NOAA Data Report ERL PMEL-39

FISHERIES-OCEANOGRAPHY COORDINATED INVESTIGATIONS SHELIKOF STRAIT: 1990 FIELD OPERATIONS REPORT

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Pacific Marine Environmental Laboratory
Boulder, Colorado
March 1992

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UNITED STATES DEPARTMENT OF COMMERCE

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Fisheries-Oceanography Coordinated Investigations Shelikof Strait: 1990 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) 1990 field season (October '89–September '90). 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 1990 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, reorganized into blocks of information categorized by equipment and in alphabetical order. 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 90 Research Cruises

The 1990 field operations were conducted aboard the NOAA ships *Miller Freeman* and *Davidson*. Shipboard operations included plankton and larval sampling, CTDs, drifter studies, moorings, and satellite observations of the sea surface. There were seven cruises during FY90, designated as follows:

TABLE 1. 1990 Cruise Summary

FOCI cruise no.	Ship cruise no.	Project	Chief Scientist
FOCI-90-01	MF-90-02	Egg Survey	Art Kendall
OCSEAP-90-01	MF-90-03	OCSEAP	Carol DeWitt
FOCI-90-02	MF-90-04	Larval Survey	Sarah Hinckley
FOCI-90-03	MF-90-05	Physical Oc.	Jim Schumacher
FOCI-90-04	MF-90-06	Larval Survey	Kevin Bailey
	DA-90-02	Moorings	Bill Parker
FOCI-90-05	MF-90-09	Juvenile Pollock	Sarah Hinckley

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A summary of the primary objectives of each cruise is:

FOCI-90-01: map the distribution of planktonic eggs of walleye pollock (*Theragra chalcogramma*) and perform associated studies concerning the ecology of early life history stages of pollock spawned in Shelikof Strait.

OCSEAP-90-01: deploy three moorings in Shelikof Strait (this pertains to the FOCI portion of this cruise only).

FOCI-90-02: investigate transport, condition, and survival of pollock eggs and larvae from Shelikof Strait spawning grounds.

FOCI-90-03: collect in situ physical and biological data at an eddy site; recover and deploy moorings.

FOCI-90-04: collect data for abundance and mortality estimates of larval pollock resulting from Shelikof Strait pollock spawning.

DA-90-02: recover three moorings and drag for one mooring.

FOCI-90-05: continue acquisition of long-term abundance index information on juvenile pollock.

MF-90-02: 5 April–14 April, 1990 (FOCI-90-01)

SCIENTIFIC PERSONNEL

Name	Title	Organization
Art Kendall	Chief Scientist	AFSC/NOAA
Debbie Blood	Fishery Biologist	AFSC/NOAA
Richard Brodeur	Fishery Biologist	AFSC/NOAA
Jay Clark	Fishery Biologist	AFSC/NOAA
Miriam Doyle	Fishery Biologist	Oregon State Univ.
Bern Megrey	Fishery Biologist	AFSC/NOAA
Mary Yoklavich	Fishery Biologist	AFSC/NOAA

SUMMARY OF OPERATIONS SCHEDULE

Depart Kodiak	5 April
CTD at M8931	6 April
Pre-survey pollock egg predator tows	7 April
Line 7.5: CTDs	7 April
Line 8: CTDs and bongos	7 April
Bongo egg survey	8–12 April
Post-survey predator tows	12 April
CTD at M8904 and 8902	12–3 April
Midwater, bottom, Tucker and Sled tows	13 April
Arrive Kodiak	14 April

CRUISE STATISTICS

Plankton tows	124
Trawls completed	7
Length/Frequency collections	282
Otolith collections	34
Ovary sample collections	42
Stomach collections	323
CTD casts	18

OBJECTIVES

The objectives of MF-90-02 (FOCI-90-01) were to:

- map the distribution of planktonic eggs of walleye pollock (*Theragra chalcogramma*) and perform associated studies concerning the ecology of early life history stages of pollock spawned in Shelikof Strait.

OPERATIONS

Acoustic Doppler Current Profiler (ADCP): The ship mounted ADCP was operated during the entire cruise. The ADCP experienced intermittent failures in the PC unit caused by run time errors, sharing violations and loss of LORAN 7000 input.

Bongos: The biological component of the cruise included a bongo egg survey consisting of 105 stations. A 60-cm bongo net with .333 mm mesh was used. The bongos were taken to a depth of 10 m off the bottom using the EBKG. The EBKG was calibrated once during the cruise. In addition, bongo samples were collected at FOCI line 8 using a 60-cm bongo net with .333 mm mesh and a 20-cm diameter bongo net with .150 mm mesh. The quality of the sampling effort was good.

CTD Casts: CTDs were located to continue the long-term, water-properties data set at specific stations and to calibrate sensors on FOCI moorings. A total of eighteen CTD stations were occupied using the PMEL Seabird CTD. CTD casts were taken to within approximately 10 m of the bottom. The Shipboard Computer System (SCS) was used for data acquisition and storage.

Trawls: Five midwater trawls and two bottom trawls were made using a Noreastern bottom trawl and a modified bridleless rope trawl (NETsystems Northern Gold 1200).

Tucker Trawls: Eight Tucker trawls were completed. A 1-m Tucker trawl with a Clarke-Bumpus net inside each Tucker net was used. The Tucker nets had 0.505 mm mesh. The lower net was fished from 250 m to 150 m and the upper net was fished from 150 m to the surface.

Tucker/Sled Tows: Two tows with a 1-m Tucker trawl mounted on a sled were made. The Tucker trawl mesh was 0.505 mm, and a Clarke-Bumpus mesh was mounted inside. The sled was lowered to the bottom, then opened by messenger and towed for approximately 10 minutes. A second messenger closed the net, which was then retrieved. It was difficult to determine when

the sled reached the bottom, since the bottom depth was beyond the maximum range of the EBKG. Also it was difficult to tell when the messenger reached the sled.

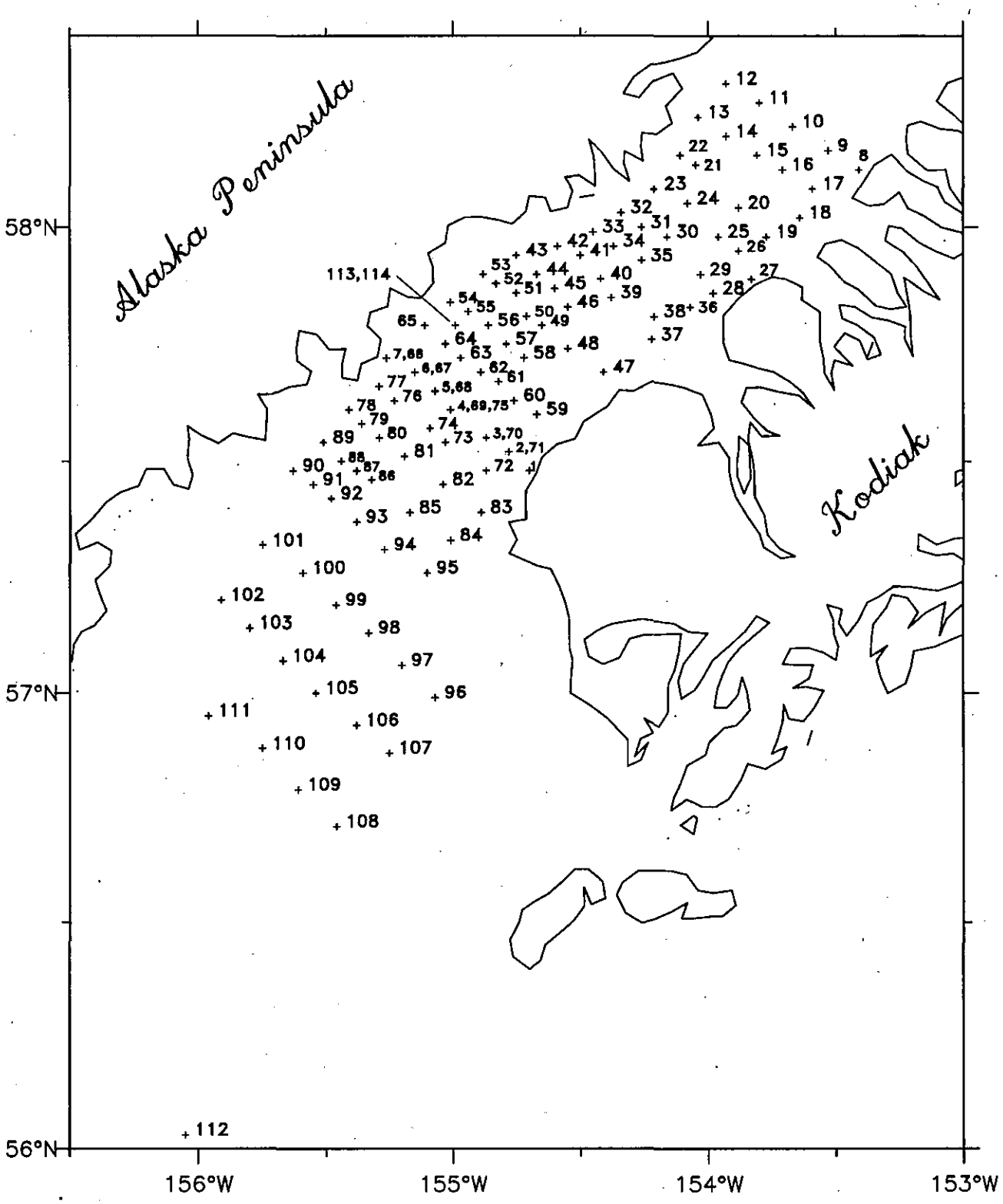

Fig. 1.1. MF-90-02 bongo stations.

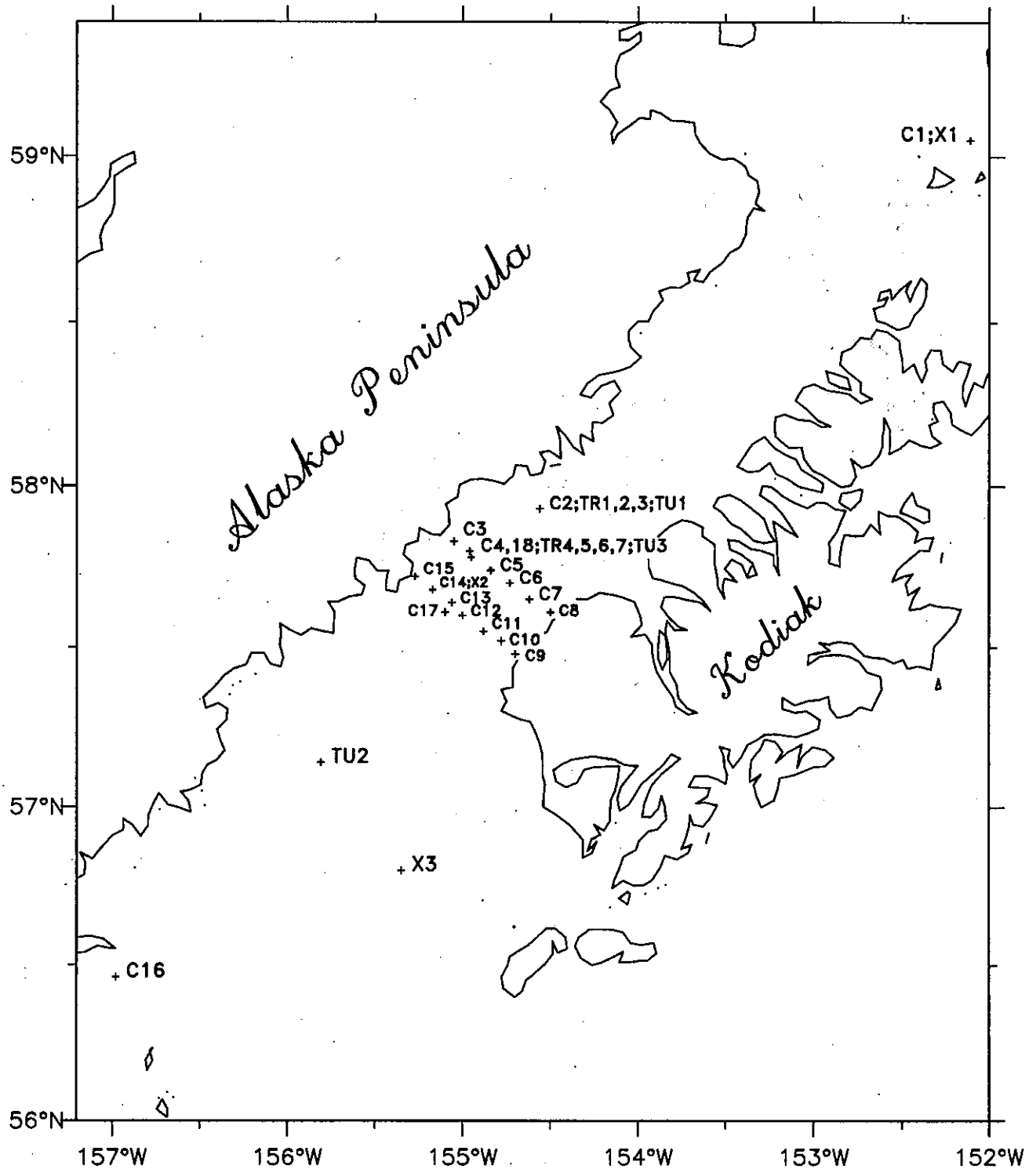

Fig. 1.2. MF-90-02 CTD (C), trawl (TR), Tucker trawl (TU), and XBT (X) stations.

TABLE 2. MF-90-02 CRUISE SUMMARY

Larval Survey 5-14 APRIL 1990

Date (JD)	Date (GMT)	Time (GMT)	Cast No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
095	5-Apr	2311				57° 43.8' N	152° 30.6' W	Depart Kodiak
096	6-Apr	0758	001		183	59° 02.7' N	152° 06.5' W	CTD
096	6-Apr	0815			177	59° 02.9' N	152° 08.1' W	XBT #1
096	6-Apr	1957			280	57° 55.8' N	154° 30.5' W	Trawl 1
096	6-Apr	2136			282	57° 55.4' N	154° 33.2' W	Trawl 2
097	7-Apr	0210	S001A		274	57° 55.5' N	154° 33.8' W	Tucker w. CB inside
097	7-Apr	0311	S001A		274	57° 55.5' N	154° 33.3' W	Tucker w. CB inside
097	7-Apr	0406	S001A		272	57° 55.6' N	154° 33.4' W	Tucker w. CB inside
097	7-Apr	0507	002		276	57° 55.5' N	154° 33.3' W	CTD
097	7-Apr	0605			285	57° 55.3' N	154° 32.2' W	Trawl 3
097	7-Apr	0728	S001A		287	57° 55.7' N	154° 32.6' W	Tucker w. CB inside
097	7-Apr	0947	003	Line 7.5	234	57° 50.0' N	155° 02.7' W	CTD
097	7-Apr	1050	004	Line 7.5	309	57° 46.9' N	154° 56.9' W	CTD
097	7-Apr	1159	005	Line 7.5	245	57° 44.2' N	154° 50.3' W	CTD
097	7-Apr	1256	006	Line 7.5	227	57° 41.7' N	154° 43.7' W	CTD
097	7-Apr	1353	007	Line 7.5	223	57° 39.2' N	154° 37.2' W	CTD
097	7-Apr	1455	008	Line 7.5	117	57° 36.3' N	154° 30.0' W	CTD
097	7-Apr	1617	009	FOX 55	66	57° 28.8' N	154° 42.2' W	CTD
097	7-Apr	1638	Z001A	FOX 55	58	57° 28.7' N	154° 41.8' W	B/b
097	7-Apr	1723	010	FOX 56	216	57° 30.9' N	154° 46.9' W	CTD
097	7-Apr	1754	Z002A	FOX 56	221	57° 31.2' N	154° 46.5' W	B/b
097	7-Apr	1852	011	FOX 57	234	57° 32.8' N	154° 52.5' W	CTD
097	7-Apr	2003	Z003A	FOX 57	230	57° 33.1' N	154° 52.4' W	B/b
097	7-Apr	2109	012	FOX 58	239	57° 36.2' N	155° 00.1' W	CTD
097	7-Apr	2133	Z004A	FOX 58	241	57° 36.3' N	155° 00.7' W	B/b
097	7-Apr	2233	013	FOX 59	258	57° 38.1' N	155° 03.8' W	CTD
097	7-Apr	2310	Z005A	FOX 59	258	57° 38.7' N	155° 04.0' W	B/b
098	8-Apr	0008	014	FOX 60	294	57° 40.8' N	155° 10.4' W	CTD
098	8-Apr	0037	Z006A	FOX 60	291	57° 41.1' N	155° 09.2' W	B/b
098	8-Apr	0044		FOX 61	291	57° 41.0' N	155° 09.0' W	XBT #2
098	8-Apr	0146	015	FOX 61	154	57° 43.0' N	155° 16.1' W	CTD
098	8-Apr	0207	Z007A	FOX 61	168	57° 43.3' N	155° 15.5' W	B/b
098	8-Apr	0814	G001A		201	58° 07.4' N	153° 24.4' W	Bongo
098	8-Apr	0909	G002A		201	58° 09.8' N	153° 31.9' W	Bongo
098	8-Apr	1009	G003A		196	58° 12.6' N	153° 40.2' W	Bongo
098	8-Apr	1105	G004A		203	58° 15.7' N	153° 47.9' W	Bongo
098	8-Apr	1157	G005A		263	58° 18.0' N	153° 55.8' W	Bongo
098	8-Apr	1252	G006A		254	58° 14.0' N	154° 02.5' W	Bongo
098	8-Apr	1344	G007A		216	58° 11.6' N	153° 55.7' W	Bongo
098	8-Apr	1433	G008A		199	58° 09.1' N	153° 48.6' W	Bongo
098	8-Apr	1514	G009A		199	58° 07.3' N	153° 42.7' W	Bongo
098	8-Apr	1611	G010A		230	58° 05.0' N	153° 35.5' W	Bongo

TABLE 2. MF-90-02 CRUISE SUMMARY

Larval Survey 5-14 APRIL 1990

Date (JD)	Date (GMT)	Time (GMT)	Cast No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
098	8-Apr	1702	G011A		189	58° 01.3' N	153° 38.5' W	Bongo
098	8-Apr	1756	G012A		236	57° 58.8' N	153° 46.0' W	Bongo
098	8-Apr	1839	G013A		198	58° 02.4' N	153° 52.6' W	Bongo
098	8-Apr	1948	G014A		245	58° 07.5' N	154° 03.2' W	Bongo
098	8-Apr	2034	G015A		270	58° 09.1' N	154° 06.6' W	Bongo
098	8-Apr	2132	G016A		279	58° 04.8' N	154° 12.7' W	Bongo
098	8-Apr	2226	G017A		212	58° 02.9' N	154° 04.5' W	Bongo
098	8-Apr	2320	G018A		203	57° 58.9' N	153° 57.6' W	Bongo
099	8-Apr	2350	G019A		205	57° 57.2' N	153° 53.0' W	Bongo
099	9-Apr	0050	G020A		149	57° 53.5' N	153° 49.8' W	Bongo
099	9-Apr	0143	G021A		210	57° 51.8' N	153° 58.8' W	Bongo
099	9-Apr	0223	G022A		199	57° 54.1' N	154° 02.0' W	Bongo
099	9-Apr	0248			199	57° 53.7' N	154° 02.5' W	BKG Calibration
099	9-Apr	0336	G023A		210	57° 58.6' N	154° 09.5' W	Bongo
099	9-Apr	0415	G024A		238	57° 59.8' N	154° 15.3' W	Bongo
099	9-Apr	0504	G025A		258	58° 01.7' N	154° 20.3' W	Bongo
099	9-Apr	0552	G026A		252	57° 59.2' N	154° 26.7' W	Bongo
099	9-Apr	0640	G027A		272	57° 57.7' N	154° 21.9' W	Bongo
099	9-Apr	0234	G028A		210	57° 55.6' N	154° 15.5' W	Bongo
099	9-Apr	0846	G029A		198	57° 49.5' N	154° 04.4' W	Bongo
099	9-Apr	0941	G030A		225	57° 45.6' N	154° 13.0' W	Bongo
099	9-Apr	1023	G031A		202	57° 48.5' N	154° 12.7' W	Bongo
099	9-Apr	1107	G032A		219	57° 51.1' N	154° 22.6' W	Bongo
099	9-Apr	1150	G033A		232	57° 53.2' N	154° 25.3' W	Bongo
099	9-Apr	1241	G034A		280	57° 56.2' N	154° 29.9' W	Bongo
099	9-Apr	1330	G035A		236	57° 57.3' N	154° 35.2' W	Bongo
099	9-Apr	1420	G036A		232	57° 56.2' N	154° 44.8' W	Bongo
099	9-Apr	1518	G037A		274	57° 53.7' N	154° 40.2' W	Bongo
099	9-Apr	1617	G038A		249	57° 52.3' N	154° 35.8' W	Bongo
099	9-Apr	1658	G039A		229	57° 50.0' N	154° 32.8' W	Bongo
099	9-Apr	1823	G040A		118	57° 41.1' N	154° 24.4' W	Bongo
099	9-Apr	1922	G041A		216	57° 44.6' N	154° 32.7' W	Bongo
099	9-Apr	2013	G042A		232	57° 47.3' N	154° 39.2' W	Bongo
099	9-Apr	2049	G043A		243	57° 48.6' N	154° 42.8' W	Bongo
099	9-Apr	2135	G044A		278	57° 51.7' N	154° 45.0' W	Bongo
099	9-Apr	2222	G045A		274	57° 52.5' N	154° 49.5' W	Bongo
099	9-Apr	2311	G046A		155	57° 54.2' N	154° 52.8' W	Bongo
099	9-Apr	2358	G047A		245	57° 50.1' N	155° 00.3' W	Bongo
100	10-Apr	0103	G048A		309	57° 49.2' N	154° 56.3' W	Bongo
100	10-Apr	0147	G049A		271	57° 47.6' N	154° 51.3' W	Bongo
100	10-Apr	0229	G050A		240	57° 45.0' N	154° 47.4' W	Bongo
100	10-Apr	0307	G051A		227	57° 43.1' N	154° 43.1' W	Bongo

TABLE 2. MF-90-02 CRUISE SUMMARY

Larval Survey 5-14 APRIL 1990

Date (JD)	Date (GMT)	Time (GMT)	Cast No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
100	10-Apr	0412	G052A		216	57° 35.8' N	154° 40.0' W	Bongo
100	10-Apr	0453	G053A		218	57° 37.7' N	154° 45.6' W	Bongo
100	10-Apr	0535	G054A		230	57° 40.2' N	154° 48.9' W	Bongo
100	10-Apr	0613	G055A		238	57° 41.4' N	154° 53.2' W	Bongo
100	10-Apr	0700	G056A		262	57° 43.1' N	154° 58.0' W	Bongo
100	10-Apr	0745	G057A		299	57° 45.1' N	155° 01.5' W	Bongo
100	10-Apr	0836	G058A		261	57° 47.5' N	155° 06.4' W	Bongo
100	10-Apr	0941	G059A		303	57° 42.8' N	155° 15.0' W	Bongo
100	10-Apr	1031	G060A		292	57° 40.3' N	155° 10.4' W	Bongo
100	10-Apr	1112	G061A		256	57° 38.4' N	155° 03.3' W	Bongo
100	10-Apr	1157	G062A		245	57° 36.0' N	155° 01.5' W	Bongo
100	10-Apr	1256	G063A		234	57° 32.8' N	154° 53.7' W	Bongo
100	10-Apr	1353	G064A		196	57° 30.7' N	154° 45.9' W	Bongo
100	10-Apr	1431	G065A		214	57° 28.8' N	154° 52.0' W	Bongo
100	10-Apr	1536	G066A		238	57° 32.3' N	155° 01.6' W	Bongo
100	10-Apr	1613	G067A		245	57° 34.3' N	155° 05.6' W	Bongo
100	10-Apr	1728	G068A		216	57° 36.2' N	155° 02.6' W	Bongo
100	10-Apr	1815	G069A		291	57° 37.9' N	155° 13.7' W	Bongo
100	10-Apr	1912	G070A		316	57° 39.4' N	155° 17.4' W	Bongo
100	10-Apr	2015	G071A		197	57° 36.8' N	155° 24.8' W	Bongo
100	10-Apr	2054	G072A		316	57° 34.7' N	155° 21.3' W	Bongo
100	10-Apr	2140	G073A		281	57° 33.0' N	155° 17.1' W	Bongo
100	10-Apr	2227	G074A		258	57° 30.3' N	155° 11.5' W	Bongo
100	10-Apr	2331	G075A		240	57° 26.7' N	155° 02.3' W	Bongo
101	11-Apr	0025	G076A		194	57° 23.5' N	154° 53.6' W	Bongo
101	11-Apr	0120	G077A		236	57° 19.6' N	155° 00.6' W	Bongo
101	11-Apr	0225	G078A		245	57° 23.2' N	155° 10.0' W	Bongo
101	11-Apr	0330	G079A		267	57° 27.3' N	155° 19.4' W	Bongo
101	11-Apr	0411	G080A		282	57° 28.5' N	155° 23.0' W	Bongo
101	11-Apr	0454	G081A		298	57° 30.1' N	155° 26.5' W	Bongo
101	11-Apr	0544	G082A		304	57° 32.6' N	155° 30.8' W	Bongo
101	11-Apr	0645	G083A		291	57° 28.7' N	155° 38.0' W	Bongo
101	11-Apr	0734	G084A		305	57° 27.2' N	155° 33.0' W	Bongo
101	11-Apr	0824	G085A		289	57° 25.0' N	155° 28.8' W	Bongo
101	11-Apr	0919	G086A		257	57° 21.9' N	155° 22.7' W	Bongo
101	11-Apr	1010	G087A		252	57° 18.8' N	155° 16.0' W	Bongo
101	11-Apr	1109	G088A		239	57° 15.6' N	155° 06.1' W	Bongo
101	11-Apr	1303	G089A		186	56° 59.6' N	155° 04.1' W	Bongo
101	11-Apr	1359	G090A		243	57° 03.5' N	155° 12.1' W	Bongo
101	11-Apr	1459	G091A		258	57° 07.6' N	155° 19.8' W	Bongo
101	11-Apr	1600	G092A		265	57° 11.5' N	155° 27.6' W	Bongo
101	11-Apr	1701	G093A		280	57° 15.6' N	155° 35.1' W	Bongo

