NOAA Data Report ERL PMEL-41

FISHERIES-OCEANOGRAPHY COORDINATED INVESTIGATIONS: 1991 FIELD OPERATIONS REPORT

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Seattle, Washington
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DEPARTMENT OF COMMERCE

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Fisheries-Oceanography Coordinated Investigations: 1991 Field Operations Report

C. DeWitt[1] and J. Clark[2]

INTRODUCTION

This data report summarizes the goals and accomplishments of the Fisheries-Oceanography Coordinated Investigations (FOCI) 1991 field season (October '90–September '91) in the Gulf of Alaska and the Bering Sea. It is intended that this report be an easy-to-use reference to cruise reports and station positions.

The report is divided into eight primary sections: one for each of the seven 1991 cruises and the eighth section devoted to moorings. Each of the cruise sections begins with a list of scientific personnel, a brief summary of the cruise operations, and a compilation of cruise statistics. This is followed by a summary of operations. The summary is the cruise report written by the Chief Scientist. Next, figures depicting the sampling sites are provided for most operations. Finally a summary of the MOA is provided with date, time, cast number, FOCI I.D., depth, latitude, and longitude. The mooring section has a summary of mooring deployments and recoveries, followed by a diagram of each mooring.

FOCI 91 Research Cruises

The 1991 field operations were conducted aboard the NOAA ship *Miller Freeman.* Shipboard operations included plankton and larval sampling, CTDs, deployment and recovery of moorings, drifter studies, and satellite observations of the sea surface. There were seven cruises during FY91, designated as follows:

TABLE 1. 1991 Cruise Summary

FOCI cruise no.	Ship cruise no.	Project	Chief Scientist
FOCI-91-01	MF-91-03	Egg Survey	Carol DeWitt
FOCI-91-02	MF-91-04	Egg Survey	Art Kendall
FOCI-91-03	MF-91-05	Larval Patch	Jeff Napp
FOCI-91-04	MF-91-06	Larval Survey	Kevin Bailey
FOCI-91-05	MF-91-08	Juvenile Study	Sarah Hinckley
BS-91-01	MF-91-09	Physical Oc.	Ron Reed
FOCI-91-06	MF-91-11	Mooring Recovery	Carol DeWitt

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A summary of the primary objectives of each cruise is:

FOCI-91-01: collect Eulerian current data by deploying moorings and using the shipboard Acoustic Doppler Current Profiler (ADCP); conduct an ichthyoplankton survey to determine the horizontal patterns of distribution and abundance of walleye pollock eggs and locate the area of maximum concentration.

FOCI-91-02: conduct an ichthyoplankton survey in the Western Gulf of Alaska to determine the horizontal patterns of distribution and abundance of walleye pollock eggs and locate the area of maximum concentration.

FOCI-91-03: conduct a survey of larval pollock for use in estimating distribution, drift and mortality rates.

FOCI-91-04: conduct a survey of larval pollock distribution in the area between Kodiak Island and the Shumagin Islands in order to estimate distribution, abundance, mortality and transport patterns of larvae.

FOCI-91-05: conduct a survey of the distribution and abundance of young of the year juvenile pollock.

BSFOCI-91-01: conduct a physical oceanography survey to gain understanding of circulation along the Aleutian Islands, through the island passes, and in the western and central Bering Sea.

FOCI-91-06: collect Eulerian current data by recovering moorings 9101, 9102, 9103, 9132, 9133, 9134, 9135, 9136, 9137, 9138, 9139, 9141, 9142, searching for mooring parts of 9031, and using the shipboard Acoustic Doppler Current Profiler.

TABLE 2. 1991 STATISTICS SUMMARY

	TOTAL	MF-91-03	MF-91-04	MF-91-05	MF-91-06	MF-91-08	MF-91-09	MF-91-11
ADCP lines	63	4	24	3	1	1	14	16
Bongos, 60 cm	433	84	151	94	97		5	2
Bongos, 20 and 60 cm	32	6		26				
Bongos, vertical (live tows)	46		14	30	2			
Buoys, Loran tracked (sequences)	2			2				
CTDs	306	28	47	59	12	8	132	20
Drifters, satellite tracked	31		1	2	3		25	
Methot Trawls	63					63		
Mocness Tows	14			14				
Mooring deployments	20	13	2				5	
Mooring recoveries	14		1					13
ToYo	1			1				
Trawls, Anchovy	7					7		
Trawls, Marinovich	2	2						
Trawls, Shrimp	2					2		
Tuckers	11	4	7					
XBTs	148		13	10	4	53	68	

Chlorophyll samples	454	30	125	227	72			
Microzooplankton samples	502	35	150	245	72			
Nutrient samples	242	53	125	43	21			
Pollock eggs	6000	6000						
Predator samples	225	106				119		
Stomach samples	80	80						

MF-91-03 (FOCI-91-01): 31 March–13 April, 1991

SCIENTIFIC PERSONNEL

Name	Title	Organization
Carol DeWitt	Chief Scientist	PMEL/NOAA
Debbie Blood	Fishery Biologist	AFSC/NOAA
Patricia Brown	Statistician	AFSC/NOAA
Jay Clark	Fishery Biologist	AFSC/NOAA
Heather Dine	Volunteer	Our World Underwater
Daniel Dougherty	Physical Science Tech.	PMEL/NOAA
William Rugen	Fishery Biologist	AFSC/NOAA

CRUISE STATISTICS

ADCP lines	4
ADCP backtrack "L"	1
Bongos, 60 cm	90
Bongos, 20 cm	6
Chlorophyll samples	30
CTDs	28
Fishing trawls	2
Microzooplankton samples	35
Mooring deployments	13
Nutrient samples	53
Pollock eggs	6000
Predator samples	106
Stomach samples	80
Tucker trawls	4

OBJECTIVES

The objectives of MF-91-03 (FOCI-91-01) were to:

- collect Eulerian current data by deploying moorings 9101, 9102, 9103, 9132, 9133, 9134, 9135, 9136, 9137, 9138, 9139, 9141, 9142, recovering mooring 9131 (a continuation of the time series at the location of 8931), and using the shipboard Acoustic Doppler Current Profiler (ADCP)

- conduct an ichthyoplankton survey to determine the horizontal patterns of distribution and abundance of walleye pollock eggs and locate the area of maximum concentration

- collect samples of adult pollock and other potential predators on pollock eggs

- collect adult pollock for maturity studies and to obtain eggs for rearing

- continue the biology and water property time series and collect CTD data at moorings

CRUISE REPORT

The first FOCI cruise of the FY-91 field season was conducted aboard the NOAA ship *Miller Freeman* during the period between March 31–April 13, 1991. The ship occupied an extensive biological and physical oceanographic sampling grid in Shelikof Strait and the Gulf of Alaska.

Acoustic Doppler Current Profiler (ADCP): The ship mounted ADCP was operated during the entire cruise. Lines specifically for ADCP data collection were run at full speed.

Line 8 (after moorings 9101, 9102 and 9103 were deployed), Kennedy Entrance on two occasions (once immediately after moorings 9141 and 9142 were deployed and once at the end of the cruise), and across Gore Point (after moorings 9132, 9133, 9134, 9135, 9136, 9137, 9138 were deployed). A backtrack-L was run to check the ADCP. There were none of the run-time errors or access violations that were encountered on the 1990 cruises. There was a problem with obtaining accurate position data during several parts of the cruise due to Loran-C cycling. Repositioning of the ADCP Loran antenna or the acquisition of a GPS positioning system might help alleviate this problem.

Bongos: Two bongo grids were conducted during MF-91-03. One was located in Shelikof Strait extending from Cape Ikolik to Cape Douglas; the second was located in the Gulf of Alaska extending from Amatuli to Montague Island.

Grid I consisted of fifty-one stations. It began with six bongos from line 8 which were taken during the beginning of the cruise (station 55 was not sampled due to severe weather conditions). Both the 60 cm bongo with 0.333 μm mesh and 20 cm bongo with 0.150 μm mesh were used during line 8. After a sixteen hour delay for severe weather, operations resumed off of Cape Ikolik (southern Shelikof Strait). During the remainder of the bongo grids, the 60 cm bongo with 0.505 μm mesh was used. Eight bongos were completed before operations were suspended to deploy three moorings. Fourteen hours later Grid I was resumed. Twenty-nine stations were completed. The final eight bongo stations of Grid I were completed near the end of the cruise, approximately 5.5 days after the previously mentioned twenty-eight stations had been completed.

Grid II consisted of thirty-nine stations. Except for a three-hour ADCP backtrack-L, the grid was completed without interruption. During four bongo casts, a Sea-Bird Seacat was attached to the winch wire in-line with the bongo. Data was collected for the purpose of writing data processing programs. The effect of the in-line Seacat on the bongo's sampling of eggs and larvae is not known at this time.

CTD Casts: A total of twenty-eight CTD stations were conducted using the PMEL Seabird CTD. CTDs were located to calibrate sensors on the moorings and to continue the long-term water-properties data set at specific stations. A CTD cast was conducted before the attempted recovery and after the deployment of each mooring. Also, thirteen CTD casts were conducted at Line 8 in conjunction with the Line 8 bongo casts. Line 8 stations 56 through 61 included chlorophyll (thirty samples), nutrient (fifty-three samples) and microzooplankton (thirty-five samples) samples. The locations of all CTD casts are given in Appendix I. CTD casts were taken to within approximately 10 m of the bottom.

The PMEL Sea-Bird CTD system was used in conjunction with the Shipboard Computer System (SCS) which was used for data acquisition and storage. Further work, including SCS users group meetings, accurate schematics, and additional training, needs to be done to utilize the full potential of this system.

Fishing trawls: Two midwater trawls were completed. Eight female pollock were stripped of their eggs which were fertilized with sperm milked from male pollock. Four thousand pollock eggs were reared during the cruise and sent to Bori Olla; two thousand pollock eggs were reared during the cruise and sent to Kevin Bailey. In addition, eighty stomach samples were obtained: forty pollock, twenty smelt, and 20 Arrowtooth Flounder.

Moorings: A total of thirteen moorings were deployed. The moorings were grouped in four areas. Three were located in the vicinity of Line 8 (9101, 9102, 9103), one in Stevenson Entrance (9139), two in Kennedy Entrance (9141 and 9142), and seven in a line off of Gore Point (9132, 9133, 9134, 9135, 9136, 9137, 9138). One mooring recovery attempt was made at Kennedy Entrance (9031).

Tucker trawls: A total of four Tucker trawls were completed. The Tucker sampling set-up included the standard Tucker nets plus a smaller net inside each of the Tucker nets (for predator sampling). Two Tucker trawls (P001A, P001B) were taken an hour apart during daylight hours during bongo Grid I in an area of high pollock egg concentration. The second two Tuckers were taken an hour apart during the night in an area of low pollock egg concentration. There were seven Tucker net samples, eight "inside" Tucker net samples, and 106 predator samples.

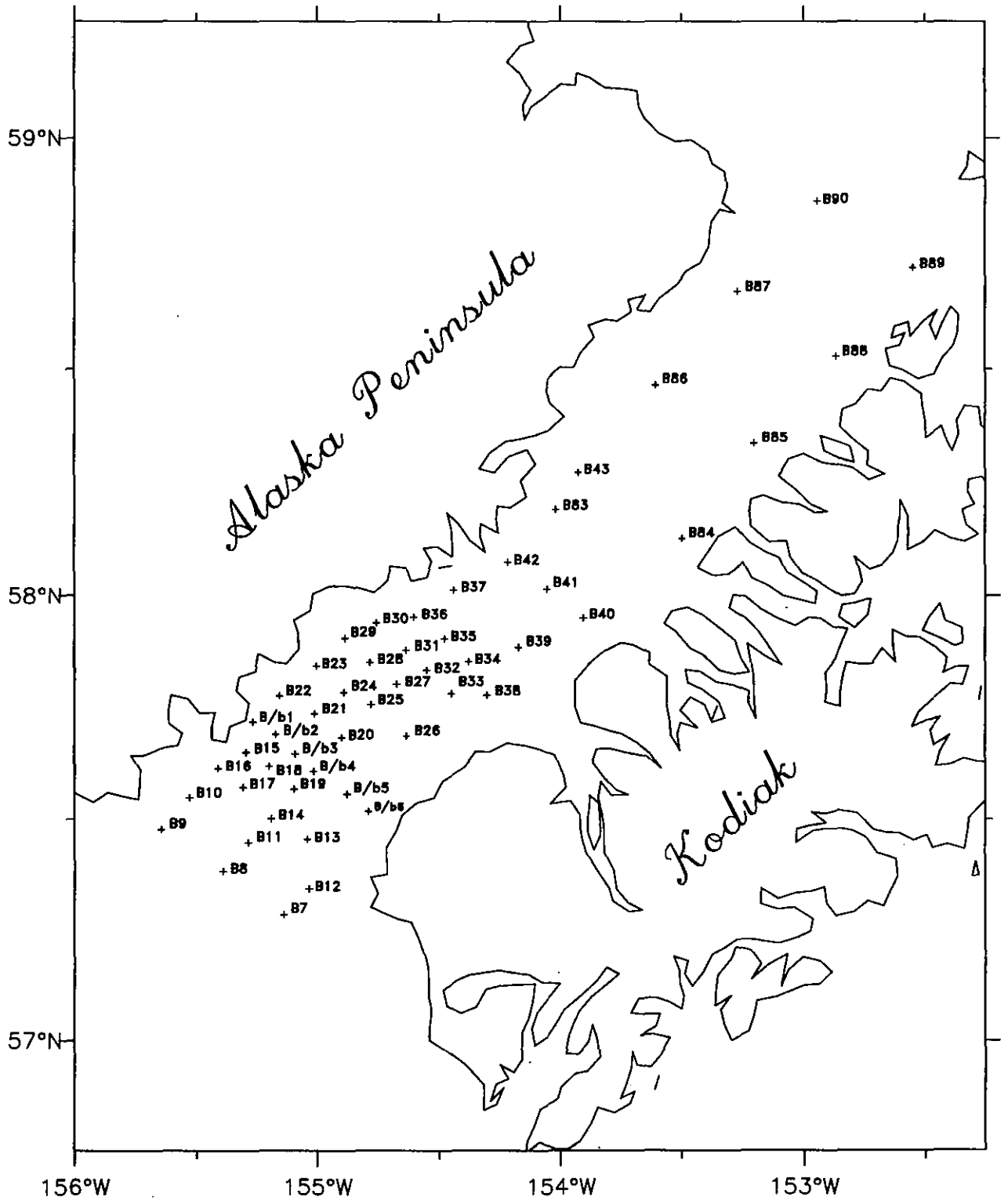


Fig. 1.1. MF-91-03 bongo stations - GRID I.

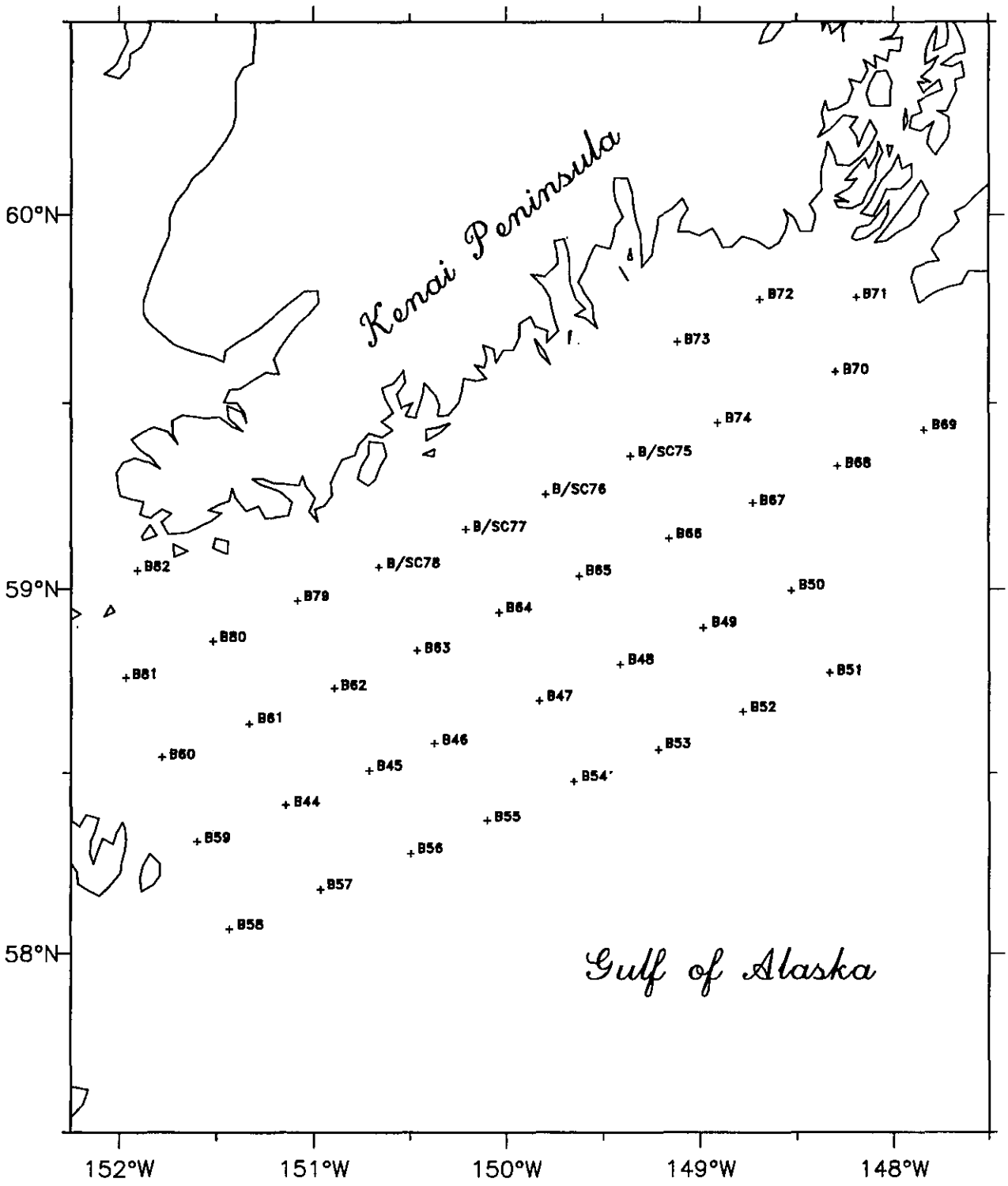


Fig. 1.2. MF-91-03 bongo stations - GRID II.

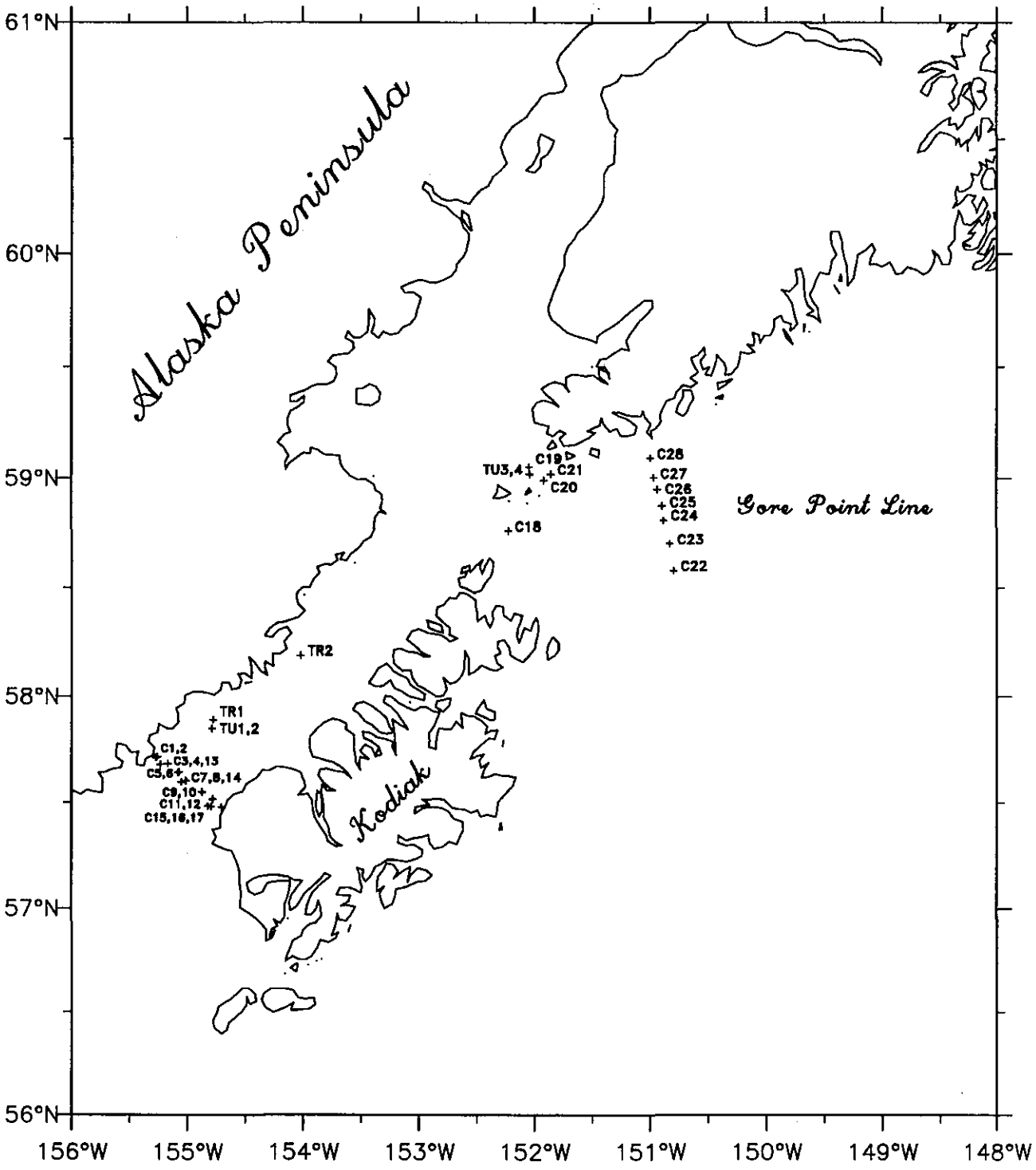


Fig. 1.3. MF-91-03 CTD (C), trawl (TR), and Tucker (Tucker) stations.

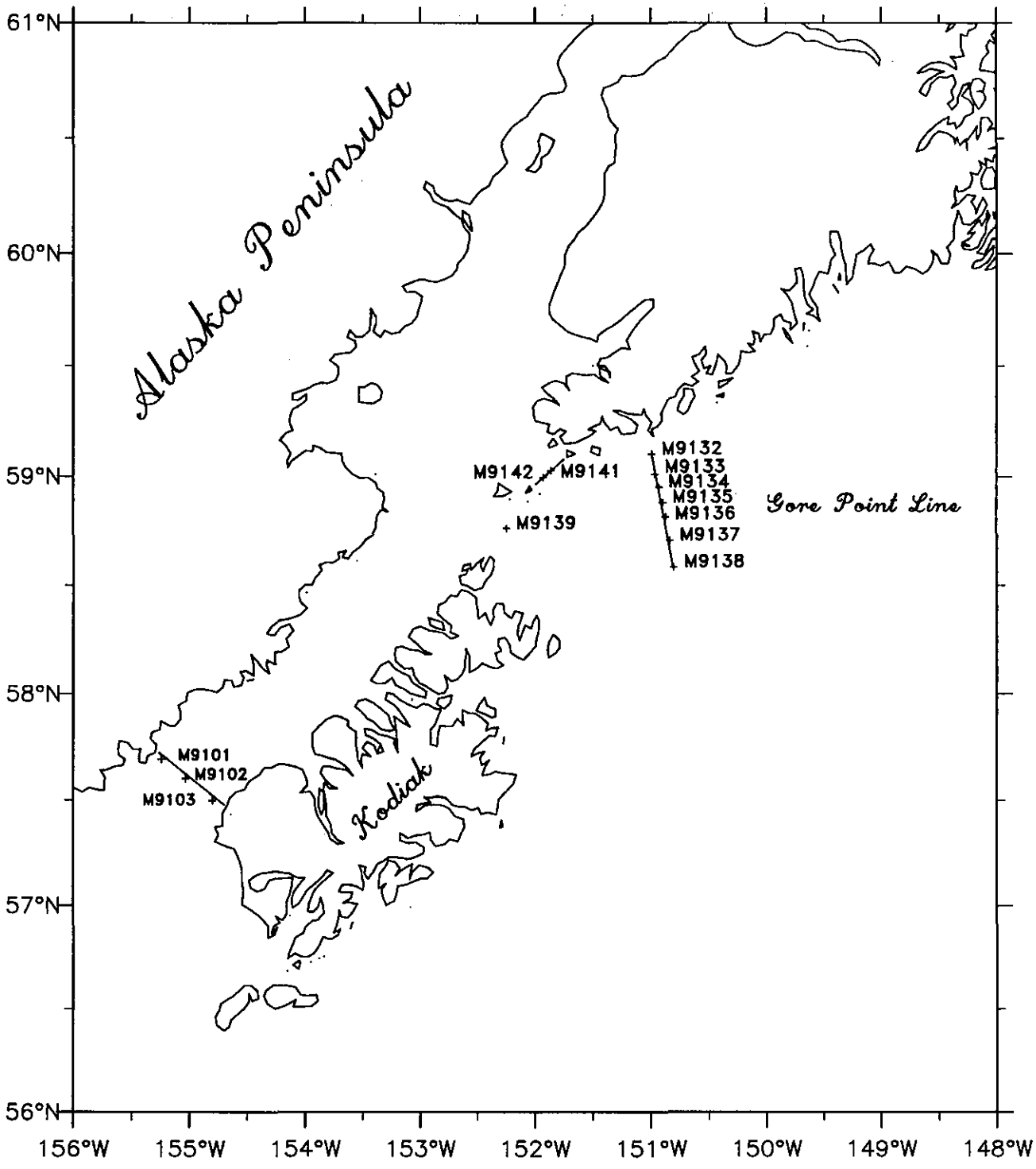


Fig. 1.4. MF-91-03 mooring (M) stations and ADCP transects (straight lines).

TABLE 3. MF-91-03 CRUISE SUMMARY

Larval Survey 1-13 APRIL 1991

Date (JD)	Date (GMT)	Time (GMT)	Cast No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
91	1-Apr	00:30			14	57° 42.9' N	152° 30.4' W	Depart Women's Bay
91	1-Apr	17:17			270	57° 53.5' N	154° 46.5' W	Fish trawl
91	1-Apr	21:26			20	57° 44.1' N	155° 31.7' W	Install stern pltfm
92	2-Apr	03:00			213			Weather/Puale Bay
92	2-Apr	17:30	001	FOX61	277	57° 42.7' N	155° 16.5' W	CTD, nutrients
92	2-Apr	18:55	G001A	FOX61	280	57° 43.1' N	155° 16.0' W	20/60 cm bongo
92	2-Apr	19:28	002	FOX61	243	57° 43.0' N	155° 15.6' W	CTD, MZ, Chl
92	2-Apr	21:09	003	FOX60	288	57° 41.0' N	155° 10.0' W	CTD, nutrients
92	2-Apr	23:03	G002A	FOX60	293	57° 41.4' N	155° 10.3' W	20/60 cm bongo
92	2-Apr	23:39	004	FOX60	290	57° 41.0' N	155° 10.0' W	CTD, MZ, Chl
93	3-Apr	00:53	005	FOX59	252	57° 38.7' N	155° 04.2' W	CTD, nutrients
93	3-Apr	01:41	G003A	FOX59	261	57° 38.8' N	155° 05.5' W	20/60 cm bongo
93	3-Apr	02:30	006	FOX59	256	57° 38.5' N	155° 04.9' W	CTD, MZ, Chl
93	3-Apr	03:39	007	FOX58	237	57° 36.2' N	155° 01.0' W	CTD, nutrients
93	3-Apr	04:35	G004A	FOX58	237	57° 36.4' N	155° 01.0' W	20/60 cm bongo
93	3-Apr	05:23	008	FOX58	237	57° 36.2' N	155° 00.5' W	CTD, MZ, Chl
93	3-Apr	06:51	009	FOX57	228	57° 32.8' N	154° 52.1' W	CTD, nutrients
93	3-Apr	07:35	G005A	FOX57	228	57° 33.4' N	154° 52.6' W	20/60 cm bongo
93	3-Apr	08:15	010	FOX57	228	57° 33.1' N	154° 52.4' W	CTD, MZ, Chl
93	3-Apr	09:23	011	FOX56	212	57° 30.9' N	154° 46.7' W	CTD, nutrients
93	3-Apr	10:03	G006A	FOX56	212	57° 31.0' N	154° 47.3' W	20/60 cm bongo
93	3-Apr	10:37	012	FOX56	210	57° 31.0' N	154° 46.6' W	CTD, MZ, Chl
93	3-Apr	12:00						Weathered out
94	4-Apr	03:37	G007A		237	57° 17.1' N	155° 08.3' W	60 cm bongo, Grid I
94	4-Apr	05:00	G008A		263	57° 23.0' N	155° 23.4' W	60 cm bongo, Grid I
94	4-Apr	06:22	G009A		288	57° 28.6' N	155° 38.7' W	60 cm bongo, Grid I
94	4-Apr	07:30	G010A		283	57° 32.9' N	155° 31.7' W	60 cm bongo, Grid I
94	4-Apr	09:10	G011A		261	57° 26.8' N	155° 17.0' W	60 cm bongo, Grid I
94	4-Apr	10:46	G012A		249	57° 20.6' N	155° 02.1' W	60 cm bongo, Grid I
94	4-Apr	11:49	G013A			57° 27.2' N	155° 02.4' W	60 cm bongo, Grid I
94	4-Apr	14:28	G014A		250	57° 30.1' N	155° 11.4' W	60 cm bongo, Grid I
94	4-Apr	19:30	9101		297	57° 41.3' N	155° 14.5' W	Deployed M9101
94	4-Apr	20:06	013		297	57° 40.9' N	155° 14.0' W	CTD at M9101
94	4-Apr	22:38	9102		237	57° 35.9' N	155° 02.1' W	Deployed M9102
94	4-Apr	23:03	014		244	57° 35.8' N	155° 02.9' W	CTD at M9102
95	5-Apr	01:31	9103		203	57° 29.7' N	154° 48.1' W	Deployed M9103
95	5-Apr	02:00	015		175	57° 28.9' N	154° 47.7' W	CTD at M9103
95	5-Apr	02:36	016		207	57° 29.0' N	154° 49.4' W	CTD at M9103
95	5-Apr	03:13	017	FOX55	62	57° 28.5' N	154° 42.3' W	CTD, Line 8
95	5-Apr	03:24		FOX55	65	57° 28.5' N	154° 42.0' W	Begin ADCP transect
95	5-Apr	05:22		FOX61	180	57° 43.2' N	155° 15.6' W	End ADCP transect

TABLE 3. MF-91-03 CRUISE SUMMARY

Larval Survey 1-13 APRIL 1991

Date (JD)	Date (GMT)	Time (GMT)	Cast No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
95	5-Apr	05:49	G015A		319	57° 39.0' N	155° 17.6' W	60 cm bongo, Grid I
95	5-Apr	06:49	G016A		201	57° 36.8' N	155° 24.7' W	60 cm bongo, Grid I
95	5-Apr	07:40	G017A		1021	57° 34.3' N	155° 18.4' W	60 cm bongo, Grid I
95	5-Apr	08:42	G018A		281	57° 37.1' N	155° 12.1' W	60 cm bongo, Grid I
95	5-Apr	09:38	G019A		247	57° 34.0' N	155° 05.8' W	60 cm bongo, Grid I
95	5-Apr	10:57	G020A		240	57° 41.0' N	154° 53.9' W	60 cm bongo, Grid I
95	5-Apr	11:50	G021A		287	57° 44.2' N	155° 00.6' W	60 cm bongo, Grid I
95	5-Apr	12:44	G022A		272	57° 46.6' N	155° 09.4' W	60 cm bongo, Grid I
95	5-Apr	13:56	G023A		237	57° 50.6' N	155° 00.3' W	60 cm bongo, Grid I
95	5-Apr	15:02	G024A		277	57° 47.1' N	154° 53.5' W	60 cm bongo, Grid I
95	5-Apr	15:51	G025A		237	57° 45.5' N	154° 46.7' W	60 cm bongo, Grid I
95	5-Apr	16:54	G026A		216	57° 41.2' N	154° 38.0' W	60 cm bongo, Grid I
95	5-Apr	17:56	G027A		231	57° 48.2' N	154° 40.4' W	60 cm bongo, Grid I
95	5-Apr	19:06	G028A		277	57° 51.0' N	154° 46.9' W	60 cm bongo, Grid I
95	5-Apr	20:06	P001A		277	57° 51.1' N	154° 47.1' W	Tucker trawl (day)
95	5-Apr	21:14	P001B		276	57° 51.0' N	154° 47.2' W	Tucker trawl (day)
95	5-Apr	22:09	G029A		98	57° 54.3' N	154° 53.1' W	60 cm bongo, Grid I
95	5-Apr	23:11	G030A		204	57° 56.4' N	154° 45.3' W	60 cm bongo, Grid I
95	5-Apr	23:58	G031A		263	57° 52.8' N	154° 38.1' W	60 cm bongo, Grid I
96	6-Apr	00:56	G032A		227	57° 50.0' N	154° 33.1' W	60 cm bongo, Grid I
96	6-Apr	01:54	G033A		211	57° 47.0' N	154° 27.0' W	60 cm bongo, Grid I
96	6-Apr	02:46	G034A		215	57° 51.2' N	154° 22.6' W	60 cm bongo, Grid I
96	6-Apr	03:34	G035A		241	57° 54.2' N	154° 28.6' W	60 cm bongo, Grid I
96	6-Apr	04:21	G036A		333	57° 57.1' N	154° 36.2' W	60 cm bongo, Grid I
96	6-Apr	05:25	G037A		96	58° 00.7' N	154° 26.4' W	60 cm bongo, Grid I
96	6-Apr	06:18	G038A		221	57° 46.8' N	154° 18.2' W	60 cm bongo, Grid I
96	6-Apr	07:16	G039A		201	57° 53.1' N	154° 10.2' W	60 cm bongo, Grid I
96	6-Apr	08:30	G040A		196	57° 57.0' N	153° 54.3' W	60 cm bongo, Grid I
96	6-Apr	09:23	G041A		203	58° 00.9' N	154° 03.3' W	60 cm bongo, Grid I
96	6-Apr	10:18	G042A		276	58° 04.4' N	154° 12.9' W	60 cm bongo, Grid I
96	6-Apr	12:14	G043A		281	58° 16.3' N	153° 55.7' W	60 cm bongo, Grid I
96	6-Apr	19:28	9139		121	58° 45.9' N	152° 14.8' W	Deployed M9139
96	6-Apr	19:52	018		116	58° 45.7' N	152° 13.8' W	CTD at M9139
96	6-Apr	22:29	019		192	59° 03.1' N	152° 02.8' W	CTD at M9031
97	7-Apr	00:30	9031			59° 03.4' N	152° 03.7' W	Search for M9031
97	7-Apr	03:52	9141		192	59° 01.6' N	151° 51.7' W	Deployed M9141
97	7-Apr	04:44	9142		192	58° 59.7' N	151° 55.7' W	Deployed M9142
97	7-Apr	05:12	020		188	58° 59.4' N	151° 55.0' W	CTD at M9142
97	7-Apr	06:00	021		178	59° 01.1' N	151° 51.5' W	CTD at M9141
97	7-Apr	06:43		Kennedy	57	58° 57.9' N	151° 59.5' W	Begin ADCP transect
97	7-Apr	07:39		Kennedy	64	59° 04.7' N	151° 44.9' W	End ADCP transect

TABLE 3. MF-91-03 CRUISE SUMMARY

Larval Survey 1-13 APRIL 1991

Date (JD)	Date (GMT)	Time (GMT)	Cast No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
97	7-Apr	17:29	9132		152	59° 06.1' N	150° 59.6' W	Deploy M9132
97	7-Apr	19:25	9133		158	59° 00.6' N	150° 57.9' W	Deploy M9133
97	7-Apr	21:23	9134		141	58° 57.1' N	150° 55.9' W	Deploy M9134
97	7-Apr	22:53	9135		147	58° 53.0' N	150° 54.0' W	Deploy M9135
98	8-Apr	00:06	9136		185	58° 49.0' N	150° 52.6' W	Deploy M9136
98	8-Apr	01:59	9137		183	58° 42.7' N	150° 50.3' W	Deploy M9137
98	8-Apr	03:55	9138		179	58° 35.3' N	150° 48.1' W	Deploy M9138
98	8-Apr	04:21	022		171	58° 34.7' N	150° 48.0' W	CTD at M9138
98	8-Apr	05:19	023		194	58° 42.0' N	150° 50.0' W	CTD at M9137
98	8-Apr	06:18	024		179	58° 48.4' N	150° 52.8' W	CTD at M9136
98	8-Apr	06:59	025		163	58° 52.3' N	150° 53.6' W	CTD at M9135
98	8-Apr	07:40	026		151	58° 56.8' N	150° 56.0' W	CTD at M9134
98	8-Apr	08:24	027		168	59° 00.2' N	150° 58.0' W	CTD at M9133
98	8-Apr	09:14	028		192	59° 05.6' N	150° 59.7' W	CTD at M9132
98	8-Apr	09:41		Gore Pt.	154	59° 06.1' N	150° 59.6' W	Begin ADCP transect
98	8-Apr	12:28		Gore Pt.	175	58° 34.9' N	150° 48.3' W	End ADCP transect
98	8-Apr	14:12	G044A		107	58° 24.7' N	151° 08.7' W	60 cm bongo, Grid II
98	8-Apr	16:21	G045A		107	58° 30.4' N	150° 42.8' W	60 cm bongo, Grid II
98	8-Apr	18:31	G046A		122	58° 34.9' N	150° 22.4' W	60 cm bongo, Grid II
98	8-Apr	20:24	G047A		164	58° 41.9' N	149° 49.8' W	60 cm bongo, Grid II
98	8-Apr	22:13	G048A		184	58° 47.8' N	149° 24.7' W	60 cm bongo, Grid II
99	9-Apr	00:00	G049A			58° 53.7' N	148° 59.0' W	60 cm bongo, Grid II
99	9-Apr	01:58	G050A		240	58° 59.8' N	148° 31.8' W	60 cm bongo, Grid II
99	9-Apr	03:50	G051A		275	58° 46.4' N	148° 20.0' W	60 cm bongo, Grid II
99	9-Apr	04:45			271	58° 40.0' N	148° 20.5' W	Begin ADCP calbn
99	9-Apr	06:40			259	58° 39.3' N	148° 21.7' W	End ADCP calbn
99	9-Apr	08:02	G052A		188	58° 40.1' N	148° 46.9' W	60 cm bongo, Grid II
99	9-Apr	09:52	G053A		100	58° 33.9' N	149° 13.0' W	60 cm bongo, Grid II
99	9-Apr	11:34	G054A		143	58° 28.5' N	149° 39.1' W	60 cm bongo, Grid II
99	9-Apr	13:17	G055A					60 cm bongo, Grid II
99	9-Apr	14:50	G056A		56	58° 16.5' N	150° 29.8' W	60 cm bongo, Grid II
99	9-Apr	16:27	G057A		148	58° 10.6' N	150° 57.9' W	60 cm bongo, Grid II
99	9-Apr	18:26	G058A		125	58° 04.1' N	151° 26.0' W	60 cm bongo, Grid II
99	9-Apr	20:17	G059A		76	58° 18.6' N	151° 35.9' W	60 cm bongo, Grid II
99	9-Apr	21:52	G060A		158	58° 32.6' N	151° 46.7' W	60 cm bongo, Grid II
99	9-Apr	23:33	G061A		190	58° 38.1' N	151° 20.1' W	60 cm bongo, Grid II
100	10-Apr	01:18	G062A		177	58° 43.9' N	150° 53.7' W	60 cm bongo, Grid II
100	10-Apr	03:00	G063A		151	58° 50.1' N	150° 27.7' W	60 cm bongo, Grid II
100	10-Apr	04:39	G064A		222	58° 56.2' N	150° 02.4' W	60 cm bongo, Grid II
100	10-Apr	06:24	G065A		226	59° 02.1' N	149° 37.5' W	60 cm bongo, Grid II
100	10-Apr	08:08	G066A		153	59° 08.2' N	149° 09.7' W	60 cm bongo, Grid II

