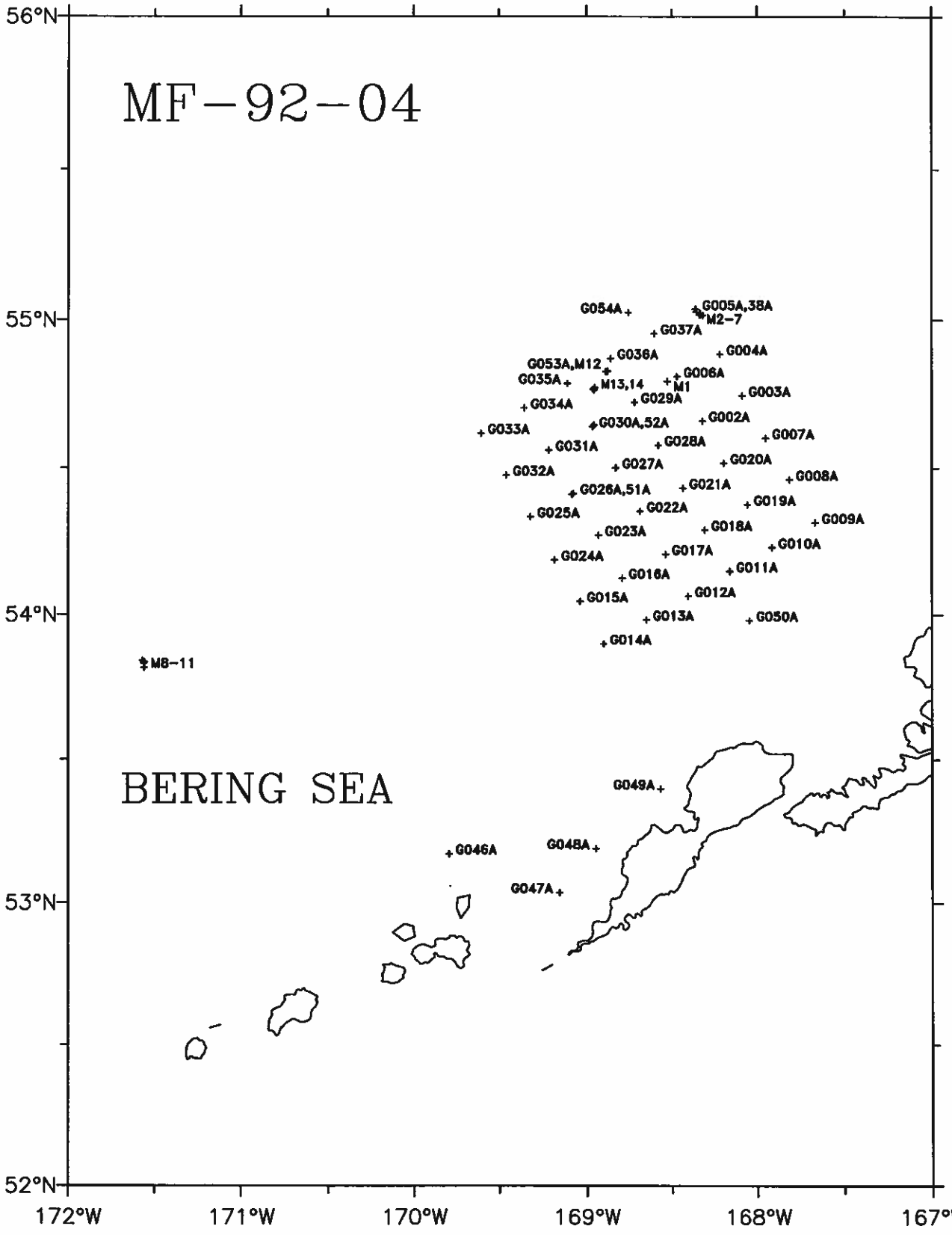

Figure 3. Locations of 60-cm bongo grid (G002A-G037A), reoccupied bongo grid stations (G038A, G051A, G052A), isolated bongo tows (G046A-G050A, G053A, G054A) and MOCNESS tows (M1-M14). MOCNESS tow M1 is near the site of Peggy Bering Sea.