TABLE 2. MF-90-02 CRUISE SUMMARY

Larval Survey 5-14 APRIL 1990

Date (JD)	Date (GMT)	Time (GMT)	Cast No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
101	11-Apr	1809	G094A		261	57° 19.1' N	155° 44.7' W	Bongo
101	11-Apr	1932	G095A		261	57° 12.2' N	155° 54.5' W	Bongo
101	11-Apr	2035	G096A		285	57° 08.2' N	155° 48.2' W	Bongo
101	11-Apr	2153	S002A		285	57° 08.2' N	155° 48.3' W	Tucker w. CB inside
101	11-Apr	2258	G097A		289	57° 03.9' N	155° 40.4' W	Bongo
102	12-Apr	0001	G098A		282	56° 59.7' N	155° 32.2' W	Bongo
102	12-Apr	0109	G099A		263	56° 56.0' N	155° 22.8' W	Bongo
102	12-Apr	0205	G100A		221	56° 52.2' N	155° 15.0' W	Bongo
102	12-Apr	0252			226	56° 48.0' N	155° 20.7' W	XBT #3
102	12-Apr	0338	G101A		225	56° 42.8' N	155° 27.8' W	Bongo
102	12-Apr	0448	G102A		269	56° 47.2' N	155° 36.8' W	Bongo
102	12-Apr	0606	G103A		295	56° 52.7' N	155° 44.9' W	Bongo
102	12-Apr	0728	G104A		261	56° 57.1' N	155° 57.4' W	Bongo
102	12-Apr	0830	G105A		210	56° 01.7' N	156° 02.8' W	Bongo
102	12-Apr	1012	S002A		289	57° 07.9' N	155° 43.6' W	Tucker w. CB inside
102	12-Apr	1526	016		77	56° 27.5' N	156° 58.6' W	CTD
103	13-Apr	0119	017		260	57° 36.7' N	155° 06.2' W	CTD
103	13-Apr	0609	018		322	57° 47.7' N	154° 57.7' W	CTD
103	13-Apr	0654			322	57° 47.4' N	154° 58.5' W	Trawl 4, midwater
103	13-Apr	0803			322	57° 47.2' N	154° 57.8' W	Trawl 5
103	13-Apr	1012	S003A		320	57° 48.0' N	154° 58.0' W	Epi. sled w. CB
103	13-Apr	1147	S003A		320	57° 47.5' N	154° 58.4' W	Tucker w. CB inside
103	13-Apr	1402	G106A		324	57° 47.1' N	154° 59.2' W	Bongo
103	13-Apr	1444	G106A		326	57° 47.1' N	154° 59.2' W	Bongo
103	13-Apr	1615			316	57° 46.7' N	154° 59.4' W	Trawl 6, midwater
103	13-Apr	1729			318	57° 48.0' N	154° 57.6' W	Trawl 7, bottom
103	13-Apr	2048	S003A		316	57° 47.3' N	154° 58.1' W	Epi. sled w. CB
103	13-Apr	2213	S003A		322	57° 47.1' N	154° 58.7' W	Tucker w. CB inside
104	14-Apr	1706				57° 43.8' N	152° 30.6' W	Arrive Kodiak

MF-90-03: 16 April–17 April, 1990 (OCSEAP-90-01)

SCIENTIFIC PERSONNEL

Name	Title	Organization
Carol DeWitt	Chief Scientist	PMEL/NOAA
Stephen Bograd	Physical Science Aide	PMEL/NOAA
Leslie Lawrence	Physical Science Technician	PMEL/NOAA
Peter Proctor	Oceanographer	PMEL/NOAA

SUMMARY OF OPERATIONS SCHEDULE

Depart Kodiak for mooring site	16 April
Mooring 9027: deploy	17 April
Mooring 9026: deploy	17 April
Mooring 9005: deploy	17 April

CRUISE STATISTICS

Mooring deployments	3
CTDs	2

OBJECTIVES

The objectives during the FOCI portion of MF-90-03 (OCSEAP-90-01) were to:

- deploy a total of three moorings in Shelikof Strait (while en route from Kodiak to the Bering Sea for an Outer Continental Shelf Environmental Assessment Program (OCSEAP) cruise).

OPERATIONS

Acoustic Doppler Current Profiler (ADCP): The ship mounted ADCP was operated during the entire cruise. There were many breaks in the data, at least one per day, due to run-time errors, access violation errors, and loss of Loran data. The cause of these errors has not been identified. These breaks in data created post processing difficulties and need to be resolved. A backtrack was completed in the Bering Sea during the OCSEAP portion of the cruise.

CTD Casts: CTDs were located to calibrate sensors on the moorings (CTDs were taken after mooring deployments). A total of two CTD stations were occupied using the PMEL Seabird CTD. CTD casts were taken to within approximately 10 m of the bottom. The Shipboard Computer System (SCS) was used for data acquisition and storage.

Moorings: Three moorings were deployed. Two of the three moorings were deployed at the same location. One of the two moorings, 9026, consisted of a 150 KHz RDI Acoustic Doppler Current Profiler (ADCP); while the second mooring, 9027, consisted of a single Aanderaa current meter (see Figures 8.4, 8.5, and 8.6). The ADCP was deployed at approximately 248 m below the surface; the single Aanderaa was deployed at approximately 80 m below the surface. The third mooring, 9005, consisted of two Neil Brown current meters, one each at 48 and 113 m.

OBJECTIVES

The objectives during the FOCI portion of MF-90-03 (OCSEAP-90-01) were to:

- deploy a total of three moorings in Shelikof Strait (while en route from Kodiak to the Bering Sea for an Outer Continental Shelf Environmental Assessment Program (OCSEAP) cruise).

OPERATIONS

Acoustic Doppler Current Profiler (ADCP): The ship mounted ADCP was operated during the entire cruise. There were many breaks in the data, at least one per day, due to run-time errors, access violation errors, and loss of Loran data. The cause of these errors has not been identified. These breaks in data created post processing difficulties and need to be resolved. A backtrack was completed in the Bering Sea during the OCSEAP portion of the cruise.

CTD Casts: CTDs were located to calibrate sensors on the moorings (CTDs were taken after mooring deployments). A total of two CTD stations were occupied using the PMEL Seabird CTD. CTD casts were taken to within approximately 10 m of the bottom. The Shipboard Computer System (SCS) was used for data acquisition and storage.

Moorings: Three moorings were deployed. Two of the three moorings were deployed at the same location. One of the two moorings, 9026, consisted of a 150 KHz RDI Acoustic Doppler Current Profiler (ADCP); while the second mooring, 9027, consisted of a single Aanderaa current meter (see Figures 8.4, 8.5, and 8.6). The ADCP was deployed at approximately 248 m below the surface; the single Aanderaa was deployed at approximately 80 m below the surface. The third mooring, 9005, consisted of two Neil Brown current meters, one each at 48 and 113 m.

TABLE 3. MF-90-03 CRUISE SUMMARY

OCSEAP cruise 16 APRIL - 4 MAY 1990

Date (JD)	Date (GMT)	Time (GMT)	Cast No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
107	16-Apr	1900			254	56° 46.9' N	155° 29.16	Deploy M9027
107	16-Apr	1941			254	56° 46.9' N	155° 29.23	Deploy M9026
107	16-Apr	2018	001		245	56° 46.4' N	155° 29.16	CTD at M9026/27
108	17-Apr	0206			128	56° 21.6' N	156° 53.97	Deploy M9005
108	17-Apr	0126	002		126	56° 21.4' N	156° 54.16	CTD at M9005

MF-90-04: 6 May–15 May, 1990 (FOCI-90-02)

SCIENTIFIC PERSONNEL

Name	Title	Organization
Hinckley, Sarah	Chief Scientist	NOAA/AFSC
Brown, Annette	Fishery Biologist	NOAA/AFSC
Clark, Jay	Fishery Biologist	NOAA/AFSC
Dell'Arciprete, Patricia	Fishery Biologist	NOAA/AFSC, UW
Merati, Nazila	Fishery Biologist	NOAA/AFSC
Theilacker, Gail	Fishery Biologist	NOAA/AFSC

SUMMARY OF OPERATIONS SCHEDULE

Depart Kodiak	6 May
Bongo survey	7–13 May
Line 8: CTDs and bongos	8–9 May
CTD at M9026	10 May
Deployed satellite-tracked drifters	11 May
CTD at M8904 and 9005	12 May
Gear comparison	12 May
Marinovich and Methot tows	13–14 May
ADCP Backtrack-L calibration	14 May
Arrive Homer	15 May

CRUISE STATISTICS

Bongo tows (larval grid stations)	(GxxxA)	78
Bongo tows (special "patch" stations)	(PxxxA)	7
Tucker trawls (special "patch" stations)	(PxxxA)	1
Vertical Bongo tows (Live tows)	(LxxxA)	11
Gear comparisons		
Bongo tows	(CxxxA)	4
Tucker trawls	(CxxxA)	4
CTD casts (total)	(xxx)	22
XBT casts		18
Satellite-tracked buoys deployed		3

CRUISE STATISTICS (cont.)

ADCP calibration	1
Marinovich trawls	3
Methot trawls	1

Collections

Larvae collected for age analysis	2205
Larvae collected for histological analysis	214
Larvae collected for RNA/DNA analysis	88
Larvae collected for stomach analysis (frozen)	80
Larvae collected for stomach analysis (formalin)	177
Larvae collected for J. Dunn	
Pollock	13
Cod	11
Flathead Sole	3
Plankton samples (formalin)	93
Microzooplankton samples (no. stations)	15
Ciliate samples (Lugol's) (no. stations)	15
Stomach samples	52
Maturity samples	5

OBJECTIVES

The objectives of MF-90-04 (FOCI-90-02) were to:

- conduct a survey of larval pollock distribution in the area between northern Shelikof Strait and the Semidi Islands
- estimate distribution, abundance, mortality and drift of larval pollock
- collect larval pollock for studies of growth and nutrition
- collect information on predators and prey of larval pollock
- conduct a series of gear comparisons to examine escapement and extrusion of larvae from the nets
- collect physical oceanographic information at stations where larval nutrition studies were conducted
- collect CTD data at the moorings deployed in 1989 and 1990
- deploy three satellite-tracked buoys in an area of aggregation of larvae
- continue the acquisition of long-term biological and physical time series at line 8

OPERATIONS

Acoustic Doppler Current Profiler (ADCP): Calibration of the ship's ADCP via a backtrack operation was done on 14 May.

Bongos: The larval survey of the region from northern Shelikof Strait to west of the Semidi Islands was started on 7 May and completed on 13 May. The 60-cm bongo with .333 mm mesh was the standard gear, deployed to 100 m at each station. Rough counts of larval pollock were made at each station to map distribution and abundance, and to decide where to do special studies. Biological samples for analysis of larval growth and condition were taken at selected stations. XBT's casts were done at stations where larval fish were collected for RNA/DNA analysis.

On 14 and 15 May, three bongo stations were done to the north and east of Kodiak to collect samples for growth and nutrition studies. A CTD cast was done at station D53, with samples taken for microzooplankton and ciliates. Live ciliates were also collected at this station.

CTD Casts: At selected bongo stations a 100-m CTD cast was done, and microzooplankton samples taken. At these stations, microzooplankton samples were collected at 10, 20, 30, 40, 50, and 60 m. Samples were also collected at 10, 30 and 50 m for examination of ciliates. At these stations, a live tow was also done to collect larvae for special studies.

Line 8 stations (FOX stations 55–61) were occupied on 8 May. Microzooplankton and ciliate samples were collected at FOX stations 55, 56, 58, 60 and 61.

CTD casts were done at current meter mooring sites 8902, 8904, 8931, 9005, 9026 and 9027.

A CTD cast was done at station D53, with samples taken for microzooplankton and ciliates.

Gear Comparisons: A set of 8 gear comparison tows were done on 12 May. A radar-tracked buoy drogued at 40 m was used as a reference point for the beginning of each tow, so that the same water mass was sampled (instead of using a fixed geographic starting point). All gear comparison tows were done to a depth of 100 m. Two night and 2 day 1-m Tucker trawls (.505 mm mesh) were done. Tucker trawls were done with a single net open only on retrieval. Two night and 2 day bongo tows were also done. The bongo had a .333 mm mesh net on one side, and a .505 mm mesh net on the other side.

Between the day and the night gear comparison tows, a 200-m Tucker trawl (using two nets, one open from 200 to 100 m, the other open from 100 to 0 m) was conducted to verify that most of the larvae were above 100 m. A 200-m CTD cast was also done at this time, with samples for microzooplankton taken at 10, 20, 30, 40, 50, 60, 80, 100, 150, and 200 m. Ciliate samples were taken at 10, 30, 50, 80, and 150 m. A sample of live ciliates was also collected on this station for transport to Seattle.

Live Tows: A live tow was done at FOX station 58. In addition, see comments under "*CTD Casts*".

Marinovich Trawls: Two trawls for predators on larval pollock were done on May 13th in an area of high larval abundance using the modified Marinovich trawl. The first two trawls were stepped at 100 m, 50 m and 10–20 m. Pollock stomachs for examination of predation were collected from these trawls, as were several samples for a pollock maturity study. A third (near-bottom) trawl was done with the Marinovich to collect larger pollock for the maturity study, but only small (2-yr-old) pollock were caught.

Methot: A Methot trawl was done to catch smaller midwater predators on larval pollock (than would be caught in the Marinovich trawls). The catch was almost 100% euphausiids.

Satellite-tracked Buoys: Three satellite-tracked buoys (no. 13, 26 and 35) were deployed on 11 May, in an area of high larval concentration. Inspection of the satellite-tracked drifter paths (see Figure 3.4) showed that all three drifters were placed in a clockwise eddy, which persisted for at least 18 days.

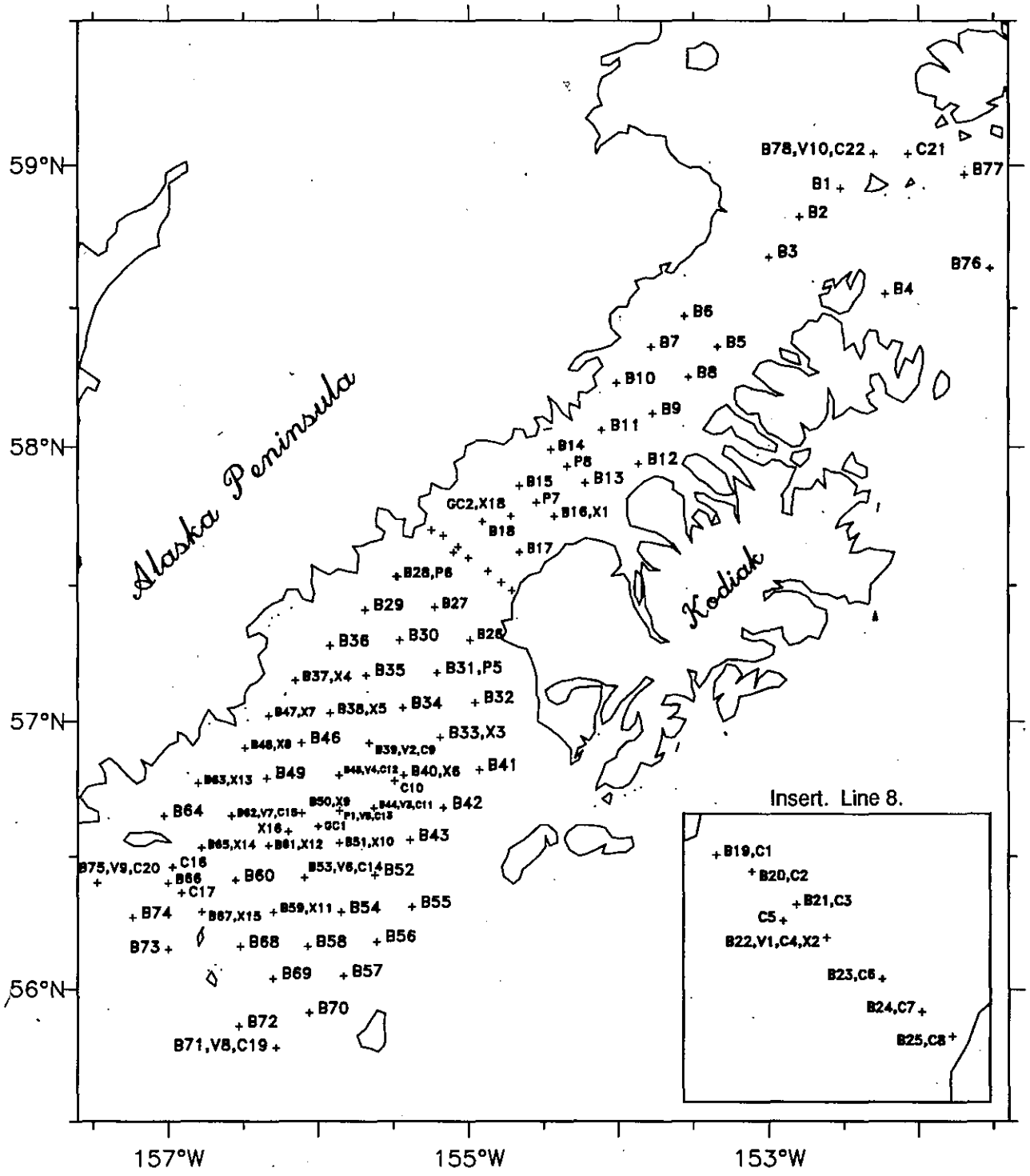

Fig. 3.1. MF-90-04 bongo (B), vertical bongo (V), patch study (P), gear comparison (GC), and CTD (C) stations.

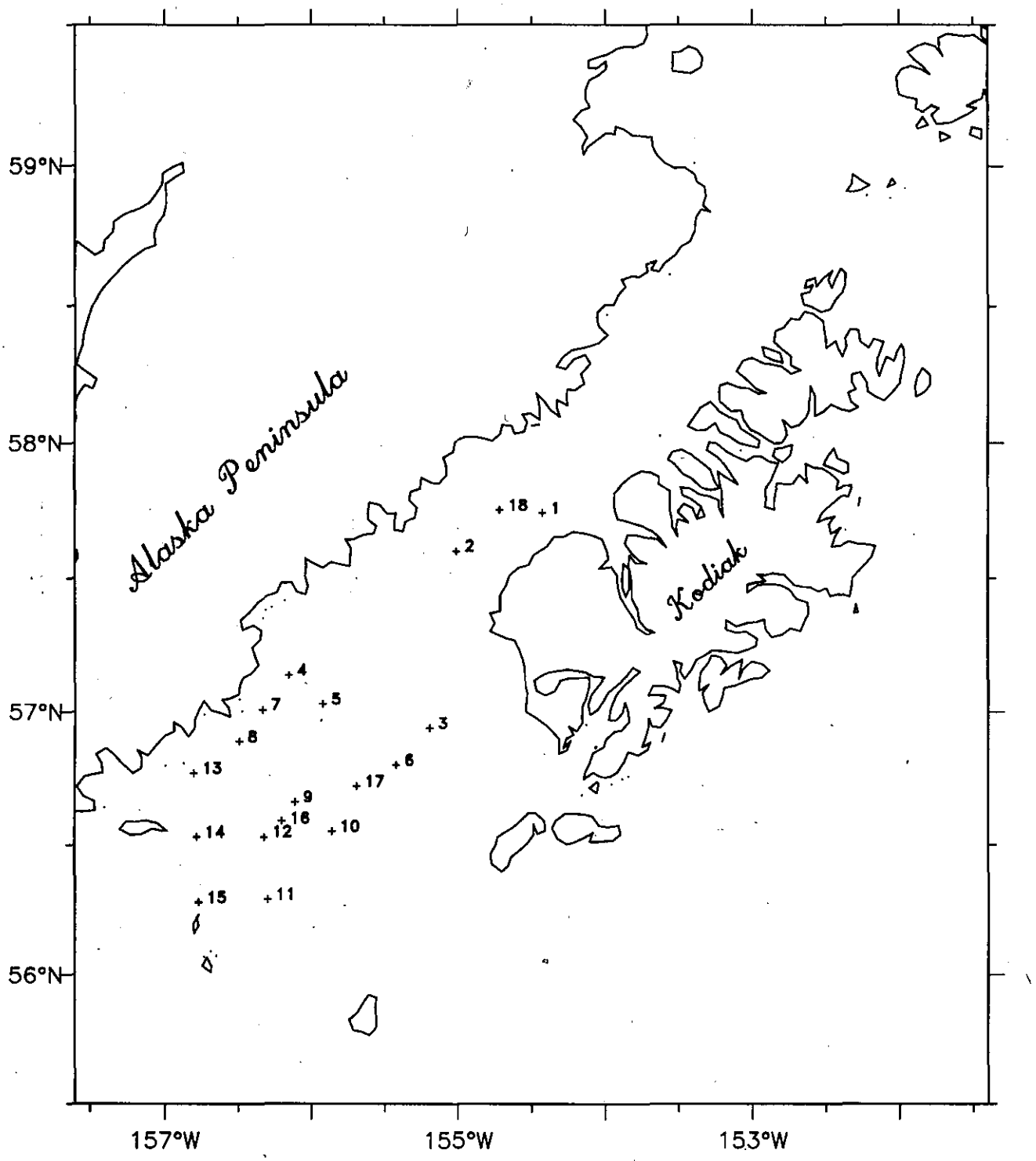

Fig. 3.2. MF-90-04 XBT stations.

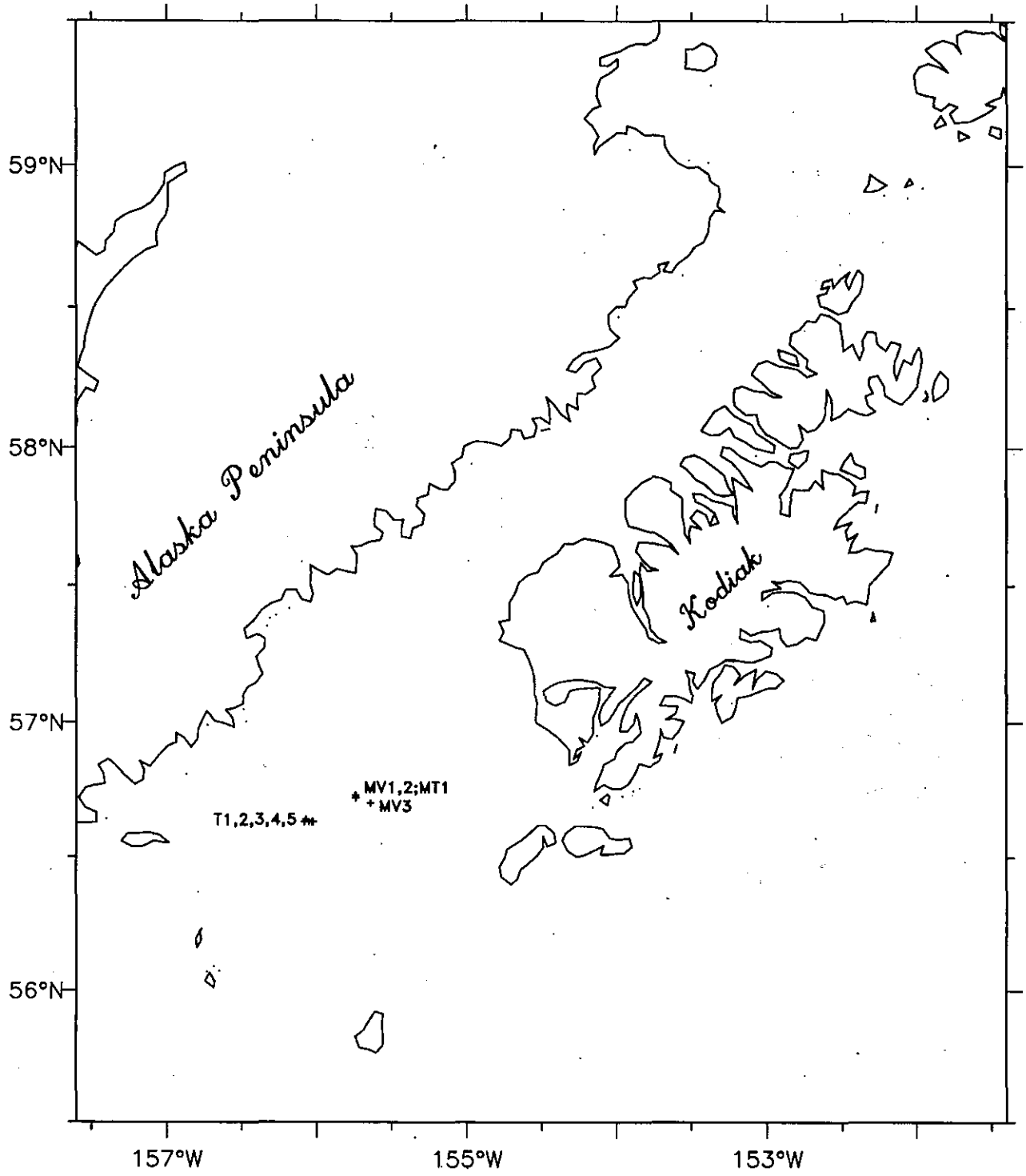

Fig. 3.3. MF-90-04 Marinovich, Methot, and Tucker trawl stations.