TABLE 3. MF-91-03 CRUISE SUMMARY

Larval Survey 1-13 APRIL 1991

Date (JD)	Date (GMT)	Time (GMT)	Cast No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
100	10-Apr	09:39	G067A		149	59° 14.0' N	148° 43.8' W	60 cm bongo, Grid II
100	10-Apr	11:02	G068A		106	59° 19.9' N	148° 17.6' W	60 cm bongo, Grid II
100	10-Apr	12:28	G069A		151	59° 25.6' N	147° 50.6' W	60 cm bongo, Grid II
100	10-Apr	14:13	G070A		194	59° 35.0' N	148° 18.1' W	60 cm bongo, Grid II
100	10-Apr	15:35	G071A			59° 46.9' N	148° 11.8' W	60 cm bongo, Grid II
100	10-Apr	17:17	G072A		177	59° 46.5' N	148° 41.6' W	60 cm bongo, Grid II
100	10-Apr	18:54	G073A		206	59° 39.9' N	149° 07.1' W	60 cm bongo, Grid II
100	10-Apr	20:34	G074A		187	59° 26.9' N	148° 54.9' W	60 cm bongo, Grid II
100	10-Apr	22:04	G075A		129	59° 21.5' N	149° 21.7' W	60 cm bongo/Seacat
100	10-Apr	23:35	G076A		195	59° 15.4' N	149° 47.8' W	60 cm bongo/Seacat
101	11-Apr	01:09	G077A		128	59° 09.8' N	150° 12.5' W	60 cm bongo/Seacat
101	11-Apr	02:46	G078A		118	59° 03.6' N	150° 39.9' W	60 cm bongo/Seacat
101	11-Apr	04:15	G079A		172	58° 58.0' N	151° 05.1' W	60 cm bongo, Grid II
101	11-Apr	05:51	G080A		128	58° 51.5' N	151° 31.0' W	60 cm bongo, Grid II
101	11-Apr	07:23	G081A		119	58° 45.7' N	151° 58.1' W	60 cm bongo, Grid II
101	11-Apr	09:06	G082A		215	59° 03.0' N	151° 54.5' W	60 cm bongo, Grid II
101	11-Apr	10:30	P002A		208	59° 01.2' N	152° 02.5' W	Tucker trawl
101	11-Apr	11:22	P002B		206	59° 01.0' N	152° 02.3' W	Tucker trawl
101	11-Apr	12:05	9031		198	59° 01.9' N	152° 00.3' W	Search for M9031
102	12-Apr	00:33			25	58° 19.5' N	154° 03.9' W	Remove stern pltfm
102	12-Apr	03:56			281	58° 11.3' N	154° 01.3' W	Fish trawl
102	12-Apr	05:40	G083A		283	58° 11.4' N	154° 01.1' W	60 cm bongo, Grid I
102	12-Apr	07:35	G084A		225	58° 07.6' N	153° 29.8' W	60 cm bongo, Grid I
102	12-Apr	09:21	G085A		189	58° 20.2' N	153° 12.2' W	60 cm bongo, Grid I
102	12-Apr	11:02	G086A		134	58° 27.9' N	153° 36.5' W	60 cm bongo, Grid I
102	12-Apr	12:50	G087A		107	58° 40.1' N	153° 16.3' W	60 cm bongo, Grid I
102	12-Apr	14:32	G088A		207	58° 31.8' N	152° 51.9' W	60 cm bongo, Grid I
102	12-Apr	16:22	G089A		174	58° 00.0' N	152° 32.9' W	60 cm bongo, Grid I
102	12-Apr	17:44			179	58° 47.6' N	152° 42.5' W	Hydraulic leak
103	13-Apr	00:55	G090A		163	58° 51.9' N	152° 56.7' W	60 cm bongo, Grid I
103	13-Apr	03:26			135	59° 01.8' N	152° 11.7' W	Search for M9031
103	13-Apr	05:46		Kennedy	147	58° 58.2' N	151° 59.2' W	Begin ADCP transect
103	13-Apr	06:32		Kennedy	201	59° 03.2' N	151° 48.2' W	End ADCP transect
103	13-Apr	14:00				59° 30.1' N	151° 47.1' W	Arrive Homer

MF-91-04 (FOCI-91-02): 15 April–28 April, 1991

SCIENTIFIC PERSONNEL

Name	Title	Organization
Art Kendall	Chief Scientist	AFSC/NOAA
Carol DeWitt	Field Operations Specialist	PMEL/NOAA
Allen Macklin	Meteorologist	PMEL/NOAA
Jeff Napp	Oceanographer	AFSC/NOAA
Debbie Siefert	Fisheries Biologist	AFSC/NOAA
Stella Spring	Fisheries Biologist	AFSC/NOAA

CRUISE STATISTICS

Plankton Tows	157
Mooring Deployments	2
Mooring Recoveries	1
Satellite Tracked Buoy Deployment	1
CTD Casts	47
Benthic Sled Tucker Trawls	2
Specimens Collected:	
Chlorophyll Samples	125
Nutrient Samples	125
Microzooplankton Samples	150
Plankton Samples	276

OBJECTIVES

The objectives of MF-91-04 (FOCI-91-02) were to:

- continue acquisition of long-term biological and physical time series
- conduct an ichthyoplankton survey in the Western Gulf of Alaska to determine the horizontal patterns of distribution and abundance of walleye pollock eggs and locate the area of maximum concentration
- conduct copepod rearing and egg production studies
- deploy current meter moorings
- deploy a satellite tracked buoy and collect samples for condition analysis in the area of highest concentration of first-feeding larvae
- investigate vertebrate and invertebrate predation on pollock eggs

CRUISE REPORT

After sailing at 1500 ADT on 15 April, 1991, we searched for a lost mooring in Kennedy Entrance for about 6 hours without finding it. We then sailed along the Alaska Peninsula side of Shelikof Strait to FOCI Line 8 where we conducted CTDs and zooplankton sampling. Not as many pollock eggs as expected were seen in the bongo samples. Low temperatures were found on Line 8 near the bottom on peninsula side and out to the middle of the strait, warmer temperatures (up to 4.7°C) were seen on the Kodiak side. We then ran an ADCP transect along Line 8 from the Kodiak Island side to the peninsula side of the strait and then went northeast for pollock egg predator tows. Night and day Tucker, bongo, and live tows were made, but few eggs were found (nevertheless, this is considered the in-patch Tucker series). This was followed by a bongo survey of the major spawning area in Shelikof Strait. Live tows were made on occasion for copepod egg production work. Egg concentration estimates showed the distribution to be quite similar to that seen on the last cruise, except a little to the northeast, and there were far fewer eggs. After finishing this survey, we returned to near Line 8 at Station 58 and did a sled, a Tucker predator and a bongo tow. We had considerable trouble with the winch used for the sled, but eventually retrieved samples. From there we returned to the southwest to run a more open grid of bongo stations including sampling the shelf southwest of the Trinity Islands. An

ADCP "L" track was performed once during this survey. The starboard winch developed problems and was declared unusable. A daytime and nighttime Tucker series was conducted east of Sutwik Island, and a mooring was recovered between Sutwik and the Semidi Islands. After completing this bongo survey, a mooring was deployed off Mitrofania Island. We next sampled along FOCI Lines 17 and 16. We then ran ADCP tracks during our transit to the lower part of Shelikof Strait where we repeated the Shelikof Strait bongo grid from south to north. Low numbers of small larvae and eggs of pollock were found in the tows. Largest numbers were seen on the Kodiak Island side of the strait, but no clear pattern developed. We established three stations on the peninsula side (clear water) and three stations on the Kodiak side (green water) of the strait to do tows for larval feeding condition and microzooplankton. We did a sled tow and set a satellite tracked drifter at northernmost station on the Kodiak Island side of the strait where fairly heavy concentrations of eggs and larvae had been seen. We completed sampling by taking a few bongo tows just south of the repeat grid.

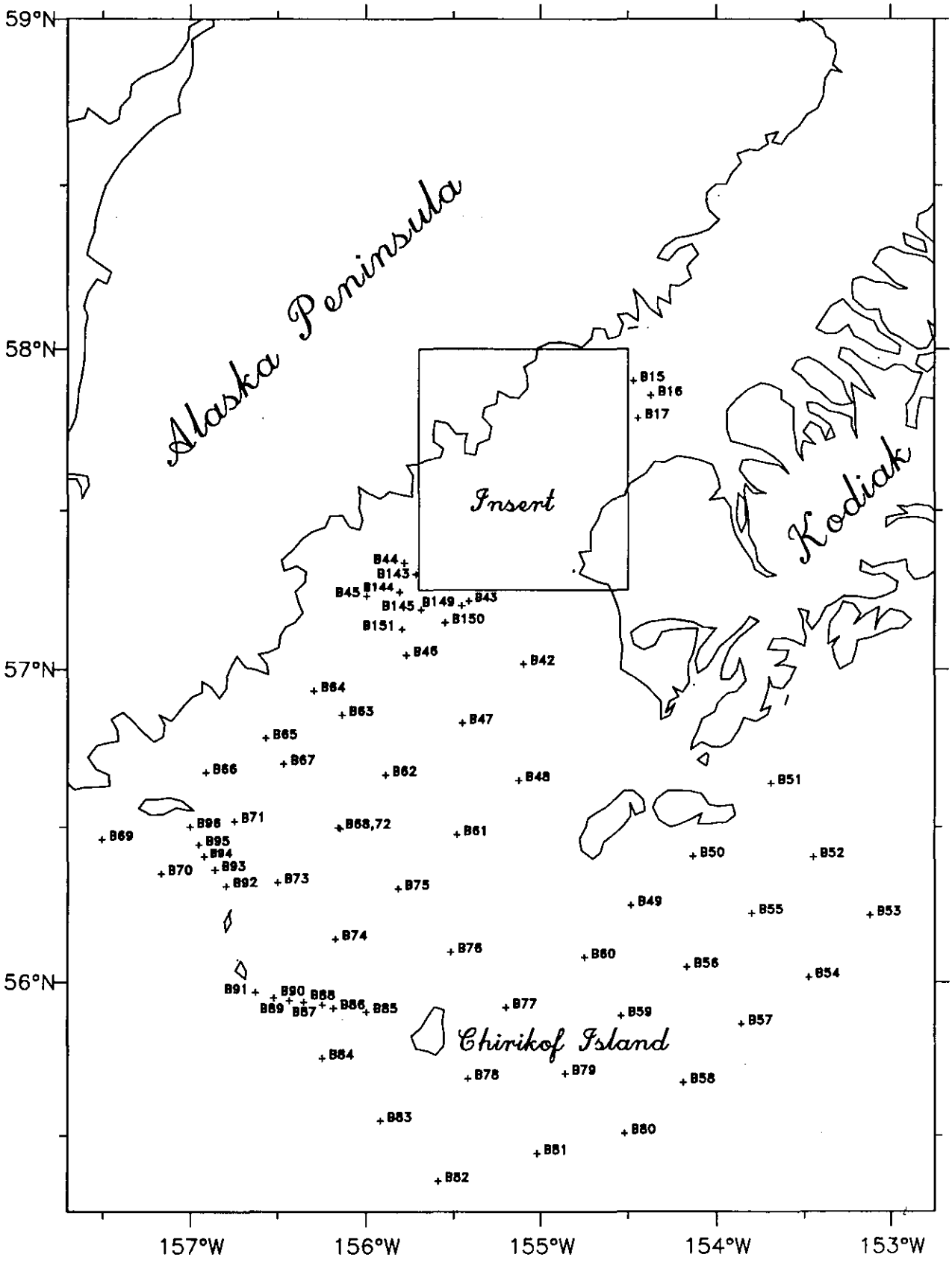


Fig. 2.1. MF-91-04 bongo stations.

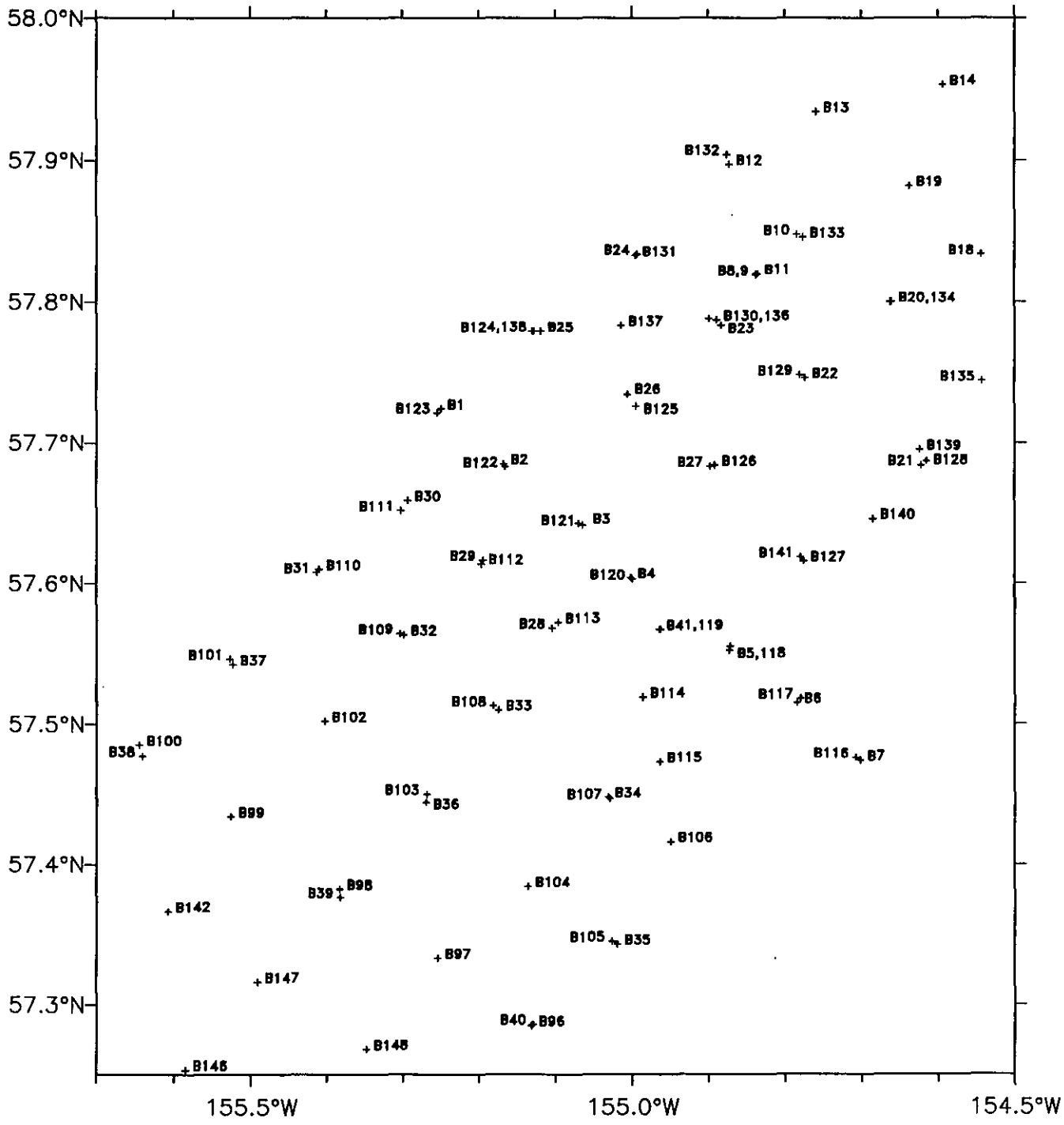


Fig. 2.2. MF-91-04 bongo insert.

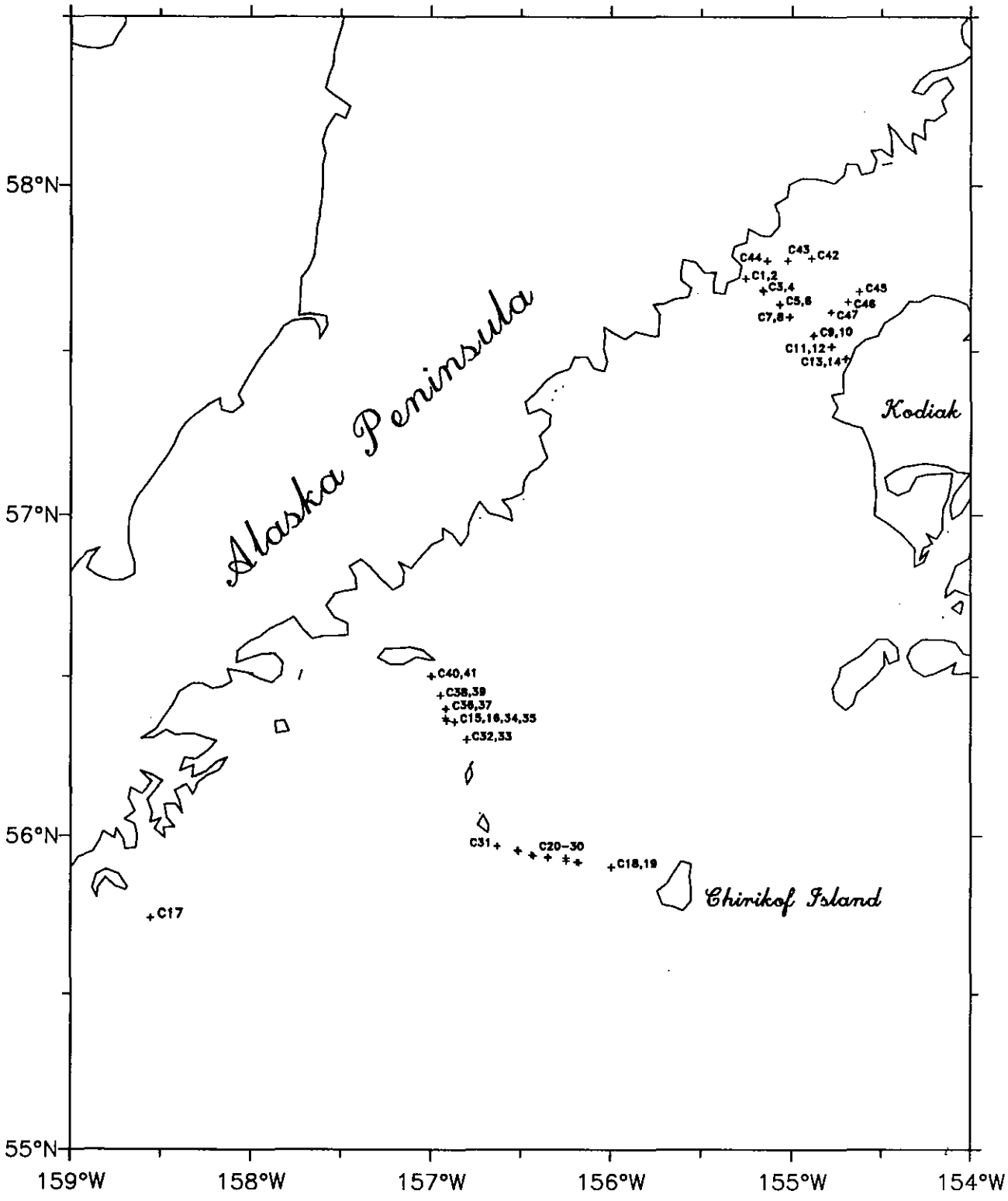


Fig. 2.3. MF-91-04 CTD stations.

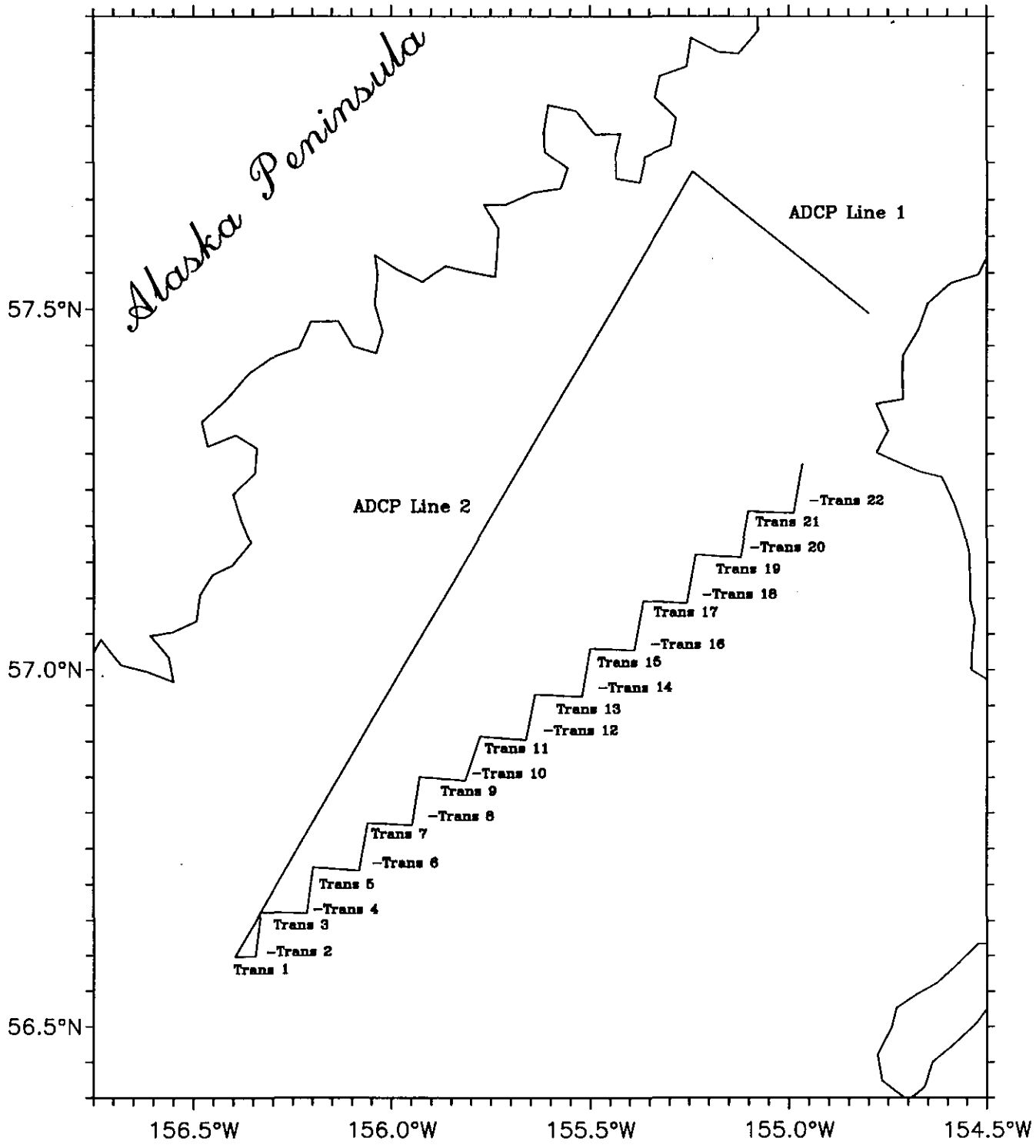


Fig. 2.4. MF-91-04 ADCP transects.

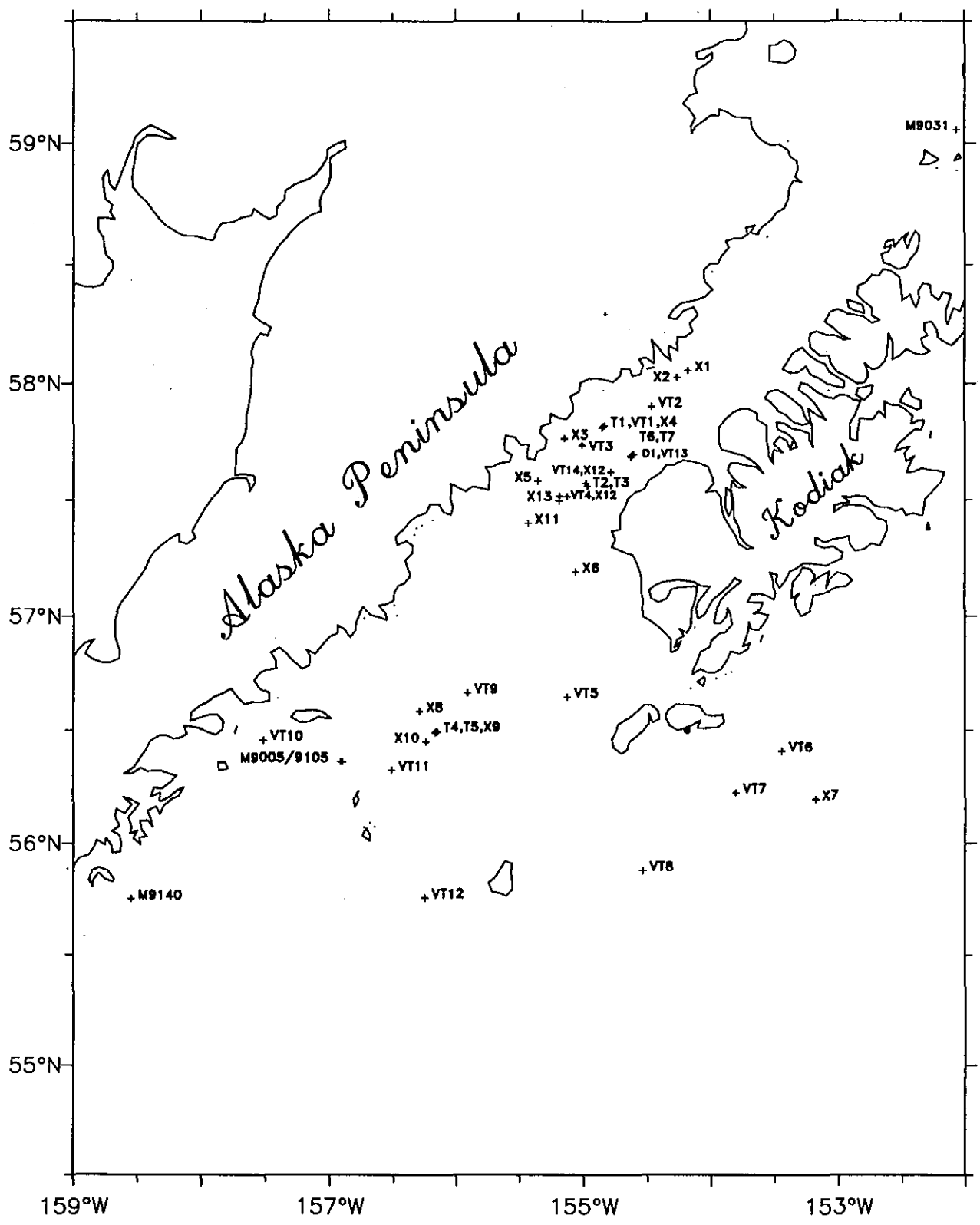


Fig. 2.5. MF-91-04 drifter (D), mooring (M), Tucker (T), vertical tow (VT) and XBT (X) stations.

TABLE 4. MF-91-04 CRUISE SUMMARY

Egg Survey 15-28 APRIL 1991

Date (JD)	Date (GMT)	Time (GMT)	Cast No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
105	15-Apr	23:00				59° 30.1' N	151° 47.1' W	Depart Homer
105	15-Apr	23:30			115	59° 34.7' N	151° 24.5' W	Lowered centerboard
106	16-Apr	03:53		9031	179	59° 03.3' N	152° 03.9' W	Search for M9031
106	16-Apr	16:51			270	58° 03.3' N	154° 10.7' W	XBT #11 (aborted)
106	16-Apr	17:06			250	58° 01.6' N	154° 15.8' W	XBT #12
106	16-Apr	20:03	001	FOX61	161	57° 43.3' N	155° 15.6' W	CTD, Nuts
106	16-Apr	20:46	G001A	FOX61	216	57° 43.4' N	155° 15.0' W	Bongo
106	16-Apr	21:14	002	FOX61	187	57° 43.3' N	155° 15.4' W	CTD, MZ, CHL
106	16-Apr	22:23	003	FOX60	290	57° 41.2' N	155° 10.0' W	CTD, Nuts
106	16-Apr	23:00	G002A	FOX60	291	57° 41.1' N	155° 10.1' W	Bongo
106	16-Apr	23:40	004	FOX60	288	57° 40.9' N	155° 09.6' W	CTD, MZ, CHL
107	17-Apr	00:37	005	FOX59	256	57° 38.6' N	155° 04.2' W	CTD, Nuts
107	17-Apr	00:59	G003A	FOX59	256	57° 38.6' N	155° 04.2' W	Bongo
107	17-Apr	01:27	006	FOX59	255	57° 38.4' N	155° 04.2' W	CTD, MZ, CHL
107	17-Apr	02:11	007	FOX58	236	57° 36.2' N	155° 01.1' W	CTD, Nuts
107	17-Apr	02:44	G004A	FOX58	236	57° 36.3' N	155° 00.1' W	Bongo
107	17-Apr	03:13	008	FOX58	238	57° 36.3' N	155° 00.9' W	CTD, MZ, CHL
107	17-Apr	04:08	009	FOX57	229	57° 32.9' N	154° 52.7' W	CTD, Nuts
107	17-Apr	04:46	G005A	FOX57	229	57° 33.3' N	154° 52.3' W	Bongo
107	17-Apr	05:25	010	FOX57	228	57° 32.8' N	154° 53.0' W	CTD, MZ, CHL
107	17-Apr	06:06	011	FOX56	205	57° 30.8' N	154° 47.1' W	CTD, Nuts
107	17-Apr	06:33	G006A	FOX56	210	57° 30.9' N	154° 47.1' W	Bongo
107	17-Apr	07:16	G006A	FOX56	210	57° 31.0' N	154° 47.2' W	Bongo
107	17-Apr	07:43	012	FOX56	208	57° 30.9' N	154° 46.8' W	CTD, MZ, CHL
107	17-Apr	08:31	013	FOX55	58	57° 28.8' N	154° 41.9' W	CTD, Nuts
107	17-Apr	08:58	G007A	FOX55	57	57° 28.4' N	154° 42.1' W	Bongo
107	17-Apr	09:14	014	FOX55	64	57° 28.7' N	154° 42.3' W	CTD, MZ, CHL
107	17-Apr	09:47		Line 8	208	57° 29.7' N	154° 48.0' W	Begin ADCP transect
107	17-Apr	11:38		Line 8	248	57° 41.3' N	155° 14.5' W	End ADCP transect
107	17-Apr	12:23			316	57° 46.0' N	155° 08.8' W	XBT
107	17-Apr	13:18	G008A	A	279	57° 49.2' N	154° 50.3' W	Bongo
107	17-Apr	14:30	G009A	A	277	57° 49.2' N	154° 50.3' W	Bongo
107	17-Apr	15:49	S009A	A	275	57° 48.9' N	154° 51.0' W	Vertical Tow
107	17-Apr	16:06			277	57° 48.7' N	154° 51.5' W	XBT
107	17-Apr	16:44	G010A		275	57° 50.9' N	154° 47.1' W	Bongo
107	17-Apr	17:48	G011A		272	57° 49.2' N	154° 50.2' W	Tucker
107	17-Apr	18:58	G012A		202	57° 53.8' N	154° 52.4' W	Bongo
107	17-Apr	19:53	G013A	10	218	57° 56.0' N	154° 45.6' W	Bongo
107	17-Apr	20:47	G014A	7	230	57° 57.2' N	154° 35.6' W	Bongo
107	17-Apr	21:34	G015A	8	236	57° 54.1' N	154° 28.2' W	Bongo
107	17-Apr	22:02	S015A	8	236	57° 54.1' N	154° 27.9' W	Vertical Tow

TABLE 4. MF-91-04 CRUISE SUMMARY

Egg Survey 15-28 APRIL 1991

Date (JD)	Date (GMT)	Time (GMT)	Cast No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
107	17-Apr	23:00	G016A	9	214	57° 51.4' N	154° 22.2' W	Bongo
107	17-Apr	23:55	G017A	13	212	57° 47.2' N	154° 26.6' W	Bongo
108	18-Apr	00:47	G018A	12	228	57° 50.1' N	154° 32.6' W	Bongo
108	18-Apr	01:40	G019A	11	264	57° 52.9' N	154° 38.3' W	Bongo
108	18-Apr	02:32	G020A	16	232	57° 48.0' N	154° 39.7' W	Bongo
108	18-Apr	03:34	G021A	20	214	57° 41.0' N	154° 37.4' W	Bongo
108	18-Apr	04:36	G022A	19	234	57° 44.7' N	154° 46.4' W	Bongo
108	18-Apr	05:26	G023A	18	270	57° 47.0' N	154° 53.0' W	Bongo
108	18-Apr	06:22	G024A	17	230	57° 50.1' N	154° 59.6' W	Bongo
108	18-Apr	07:15	G025A	21	264	57° 46.7' N	155° 07.2' W	Bongo
108	18-Apr	08:06	G026A	22	276	57° 44.0' N	155° 00.4' W	Bongo
108	18-Apr	08:36	S026A	22	280	57° 44.2' N	155° 00.6' W	Vertical Tow
108	18-Apr	09:21	G027A	23	233	57° 41.0' N	154° 53.9' W	Bongo
108	18-Apr	10:37	G028A	33	244	57° 34.1' N	155° 06.3' W	Bongo
108	18-Apr	11:30	G029A	32	276	57° 37.0' N	155° 11.7' W	Bongo
108	18-Apr	12:24	G030A	31	317	57° 39.5' N	155° 17.6' W	Bongo
108	18-Apr	13:23	G031A	34	321	57° 36.5' N	155° 24.8' W	Bongo
108	18-Apr	13:52			312	57° 34.9' N	155° 21.0' W	XBT
108	18-Apr	14:12	G032A	35	287	57° 33.8' N	155° 17.9' W	Bongo
108	18-Apr	15:06	G033A	36	247	57° 30.6' N	155° 10.5' W	Bongo
108	18-Apr	15:42	S033A	36	251	57° 31.1' N	155° 11.1' W	Vertical Tow
108	18-Apr	16:30	G034A	37	232	57° 26.9' N	155° 01.9' W	Bongo
108	18-Apr	17:32	G035A	40	234	57° 20.6' N	155° 01.2' W	Bongo
108	18-Apr	19:01	G036A	39	250	57° 26.6' N	155° 16.2' W	Bongo
108	18-Apr	20:23	G037A	38	289	57° 32.5' N	155° 31.4' W	Bongo
108	18-Apr	21:18	G038A	41	284	57° 28.6' N	155° 38.4' W	Bongo
108	18-Apr	22:42	G039A	42	260	57° 22.5' N	155° 22.9' W	Bongo
108	18-Apr	23:56	G040A	43	237	57° 17.1' N	155° 07.8' W	Bongo
109	19-Apr	04:04	S041A	58	231	57° 34.4' N	154° 58.7' W	Tucker Sled
109	19-Apr	06:08	S041B	58	230	57° 33.6' N	154° 58.0' W	Tucker
109	19-Apr	06:58	G041A	58	230	57° 34.0' N	154° 57.9' W	Bongo
109	19-Apr	09:21			216	57° 11.6' N	155° 03.5' W	XBT
109	19-Apr	10:34	G042A	101	209	57° 01.0' N	155° 05.8' W	Bongo
109	19-Apr	12:33	G043A	102	258	57° 12.9' N	155° 24.8' W	Bongo
109	19-Apr	14:29	G044A	103A	258	57° 20.2' N	155° 46.9' W	Bongo
109	19-Apr	16:27	G045A	104	179	57° 13.8' N	155° 59.7' W	Bongo
109	19-Apr	18:06	G046A	105	288	57° 02.7' N	155° 46.1' W	Bongo
109	19-Apr	20:13	G047A	106	250	56° 49.8' N	155° 27.1' W	Bongo
109	19-Apr	20:39			252	56° 48.9' N	155° 29.3' W	ADCP Backtrack-L
110	20-Apr	00:06	G048A	107	48	56° 38.8' N	155° 07.6' W	Bongo
110	20-Apr	00:20	S048A	107	48	56° 38.8' N	155° 07.6' W	Vertical Tow

TABLE 4. MF-91-04 CRUISE SUMMARY

Egg Survey 15-28 APRIL 1991

Date (JD)	Date (GMT)	Time (GMT)	Cast No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
110	20-Apr	04:41	G049A	109	92	56° 14.8' N	154° 29.1' W	Bongo
110	20-Apr	06:20	G050A		46	56° 24.3' N	154° 07.9' W	Bongo
110	20-Apr	08:44	G051A	115	86	56° 38.3' N	153° 41.5' W	Bongo
110	20-Apr	10:33	G052A	116	62	56° 24.1' N	153° 26.9' W	Bongo
110	20-Apr	10:55	S052A	116	62	56° 24.5' N	153° 26.5' W	Vertical Tow
110	20-Apr	12:42	G053A	117	1134	56° 12.9' N	153° 07.4' W	Bongo
110	20-Apr	13:14			1258	56° 11.7' N	153° 10.7' W	XBT
110	20-Apr	14:47	G054A	112	382	56° 00.9' N	153° 28.5' W	Bongo
110	20-Apr	16:51	G055A	113	110	56° 13.3' N	153° 48.1' W	Bongo
110	20-Apr	17:15	S055A	113	111	56° 13.4' N	153° 48.1' W	Vertical tow
110	20-Apr	19:10	G056A	110	134	56° 02.9' N	154° 10.1' W	Bongo
110	20-Apr	21:03	G057A	111	1081	55° 51.8' N	153° 51.5' W	Bongo
110	20-Apr	23:00	G058A	118	890	55° 40.4' N	154° 11.4' W	Bongo
111	21-Apr	02:05	G059A	119	881	55° 53.4' N	154° 32.4' W	Bongo
111	21-Apr	02:43	S059A	119	890	55° 52.7' N	154° 32.3' W	Vertical tow
111	21-Apr	04:20	G060A	120	135	56° 04.7' N	154° 45.1' W	Bongo
111	21-Apr	07:42	G061A	122	55	56° 28.4' N	155° 28.9' W	Bongo
111	21-Apr	09:28	G062A	123	280	56° 39.9' N	155° 53.4' W	Bongo
111	21-Apr	10:09	S062A	123	282	56° 39.8' N	155° 54.5' W	Vertical tow
111	21-Apr	11:32	G063A	124	240	56° 51.4' N	156° 08.2' W	Bongo
111	21-Apr	12:39	G064A	126	163	56° 55.9' N	156° 17.8' W	Bongo
111	21-Apr	14:01	G065A	127	107	56° 46.8' N	156° 34.1' W	Bongo
111	21-Apr	15:26	G066A	141	107	56° 40.3' N	156° 54.7' W	Bongo
111	21-Apr	17:02	G067A	128	197	56° 41.9' N	156° 27.9' W	Bongo
111	21-Apr	18:06			219	56° 35.1' N	156° 17.3' W	XBT
111	21-Apr	18:50	G068A	129	280	56° 29.8' N	156° 09.4' W	Bongo
111	21-Apr	19:45	S068A	129	279	56° 29.8' N	156° 09.2' W	Tucker
111	21-Apr	20:00		129	278	56° 29.5' N	156° 09.7' W	XBT
111	21-Apr	22:35	015	M9005	130	56° 21.8' N	156° 54.8' W	CTD
111	21-Apr	23:08		M9005	121	56° 21.7' N	156° 53.8' W	Recovered M9005
112	22-Apr	02:27		M9105	126	56° 21.8' N	156° 54.6' W	Deployed M9105
112	22-Apr	02:47	016	M9105	130	56° 22.4' N	156° 55.2' W	CTD
112	22-Apr	04:54	G069A		98	56° 27.5' N	157° 30.3' W	Bongo
112	22-Apr	05:15	S069A		97	56° 27.4' N	157° 30.8' W	Vertical tow
112	22-Apr	06:46	G070A		175	56° 20.9' N	157° 10.3' W	Bongo
112	22-Apr	08:38	G071A		138	56° 31.0' N	156° 44.9' W	Bongo
112	22-Apr	10:45	S072A	129	280	56° 29.7' N	156° 08.8' W	Tucker
112	22-Apr	11:41	G072A	129	278	56° 29.6' N	156° 08.7' W	Bongo
112	22-Apr	12:28			272	56° 26.9' N	156° 14.1' W	XBT
112	22-Apr	13:34	G073A	139	218	56° 19.2' N	156° 30.2' W	Bongo
112	22-Apr	14:10	S073A	139	213	56° 19.5' N	156° 30.5' W	Vertical tow