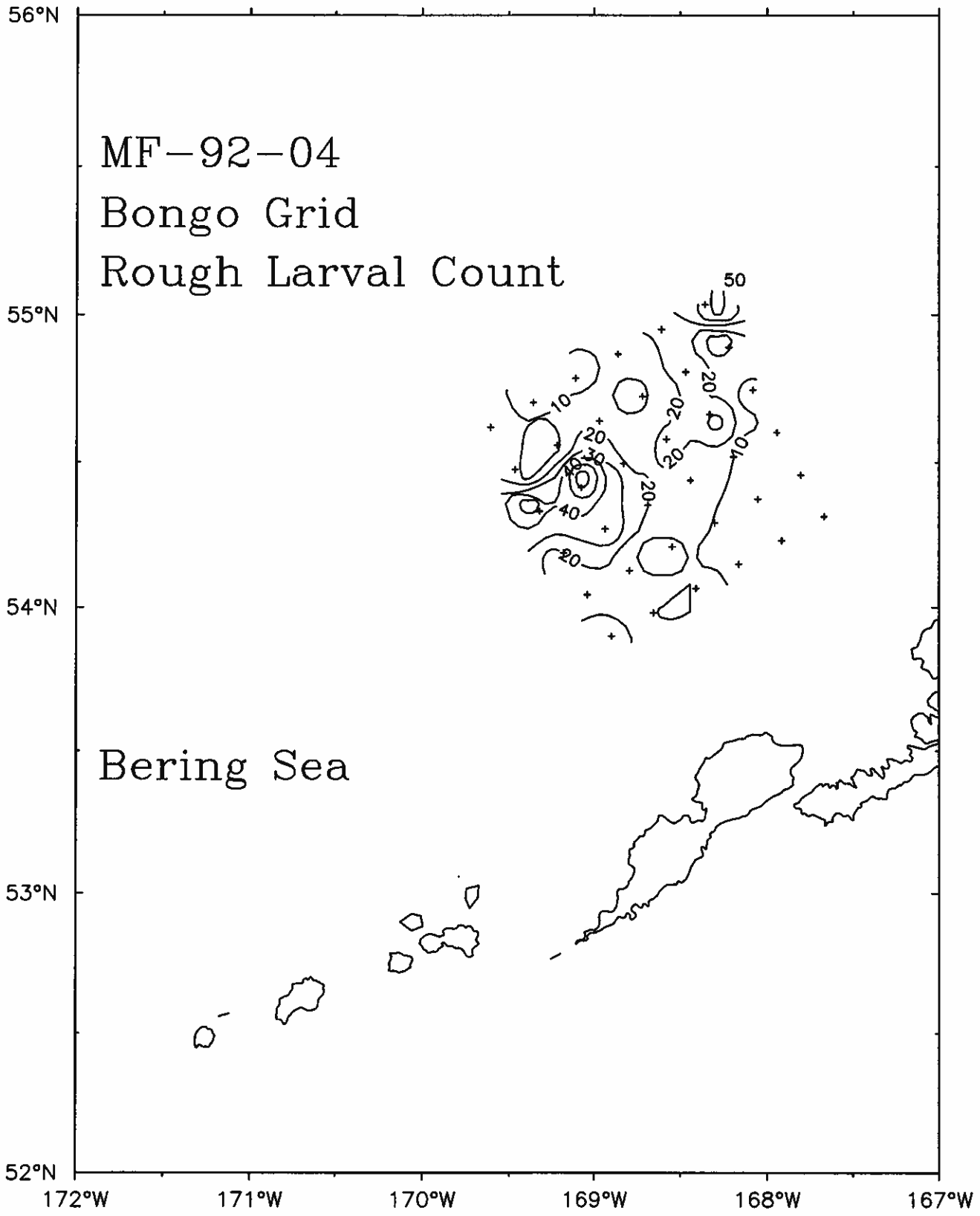

Figure 4. Bongo larval grid rough counts. Values shown are 1000 times the rough count divided by the flow meter difference.