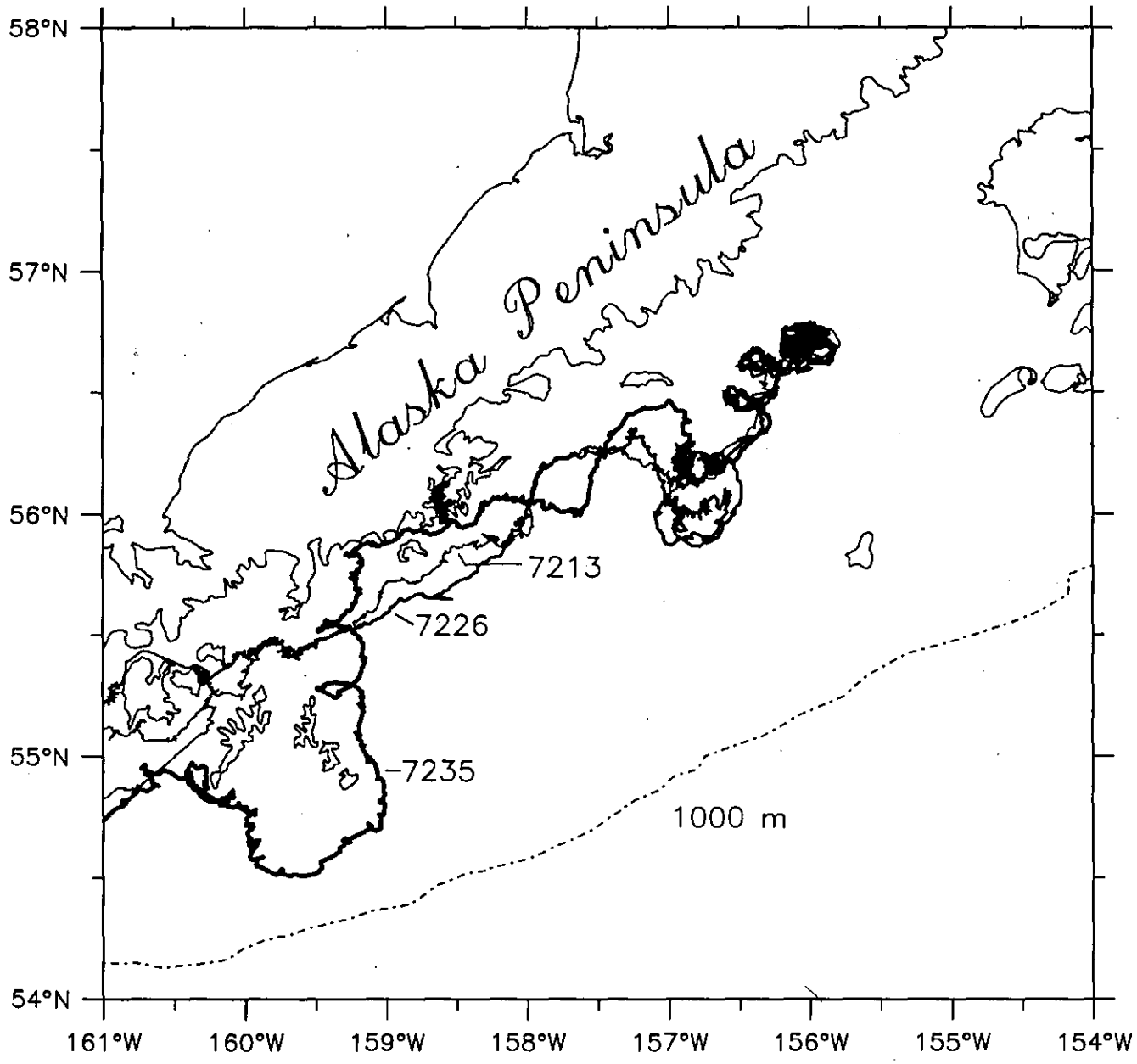

Fig. 3.4. MF-90-04 satellite-tracked drifters.

TABLE 4. MF-90-04 CRUISE SUMMARY (continued)

Larval Survey 6-15 MAY 1990

Date (JD)	Date (GMT)	Time (GMT)	Station No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
131	11-May	0049	013	G20	284	56° 40.2' N	155° 52.0' W	CTD
131	11-May	0111		G20	276	56° 40.0' N	155° 51.9' W	Deployed drifter #13
131	11-May	0121		G20	280	56° 39.7' N	155° 52.1' W	Deployed drifter #35
131	11-May	0125		G20	276	56° 39.5' N	155° 52.3' W	Deployed drifter #26
131	11-May	0312	G053A	H17	258	56° 25.1' N	156° 05.1' W	Bongo
131	11-May	0347	014	H17	259	56° 25.0' N	156° 05.3' W	CTD
131	11-May	0414	L006A	H17	259	56° 24.9' N	156° 05.1' W	Vertical tow
131	11-May	0430	014	H17	259	56° 25.0' N	156° 05.2' W	CTD (repeat)
131	11-May	0548	G054A	J17	96	56° 17.6' N	155° 50.9' W	Bongo
131	11-May	0744	G055A	L19	49	56° 18.8' N	155° 22.6' W	Bongo
131	11-May	0915	G056A	L17	63	56° 10.8' N	155° 36.7' W	Bongo
131	11-May	1038	G057A	L15	69	56° 03.0' N	155° 49.7' W	Bongo
131	11-May	1159	G058A	J15	243	56° 09.8' N	156° 04.4' W	Bongo
131	11-May	1331	G059A	H15	280	56° 17.4' N	156° 18.3' W	Bongo
131	11-May	1352			282	56° 17.2' N	156° 18.1' W	XBT #11
131	11-May	1508	G060A	F15	209	56° 24.4' N	156° 32.8' W	Bongo
131	11-May	1634	G061A	F17	214	56° 32.1' N	156° 19.7' W	Bongo
131	11-May	1648		F17	216	56° 32.0' N	156° 19.5' W	XBT #12
131	11-May	1804	G062A	D17	160	56° 39.0' N	156° 34.6' W	Bongo
131	11-May	1835	015	D17	160	56° 38.8' N	156° 34.8' W	CTD
131	11-May	1858	L007A	D17	160	56° 38.9' N	156° 34.3' W	Vertical tow
131	11-May	2015	G063A	B17	62	56° 46.2' N	156° 48.1' W	Bongo
131	11-May	2028		B17	62	56° 46.0' N	156° 48.0' W	XBT #13
131	11-May	2143	G064A	B15	141	56° 38.8' N	157° 01.9' W	Bongo
131	11-May	2308	G065A	D15	125	56° 31.6' N	156° 46.9' W	Bongo
131	11-May	2324		D15	125	56° 31.5' N	156° 47.1' W	XBT #14
132	12-May	0022	016	M8904	75	56° 27.6' N	156° 58.3' W	CTD
132	12-May	0105	G066A	D13	171	56° 24.0' N	157° 00.1' W	Bongo
132	12-May	0150	017	M9005	134	56° 21.8' N	156° 54.7' W	CTD
132	12-May	0240	G067A	F13	88	56° 17.2' N	156° 46.7' W	Bongo
132	12-May	0254			80	56° 17.1' N	156° 46.1' W	XBT #15
132	12-May	0416	G068A	H13	223	56° 09.3' N	156° 31.3' W	Bongo
132	12-May	0754	P002A	G19	288	56° 36.3' N	155° 59.9' W	Bongo
132	12-May	0938	C001A	G19	289	56° 36.5' N	155° 59.9' W	Bongo
132	12-May	1001	C002A	G19	292	56° 36.6' N	156° 00.0' W	Bongo
132	12-May	1203	C003A	G19	300	56° 37.6' N	156° 01.3' W	Tucker
132	12-May	1309	C004A	G19	302	56° 37.9' N	156° 01.8' W	Tucker
132	12-May	1342	018	G19	302	56° 38.5' N	156° 02.3' W	CTD
132	12-May	1426	018	G19	295	56° 38.9' N	156° 02.9' W	CTD
132	12-May	1455	P003A	G19	298	56° 38.0' N	156° 02.8' W	Tucker
132	12-May	1622	C005A	G19	299	56° 38.1' N	156° 04.3' W	Tucker
132	12-May	1648	C006A	G19	296	56° 37.8' N	156° 04.6' W	Tucker

TABLE 4. MF-90-04 CRUISE SUMMARY (continued)

Larval Survey 6-15 MAY 1990

Date (JD)	Date (GMT)	Time (GMT)	Station No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
132	12-May	1727	C007A	G19	296	56° 37.7' N	156° 05.3' W	Bongo
132	12-May	1754	C008A	G19	300	56° 37.8' N	156° 05.1' W	Bongo
132	12-May	2230	G069A	J13	215	56° 02.3' N	156° 17.9' W	Bongo
133	13-May	0012	G070A	L13	137	55° 54.8' N	156° 03.5' W	Bongo
133	13-May	0156	G071A	L11	247	55° 46.8' N	156° 16.8' W	Bongo
133	13-May	0245	L008A	L11	247	55° 46.7' N	156° 17.1' W	Vertical tow
133	13-May	0307	019	L11	247	55° 46.8' N	156° 16.9' W	CTD
133	13-May	0436	G072A	J11	230	55° 51.8' N	156° 31.7' W	Bongo
133	13-May	0738	G073A	F11	100	56° 09.0' N	156° 59.9' W	Bongo
133	13-May	0858	G074A	D11	134	56° 16.0' N	157° 14.3' W	Bongo
133	13-May	1023	G075A	B11	131	56° 23.9' N	157° 27.9' W	Bongo
133	13-May	1113	020	B11	160	56° 24.0' N	157° 27.9' W	CTD
133	13-May	1143	L009A	B11	145	56° 24.0' N	157° 27.8' W	Vertical tow
133	13-May	1613			265	56° 35.5' N	156° 11.8' W	XBT #16
133	13-May	1804	P004A	G21	276	56° 44.0' N	155° 44.8' W	Bongo
133	13-May	1858		G21	272	56° 43.6' N	155° 44.4' W	Marinovich #1 E.Q.
133	13-May	1958		G21	254	56° 42.3' N	155° 39.9' W	Marinovich #1 H.B.
133	13-May	2058		G21	274	56° 43.6' N	155° 44.5' W	Marinovich #2 E.Q.
133	13-May	2228		G21	249	56° 41.9' N	155° 37.6' W	Marinovich #2 H.B.
133	13-May	2302		G21	252	56° 42.2' N	155° 38.6' W	Marinovich #3 E.Q.
133	13-May	2333		G21	262	56° 43.0' N	155° 40.4' W	Marinovich #3 H.B.
133	13-May	2349		G21	267	56° 43.5' N	155° 41.4' W	XBT #17
134	14-May	0119		G21	267	56° 43.0' N	155° 44.6' W	Methot E.Q.
134	14-May	0130		G21	269	56° 42.5' N	155° 44.2' W	Methot H.B.
134	14-May	0546	P005A	F27	239	57° 11.0' N	155° 12.7' W	Bongo
134	14-May	0843	P006A	B29	314	57° 32.0' N	155° 28.3' W	Bongo
134	14-May	1151			234	57° 45.2' N	154° 42.9' W	XBT #18
134	14-May	1233	P007A	D35	227	57° 48.2' N	154° 32.8' W	Bongo
134	14-May	1408	P008A	D37	227	57° 55.7' N	154° 20.3' W	Bongo
134	14-May	1740			178	58° 16.3' N	153° 35.7' W	Begin ADCP calbn
134	14-May	1935			179	58° 15.9' N	153° 35.7' W	End ADCP calbn
135	15-May	0301	G076A	J53	154	58° 38.2' N	151° 31.0' W	Bongo
135	15-May	0604	G077A	G55	80	58° 58.0' N	151° 41.6' W	Bongo
135	15-May	0807	021	M8931	188	59° 02.2' N	152° 04.0' W	CTD
135	15-May	0915	G078A	D53	124	59° 02.2' N	152° 18.1' W	Bongo
135	15-May	0951	022	D53	124	59° 02.3' N	152° 18.1' W	CTD
135	15-May	1023	L010A	D53	124	59° 02.3' N	152° 18.2' W	Vertical tow
135	15-May	1048	L010B	D53	124	59° 02.2' N	152° 18.0' W	Vertical tow

MF-90-05: 17 May–25 May, 1990 (FOCI-90-03)

SCIENTIFIC PERSONNEL

Name	Title	Organization
DeWitt, Carol	Chief Scientist	PMEL/NOAA
Kachel, David	Computer Programmer	PMEL/NOAA
Parker, Bill	Field Operations Manager	PMEL/NOAA
Schumacher, James D.	Oceanographer	PMEL/NOAA
Shields, Dennis	Computer Programmer	ONCO/NOAA

SUMMARY OF OPERATIONS SCHEDULE

Depart Homer for eddy site	17 May
Eddy site, Grid I: CTDs, Loran-C drogued drifters, bongos	18–20 May
Eddy site, Grid II: CTDs	20–21 May
Line 16: CTDs	21 May
Mooring 8904: recovery	21 May
Loran-C drogued drifters	21–22 May
Mooring 9032: deployment	21 May
Line 17: CTDs	22–23 May
Eddy site, Grid III: CTDs	23–24 May
Line 8, CTDs and bongos	24 May
Mooring 8902: recovery	24 May
Mooring 8931: search	25 May
Mooring 9031: deployment	25 May
Arrive Kodiak	25 May

CRUISE STATISTICS

Bongos	17
CTDs	84
Drifter deployment sequences	2
Mooring deployments	3 2
Mooring recoveries	2
XBTs	6

OBJECTIVES

The objectives of MF-90-05 (FOCI-90-03) were to:

- collect Lagrangian current data using Loran-C drogued buoys
- collect Eulerian current data by recovering moorings 8904, 8902, and 8931, deploying moorings 9031 and 9032, and using the shipboard Acoustic Doppler Current Profiler (ADCP)
- continue the biology and water property time series and collect CTD data at moorings
- examine physical and biological characteristics of the eddy found in MF-90-04 (FOCI-90-02)

OPERATIONS

Acoustic Doppler Current Profiler (ADCP): The ship mounted ADCP was operated during the entire cruise. As in cruise MF-90-03, there were many breaks in the data, at least one per day, due to run-time errors, access violation errors, and loss of Loran data. These breaks in data created post processing difficulties. Time constraints did not allow a backtrack to be completed.

Bongos: The biological component of the cruise consisted of occupying bongo stations at Line 8 and in the area of the eddy, which was marked by the satellite buoys deployed in MF-90-04. Bongo net tows, designed to show the horizontal distribution of eggs and larvae, were completed at 17 stations. During the grid at the eddy site, twelve samples using a 60-cm bongo net with .333 mm mesh were obtained. The bongos were taken to a depth of 10 m off the bottom using the EBKG. During Line 8, a 60-cm bongo net with .333 mm mesh and a 20-cm diameter bongo net with .150 mm mesh was used. The bongos on line 8 were taken to a depth of 10 m off the bottom using the EBKG or to 100 m, whichever was shallower. The quality of the sampling effort was good.

CTD Casts: CTDs were located to 1) examine water property differences at the eddy location, 2) calibrate sensors on the moorings, and to 3) continue the long-term, water-properties data set at specific stations. A total of 84 CTD stations were occupied using the PMEL Seabird CTD. The CTD grid at the eddy area was occupied three times for a total of 60 CTDs at the eddy site. CTD casts were taken to within approximately 10 m of the bottom. The Shipboard Computer System (SCS) was used for data acquisition and storage.

Current Moorings: A total of two moorings were deployed. The first mooring, 9032, was a 600 KHz RDI Acoustic Doppler Current Profiler (ADCP) and a Seacat; the second mooring, 9031, consisted of a single Aanderaa current meter, two Neil Brown current meters and a WLR-7 digital pressure gauge (see Figures 8.7 and 8.8). The ADCP was deployed at a depth of 60 m and the Seacat at approximately 66 m. The Aanderaa was deployed at a depth of 49 m, the two Neil Brown current meters at 47 and 148 m, and the pressure gauge at 186 m. Both moorings were deployed successfully.

A total of three moorings were scheduled to be recovered (see Figures 8.1, 8.2, and 8.3). Mooring 8904 was recovered successfully. Mooring 8902 was snagged by the CTD during a pre-recovery CTD cast at the mooring site. The snag caused the mooring to break between the second current meter and the second flotation. Due to the location of the break in the mooring, we were able to recover both the upper and lower halves of the mooring. Mooring 8931 was located successfully, and then released. However, the mooring never came to the surface. Since there was no flotation below the top floats, it was hypothesized that the mooring had lost its flotation and was lying on the bottom. To confirm this, the release was interrogated at four points, 0°, 90°, 180° and 270°, approximately 0.5 nm from the mooring site. The results of this test further substantiated the hypothesis, since the release responded at only three of the four points.

Loran-C tracked drifters: Last year's experience (Candel drifters which leaked) led to extensive redesign of the drifters. PMEL's machine shop personnel worked in cooperation with MSRD personnel to create a waterproof drifter. Machine shop personnel did an excellent job of refinishing surface areas, replacing old gaskets with new thicker gaskets, replacing standard screws with new screws and washers with individual gaskets, and determining optimum torque values for the screws. MSRD personnel individually tested each drifter in a dive tank. No drifter leaked during testing. In addition to the Candel drifters, three drifters with a range of 20 nm were ordered from Seimac. The manufacturer did not meet its deadline; the drifters were not delivered. In compensation, Seimac loaned two drifters to PMEL with a reduced range.

A total of two sets of drifter deployments was completed. The first set was deployed at the center of the eddy. During the deployment, one of the Candel drifters leaked, flooding the interior and destroying the electronics. This drifter could not be used for the remainder of the cruise. In addition, there were reception problems with one of the Seimac drifters. During one of the Seimac recoveries, the weld connecting the drifter with the line for the drogue broke from the strain of the drogue in the water. This caused the drifter to be propelled across the deck, endangering personnel. Fortunately no one was injured. The ship's engineering department designed and manufactured a coupling which connected the drifter with a drogue. This was an excellent, sturdy design which worked well throughout the remaining deployments. Despite these

difficulties, two sets of data using three drifters was obtained (see Table 6 and Figures 4.1 for details).

The second set was deployed in the vicinity of mooring 9032. The two Candel drifters worked perfectly. Range limitations of the Seimac drifters required the ship to stay in the vicinity of the Seimac drifters during the entire deployment. This allowed us to successfully obtain data from four drifters (see Table 2 for details), but limited us from conducting any other operations (see Table 6 and Figure 4.2 for details).

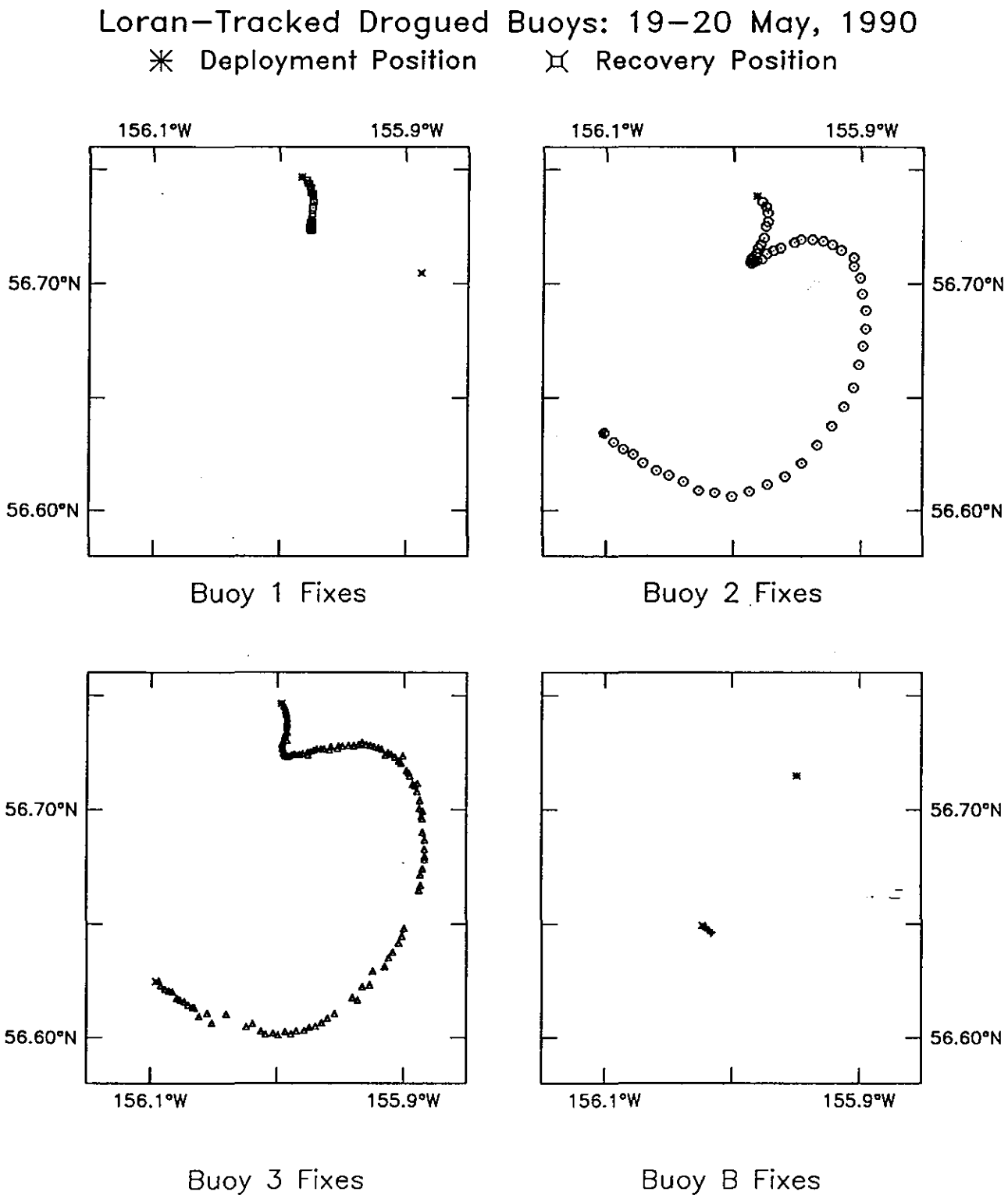
Loran–Tracked Drogued Buoys: 19–20 May, 1990
✳ Deployment Position
⌑ Recovery Position
156.1°W
155.9°W
56.70°N
56.60°N
Buoy 1 Fixes
Buoy 2 Fixes
Buoy 3 Fixes
Buoy B Fixes

Fig. 4.1.

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The second set was deployed in the vicinity of mooring 9032. The two Candel drifters worked perfectly. Range limitations of the Seimac drifters required the ship to stay in the vicinity of the Seimac drifters during the entire deployment. This allowed us to successfully obtain data from four drifters (see Table 2 for details), but limited us from conducting any other operations (see Table 6 and Figure 4.2 for details).