TABLE 4. MF-91-04 CRUISE SUMMARY

Egg Survey 15-28 APRIL 1991

Date (JD)	Date (GMT)	Time (GMT)	Cast No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
112	22-Apr	15:55	G074A	138	238	56° 08.3' N	156° 10.4' W	Bongo
112	22-Apr	17:29	G075A	130	83	56° 18.0' N	155° 49.2' W	Bongo
112	22-Apr	19:00	G076A	131	39	56° 05.8' N	155° 31.0' W	Bongo
112	22-Apr	20:17	G077A	132	48	55° 55.0' N	155° 12.0' W	Bongo
112	22-Apr	21:46	G078A	136	160	55° 41.2' N	155° 25.3' W	Bongo
113	23-Apr	00:01	G079A	133	928	55° 42.1' N	154° 51.8' W	Bongo
113	23-Apr	02:48	G080A	134	878	55° 30.4' N	154° 31.4' W	Bongo
113	23-Apr	04:49	G081A	135A	981	55° 26.5' N	155° 01.5' W	Bongo
113	23-Apr	07:06	G082A	148	1350	55° 21.0' N	155° 35.4' W	Bongo
113	23-Apr	08:54	G083A	147	207	55° 33.0' N	155° 55.1' W	Bongo
113	23-Apr	10:40	G084A	146	244	55° 45.1' N	156° 14.9' W	Bongo
113	23-Apr	11:12	S084A	146	243	55° 45.4' N	156° 14.8' W	Vertical tow
113	23-Apr	19:33	M9140		88	55° 45.0' N	158° 32.9' W	Deployed M9140
113	23-Apr	20:01	017		97	55° 44.4' N	158° 33.2' W	CTD
114	24-Apr	03:33	018	152	82	55° 54.1' N	155° 59.8' W	CTD, Nuts
114	24-Apr	04:02	019	152	83	55° 54.1' N	155° 60.0' W	CTD, MZ, CHL
114	24-Apr	04:20	G085A	152	82	55° 54.1' N	155° 59.9' W	Bongo
114	24-Apr	05:12	020	153	202	55° 55.0' N	156° 11.4' W	CTD, Nuts
114	24-Apr	05:41	G086A	153	198	55° 54.9' N	156° 11.0' W	Bongo
114	24-Apr	06:08	021	153	202	55° 54.9' N	156° 10.8' W	CTD, MZ, CHL
114	24-Apr	06:50	022	154	224	55° 55.8' N	156° 15.1' W	CTD, Nuts
114	24-Apr	07:23	G087A	154	228	55° 55.5' N	156° 14.8' W	Bongo
114	24-Apr	07:48	023	154	226	55° 55.2' N	156° 14.9' W	CTD, MZ, CHL
114	24-Apr	08:34	024	155	234	55° 56.0' N	156° 21.0' W	CTD, Nuts
114	24-Apr	09:02	G088A	155	233	55° 56.1' N	156° 21.1' W	Bongo
114	24-Apr	09:27	025	155	234	55° 55.8' N	156° 21.1' W	CTD, MZ, CHL
114	24-Apr	10:04	026	156	216	55° 56.2' N	156° 25.9' W	CTD, Nuts
114	24-Apr	10:30	G089A	156	213	55° 56.3' N	156° 26.0' W	Bongo
114	24-Apr	10:54	027	156	211	55° 56.4' N	156° 26.5' W	CTD, MZ, CHL
114	24-Apr	11:36	028	157	202	55° 57.0' N	156° 30.9' W	CTD, Nuts
114	24-Apr	12:10	G090A	157	204	55° 56.9' N	156° 31.3' W	Bongo
114	24-Apr	12:45	029	157	201	55° 57.2' N	156° 31.2' W	CTD (aborted)
114	24-Apr	13:08	029	157	200	55° 57.3' N	156° 31.2' W	CTD, MZ, CHL
114	24-Apr	13:50	030	158	199	55° 58.1' N	156° 38.0' W	CTD, Nuts
114	24-Apr	1412	G091A	158	197	55° 57.9' N	156° 37.6' W	Bongo
114	24-Apr	14:41	031	158	197	55° 58.1' N	156° 38.0' W	CTD, MZ, CHL
114	24-Apr	17:01	032	147	104	56° 18.1' N	156° 48.3' W	CTD, Nuts
114	24-Apr	17:23	G092A	147	108	56° 18.5' N	156° 47.7' W	Bongo
114	24-Apr	17:46	033	147	105	56° 18.2' N	156° 48.0' W	CTD, MZ, CHL
114	24-Apr	18:28	034	148	130	56° 21.6' N	156° 52.1' W	CTD, Nuts
114	24-Apr	18:46	G093A	148	130	56° 21.7' N	156° 51.8' W	Bongo

TABLE 4. MF-91-04 CRUISE SUMMARY

Egg Survey 15-28 APRIL 1991

Date (JD)	Date (GMT)	Time (GMT)	Cast No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
114	24-Apr	19:12	035	148	129	56° 21.6' N	156° 52.3' W	CTD, MZ, CHL
114	24-Apr	19:44	036	149	126	56° 24.0' N	156° 54.9' W	CTD, Nuts
114	24-Apr	20:03	G094A	149	126	56° 24.3' N	156° 55.2' W	Bongo
114	24-Apr	20:17	037	149	129	56° 24.0' N	156° 55.3' W	CTD, MZ, CHL
114	24-Apr	20:49	038	150	104	56° 26.5' N	156° 57.0' W	CTD, Nuts
114	24-Apr	21:07	G095A	150	105	56° 26.5' N	156° 57.1' W	Bongo
114	24-Apr	21:21	039	150	104	56° 26.5' N	156° 56.9' W	CTD, MZ, CHL
114	24-Apr	22:09	040	151	48	56° 30.0' N	156° 59.8' W	CTD
114	24-Apr	22:20	G096A	151	51	56° 30.0' N	157° 00.2' W	Bongo
114	24-Apr	22:29	041	151	48	56° 30.1' N	157° 00.2' W	CTD, MZ, CHL
115	25-Apr	00:32				56° 35.9' N	156° 23.8' W	Begin ADCP trans 1
115	25-Apr	00:40			196	56° 36.0' N	156° 20.7' W	Begin ADCP trans 2
115	25-Apr	01:00			194	56° 39.7' N	156° 19.9' W	Begin ADCP trans 3
115	25-Apr	01:20			214	56° 39.6' N	156° 12.8' W	Begin ADCP trans 4
115	25-Apr	01:40			197	56° 43.5' N	156° 11.9' W	Begin ADCP trans 5
115	25-Apr	02:00			266	56° 43.2' N	156° 04.9' W	Begin ADCP trans 6
115	25-Apr	02:20			230	56° 47.2' N	156° 03.6' W	Begin ADCP trans 7
115	25-Apr	02:40			306	56° 47.0' N	155° 56.9' W	Begin ADCP trans 8
115	25-Apr	03:00			289	56° 51.0' N	155° 55.8' W	Begin ADCP trans 9
115	25-Apr	03:15			294	56° 50.7' N	155° 48.9' W	Begin ADCP trans 10
115	25-Apr	03:40			290	56° 54.4' N	155° 46.7' W	Begin ADCP trans 11
115	25-Apr	04:00			283	56° 54.1' N	155° 39.7' W	Begin ADCP trans 12
115	25-Apr	04:20			280	56° 58.0' N	155° 38.4' W	Begin ADCP trans 13
115	25-Apr	04:40			273	56° 57.8' N	155° 31.3' W	Begin ADCP trans 14
115	25-Apr	05:00			269	57° 01.8' N	155° 30.1' W	Begin ADCP trans 15
115	25-Apr	05:20			262	57° 01.7' N	155° 23.4' W	Begin ADCP trans 16
115	25-Apr	05:40			256	57° 05.8' N	155° 22.0' W	Begin ADCP trans 17
115	25-Apr	06:00			245	57° 05.6' N	155° 15.4' W	Begin ADCP trans 18
115	25-Apr	06:20			238	57° 09.6' N	155° 14.1' W	Begin ADCP trans 19
115	25-Apr	06:40			222	57° 09.4' N	155° 07.3' W	Begin ADCP trans 20
115	25-Apr	07:00			210	57° 13.2' N	155° 06.0' W	Begin ADCP trans 21
115	25-Apr	07:20			195	57° 13.1' N	154° 59.2' W	Begin ADCP trans 22
115	25-Apr	07:40			190	57° 17.2' N	154° 58.0' W	End ADCP transect
115	25-Apr	08:29	G096A	43	238	57° 17.1' N	155° 07.9' W	Bongo
115	25-Apr	09:25	G097A	42A	246	57° 20.0' N	155° 15.2' W	Bongo
115	25-Apr	10:19	G098A	42	263	57° 22.9' N	155° 23.0' W	Bongo
115	25-Apr	10:55	G098B	42	263	57° 22.8' N	155° 23.2' W	Bongo
115	25-Apr	11:20	XBT		272	57° 24.0' N	155° 25.7' W	XBT
115	25-Apr	11:49	G099A	41A	294	57° 26.0' N	155° 31.6' W	Bongo
115	25-Apr	12:47	G100A	41	283	57° 29.1' N	155° 38.7' W	Bongo
115	25-Apr	13:59	G101A	38	287	57° 32.8' N	155° 31.6' W	Bongo

TABLE 4. MF-91-04 CRUISE SUMMARY

Egg Survey 15-28 APRIL 1991

Date (JD)	Date (GMT)	Time (GMT)	Cast No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
115	25-Apr	15:02	G102A	38A	289	57° 30.1' N	155° 24.2' W	Bongo
115	25-Apr	16:15	G103A		251	57° 27.0' N	155° 16.2' W	Bongo
115	25-Apr	17:55	G104A	39A	238	57° 23.0' N	155° 08.2' W	Bongo
115	25-Apr	18:52	G105A	40	242	57° 20.7' N	155° 01.6' W	Bongo
115	25-Apr	19:47	G106A	37A	229	57° 25.0' N	154° 57.0' W	Bongo
115	25-Apr	20:34	G107A	37	234	57° 26.8' N	155° 01.8' W	Bongo
115	25-Apr	21:37	G108A	36	251	57° 30.8' N	155° 10.9' W	Bongo
115	25-Apr	22:32	G109A	35	287	57° 33.9' N	155° 18.2' W	Bongo
115	25-Apr	23:21	G110A	34	220	57° 36.6' N	155° 24.6' W	Bongo
116	26-Apr	00:15	G111A	31	329	57° 39.1' N	155° 18.2' W	Bongo
116	26-Apr	01:08	G112A	32	242	57° 36.8' N	155° 11.8' W	Bongo
116	26-Apr	01:55	G113A	33	241	57° 34.3' N	155° 05.8' W	Bongo
116	26-Apr	02:45	G114A	33A	228	57° 31.1' N	154° 59.1' W	Bongo
116	26-Apr	03:24	G115A	33B	229	57° 28.4' N	154° 57.8' W	Bongo
116	26-Apr	04:21	G116A	55	66	57° 28.6' N	154° 42.5' W	Bongo
116	26-Apr	04:57	G117A	56	213	57° 31.1' N	154° 46.8' W	Bongo
116	26-Apr	05:47	G118A	57	229	57° 33.1' N	154° 52.4' W	Bongo
116	26-Apr	06:33	G119A	57A	230	57° 34.0' N	154° 57.8' W	Bongo
116	26-Apr	07:27	G120A	58	236	57° 36.2' N	155° 00.0' W	Bongo
116	26-Apr	08:11	G121A	59	254	57° 38.5' N	155° 03.9' W	Bongo
116	26-Apr	09:00	G122A	60	290	57° 41.0' N	155° 10.0' W	Bongo
116	26-Apr	09:50	G123A	61	209	57° 43.3' N	155° 15.3' W	Bongo
116	26-Apr	10:42	G124A	21	267	57° 46.8' N	155° 07.7' W	Bongo
116	26-Apr	11:36	G125A	22	271	57° 43.5' N	154° 59.7' W	Bongo
116	26-Apr	12:27	G126A	23	234	57° 41.1' N	154° 53.5' W	Bongo
116	26-Apr	13:25	G127A	23A	222	57° 37.0' N	154° 46.6' W	Bongo
116	26-Apr	14:23	G128A	20	212	57° 41.2' N	154° 36.9' W	Bongo
116	26-Apr	15:38	G129A	19	230	57° 44.9' N	154° 46.8' W	Bongo
116	26-Apr	16:24	G130A	18	270	57° 47.2' N	154° 53.4' W	Bongo
116	26-Apr	17:18	G131A	17	230	57° 50.0' N	154° 59.8' W	Bongo
116	26-Apr	18:13	G132A	14	148	57° 54.2' N	154° 52.5' W	Bongo
116	26-Apr	19:02	G133A	15	273	57° 50.7' N	154° 46.6' W	Bongo
116	26-Apr	19:51	G134A	16	233	57° 48.0' N	154° 39.8' W	Bongo
116	26-Apr	20:38	G135A	16A	213	57° 44.7' N	154° 32.6' W	Bongo
116	26-Apr	22:28	G136A	18	283	57° 47.3' N	154° 54.0' W	Bongo
116	26-Apr	22:57	042	18	278	57° 47.0' N	154° 53.8' W	CTD, MZ, CHL
116	26-Apr	23:35	G137A	21A	293	57° 47.0' N	155° 00.9' W	Bongo
117	27-Apr	00:04	043	21A	295	57° 46.5' N	155° 01.7' W	CTD, MZ, CHL
117	27-Apr	01:06	G138A	21	267	57° 46.8' N	155° 07.9' W	Bongo
117	27-Apr	01:34	044	21	268	57° 46.5' N	155° 08.5' W	CTD, MZ, CHL
117	27-Apr	04:15	S139A	20	213	57° 41.7' N	154° 37.0' W	Begin Tucker sled

TABLE 4. MF-91-04 CRUISE SUMMARY

Egg Survey 15-28 APRIL 1991

Date (JD)	Date (GMT)	Time (GMT)	Cast No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
117	27-Apr	05:44	S139B	20	214	57° 41.7' N	154° 36.5' W	Begin Tucker sled
117	27-Apr	06:49		20	--------	57° 41.1' N	154° 37.7' W	Deployed drifter
117	27-Apr	07:13	G139A	20	215	57° 41.7' N	154° 37.5' W	Bongo
117	27-Apr	07:42	G139B	20	216	57° 41.3' N	154° 37.9' W	Modified vert. tow
117	27-Apr	08:09	045	20	216	57° 40.9' N	154° 37.6' W	CTD, MZ, CHL
117	27-Apr	08:47	G140A	23B	220	57° 38.8' N	154° 41.2' W	Bongo
117	27-Apr	09:16	046	23B	220	57° 39.0' N	154° 41.4' W	CTD, MZ, CHL
117	27-Apr	09:57	G141A	23A	223	57° 37.1' N	154° 46.8' W	Bongo
117	27-Apr	10:25	047	23A	224	57° 37.1' N	154° 47.2' W	CTD, MZ, CHL
117	27-Apr	10:58	S141A	23A	223	57° 37.2' N	154° 47.2' W	Vertical tow
117	27-Apr	12:12			241	57° 31.0' N	155° 07.6' W	XBT
117	27-Apr	12:22			246	57° 29.9' N	155° 11.1' W	XBT
117	27-Apr	13:53	G142A	200	287	57° 22.0' N	155° 36.5' W	Bongo
117	27-Apr	14:48	G143A	201	268	57° 18.0' N	155° 42.9' W	Bongo
117	27-Apr	15:57	G144A	202	242	57° 14.6' N	155° 48.5' W	Bongo
117	27-Apr	16:56	G145A	203	270	57° 11.3' N	155° 41.1' W	Bongo
117	27-Apr	17:49	G146A	204	275	57° 15.2' N	155° 35.1' W	Bongo
117	27-Apr	18:40	G147A	205	269	57° 19.0' N	155° 29.5' W	Bongo
117	27-Apr	19:43	G148A	206	251	57° 16.1' N	155° 20.9' W	Bongo
117	27-Apr	20:36	G149A	207	261	57° 12.0' N	155° 27.3' W	Bongo
117	27-Apr	21:27	G150A	208	269	57° 08.7' N	155° 32.9' W	Bongo
117	27-Apr	22:36	G151A	209	283	57° 07.5' N	155° 47.7' W	Bongo

MF-91-05 (FOCI-91-03): 30 April–15 May, 1991

SCIENTIFIC PERSONNEL

Name	Title	Organization
Jeff Napp	Chief Scientist	AFSC/NOAA
Annette Brown	Fisheries Biologist	AFSC/NOAA
Morgan Busby	Fisheries Biologist	AFSC/NOAA
Michael Canino	Fisheries Biologist	AFSC/NOAA
Shailer Cummings	Oceanographer	AOML/NOAA
Miriam Doyle	Fisheries Biologist	AFSC/NOAA
Dave Kachel	Computer Programmer	PMEL/NOAA
Peter Ortner	Oceanographer	AOML/NOAA
James Schumacher	Oceanographer	PMEL/NOAA
Gail Theilacker	Fisheries Biologist	AFSC/NOAA

CRUISE STATISTICS

Plankton Tows	118
Loran-C Drifters Deployed	5
Loran-C Drifters Recovered	4
Satellite Tracked Buoy Deployments	2
CTD Casts	59
MOCNESS Tows	13
Live Tows	30
ToYo	1
Specimens Collected:	
Nutrient Samples	43
Microzooplankton Samples	245
Chlorophyll Samples	227
Pollock Larvae	250

OBJECTIVES

The objectives of MF-91-05 (FOCI-91-05) were to:

- obtain samples from traditional FOCI time series stations
- measure the magnitude of physical dispersion in a patch of larval pollock marked with satellite and LORAN-tracked drifters
- map the distribution of larval pollock between Mitrofania Island and the lower region of Shelikof Strait for estimates of larval mortality
- collect samples of first-feeding larval pollock for age and condition factor analyses
- sample the vertical distribution of larval pollock and zooplankton using a new 1.2 MHz acoustic transducer mounted on a MOCNESS
- continue copepod egg/prey production experiments initiated on the previous FOCI cruise

CRUISE REPORT

All time-series stations along FOCI lines 8, 16, & 17 were occupied at least once during the cruise. In addition to the suite of measurements normally performed at these stations, we obtained continuous measurements of in situ fluorescence, light, and discrete measurements of extracted chlorophyll and (sometimes) particulate carbon/nitrogen.

Unlike most years when large concentrations of larval pollock formed "discrete patches", the 1991 larval abundances were low and it was not possible to identify a distinct "patch" of larvae using our historical abundance criteria and traditional sampling grid (10 nm between stations). This observation in itself is very interesting; the correct interpretation of the mechanisms which lead to this pattern will await the analysis of our biological, physical, and meteorological data sets.

During the cruise (and at the request of the Principal Investigators in Seattle), we altered our agenda to include the deployment of two additional ARGOS-tracked drifters; one over the sea valley in lower Shelikof Strait and the other at the exit region of the Strait where the influence of the Alaskan Stream becomes important. These additional drifters were to document the transport of water (and possibly larvae) out of Shelikof Strait (i.e., to test the original FOCI

hypothesis). Several bongo tows and one CTD/rosette cast were obtained near each release site. A subsequent cruise was to rendezvous with these drifters and document any changes in the number of larvae or larval prey items. Our attempts to sample around satellite-tracked drifters deployed during the previous cruise were only partially successful since the drifters lacked any kind of locating signal monitored by the ship (e.g., RDF).

The observed larval pollock distribution pattern also meant that we had to alter our site selection criteria for the drifter experiments. Since we were unable to document the existence of a "patch", deployments of the LORAN-tracked drifters were made in two different regimes: the inner shelf between Sutwik and the Semidi Islands, and over the deep sea valley at the lower end of Shelikof Strait. Although not all of the drifters were recovered, it appears that enough data were collected to make the diffusivity estimates.

During the large-scale bongo survey there was ample opportunity to collect pollock larvae for feeding condition (brain cell RNA:DNA, whole animal RNA:DNA, gut histology) and age (otolith) analyses. One interesting, but preliminary, observation was that many of the first feeding larvae contained only phytoplankton, or phytoplankton and invertebrate eggs in their guts; very few first-feeding larvae had crustacean nauplii in their guts.

There were fourteen opportunities to collect information on the vertical distribution of larval pollock and zooplankton. The new Searchlight SONAR (a 1.2 MHz acoustic transducer) collected data on almost all of those MOCNESS tows. We were also able to conduct an exciting demonstration of the MOCNESS sensor package as a survey tool. At the end of the cruise, the MOCNESS nets were stripped from the frame and a Methot trawl depressor and several lead balls were attached. An in situ fluorometer was added to the sensor package. The whole package was towyoed (towed in a sawtooth pattern, up-down, up-down, etc.) from a nearshore position off Wide Bay east to the sea valley. Dramatic changes in the magnitude and position of both the fluorescence and volume backscatter (the acoustic return) maxima were observed (in real time) indicating patchiness on a scale previously undetected by our coarse bongo surveys.

Copepod egg laying experiments were continued on this FOCI leg, however, as during the previous leg, the number of female *Pseudocalanus* spp. laying eggs was very small. It is thought that this was the result of low food concentrations and water temperature. Proof of this awaits analysis of the collected samples.

Conclusion:

We observed a very different larval pollock distribution pattern this year. This unexpected result combined with some bad weather and equipment problems made it necessary for us to continually modify our operations. However, due to the flexibility of the officers and crew of the R/V *Miller Freeman*, we were able to conduct almost all of the planned operations. We anxiously look forward to the future when our samples will be processed and we can begin to understand the mechanisms which led to the observed anomalous pattern of larval pollock.

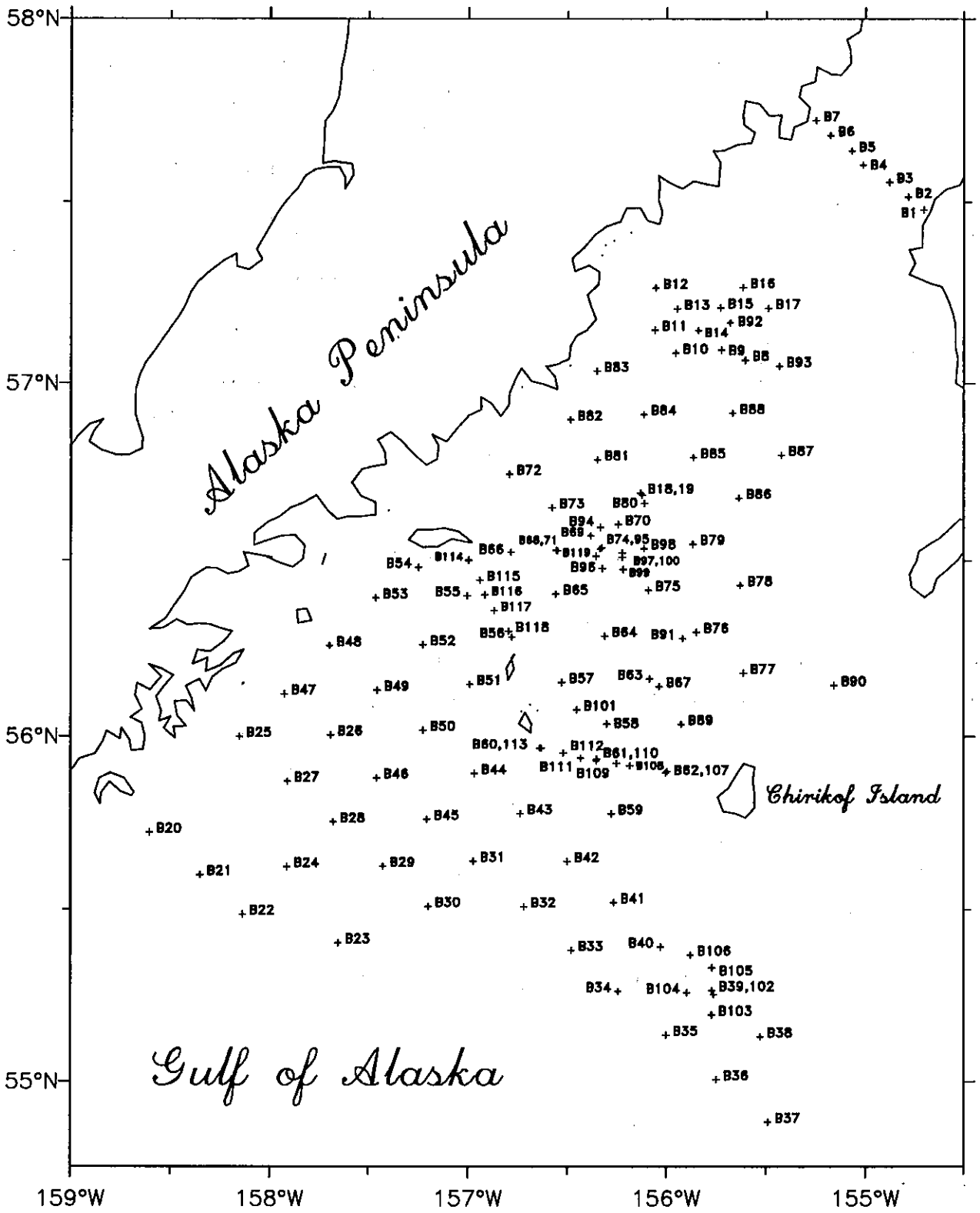


Fig. 3.1. MF-91-05 bongo stations.

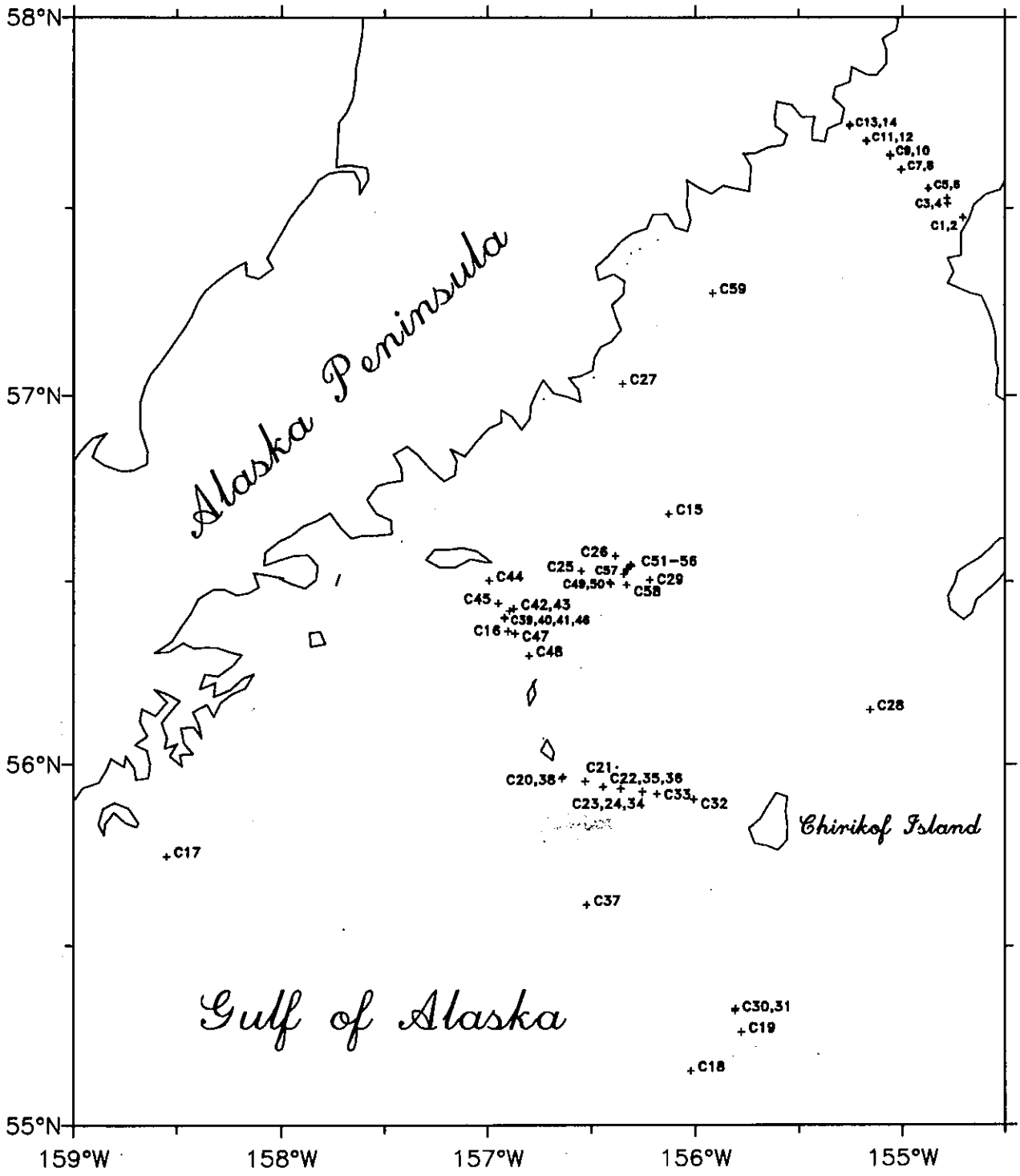


Fig. 3.2. MF-91-05 CTD stations.

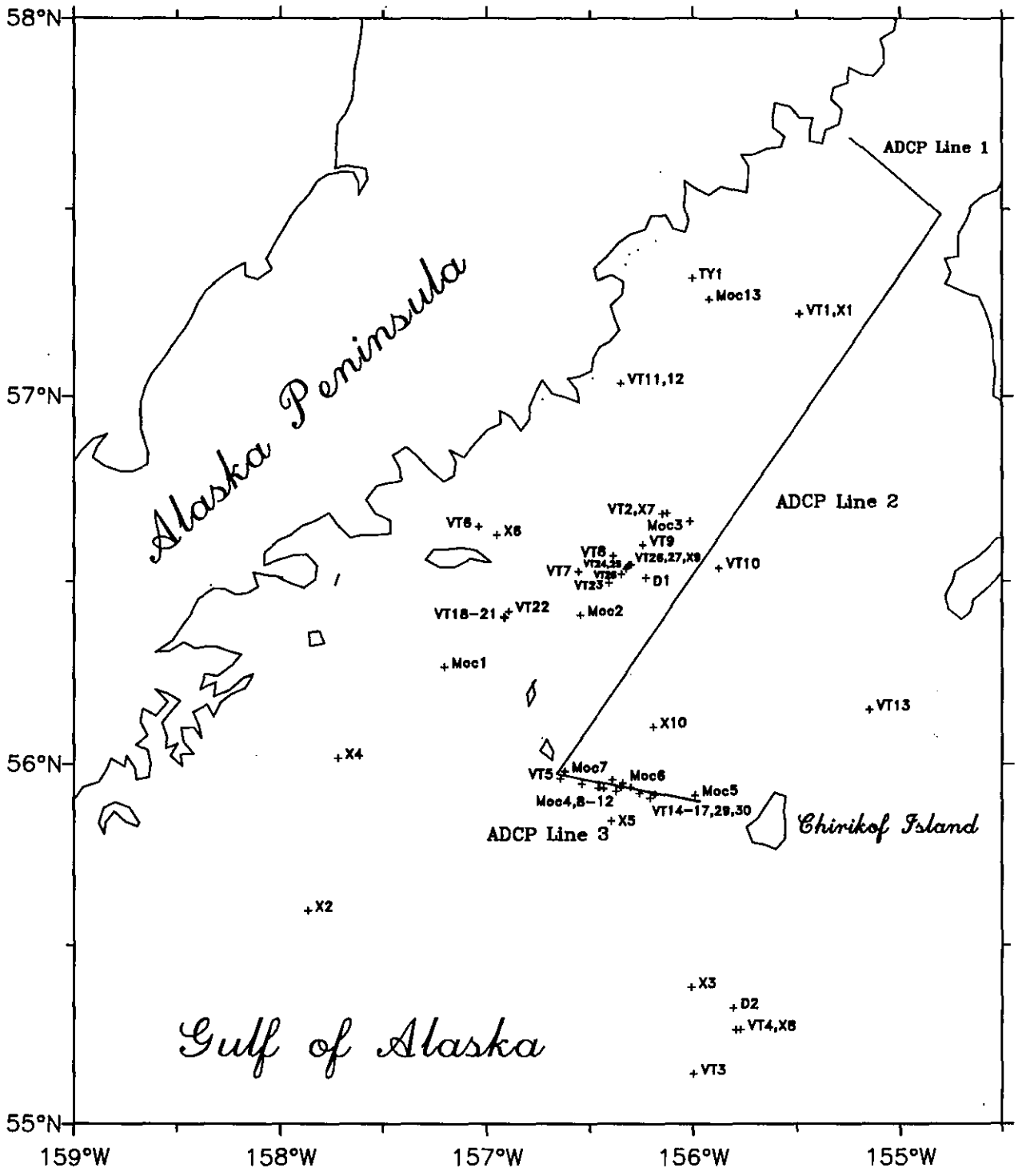


Fig. 3.3. MF-91-05 ADCP, drifter (D), MOCNESS (Moc), towyo (TY), vertical tow (VT), and XBT (X) stations.

TABLE 5. MF-91-05 CRUISE SUMMARY

Larval Survey — 30 April - 15 May 1991

Date (JD)	Date (GMT)	Time (GMT)	Cast No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
120	30-Apr	16:07						Depart Kodiak
120	30-Apr	16:35				58° 44.0' N	152° 24.0' W	Lowered centerboard
121	1-May	16:00	001	FOX55	57	57° 28.4' N	154° 42.2' W	CTD, NUTS
121	1-May	16:31	G001A	FOX55	61	57° 28.7' N	154° 42.3' W	Bongo
121	1-May	13:50	002	FOX55	60	57° 28.6' N	154° 42.3' W	CTD, MZ, CHL
121	1-May	17:48	003	FOX56	205	57° 30.7' N	154° 46.8' W	CTD, NUTS
121	1-May	18:32	G002A	FOX56	209	57° 30.9' N	154° 47.1' W	Bongo
121	1-May	18:56	004	FOX56	211	57° 31.6' N	154° 47.0' W	CTD, MZ, CHL
121	1-May	19:48	005	FOX57	227	57° 33.1' N	154° 52.5' W	CTD, NUTS
121	1-May	20:32	G003A	FOX57	225	57° 33.4' N	154° 52.8' W	Bongo
121	1-May	21:05	006	FOX57	227	57° 33.1' N	154° 52.2' W	CTD, MZ, CHL
121	1-May	22:35	007	FOX58	234	57° 36.1' N	155° 00.2' W	CTD, NUTS
121	1-May	23:19	G004A	FOX58	236	57° 36.2' N	155° 00.8' W	Bongo
121	1-May	23:50	008	FOX58	239	57° 36.0' N	155° 00.3' W	CTD, MZ, CHL
122	2-May	01:30	009	FOX59	255	57° 38.4' N	155° 03.6' W	CTD, NUTS
122	2-May	01:49	G005A	FOX59	254	57° 38.5' N	155° 04.3' W	Bongo
122	2-May	02:25	010	FOX59	251	57° 38.2' N	155° 03.6' W	CTD, MZ, CHL
122	2-May	03:26	011	FOX60	288	57° 40.6' N	155° 10.5' W	CTD, NUTS
122	2-May	04:36	G006A	FOX60	290	57° 41.1' N	155° 10.6' W	Bongo
122	2-May	05:14	012	FOX60	288	57° 40.5' N	155° 10.3' W	CTD, MZ, CHL
122	2-May	06:12	013	FOX61	293	57° 42.9' N	155° 15.3' W	CTD, NUTS
122	2-May	07:00	G007A	FOX61	180	57° 43.5' N	155° 15.0' W	Bongo
122	2-May	07:33	014	FOX61	273	57° 43.1' N	155° 15.2' W	CTD, MZ, CHL
122	2-May	08:04			295	57° 41.3' N	155° 14.5' W	Begin ADCP transect
122	2-May	09:49			198	57° 29.2' N	154° 48.1' W	End ADCP transect
122	2-May	13:07	G008A	1	272	57° 03.9' N	155° 36.3' W	Bongo
122	2-May	14:19	G009A	2	288	57° 05.6' N	155° 43.5' W	Bongo
122	2-May	15:30	G010A	3	247	57° 05.0' N	155° 57.2' W	Bongo
122	2-May	16:22	G011A	4	108	57° 08.8' N	156° 03.5' W	Bongo
122	2-May	17:51	G012A	5	180	57° 15.8' N	156° 03.3' W	Bongo
122	2-May	18:39	G013A	6	257	57° 12.3' N	155° 56.8' W	Bongo
122	2-May	19:23	G014A	7	273	57° 08.7' N	155° 50.4' W	Bongo
122	2-May	20:18	G015A	8	264	57° 12.5' N	155° 43.7' W	Bongo
122	2-May	21:06	G016A	9	278	57° 15.9' N	155° 37.0' W	Bongo
122	2-May	21:50	G017A	10	263	57° 12.4' N	155° 29.4' W	Bongo
122	2-May	22:17	S017B	10	263	57° 13.2' N	155° 29.3' W	Vertical tow
122	2-May	22:20		10	262	57° 13.3' N	155° 29.3' W	XBT
123	3-May	01:52	G018A		257	56° 41.4' N	156° 07.9' W	Bongo
123	3-May	02:39	S018B		260	56° 41.1' N	156° 07.6' W	Vertical tow
123	3-May	03:09	015		260	56° 40.9' N	156° 07.7' W	CTD, MZ, CHL
123	3-May	03:42	G019A		260	56° 41.1' N	156° 07.4' W	Bongo

TABLE 5. MF-91-05 CRUISE SUMMARY

Larval Survey 30 April - 15 May 1991

Date (JD)	Date (GMT)	Time (GMT)	Cast No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
123	3-May	06:48	016		121	56° 21.9' N	156° 54.1' W	CTD
123	3-May	12:56	017	9140	92	55° 44.8' N	158° 33.0' W	CTD
123	3-May	13:31	G020A	B1	114	55° 43.3' N	158° 36.4' W	Bongo
123	3-May	14:56	G021A	D1	138	55° 36.0' N	158° 21.2' W	Bongo
123	3-May	16:08	G022A	F1	129	55° 29.2' N	158° 08.3' W	Bongo
123	3-May	17:56	G023A	H3	83	55° 24.2' N	157° 39.2' W	Bongo
123	3-May	18:47			129	55° 35.8' N	157° 52.0' W	XBT
123	3-May	19:16	G024A	F3	130	55° 37.4' N	157° 54.8' W	Bongo
123	3-May	22:25	G025A	B5	121	55° 59.9' N	158° 09.2' W	Bongo
123	3-May	23:58	G026A	D7	73	56° 00.2' N	157° 41.5' W	Bongo
124	4-May	01:18	G027A	D5	100	55° 52.2' N	157° 54.7' W	Bongo
124	4-May	02:32	G028A	F5	130	55° 45.1' N	157° 40.7' W	Bongo
124	4-May	03:52	G029A	H5	97	55° 37.5' N	157° 25.6' W	Bongo
124	4-May	05:01	G030A	J5	86	55° 30.5' N	157° 12.0' W	Bongo
124	4-May	06:11	G031A	J7	86	55° 38.4' N	156° 58.5' W	Bongo
124	4-May	07:28	G032A	L7	125	55° 30.5' N	156° 43.1' W	Bongo
124	4-May	08:42	G033A	N7	165	55° 22.9' N	156° 28.9' W	Bongo
124	4-May	09:57	G034A	P7	253	55° 15.8' N	156° 14.6' W	Bongo
124	4-May	11:36	G035A	R7	2000	55° 08.2' N	156° 00.1' W	Bongo
124	4-May	12:23	S035A	R7	2000	55° 08.4' N	155° 59.9' W	Vertical tow
124	4-May	12:56	018	R7	2000	55° 09.1' N	156° 01.3' W	CTD, MZ, CHL
124	4-May	15:00	G036A	T7	1600	55° 00.3' N	155° 44.9' W	Bongo
124	4-May	16:46	G037A	V7	4500	54° 52.8' N	155° 29.4' W	Bongo
124	4-May	18:36	G038A	T9	2400	55° 07.9' N	155° 31.7' W	Bongo
124	4-May	20:07	G039A	R9	812	55° 16.0' N	155° 46.2' W	Bongo
124	4-May	20:34	019	R9	825	55° 15.6' N	155° 46.7' W	CTD, MZ, CHL
124	4-May	21:09	S039B	R9	815	55° 15.9' N	155° 46.3' W	Vertical tow
124	4-May	22:14			208	55° 23.0' N	156° 00.4' W	XBT
124	4-May	22:28	G040A	P9	207	55° 23.5' N	156° 01.7' W	Bongo
124	4-May	23:49	G041A	N9	209	55° 31.2' N	156° 16.0' W	Bongo
125	5-May	01:09	G042A	L9	230	55° 38.3' N	156° 30.1' W	Bongo
125	5-May	02:34	G043A	J9	204	55° 46.6' N	156° 44.2' W	Bongo
125	5-May	03:58	G044A	H9	126	55° 53.5' N	156° 58.1' W	Bongo
125	5-May	05:27	G045A	H7	81	55° 45.6' N	157° 12.4' W	Bongo
125	5-May	06:52	G046A		94	55° 52.7' N	157° 27.6' W	Bongo
125	5-May	08:08		D7	90	56° 00.9' N	157° 43.3' W	XBT
125	5-May	09:12	G047A	B7	123	56° 07.3' N	157° 55.6' W	Bongo
125	5-May	10:37	G048A	B9	84	56° 15.5' N	157° 41.8' W	Bongo
125	5-May	12:02	G049A	D9	154	56° 07.9' N	157° 27.4' W	Bongo
125	5-May	13:24	G050A	F9	114	56° 01.0' N	157° 13.6' W	Bongo
125	5-May	14:43	G051A	F11	97	56° 08.9' N	156° 59.5' W	Bongo