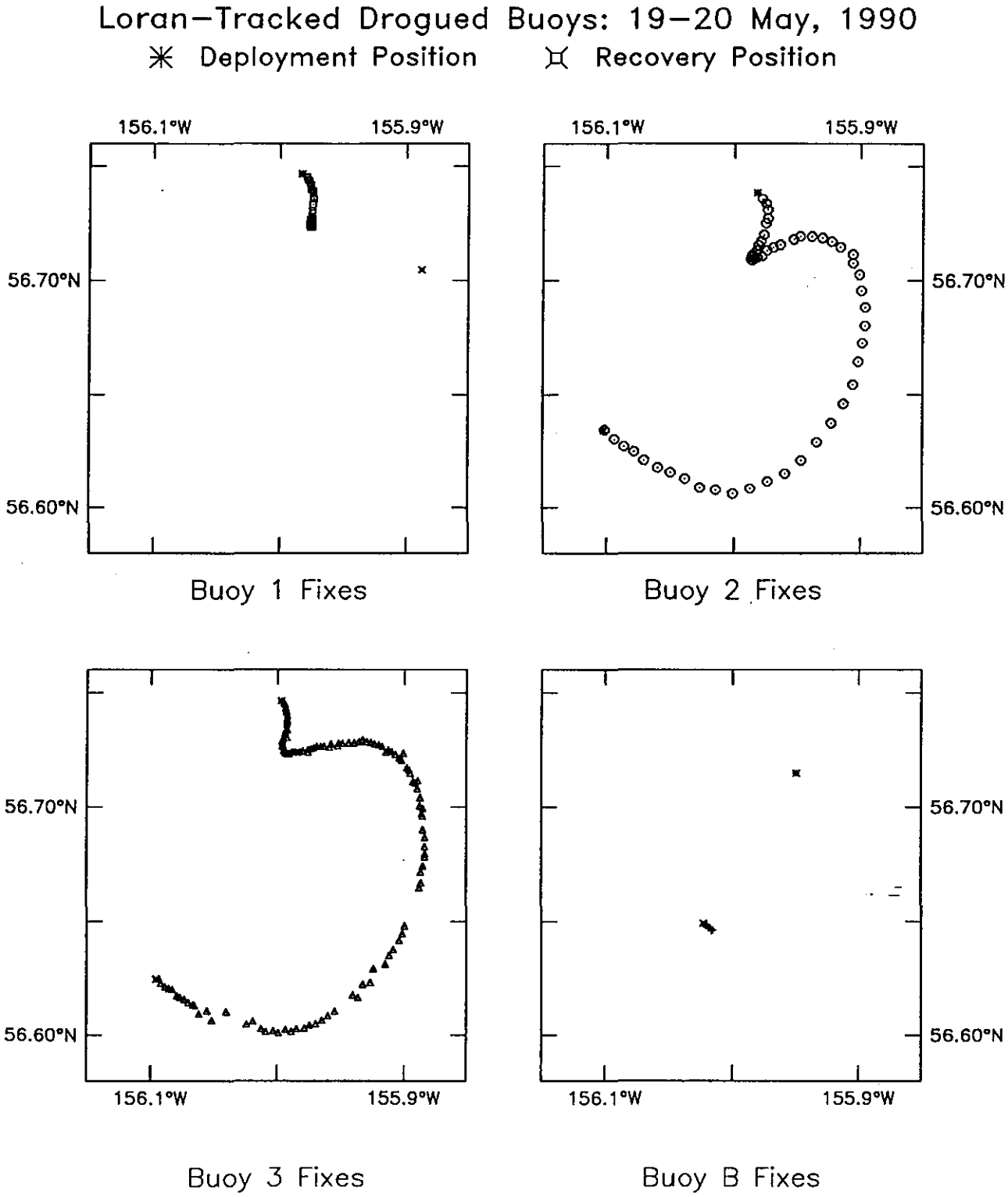
Loran–Tracked Drogued Buoys: 19–20 May, 1990
Deployment Position
Recovery Position
156.1°W
155.9°W
56.70°N
56.60°N
Buoy 1 Fixes
Buoy 2 Fixes
Buoy 3 Fixes
Buoy B Fixes

Fig. 4.1.

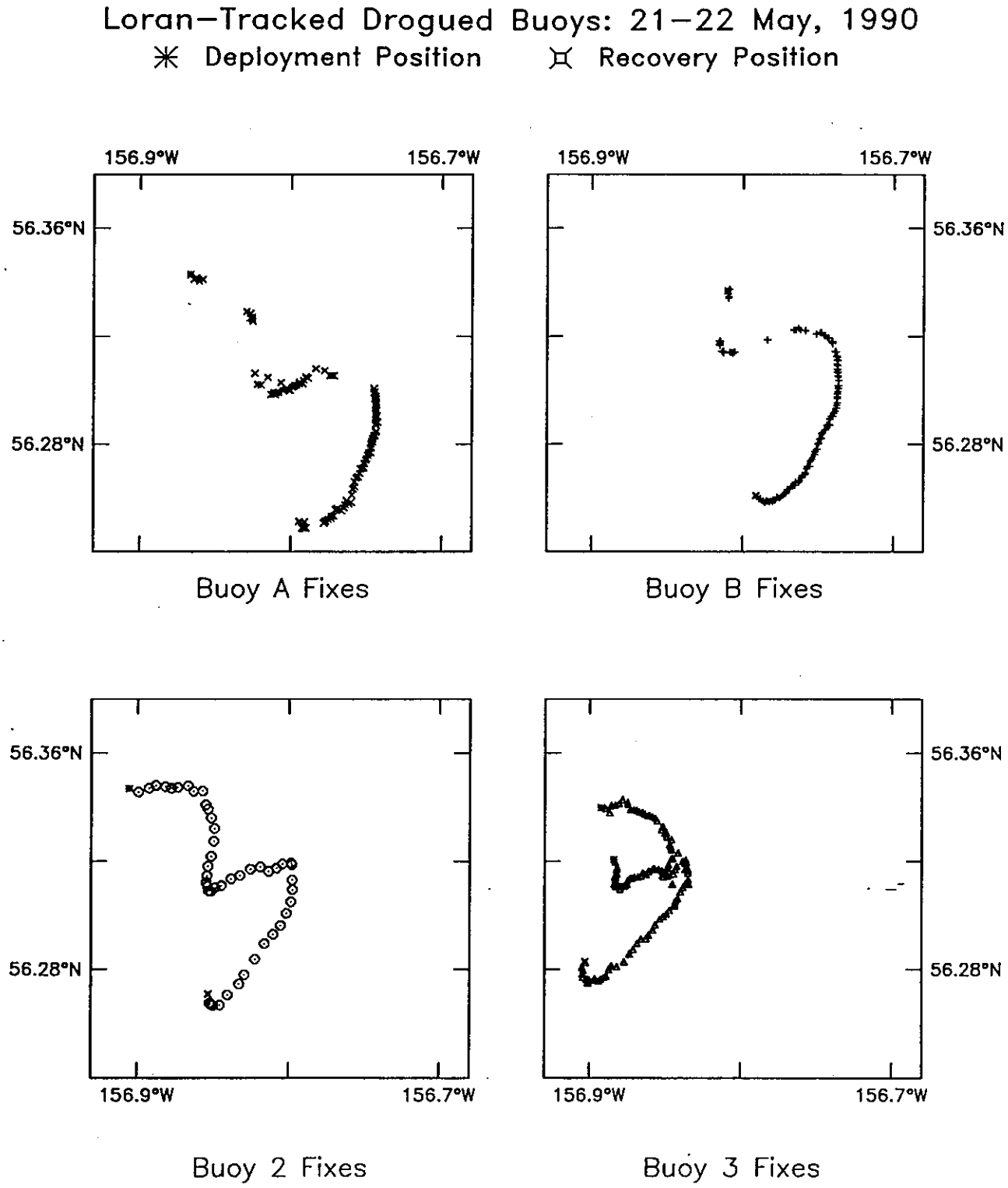
Loran–Tracked Drogued Buoys: 21–22 May, 1990
Deployment Position
Recovery Position
156.9°W
156.7°W
56.36°N
56.28°N
Buoy A Fixes
Buoy B Fixes
Buoy 2 Fixes
Buoy 3 Fixes

Fig. 4.2.

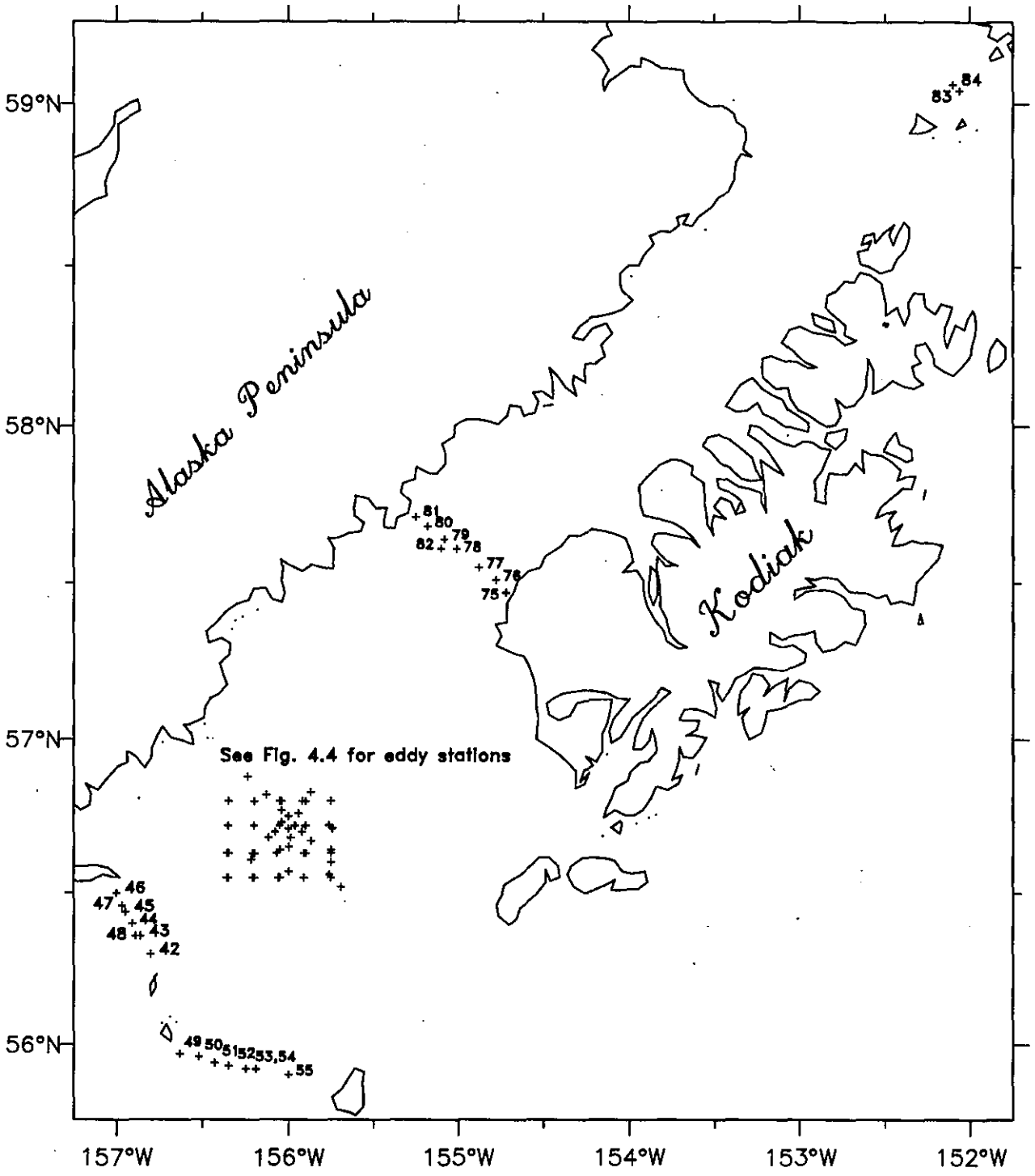

Fig. 4.3. MF-90-05 CTD stations.

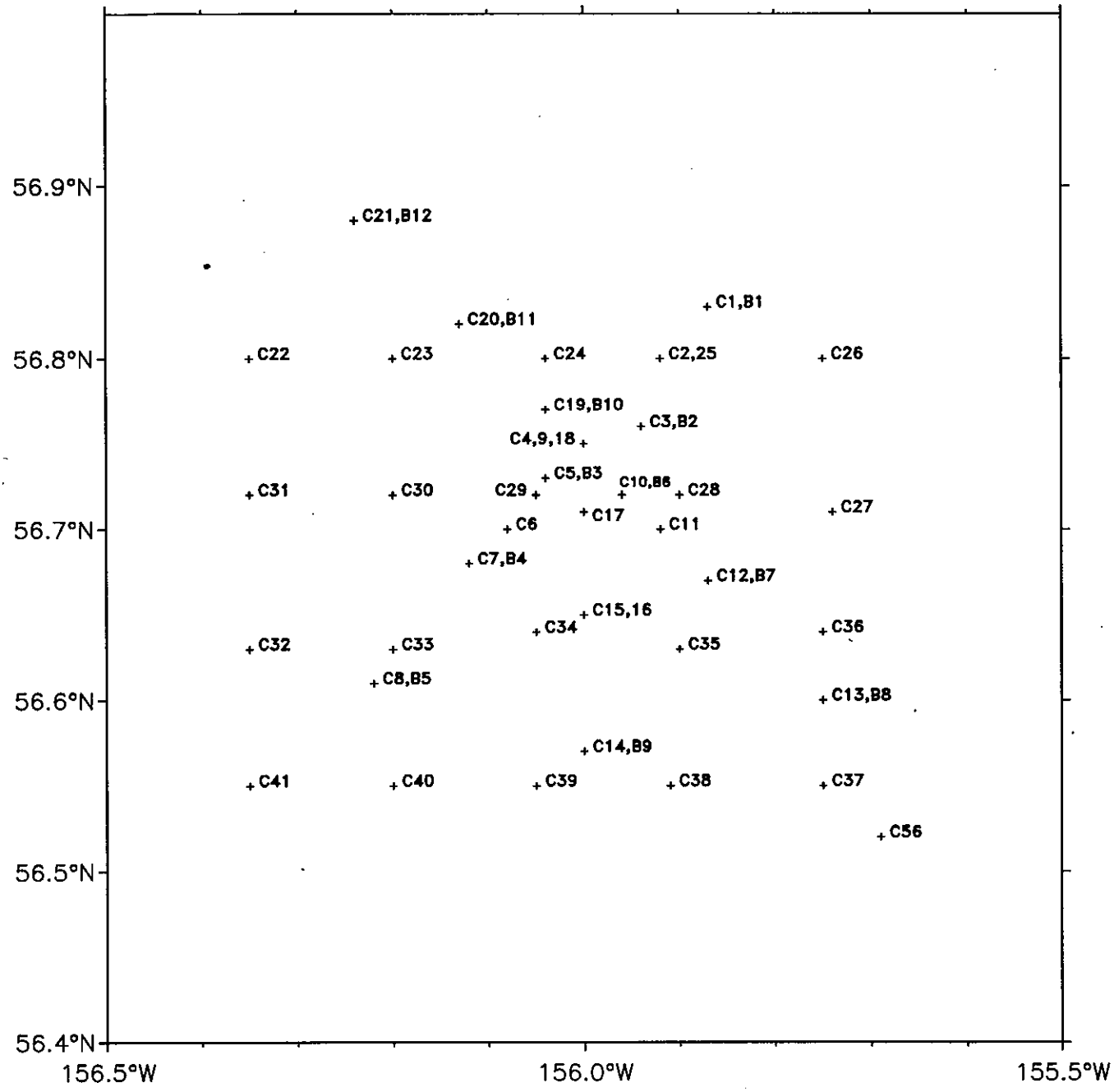

Fig. 4.4. MF-90-05 CTD (C) and bongo (B) stations at the eddy site. Three grids were occupied at the eddy site: GRID I (CTD stations 1–21), GRID II (CTD stations 22–41), and GRID III (CTD stations 56–74).

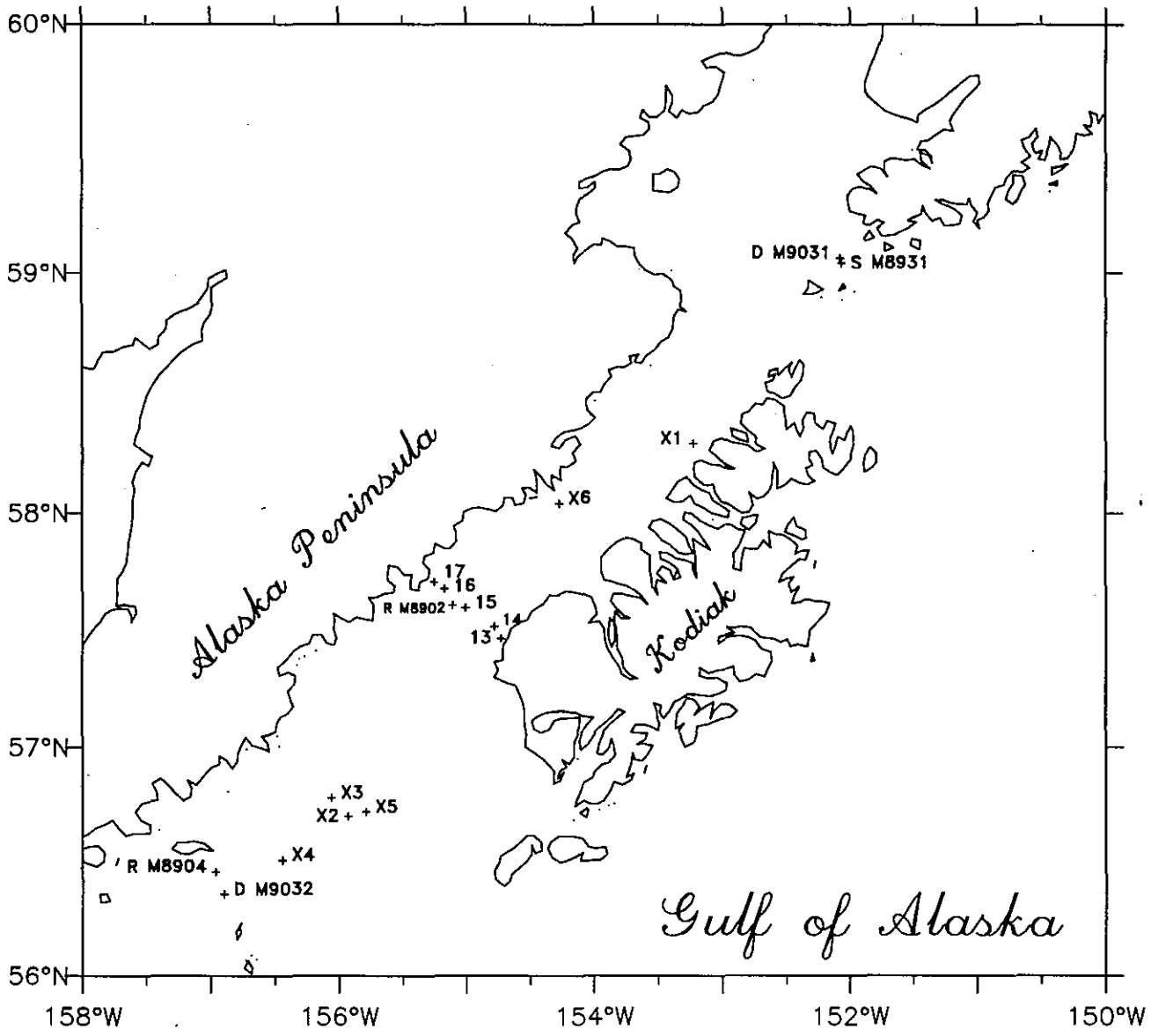

Fig. 4.5. MF-90-05 bongo (B), mooring deployment (D), mooring recovery (R), mooring search (S), and XBT (X) stations.

TABLE 5. Loran-Tracked Drifter Deployments

DEPLOYMENT 1

DRIFTER	DEPLOYMENT JD	DEPLOYMENT TIME (Z)	RECOVERY JD	RECOVERY TIME (Z)	TOTAL TIME(HH:MM)
Candel drifter #1	139	0553	139	1745	11:52
Candel drifter #2	139	0530	140	0727	25:57
Candel drifter #3	139	0607	140	0637	24:30
Selmac drifter A	139	0507	139	0736	02:29
Selmac drifter B	139	1828	140	0404	09:36

DATA SET 1: JD 139 0607 - JD 139 1745 (total time: 11:38): Candel drifters #1, 2, and 3
DATA SET 2: JD 139 1828 - JD 140 0404 (total time: 09:36): Candel drifters #2 and 3, and Selmac drifter B

DEPLOYMENT 2

DRIFTER	DEPLOYMENT JD	DEPLOYMENT TIME (Z)	RECOVERY JD	RECOVERY TIME (Z)	TOTAL TIME(HH:MM)
Candel drifter #1	not deployed				
Candel drifter #2	141	1721	142	1704	23:43
Candel drifter #3	141	1846	142	0106	06:20
	142	0120	142	1732	16:12
Selmac drifter A	141	1930	142	1601	20:01
Selmac drifter B	141	2358	142	1628	16:30

TABLE 6. MF-90-05 CRUISE SUMMARY

Physical Oceanography 17 - 25 MAY 1990

Date (JD)	Date (GMT)	Time (GMT)	Cast No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
137	17-May	2300				59° 36.3' N	151° 25.0' W	Depart Homer
138	18-May	0825			221	58° 17.4' N	153° 13.7' W	XBT #1
138	18-May	1859	B001			56° 49.6' N	155° 52.4' W	Bongo, GRID I, Line I
138	18-May	1938	001		310	56° 49.5' N	155° 51.9' W	CTD, GRID I, Line I
138	18-May	2021	002		314	56° 47.8' N	155° 54.9' W	CTD, GRID I, Line I
138	18-May	2101			308	56° 46.4' N	155° 57.6' W	Deploy Sei. drifter A
138	18-May	2121	B002		308	56° 46.4' N	155° 57.6' W	Bongo, GRID I, Line I
138	18-May	2202	003		311	56° 45.8' N	155° 56.5' W	CTD, GRID I, Line I
138	18-May	2236			311	56° 45.6' N	155° 56.3' W	Recover Sei drifter A
138	18-May	2311	004		298	56° 44.9' N	155° 59.9' W	CTD, GRID I, Line I
138	18-May	2340	B003		287	56° 43.4' N	156° 02.5' W	Bongo, GRID I, Line I
139	19-May	0015	005		287	56° 43.5' N	156° 02.4' W	CTD, GRID I, Line I
139	19-May	0117	006		278	56° 42.0' N	156° 04.6' W	CTD, GRID I, Line I
139	19-May	0148	B004		263	56° 40.5' N	156° 07.9' W	Bongo, GRID I, Line I
139	19-May	0220	007		263	56° 40.5' N	156° 07.4' W	CTD, GRID I, Line I
139	19-May	0310	B005		241	56° 36.5' N	156° 13.6' W	Bongo, GRID I, Line I
139	19-May	0341	008		241	56° 36.6' N	156° 13.3' W	CTD, GRID I, Line I
139	19-May	0507			300	56° 45.0' N	155° 59.9' W	Deploy Sei drifter A
139	19-May	0530			307	56° 45.0' N	155° 58.9' W	Deploy Can drifter 2
139	19-May	0553			304	56° 45.5' N	155° 58.9' W	Deploy Can drifter 1
139	19-May	0607			307	56° 45.5' N	155° 59.8' W	Deploy Can drifter 3
139	19-May	0736			307	56° 44.5' N	155° 59.7' W	Recover Sei drifter A
139	19-May	0810	009		300	56° 44.8' N	155° 59.9' W	CTD, GRID I, Line III
139	19-May	0840	B006		300	56° 43.5' N	155° 57.4' W	Bongo, GRID I, Line III
139	19-May	0919	010		309	56° 43.2' N	155° 57.5' W	CTD, GRID I, Line III
139	19-May	0957	011		296	56° 41.7' N	155° 54.9' W	CTD, GRID I, Line III
139	19-May	1026	B007		283	56° 40.6' N	155° 52.2' W	Bongo, GRID I, Line III
139	19-May	1106	012		280	56° 40.2' N	155° 52.0' W	CTD, GRID I, Line III
139	19-May	1155	B008		241	56° 36.4' N	155° 45.2' W	Bongo, GRID I, Line III
139	19-May	1231	013		241	56° 36.1' N	155° 45.0' W	CTD, GRID I, Line III
139	19-May	1345	B009		280	56° 34.1' N	156° 00.3' W	Bongo, GRID I, Line II
139	19-May	1422	014		280	56° 34.0' N	156° 00.1' W	CTD, GRID I, Line II
139	19-May	1521	015		298	56° 38.9' N	156° 00.0' W	CTD, GRID I, Line II
139	19-May	1624	016		307	56° 41.0' N	155° 59.6' W	CTD, GRID I, Line II
139	19-May	1648			305	56° 42.2' N	155° 56.1' W	XBT #2
139	19-May	1745			298	56° 43.0' N	155° 53.2' W	Recover Can drifter 1
139	19-May	1828			311	56° 43.7' N	155° 56.9' W	Deploy Sei drifter B
139	19-May	1919	017		305	56° 42.8' N	155° 59.7' W	CTD, GRID I, Line II
140	20-May	0404			305	56° 39.7' N	156° 01.3' W	Recover Sei drifter B
140	20-May	0637			296	56° 38.2' N	156° 05.7' W	Recover Can drifter 3
140	20-May	0727			289	56° 38.8' N	156° 06.1' W	Recover Can drifter 2
140	20-May	0847	018		302	56° 44.8' N	155° 59.9' W	CTD, GRID I, Line III

TABLE 6. MF-90-05 CRUISE SUMMARY

Physical Oceanography 17 - 25 MAY 1990

Date (JD)	Date (GMT)	Time (GMT)	Cast No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
140	20-May	0929	B010		265	56° 46.5' N	156° 02.5' W	Bongo, GRID I, Line III
140	20-May	1004	019		272	56° 46.2' N	156° 02.2' W	CTD, GRID I, Line III
140	20-May	1024			249	56° 46.9' N	156° 03.6' W	XBT #3
140	20-May	1053	B011		196	56° 49.5' N	156° 08.0' W	Bongo, GRID I, Line III
140	20-May	1123	020		199	56° 49.3' N	156° 07.9' W	CTD, GRID I, Line III
140	20-May	1213	B012		196	56° 53.2' N	156° 14.1' W	Bongo, GRID I, Line III
140	20-May	1245	021		196	56° 52.9' N	156° 14.1' W	CTD, GRID I, Line III
140	20-May	1350	022		198	56° 48.0' N	156° 21.1' W	CTD, GRID II, Line I
140	20-May	1448	023		192	56° 47.9' N	156° 11.8' W	CTD, GRID II, Line I
140	20-May	1555	024		254	56° 47.8' N	156° 02.5' W	CTD, GRID II, Line I
140	20-May	1647	025		312	56° 48.0' N	155° 53.7' W	CTD, GRID II, Line I
140	20-May	1741	026		288	56° 48.0' N	155° 44.7' W	CTD, GRID II, Line I
140	20-May	1848	027		270	56° 42.7' N	155° 44.3' W	CTD, GRID II, Line II
140	20-May	2000	028		300	56° 42.9' N	155° 54.1' W	CTD, GRID II, Line II
140	20-May	2059	029		287	56° 42.9' N	156° 03.0' W	CTD, GRID II, Line II
140	20-May	2200	030		284	56° 43.0' N	156° 11.9' W	CTD, GRID II, Line II
140	20-May	2255	031		192	56° 43.1' N	156° 20.9' W	CTD, GRID II, Line II
140	20-May	2347	032		198	56° 38.0' N	156° 20.8' W	CTD, GRID II, Line III
141	21-May	0053	033		251	56° 38.0' N	156° 11.7' W	CTD, GRID II, Line III
141	21-May	0151	034		298	56° 38.2' N	156° 02.7' W	CTD, GRID II, Line III
141	21-May	0245	035		276	56° 37.9' N	155° 53.7' W	CTD, GRID II, Line III
141	21-May	0342	036		268	56° 38.1' N	155° 44.7' W	CTD, GRID II, Line III
141	21-May	0434	037		223	56° 33.1' N	155° 45.0' W	CTD, GRID II, Line IV
141	21-May	0546	038		254	56° 33.0' N	155° 54.3' W	CTD, GRID II, Line IV
141	21-May	0636	039		285	56° 33.1' N	156° 03.1' W	CTD, GRID II, Line IV
141	21-May	0732	040		272	56° 33.0' N	156° 12.1' W	CTD, GRID II, Line IV
141	21-May	0826	041		216	56° 33.0' N	156° 20.8' W	CTD, GRID II, Line IV
141	21-May	0904			221	56° 30.7' N	156° 26.4' W	XBT #4
141	21-May	1102	042		106	56° 17.8' N	156° 47.8' W	CTD, Line 16, Sta 147
141	21-May	1151	043		134	56° 21.3' N	156° 51.7' W	CTD, Line 16, Sta 148
141	21-May	1231	044		132	56° 23.7' N	156° 54.8' W	CTD, Line 16, Sta 149
141	21-May	1312	045		110	56° 26.4' N	156° 57.1' W	CTD, Line 16, Sta 150
141	21-May	1359	046		47	56° 30.1' N	157° 00.2' W	CTD, Line 16, Sta 151
141	21-May	1447	047		73	56° 27.7' N	156° 58.2' W	CTD at mooring 8904
141	21-May	1631			82	56° 27.8' N	156° 57.8' W	Recover M8904
141	21-May	1721			124	56° 21.5' N	156° 54.3' W	ADCP comparison
141	21-May	1721			124	56° 21.5' N	156° 54.3' W	Deploy Can drifter 2
141	21-May	1846			126	56° 21.1' N	156° 53.5' W	Deploy Can drifter 3
141	21-May	1930			135	56° 21.3' N	156° 52.0' W	Deploy Sei drifter A
141	21-May	2137			126	56° 21.3' N	156° 53.8' W	Deploy M9032
141	21-May	2151	048		129	56° 21.4' N	156° 53.4' W	CTD at M9032
141	21-May	2358			132	56° 21.0' N	156° 48.6' W	Deploy Sei drifter B

TABLE 6. MF-90-05 CRUISE SUMMARY

Physical Oceanography 17 - 25 MAY 1990

Date (JD)	Date (GMT)	Time (GMT)	Cast No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
142	22-May	0106			126	56° 19.7' N	156° 51.1' W	Recover Can drifter 3
142	22-May	0120			124	56° 20.0' N	156° 53.0' W	Deploy Can drifter 3
142	22-May	1601			84	56° 15.8' N	156° 47.6' W	Recover Sei drifter A
142	22-May	1628			82	56° 16.4' N	156° 47.4' W	Recover Sei drifter B
142	22-May	1704			90	56° 17.0' N	156° 51.2' W	Recover Can drifter 2
142	22-May	1732			110	56° 17.7' N	156° 54.1' W	Recover Can drifter 3
142	22-May	2057	049		199	55° 58.3' N	156° 37.9' W	CTD,Line XVII,Sta158
142	22-May	2143	050		199	55° 57.4' N	156° 30.9' W	CTD,Line XVII,Sta157
142	22-May	2221	051		216	55° 56.6' N	156° 26.0' W	CTD,Line XVII,Sta156
142	22-May	2300	052		237	55° 55.9' N	156° 21.2' W	CTD,Line XVII,Sta155
142	22-May	2354	053		229	55° 55.3' N	156° 15.0' W	CTD,Line XVII,Sta154
143	23-May	0030	054		220	55° 54.9' N	156° 11.3' W	CTD,Line XVII,Sta153
143	23-May	0130	055		88	55° 54.1' N	156° 00.1' W	CTD,Line XVII,Sta152
143	23-May	0558	056		177	56° 31.1' N	155° 41.5' W	CTD, GRID III, Line V
143	23-May	0636	057		223	56° 33.3' N	155° 45.4' W	CTD, GRID III, Line IV
143	23-May	0725	058		254	56° 33.2' N	155° 54.4' W	CTD, GRID III, Line IV
143	23-May	0817	059		287	56° 33.2' N	156° 03.5' W	CTD, GRID III, Line IV
143	23-May	0921	060		269	56° 33.1' N	156° 12.6' W	CTD, GRID III, Line IV
143	23-May	1059	061		217	56° 33.0' N	156° 21.4' W	CTD, GRID III, Line IV
143	23-May	1203	062		199	56° 37.9' N	156° 21.6' W	CTD, GRID III, Line III
143	23-May	1315	063		240	56° 37.9' N	156° 12.8' W	CTD, GRID III, Line III
143	23-May	1512	064		299	56° 37.9' N	156° 03.9' W	CTD, GRID III, Line III
143	23-May	1617	065		276	56° 37.9' N	155° 54.3' W	CTD, GRID III, Line III
143	23-May	1719	066		247	56° 37.9' N	155° 45.2' W	CTD, GRID III, Line III
143	23-May	1822	067		272	56° 42.9' N	155° 45.3' W	CTD, GRID III, Line II
143	23-May	1843			280	56° 42.9' N	155° 47.1' W	XBT #5
143	23-May	1922	068		296	56° 43.0' N	155° 54.2' W	CTD, GRID III, Line II
143	23-May	2016	069		282	56° 43.1' N	156° 03.1' W	CTD, GRID III, Line II
143	23-May	2109	070		203	56° 43.2' N	156° 12.2' W	CTD, GRID III, Line II
143	23-May	2157	071		194	56° 43.0' N	156° 21.2' W	CTD, GRID III, Line II
143	23-May	2306	072		195	56° 47.9' N	156° 12.0' W	CTD, GRID III, Line I
143	23-May	2358	073		254	56° 47.9' N	156° 02.9' W	CTD, GRID III, Line I
144	24-May	0052	074		308	56° 47.8' N	155° 54.2' W	CTD, GRID III, Line I
144	24-May	0622	075	FOX 55	84	57° 28.1' N	154° 43.4' W	CTD, Line 8, Sta 55
144	24-May	0638	B013	FOX 55	96	57° 28.4' N	154° 43.7' W	Bongo, Line 8, Sta 55
144	24-May	0717	076	FOX 56	219	57° 30.8' N	154° 47.0' W	CTD, Line 8, Sta 56
144	24-May	0733	B014	FOX 56	217	57° 31.0' N	154° 46.8' W	Bongo, Line 8, Sta 56
144	24-May	0821	077	FOX 57	236	57° 33.1' N	154° 52.6' W	CTD, Line 8, Sta 57,
144	24-May	0906	B015	FOX 58	242	57° 36.3' N	155° 00.4' W	Bongo, Line 8, Sta 58
144	24-May	0939	078	FOX 58	243	57° 36.3' N	155° 00.6' W	CTD, Line 8, Sta 58
144	24-May	1021	079	FOX 59	261	57° 38.3' N	155° 04.7' W	CTD, Line 8, Sta 59
144	24-May	1112	080	FOX 60	296	57° 40.8' N	155° 10.5' W	CTD, Line 8, Sta 60

TABLE 6. MF-90-05 CRUISE SUMMARY

Physical Oceanography 17 - 25 MAY 1990

Date (JD)	Date (GMT)	Time (GMT)	Cast No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
144	24-May	1136	B016	FOX 60	294	57° 41.0' N	155° 10.3' W	Bongo, Line 8, Sta 60
144	24-May	1235	081	FOX 61	304	57° 42.7' N	155° 15.0' W	CTD, Line 8, Sta 61
144	24-May	1301	B017	FOX 61	304	57° 42.9' N	155° 14.8' W	Bongo, Line 8, Sta 61
144	24-May	1421	082	M8902	256	57° 36.8' N	155° 05.8' W	CTD at M8902
144	24-May	1800		M8902	254	57° 36.5' N	155° 06.5' W	Recover M8902
144	24-May	2119			278	58° 02.5' N	154° 16.2' W	XBT #6
145	25-May	0516	083	M8931	192	59° 02.1' N	152° 03.7' W	CTD at M8931
145	25-May	0600		M8931		59° 02.1' N	152° 03.7' W	Search for M8931
145	25-May	0810		M9031	188	59° 03.4' N	152° 04.3' W	Deploy M9031
145	25-May	0831	084	M9031	188	59° 03.4' N	152° 05.7' W	CTD at M9031
145	25-May	2137				57° 43.8' N	152° 30.6' W	Arrive Kodiak

MF-90-06: 27 May–5 June, 1990 (FOCI-90-04)

SCIENTIFIC PERSONNEL

Name	Title	Organization
Bailey, Kevin	Chief Scientist	AFSC/NOAA
Busby, Morgan	Fisheries Biologist	AFSC/NOAA
Canino, Mike	Fisheries Biologist	AFSC/NOAA
Clark, Jay	Fisheries Biologist	AFSC/NOAA
Picquelle, Sue	Fisheries Biologist	AFSC/NOAA
Siefert, Debbie	Fisheries Biologist	AFSC/NOAA
Spring, Stella	Fisheries Biologist	AFSC/NOAA

SUMMARY OF OPERATIONS SCHEDULE

Depart Kodiak	27 May
Presurvey bongo tows/CTDs/MZ/CHL	27–30 May
Bongo survey/CTDs	30 May–5 June
Deployed and recovered drifter in patch	2–3 June
Gear comparison	2 June
Line 8: CTDs and bongos	4–5 June
ADCP Backtrack-L	5 June
Anchored at Alitak Bay	5 June

CRUISE STATISTICS

Bongo tows	
(grid stations)	96
(presurvey	29
(line 8)	5
Gear comparisons	
Bongo tows	3
Tucker tows	3
Methot tows	4
CTD casts	24

CRUISE STATISTICS (cont.)

Collections

Larvae for age analysis	4832
Larvae for RNA/DNA	98
Plankton samples frozen for hydrocarbons	9
Larvae collected for J. Dunn (Ossification)	
Pollock	61
Cod	47
Flathead sole	37
Larvae collected for Frank Morado (Parasites)	376
Microzooplankton samples	53
Chlorophyll samples	45
XBTs	9

OBJECTIVES

The objectives of MF-90-06 (FOCI-90-04) 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.

OPERATIONS

Bongos: An initial presurvey was conducted around the northeast side of Kodiak Island, through Shelikof Strait, and within and beyond the major aggregation of pollock larvae. Based on these results a stratified grid of stations was established to sample the distribution and abundance of larvae. During all phases of the survey the standard gear utilized was a 60 cm frame bongo with 0.505 mm mesh netting and a hard PVC codend with 0.333 mm mesh netting covering holes. One side of the bongo tow was counted onboard and the other side was preserved. The codend from net 2 was taped closed; after a tow the contents were sorted in chilled seawater and larvae were counted and frozen or fixed in 95% ethanol as soon as possible. The sample from net 1 was fixed in 5% formalin immediately.

At the end of the presurvey, larval concentrations had declined significantly, allowing establishment of the grid boundaries. The grid was sampled from Mitrofania Island, upstream towards Kodiak Island. Sampling stations were 10 nm apart, except within high density strata where they were 5 nm apart. The grid was sampled from May 31 to June 4.

The major aggregation of larvae sampled during MF-90-06 had shifted downstream from the larval aggregation sampled during MF-90-02 in early May. Larvae were apparently entrained in an eddy along with the satellite tracked drifters for at least eleven days from May 10 to

May 21. The movement of the drifters matched those of the larval aggregation fairly well; the leading and trailing edges and midpoint of the aggregation (as defined by the 200 and 100 larvae/tow isopleths for MF-90-02 and MF-90-06, respectively) moved a net distance of 29 nm during the 23 day interval between the midpoint of the surveys in the aggregation area, or a net speed of 1.3 nm/d. During the same interval the drifter moved 33 nm, or 1.4 nm/d.

On line 8, CTD casts were conducted at FOX stations 55–61 with bongos (60 cm with 0.505 and 0.333 mm mesh, and 30 cm with 0.150 mm mesh) at stations 55, 56, 58, 60 and 61.

CTD Casts: During the bongo presurvey a grid of CTD stations was occupied around the latest position of satellite tracked drifters that had been released in the larval patch in early May. Bongo tows during this phase were conducted at every other station to sample larvae, and water samples were collected for chlorophyll (100–200 ml sample collected on a 0.45 μm pore filter from 10, 20, 30, 40, and 50 m) and microzooplankton (10 l sample strained through 41 μm mesh netting from 10, 20, 30, 40, 50 and 60 m). Several additional CTD casts with biological sampling were conducted at stations upstream and downstream of the eddy for contrast.

On line 8 CTD casts were conducted at FOX stations 55–61 with bongos (60 cm with 0.505 and 0.333 mm mesh, and 30 cm with 0.150 mm mesh) at stations 55, 56, 58, 60 and 61. No chlorophyll or microzooplankton samples were collected at line 8.

Drifters: Satellite-tracked drifters were apparently entrained in an eddy for at least 11 days from May 10 to May 21. During that period the net movement of the center of the drifters downstream was only 11 nm, or a net speed downstream of 1.1 nm/d. Between May 21 and May 28 the drifters moved westward, a net downstream distance of 9 nm or a net downstream speed of 1.3 nm/d. Between May 28 and June 1 (our last satellite fix) the drifters were displaced markedly to the SW about 22 nm, or a net speed of 5.5 nm/d.

Deck weather observations were compared to the drifter movement. The acceleration of the drifters down the sea valley from May 28 to June 1 corresponded to a period of strong wind conditions blowing towards the SW. During that time the area was influenced by a series of low pressure systems in the Gulf of Alaska.

Fishing operations: Due to a generator failure there was no trawling for fish on MF-90-06. Consequently, it was not possible to collect samples for fish predators or reproductive condition.

Gear comparisons: In the major aggregation of pollock larvae a series of gear comparisons was made using the standard bongo array, Tucker trawl (0.505 mm mesh) and Methot trawl. One Methot trawl was towed at 1.5 kts, and the others were towed at 2.5 to 3.5 kts.

Hydrocarbon samples: Nine hydrocarbon samples comprised of 10 g of bongo-caught plankton were collected and frozen for the EC Division of the Northwest Fisheries Center.

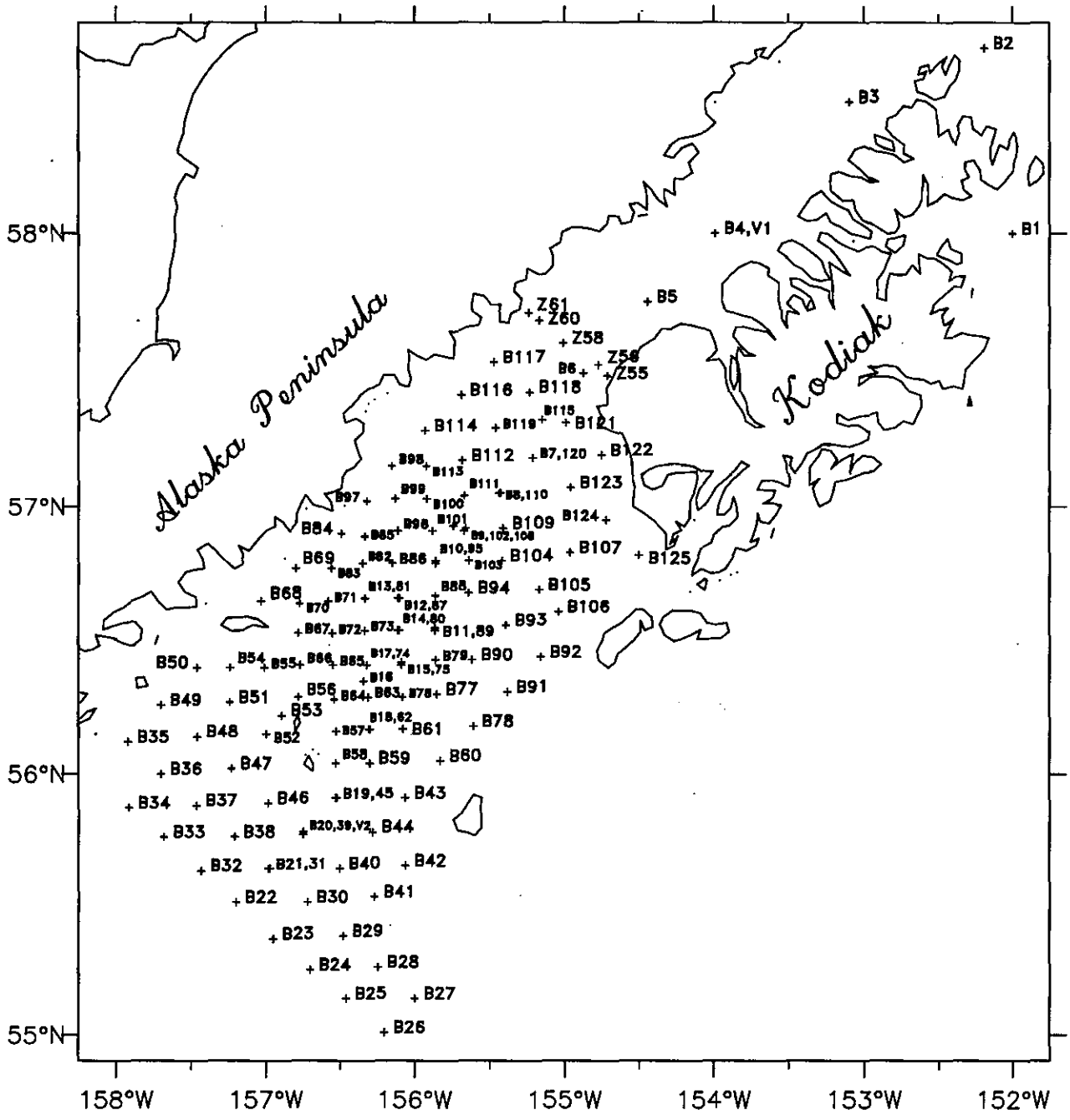

Fig. 5.1. MF-90-06 bongo (B) and vertical bongo (V) stations.

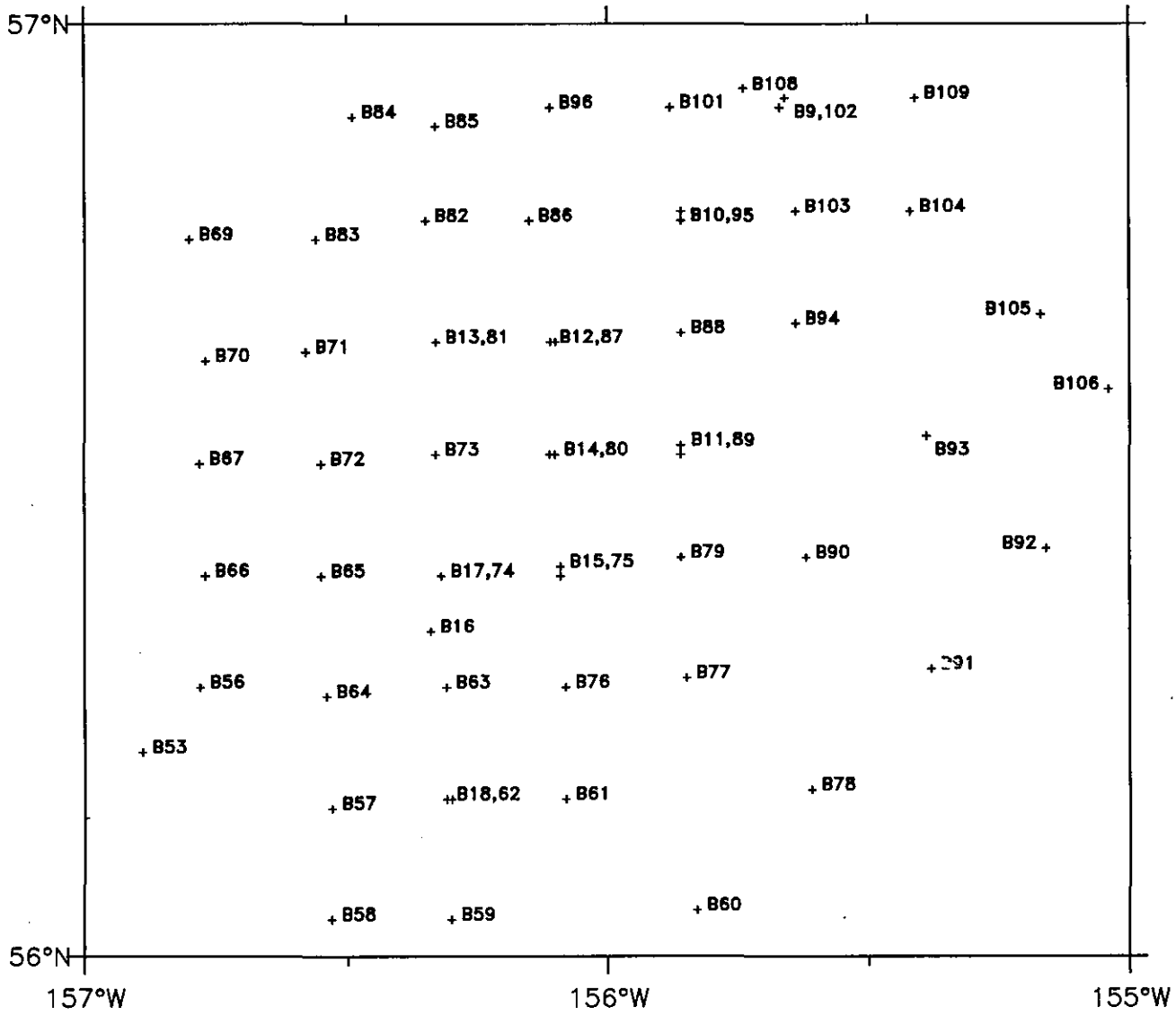

Fig. 5.2. MF-90-06 expanded view of Fig. 5.1, between 56–57°N and 155–157°W.