TABLE 5. MF-91-05 CRUISE SUMMARY

Larval Survey 30 April - 15 May 1991

Date (JD)	Date (GMT)	Time (GMT)	Cast No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
125	5-May	16:00	G052A	D11	130	56° 15.7' N	157° 13.5' W	Bongo
125	5-May	16:52	M052B	D11	139	56° 16.0' N	157° 12.2' W	Begin MOC 01
125	5-May	19:33	G053A	B11	50	56° 23.7' N	157° 27.8' W	Bongo
125	5-May	20:30	G054A	B13	40	56° 28.9' N	157° 15.0' W	Bongo
125	5-May	21:31	G055A	D13	161	56° 24.1' N	157° 00.3' W	Bongo
125	5-May	22:41	G056A	F13	77	56° 17.0' N	156° 46.8' W	Bongo
125	5-May	23:56	G057A	H13	218	56° 09.3' N	156° 31.7' W	Bongo
126	6-May	01:11	G058A	J13	211	56° 02.2' N	156° 18.1' W	Bongo
126	6-May	02:57	G059A	L11	136	55° 46.6' N	156° 16.7' W	Bongo
126	6-May	03:43			250	55° 50.5' N	156° 24.0' W	XBT
126	6-May	04:52	G060A	158	196	55° 57.9' N	156° 37.9' W	Bongo
126	6-May	05:19	020	158	196	55° 58.0' N	156° 38.2' W	CTD, MZ, CHL
126	6-May	05:53	S060B	158	196	55° 57.6' N	156° 38.6' W	Vertical tow
126	6-May	06:45	021	157	202	55° 57.2' N	156° 31.7' W	CTD, CHL
126	6-May	07:43	022	156	212	55° 56.2' N	156° 26.6' W	CTD, CHL
126	6-May	08:39	G061A	155	232	55° 55.8' N	156° 21.2' W	Bongo
126	6-May	09:10	023	155	232	55° 55.9' N	156° 21.6' W	CTD, MZ, CHL
126	6-May	10:15	024	154	226	55° 55.5' N	156° 15.2' W	CTD, CHL
126	6-May	14:34	G062A	152	84	55° 53.9' N	155° 59.8' W	Bongo
126	6-May	16:28	G063A	J15	239	56° 09.9' N	156° 05.1' W	Bongo
126	6-May	17:46	G064A	H15	278	56° 17.2' N	156° 18.6' W	Bongo
126	6-May	19:06	G065A	F15	205	56° 24.3' N	156° 33.5' W	Bongo
126	6-May	20:02	M065A	F15	235	56° 24.5' N	156° 32.9' W	Begin MOC 02
126	6-May	21:52	G066A	D15	116	56° 31.4' N	156° 47.1' W	Bongo
126	6-May	22:25	G067A	B15	145	56° 08.6' N	156° 02.2' W	Bongo
126	6-May	23:47	S067B	B15	133	56° 38.8' N	157° 02.3' W	Vertical tow
127	7-May	00:14			108	56° 37.5' N	156° 57.1' W	XBT
127	7-May	01:34	G068A	E1	196	56° 31.7' N	156° 32.9' W	Bongo
127	7-May	02:00	S068B	E1	196	56° 31.6' N	156° 33.4' W	Vertical tow
127	7-May	02:51	025	E1	196	56° 31.7' N	156° 32.8' W	CTD, MZ, CHL
127	7-May	03:54	G069A	E2	209	56° 34.2' N	156° 23.1' W	Bongo
127	7-May	04:06	S069B	E2	209	56° 34.1' N	156° 23.4' W	Vertical tow
127	7-May	04:33	026	E2	209	56° 34.1' N	156° 23.1' W	CTD, MZ, CHL
127	7-May	05:29	G070A	E3	232	56° 36.1' N	156° 14.6' W	Bongo
127	7-May	05:43	S070B	E3	207	56° 35.9' N	156° 14.8' W	Vertical tow
127	7-May	07:05	G071A	E1	193	56° 31.7' N	156° 33.4' W	Bongo
127	7-May	08:56	G072A	B17	105	56° 44.6' N	156° 47.6' W	Bongo
127	7-May	09:59	G073A	D17	156	56° 39.0' N	156° 34.7' W	Bongo
127	7-May	11:20	G074A	F17	209	56° 32.0' N	156° 20.1' W	Bongo
127	7-May	12:59	G075A	H17	256	56° 25.0' N	156° 05.5' W	Bongo
127	7-May	14:22	G076A	J17	110	56° 17.9' N	155° 50.9' W	Bongo

TABLE 5. MF-91-05 CRUISE SUMMARY

Larval Survey 30 April - 15 May 1991

Date (JD)	Date (GMT)	Time (GMT)	Cast No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
127	7-May	15:47	G077A		56	56° 10.9' N	155° 36.8' W	Bongo
127	7-May	17:36	G078A	J19	75	56° 25.8' N	155° 37.8' W	Bongo
127	7-May	18:54	G079A	H19	240	56° 32.8' N	155° 52.0' W	Bongo
127	7-May	19:18	S079B	H19	246	56° 32.2' N	155° 52.6' W	Vertical tow
127	7-May	20:41	G080A	F19	269	56° 39.7' N	156° 06.7' W	Bongo
127	7-May	21:42	M080B	F19	298	56° 39.7' N	156° 00.8' W	Begin MOC 03
127	7-May	23:06			251	56° 41.0' N	156° 08.9' W	XBT
128	8-May	00:02	G081A	D19	194	56° 47.1' N	156° 21.0' W	Bongo
128	8-May	01:10	G082A	B19	73	56° 53.9' N	156° 29.2' W	Bongo
128	8-May	02:23	G083A	B21	50	57° 02.0' N	156° 21.1' W	Bongo
128	8-May	02:35	S083B	B21	54	57° 02.1' N	156° 21.1' W	Vertical tow
128	8-May	02:58	027	B21	76	57° 02.0' N	156° 20.9' W	CTD, MZ, CHL
128	8-May	03:20	S083C	B21	56	57° 02.1' N	156° 21.1' W	Vertical tow
128	8-May	04:32	G084A	D21	206	56° 54.8' N	156° 06.9' W	Bongo
128	8-May	05:51	G085A	F21	360	56° 47.4' N	155° 51.9' W	Bongo
128	8-May	07:02	G086A		240	56° 40.6' N	155° 38.2' W	Bongo
128	8-May	08:17	G087A	H23	240	56° 47.9' N	155° 25.4' W	Bongo
128	8-May	09:27	G088A	F23	286	56° 55.0' N	155° 40.1' W	Bongo
128	8-May	10:39	G089A	D23	256	56° 02.1' N	155° 55.5' W	Bongo
128	8-May	11:59	G090A	B23	93	56° 08.8' N	155° 09.5' W	Bongo
128	8-May	12:50	028	B23	98	56° 08.9' N	155° 09.4' W	CTD, MZ, CHL
128	8-May	13:07	S090B	B23	108	56° 09.0' N	155° 09.0' W	Vertical tow
128	8-May	14:28	G091A	B25	240	56° 16.8' N	155° 55.0' W	Bongo
128	8-May	16:01	G092A	D25	280	57° 10.1' N	155° 40.8' W	Bongo
128	8-May	17:41	G093A	F25	265	57° 02.9' N	155° 26.0' W	Bongo
128	8-May	22:57	G094A	F17	198	56° 35.7' N	156° 20.0' W	Bongo
128	8-May	23:40	G095A	F17	210	56° 32.2' N	156° 19.6' W	Bongo
129	9-May	00:25	G096A	F17	220	56° 28.7' N	156° 19.4' W	Bongo
129	9-May	01:19	G097A	F17	264	56° 31.4' N	156° 13.4' W	Bongo
129	9-May	02:14	G098A	F17	282	56° 32.1' N	156° 06.9' W	Bongo
129	9-May	03:27	G099A	F17	275	56° 28.6' N	156° 13.1' W	Bongo
129	9-May	04:12	G100A	F17	268	56° 30.6' N	156° 13.5' W	Bongo
129	9-May	04:50	029	F17	267	56° 30.3' N	156° 13.2' W	CTD, MZ, CHL
129	9-May	05:25		F17	266	56° 30.6' N	156° 13.7' W	Deployed drifter
129	9-May	09:10	G101A		218	56° 04.6' N	156° 27.3' W	Bongo
130	10-May	02:01			700	55° 15.8' N	155° 47.5' W	XBT
130	10-May	02:22	G102A	R9	865	55° 15.2' N	155° 45.7' W	Bongo
130	10-May	03:02	G103A	R9	1100	55° 11.7' N	155° 46.4' W	Bongo
130	10-May	05:10	G104A	R9	680	55° 15.6' N	155° 53.8' W	Bongo
130	10-May	06:13	G105A	R9	631	55° 19.9' N	155° 46.2' W	Bongo
130	10-May	07:14	030	R9	571	55° 19.1' N	155° 48.5' W	CTD, MZ, CHL

TABLE 5. MF-91-05 CRUISE SUMMARY

Larval Survey — 30 April - 15 May 1991

Date (JD)	Date (GMT)	Time (GMT)	Cast No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
130	10-May	07:56			556	55° 19.5' N	155° 48.4' W	Deployed drifter
130	10-May	08:17	031		553	55° 19.5' N	155° 48.4' W	CTD
130	10-May	09:34	G106A		257	55° 22.1' N	155° 52.8' W	Bongo
130	10-May	15:46	G107A	152	85	55° 53.7' N	156° 00.2' W	Bongo
130	10-May	16:14	032	152	86	55° 54.2' N	156° 00.5' W	CTD, MZ, CHL
130	10-May	17:14	G108A	153	200	55° 54.9' N	156° 11.0' W	Bongo
130	10-May	17:13	033	153	200	55° 55.1' N	156° 11.1' W	CTD, CHL
130	10-May	18:11	S108B	153	200	55° 55.0' N	156° 10.9' W	Vertical tow
130	10-May	18:46	G109A	154	226	55° 55.3' N	156° 15.0' W	Bongo
130	10-May	19:15	034	154	228	55° 55.5' N	156° 15.2' W	CTD, CHL
130	10-May	19:49	S109B	154	228	55° 55.1' N	156° 15.5' W	Vertical tow
130	10-May	20:32	M109C	155	235	55° 56.1' N	156° 21.0' W	Begin MOC 04
130	10-May	21:52	G110A	155	234	55° 56.1' N	156° 21.1' W	Bongo
130	10-May	22:24	035	155	233	55° 56.0' N	156° 21.3' W	CTD, MZ, CHL
130	10-May	22:56	S110B	155	235	55° 56.1' N	156° 21.1' W	Vertical tow
130	10-May	23:29	G111A	156	214	55° 56.2' N	156° 26.0' W	Bongo
130	10-May	23:45	S111B	156	128	55° 55.9' N	156° 26.1' W	Vertical tow
131	11-May	00:00	036	156	211	55° 56.4' N	156° 26.5' W	CTD, CHL
131	11-May	01:10	G112A	157	201	55° 57.1' N	156° 31.2' W	Bongo
131	11-May	01:35	037	157	202	55° 36.8' N	156° 31.4' W	CTD, MZ, CHL
131	11-May	02:25	G113A	158	193	55° 57.9' N	156° 38.2' W	Bongo
131	11-May	02:53	038	158	193	55° 57.6' N	156° 38.5' W	CTD, CHL
131	11-May	03:32		158	191	55° 58.3' N	156° 39.8' W	Begin ADCP transect
131	11-May	06:03		152	78	55° 53.8' N	155° 57.8' W	End ADCP transect
131	11-May	06:20	M114A	152	79	55° 54.9' N	155° 59.3' W	Begin MOC 05
131	11-May	08:11	M115A	155	233	55° 56.8' N	156° 20.5' W	Begin MOC 06
131	11-May	10:12	M116A	158	194	55° 58.8' N	156° 37.4' W	Begin MOC 07
131	11-May	13:59			130	56° 23.1' N	156° 55.1' W	Deployed Seimac 70
131	11-May	14:29			149	56° 23.7' N	156° 56.8' W	Deployed Seimac 71
131	11-May	14:56			117	56° 24.8' N	156° 56.1' W	Deployed Candel 3
131	11-May	15:23			130	56° 24.9' N	156° 54.1' W	Deployed Seimac 72
131	11-May	16:05			120	56° 23.6' N	156° 53.4' W	Deployed Candel 2
131	11-May	16:23	S117A	149	126	56° 24.0' N	156° 55.0' W	Vertical tow
131	11-May	17:04	039	149	127	56° 24.1' N	156° 55.1' W	CTD, MZ, CHL
131	11-May	17:37	S117B	149	122	56° 24.2' N	156° 55.1' W	Vertical tow
131	11-May	18:04	040	149	127	56° 24.0' N	156° 55.0' W	CTD
131	11-May	18:33	S117C	149	127	56° 24.1' N	156° 55.1' W	Vertical tow
131	11-May	19:04	041	149	127	56° 24.1' N	156° 55.1' W	CTD, MZ, CHL
131	11-May	19:37	S117D	149	122	56° 24.1' N	156° 54.9' W	Vertical tow
131	11-May	21:07			122	56° 24.9' N	156° 56.1' W	Recover Seimac 70
132	12-May	00:05	042		118	56° 25.6' N	156° 52.4' W	CTD, MZ

TABLE 5. MF-91-05 CRUISE SUMMARY

Larval Survey 30 April - 15 May 1991

Date (JD)	Date (GMT)	Time (GMT)	Cast No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
132	12-May	01:39	043		123	56° 25.2' N	156° 53.6' W	CTD
132	12-May	01:56	S118A		123	56° 25.1' N	156° 53.7' W	Vertical tow
132	12-May	02:45			116	56° 25.5' N	156° 00.8' W	Recovered Selmac 71
132	12-May	05:00			118	56° 25.0' N	156° 57.0' W	Recovered Candel 3
132	12-May	05:30			119	56° 25.6' N	156° 54.5' W	Recovered Candel 2
132	12-May	06:44			118	56° 28.0' N	156° 52.8' W	Recovered Selmac 72
132	12-May	07:31	G119A	151	48	56° 30.1' N	156° 59.9' W	Bongo
132	12-May	07:45	044	151	47	56° 30.1' N	156° 59.5' W	CTD, MZ, CHL
132	12-May	08:35	G120A	150	112	56° 26.7' N	156° 56.5' W	Bongo
132	12-May	09:01	045	150	103	56° 26.5' N	156° 57.0' W	CTD
132	12-May	09:39	046	149	129	56° 24.1' N	156° 55.2' W	CTD, MZ, CHL
132	12-May	10:01	G121A	149	123	56° 24.2' N	156° 54.9' W	Bongo
132	12-May	10:35	G122A	148	131	56° 21.6' N	156° 52.1' W	Bongo
132	12-May	10:57	047	148	133	56° 21.5' N	156° 52.1' W	CTD, MZ, CHL
132	12-May	11:46	G123A	147	104	56° 18.0' N	156° 47.8' W	Bongo
132	12-May	12:14	048	147	101	56° 17.9' N	156° 48.0' W	CTD
132	12-May	14:21	049		216	56° 29.9' N	156° 24.6' W	CTD
132	12-May	14:36			217	56° 29.7' N	156° 24.5' W	Deployed Candel 3
132	12-May	15:01			217	56° 29.5' N	156° 19.7' W	Deployed Selmac 72
132	12-May	15:27				56° 32.0' N	156° 19.5' W	Deployed Candel 2
132	12-May	15:54			214	56° 32.0' N	156° 24.4' W	Deployed Selmac 71
132	12-May	16:26	050		218	56° 29.6' N	156° 24.4' W	CTD
132	12-May	16:44	S124A		217	56° 29.7' N	156° 24.5' W	Vertical tow
132	12-May	17:39	051		210	56° 32.0' N	156° 19.7' W	CTD, MZ
132	12-May	18:32	052		211	56° 32.0' N	156° 19.7' W	CTD
132	12-May	18:45	S124B		211	56° 32.0' N	156° 19.6' W	Vertical tow
132	12-May	19:31	053		207	56° 32.0' N	156° 19.4' W	CTD, MZ
132	12-May	19:47	S124C		213	56° 32.4' N	156° 19.1' W	Vertical tow
132	12-May	20:10			217	56° 32.6' N	156° 18.5' W	XBT
132	12-May	20:28	054		215	56° 32.7' N	156° 18.7' W	CTD, MZ
132	12-May	20:56	S124D		214	56° 32.7' N	156° 18.6' W	Vertical tow
132	12-May	21:28	055		215	56° 32.7' N	156° 18.6' W	CTD
132	12-May	22:29	056		219	56° 32.6' N	156° 18.4' W	CTD
132	12-May	22:48	S124E		221	56° 32.7' N	156° 18.1' W	Vertical tow
132	12-May	23:27	057		217	56° 31.2' N	156° 20.6' W	CTD
132	12-May	23:55	S125A		217	56° 31.1' N	156° 21.0' W	Vertical tow
133	13-May	00:12	G125B		193	56° 30..79	156° 21.4' W	Bongo
133	13-May	01:11	058		218	56° 29.5' N	156° 19.8' W	CTD
133	13-May	10:16	M126A	156	212	55° 56.0' N	156° 27.7' W	Begin MOC 08
133	13-May	12:04		154		55° 54.7' N	156° 16.2' W	Begin MOC 09
133	13-May	13:59			80	55° 53.8' N	155° 58.3' W	Begin ADCP transect

TABLE 5. MF-91-05 CRUISE SUMMARY

Larval Survey — 30 April - 15 May 1991

Date (JD)	Date (GMT)	Time (GMT)	Cast No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
133	13-May	15:58			200	55° 57.5' N	156° 32.7' W	End ADCP transect
133	13-May	16:52	M127A	157	203	55° 56.7' N	156° 32.4' W	Begin MOC 10
133	13-May	18:58	M128A	156	209	55° 56.0' N	156° 27.3' W	Begin MOC 11
133	13-May	20:32	S128B	156	213	55° 57.3' N	156° 23.5' W	Vertical tow
133	13-May	21:36	M129A	155	231	55° 55.5' N	156° 22.5' W	Begin MOC 12
133	13-May	23:12	S129B	155	226	55° 56.1' N	156° 18.1' W	Vertical tow
134	14-May	00:03	M130A	153	177	55° 54.3' N	156° 12.4' W	Begin MOC 13
134	14-May	02:20			221	56° 06.2' N	156° 11.5' W	XBT
134	14-May	05:00			170	56° 23.9' N	156° 15.7' W	Recovered Selmac 72
134	14-May	05:33			263	56° 24.8' N	156° 14.5' W	Recovered Candel 2
134	14-May	08:16			304	56° 23.9' N	156° 15.5' W	Recovered drifter 3
134	14-May	13:56	M131A		247	57° 15.6' N	155° 55.4' W	Begin MOC 14
134	14-May	15:41	059		238	57° 16.5' N	155° 55.0' W	CTD, CHL
134	14-May	17:53				57° 19.0' N	156° 00.2' W	Begin TOYO tow
134	14-May	23:26			267	57° 06.6' N	155° 33.1' W	End TOYO tow
135	15-May	03:26			55	56° 44.6' N	154° 18.9' W	Raised centerboard
135	15-May	04:53			71	56° 38.7' N	153° 54.2' W	Lowered centerboard

MF-91-06 (FOCI-91-04): 17 May–25 May, 1991

SCIENTIFIC PERSONNEL

Name	Title	Organization
Kevin Bailey	Chief Scientist	AFSC/NOAA
Michael Canino	Fisheries Biologist	AFSC/NOAA
Patricia Dell'Arciprete	Fisheries Biologist	AFSC/NOAA
Bern Megrey	Fisheries Biologist	AFSC/NOAA
Steve Porter	Oceanographer	AFSC/NOAA
Bill Rugen	Fisheries Biologist	AFSC/NOAA

CRUISE STATISTICS

Plankton Tows	97
Satellite Tracked Buoy Deployments	3
CTD Casts	12
Live Tows	2
Specimens Collected:	
Nutrient Samples	21
Microzooplankton Samples	72
Chlorophyll Samples	72
Pollock Larvae	512

OBJECTIVES

The objectives of MF-91-06 (FOCI-91-04) were to:

- conduct a survey of larval pollock distribution in the area between Kodiak Island and Mitrofania Island in order to estimate distribution, abundance, mortality and transport of larvae

- measure physical and biological conditions in and around an eddy which had entrained 3 satellite tracked drifters released in early May

- collect samples of larval walleye pollock and other target species for studies of growth, nutrition, parasite loads and ossification

- conduct a series of gear comparisons for studies of avoidance and extrusion of larvae

- collect information on predators and prey of larval walleye pollock

- continue the acquisition of long term biological and physical time series at line 8

CRUISE REPORT

An initial transect of bongo stations was occupied around the NE end of Kodiak Island and along the outer shelf of Kodiak Island on the way to our regular grid of stations. Two satellite tracked drifters were deployed seaward of Chirikof Island over the 800 m isobath (grid station R9) in accordance with the instructions of PMEL scientists. We then commenced with an array of offshore stations between Chirikof Island and the Shumagin Islands over the outer shelf and deep water of the Alaska Stream. Based on reports of the locations of satellite tracked drifters deployed prior to this cruise in 1991, we established the downstream end of our shelf sampling grid at the Shumagin Islands and worked our way towards the northeast and Shelikof Strait. At FOCI line #17, CTD stations were occupied and additional nutrient, chlorophyll and microzooplankton samples were taken. Additional CTD casts were made at several stations elsewhere on the grid track, where biologically appropriate. Our survey was completed with stations occupied in Shelikof Strait and north and northeast of Kodiak Island.

Rough counts of larvae were made under the microscope by subsampling about 1/10 of the codend contents from one of the two bongo nets. The codend contents of the other net was

preserved in formalin for more detailed analysis in the laboratory. Larvae were sorted out of the subsample and preserved in ethanol for ageing analysis.

Preliminary data from the rough counts support work done on prior 1991 cruises, indicating that 1991 is a very interesting year for walleye pollock in the western Gulf of Alaska. Zero counts were logged at 48 of 92 stations. This compares to the late May cruise in 1990 when there were only 2 zero counts at 96 stations over the survey grid. Peak larvae counts in the major aggregations were about an order of magnitude lower compared with catches at the same time of year in 1988–90.

The distribution of pollock larvae was also noticeably different compared with most other years. In most years pollock are located over the shelf region between Kodiak Island and the Semidi Islands. This year pollock were remarkably sparse in the region.

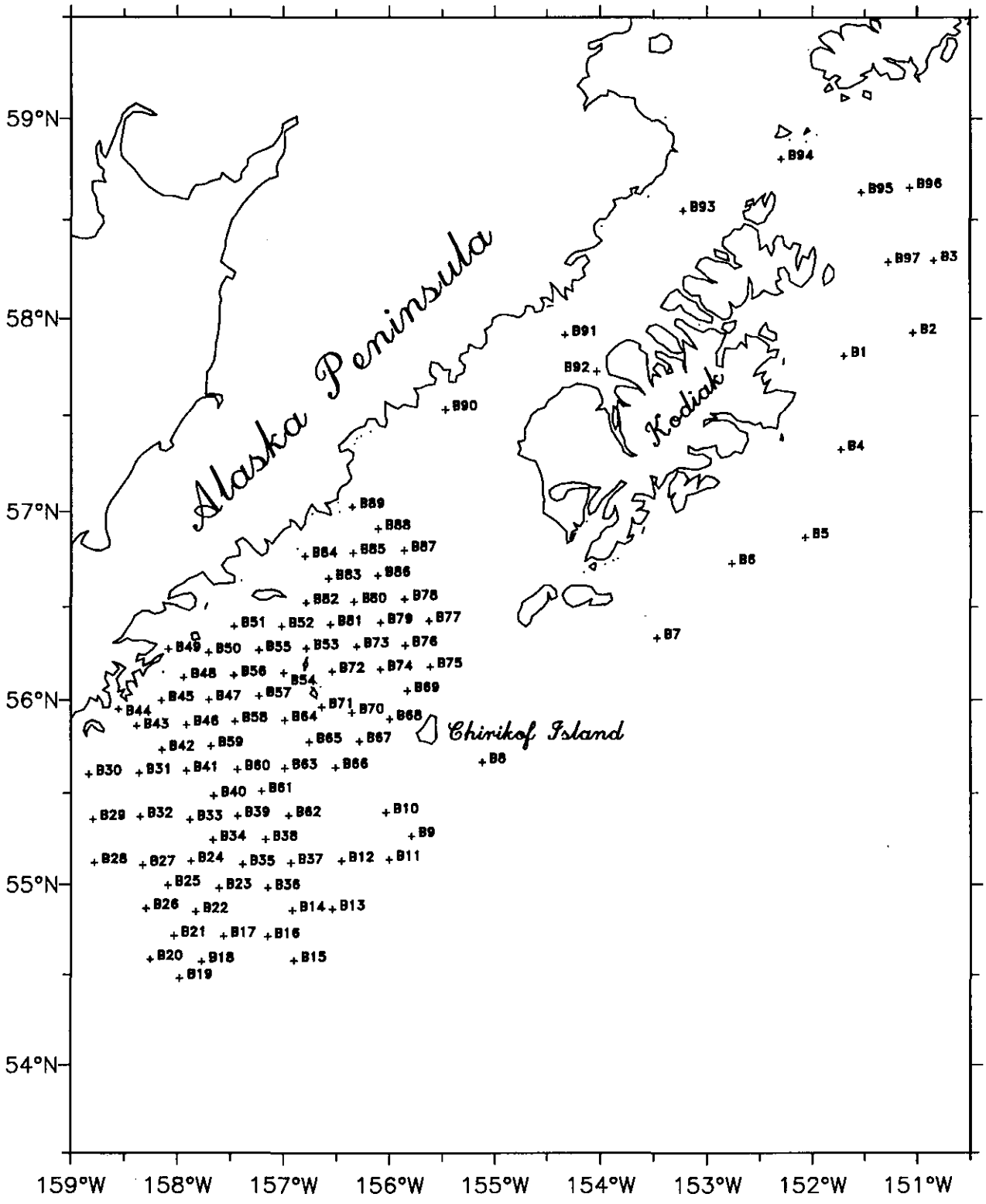


Fig. 4.1. MF-91-06 bongo stations.

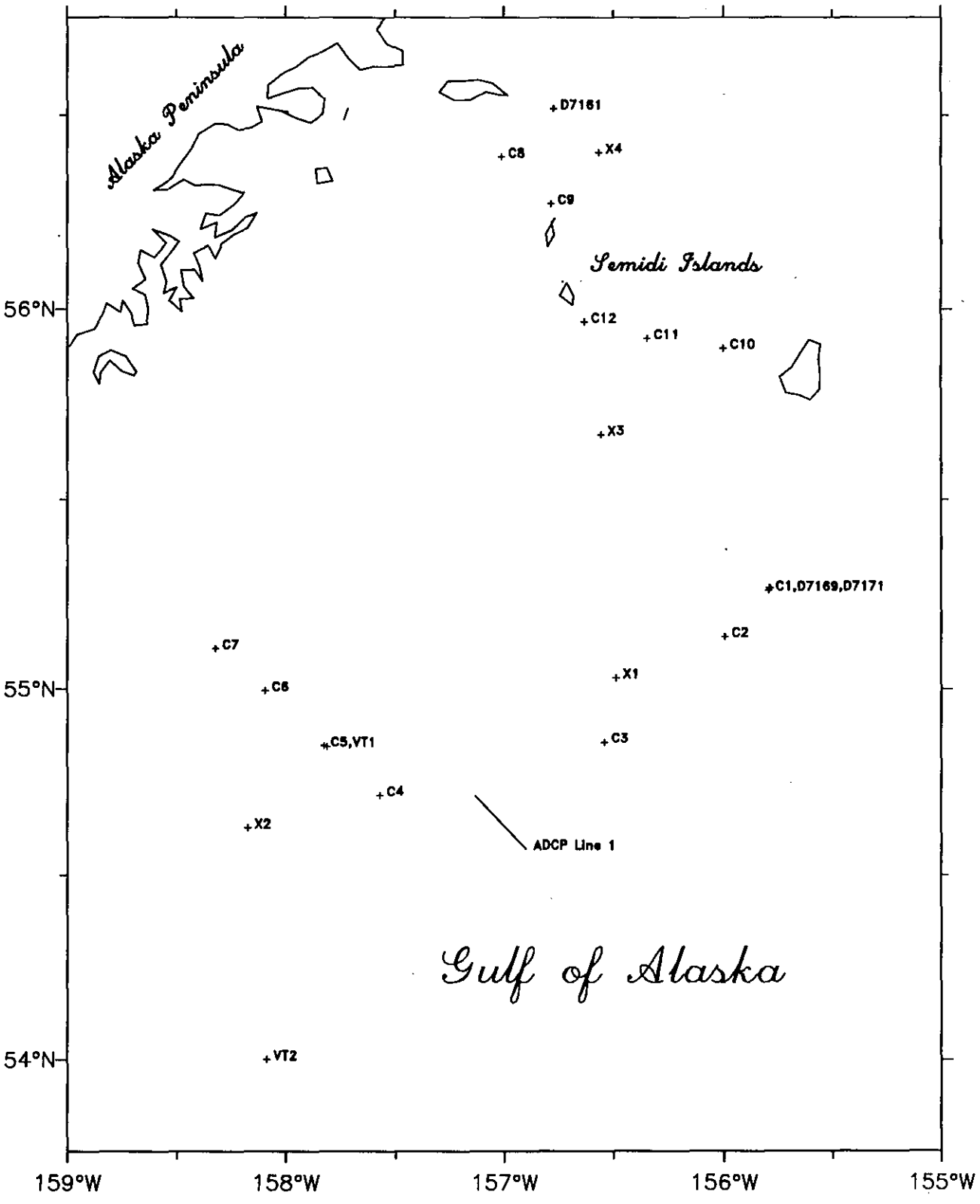


Fig. 4.2. MF-91-06 ADCP, CTD (C), drifter (D), vertical tow (VT)and XBT (X) stations.

TABLE 6. MF-91-06 CRUISE SUMMARY

Larval Survey 17 - 25 May 1991

Date (JD)	Date (GMT)	Time (GMT)	Cast No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
138	18-May	02:25	G001A	P45	51	57° 48.6' N	151° 41.8' W	Bongo
138	18-May	04:47	G002A	R49	57	57° 55.7' N	151° 02.3' W	Bongo
138	18-May	07:21	G003A	P53	61	58° 17.6' N	150° 50.4' W	Bongo
138	18-May	16:57	G004A	T42	60	57° 19.4' N	151° 43.7' W	Bongo
138	18-May	20:38	G005A	V37	89	56° 52.0' N	152° 04.2' W	Bongo
138	18-May	23:39	G006A	T33	71	56° 43.9' N	152° 46.1' W	Bongo
139	19-May	03:26	G007A	T27	65	56° 20.2' N	153° 28.1' W	Bongo
139	19-May	09:31	G008A	R15	500	55° 40.0' N	155° 07.1' W	Bongo
139	19-May	12:38	G009A	R9	784	55° 15.9' N	155° 47.7' W	Bongo
139	19-May	13:25	001	R9	791	55° 15.7' N	155° 47.6' W	CTD, MZ, CHL
139	19-May	14:00		R9	800	55° 16.0' N	155° 47.1' W	Deployed drftr 7169
139	19-May	14:03		R9	787	55° 16.1' N	155° 47.4' W	Deployed drftr 7170
139	19-May	15:18	G010A	P9	208	55° 23.7' N	156° 01.9' W	Bongo
139	19-May	17:01	G011A	R7	787	55° 08.2' N	156° 00.3' W	Bongo
139	19-May	17:37	002	R7	785	55° 08.4' N	155° 59.7' W	CTD, MZ, CHL
139	19-May	19:34	G012A	P5	687	55° 07.8' N	156° 27.1' W	Bongo
139	19-May	20:13			1359	55° 01.8' N	156° 29.2' W	XBT
139	19-May	21:06	G013A	R3	1920	54° 51.9' N	156° 32.2' W	Bongo
139	19-May	21:36	003	R3	1920	54° 51.4' N	156° 32.5' W	CTD, MZ, CHL
139	19-May	22:09	G014A	P1	1037	54° 51.5' N	156° 54.9' W	Bongo
140	20-May	00:42	G015A	R99	206	54° 34.8' N	156° 54.1' W	Bongo
140	20-May	01:16		R99	2400	54° 34.2' N	156° 53.8' W	Begin ADCP transect
140	20-May	02:15			1465	54° 42.8' N	157° 08.0' W	End ADCP transect
140	20-May	02:23	G016A	P99	1407	54° 42.7' N	157° 09.1' W	Bongo
140	20-May	03:45	G017A	N97	1446	54° 42.9' N	157° 34.0' W	Bongo
140	20-May	04:13	004	N97	1446	54° 42.9' N	157° 34.3' W	CTD, MZ, CHL
140	20-May	05:30	G018A	N95	1400	54° 34.4' N	157° 46.4' W	Bongo
140	20-May	06:26	G019A	N93	1500	54° 28.9' N	157° 58.6' W	Bongo
140	20-May	07:41	G020A	L93	900	54° 35.1' N	158° 15.6' W	Bongo
140	20-May	08:20			810	54° 37.7' N	158° 10.3' W	XBT
140	20-May	09:07	G021A	L95	220	54° 43.0' N	158° 02.0' W	Bongo
140	20-May	10:24	G022A	L97	144	54° 51.0' N	157° 49.7' W	Bongo
140	20-May	10:52	005	L97	144	54° 50.8' N	157° 49.6' W	CTD, MZ, CHL
140	20-May	11:25	S022B	L97	157	54° 50.7' N	157° 48.8' W	Vertical tow
140	20-May	12:40	G023A	L99	97	54° 58.9' N	157° 36.6' W	Bongo
140	20-May	13:59	G024A	J99	78	55° 07.6' N	157° 52.5' W	Bongo
140	20-May	15:10	G025A	J97	117	54° 59.8' N	158° 05.5' W	Bongo
140	20-May	15:33	006	J97	121	54° 59.8' N	158° 05.6' W	CTD, MZ, CHL
140	20-May	16:00	S025B	J97	107	54° 00.1' N	158° 05.2' W	Vertical tow
140	20-May	17:11	G026A	J95	195	54° 52.1' N	158° 17.7' W	Bongo
140	20-May	18:46	G027A	H97	175	55° 06.4' N	158° 19.6' W	Bongo

TABLE 6. MF-91-06 CRUISE SUMMARY

Larval Survey 17 - 25 May 1991

Date (JD)	Date (GMT)	Time (GMT)	Cast No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
140	20-May	19:41	007	H97	175	55° 06.5' N	158° 19.3' W	CTD, MZ, CHL
140	20-May	21:26	G028A	F95	200	55° 07.1' N	158° 46.8' W	Bongo
140	20-May	22:59	G029A	D97	168	55° 21.4' N	158° 47.6' W	Bongo
141	21-May	00:35	G030A	D99	154	55° 36.0' N	158° 50.0' W	Bongo
141	21-May	02:15	G031A	D1	136	55° 36.5' N	158° 21.6' W	Bongo
141	21-May	03:41	G032A	F99	137	55° 22.2' N	158° 21.0' W	Bongo
141	21-May	05:16	G033A	H1	83	55° 21.3' N	157° 53.0' W	Bongo
141	21-May	06:19	G034A	J1	82	55° 14.6' N	157° 39.9' W	Bongo
141	21-May	07:35	G035A	L1	88	55° 06.6' N	157° 23.3' W	Bongo
141	21-May	08:45	G036A	N1	640	54° 58.8' N	157° 08.9' W	Bongo
141	21-May	10:19	G037A	N3	255	55° 07.2' N	156° 55.8' W	Bongo
141	21-May	11:30	G038A	L3	118	55° 14.8' N	157° 10.3' W	Bongo
141	21-May	12:43	G039A	J3	84	55° 22.5' N	157° 26.1' W	Bongo
141	21-May	13:50	G040A	H3	96	55° 29.1' N	157° 39.5' W	Bongo
141	21-May	15:05	G041A	F3	129	55° 37.1' N	157° 55.1' W	Bongo
141	21-May	16:14	G042A		121	55° 44.0' N	158° 08.8' W	Bongo
141	21-May	17:29	G043A	B3	122	55° 51.7' N	158 23.12	Bongo
141	21-May	18:26	G044A	A3	115	55° 57.0' N	158° 33.1' W	Bongo
141	21-May	19:59	G045A	B5	131	55° 59.8' N	158° 09.0' W	Bongo
141	21-May	21:04	G046A	D5	99	55° 52.0' N	157° 55.0' W	Bongo
141	21-May	22:11	G047A	D7	73	56° 00.1' N	157° 42.3' W	Bongo
141	21-May	23:13	G048A	B7	133	56° 07.3' N	157° 56.3' W	Bongo
141	21-May	01:30			35	56° 13.1' N	158° 13.8' W	Anchored Castle Bay
142	22-May	05:33	G049A	A7	73	56° 16.4' N	158° 05.0' W	Bongo
142	22-May	05:33	G049A	A7	73	56° 16.4' N	158° 05.0' W	Lowered centerboard
142	22-May	06:46	G050A	B9	95	56° 15.3' N	157° 42.3' W	Bongo
142	22-May	07:55	G051A	B11	55	56° 23.8' N	157° 27.8' W	Bongo
142	22-May	09:22	G052A	D13	161	56° 23.8' N	157° 00.8' W	Bongo
142	22-May	09:50	008	D13	170	56° 23.6' N	157° 00.6' W	CTD, MZ, CHL
142	22-May	11:05	G053A	F13	75	56° 16.8' N	156° 46.8' W	Bongo
142	22-May	11:30	009	F13	75	56° 16.3' N	156° 47.1' W	CTD, MZ, CHL
142	22-May	12:33	G054A	F11	99	56° 08.9' N	156° 59.8' W	Bongo
142	22-May	13:41	G055A	D11	128	56° 16.0' N	157° 13.8' W	Bongo
142	22-May	14:54	G056A	D9	144	56° 08.0' N	157° 28.0' W	Bongo
142	22-May	15:59	G057A	F9	110	56° 01.3' N	157° 13.7' W	Bongo
142	22-May	17:13	G058A	F7	91	55° 53.2' N	157° 27.4' W	Bongo
142	22-May	18:21	G059A	F5	130	55° 45.2' N	157° 41.1' W	Bongo
142	22-May	19:32	G060A	H5	97	55° 37.6' N	157° 26.0' W	Bongo
142	22-May	20:36	G061A	J5	86	55° 30.6' N	157° 12.5' W	Bongo
142	22-May	21:42	G062A	L5	89	55° 22.7' N	156° 57.0' W	Bongo
142	22-May	23:14	G063A	J7	81	55° 38.2' N	156° 59.1' W	Bongo

TABLE 6. MF-91-06 CRUISE SUMMARY

Larval Survey 17 - 25 May 1991

Date (JD)	Date (GMT)	Time (GMT)	Cast No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
143	23-May	00:46	G064A	H9	119	55° 53.6' N	156° 59.2' W	Bongo
143	23-May	01:57	G065A	J9	183	55° 46.5' N	156° 45.2' W	Bongo
143	23-May	02:50			235	55° 40.4' N	156° 33.4' W	XBT
143	23-May	03:01	G066A	L9	248	55° 38.3' N	156° 30.4' W	Bongo
143	23-May	04:23	G067A	L11	242	55° 46.7' N	156° 17.0' W	Bongo
143	23-May	05:43	G068A	152	83	55° 53.9' N	155° 59.8' W	Bongo
143	23-May	06:00	010	152	85	55° 54.0' N	156° 00.1' W	CTD, MZ, CHL, NUTS
143	23-May	07:10	G069A	L15	65	56° 03.0' N	155° 49.8' W	Bongo
143	23-May	09:12	G070A	155	231	55° 56.0' N	156° 21.3' W	Bongo
143	23-May	09:41	011	155	232	55° 55.5' N	156° 20.9' W	CTD, MZ, CHL, NUTS
143	23-May	11:13	G071A	158	193	55° 57.8' N	156° 38.3' W	Bongo
143	23-May	11:44	012	158	192	55° 58.1' N	156° 38.1' W	CTD, MZ, CHL, NUTS
143	23-May	12:30	G072A	H13	213	56° 09.3' N	156° 32.2' W	Bongo
143	23-May	14:30	G073A	H15	276	56° 17.3' N	156° 18.4' W	Bongo
143	23-May	15:38	G074A	J15	237	56° 09.9' N	156° 05.1' W	Bongo
143	23-May	17:11	G075A	L17	56	56° 10.7' N	155° 36.7' W	Bongo
143	23-May	18:17	G076A	J17	101	56° 17.7' N	155° 51.0' W	Bongo
143	23-May	19:33	G077A	J19	96	56° 25.6' N	155° 37.4' W	Bongo
143	23-May	20:45	G078A	H19	236	56° 32.6' N	155° 51.1' W	Bongo
143	23-May	21:59	G079A	H17	235	56° 25.0' N	156° 04.8' W	Bongo
143	23-May	23:11	G080A	F17	211	56° 31.7' N	156° 19.8' W	Bongo
144	24-May	00:12	G081A	F15	203	56° 24.4' N	156° 33.1' W	Bongo
144	24-May	00:23			202	56° 24.2' N	156° 33.9' W	XBT
144	24-May		G082A	D15	116	56° 31.4' N	156° 46.8' W	Bongo
144	24-May			D15	121	56° 31.0' N	156° 46.4' W	Deployed drftr 7161
144	24-May	02:44	G083A	D17		56° 39.0' N	156° 34.5' W	Bongo
144	24-May	03:52	G084A	B17	57	56° 46.1' N	156° 47.9' W	Bongo
144	24-May	05:18	G085A	D19	194	56° 47.1' N	156° 20.7' W	Bongo
144	24-May	06:28	G086A	F19	265	56° 40.0' N	156° 06.6' W	Bongo
144	24-May	07:46	G087A	F21	301	56° 47.9' N	155° 51.8' W	Bongo
144	24-May	09:00	G088A	D21	209	56° 54.7' N	156° 06.5' W	Bongo
144	24-May	10:35	G089A	B21	162	57° 01.5' N	156° 21.0' W	Bongo
144	24-May	14:20	G090A	B29	307	57° 31.9' N	155° 28.3' W	Bongo
144	24-May	18:15	G091A	D37	216	57° 55.1' N	154° 19.8' W	Bongo
144	24-May	19:44	G092A	Uyak Bay	133	57° 43.8' N	154° 02.1' W	Bongo
145	25-May	00:29	G093A	D45	179	58° 32.8' N	153° 13.8' W	Bongo
145	25-May	03:32	G094A	F51	116	58° 48.0' N	152° 17.9' W	Bongo
145	25-May	06:14	G095A		163	58° 38.0' N	151° 32.2' W	Bongo
145	25-May	07:51	G096A	L55	184	58° 39.4' N	151° 04.4' W	Bongo
145	25-May	10:15	G097A	N51	112	58° 17.1' N	151° 16.3' W	Bongo

F-91-08 (FOCI-91-05): 22 July–1 August, 1991

SCIENTIFIC PERSONNEL

Name	Title	Organization
Sarah Hinckley	Chief Scientist	AFSC/NOAA
Steven Bograd	Oceanographer	UW/PMEL
Jay Clark	Fisheries Biologist	AFSC/NOAA
Jennifer Gervais	Ornithologist	USF & WS
Jay Pitochelli	Ornithologist	USF & WS
Stella Spring	Fisheries Biologist	AFSC/NOAA
Ken Weinberg	Fisheries Biologist	AFSC/NOAA

CRUISE STATISTICS

Methot Trawls	63
Midwater Shrimp Trawls	2
Anchovy Trawls	7
CTDs	8
XBTs	53

OBJECTIVES

The objectives of MF-91-08 (FOCI-91-05) were to:

- conduct a survey of the distribution and abundance of young-of-the-year juvenile pollock
- develop assessment techniques for future estimation of total abundance of this stage, and assess catchability of juveniles by several gear types
- collect samples of juvenile pollock for studies of growth and condition
- investigate predation on juveniles by seabirds and fish

CRUISE REPORT

The first operation after leaving Sand Point was a set of gear comparisons (at grid station G7). These consisted of four day-time Methot trawls and two night-time Methots, one day and one night shrimp trawl, and two day and one night anchovy trawls. Of the three pieces of gear, the shrimp trawl caught the least juvenile pollock. The Methot had the highest catch/10 m^2 (average = 5.2 juveniles/10 m^2). The anchovy trawl averaged about 0.34–0.68 juveniles/10 m^2). The average length of juveniles caught by the Methot net was about 23.8 mm, while the average length of juveniles caught by the anchovy trawl was about 31.7 mm. It was decided, based on the results of the gear comparisons, to use the Methot as the primary gear for the survey. The anchovy net would be used occasionally to check the overall length range of juvenile pollock present, and to gather more data on day/night catchability of the two nets.