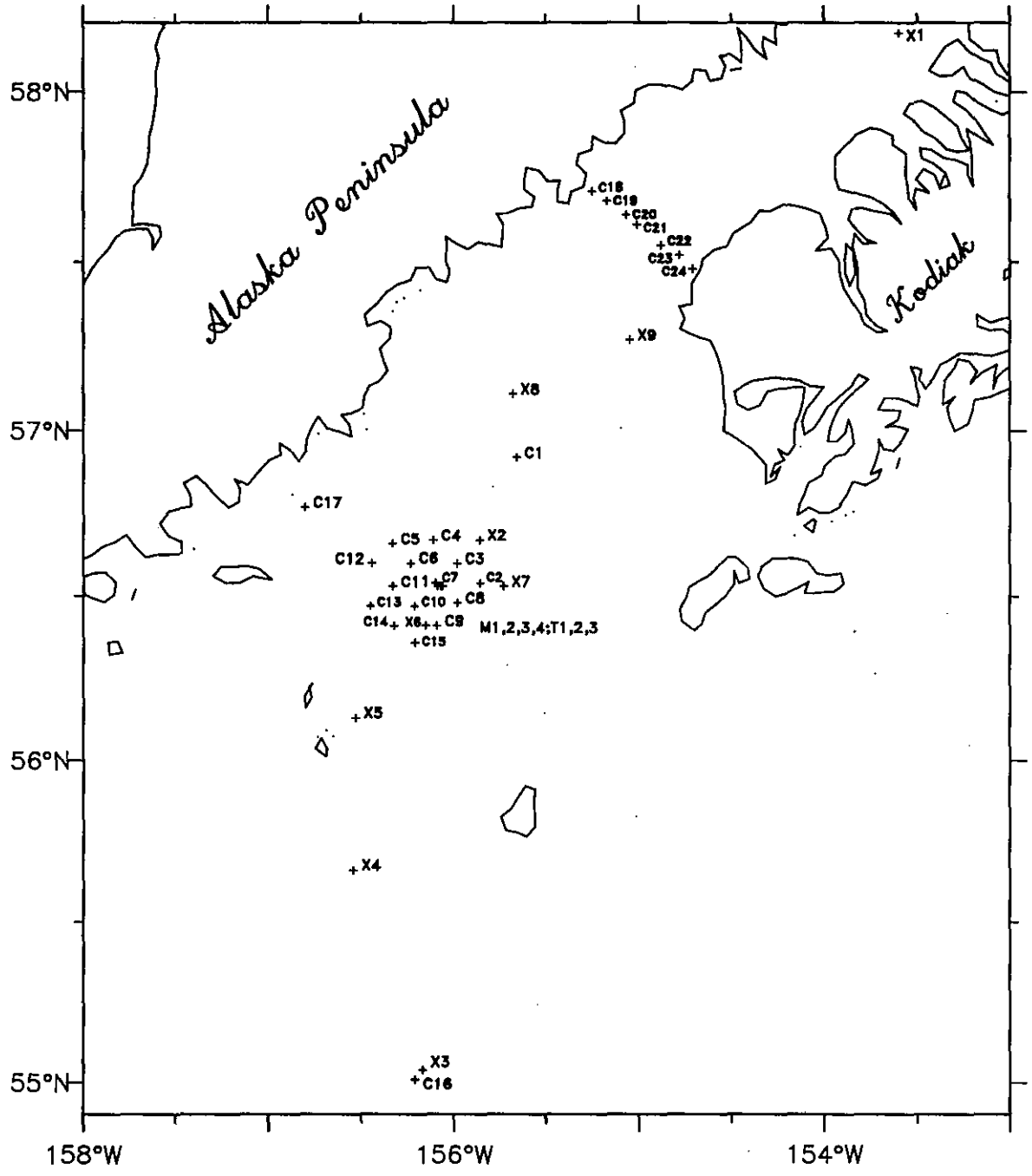

Fig. 5.3. MF-90-06 CTD (C), Methot trawl (M), Tucker trawl (T), and XBT (X) stations.

TABLE 7. MF-90-06 CRUISE SUMMARY

Larval Survey — 27 MAY - 5 JUNE 1990

Date (JD)	Date (GMT)	Time (GMT)	Cast No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
147	27-May	2305				57° 43.8' N	152° 29.6' W	Depart Kodiak
147	27-May	0256	G001A		170	58° 00.1' N	152° 00.3' W	Bongo
148	28-May	0810	G002A		132	58° 39.4' N	152° 11.7' W	Bongo
148	28-May	1201	G003A	E45	177	58° 28.4' N	153° 05.8' W	Bongo
148	28-May	1440			199	58° 10.1' N	153° 36.1' W	XBT #1
148	28-May	1617	G004A	E39	203	58° 00.0' N	153° 59.3' W	Bongo
148	28-May	1640	L001A	E39	203	57° 59.7' N	153° 59.0' W	Vertical tow
148	28-May	1851	G005A	E35	207	57° 44.9' N	154° 26.3' W	Bongo
148	28-May	2111	G006A	E31	218	57° 29.3' N	154° 52.0' W	Bongo
148	28-May	2345	G007A	F27	243	57° 10.7' N	155° 12.8' W	Bongo
149	29-May	0107	G008A	F25	271	57° 03.1' N	155° 25.9' W	Bongo
149	29-May	0244	001	F23	291	56° 55.0' N	155° 39.9' W	CTD/MZ/CHL
149	29-May	0311	G009A	F23	291	56° 54.9' N	155° 40.1' W	Bongo
149	29-May	0439	G010A	F21	305	56° 48.1' N	155° 51.5' W	Bongo
149	29-May	0540			280	56° 40.2' N	155° 51.4' W	XBT #2
149	29-May	0642	002	H19	241	56° 32.7' N	155° 51.3' W	CTD/MZ/CHL
149	29-May	0709	G011A	H19	243	56° 32.7' N	155° 51.6' W	Bongo
149	29-May	0814	003	G19	287	56° 36.2' N	155° 59.1' W	CTD
149	29-May	0924	004	F19	274	56° 39.9' N	156° 06.6' W	CTD/MZ/CHL
149	29-May	0957	G012A	F19	275	56° 39.9' N	156° 06.3' W	Bongo
149	29-May	1111	005	E18	197	56° 39.8' N	156° 19.9' W	CTD/MZ/CHL
149	29-May	1137	G013A	E18	199	56° 39.8' N	156° 19.9' W	Bongo
149	29-May	1235	006	F18	247	56° 36.0' N	156° 13.7' W	CTD
149	29-May	1337	007	G18	289	56° 32.2' N	156° 06.2' W	CTD/MZ/CHL
149	29-May	1404	G014A	G18	289	56° 32.2' N	156° 06.3' W	Bongo
149	29-May	1501	008	H18	250	56° 28.9' N	155° 58.6' W	CTD
149	29-May	1601	009	H17	258	56° 24.6' N	156° 05.4' W	CTD/MZ/CHL
149	29-May	1634	G015A	H17	262	56° 24.7' N	156° 05.5' W	Bongo
149	29-May	1733	010	G17	280	56° 28.3' N	156° 12.6' W	CTD
149	29-May	1837	011	F17	214	56° 32.0' N	156° 20.0' W	CTD/MZ/CHL
149	29-May	1906	G016A	F17	214	56° 21.1' N	156° 20.1' W	Bongo
149	29-May	2002	012	E17	207	56° 35.9' N	156° 26.4' W	CTD
149	29-May	2107	013	F16	221	56° 28.3' N	156° 26.7' W	CTD
149	29-May	2222	014	G16	243	56° 24.5' N	156° 19.2' W	CTD/MZ/CHL
149	29-May	2246	G017A	G16	236	56° 24.5' N	156° 19.5' W	Bongo
149	29-May	2346	015	H16	276	56° 21.6' N	156° 12.3' W	CTD
150	30-May	0118	G018A	I14	232	56° 10.0' N	156° 18.3' W	Bongo
150	30-May	0324	G019A	J11	230	55° 54.6' N	156° 31.3' W	Bongo
150	30-May	0450	G020A	J 9	200	55° 46.5' N	156° 44.9' W	Bongo
150	30-May	0619	G021A	J 7	88	55° 38.4' N	156° 58.5' W	Bongo
150	30-May	0745	G022A	J 5	91	55° 30.5' N	157° 12.0' W	Bongo
150	30-May	0911	G023A	L 5	95	55° 22.4' N	156° 56.8' W	Bongo

TABLE 7. MF-90-06 CRUISE SUMMARY

Larval Survey 27 MAY - 5 JUNE 1990

Date (JD)	Date (GMT)	Time (GMT)	Cast No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
150	30-May	1038	G024A	N 5	115	55° 15.0' N	156° 41.9' W	Bongo
150	30-May	1207	G025A	P 5	656	55° 08.1' N	156° 27.4' W	Bongo
150	30-May	1350	16A	R5	1666	55° 00.6' N	156° 13.0' W	CTD
150	30-May	1434	G026A	R 5	1796	55° 00.7' N	156° 12.3' W	Bongo
150	30-May	1457	16B	R5	1756	55° 00.5' N	156° 12.5' W	CTD/MZ/CHL
150	30-May	1530			1774	55° 02.3' N	156° 09.9' W	XBT #3
150	30-May	1631	G027A	R 7	1600	55° 08.3' N	155° 59.9' W	Bongo
150	30-May	1754	G028A	P 7	262	55° 15.9' N	156° 14.3' W	Bongo
150	30-May	1920	G029A	N 7	168	55° 23.1' N	156° 28.6' W	Bongo
150	30-May	2047	G030A	L 7	133	55° 30.5' N	156° 43.0' W	Bongo
150	30-May	2213	G031A	J 7	86	55° 38.5' N	156° 58.7' W	Bongo
151	31-May	0002	G032A	H 5	102	55° 37.7' N	157° 25.8' W	Bongo
151	31-May	0122	G033A	F 5	133	55° 45.4' N	157° 40.9' W	Bongo
151	31-May	0236	G034A	D 5	106	55° 52.4' N	157° 54.6' W	Bongo
151	31-May	0424	G035A	B 7	152	56° 07.4' N	157° 55.5' W	Bongo
151	31-May	0609	G036A	D 7	79	56° 00.3' N	157° 41.9' W	Bongo
151	31-May	0743	G037A	F 7	98	55° 53.0' N	157° 27.6' W	Bongo
151	31-May	0912	G038A	H 7	86	55° 45.4' N	157° 12.6' W	Bongo
151	31-May	1114	G039A	J 9	190	55° 46.6' N	156° 45.2' W	Bongo
151	31-May	1133	L002A	J9	174	55° 46.5' N	156° 45.8' W	Vertical tow
151	31-May	1250			243	55° 39.9' N	156° 32.7' W	XBT #4
151	31-May	1310	G040A	L 9	252	55° 38.6' N	156° 30.1' W	Bongo
151	31-May	1451	G041A	N 9	217	55° 31.6' N	156° 16.3' W	Bongo
151	31-May	1612	G042A	N11	251	55° 39.1' N	156° 03.4' W	Bongo
151	31-May	1803	G043A	L13	134	55° 54.8' N	156° 03.5' W	Bongo
151	31-May	1930	G044A	L11	239	55° 46.9' N	156° 16.6' W	Bongo
151	31-May	2056	G045A	J11	225	55° 54.6' N	156° 31.8' W	Bongo
151	31-May	2247	G046A	H 9	126	55° 53.6' N	156° 59.0' W	Bongo
152	01-Jun	0010	G047A	F 9	115	56° 01.3' N	157° 13.7' W	Bongo
152	01-Jun	0129	G048A	D 9	148	56° 08.2' N	157° 27.9' W	Bongo
152	01-Jun	0246	G049A	B 9	104	56° 15.4' N	157° 41.9' W	Bongo
152	01-Jun	0408	G050A	B11	146	56° 24.0' N	157° 27.8' W	Bongo
152	01-Jun	0539	G051A	D11	139	56° 16.1' N	157° 14.2' W	Bongo
152	01-Jun	0703	G052A	F11	102	56° 09.1' N	157° 00.0' W	Bongo
152	01-Jun	0753	G053A	F12	93	56° 13.1' N	156° 53.2' W	Bongo
152	01-Jun	0941	G054A	C12	121	56° 23.9' N	157° 14.2' W	Bongo
152	01-Jun	1050	G055A	D13	166	56° 24.1' N	157° 00.6' W	Bongo
152	01-Jun	1213	G056A	F13	88	56° 17.2' N	156° 46.9' W	Bongo
152	01-Jun	1349	G057A	H13	221	56° 09.6' N	156° 32.0' W	Bongo
152	01-Jun	1410			221	56° 07.8' N	156° 32.0' W	XBT #5
152	01-Jun	1451	G058A	I12	201	56° 02.4' N	156° 31.8' W	Bongo
152	01-Jun	1553	G059A	J13	210	56° 02.4' N	156° 18.2' W	Bongo

TABLE 7. MF-90-06 CRUISE SUMMARY

Larval Survey — 27 MAY - 5 JUNE 1990

Date (JD)	Date (GMT)	Time (GMT)	Cast No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
152	01-Jun	1749	G060A	L15	69	56° 02.9' N	155° 49.8' W	Bongo
152	01-Jun	1909	G061A	J15	243	56° 10.0' N	156° 04.8' W	Bongo
152	01-Jun	2008	G062A	I14	234	56° 10.0' N	156° 18.7' W	Bongo
152	01-Jun	2111	G063A	H15	283	56° 17.5' N	156° 18.6' W	Bongo
152	01-Jun	2207	G064A	G14	203	56° 17.1' N	156° 32.7' W	Bongo
152	01-Jun	2308	G065A	F15	208	56° 24.7' N	156° 33.1' W	Bongo
153	02-Jun	0004	G066A	E14	122	56° 24.4' N	156° 46.1' W	Bongo
153	02-Jun	0103	G067A	D15	121	56° 31.6' N	156° 47.0' W	Bongo
153	02-Jun	0218	G068A	B15	141	56° 38.9' N	157° 02.0' W	Bongo
153	02-Jun	0348	017	B17	66	56° 46.1' N	156° 48.0' W	CTD
153	02-Jun	0405	G069A	B17	66	56° 46.2' N	156° 48.1' W	Bongo
153	02-Jun	0509	G070A	C16	142	56° 38.6' N	156° 46.3' W	Bongo
153	02-Jun	0610	G071A	D17	164	56° 39.3' N	156° 34.6' W	Bongo
153	02-Jun	0713	G072A	E16	199	56° 31.9' N	156° 33.1' W	Bongo
153	02-Jun	0818	G073A	F17	215	56° 32.3' N	156° 19.9' W	Bongo
153	02-Jun	0921	G074A	G16	247	56° 24.5' N	156° 19.1' W	Bongo
153	02-Jun	1010			274	56° 24.8' N	156° 09.2' W	XBT #6
153	02-Jun	1030	G075A	H17	260	56° 25.0' N	156° 05.2' W	Bongo
153	02-Jun	1128	G076A	I16	241	56° 17.7' N	156° 05.0' W	Bongo
153	02-Jun	1241	G077A	J17	117	56° 18.0' N	155° 51.1' W	Bongo
153	02-Jun	1417	G078A	L17	60	56° 11.0' N	155° 36.7' W	Bongo
153	02-Jun	1610	G079A	I18	199	56° 25.7' N	155° 51.3' W	Bongo
153	02-Jun	1729	G080A	G18	284	56° 32.5' N	156° 06.0' W	Bongo
153	02-Jun	1754		G18	288	56° 32.5' N	156° 06.1' W	Deployed drifter
153	02-Jun	1837	C080A	G18	289	56° 32.6' N	156° 06.1' W	Tucker
153	02-Jun	1915	C080B	G18	289	56° 32.4' N	156° 05.8' W	Tucker
153	02-Jun	1936	C080C	G18	289	56° 32.3' N	156° 05.8' W	Tucker
153	02-Jun	2006	C080D	G18	289	56° 32.1' N	156° 05.6' W	Bongo
153	02-Jun	2024	C080E	G18	289	56° 32.4' N	156° 05.5' W	Bongo
153	02-Jun	2044	C080F	G18	289	56° 32.2' N	156° 05.7' W	Bongo
153	02-Jun	2115	C080G	G18	289	56° 32.1' N	156° 05.5' W	Methot
153	02-Jun	2149	C080H	G18	287	56° 31.9' N	156° 05.5' W	Methot
153	02-Jun	2258	C080I	G18	285	56° 32.0' N	156° 04.2' W	Methot
153	02-Jun	2338	C080J	G18	280	56° 31.8' N	156° 03.6' W	Methot
154	03-Jun	0032			283	56° 31.4' N	156° 05.4' W	Recovered drifter
154	03-Jun	0153	G081A	E18	197	56° 39.8' N	156° 20.0' W	Bongo
154	03-Jun	0253	G082A	D19	199	56° 47.2' N	156° 20.9' W	Bongo
154	03-Jun	0348	G083A	C18	124	56° 46.2' N	156° 33.6' W	Bongo
154	03-Jun	0453	G084A	B18	93	56° 54.0' N	156° 29.5' W	Bongo
154	03-Jun	0542	G085A	C20	104	56° 53.5' N	156° 19.6' W	Bongo
154	03-Jun	0656	G086A	E20	225	56° 47.3' N	156° 08.9' W	Bongo
154	03-Jun	0755	G087A	F19	276	56° 39.9' N	156° 06.3' W	Bongo

TABLE 7. MF-90-06 CRUISE SUMMARY

Larval Survey 27 MAY - 5 JUNE 1990

Date (JD)	Date (GMT)	Time (GMT)	Cast No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
154	03-Jun	0858	G088A	G20	281	56° 40.2' N	155° 51.8' W	Bongo
154	03-Jun	0954	G089A	H19	244	56° 32.8' N	155° 51.4' W	Bongo
154	03-Jun	1013			227	56° 31.7' N	155° 43.9' W	XBT #7
154	03-Jun	1107	G090A	J19	77	56° 25.7' N	155° 37.1' W	Bongo
154	03-Jun	1220	G091A	L19	49	56° 18.8' N	155° 22.6' W	Bongo
154	03-Jun	1338	G092A	L21	31	56° 26.6' N	155° 09.5' W	Bongo
154	03-Jun	1446	G093A	J21	71	56° 33.4' N	155° 23.3' W	Bongo
154	03-Jun	1602	G094A	H21	243	56° 40.7' N	155° 38.1' W	Bongo
154	03-Jun	1719	G095A	F21	304	56° 47.7' N	155° 51.8' W	Bongo
154	03-Jun	1840	G096A	D21	212	56° 54.9' N	156° 06.8' W	Bongo
154	03-Jun	1949	G097A	B21	103	57° 01.1' N	156° 19.2' W	Bongo
154	03-Jun	2057	G098A	B23	118	57° 09.1' N	156° 09.1' W	Bongo
154	03-Jun	2149	G099A	C22	107	57° 01.8' N	156° 07.8' W	Bongo
154	03-Jun	2242	G100A	D23	268	57° 02.0' N	155° 55.2' W	Bongo
154	03-Jun	2336	G101A	E22	300	56° 54.7' N	155° 52.8' W	Bongo
155	04-Jun	0029	G102A	F23	289	56° 55.1' N	155° 39.6' W	Bongo
155	04-Jun	0127	G103A	G27	274	56° 47.8' N	155° 38.6' W	Bongo
155	04-Jun	0224	G104A	H23	245	56° 48.1' N	155° 25.4' W	Bongo
155	04-Jun	0338	G105A	J23	75	56° 41.1' N	155° 10.0' W	Bongo
155	04-Jun	0427	G106A	L23	38	56° 36.6' N	155° 02.3' W	Bongo
155	04-Jun	0548	G107A	J25	99	56° 49.6' N	154° 57.5' W	Bongo
155	04-Jun	0707	G108A	H25	227	56° 56.1' N	155° 44.6' W	Bongo
155	04-Jun	0806	G109A	G24	267	56° 55.5' N	155° 24.6' W	Bongo
155	04-Jun	0904	G110A	F25	270	57° 03.0' N	155° 26.3' W	Bongo
155	04-Jun	1004	G111A	E24	289	57° 02.5' N	155° 40.2' W	Bongo
155	04-Jun	1034			285	57° 06.4' N	155° 40.7' W	XBT #8
155	04-Jun	1101	G112A	D25	284	57° 10.0' N	155° 40.9' W	Bongo
155	04-Jun	1201	G113A	C24	272	57° 09.1' N	155° 55.1' W	Bongo
155	04-Jun	1304	G114A	B25	247	57° 16.5' N	155° 55.5' W	Bongo
155	04-Jun	1401	G115A	A24	247	57° 19.0' N	155° 09.0' W	Bongo
155	04-Jun	1558	G116A	B27	284	57° 24.5' N	155° 41.5' W	Bongo
155	04-Jun	1717	G117A	B29	312	57° 31.9' N	155° 28.5' W	Bongo
155	04-Jun	1915	018	FOX61	299	57° 42.5' N	155° 14.9' W	CTD
155	04-Jun	1937	Z061A	FOX61	298	57° 42.5' N	155° 14.6' W	Bongo
155	04-Jun	2028	019	FOX60	293	57° 40.9' N	155° 09.9' W	CTD
155	04-Jun	2057	Z060A	FOX60	293	57° 40.7' N	155° 10.5' W	Bongo
155	04-Jun	2158	020	FOX59	260	57° 38.6' N	155° 04.1' W	CTD
155	04-Jun	2246	021	FOX58	237	57° 36.4' N	155° 00.4' W	CTD
155	04-Jun	2308	Z058A	FOX58	237	57° 36.3' N	155° 00.8' W	Bongo
156	05-Jun	0013	022	FOX57	228	57° 33.1' N	154° 52.5' W	CTD
156	05-Jun	0106	023	FOX56	212	57° 30.9' N	154° 47.0' W	CTD
156	05-Jun	0126	Z056A	FOX56	210	57° 31.1' N	154° 46.5' W	Bongo

TABLE 7. MF-90-06 CRUISE SUMMARY

Larval Survey — 27 MAY - 5 JUNE 1990

Date (JD)	Date (GMT)	Time (GMT)	Cast No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
156	05-Jun	0206	024	FOX55	64	57° 28.8' N	154° 42.3' W	CTD
156	05-Jun	0219	Z055A	FOX55	62	57° 28.7' N	154° 42.4' W	Bongo
156	05-Jun	0416	G118A	D29	245	57° 25.2' N	155° 13.7' W	Bongo
156	05-Jun	0534	G119A	D27	254	57° 17.2' N	155° 27.6' W	Bongo
156	05-Jun	0550			254	57° 17.2' N	155° 27.2' W	ADCP Backtrack-L
156	05-Jun	0903	G120A	F27	237	57° 10.7' N	155° 12.9' W	Bongo
156	05-Jun	0959			223	57° 16.1' N	155° 03.2' W	XBT #9
156	05-Jun	1023	G121A	F29	214	57° 18.4' N	154° 59.6' W	Bongo
156	05-Jun	1137	G122A	H29	69	57° 11.6' N	154° 45.1' W	Bongo
156	05-Jun	1249	G123A	H27	137	57° 04.0' N	154° 57.9' W	Bongo
156	05-Jun	1406	G124A	J27	46	56° 56.7' N	154° 43.2' W	Bongo
156	05-Jun	1514	G125A	L27	60	56° 49.4' N	154° 30.2' W	Bongo
156	05-Jun	1730				56° 53.6' N	154° 14.8' W	Anchored, Alitak

DA-90-02: 13 August–16 August, 1990

SCIENTIFIC PERSONNEL

Name	Title	Organization
Bill Parker	Chief Scientist	PMEL/NOAA
Carol DeWitt	Field Operations Specialist	PMEL/NOAA

SUMMARY OF OPERATIONS SCHEDULE

Depart Kodiak for mooring site	13 August
Mooring 9026, 9027, and 9032: recover	14 August
Mooring 8931: drag operations	15 August
Arrive Kodiak	16 August

CRUISE STATISTICS

Mooring recoveries	3
CTDs	2

OBJECTIVES

DA-90-02 was designed to:

- recover three moorings, 9026, 9027 and 9032
- drag for one mooring, 8931

OPERATIONS

CTD Casts: CTDs were located at two mooring sites (9032 and 9026/9027) to calibrate sensors on the moorings (CTDs were taken before mooring recoveries). The *Davidson*'s SEACAT CTD system was used. The CTD cast at mooring 9032 was taken to approximately 100 m, while the CTD cast at mooring 9026/9027 was taken to approximately 245 m. The descent rate of the CTD was 60 m/min. CTD cast data were internally recorded in the Seacat during both the descent and ascent. The data were then downloaded onto 3.5" floppy diskettes.

Moorings: A total of three moorings were successfully recovered in Shelikof Strait. One of the two moorings, 9032, consisted of a 600 KHz RDI Acoustic Doppler Current Profiler (ADCP) and a Sea-Bird Seacat, deployed at approximately 60 m and 66 m respectively. The other two moorings were deployed at the same location. One mooring, 9026, consisted of a 150 KHz RDI ADCP deployed at approximately 248 m below the surface. The third mooring, 9027, consisted of a single Aanderaa current meter deployed approximately 80 m below the surface.