Upon completion of the gear comparisons, we headed eastward, doing grid stations along the Alaska Peninsula. We proceeded to transect line M, the easternmost line of the station grid. Midway through this line, the seven CTDs on FOCI Line 17 (between the Semidi Islands and Chirikof Island) were done. It was not possible to do the ADCP transect along Line 17 as was planned, as the GPS system was not sending accurate readings to the SCS.

The station grid was occupied from east to west between 7/24 and 7/31. Seven additional stations were added along the transect line between station A5 (at the westernmost edge of the station grid) and Akutan Pass, our route into Dutch Harbor. A total of 63 Methots was done. Three more anchovy trawls (2 night and 1 day) were also done in areas of high catches of juveniles. Catch per 30 minute tow are shown in Figure 1 and Table 2. Highest catches were obtained in inshore areas.

Transects to count seabirds were done throughout the cruise. The total number of ten minute transects was 210, covering a total of 790 km in 35 hours of observation. A total of 29 bird species and seven marine mammal species were sighted.

Seabirds were collected three times during the cruise. A total of 119 birds of 11 different species were collected. The stomach contents of these birds will be analyzed as part of a study to assess seabird predation on juvenile pollock.

We had problems with the Rowe winch twice during the cruise. At station L7, a broken chain caused the winch to freewheel, and the Methot net to hit bottom. The chain was eventually repaired and the net retrieved. Further problems with the Rowe winch (the chain broke again), at grid station I15, caused us to switch to the Marco winch for several trawls. The Marco winch does not allow adequate wire rate control. The Rowe winch was repaired again and used for the remainder of the survey. Also, the Rowe winch does not have the power to haul the Methot net in at speeds greater than about 3.5 knots, which may compromise the quality of the data received from Methot surveys. A winch of greater power and reliability is needed for future Methot surveys.

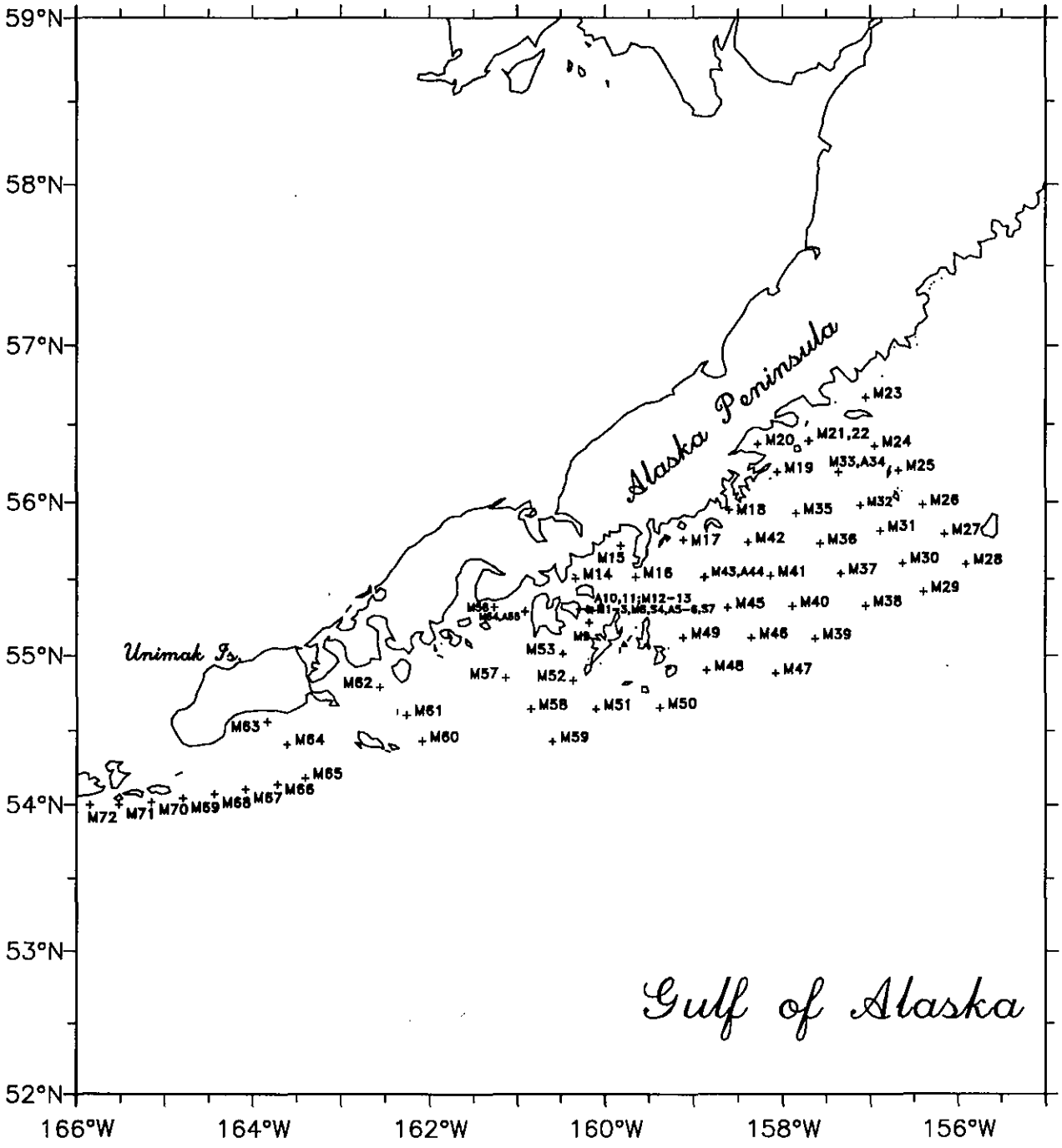


Fig. 5.1. MF-91-08 Methot (M) and anchovy (A) trawl stations.

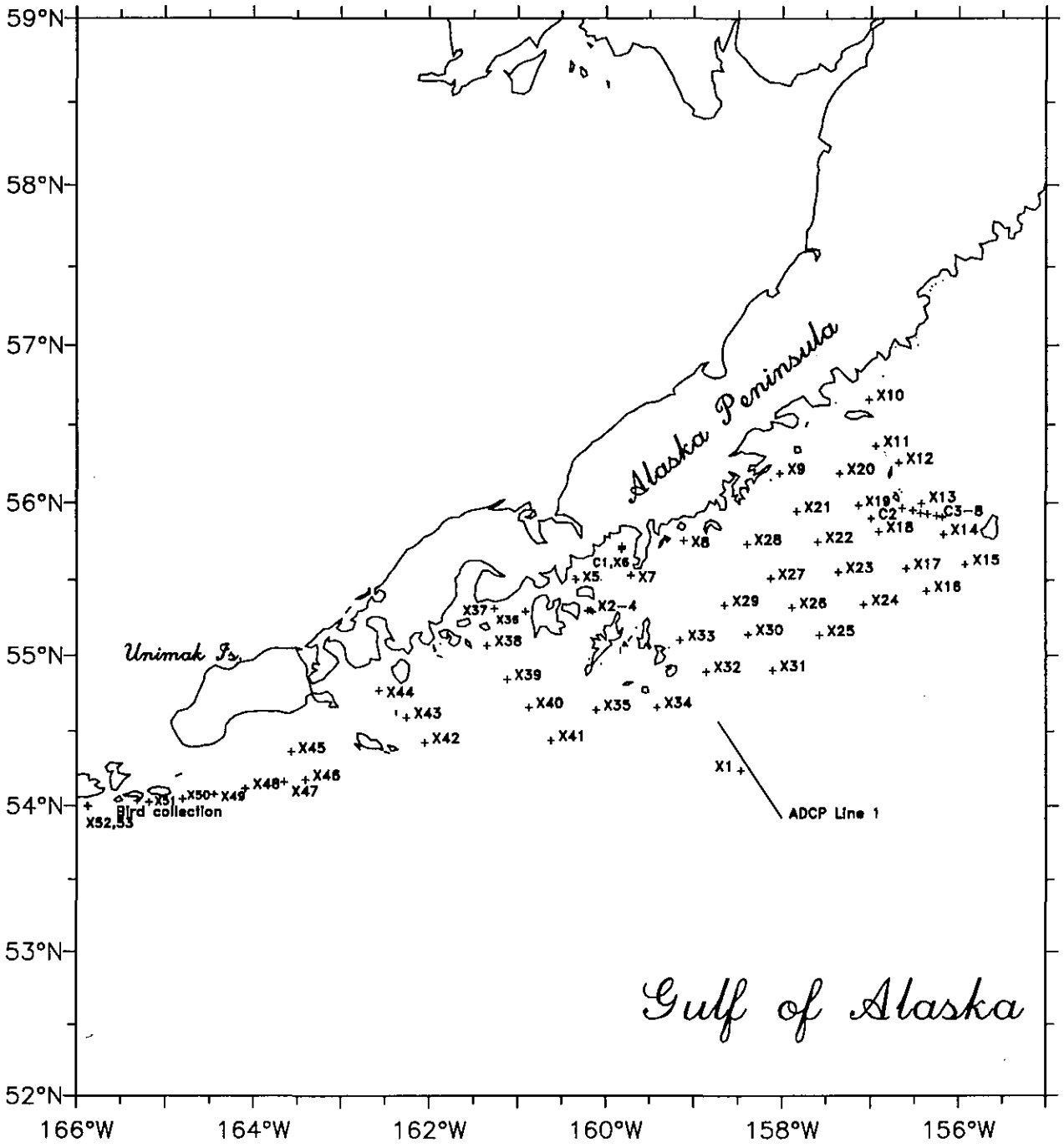


Fig. 5.2. MF-91-08 ADCP, bird collection, CTD (C), and XBT (X) stations.

TABLE 7. MF-91-08 CRUISE SUMMARY

Larval Survey — 22 July - 1 August 1991

Date (JD)	Date (GMT)	Time (GMT)	Cast No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
203	22-Jul	19:00			1700	54° 14.3' N	158° 31.8' W	Centerboard up
203	22-Jul	19:00			1700	54° 14.3' N	158° 31.8' W	Begin ADCP calbn
203	22-Jul	21:30			1700	54° 14.4' N	158° 32.8' W	End ADCP calbn
203	22-Jul	21:50			1700	54° 14.4' N	158° 32.0' W	Centerboard down
203	22-Jul	21:50			1700	54° 14.4' N	158° 32.0' W	Begin ADCP calbn
203	22-Jul	23:23				54° 14.4' N	158° 27.9' W	XBT
204	23-Jul	00:12			1850	54° 15.0' N	158° 31.9' W	End ADCP calbn
204	23-Jul	00:55			2000	54° 08.5' N	158° 22.2' W	Centerboard up
204	23-Jul	02:44			3270	53° 55.4' N	158° 00.3' W	Begin ADCP transect
204	23-Jul	06:21			218	54° 34.1' N	158° 43.5' W	End ADCP transect
204	23-Jul	15:33				55° 18.8' N	160° 32.4' W	Arrive Sand Point
204	23-Jul	20:00			20	55° 19.9' N	160° 31.4' W	Depart Sand Point
204	23-Jul	23:41	Haul 1	G7	126	55° 17.6' N	160° 08.4' W	Methot
204	23-Jul	23:42			145	55° 17.5' N	160° 08.9' W	XBT
205	24-Jul	02:18	Haul 2	G7	202	55° 18.0' N	160° 11.4' W	Methot (day)
205	24-Jul	03:35	Haul 3	G7	201	55° 17.7' N	160° 11.7' W	Methot (day)
205	24-Jul	05:05		G7	194	55° 17.9' N	160° 12.3' W	XBT
205	24-Jul	05:50	Haul 4	G7	184	55° 12.9' N	160° 10.9' W	Shrimp (day)
205	24-Jul	07:08	Haul 5	G7	146	55° 17.9' N	160° 10.2' W	Anchovy (day)
205	24-Jul	08:59	Haul 6	G7	200	55° 17.8' N	160° 11.6' W	Anchovy (night)
205	24-Jul	10:30	Haul 7	G7	193	55° 18.0' N	160° 12.4' W	Shrimp (night)
205	24-Jul	12:16	Haul 8	G7	179	55° 18.1' N	160° 17.3' W	Methot (night)
205	24-Jul	12:46			138	55° 17.9' N	160° 10.3' W	XBT
205	24-Jul	13:25	Haul 9	G7	194	55° 18.1' N	160° 12.4' W	Methot (night)
205	24-Jul	16:21	Haul 10	G7	192	55° 18.2' N	160° 12.2' W	Anchovy (day)
205	24-Jul	17:59	Haul 11	G7	225	55° 18.2' N	160° 11.6' W	Anchovy (day)
205	24-Jul	19:01	Haul 12	G7	180	55° 18.1' N	160° 12.0' W	Methot (speed comp)
205	24-Jul	20:04	Haul 13	G7	183	55° 18.1' N	160° 11.5' W	Methot (speed comp)
205	24-Jul	22:30		11	151	55° 30.3' N	160° 20.2' W	XBT
205	24-Jul	22:33	Haul 14	G5		55° 30.1' N	160° 20.4' W	Methot
206	25-Jul	00:51			120	55° 42.2' N	159° 49.0' W	XBT
206	25-Jul	01:14	001		126	55° 43.2' N	159° 48.8' W	CTD
206	25-Jul	01:37	Haul 15	H5	123	55° 43.0' N	159° 49.4' W	Methot
206	25-Jul	03:09			121	55° 31.8' N	159° 42.7' W	XBT
206	25-Jul	03:50	Haul 16	H7	139	55° 30.7' N	159° 39.2' W	Methot
206	25-Jul	06:28		I7	100	55° 45.5' N	159° 06.6' W	XBT
206	25-Jul	06:37	Haul 17	I7	100	55° 45.3' N	159° 07.1' W	Methot
206	25-Jul	09:39	Haul 18	J7	80	55° 56.9' N	158° 36.6' W	Methot
206	25-Jul	14:25	Haul 19	K7	120	56° 11.6' N	158° 03.6' W	Methot
206	25-Jul	15:14			125	56° 11.5' N	158° 01.8' W	XBT
206	25-Jul	16:40	Haul 20	K5	48	56° 22.3' N	158° 16.8' W	Methot

TABLE 7. MF-91-08 CRUISE SUMMARY

Larval Survey 22 July - 1 August 1991

Date (JD)	Date (GMT)	Time (GMT)	Cast No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
206	25-Jul	18:46	Haul 21	L7		56° 23.6' N	157° 41.7' W	Methot
206	25-Jul	20:31	Haul 22	L7	240	56° 23.6' N	157° 42.2' W	Methot
207	26-Jul	03:05				56° 39.6' N	157° 01.5' W	XBT
207	26-Jul	03:30	Haul 23	M7	127	56° 40.3' N	157° 03.3' W	Methot
207	26-Jul	05:34		M9	120	56° 22.1' N	156° 56.9' W	XBT
207	26-Jul	05:47	Haul 24	M9	127	56° 21.7' N	156° 57.1' W	Methot
207	26-Jul	07:13		M11	100	56° 15.5' N	156° 41.4' W	XBT
207	26-Jul	07:36	Haul 25	M11	88	56° 12.3' N	156° 40.7' W	Methot
207	26-Jul	09:32	Haul 26	M13	206	55° 58.9' N	156° 24.5' W	Methot
207	26-Jul	09:59		M13	206	55° 59.9' N	156° 25.3' W	XBT
207	26-Jul	11:49	002	152	83	55° 54.1' N	156° 59.8' W	CTD
207	26-Jul	12:50	003	153	196	55° 54.6' N	156° 10.8' W	CTD
207	26-Jul	13:36	004	154	225	55° 55.2' N	156° 15.0' W	CTD
207	26-Jul	14:30	005	155	231	55° 55.8' N	156° 21.2' W	CTD
207	26-Jul	15:14	006	156	211	55° 56.3' N	156° 26.1' W	CTD
207	26-Jul	16:49	007	157	198	55° 57.2' N	156° 31.1' W	CTD
207	26-Jul	17:45	008	158	190	55° 58.0' N	156° 38.6' W	CTD
207	26-Jul	19:50	Haul 27	M15	220	55° 47.4' N	156° 09.5' W	Methot
207	26-Jul	20:05		M15	224	55° 47.9' N	156° 10.3' W	XBT
207	26-Jul	22:26		M17	188	55° 36.2' N	155° 55.4' W	XBT
207	26-Jul	22:40	Haul 28	M17	191	55° 35.7' N	155° 54.6' W	Methot
208	27-Jul	00:50			195	55° 25.7' N	156° 21.8' W	XBT
208	27-Jul	01:05	Haul 29	L17	186	55° 24.9' N	156° 23.7' W	Methot
208	27-Jul	02:56				55° 34.6' N	156° 35.7' W	XBT
208	27-Jul	03:15	Haul 30	L15	233	55° 36.2' N	156° 38.1' W	Methot
208	27-Jul	06:11		L13	100	55° 49.0' N	156° 54.5' W	XBT
208	27-Jul	06:38	Haul 31	L13	109	55° 48.9' N	156° 53.4' W	Methot
208	27-Jul	08:34	Haul 32	L11	96	55° 58.6' N	157° 07.2' W	Methot
208	27-Jul	08:49			105	55° 59.2' N	157° 08.2' W	XBT
208	27-Jul	10:36		L9	150	56° 11.5' N	157° 21.5' W	XBT
208	27-Jul	10:41	Haul 33	L9	150	56° 11.6' N	157° 21.7' W	Methot
208	27-Jul	12:22	Haul 34	L9	148	56° 11.8' N	157° 21.7' W	Anchovy
208	27-Jul	16:08	Haul 35	K9	96	55° 55.5' N	157° 51.1' W	Methot
208	27-Jul	16:36		K9	93	55° 56.7' N	157° 49.9' W	XBT
208	27-Jul	18:09	Haul 36	K11	121	55° 43.8' N	157° 34.6' W	Methot
208	27-Jul	18:39			121	55° 45.1' N	157° 35.5' W	XBT
208	27-Jul	19:55		K13	90	55° 33.2' N	157° 21.8' W	XBT
208	27-Jul	20:10	Haul 37	K13	80	55° 32.2' N	157° 20.5' W	Methot
208	27-Jul	22:11		K15	93	55° 20.4' N	157° 04.7' W	XBT
208	27-Jul	22:29	Haul 38	K15	94	55° 19.6' N	157° 03.4' W	Methot

TABLE 7. MF-91-08 CRUISE SUMMARY

Larval Survey 22 July - 1 August 1991

Date (JD)	Date (GMT)	Time (GMT)	Cast No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
209	28-Jul	00:48			80	55° 08.1' N	157° 34.5' W	XBT
209	28-Jul	01:09	Haul 39	J15	76	55° 06.6' N	157° 37.9' W	Methot
209	28-Jul	02:52			79	55° 19.2' N	157° 53.2' W	XBT
209	28-Jul	03:11	Haul 40	J13	80	55° 19.3' N	157° 53.3' W	Methot
209	28-Jul	05:03	Haul 41	J11	130	55° 31.2' N	158° 08.3' W	Methot
209	28-Jul	05:13		J11	130	55° 30.8' N	158° 07.7' W	XBT
209	28-Jul	07:11			118	55° 44.2' N	158° 23.8' W	XBT
209	28-Jul	07:27	Haul 42	J9	118	55° 44.3' N	158° 23.6' W	Methot
209	28-Jul	09:55	Haul 43	I9	103	55° 30.6' N	158° 52.4' W	Methot
209	28-Jul	11:35	Haul 44	I9	100	55° 30.4' N	158° 53.0' W	Anchovy
209	28-Jul	13:34	Haul 45	I11	181	55° 18.7' N	158° 37.0' W	Methot
209	28-Jul	14:14			171	55° 20.2' N	158° 39.0' W	XBT
209	28-Jul	15:59	Haul 46	I13	176	55° 07.0' N	158° 21.1' W	Methot
209	28-Jul	16:42		I13	175	55° 08.5' N	158° 22.9' W	XBT
209	28-Jul	18:28	Haul 47	I15	95	54° 52.9' N	158° 04.7' W	Methot
209	28-Jul	19:01			105	54° 54.2' N	158° 06.6' W	XBT
209	28-Jul	23:36			86	54° 53.9' N	158° 51.5' W	XBT
210	29-Jul	00:00	Haul 48	H13	90	54° 54.0' N	158° 51.1' W	Methot
210	29-Jul	01:43			75	55° 06.1' N	159° 09.1' W	XBT
210	29-Jul	02:00	Haul 49	H11	78	55° 07.1' N	159° 07.0' W	Methot
210	29-Jul	04:59		G13	72	54° 39.5' N	159° 25.0' W	XBT
210	29-Jul	05:21	Haul 50	G13	72	54° 39.2' N	159° 23.0' W	Methot
210	29-Jul	08:00	Haul 51	F11	89	54° 38.6' N	160° 06.6' W	Methot
210	29-Jul	08:00		F11	89	54° 38.6' N	160° 06.6' W	XBT
210	29-Jul	08:36	Haul 52	F9	87	54° 50.0' N	160° 21.6' W	Methot
210	29-Jul	12:11	Haul 53	F8	133	55° 00.5' N	160° 28.9' W	Methot
210	29-Jul	15:00			34	55° 17.6' N	160° 54.8' W	XBT
210	29-Jul	15:05	Haul 54	F5	36	55° 17.3' N	160° 54.9' W	Methot
210	29-Jul	16:41	Haul 55	F5	35	55° 17.0' N	160° 55.2' W	Anchovy
210	29-Jul	18:35	Haul 56	E3	53	55° 18.9' N	161° 16.0' W	Methot
210	29-Jul	18:35		E3	53	55° 18.9' N	161° 16.0' W	XBT
210	29-Jul	20:39			79	55° 04.0' N	161° 20.9' W	XBT
210	29-Jul	21:56			108	54° 50.6' N	161° 07.3' W	XBT
210	29-Jul	22:13	Haul 57	E7	104	54° 51.1' N	161° 07.9' W	Methot
210	29-Jul	23:45		E9	100	54° 39.5' N	160° 52.6' W	XBT
210	29-Jul	23:58	Haul 58	E9	110	54° 38.5' N	160° 51.2' W	Methot
211	30-Jul	01:48			116	54° 26.4' N	160° 37.3' W	XBT
211	30-Jul	02:00	Haul 59	E11	114	54° 25.6' N	160° 36.2' W	Methot
211	30-Jul	06:34		C7	142	54° 25.5' N	162° 03.1' W	XBT
211	30-Jul	06:53	Haul 60	C7	143	54° 25.7' N	162° 05.5' W	Methot

TABLE 7. MF-91-08 CRUISE SUMMARY

Larval Survey 22 July - 1 August 1991

Date (JD)	Date (GMT)	Time (GMT)	Cast No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
211	30-Jul	08:30	Haul 61	C5	105	54° 36.2' N	162° 16.2' W	Methot
211	30-Jul	09:18		C5	110	54° 35.6' N	162° 15.4' W	XBT
211	30-Jul	11:26	Haul 62	C3	52	54° 47.3' N	162° 33.8' W	Methot
211	30-Jul	11:49			60	54° 46.3' N	162° 34.1' W	XBT
211	30-Jul	16:02	Haul 63	A1	82	54° 33.5' N	163° 50.3' W	Methot
211	30-Jul	17:38	Haul 64	A3	100	54° 24.4' N	163° 36.8' W	Methot
211	30-Jul	18:25		A3	107	54° 21.7' N	163° 34.3' W	XBT
211	30-Jul	19:37		A5	72	54° 10.7' N	163° 24.4' W	XBT
211	30-Jul	19:39	Haul 65		73	54° 10.8' N	163° 24.4' W	Methot
211	30-Jul	21:00		AA1	76	54° 09.7' N	163° 39.1' W	XBT
211	30-Jul	21:36	Haul 66	AA1	77	54° 08.3' N	163° 43.3' W	Methot
211	30-Jul	23:09		AA2		54° 07.0' N	164° 05.6' W	XBT
211	30-Jul	23:20	Haul 67	AA2	68	54° 06.3' N	164° 05.0' W	Methot
212	31-Jul	00:52			88	54° 04.7' N	164° 26.8' W	XBT
212	31-Jul	01:00	Haul 68	AA3	89	54° 04.3' N	164° 26.4' W	Methot
212	31-Jul	02:35			91	54° 02.8' N	164° 48.3' W	XBT
212	31-Jul	02:44	Haul 69	AA4	102	54° 02.5' N	164° 47.8' W	Methot
212	31-Jul	04:18		AA5	72	54° 01.5' N	165° 11.1' W	XBT
212	31-Jul	04:35	Haul 70	AA5	74	54° 00.9' N	165° 09.2' W	Methot
212	31-Jul	05:30			50	54° 02.0' N	165° 19.2' W	Bird collections
212	31-Jul	08:03	Haul 71	AA6	75	53° 59.8' N	165° 31.4' W	Methot
212	31-Jul	09:56	Haul 72	AA7	65	53° 59.8' N	165° 51.0' W	Methot
212	31-Jul	10:14		AA7	69	53° 59.8' N	165° 52.2' W	XBT
212	31-Jul	10:21		AA7	72	53° 59.9' N	165° 52.7' W	XBT

MF-91-09 (BSFOCI-91-01): 02 August--29 August, 1991

SCIENTIFIC PERSONNEL

Name	Title	Organization
Ron Reed	Chief Scientist	PMEL/NOAA
Ned Cokelet	Oceanographer	PMEL/NOAA
Carol DeWitt	Field Operations Specialist	PMEL/NOAA
Leslie Lawrence	Physical Science Technician	PMEL/NOAA
Terrence Stewart	Chemical Analyst	University of Texas
Andrew Verkhunov	Oceanographer	VNIRO
Gennady Khen	Oceanographer	TINRO

CRUISE STATISTICS

CTDs, shallow and deep	132
Mooring Deployments	5
Satellite Drifters Deployed	25
ADCP Tracklines	14
Bongo Tows	5
XBTs	68

OBJECTIVES

MF-91-09 was designed to:

- increase understanding of upper-ocean circulation in the Bering Sea—initially consisting of a shipboard survey of the central and western Bering Sea supplemented by year-long current meter moorings
- study variability of surface current flow through satellite altimetry
- develop a numerical model of the Bering Sea circulation and its variations

CRUISE REPORT

Current Moorings: A total of five current moorings were deployed; information on the moorings is given in Table 12. All of the moorings had subsurface floats (near 125 or 150 m) with Kevlar line. They were deployed by the "anchor-last" method. Four or five current meters were used on the moorings, and the meters had thermistors and conductivity sensors. Prior to deployment of each mooring, a bathymetric survey was carried out to find a suitable site. Extremely steep bottom relief was typical, and depths on charts were sometimes found to be in error.

Satellite-tracked Drifting Buoys: A total of 25 drifters were released on this cruise. They were drogued (with tristar drogues) at a depth of 40 m, except for five which were drogued at 100 m. In some cases, the carton was removed from the drifters, and they were deployed by crane; others were deployed with the carton intact. Data are received at PMEL through Service Argos.

ADCP: The ADCP was operated continuously at sea. This was our first use of GPS navigation, rather than Loran-C, and the system appeared to work very well. Also, four backtrack calibrations were run during the cruise. Since data between closely-spaced CTD casts are compromised by the ship's accelerations, "ADCP transects" (Table 8) retraced the track along CTD sections, at constant speed and direction, in most instances. Hopefully, these numerous modifications will yield better, more easily processed, data.

CTD casts: Casts were made in general accordance with the ship's Project Instructions. Because of time constraints, the number of deep stations were reduced, and section XII was not occupied.

At the 20 deep stations occupied, a shallow CTD sensor was used to 1200 m, and a deep sensor was used below. Nutrient samples were drawn at 20 depths from the surface to bottom.

All samples were analyzed, without freezing, on an auto-analyzer for phosphate, nitrate, nitrite, ammonia, and silica.

Salinity samples were drawn from five or more bottles on deep casts. They were analyzed shortly afterward on a laboratory salinometer. Thermometers were also reversed at five depths. On shallow casts, a single salinity sample was taken at various depths.

Starting at station 66, the conductivity sensor on the deep fish started giving intermittent spurious (high) salinity values. It was replaced with a new sensor, and a new pump, prior to cast 86.

Much of the CTD data processing was done aboard. It was very helpful to have these products shortly after the data were acquired. During 19–21 August, however, the processing computer failed. The steps taken to restore the system are described in Appendix 1 by Cokelet, DeWitt, and Floering in the Cruise Report.

Other: Expendable bathythermographs (XBTs) were dropped at a few special sites as follows: across an eddy south of the Aleutians near 166.7°W, across the Alaskan Stream near 171° W, in the vicinity of a "seamount" near 58° N, 164° E, and north of the Aleutians near Amukta Pass.

Five plankton sampling stations were occupied, at the request of AFSC, with bongo nets to 100 m. The samples were preserved in formalin.

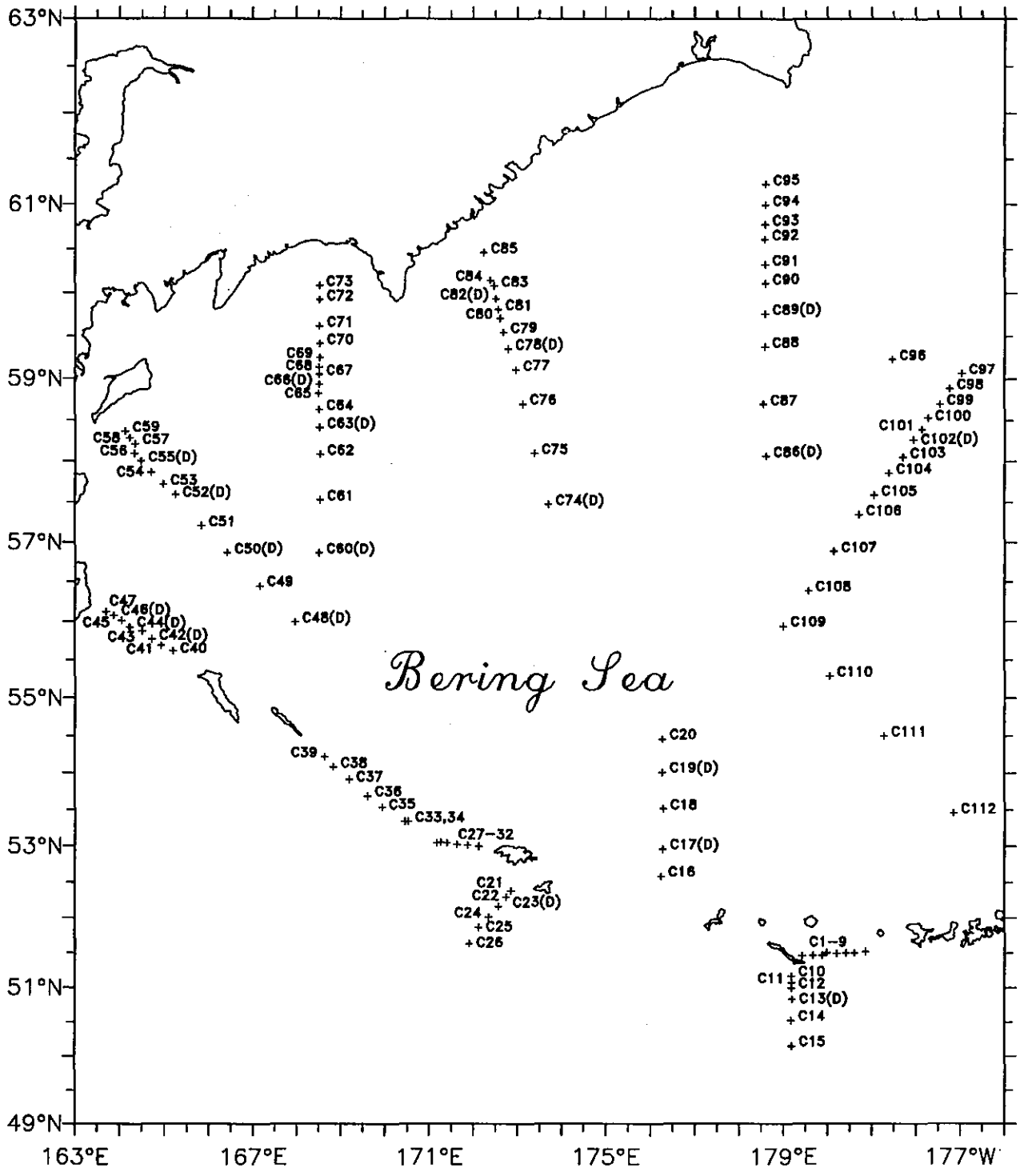


Fig. 6.1. MF-91-09 CTD stations.

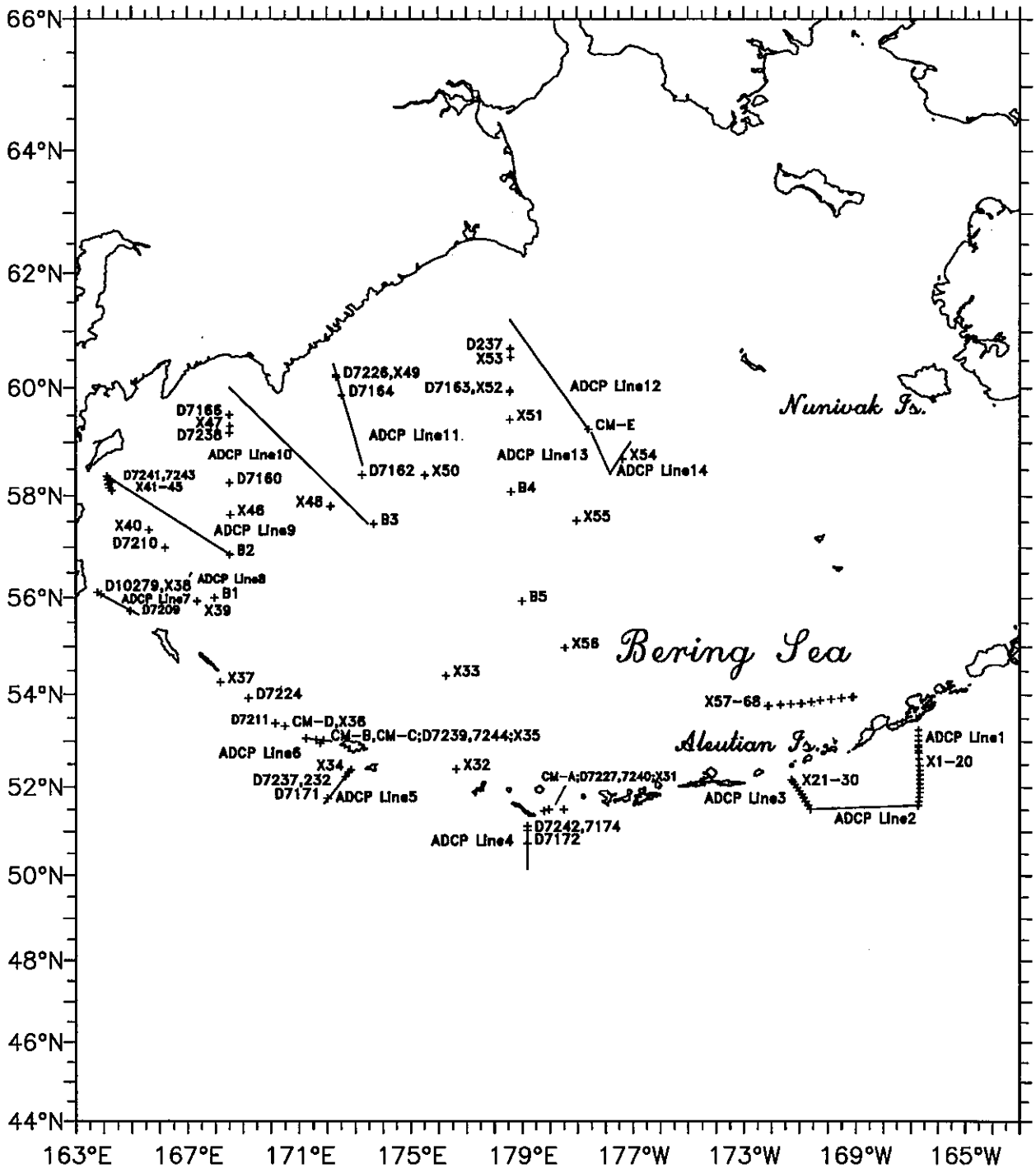


Fig. 6.2. MF-91-09 ADCP, bongo (B), drifter (D), mooring (CM) and XBT (X) stations.