Small boat operations were used during all mooring recoveries. This ensured the safe and efficient recoveries of the ADCPs.

Drag Operations: Plans to drag mooring 8931 were started in June 1990, when it was determined that the release was communicating with the deck gear but lacked the flotation to rise to the surface. However, upon arrival at the mooring site during DA-90-02, approximately two months later, the release had ceased communications with the deck gear. A search grid was completed; no communications were established. Dragging operations were briefly conducted; results were unsuccessful.

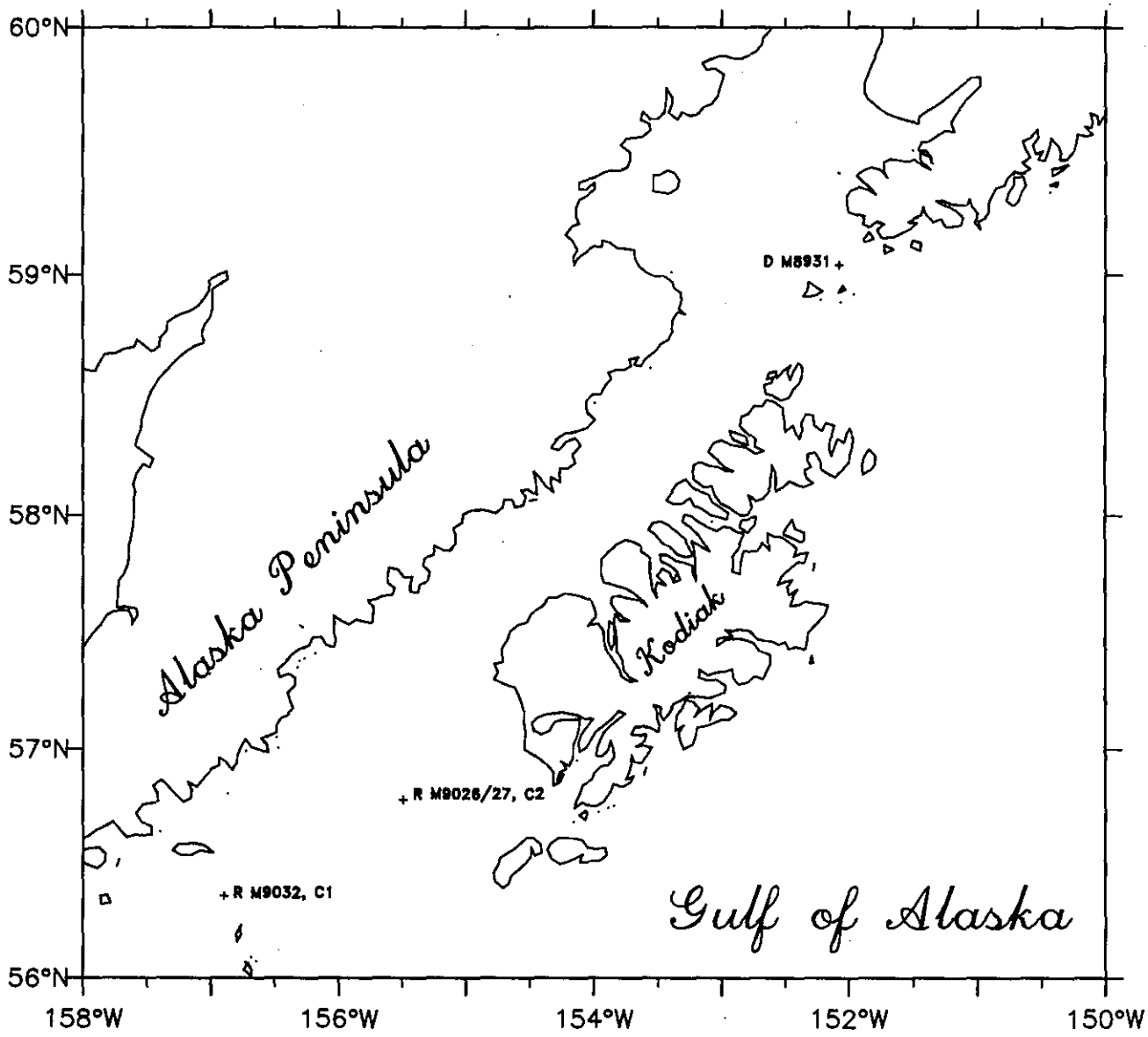

Fig. 6.1. DA-90-02 CTD (C), mooring recovery (R), and mooring drag (D) stations.

TABLE 8. DA-90-02 CRUISE SUMMARY

Mooring recoveries 13 - 16 August 1990

Date (JD)	Date (GMT)	Time (GMT)	Cast No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
226	14-Aug	2318	001		122	56° 21.3' N	156° 53.50	CTD at M9032
226	14-Aug	2343			122	56° 21.3' N	156° 53.80	Recover M9032
227	15-Aug	0645	002		235	56° 47.1' N	155° 28.70	CTD at M9026/27
227	15-Aug	0515			241	56° 46.9' N	155° 29.20	Recover M9026
227	15-Aug	0541			241	56° 46.9' N	155° 29.20	Recover M9027
227	15-Aug	2315			198	59° 02.1' N	152° 04.2' W	Drag for M8931

MF-90-09: 6 September–23 September, 1990 (FOCI-90-05)

SCIENTIFIC PERSONNEL

Name	Title	Organization
Hinckley, Sarah	Chief Scientist	NOAA/AFSC
Adams, Denise	Fishery Biologist	NOAA/AFSC
Brown, Annette	Fishery Biologist	NOAA/AFSC
Busby, Morgan	Fishery Biologist	NOAA/AFSC
Fadely, Brian	Ornithologist	USF&WS
Nunnallee, Ed	Fishery Biologist	NOAA/AFSC
Porter, Steve	Fishery Biologist	NOAA/AFSC
Rugen, Bill	Fishery Biologist	NOAA/AFSC
Spring, Stella	Fishery Biologist	NOAA/AFSC
Wilson, Matt	Fishery Biologist	NOAA/AFSC

SUMMARY OF OPERATIONS SCHEDULE

Depart Kodiak	6 September
Start field operations	6 September
Complete field operations	23 September
Arrive Dutch Harbor	23 September

CRUISE STATISTICS

Shrimp trawls	118
Anchovy trawls	13
Noreastern trawls	4
Bongo tows	6
Methot tows	6
Gear comparison tows	
Methot trawl	2
shrimp trawl	1
anchovy trawl	11
XBT casts	105
No. of hydroacoustic transect miles	2386

CRUISE STATISTICS (cont.)

Collections

Juvenile growth study (otolith samples)	3218
Juvenile condition study	472
Juvenile disease study (for Frank Morado)	331
Jellyfish species id	7
Specimen collection (Photographic data on fish and jellyfish)	
Shrimp collection (for Paul Anderson)	7.75 lbs
Rockfish collection (for Art Kendall)	8
Jean Dunn samples	
0-age pollock	62
0-age Pacific cod	9
Maturity samples (for Nazila Merati)	134
Fish predation study (stomach scans)	316
Total lengths (pollock)	4847
Seabird observations	
Transects (10 min)	251
Birds collected	37

OBJECTIVES

The objectives of MF-90-09 (FOCI-90-05), a study of young-of-the-year juvenile pollock, were to:

- continue acquisition of long-term abundance index information on juvenile pollock
- develop assessment techniques for future estimation of total abundance, including a comparison of hydroacoustic versus trawl assessment
- collect samples of juvenile pollock for studies of growth, condition and disease
- test catchability of juvenile pollock by several gear types
- investigate predation on juveniles by seabirds and fish

OPERATIONS

Gear Comparisons: A set of gear comparison trawls was done on 18 September, in the Castle Bay area, using the shrimp trawl, the anchovy trawl and the Methot trawl. One tow with each gear type was done at night, and two tows with each gear type were done during the day. The anchovy trawl was used thereafter, along with the shrimp trawl at several selected grid stations, to provide more comparisons.

Hydroacoustics: One of the major goals of the cruise was to test whether the Simrad EK-500 echo integration system could provide an effective means of assessing the abundance and distribution of juvenile pollock. An initial calibration of the EK-500 was performed in Izhut Bay from 2030 GMT (6 September) to 0930 GMT (7 September). A second calibration was done in Castle Bay on 18 September (0800–1800 GMT). The EK-500 hydroacoustic system was operated continuously beginning on 7 September. Data was logged separately for trawls and for transits between stations. Opportunistic trawls (using the shrimp trawl, the anchovy trawl or the Noreastern trawl) were conducted to validate acoustic sign. Figures 7.1 shows the hydroacoustic transects.

Net Mensuration: A set of six tow was done on 15 September to measure the mouth opening of the shrimp trawl. Height and spread measurements had to be made on separate trawls, as the Scanmar spread sensors were used on the headrope and footrope to measure vertical opening, as well as to measure spread. Measurements were done on both stepped and oblique tows. Height

and spread measurements were also made on the anchovy trawl, during the gear comparisons on 18 September.

Trawling: Operations near Kodiak Island: Two midwater shrimp trawls for juvenile pollock were conducted in Marmot Bay, as were a Noreastern trawl for adult (live) pollock for maturity studies, a bongo tow and a Methot trawl (to investigate size-composition of pollock present). Two midwater shrimp trawls and one bongo tow were conducted in Alitak Bay and Sutwik Island.

Operations in the main study area: A grid of stations was sampled, extending from Sutwik and the Semidi Islands in the east, to west of Unimak Pass. Sampling of the grid began on 9 September. The main sampling gear for the grid stations was the midwater shrimp trawl. Noreastern trawls (used on and off bottom, for investigation of predators), bongo tows and Methot trawls (for investigation of size-composition of young-of-the-year pollock present) were done at selected stations. A second trawl for live adult pollock for maturity studies was done on 13 September.

Shrimp trawls at grid stations were initially done in a stepped manner, with steps at preset depths. A comparison between this method and oblique tows (using the shrimp trawl) was done part way through the grid, and it was decided that the oblique trawls provided a more representative sample of the water column. Pairs of trawls (stepped and oblique) were done on 12 and 13 September, and all grid stations after 13 September were done using the oblique method.

Operations at grid stations (west of the Shumagin Islands) were suspended on 16 September due to weather. A nearshore hydroacoustic transect from near Unimak Island to east of the Shumagin Islands was done. Ten grid stations east of the Shumagins were resurveyed using oblique tows (these stations had been done previously using stepped tows). Bad weather again interrupted operations on the grid, and we took shelter in Castle Bay. A second calibration of the hydroacoustics system was done at this time (18 September). More stations to resurvey more of the grid stations east of the Shumagins were planned after the calibration, but bad weather forced us to remain in Castle Bay until 19 September (1500). Due to time limitations, the ship then proceeded directly to the Unimak area where the grid had been interrupted on 16 September. The grid stations were completed on 22 September. The final operation was a hydroacoustic survey of the area around Sanak Island, an area in which juveniles had been found earlier.

Trawl catch processing: Trawl catches (shrimp, anchovy and Noreastern) at each grid station and opportunistic trawl, were processed according to standard RACE groundfish procedures. Species composition for the total catch was obtained (no subsampling was done). All jellyfish were

weighed, and samples and photographs were taken for species identification. Lengths were taken on all pollock. Samples of juveniles for age and growth studies were taken at all stations, and various other special studies were done at selected stations. Stomach scans were done of all potential predators on juvenile pollock on both the special predation trawls, and whenever potential predators were caught in the juvenile pollock trawls. An XBT was done at every trawl station. CTDs for water samples were taken for live ciliates at Uyak Bay, and during the grid on 13 and 21 September.

Seabirds and marine mammals: Seabird and marine mammal transects were conducted throughout the grid, in several coves and bays, and around parts of Kodiak Island. Approximately 41.8 hours of transects (251 10-min transects) were completed, including 27 transects during fishing trawls for direct comparison to juvenile pollock distribution and abundance. Thirty-seven seabirds were collected for stomach analysis, including Black-legged Kittiwakes, Horned Puffins, Tufted Puffins, Red-faced Cormorants, Marbled Murrelets and Common Murres. There were several marine mammal sightings throughout the cruise, including sea otters, northern fur seals, minke whales, and humpback whales.

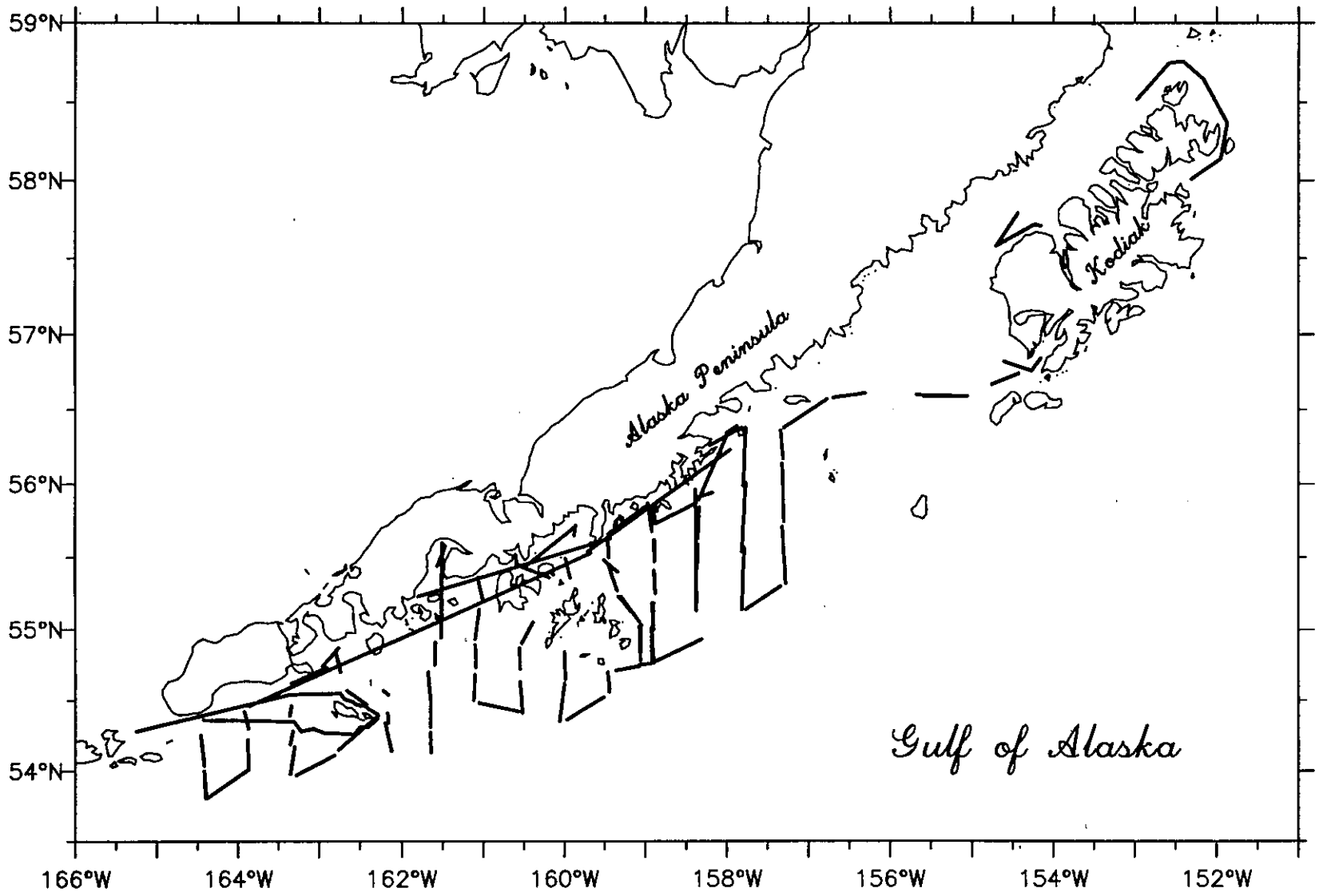

Fig. 7.1. MF-90-09 hydroacoustic transects.

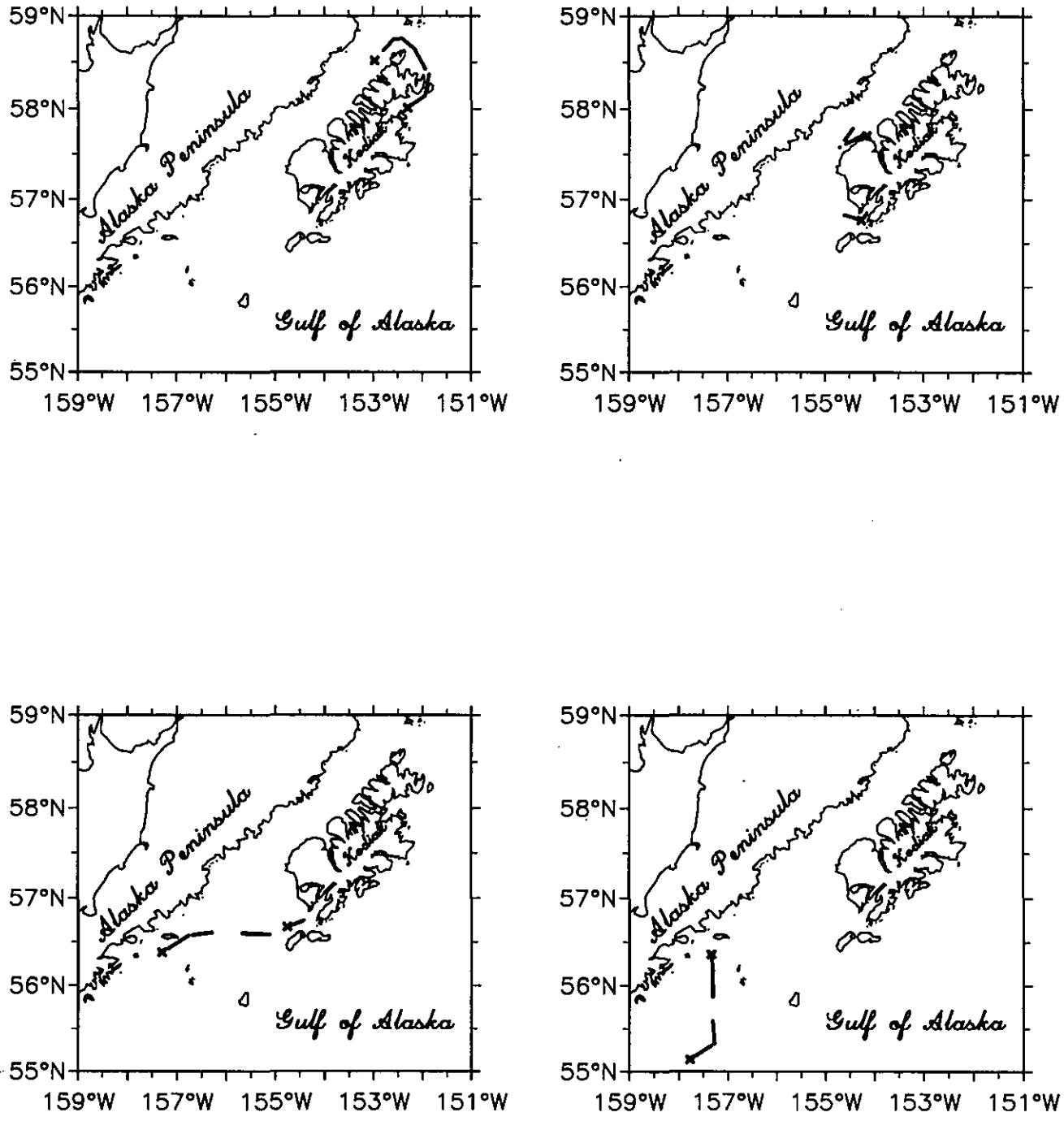

Fig. 7.2. MF-90-09 200, 300, 400, and 500 hydroacoustic transects series.

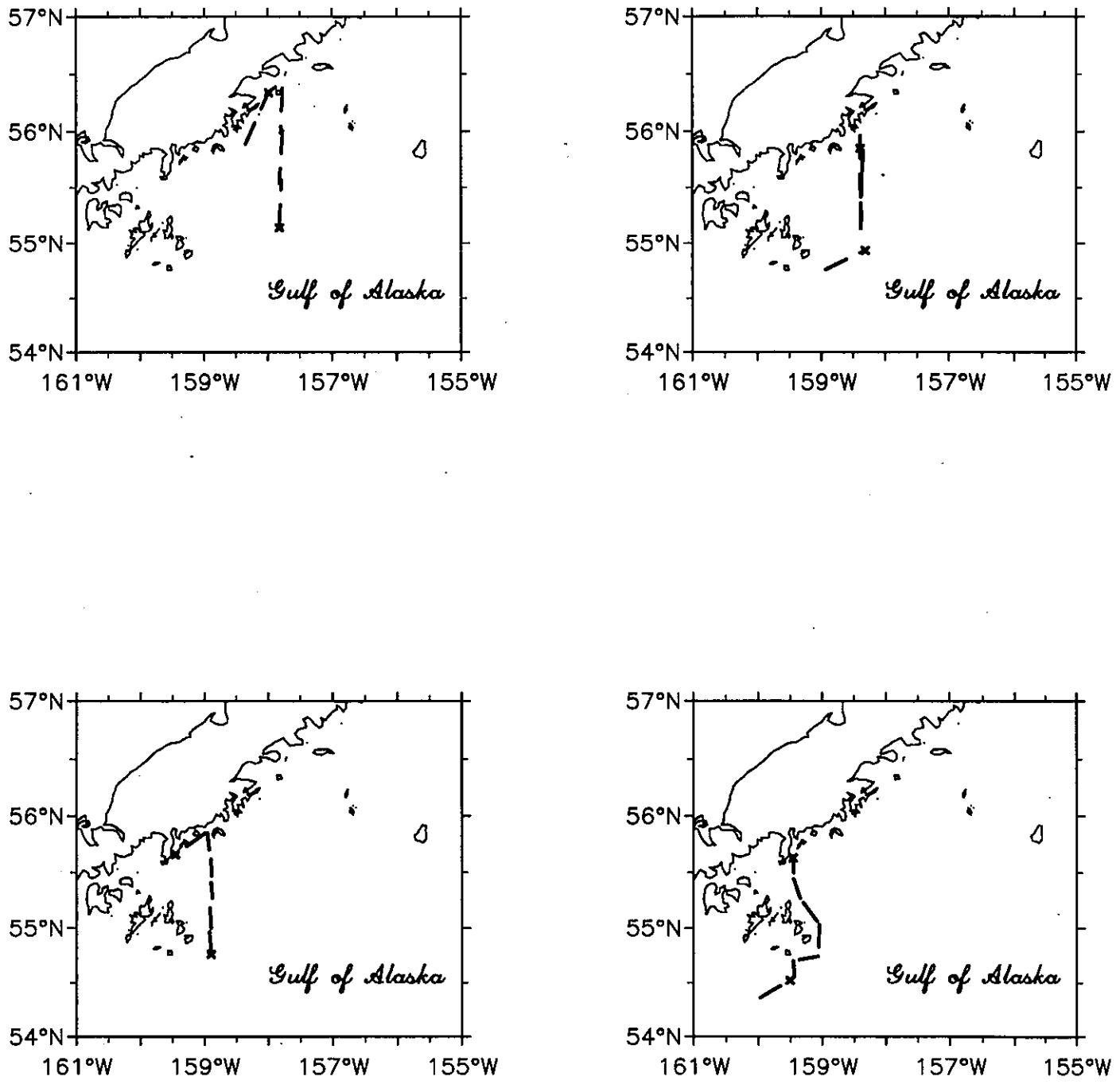

Fig. 7.3. MF-90-09 600, 700, 800, 900 hydroacoustic transects series.