TABLE 8. MF-91-09 CRUISE SUMMARY

Physical Oceanography 02 - 29 August 1991

Date (JD)	Date (GMT)	Time (GMT)	Cast No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
215	02-Aug	0457			200	53° 14.5' N	166° 42.2' W	Begin ADCP transect
215	02-Aug	0457			200	53° 14.5' N	166° 42.2' W	XBT #1
215	02-Aug	0528			1300	53° 07.7' N	166° 42.3' W	XBT #2
215	02-Aug	0600			2750	53° 01.0' N	166° 42.8' W	XBT #3
215	02-Aug	0627			3028	52° 55.2' N	166° 42.9' W	XBT #4 (faulty)
215	02-Aug	0634			3165	52° 53.7' N	166° 42.8' W	XBT #5 (faulty)
215	02-Aug	0640			3275	52° 52.4' N	166° 42.7' W	XBT #6 (faulty)
215	02-Aug	0658			4125	52° 48.0' N	166° 42.2' W	XBT #7
215	02-Aug	0714			4200	52° 45.0' N	166° 41.9' W	XBT #8
215	02-Aug	0750			4000	52° 37.0' N	166° 41.5' W	XBT #9
215	02-Aug	0830			4300	52° 28.1' N	166° 40.5' W	XBT #10
215	02-Aug	0901			4500	52° 21.9' N	166° 40.0' W	XBT #11
215	02-Aug	0930			4450	52° 16.2' N	166° 39.7' W	XBT #12
215	02-Aug	1000			6800	52° 10.2' N	166° 39.5' W	XBT #13
215	02-Aug	1030			7050	52° 04.3' N	166° 39.5' W	XBT #14
215	02-Aug	1100			6700	51° 58.3' N	166° 39.6' W	XBT #15
215	02-Aug	1130			6400	51° 52.5' N	166° 39.9' W	XBT #16
215	02-Aug	1200			4590	51° 46.7' N	166° 40.9' W	XBT #17
215	02-Aug	1230			4934	51° 40.9' N	166° 42.1' W	XBT #18
215	02-Aug	1258			4853	51° 35.6' N	166° 43.1' W	XBT #19 (aborted)
215	02-Aug	1258			4853	51° 35.6' N	166° 43.1' W	End ADCP transect
215	02-Aug	1304			4400	51° 35.5' N	166° 45.0' W	XBT #20
215	02-Aug	1330			3500	51° 35.4' N	166° 52.6' W	Begin ADCP transect
216	03-Aug	0121			4800	51° 30.2' N	170° 36.0' W	XBT #21
216	03-Aug	0121			4800	51° 30.2' N	170° 36.0' W	End ADCP transect
216	03-Aug	0121			4800	51° 30.2' N	170° 36.0' W	Begin ADCP transect
216	03-Aug	0149			4600	51° 35.4' N	170° 41.2' W	XBT #22
216	03-Aug	0219			4400	51° 40.9' N	170° 46.1' W	XBT #23
216	03-Aug	0248			4300	51° 45.9' N	170° 50.3' W	XBT #24
216	03-Aug	0318			4050	51° 50.3' N	170° 54.5' W	XBT #25
216	03-Aug	0349			3912	51° 54.7' N	170° 59.4' W	XBT #26
216	03-Aug	0419			3625	51° 59.0' N	171° 04.4' W	XBT #27
216	03-Aug	0448			2870	52° 03.4' N	171° 09.2' W	XBT #28
216	03-Aug	0510			1545	52° 06.6' N	171° 12.9' W	XBT #29
216	03-Aug	0530			412	52° 09.6' N	171° 16.2' W	XBT #30
216	03-Aug	0530			412	52° 09.6' N	171° 16.2' W	End ADCP transect
217	04-Aug	0430	001		1135	51° 31.4' N	179° 08.7' W	CTD
217	04-Aug	0624	002		1204	51° 30.3' N	179° 23.6' W	CTD
217	04-Aug	0727			1324	51° 30.0' N	179° 29.8' W	Deployed drifter 0727
217	04-Aug	0834	003		1116	51° 30.1' N	179° 35.5' W	CTD
217	04-Aug	1012	004		529	51° 29.7' N	179° 48.1' W	CTD

TABLE 8. MF-91-09 CRUISE SUMMARY

Physical Oceanography 02 - 29 August 1991

Date (JD)	Date (GMT)	Time (GMT)	Cast No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
217	04-Aug	1157	005		1078	51° 30.7' N	179° 59.0' E	CTD
217	04-Aug	1318	006		312	51° 28.0' N	179° 52.5' E	CTD
217	04-Aug	1543			1141	51° 30.4' N	179° 58.3' E	XBT #31
217	04-Aug	1913	CM-A			51° 30.0' N	179° 58.3' E	Deployed CM-A
217	04-Aug	2017	007		1150	51° 29.8' N	179° 58.3' E	CTD
217	04-Aug	2144			502	51° 28.2' N	179° 47.7' E	Deployed drifter 7227
217	04-Aug	2254	008		1213	51° 27.9' N	179° 39.9' E	CTD
218	05-Aug	0052	009		1320	51° 28.3' N	179° 25.1' E	CTD
218	05-Aug	0429	010		1075	51° 10.3' N	179° 10.7' E	CTD
218	05-Aug	0516				51° 07.6' N	179° 11.6' E	Deployed drifter 7242
218	05-Aug	0615	011		1908	51° 04.7' N	179° 11.1' E	CTD
218	05-Aug	0722			3100	51° 01.8' N	179° 11.6' E	Deployed drifter 7174
218	05-Aug	0826	012		3141	51° 00.1' N	179° 10.9' E	CTD
218	05-Aug	1133	013		4129	50° 50.2' N	179° 12.0' E	CTD (shallow)
218	05-Aug	1426	013		4487	50° 49.0' N	179° 12.1' E	CTD (deep)
218	05-Aug	1726			4712	50° 44.0' N	179° 11.3' E	Deployed drifter 7172
218	05-Aug	1926	014		6700	50° 31.7' N	179° 10.7' E	CTD
218	05-Aug	2245	015		5950	50° 09.2' N	179° 11.7' E	CTD
218	05-Aug	2338			7400	50° 09.1' N	179° 12.0' E	Begin ADCP transect
219	06-Aug	0439			1000	51° 11.3' N	179° 11.9' E	End ADCP transect
219	06-Aug	1452			2225	52° 23.6' N	176° 38.1' E	XBT #32
219	06-Aug	1711	016		2658	52° 35.2' N	176° 14.4' E	CTD
219	06-Aug	2009	017		3937	52° 58.0' N	176° 16.6' E	CTD (shallow)
219	06-Aug	2229	017		3937	52° 59.6' N	176° 15.7' E	CTD (deep) - aborted
220	07-Aug	0200	017		3937	53° 01.9' N	176° 15.3' E	CTD (deep)
220	07-Aug	0655	018		3937	53° 30.8' N	176° 16.8' E	CTD
220	07-Aug	1049	019		3937	54° 00.8' N	176° 16.4' E	CTD (shallow)
220	07-Aug	1330	019		3937	54° 01.2' N	176° 16.2' E	CTD (deep)
220	07-Aug	1738			3815	54° 24.1' N	176° 15.5' E	XBT #33
220	07-Aug	1830	020		3314	54° 27.6' N	176° 15.0' E	CTD - aborted
220	07-Aug	1939	020		3308	54° 27.7' N	176° 16.2' E	CTD
220	07-Aug	2055			3825	54° 19.8' N	176° 16.0' E	Begin ADCP backtrack
220	07-Aug	2126			3242	54° 13.2' N	176° 16.1' E	Abort ADCP backtrack
220	07-Aug	2325			------	53° 56.7' N	175° 48.0' E	Begin ADCP backtrack
221	08-Aug	0200			3904	53° 56.2' N	175° 49.3' E	End ADCP backtrack
221	08-Aug	1421			1279	52° 22.9' N	172° 51.1' E	XBT #34
221	08-Aug	1427	021		1287	52° 22.9' N	172° 51.1' E	CTD
221	08-Aug	1546			1980	52° 20.0' N	172° 46.9' E	Deployed drifter 0232
221	08-Aug	1700	022		2562	52° 17.7' N	172° 44.7' E	CTD
221	08-Aug	1817			3108	52° 14.0' N	172° 39.0' E	Deployed drifter 7237
221	08-Aug	1924	023		3725	52° 09.8' N	172° 34.3' E	CTD (shallow)

TABLE 8. MF-91-09 CRUISE SUMMARY

Physical Oceanography 02 - 29 August 1991

Date (JD)	Date (GMT)	Time (GMT)	Cast No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
221	08-Aug	2139	023		3990	52° 08.7' N	172° 35.8' E	CTD (deep)
222	09-Aug	0113	024		5805	52° 01.0' N	172° 20.9' E	CTD
222	09-Aug	0325	025		7200	51° 51.9' N	172° 07.8' E	CTD
222	09-Aug	0433			6218	51° 45.0' N	172° 01.0' E	Deployed drifter 7171
222	09-Aug	0555	026		5418	51° 37.9' N	171° 54.1' E	CTD
222	09-Aug	0650			5420	51° 38.0' N	171° 54.0' E	Begin ADCP transect
222	09-Aug	1119			1230	52° 23.2' N	172° 51.4' E	End ADCP transect
222	09-Aug	1534			829	52° 58.1' N	171° 44.9' E	XBT #35
222	09-Aug	1837	CM-B		708	53° 01.9' N	171° 36.6' E	Deployed CM-B
223	10-Aug	0008	CM-C		1494	53° 03.8' N	171° 15.2' E	Deployed CM-C
223	10-Aug	0036			1070	53° 03.4' N	171° 20.2' E	Begin ADCP transect
223	10-Aug	0257			------	53° 00.4' N	172° 08.5' E	End ADCP transect
223	10-Aug	0321	027		464	53° 00.1' N	172° 07.4' E	CTD
223	10-Aug	0442	028		514	53° 01.1' N	171° 52.0' E	CTD
223	10-Aug	0456			------	53° 01.1' N	171° 52.0' E	Deployed drifter 7244
223	10-Aug	0603	029		654	53° 01.5' N	171° 37.4' E	CTD
223	10-Aug	0722	030		570	53° 02.9' N	171° 23.9' E	CTD
223	10-Aug	0850	031		1550	53° 03.4' N	171° 15.7' E	CTD
223	10-Aug	0948			1530	53° 03.2' N	171° 15.6' E	Deployed drifter 7239
223	10-Aug	1034	032		650	53° 02.8' N	171° 10.2' E	CTD
223	10-Aug	1405	033		1179	53° 20.4' N	170° 26.9' E	CTD
223	10-Aug	1602			1000	53° 23.0' N	170° 09.0' E	CTD
223	10-Aug	2024	CM-D		1040	53° 19.8' N	170° 30.3' E	Deployed CM-D
223	10-Aug	2108	034		766	53° 20.7' N	170° 32.1' E	CTD (jellyfish)
223	10-Aug	2222	034		731	53° 20.5' N	170° 31.1' E	CTD
223	10-Aug	2357			1504	53° 23.4' N	170° 09.7' E	Deployed drifter 7211
224	11-Aug	0128	035		1166	53° 32.3' N	169° 56.2' E	CTD
224	11-Aug	0341	036		1545	53° 41.3' N	169° 37.3' E	CTD
224	11-Aug	0641	037		1733	53° 55.0' N	169° 11.9' E	CTD
224	11-Aug	0713			1725	53° 55.3' N	169° 12.6' E	Deployed drifter 7224
224	11-Aug	0923	038		1225	54° 05.0' N	168° 50.5' E	CTD
224	11-Aug	1106	039		445	54° 13.1' N	168° 38.4' E	CTD
224	11-Aug	1245			1941	54° 15.6' N	168° 11.3' E	XBT #37
225	12-Aug	0037	040		695	55° 37.1' N	165° 11.8' E	CTD
225	12-Aug	0221	041		2950	55° 41.3' N	164° 55.7' E	CTD
225	12-Aug	0330			3001	55° 43.8' N	164° 56.6' E	Deployed drifter 7209
225	12-Aug	0450	042		4039	55° 46.0' N	164° 43.2' E	CTD (shallow)
225	12-Aug	0704	042		4008	55° 45.7' N	164° 43.9' E	CTD (deep)
225	12-Aug	1040	043		4387	55° 52.0' N	164° 30.3' E	CTD
225	12-Aug	1242	044		4391	55° 55.7' N	164° 13.4' E	CTD (shallow)
225	12-Aug	1522	044		4408	55° 55.7' N	164° 13.2' E	CTD (deep)

TABLE 8. MF-91-09 CRUISE SUMMARY

Physical Oceanography 02 - 29 August 1991

Date (JD)	Date (GMT)	Time (GMT)	Cast No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
225	12-Aug	1859	045		4387	56° 00.6' N	164° 02.7' E	CTD
225	12-Aug	2002			3470	56° 04.5' N	163° 53.8' E	XBT #38
225	12-Aug	2041	046		3091	56° 04.6' N	163° 52.3' E	CTD (shallow)
225	12-Aug	2234	046		3095	56° 04.0' N	163° 51.9' E	CTD (deep)
226	13-Aug	0041			2356	56° 06.1' N	163° 46.4' E	Deployed drifter 10279
226	13-Aug	0209	047		1510	56° 07.4' N	163° 42.4' E	CTD
226	13-Aug	0300			2380	56° 05.8' N	163° 46.9' E	Begin ADCP transect
226	13-Aug	0357			2630	56° 05.3' N	163° 48.2' E	Restart ADCP transect
226	13-Aug	0806			912	55° 39.5' N	165° 14.8' E	End ADCP transect
226	13-Aug	1346			3929	55° 55.8' N	167° 21.5' E	XBT #39
226	13-Aug	1605	048		3937	55° 59.5' N	167° 58.2' E	CTD (shallow)
226	13-Aug	1830	048		3941	56° 00.0' N	167° 58.0' E	CTD (deep)
226	13-Aug	2038			3937	56° 00.2' N	167° 59.0' E	Bongo #1
227	14-Aug	0039	049		3895	56° 26.9' N	167° 09.4' E	CTD
227	14-Aug	0130			3887	56° 29.7' N	167° 09.0' E	Begin ADCP transect
227	14-Aug	0345			3887	56° 26.1' N	167° 04.9' E	End ADCP transect
227	14-Aug	0651	050		3729	56° 52.0' N	166° 24.9' E	CTD (shallow)
227	14-Aug	0858	050		3720	56° 51.9' N	166° 22.7' E	CTD (deep)
227	14-Aug	1130			3625	56° 59.8' N	166° 12.1' E	Deployed drifter 7210
227	14-Aug	1333	051		3612	57° 12.4' N	165° 50.6' E	CTD
227	14-Aug	1457			3383	57° 20.6' N	165° 37.5' E	XBT #40
227	14-Aug	1711	052		3458	57° 35.4' N	165° 14.6' E	CTD (shallow)
227	14-Aug	1935	052		3454	57° 35.9' N	165° 15.4' E	CTD (deep)
227	14-Aug	2253	053		3470	57° 42.9' N	164° 58.2' E	CTD
228	15-Aug	0108	054		3387	57° 51.6' N	164° 41.7' E	CTD
228	15-Aug	0315	055		3387	57° 59.7' N	164° 28.2' E	CTD (shallow)
228	15-Aug	0506	055		3333	57° 59.9' N	164° 27.8' E	CTD (deep)
228	15-Aug	0811	056		3408	58° 05.9' N	164° 19.6' E	CTD
228	15-Aug	1013	057		3466	58° 12.9' N	164° 20.2' E	CTD
228	15-Aug	1113			3395	58° 15.6' N	164° 16.7' E	Deployed drifter 7241
228	15-Aug	1237	058		3283	58° 17.2' N	164° 12.9' E	CTD
228	15-Aug	1325			2400	58° 19.8' N	164° 11.0' E	Deployed drifter 7243
228	15-Aug	1435	059		1750	58° 22.0' N	164° 06.8' E	CTD
228	15-Aug	1545			2000	58° 22.2' N	164° 07.4' E	Begin ADCP transect
228	15-Aug	1545			2000	58° 22.2' N	164° 07.4' E	XBT #41
228	15-Aug	1605			1700	58° 17.7' N	164° 08.5' E	XBT #42
228	15-Aug	1625			3000	58° 13.4' N	164° 09.7' E	XBT #43
228	15-Aug	1645			3358	58° 08.9' N	164° 11.8' E	XBT #44
228	15-Aug	1705			3379	58° 05.8' N	164° 17.3' E	XBT #45
229	16-Aug	0530			3865	56° 52.5' N	168° 29.9' E	End ADCP transect
229	16-Aug	0547			3866	56° 51.7' N	168° 31.1' E	Bongo #2

TABLE 8. MF-91-09 CRUISE SUMMARY

Physical Oceanography 02 - 29 August 1991

Date (JD)	Date (GMT)	Time (GMT)	Cast No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
229	16-Aug	0644	060		3866	56° 52.0' N	168° 30.4' E	CTD (shallow)
229	16-Aug	0853	060		3866	56° 52.8' N	168° 29.4' E	CTD (deep)
229	16-Aug	1503	061		3750	57° 31.7' N	168° 32.0' E	CTD
229	16-Aug	1610			3766	57° 38.0' N	168° 32.8' E	XBT #46
229	16-Aug	1905	062		3737	58° 05.1' N	168° 31.8' E	CTD - aborted
229	16-Aug	1943	062		3737	58° 05.1' N	168° 32.0' E	CTD
229	16-Aug	2117			3687	58° 14.7' N	168° 31.0' E	Deployed drifter 7160
229	16-Aug	2250	063		3595	58° 24.8' N	168° 31.2' E	CTD (shallow)
230	17-Aug	0051	063		3595	58° 24.2' N	168° 31.7' E	CTD (deep)
230	17-Aug	0419	064		3520	58° 37.8' N	168° 31.3' E	CTD
230	17-Aug	0631	065		3195	58° 49.2' N	168° 30.0' E	CTD
230	17-Aug	0807	066		3179	58° 55.8' N	168° 31.2' E	CTD (shallow)
230	17-Aug	1006	066		3216	58° 55.8' N	168° 31.8' E	CTD (deep)
230	17-Aug	1312	067		3158	59° 03.1' N	168° 30.8' E	CTD
230	17-Aug	1452	068		3280	59° 08.1' N	168° 31.1' E	CTD
230	17-Aug	1546			3250	59° 11.0' N	168° 31.0' E	Deployed drifter 7238
230	17-Aug	1656	069		3220	59° 15.1' N	168° 31.9' E	CTD
230	17-Aug	1750			3175	59° 18.5' N	168° 32.1' E	XBT #47
230	17-Aug	1907	070		3087	59° 24.8' N	168° 31.4' E	CTD
230	17-Aug	2012			3054	59° 30.8' N	168° 30.7' E	Deployed drifter 7166
230	17-Aug	2127	071		2966	59° 37.2' N	168° 31.1' E	CTD
231	18-Aug	0008	072		1368	59° 55.4' N	168° 30.7' E	CTD
231	18-Aug	0208	073		270	60° 05.1' N	168° 30.9' E	CTD
231	18-Aug	0247			483	60° 00.6' N	168° 31.1' E	Begin ADCP transect
231	18-Aug	1906			3537	57° 48.2' N	172° 07.6' E	XBT #48
231	18-Aug	2315			3712	57° 28.1' N	173° 28.1' E	End ADCP transect
231	18-Aug	2351			3712	57° 27.5' N	173° 40.7' E	Bongo #3
232	19-Aug	0042	074		3712	57° 28.3' N	173° 42.2' E	CTD (shallow)
232	19-Aug	0300	074		3712	57° 28.3' N	173° 43.0' E	CTD (deep)
232	19-Aug	0829	075		3612	58° 05.9' N	173° 22.6' E	CTD
232	19-Aug	1038			3525	58° 23.9' N	173° 15.8' E	Deployed drifter 7162
232	19-Aug	1254	076		3450	58° 41.7' N	173° 07.0' E	CTD
232	19-Aug	1346			3356	58° 44.7' N	173° 06.0' E	XBT ABORT
232	19-Aug	1403			3362	58° 47.8' N	173° 04.6' E	XBT ABORT
232	19-Aug	1442			3350	58° 55.9' N	173° 01.4' E	XBT ABORT
232	19-Aug	1617	077		3331	59° 06.3' N	172° 57.7' E	CTD
232	19-Aug	1837	078		3368	59° 21.3' N	172° 46.7' E	CTD (shallow)
232	19-Aug	2135	078		3362	59° 22.6' N	172° 45.3' E	CTD (deep)
233	20-Aug	0056	079		3325	59° 33.0' N	172° 40.2' E	CTD
233	20-Aug	0303	080		3237	59° 42.8' N	172° 35.6' E	CTD
233	20-Aug	0446	081		3181	59° 49.0' N	172° 33.0' E	CTD

TABLE 8. MF-91-09 CRUISE SUMMARY

Physical Oceanography 02 - 29 August 1991

Date (JD)	Date (GMT)	Time (GMT)	Cast No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
233	20-Aug	0542			3125	59° 52.0' N	172° 31.9' E	Deployed drifter 7164
233	20-Aug	0645	082		3056	59° 56.1' N	172° 29.7' E	CTD (shallow)
233	20-Aug	0911	082		3037	59° 57.6' N	172° 29.2' E	CTD (deep)
233	20-Aug	1219	083		2881	60° 04.9' N	172° 27.4' E	CTD
233	20-Aug	1418	084		2731	60° 08.8' N	172° 22.2' E	CTD
233	20-Aug	1513			2380	60° 11.9' N	172° 20.1' E	Deployed drifter 7226
233	20-Aug	1527			2125	60° 14.6' N	172° 19.5' E	XBT #49
233	20-Aug	1734	085		1433	60° 27.7' N	172° 13.9' E	CTD
233	20-Aug	1815			1579	60° 25.3' N	172° 14.3' E	Begin ADCP transect
234	21-Aug	0400			3447	58° 34.9' N	173° 17.1' E	End ADCP transect
234	21-Aug	0400			3447	58° 34.9' N	173° 17.1' E	Begin ADCP transect
234	21-Aug	0930			3712	58° 23.6' N	175° 31.8' E	XBT #50
234	21-Aug	1733			3795	58° 05.0' N	178° 35.9' E	Begin ADCP calbn
234	21-Aug	1944			3795	58° 04.9' N	178° 34.9' E	End ADCP calbn
234	21-Aug	2001			3795	58° 04.5' N	178° 36.3' E	Bongo #4
234	21-Aug	2101	086		3795	58° 04.1' N	178° 36.4' E	CTD (shallow)
235	22-Aug	0203	086		3800	58° 05.0' N	178° 37.9' E	CTD (deep)
235	22-Aug	0741	087		3752	58° 41.8' N	178° 33.0' E	CTD
235	22-Aug	1232	088		3756	59° 22.9' N	178° 34.9' E	CTD
235	22-Aug	1317			3566	59° 25.5' N	178° 34.4' E	XBT #51
235	22-Aug	1528	089		3443	59° 45.9' N	178° 35.0' E	CTD (shallow)
235	22-Aug	1746	089		3416	59° 45.8' N	178° 32.4' E	CTD (deep)
235	22-Aug	2020			3460	59° 56.0' N	178° 34.7' E	Deployed drifter 7163
235	22-Aug	2030			3466	59° 57.4' N	178° 34.8' E	XBT #52
235	22-Aug	2201	090		2850	60° 06.6' N	178° 34.8' E	CTD
236	23-Aug	0036	091		2489	60° 19.7' N	178° 35.4' E	CTD
236	23-Aug	0337	092		2312	60° 36.7' N	178° 34.7' E	CTD
236	23-Aug	0435			2722	60° 42.1' N	178° 35.3' E	Deployed drifter 0237
236	23-Aug	0551	093		2487	60° 46.6' N	178° 35.2' E	CTD
236	23-Aug	0806	094		1543	60° 59.9' N	178° 35.3' E	CTD
236	23-Aug	1027	095		368	61° 13.7' N	178° 35.7' E	CTD
236	23-Aug	1057			387	61° 12.4' N	178° 35.1' E	Begin ADCP transect
236	23-Aug	1417			3025	60° 32.9' N	178° 35.9' E	XBT #53
237	24-Aug	0230			2262	59° 15.1' N	178° 36.4' W	End ADCP transect
237	24-Aug	0549	CM-E		1001	59° 15.0' N	178° 35.9' W	Deployed CM-E
237	24-Aug	0645	096		939	59° 14.1' N	178° 32.5' W	CTD
237	24-Aug	0726			673	59° 11.6' N	178° 29.6' W	Begin ADCP transect
237	24-Aug	1130			2575	58° 25.0' N	177° 49.2' W	End ADCP transect
237	24-Aug	1137			2587	58° 25.4' N	177° 49.4' W	Begin ADCP transect
237	24-Aug	1309			743	58° 41.6' N	177° 21.1' W	XBT #54
237	24-Aug	1511			148	59° 01.0' N	177° 04.2' W	End ADCP transect

TABLE 8. MF-91-09 CRUISE SUMMARY

Physical Oceanography 02 - 29 August 1991

Date (JD)	Date (GMT)	Time (GMT)	Cast No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
237	24-Aug	1548	097		141	59° 03.9' N	176° 57.7' W	CTD
237	24-Aug	1712	098		126	58° 53.1' N	177° 14.0' W	CTD
237	24-Aug	1845	099		330	58° 41.8' N	177° 27.3' W	CTD
237	24-Aug	2046	100		2150	58° 31.6' N	177° 44.1' W	CTD
237	24-Aug	2302	101		2950	58° 23.7' N	177° 52.6' W	CTD
238	25-Aug	0113	102		3368	58° 16.0' N	178° 03.4' W	CTD (shallow)
238	25-Aug	0316	102		3368	58° 16.6' N	178° 01.2' W	CTD (deep)
238	25-Aug	0703	103		3581	58° 03.3' N	178° 17.9' W	CTD
238	25-Aug	1001	104		3718	57° 51.6' N	178° 36.8' W	CTD
238	25-Aug	1308	105		3733	57° 35.6' N	178° 56.7' W	CTD
238	25-Aug	1418			3760	57° 31.5' N	179° 01.6' W	XBT #55
238	25-Aug	1628	106		3800	57° 20.8' N	179° 17.2' W	CTD
238	25-Aug	2049	107		3812	56° 53.2' N	179° 51.6' W	CTD
239	26-Aug	0114	108		3837	56° 23.5' N	179° 33.9' E	CTD
239	26-Aug	0451			3856	55° 56.3' N	179° 00.5' E	Bongo #5
239	26-Aug	0600	109		3856	55° 56.5' N	179° 00.1' E	CTD
239	26-Aug	1138	110		3843	55° 17.6' N	179° 57.3' W	CTD
239	26-Aug	1408			3843	54° 58.7' N	179° 27.1' W	XBT #56
239	26-Aug	1756	111		3837	54° 30.3' N	178° 43.5' W	CTD
239	26-Aug	2005			3840	54° 14.9' N	178° 20.9' W	Begin ADCP calbn
239	26-Aug	2034			3830	54° 09.1' N	178° 17.7' W	Abort ADCP calbn
239	26-Aug	2034			3830	54° 09.1' N	178° 17.7' W	ADCP backscatter cal
240	27-Aug	0301	112		3784	53° 27.7' N	177° 09.3' W	CTD
240	27-Aug	1720			3354	53° 45.5' N	172° 07.0' W	XBT #57 - aborted
240	27-Aug	1724			3391	53° 45.6' N	172° 05.0' W	XBT #58 - aborted
240	27-Aug	1825			3193	53° 46.9' N	171° 39.9' W	XBT #59
240	27-Aug	1924			2754	53° 48.0' N	171° 18.3' E	XBT #60
240	27-Aug	2024			1887	53° 18.7' N	170° 56.4' E	XBT #61
240	27-Aug	2029			1877	53° 48.8' N	170° 54.5' E	XBT #62
240	27-Aug	2124			1912	53° 50.8' N	170° 33.8' E	XBT #63
240	27-Aug	2224			1931	53° 52.5' N	170° 14.5' E	XBT #64
240	27-Aug	2324			1950	53° 53.9' N	169° 51.7' E	XBT #65
241	28-Aug	0023			1768	53° 55.2' N	169° 29.4' E	XBT #66
241	28-Aug	0121			1862	53° 56.9' N	169° 07.1' E	XBT #67 - aborted
241	28-Aug	0127			1920	53° 57.0' N	169° 04.7' E	XBT #68
241	28-Aug	0145			2010	53° 57.2' N	168° 57.9' E	Begin ADCP calbn
241	28-Aug	0400			2462	54° 00.1' N	168° 55.1' E	End ADCP calbn

MF-91-11 (FOCI-91-06): 30 September–06 October, 1991

SCIENTIFIC PERSONNEL

Name	Title	Organization
Carol DeWitt	Chief Scientist	PMEL/NOAA
Kevin Kinsey	General Equipment Operator	PMEL/NOAA
Allen Macklin	Meteorologist	PMEL/NOAA

CRUISE STATISTICS

ADCP lines	16
ADCP backtrack "L"	1
Bongo/Seacats, 60 cm	2
CTDs	20
Mooring recoveries	13

OBJECTIVES

MF-91-11 was designed to:

- collect Eulerian current data by recovering moorings 9101, 9102, 9103, 9132, 9133, 9134, 9135, 9136, 9137, 9138, 9139, 9141, 9142, searching for mooring parts of 9031, and using the shipboard Acoustic Doppler Current Profiler (ADCP)
- conduct a field test of the newly designed Seacat/bongo system
- continue the water property time series at line 8 and collect CTD data at moorings

CRUISE REPORTS

Acoustic Doppler Current Profiler (ADCP): The ship mounted ADCP was operated during the entire cruise. Lines specifically for ADCP data collection were run at full speed across

- Line 8 four times (before moorings 9101, 9102 and 9103 were recovered)
- Shelikof Strait during the transit between Line 8 and Kupreanof Strait
- Shelikof Strait during the transit between Kupreanof Strait and Stevenson Entrance
- Kennedy Entrance on four occasions
- Gore Point once before any of the Gore Point moorings were recovered and twice after moorings 9138, 9137, and 9136 were recovered (9135, 9134, 9133 and 9132 were still deployed)

A backtrack-L was run to check the ADCP.

Bongos: During MF-91-11 two bongo casts were taken for testing the new Seacat/bongo system. PMEL's Engineering Development Department designed and manufactured a footed stainless hollow cylinder which attaches to the bottom shackle of the bongo frame, replacing the usual lead weight set-up; the Seacat is bolted inside the cylinder. The test consisted of a visual check of the Seacat/bongo system at the surface. The ride of the bongo frame seemed unaffected by the Seacat; however, the Seacat canted away from the ship, possibly due to the wake of the ship.

CTD Casts: A total of twenty CTD stations were conducted using the PMEL Seabird CTD. CTDs were located to calibrate sensors on the moorings and to continue the long-term water-properties data set at Line 8. A CTD cast was conducted before the recovery of each mooring. Also, seven CTD casts were conducted at Line 8. The locations of all CTD casts are given in Table 1. CTD casts were taken to within approximately 10 m of the bottom.

The PMEL Sea-Bird CTD system, SBE-9 S/N 91220-B, was used in conjunction with the Shipboard Computer System (SCS) for data acquisition and storage.

Current Moorings: A total of thirteen moorings were recovered. The moorings were grouped in four areas. Three were located in the vicinity of Line 8 (9101, 9102, 9103), one in Stevenson Entrance (9139), two in Kennedy Entrance (9141 and 9142), and seven in a line off of Gore Point (9132, 9133, 9134, 9135, 9136, 9137, 9138). All recoveries occurred without incident except for 9101. During maneuvering for the recovery of 9101, mooring wire wrapped around the bowthruster, resulting in flooding and extensive damage of the top current meter.

Approximately fourteen hours were spent searching for parts of mooring 9031 at Kupreanof Strait (9031). A visual search of the shoreline was conducted by small boat, as well as interrogation with a transducer in the area from the entrance of Kupreanof to Dry Spruce Bay. No parts were found, but we were able to speak with the person who had found, earlier this year, the lower float and bottom Neil Brown current meter in Kupreanof Strait (the mooring was originally deployed in Kennedy Entrance). The bottom float and bottom Neil Brown current meter were found floating in an area where nets are set. When originally found a large length of wire was attached to the bottom of the Neil Brown—the end of the wire was frayed. The wire had been removed and discarded by the people who found the mooring. No one remembered exactly when the mooring had been found or any other specifics on the condition of the mooring.

All current meter, Seacat, Seagauge and RDI ADCP data was downloaded from the equipment while at sea.

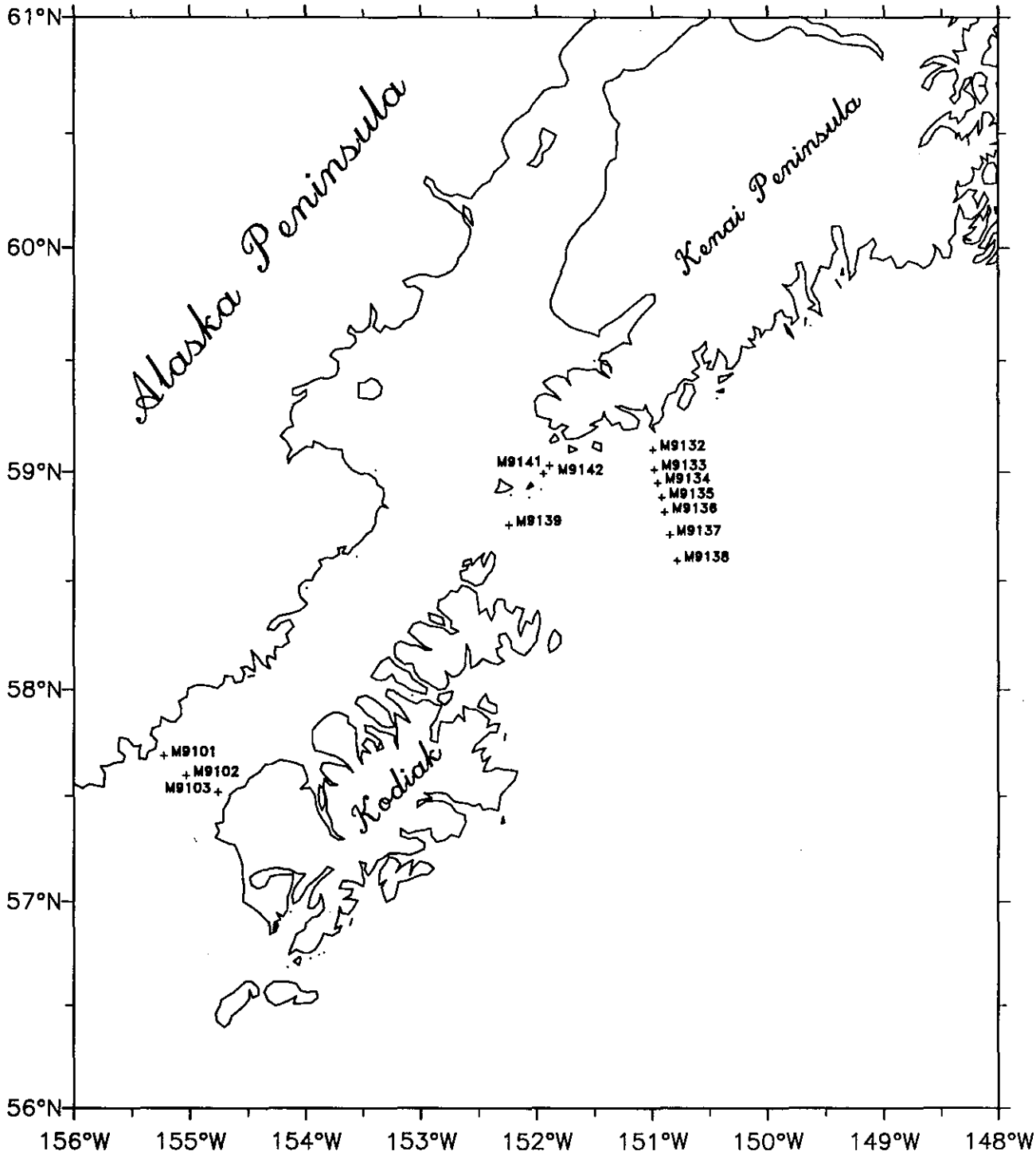


Fig. 7.1. MF-91-11 mooring stations.

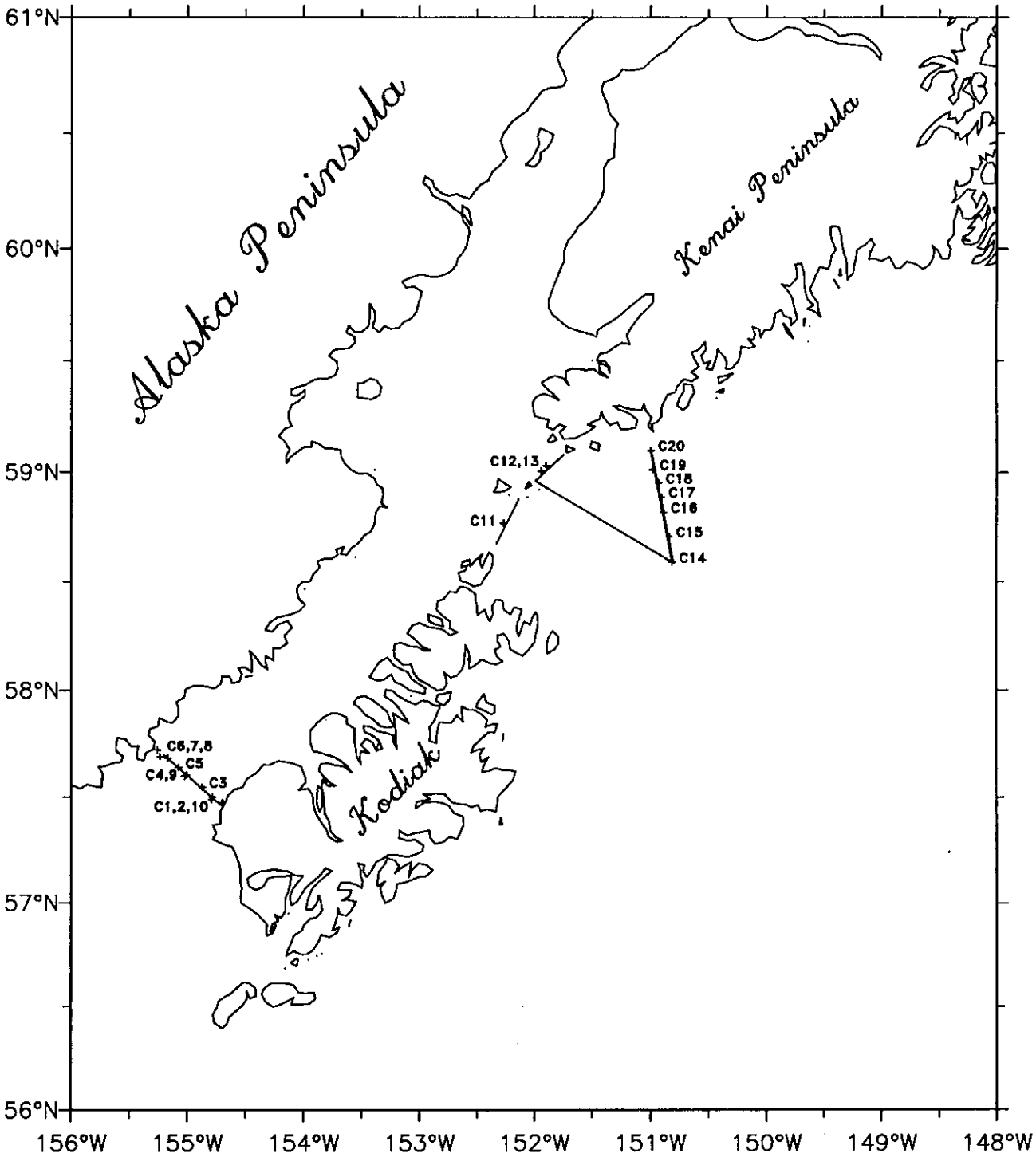


Fig. 7.2. MF-91-11 ADCP (straight lines) and CTD (C) stations.

TABLE 9. MF-91-11 CRUISE SUMMARY

Mooring recoveries — 30 SEPTEMBER - 06 OCTOBER 1991

Date (JD)	Date (GMT)	Time (GMT)	Cast No.	FOCI ID	Depth (m)	Latitude Deg.	Min		Longitude Deg.	Min.		Activity
273	30-Sep	21:00			42							Depart Larsen Bay
274	1-Oct	01:38	001	FOX55	59	57°	28.5'	N	154°	41.9'	W	CTD
274	1-Oct	02:14	002	FOX56	200	57°	30.1'	N	154°	47.1'	W	CTD
274	1-Oct	03:01	003	FOX57	229	57°	32.8'	N	154°	52.4'	W	CTD
274	1-Oct	04:02	004	FOX58	237							CTD
274	1-Oct	04:51	005	FOX59	254	57°	38.3'	N	155°	04.6'	W	CTD
274	1-Oct	05:47	006	FOX60	290	57°	41.0'	N	155°	10.3'	W	CTD
274	1-Oct	06:34	007	FOX61	134	57°	43.3'	N	155°	15.6'	W	CTD
274	1-Oct	06:58		Line 8	300	57°	42.0'	N	155°	12.4'	W	ADCP/Line 8 (easterly)
274	1-Oct	08:44		Line 8	61	57°	27.8'	N	154°	42.9'	W	End ADCP transect
274	1-Oct	08:56		Line 8	115	57°	29.2'	N	154°	43.2'	W	ADCP/Line 8 (westerly)
274	1-Oct	10:59		Line 8	100	57°	42.5'	N	155°	17.1'	W	End ADCP transect
274	1-Oct	11:11		Line 8	56	57°	42.7'	N	155°	14.4'	W	ADCP/Line 8 (easterly)
274	1-Oct	13:02		Line 8	67	57°	28.6'	N	154°	43.2'	W	End ADCP transect
274	1-Oct	13:05		Line 8	77	57°	28.8'	N	154°	42.7'	W	ADCP/Line 8 (westerly)
274	1-Oct	15:21		Line 8	291	57°	43.0'	N	155°	15.6'	W	End ADCP transect
274	1-Oct	16:11	008	9101	295	57°	41.4'	N	155°	14.2'	W	CTD
274	1-Oct	20:15		9101	295	57°	41.5'	N	155°	13.3'	W	Recovered 9101
274	1-Oct	21:36	009	9102	237	57°	35.9'	N	155°	01.5'	W	CTD
274	1-Oct	23:00		9102	235	57°	35.9'	N	155°	01.7'	W	Recovered 9102
275	2-Oct	00:50	010	9103	186	57°	29.3'	N	154°	47.4'	W	CTD
275	2-Oct	03:10		9103	193	57°	31.2'	N	154°	45.3'	W	Recovered 9103
275	2-Oct	03:47			240	57°	34.4'	N	154°	48.0'	W	ADCP/Shelikof Strait
275	2-Oct	09:30			83	58°	01.7'	N	155°	28.3'	W	End ADCP transect
275	2-Oct	09:42				58°	01.2'	N	155°	25.9'	W	Search for 9031
275	2-Oct	23:30			89	57°	55.4'	N	153°	16.1'	W	End search for 9031
276	3-Oct	03:00			135	58°	00.8'	N	153°	23.8'	W	ADCP/Shelikof Strait
276	3-Oct	09:07			127	58°	39.8'	N	152°	20.5'	W	End ADCP transect
276	3-Oct	09:13			162	58°	40.6'	N	152°	19.7'	W	ADCP/Stevenson Entrance
276	3-Oct	10:21			92	58°	52.7'	N	152°	08.1'	W	End ADCP transect
276	3-Oct	10:36			90	58°	52.7'	N	152°	08.1'	W	ADCP/Stevenson Entrance
276	3-Oct	11:51			120	58°	40.0'	N	152°	20.4'	W	End ADCP transect
276	3-Oct	11:58			118	58°	38.0'	N	152°	20.8'	W	ADCP/Stevenson Entrance
276	3-Oct	13:26			86	58°	52.8'	N	152°	07.5'	W	End ADCP transect
276	3-Oct	21:02	011	9139	117	58°	46.1'	N	152°	16.0'	W	CTD
276	3-Oct	23:12		9139	120	58°	45.5'	N	152°	14.0'	W	Recovered 9139
277	4-Oct	01:53	012	9142	194	59°	00.3'	N	151°	56.5'	W	CTD
277	4-Oct	02:47	013	9141	192	59°	01.8'	N	151°	53.8'	W	CTD
277	4-Oct	03:40			81	58°	57.8'	N	151°	59.9'	W	ADCP/Kennedy Entrance
277	4-Oct	04:40			180	59°	04.6'	N	151°	44.9'	W	End ADCP transect
277	4-Oct	07:07			170	59°	06.0'	N	151°	00.2'	W	ADCP/Gore Point (south)

TABLE 9. MF-91-11 CRUISE SUMMARY

Mooring recoveries — 30 SEPTEMBER - 06 OCTOBER 1991

Date (JD)	Date (GMT)	Time (GMT)	Cast No.	FOCI ID	Depth (m)	Latitude Deg.	Min		Longitude Deg.	Min.		Activity
277	4-Oct	09:49			180	58°	35.6'	N	150°	49.0'	W	End ADCP transect
277	4-Oct	10:02			183	58°	35.8'	N	150°	49.7	W	ADCP/to Kennedy Entrance
277	4-Oct	13:40			70	58°	57.6'	N	151°	59.5'	W	End ADCP transect
277	4-Oct	13:42			81	58°	57.8'	N	151°	59.1'	W	ADCP/Kennedy Entrance
277	4-Oct	14:32			67	59°	04.8'	N	151°	44.7'	W	End ADCP transect
277	4-Oct	14:36			69	59°	05.0'	N	151°	44.8'	W	ADCP/Kennedy Entrance
277	4-Oct	15:22			95	58°	58.0'	N	151°	58.8'	W	End ADCP transect
277	4-Oct	16:01		9142	187	58°	59.5'	N	151°	56.2'	W	Recovered 9142
277	4-Oct	17:24		9141	193	59°	01.7'	N	151°	53.1'	W	Recovered 9141
277	4-Oct	22:22	014	9138	180	58°	35.5'	N	151°	48.9'	W	CTD
277	4-Oct	23:21		9138	181	58°	35.5'	N	150°	47.1'	W	Recovered 9138
278	5-Oct	00:38	015	9137	187	58°	42.5'	N	150°	50.4'	W	CTD
278	5-Oct	01:00		9137	182	58°	42.8'	N	150°	50.9'	W	Recovered 9137
278	5-Oct	02:27	016	9136	182	58°	49.0'	N	150°	53.3'	W	CTD
278	5-Oct	02:41		9136	184	58°	49.0'	N	150°	53.1'	W	Recovered 9136
278	5-Oct	05:02	017	9135	146	58°	53.2'	N	150°	54.4'	W	CTD
278	5-Oct	05:49	018	9134	150	58°	57.1'	N	150°	55.9'	W	CTD
278	5-Oct	06:32	019	9133	165	59°	00.7'	N	150°	59.0'	W	CTD
278	5-Oct	07:25	020	9132	165	59°	05.9'	N	150°	59.9'	W	CTD
278	5-Oct	07:54			194	59°	05.7'	N	150°	59.6'	W	ADCP/Gore Point
278	5-Oct	10:28			177	58°	35.3'	N	150°	48.1'	W	End ADCP transect
278	5-Oct	11:05			198	58°	37.8'	N	150°	39.8'	W	ADCP Backtrack-L
278	5-Oct	13:31			182	58°	35.3'	N	150°	48.0'	W	ADCP/Gore Point
278	5-Oct	14:40			144	58°	53.2'	N	150°	51.5'	W	End ADCP transect
278	5-Oct	15:49		9135	145	58°	53.0'	N	150°	54.8'	W	Recovered 9135
278	5-Oct	17:22		9134	139	58°	57.2'	N	150°	56.9'	W	Recovered 9134
278	5-Oct	19:00		9133	157	59°	00.7'	N	150°	58.9'	W	Recovered 9133
278	5-Oct			9132								Recovered 9132
279	6-Oct	00:14			53	59°	11.1'	N	150°	57.8'	W	Bongo/Seacat test
279	6-Oct	01:25			185	59°	20.9'	N	150°	49.1'	W	Bongo/Seacat test

MOORING INFORMATION

Table 10. Summary of FOCI's 1991 Shelikof Strait Mooring Recoveries

Summary of equipment recovered

No. of RCM-4s:	42
No. of Neil Browns:	2
No. of Seacats:	12
No. of RDI ADCPs:	2
No. of WLR-5s:	3
No. of Seagauges:	3
No. of releases:	16

Mooring I.D.	9005	9031	9101	9102	9103	9132
Location	Sutwik 56° 21.58' N 156° 53.97' W	Kennedy 59° 03.36' N 152° 03.36' W	Line 8 57° 41.31' N 155° 14.46' W	Line 8 57° 35.92' N 155° 02.12' W	Line 8 57° 29.72' N 154° 48.09' W	Gore Point 59° 06.11' N 150° 59.55' W
Duration	4/17/90-	RECOVERY FAILURE	4/4/91-10/1/91	4/4/91-10/1/91	4/5/91-10/2/91	4/7/91-10/5/91
Depth	128 m	188 m	297	237	203	152
Instruments	Neil Brown 48 m Neil Brown 113 m	Neil Brown 47 m Aanderaa 49 m Neil Brown 148 m	Aanderaa 37 m Aanderaa 77 m Aanderaa 152 m Aanderaa 282 m	Aanderaa 37 m Aanderaa 77 m Aanderaa 152 m Aanderaa 222 m	Aanderaa 38 m Aanderaa 78 m Aanderaa 153 m Aanderaa 188 m	Aanderaa 37 m Aanderaa 72 m Aanderaa 102 m Aanderaa 137 m
Release	8242	191	8242	8242	8242	8242
Press Gage	none	Aanderaa WLR-7	none	none	none	none

Table 10. Summary of FOCI's 1991 Shelikof Strait Mooring Recoveries

Mooring I.D.	9133	9134	9135	9136	9137	9138
Location	Gore Point 59° 00.64' N 150° 57.92' W	Gore Point 58° 57.12' N 150° 55.91' W	Gore Point 58° 52.99' N 150° 53.98' W	Gore Point 58° 48.99' N 150° 52.57' W	Gore Point 58° 42.71' N 150° 50.31' W	Gore Point 58° 35.32' N 150° 48.13' W
Duration	4/7/91-10/5/91	4/7/91-10/5/91	4/7/91-10/5/91	4/7/91-10/5/91	4/8/91-10/5/91	4/8/91-10/4/91
Depth	158	141	147	185	183	179
Instruments	Aanderaa 36 m Seacat 38 m Aanderaa 71 m Seacat 73 m Aanderaa 101 m Seacat 103 m Aanderaa 143 m	Aanderaa 30 m Seacat 32 m Aanderaa 65 m Seacat 67 m Aanderaa 95 m Seacat 97 m Aanderaa 126 m Seacat 128 m	Aanderaa 36 m Seacat 38 m Aanderaa 71 m Seacat 73 m Aanderaa 101 m Seacat 103 m Aanderaa 132 m	Aanderaa 34 m Seacat 36 m Aanderaa 69 m Aanderaa 99 m Aanderaa 170 m	Aanderaa 35 m Aanderaa 70 m Aanderaa 100 m Aanderaa 168 m	Aanderaa 39 m Seacat 41 m Aanderaa 74 m Aanderaa 104 m Aanderaa 164 m
Release	8242	8242	8242	191	191	8242
Press Gage	Aanderaa WLR-5	Sea-Bird Seagauge	Sea-Bird Seagauge	Aanderaa WLR-5	Aanderaa WLR-5	Sea-Bird Seagauge

Table 10. Summary of FOCI's 1991 Shelikof Strait Mooring Recoveries

Mooring I.D.	9139	9141	9142
Location	Stevenson Entrance 58° 45.86' N 152° 14.82' W	Kennedy Entrance 59° 01.62' N 151° 51.66' W	Kennedy Entrance 58° 59.72' N 151° 55.70' W
Duration	4/6/91-10/3/91	4/7/91-10/4/91	4/7/91-10/4/91
Depth	121	191	192
Instruments	Aanderaa 54 m Aanderaa 106 m	150 KHz RDI ADCP at 181 m	150 KHz RDI ADCP at 182 m
Release Press Gage	8242	8242/191	8242/191

Table 11. Summary of FOCI's 1991 Shelikof Strait Mooring Deployments

Summary of equipment recovered

No. of RCM-4s:	46
No. of Seacats:	12
No. of RDI ADCPs:	2
No. of WLR-5s:	4
No. of Seagauges:	3
No. of releases:	17

Mooring I.D.	9101	9102	9103	9105	9132	9133
Location	Line 8 57° 41.31' N 155° 14.46' W	Line 8 57° 35.92' N 155° 02.12' W	Line 8 57° 29.72' N 154° 48.09' W	Sutwik 56° 21.78' N 156° 54.59' W	Gore Point 59° 06.11' N 150° 59.55' W	Gore Point 59° 00.64' N 150° 57.92' W
Duration	4/4/91-10/1/91	4/4/91-10/1/91	4/5/91-10/2/91	4/22/91-4/13/92	4/7/91-10/5/91	4/7/91-10/5/91
Depth	297	237	203	126	152	158
Instruments	Aanderaa 37 m Aanderaa 77 m Aanderaa 152 m Aanderaa 282 m	Aanderaa 37 m Aanderaa 77 m Aanderaa 152 m Aanderaa 222 m	Aanderaa 38 m Aanderaa 78 m Aanderaa 153 m Aanderaa 188 m	Aanderaa 31 m Aanderaa 111 m	Aanderaa 37 m Aanderaa 72 m Aanderaa 102 m Aanderaa 137 m	Aanderaa 36 m Seacat 38 m Aanderaa 71 m Seacat 73 m Aanderaa 101 m Seacat 103 m Aanderaa 143 m
Release	8242	8242	191	8242	8242	8242
Press Gage	none	none	none	none	none	Aanderaa WLR-5

Table 11. Summary of FOCI's 1991 Shelikof Strait Mooring Deployments

Mooring I.D.	9134	9135	9136	9137	9138	9139
Location	Gore Point 58° 57.12' N 150° 55.91' W	Gore Point 58° 52.99' N 150° 53.98' W	Gore Point 58° 48.99' N 150° 52.57' W	Gore Point 58° 42.71' N 150° 50.31' W	Gore Point 58° 35.32' N 150° 48.13' W	Stevenson Entrance 58° 45.86' N 152° 14.82' W
Duration	4/7/91-10/5/91	4/7/91-10/5/91	4/7/91-10/5/91	4/8/91-10/5/91	4/8/91-10/4/91	4/6/91-10/3/91
Depth	141	147	185	183	179	121
Instruments	Aanderaa 30 m Seacat 32 m Aanderaa 65 m Seacat 67 m Aanderaa 95 m Seacat 97 m Aanderaa 126 m Seacat 128 m	Aanderaa 36 m Seacat 38 m Aanderaa 71 m Seacat 73 m Aanderaa 101 m Seacat 103 m Aanderaa 132 m	Aanderaa 34 m Seacat 36 m Aanderaa 69 m Aanderaa 99 m Aanderaa 170 m	Aanderaa 35 m Aanderaa 70 m Aanderaa 100 m Aanderaa 168 m	Aanderaa 39 m Seacat 41 m Aanderaa 74 m Aanderaa 104 m Aanderaa 164 m	Aanderaa 54 m Aanderaa 106 m
Release	8242	8242	191	191	8242	8242
Press Gage	Sea-Bird Seagauge	Sea-Bird Seagauge	Aanderaa WLR-5	Aanderaa WLR-5	Sea-Bird Seagauge	

Table 11. Summary of FOCI's 1991 Shelikof Strait Mooring Deployments

Mooring I.D.	9140	9141	9142			
Location	Mitrofania 55° 45.03' N 158° 32.90' W	Kennedy Entrance 59° 01.62' N 151° 51.66' W	Kennedy Entrance 58° 59.72' N 151° 55.70' W			
Duration	4/23/91-4/13/92	4/7/91-10/4/91	4/7/91-10/4/91			
Depth	141	191	192			
Instruments	Aanderaa 32.5 m Aanderaa 72.5 m	150 KHz RDI ADCP at 181 m	150 KHz RDI ADCP at 182 m			
Release Press Gage	191 Aanderaa WLR-5	8242/191	8242/191			

Table 12. Summary of FOCI's 1991 Bering Sea Mooring Deployments

Summary of equipment deployed

No. of RCM-4s: 21
No. of releases: 5

Mooring I.D.	CM-A	CM-B	CM-C	CM-D	CM-E
Location	Amchitka Pass 57° 30.00' N 179° 58.30' E	Near Strait 53° 01.91' N 171° 36.59' E	Near Strait 53° 03.81' N 171° 15.23' E	Near Strait 53° 19.83' N 170° 30.34' E	St. Matthew 59° 14.97' N 178° 35.92' W
Duration	RECOVERY FAILURE	8/10/91-9/19/92	8/11/91-9/19/92	8/11/91-9/20/92	8/25/91- //92
Depth (m)	1145	708	1494	1040	1001
Instruments	Aanderaa 140 m	Aanderaa 125 m	Aanderaa 131 m	Aanderaa 125 m	Aanderaa 150 m
	Aanderaa 290 m	Aanderaa 250 m	Aanderaa 281 m	Aanderaa 275 m	Aanderaa 300 m
	Aanderaa 440 m	Aanderaa 400 m	Aanderaa 481 m	Aanderaa 500 m	Aanderaa 500 m
	Aanderaa 590 m	Aanderaa 550 m	Aanderaa 731 m	Aanderaa 750 m	Aanderaa 750 m
			Aanderaa 981 m		
Release	8242	8242	8242	8242	8242
Press Gage	none	none	none	none	none

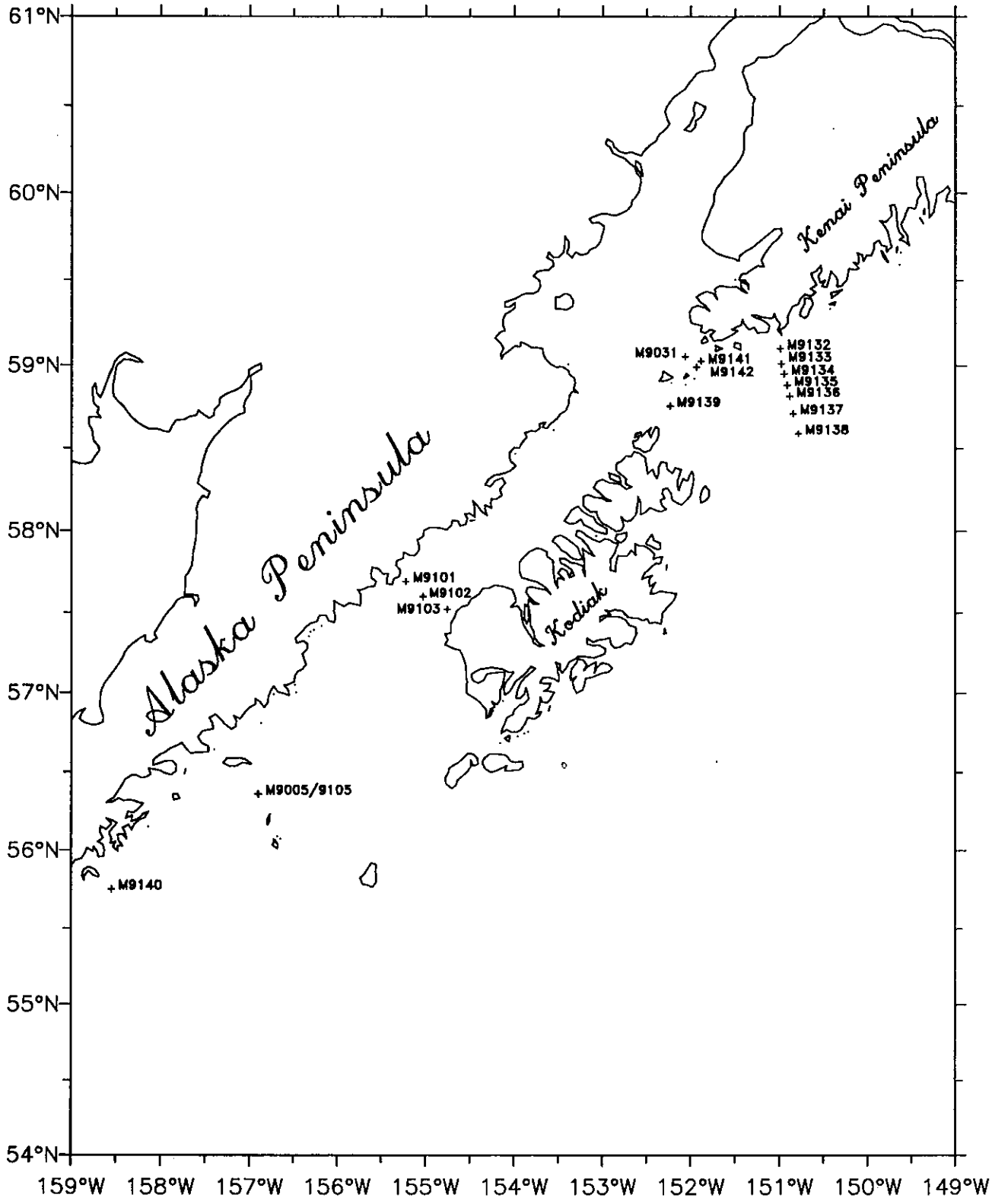


Fig. 8.0. 1991 Shelikof Strait mooring deployment/recovery sites.

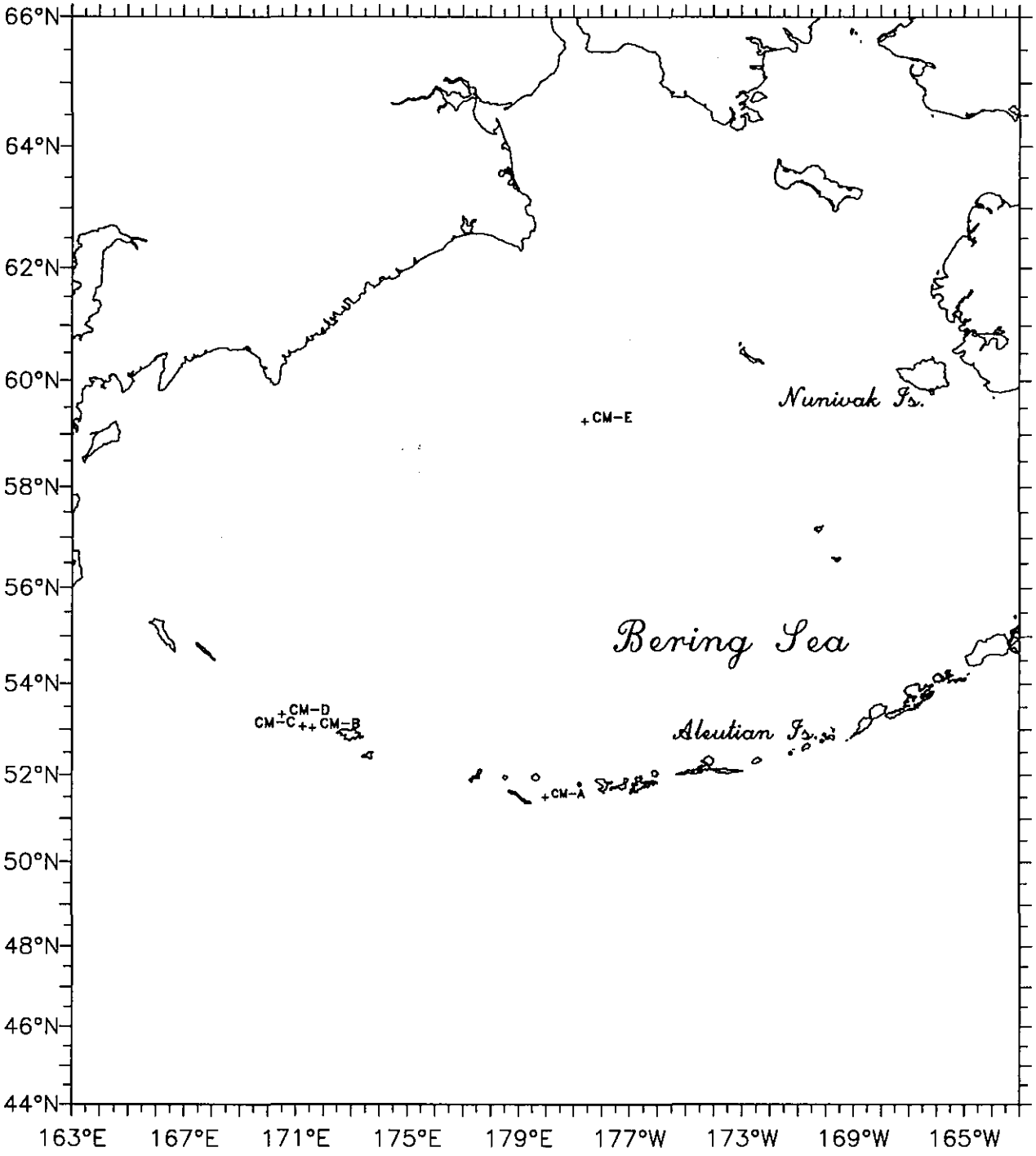


Fig. 8.1. 1991 Bering Sea mooring deployment sites.

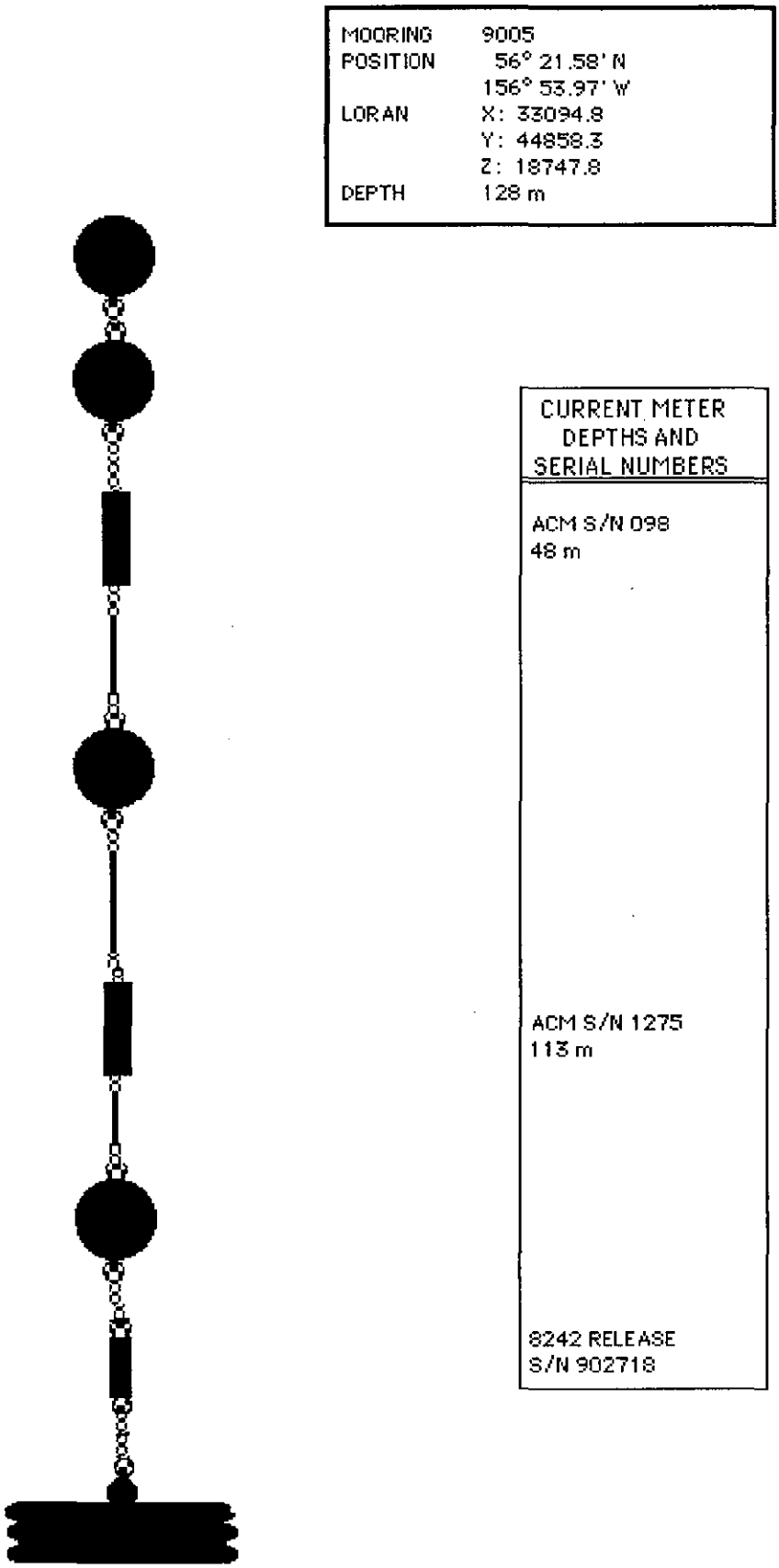
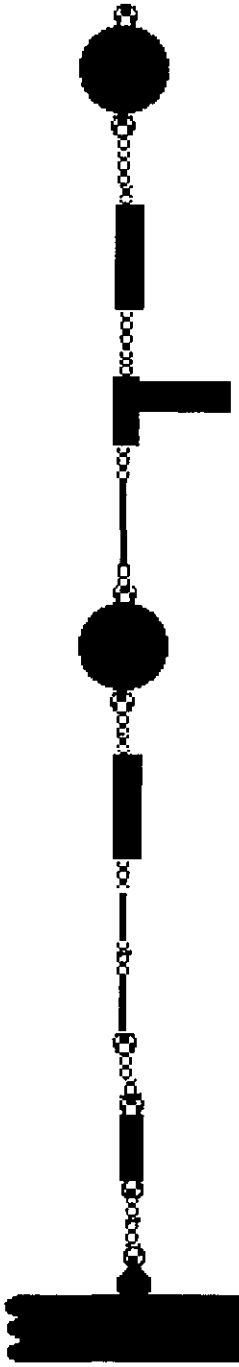


Fig. 8.2. Mooring 9005.

MOORING	9031
POSITION	59° 03.36' N
	152° 03.36' W
LORAN	X: 12109.4
	Y: 31737.9
DEPTH	188 METERS



CURRENT METER DEPTHS AND SERIAL NUMBERS

ACM S/N 1277
47 m

RCM S/N 1323
49 m

ACM S/N 1272
148 m

191 RELEASE
S/N 91U

Fig. 8.3. Mooring 9031.

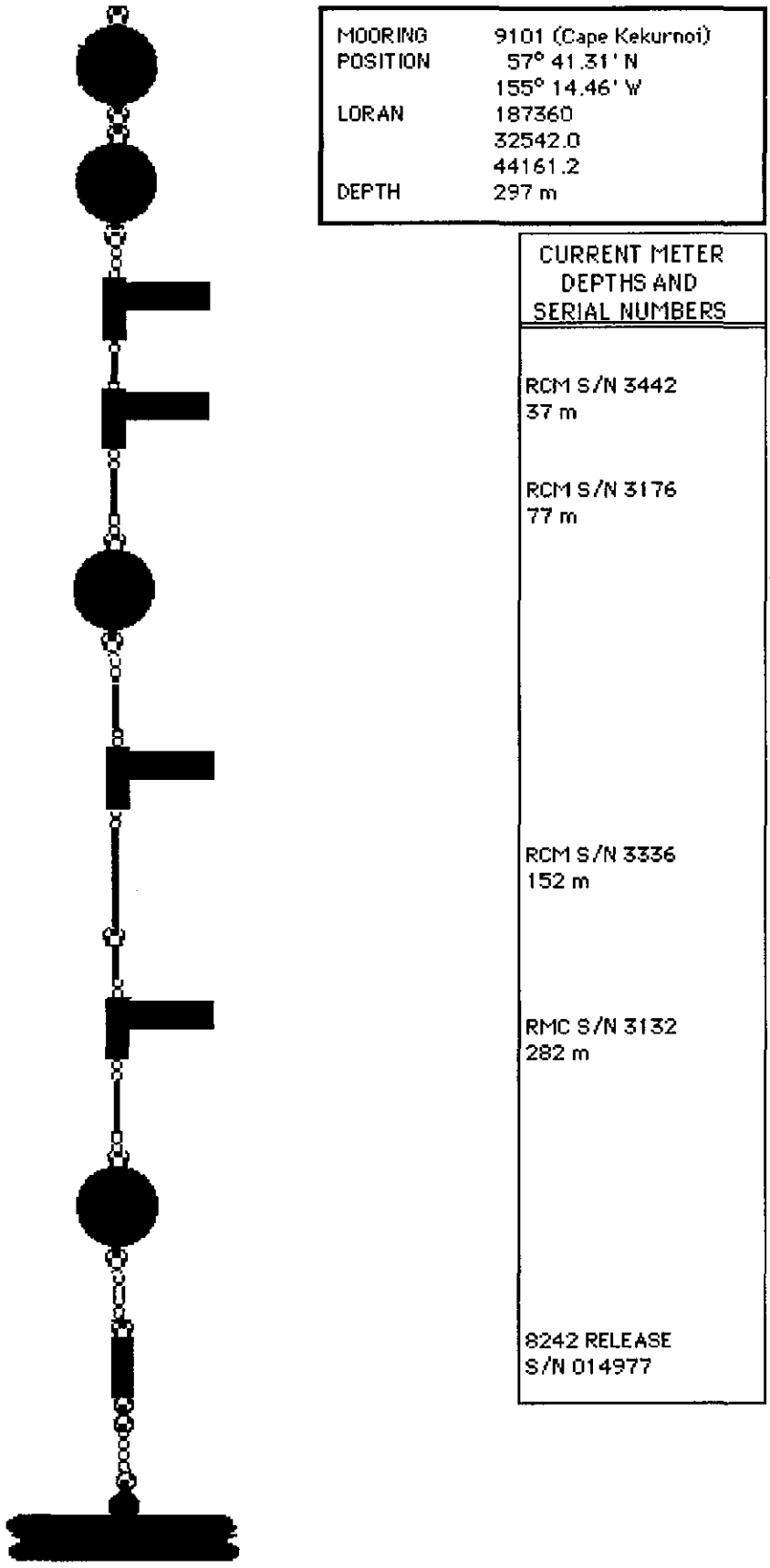


Fig. 8.4. Mooring 9101.

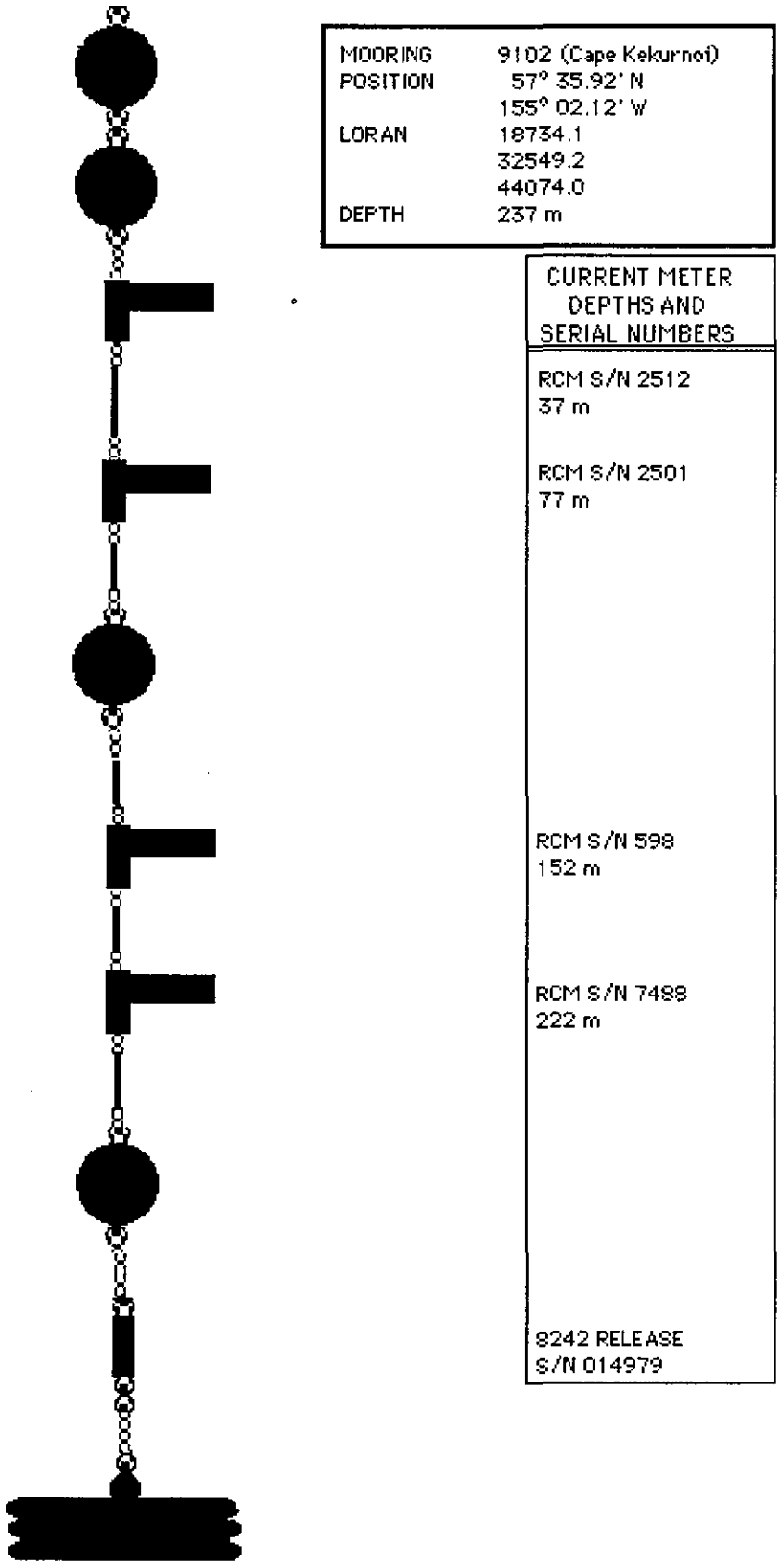


Fig. 8.5. Mooring 9102.

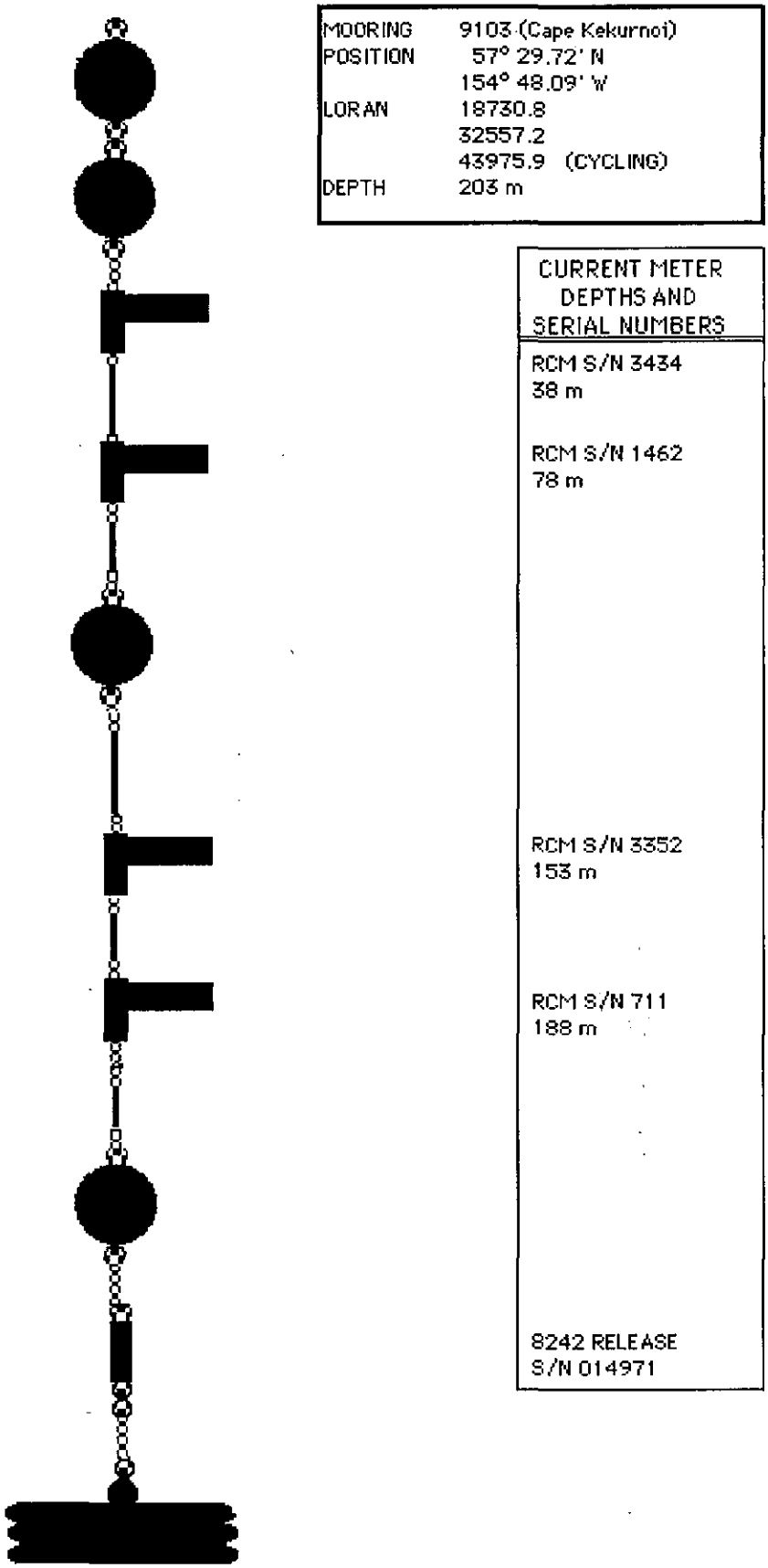
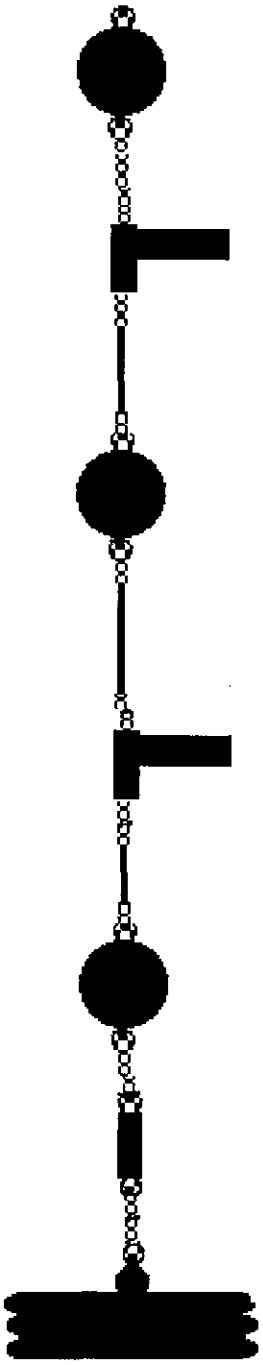


Fig. 8.6. Mooring 9103.

MOORING	9105 (Sutwik)
POSITION	56° 21.78' N
	156° 54.59' W
LORAN	18724.9
	33095.2
	44862.1
DEPTH	126 m



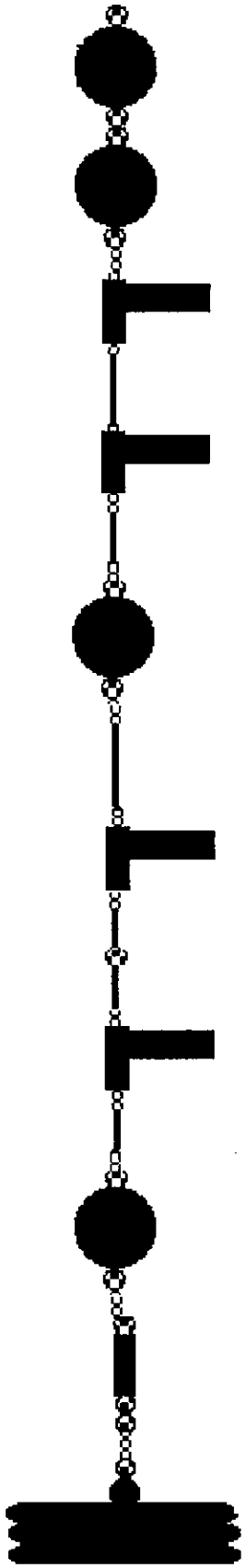
CURRENT METER DEPTHS AND SERIAL NUMBERS

RCM S/N 5257
31 m

RCM S/N 1960
111 m

AR 191 RELEASE
S/N 78 U

Fig. 8.7. Mooring 9105.



MOORING	9132 (Gore Point)
POSITION	59° 06.11' N
	150° 59.55' W
LORAN	12328.1 GRID 7960
	31685.7 (CYCLING)
DEPTH	152 m

CURRENT METER DEPTHS AND SERIAL NUMBERS

RCM S/N 5261
37 m

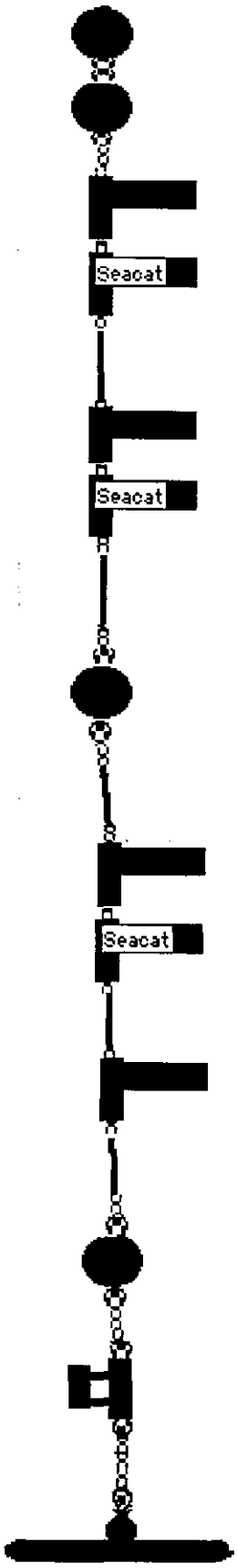
RCM S/N 1987
72 m

RCM S/N 1682
102 m

RCM S/N 1981
137 m

8242 RELEASE
S/N 014978

Fig. 8.8. Mooring 9132.



MOORING	9133 (Gore Point)
POSITION	159° 00.64' N
	150° 57.92' W
LORAN	12276.7 (CYCLING)
	31651.7 (LOCKED)
	GRID 7960
DEPTH	158 m

CURRENT METER DEPTHS AND SERIAL NUMBERS

RCM S/N 5431
36 m
SEACAT S/N 661
38 m

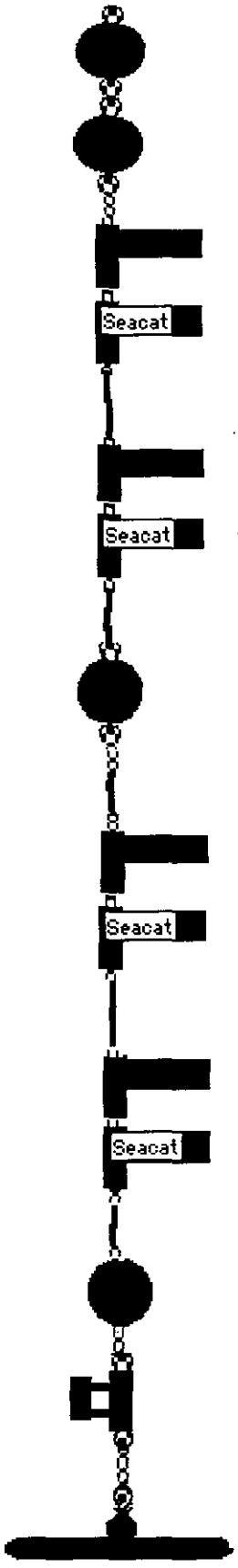
RCM S/N 2157
71 m
SEACAT S/N 659
73 m

RCM S/N 2359
101 m
SEACAT S/N 660
103 m

RCM S/N 2477
143 m

ART 191 RELEASE
S/N 72U
WLR-5 PRESS GAGE
S/N 1059

Fig. 8.9. Mooring 9133.



MOORING	9134 (Gore Point)
POSITION	58° 57.12' N
	150° 55.91' W
LORAN	12246.9 GRID 7960
	31628.9
DEPTH	141 m

CURRENT METER DEPTHS AND SERIAL NUMBERS

RCM S/N 704
30 m
SEACAT S/N 651
32 m

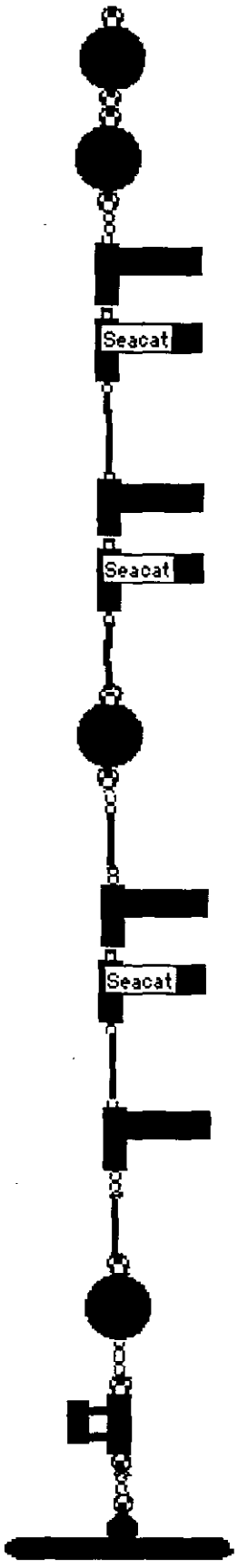
RCM S/N 2265
65 m
SEACAT S/N 658
67 m

RCM S/N 7486
95 m
SEACAT S/N 706
97 m

RCM S/N 2493
126 m
SEACAT S/N 652
128 m

8242 RELEASE
S/N 014974
SEAGAUGE PRES GAGE
S/N 264284-0012

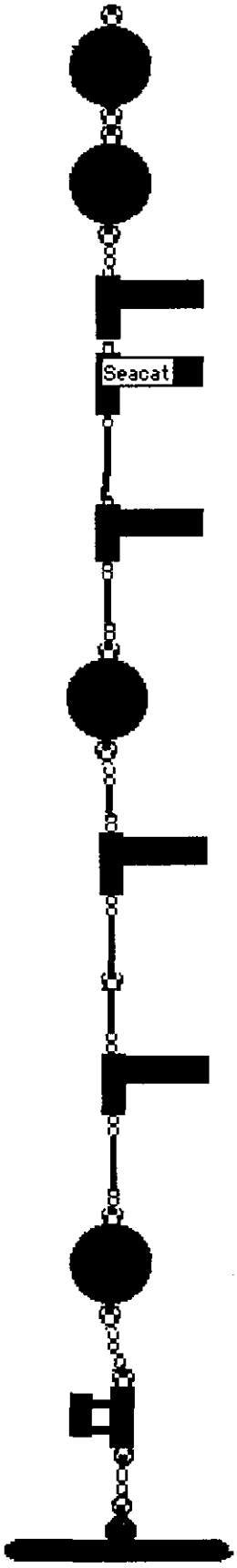
Fig. 8.10. Mooring 9134.



MOORING	9135 (Gore Point)
POSITION	58° 52.99' N
	150° 53.98' W
LORAN	12210.8 GRID 7960
	31602.0
DEPTH	147 m

CURRENT METER DEPTHS AND SERIAL NUMBERS
RCM S/N 3290
36 m
SEACAT S/N 379
38 m
RCM S/N 2358
71 m
SEACAT S/N 653
73 m
RCM S/N 2354
101 m
SEACAT S/N 656
103 m
RCM S/N 2500
132 m
8242 RELEASE
S/N 705532
SEAGAUGE PRES GAGE
S/N 264284-0013

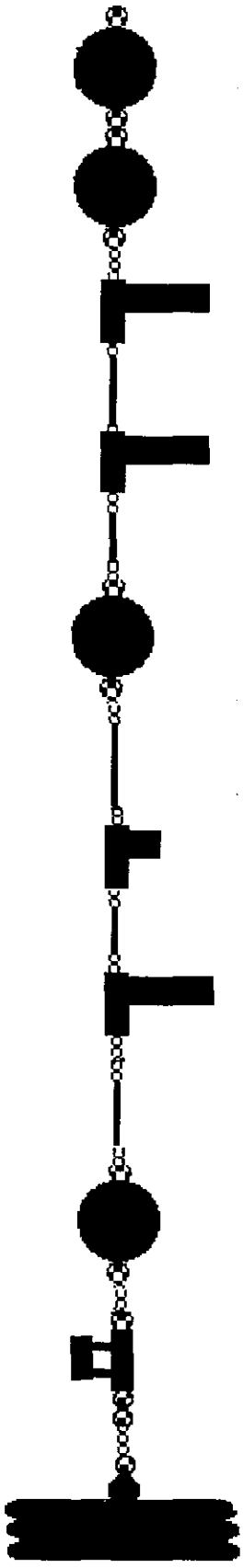
Fig. 8.11. Mooring 9135.



MOORING	9136 (Gore Point)
POSITION	58° 48.99' N
	150° 52.57' W
LORAN	12174.7 (CYCLING)
	31576.5 (LOCKED)
	GRID 7960
DEPTH	185 m

CURRENT METER DEPTHS AND SERIAL NUMBERS
RCM S/N 5072
34 m
SEACAT S/N 654
36 m
RCM S/N 1463
69 m
RCM S/N 5955
99 m
RCM S/N 6502
170 m
ART 191 RELEASE
S/N 85U
WLR-5 PRESS GAGE
S/N 853

Fig. 8.12. Mooring 9136.



MOORING	9137 (Gore Point)
POSITION	58° 42.71' N
	150° 50.31' W
LORAN	12118.8 (CYCLING)
	31536.6
	GRID 7960
DEPTH	183 m

CURRENT METER DEPTHS AND SERIAL NUMBERS

RCM S/N 5426
35 m

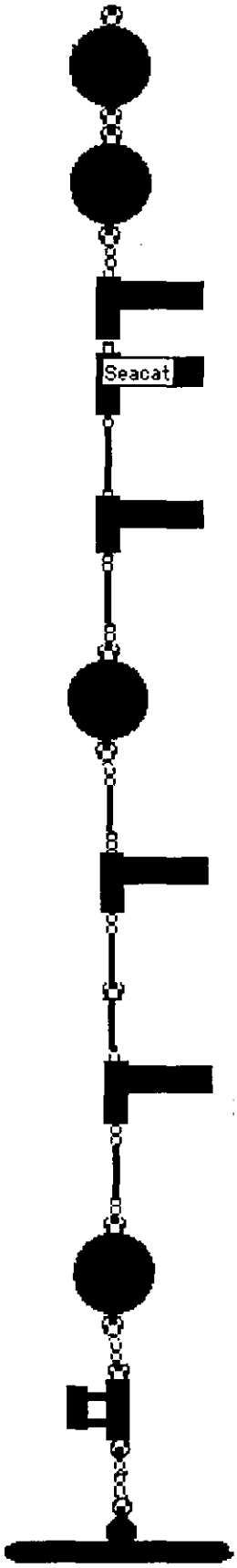
RCM S/N 1071
70 m

RCM S/N 9004
100 m

RCM S/N 6006
168 m

ART 191 RELEASE
S/N 90U
WLR-5 PRESS GAGE
S/N 331

Fig. 8.13. Mooring 9137.



MOORING	9138 (Gore Point)
POSITION	58° 35.32' N
	150° 48.13' W
LORAN	12052.3 (CYCLING)
	31489.8 (LOCKED)
	GRID 7960
DEPTH	179 m

CURRENT METER DEPTHS AND SERIAL NUMBERS
RCM S/N 3214
39 m
SEACAT S/N 657
41 m
RCM S/N 5988
74 m
RCM S/N 1675
104 m
RCM S/N 1074
164 m
8242 RELEASE
S/N 802101
SEAGAUGE PRES GAGE
S/N 264284-0011

Fig. 8.14. Mooring 9138.

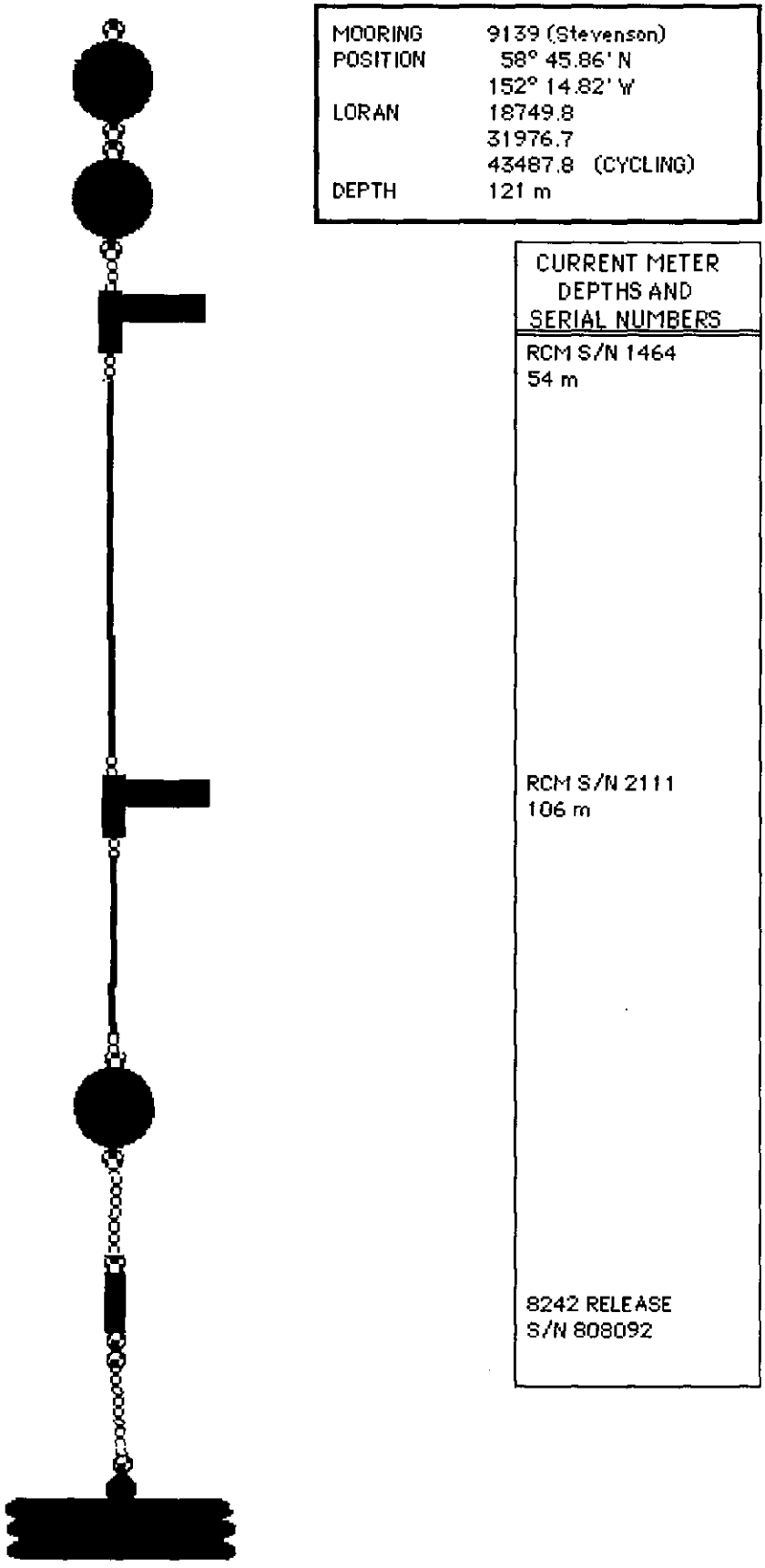


Fig. 8.15. Mooring 9139.

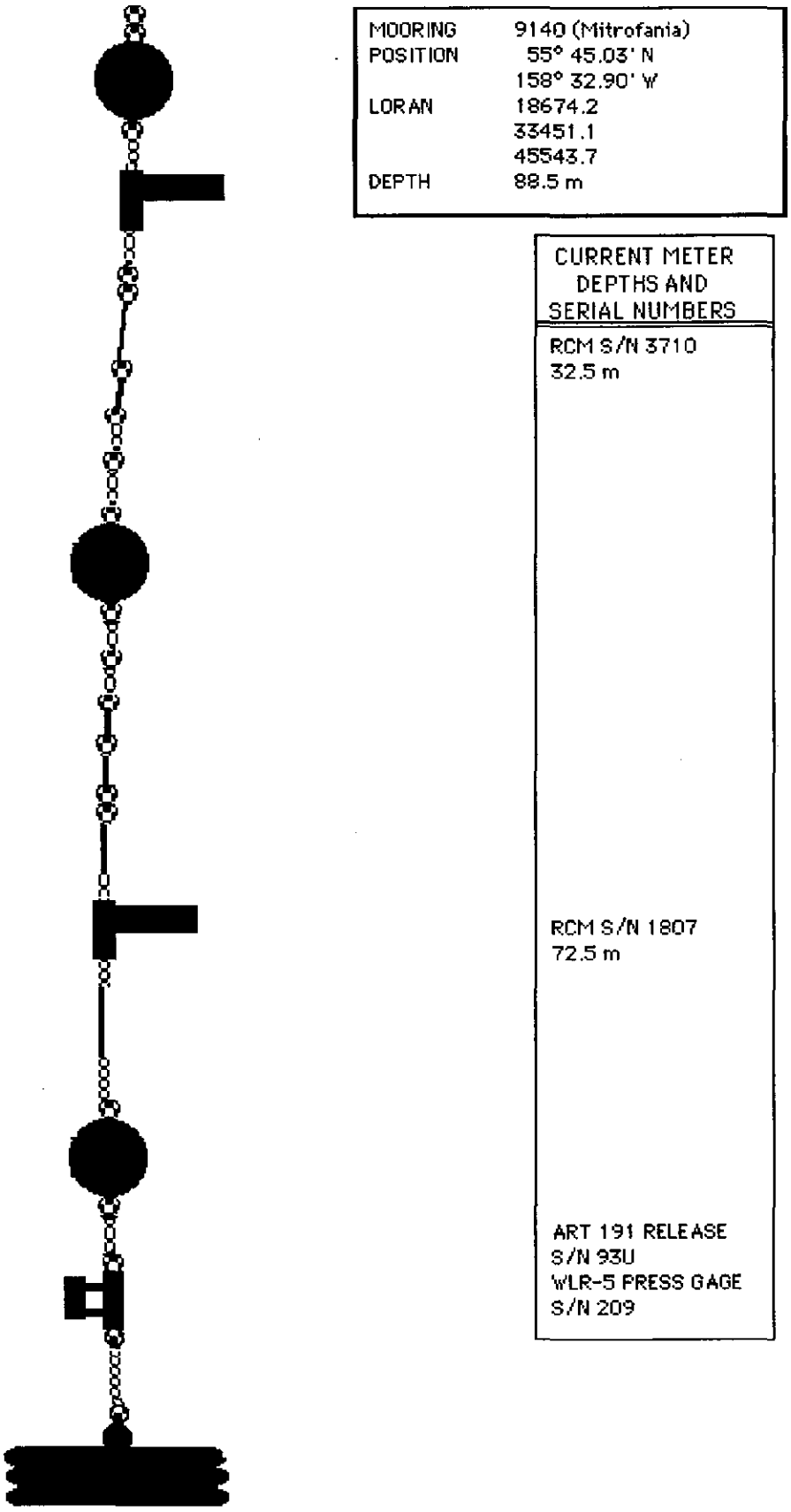
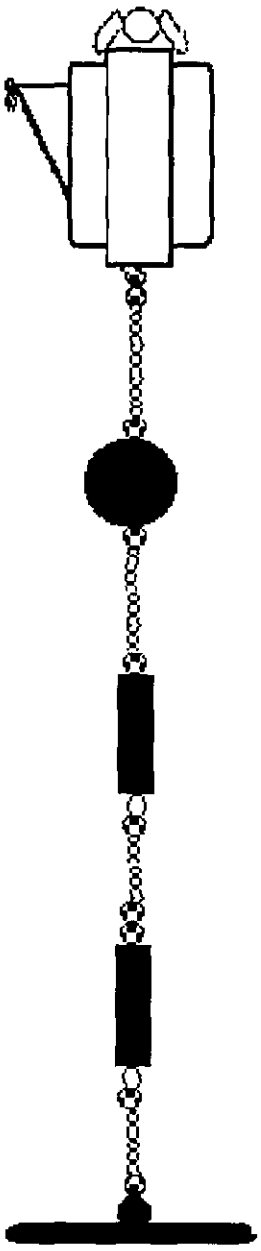


Fig. 8.16. Mooring 9140.

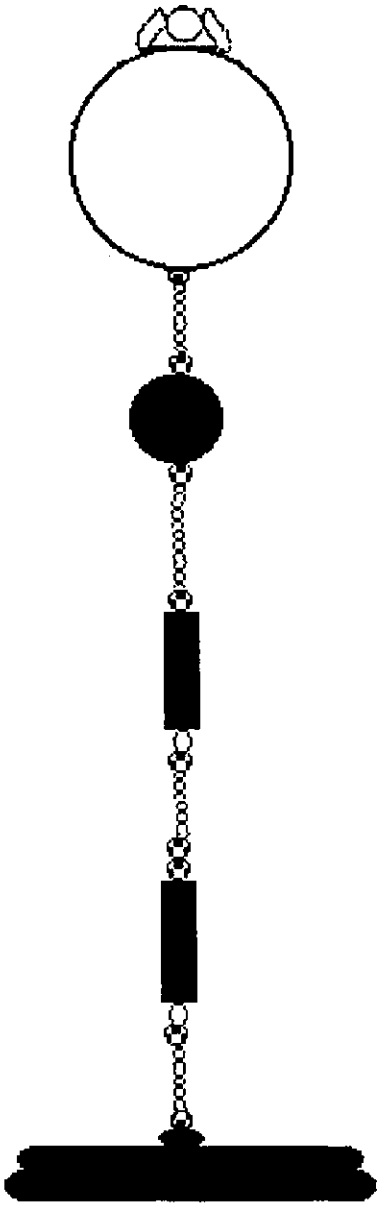
MOORING	9141 (Kennedy)
POSITION	59° 01.62' N
	151° 51.66' W
LORAN	18750.0
	31873.9
	43514.9 (CYCLING)
DEPTH	191 m



CURRENT METER DEPTHS AND SERIAL NUMBERS
150 KHz RD ADCP S/N 4009 (LOANER) 181 m
8242 RELEASE S/N 014975
ART 191 RELEASE S/N 77U

Fig. 8.17. Mooring 9141.

MOORING	9142 (Kennedy)
POSITION	58° 59.72' N
	151° 55.70' W
LORAN	18749.9
	31887.5
	43514.7
DEPTH	192 m



CURRENT METER DEPTHS AND SERIAL NUMBERS

150 KHz RD ADCP
S/N 461
182 m

8242 RELEASE
S/N 014970

ART 191 RELEASE
S/N 84U

Fig. 8.18. Mooring 9142.

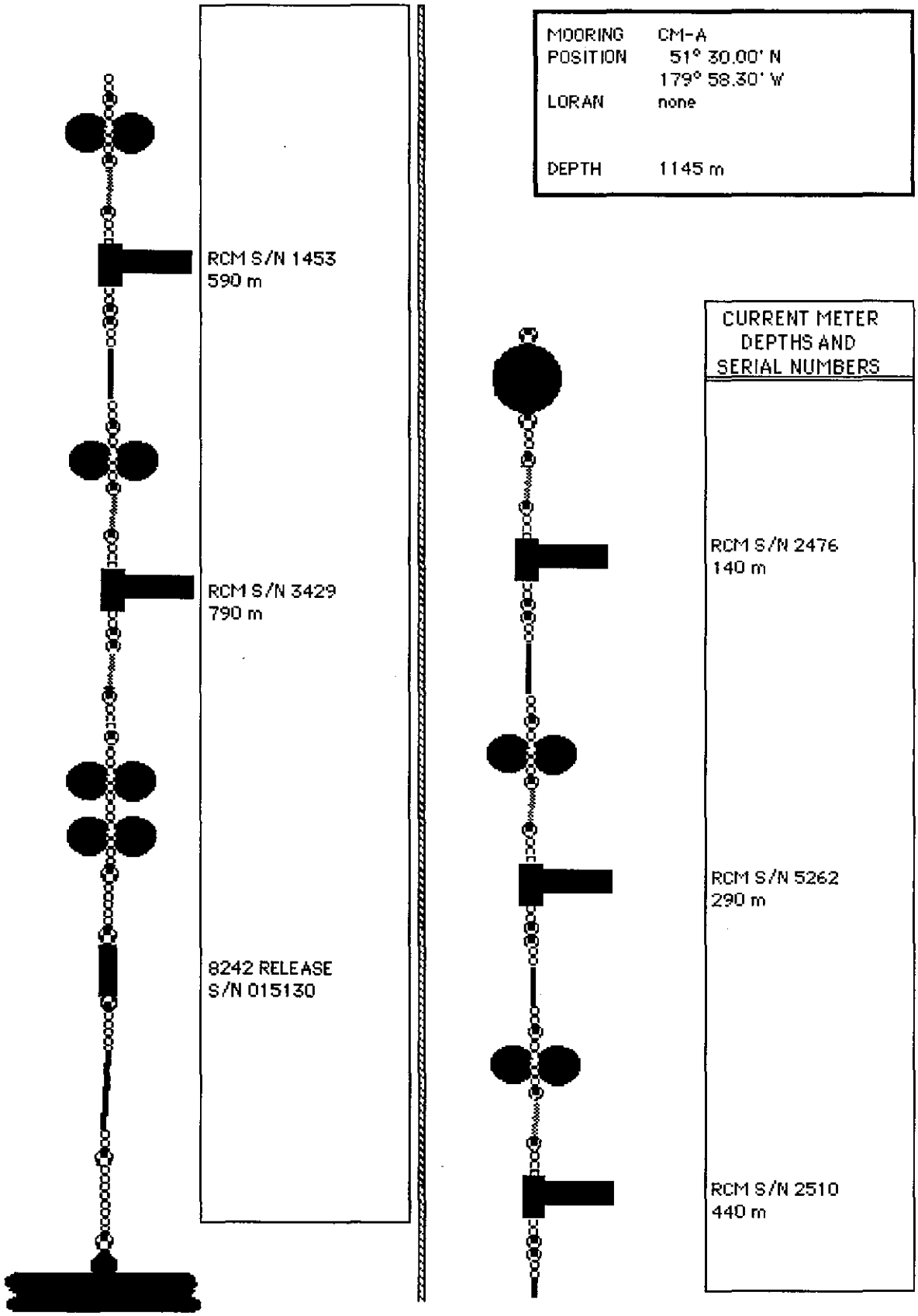


Fig. 8.19. Mooring CM-A.

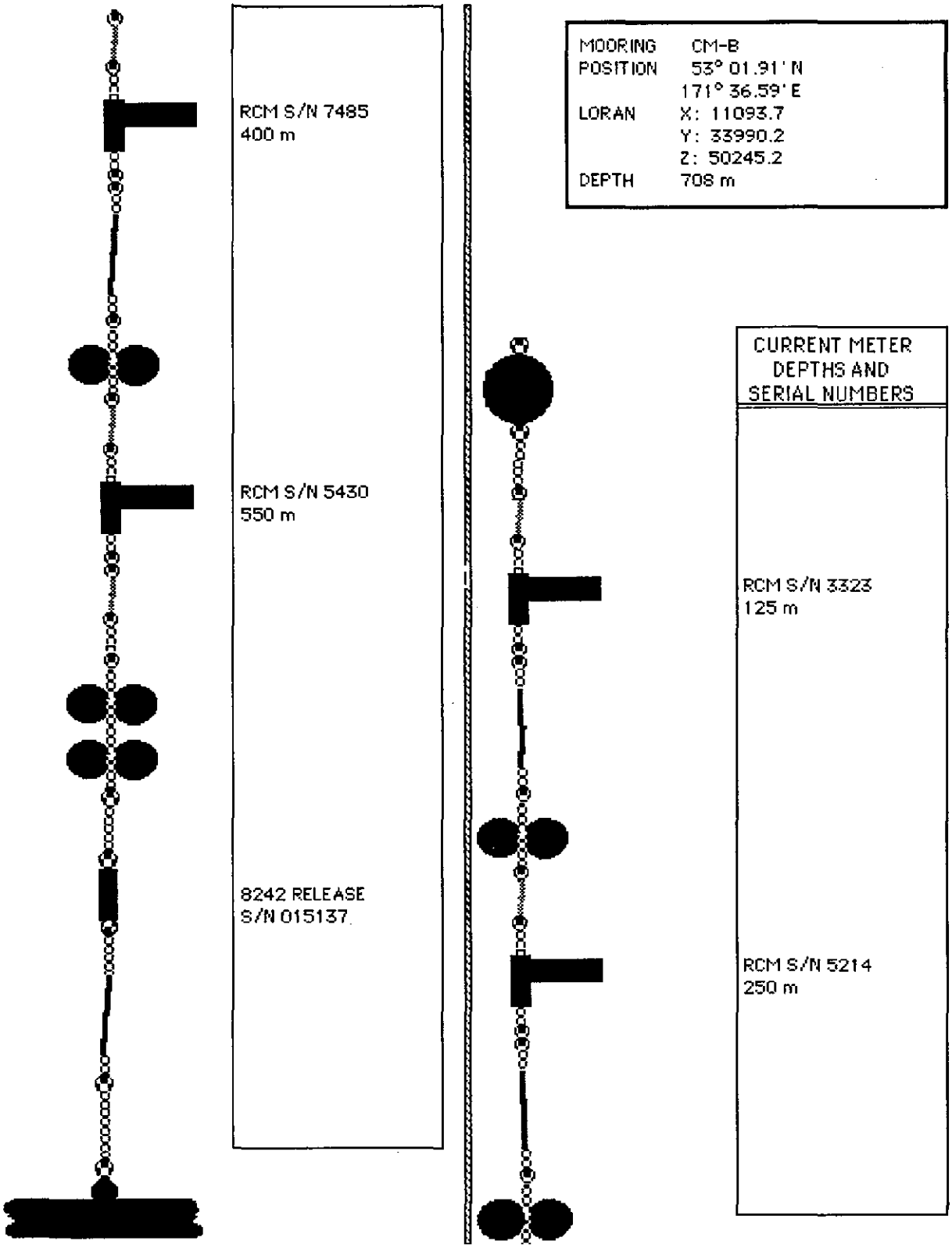


Fig. 8.20. Mooring CM-B.

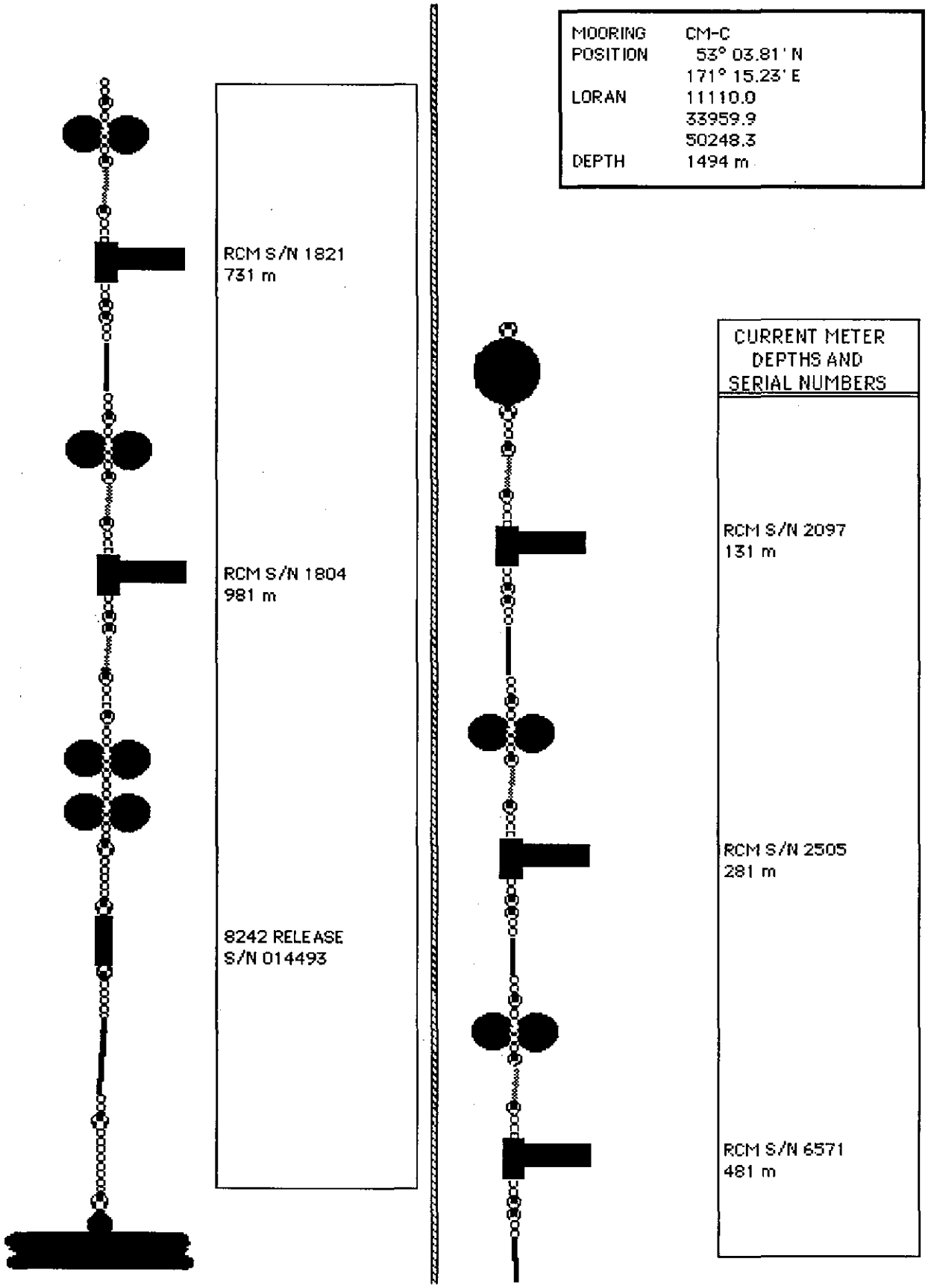


Fig. 8.21. Mooring CM-C.

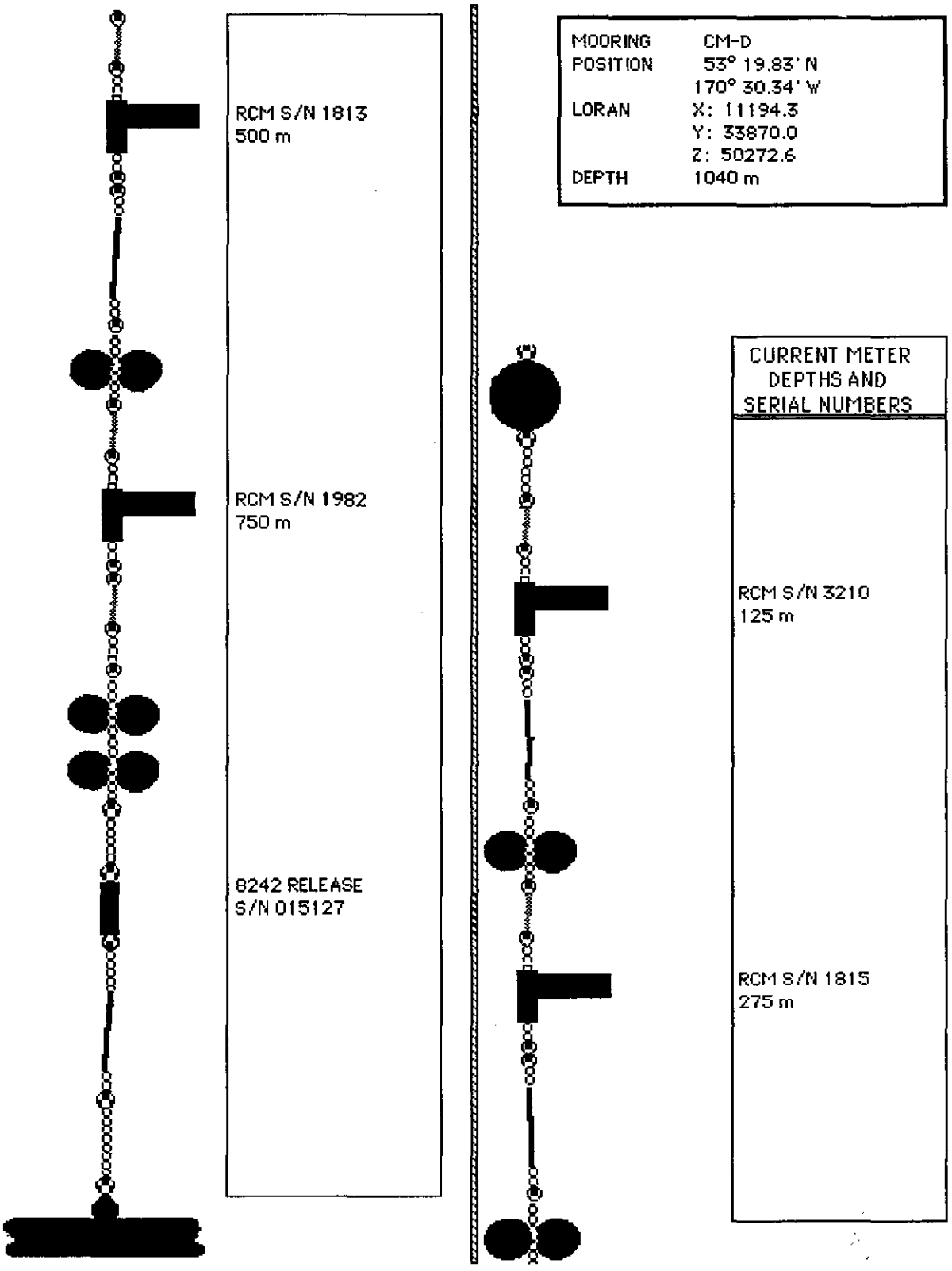


Fig. 8.22. Mooring CM-D.

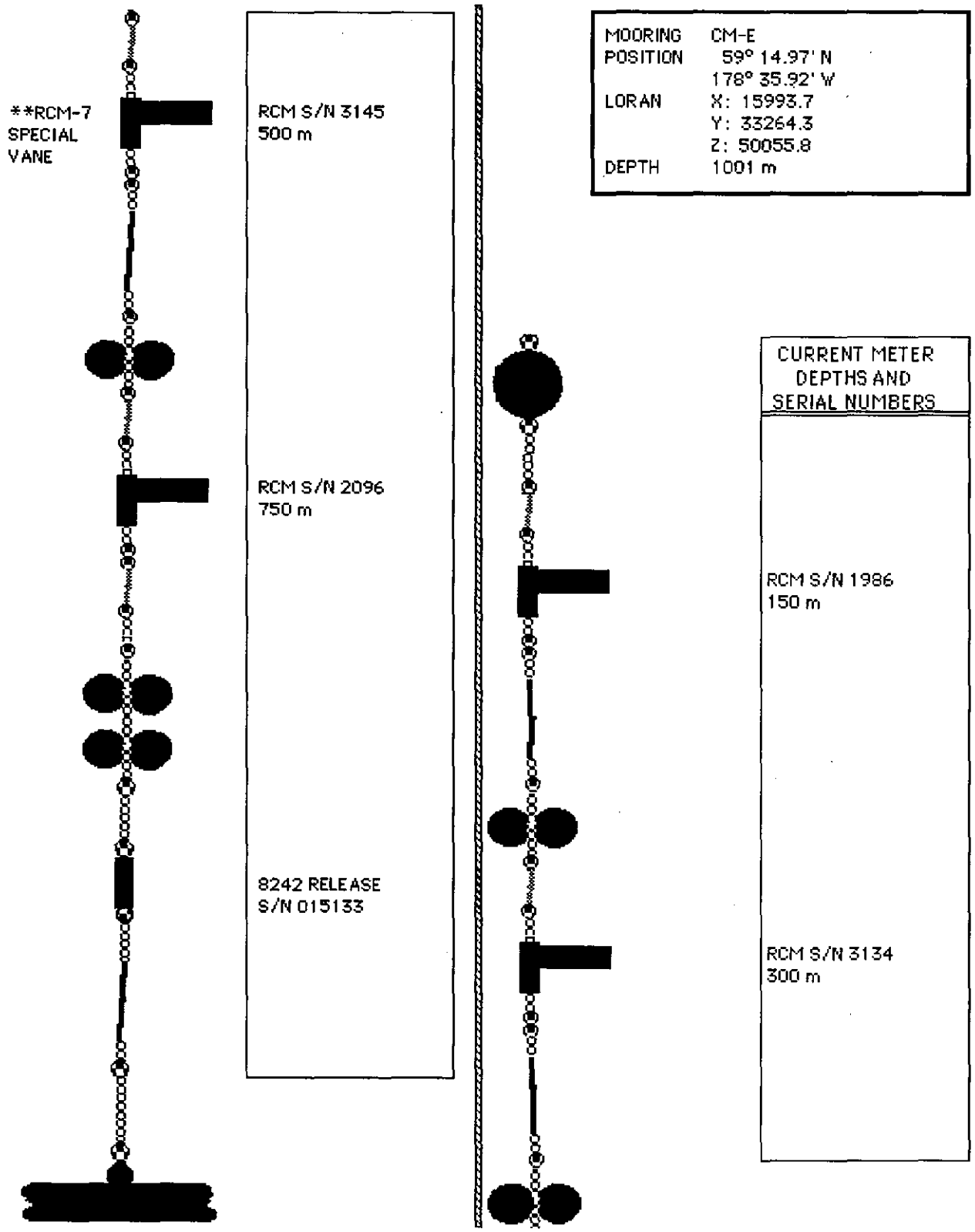


Fig. 8.23. Mooring CM-E.

*U.S. GOVERNMENT PRINTING OFFICE: 1993-774-025/89007