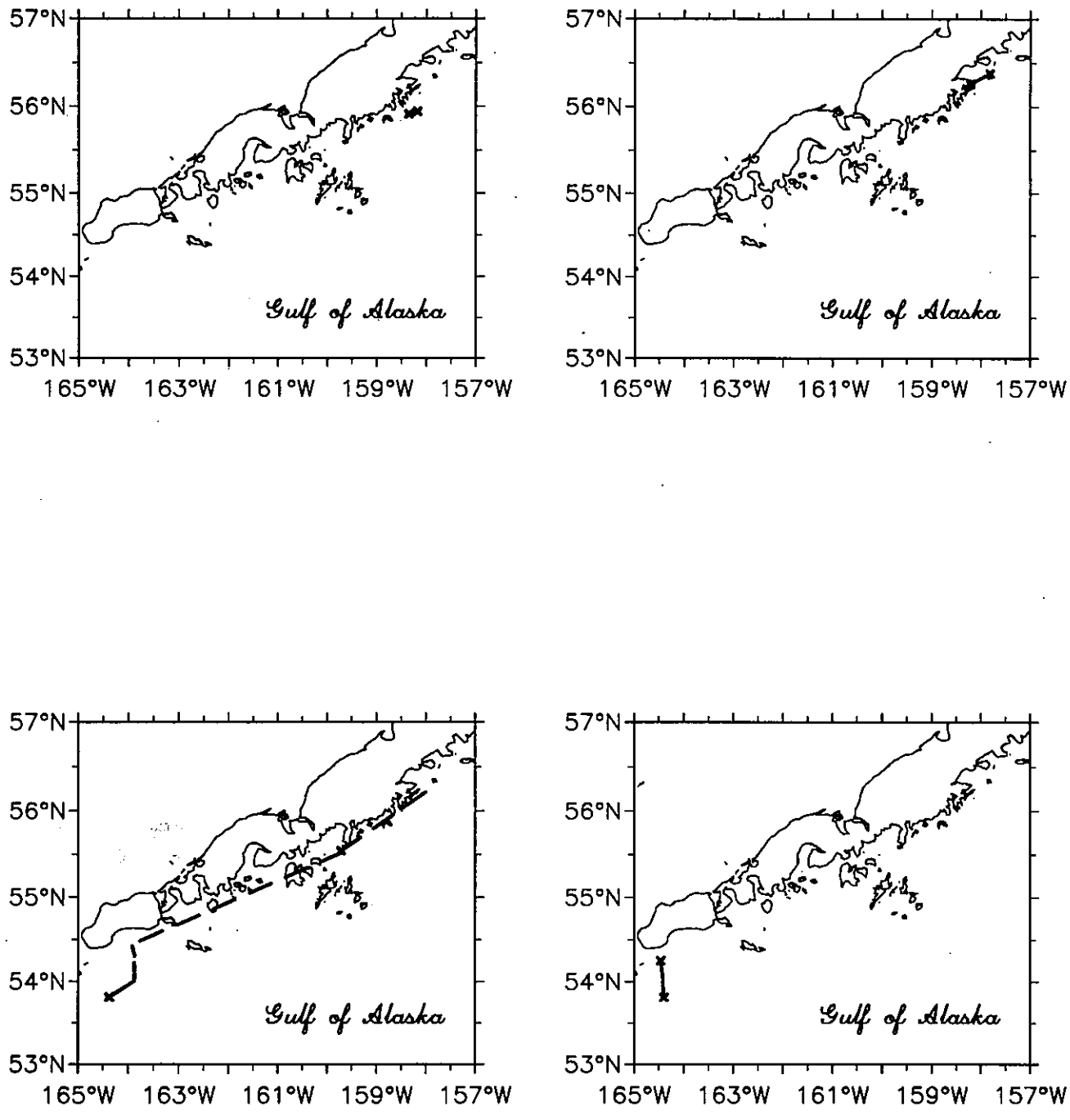

Fig. 7.6. MF-90-09 series 1900, 2000, 2100, and 2200 hydroacoustic transects series.

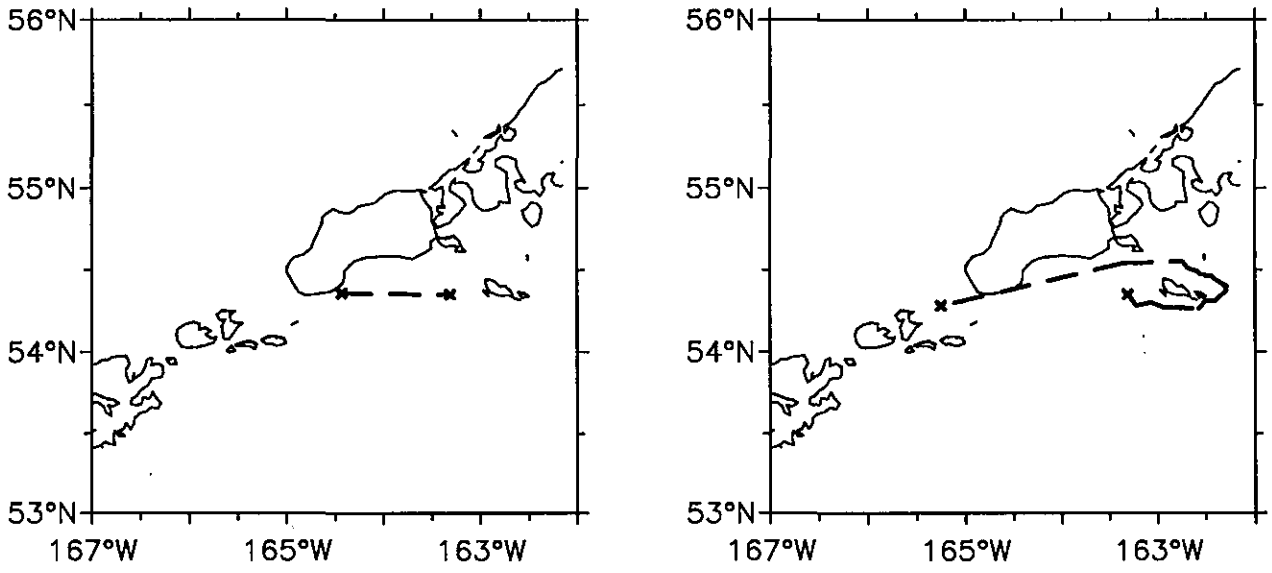

Fig. 7.7. MF-90-09 series 2300 and 2400 hydroacoustic transects series.

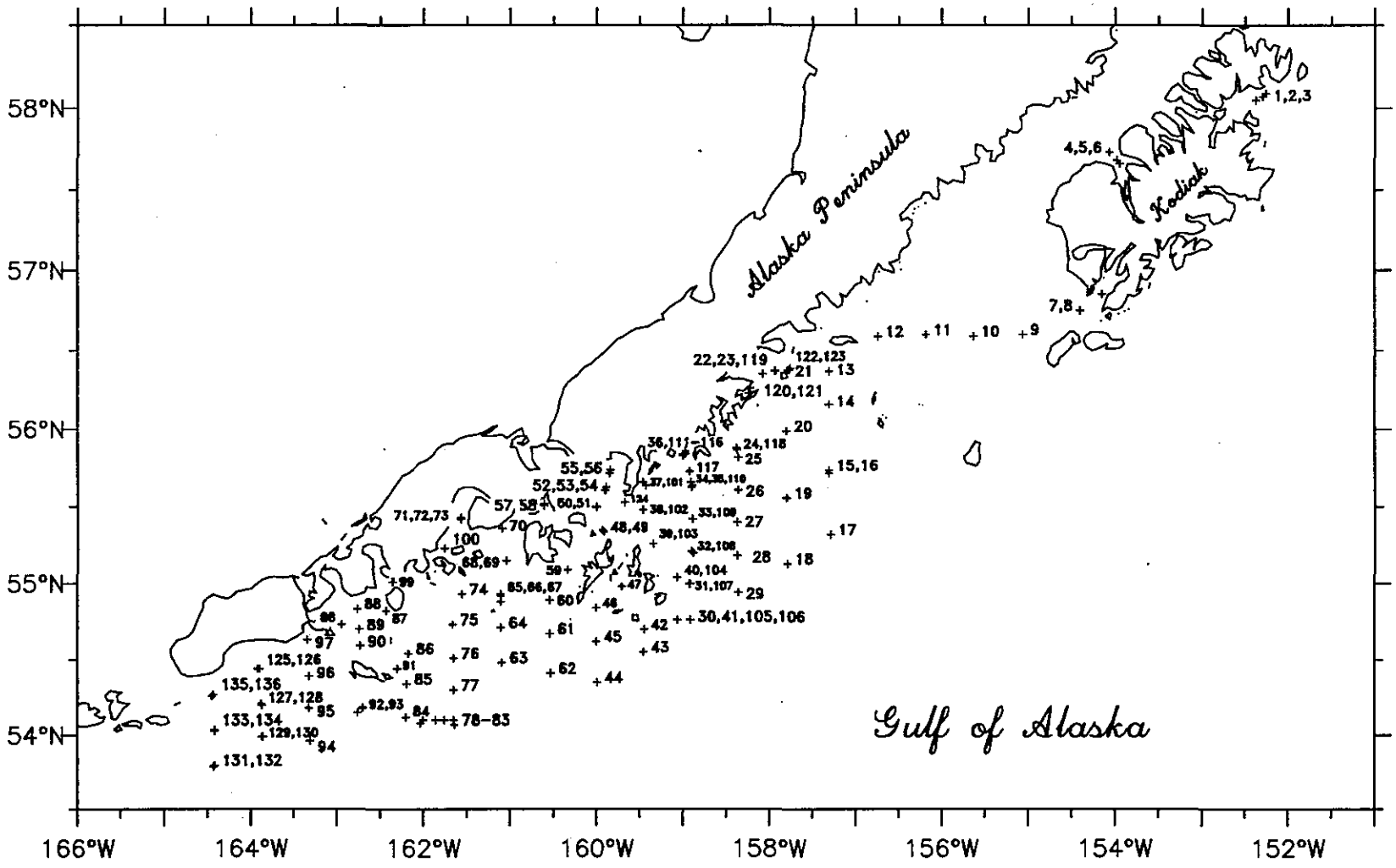

Fig. 7.8. MF-90-09 trawl stations.

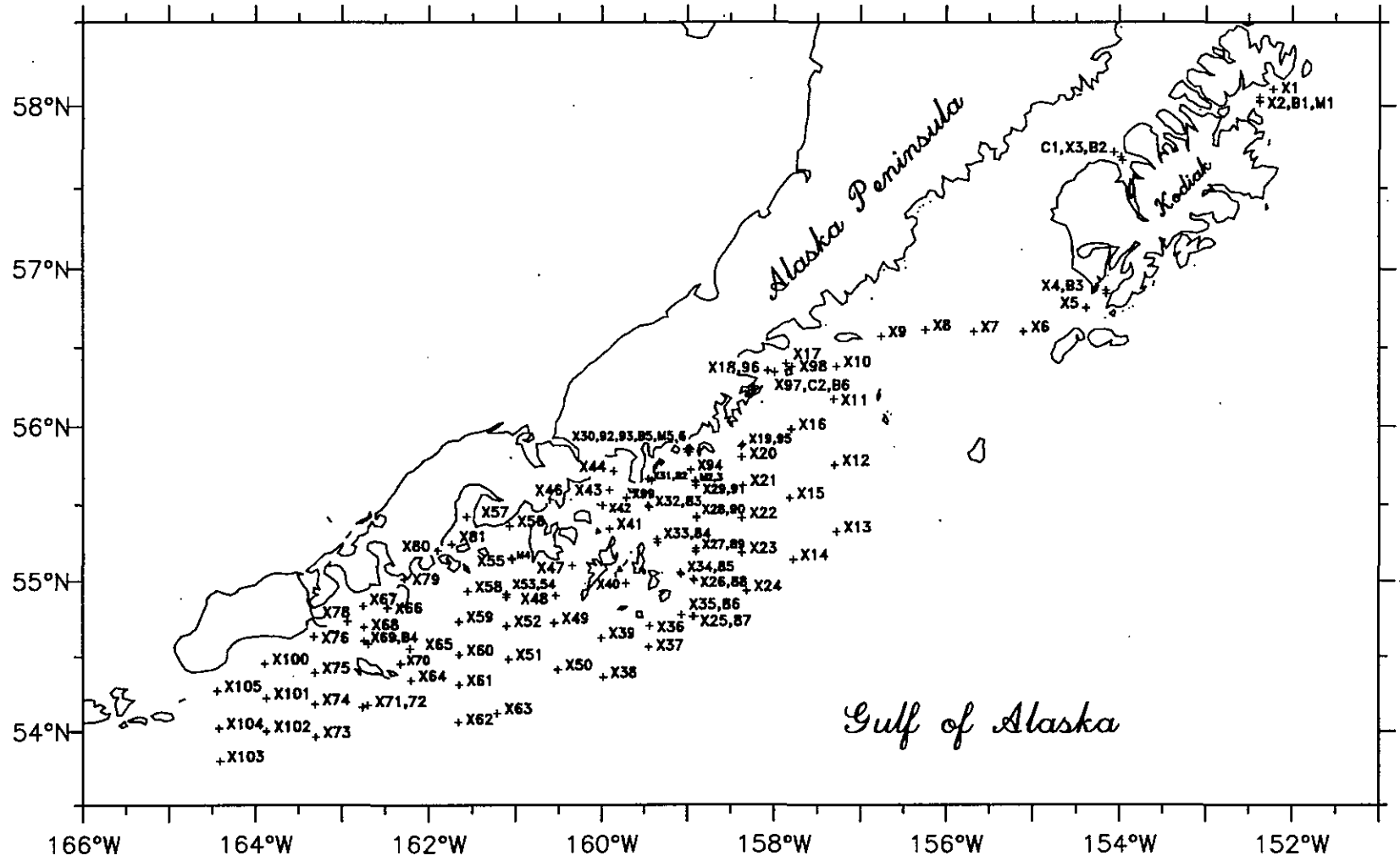

Fig. 7.9. MF-90-09 bongo (B), CTD (C), Methot trawl (M), and XBT (X) stations.

TABLE 9. MF-90-09 CRUISE SUMMARY

Larval Survey 6 - 23 SEPTEMBER 1990

Date (JD)	Date (GMT)	Time (GMT)	Station No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
249	6-Sep	2309				57° 43.6' N	152° 30.8' W	Depart Kodiak
250	7-Sep	0428			084	58° 13.8' N	152° 17.3' W	Hydroacoustics calbn
250	7-Sep	2031			172	58° 05.9' N	152° 13.2' W	XBT #1
250	7-Sep	2054		MB3	172	58° 05.2' N	152° 15.3' W	Trawl 1 E.Q.
250	7-Sep	2307		MB3	176	58° 04.2' N	152° 17.8' W	Trawl 2 E.Q.
251	8-Sep	0042		MB2	256	58° 03.1' N	152° 22.9' W	Trawl 3 E.Q.
251	8-Sep	0118			163	58° 01.3' N	152° 22.8' W	XBT #2
251	8-Sep	0159	B001A	MB2	263	58° 02.9' N	152° 22.8' W	Bongo
251	8-Sep	0304	M001A	MB2	219	58° 01.8' N	152° 22.6' W	Methot
251	8-Sep	0347		TO201	101	58° 00.6' N	152° 18.8' W	Commence TO201
251	8-Sep	0456		TO201	053	58° 08.4' N	151° 56.8' W	End TO201
251	8-Sep	0456		TO202	053	58° 08.3' N	151° 56.8' W	Commence TO202
251	8-Sep	0614		TO202	059	58° 22.2' N	151° 52.3' W	End TO202
251	8-Sep	0614		TO203	059	58° 22.2' N	151° 52.3' W	Commence TO203
251	8-Sep	0750		TO203	128	58° 38.8' N	152° 09.6' W	End TO203
251	8-Sep	0750		TO204	128	58° 38.8' N	152° 09.6' W	Commence TO204
251	8-Sep	0836		TO204	181	58° 45.3' N	152° 24.5' W	End TO204
251	8-Sep	0836		TO205	181	58° 45.3' N	152° 24.5' W	Commence TO205
251	8-Sep	0858		TO205	203	58° 45.2' N	152° 34.7' W	End TO205
251	8-Sep	0858		TO206	203	58° 45.2' N	152° 34.7' W	Commence TO206
251	8-Sep	----	----	TO206	----	58 31.2' N	152 58.2' W	End TO206
251	8-Sep	1545			115	57° 43.0' N	154° 03.4' W	CTD
251	8-Sep	1651		UB1	163	57° 43.8' N	154° 04.0' W	Trawl 4 E.Q.
251	8-Sep	1810		UB2	221	57° 39.5' N	153° 56.6' W	Trawl 5 E.Q.
251	8-Sep	1847		UB2	243	57° 41.1' N	153° 58.6' W	XBT #3
251	8-Sep	1919		UB2	207	57° 40.6' N	153° 58.0' W	Trawl 6 E.Q.
251	8-Sep	2034	B002A	UB2	217	57° 40.2' N	153° 57.4' W	Bongo
251	8-Sep	2143		TO301	062	57° 42.4' N	154° 09.4' W	Commence TO301
251	8-Sep	2155		TO301	154	57° 43.1' N	154° 14.0' W	End TO301
251	8-Sep	2155		TO302	154	57° 43.1' N	154° 14.0' W	Commence TO302
251	8-Sep	2320		TO302	212	57° 34.5' N	154° 42.6' W	End TO302
251	8-Sep	2320		TO303	212	57° 34.5' N	154° 42.6' W	Commence TO303
----	----	----	----	TO303	----	57° 47.4' N	154° 26.4' W	End TO303
252	9-Sep	0400		TO305	059	56° 49.4' N	154° 36.8' W	Commence TO305
252	9-Sep	0457		TO305	044	56° 45.5' N	154° 16.3' W	End TO305
252	9-Sep	0457		TO306	044	56° 45.5' N	154° 16.3' W	Commence TO306
252	9-Sep	----	----	TO306	----	56° 50.4' N	154° 09.6' W	End TO306
252	9-Sep	0535			046	56° 50.5' N	154° 09.2' W	XBT #4
252	9-Sep	0542			049	56° 50.9' N	154° 08.7' W	Trawl 7 E.Q.
252	9-Sep	0621	B003A		049	56° 51.6' N	154° 08.9' W	Bongo
252	9-Sep	0732		AB2	064	56° 44.9' N	154° 22.9' W	XBT #5
252	9-Sep	0740		AB2	062	56° 44.7' N	154° 23.9' W	Trawl 8 E.Q.

TABLE 9. MF-90-09 CRUISE SUMMARY

Larval Survey 6 - 23 SEPTEMBER 1990

Date (JD)	Date (GMT)	Time (GMT)	Station No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
252	9-Sep	0801		TO401	024	56° 44.5' N	154° 26.0' W	Commence TO401
252	9-Sep	1004		J36	032	56° 36.0' N	155° 03.5' W	Trawl 9 E.Q.
252	9-Sep	1034			038	56° 35.9' N	155° 06.0' W	XBT #6
252	9-Sep	1100		TO401	-----	56° 40.2' N	154° 45.6' W	End TO401
252	9-Sep	-----		TO402	049	56° 35.6' N	155° 03.7' W	Commence TO402
252	9-Sep	-----		TO402	-----	56° 35.4' N	155° 36.0' W	End TO402
252	9-Sep	----		TO403	----	56° 36.0' N	155° 40.8' W	Commence TO403
252	9-Sep	----		TO403	----	56° 35.4' N	155° 09.0' W	End TO403
252	9-Sep	1229		H34	207	56° 35.6' N	155° 37.6' W	Trawl 10 E.Q.
252	9-Sep	1307			225	56° 36.2' N	155° 41.0' W	XBT #7
252	9-Sep	1452		F32	260	56° 35.8' N	156° 11.0' W	Trawl 11 E.Q.
252	9-Sep	1529		F32	232	56° 36.4' N	156° 14.1' W	XBT #8
252	9-Sep	1545		TO404	203	56° 36.4' N	156° 17.7' W	Commence TO404
252	9-Sep	1659		TO404	132	56° 34.5' N	156° 41.5' W	End TO404
252	9-Sep	1723		D30	124	56° 35.6' N	156° 44.6' W	Trawl 12 E.Q.
252	9-Sep	1749		D30	110	56° 34.4' N	156° 45.7' W	XBT #9
252	9-Sep	1755		TO405	117	56° 33.9' N	156° 46.3' W	Commence TO405
252	9-Sep	----		TO405	----	56° 22.8' N	157° 18.0' W	End TO405
252	9-Sep	2010		D28	110	56° 22.4' N	157° 18.6' W	Trawl 13 E.Q.
252	9-Sep	2040		TO501	099	56° 21.5' N	157° 20.6' W	Commence TO501
252	9-Sep	----		TO501	----	56° 10.2' N	157° 18.6' W	End TO501
252	9-Sep	2151		D28	----	56° 22.8' N	157° 17.0' W	XBT #10
252	9-Sep	2157		F28	148	56° 09.9' N	157° 18.5' W	XBT #11
252	9-Sep	2205		F28	148	56° 09.7' N	157° 18.7' W	Trawl 14 E.Q.
252	9-Sep	2239		TO502	152	56° 08.4' N	157° 18.9' W	Commence TO502
253	10-Sep	----		TO502	----	55° 45.0' N	157° 18.0' W	End TO502
253	10-Sep	0105		J28	095	55° 44.8' N	157° 18.2' W	XBT #12
253	10-Sep	0110		J28	097	55° 44.6' N	157° 18.7' W	Trawl 15 E.Q.
253	10-Sep	0159		J28	094	55° 43.5' N	157° 18.4' W	Trawl 16 E.Q.
253	10-Sep	0223		TO503	091	55° 42.6' N	157° 19.0' W	Commence TO503
253	10-Sep	----		TO503	----	55° 19.2' N	157° 16.8' W	END TO503
253	10-Sep	0434		N28	088	55° 19.2' N	157° 17.0' W	XBT #13
253	10-Sep	0439		N28	088	55° 19.1' N	157° 17.5' W	Trawl 17 E.Q.
253	10-Sep	0505		TO504	088	55° 18.1' N	157° 20.4' W	Commence TO504
253	10-Sep	0640		TO504	073	55° 08.6' N	157° 46.3' W	End TO504
253	10-Sep	0646		N26	073	55° 08.3' N	157° 47.0' W	XBT #14
253	10-Sep	0651		N26	073	55° 08.1' N	157° 47.5' W	Trawl 18 E.Q.
253	10-Sep	0716		TO601	073	55° 08.1' N	157° 49.1' W	Commence TO601
253	10-Sep	----		TO601	----	55° 34.2' N	157° 47.4' W	End TO601
253	10-Sep	1008		J26	121	55° 33.6' N	157° 48.2' W	Trawl 19 E.Q.
253	10-Sep	1033			115	55° 32.5' N	157° 49.1' W	XBT #15
253	10-Sep	1049		TO602	119	55° 32.6' N	157° 49.1' W	Commence TO602

TABLE 9. MF-90-09 CRUISE SUMMARY

Larval Survey 6 - 23 SEPTEMBER 1990

Date (JD)	Date (GMT)	Time (GMT)	Station No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
253	10-Sep	----		TO602	----	56° 00.6' N	157° 46.2' W	End TO602
253	10-Sep	1314		F26	115	55° 59.1' N	157° 47.8' W	Trawl 20 E.Q.
253	10-Sep	1340		F26	112	55° 58.9' N	157° 47.9' W	XBT #16
253	10-Sep	1350		TO603	121	55° 59.2' N	157° 48.0' W	Commence TO603
253	10-Sep	----		TO603	----	56° 22.8' N	157° 46.2' W	End TO603
253	10-Sep	1600		B26	263	56° 23.1' N	157° 47.3' W	Trawl 21 E.Q.
253	10-Sep	1646			263	56° 23.8' N	157° 51.3' W	XBT#17
253	10-Sep	1658		TO604	265	56° 23.5' N	157° 52.5' W	Commence TO604
253	10-Sep	----		TO604	----	56° 20.4' N	158° 00.6' W	End TO604
253	10-Sep	1911			117	56° 22.3' N	157° 55.9' W	Trawl 22 E.Q.
253	10-Sep	2005			053	56° 20.6' N	157° 59.6' W	XBT #18
253	10-Sep	2142			119	56° 22.0' N	157° 56.4' W	Trawl 23 E.Q.
253	10-Sep	2229		TO605	----	56° 20.4' N	157° 59.1' W	Commence TO605
----	----	----		TO605	----	55° 53.4' N	158° 21.0' W	End TO605
254	11-Sep	0114		D24	123	55° 53.0' N	158° 21.8' W	XBT #19
254	11-Sep	0121		D24	128	55° 52.4' N	158° 22.1' W	Trawl 24 E.Q.
254	11-Sep	0202		TO701	----	55° 50.7' N	158° 23.4' W	Commence TO701
254	11-Sep	----		TO701	----	55° 48.0' N	158° 22.2' W	End TO701
254	11-Sep	0228		F24	113	55° 48.1' N	158° 22.4' W	XBT #20
254	11-Sep	0240		F24	113	55° 49.0' N	158° 21.8' W	Trawl 25 E.Q.
254	11-Sep	0314		TO702	----	55° 50.2' N	158° 20.5' W	Commence TO702
254	11-Sep	0415		TO702	134	55° 37.7' N	158° 21.6' W	End TO702
254	11-Sep	----		TO703	----	55° 35.4' N	158° 21.6' W	Commence TO703
254	11-Sep	0421		H24	135	55° 37.1' N	158° 21.6' W	XBT #21
254	11-Sep	0425		H24	135	55° 36.9' N	158° 21.7' W	Trawl 26 E.Q.
254	11-Sep	0545		TO703	141	55° 25.2' N	158° 22.2' W	End TO703
254	11-Sep	0554		J24	141	55° 24.4' N	158° 22.1' W	XBT #22
254	11-Sep	0559		J24	139	55° 24.0' N	158° 22.2' W	Trawl 27 E.Q.
254	11-Sep	0633		TO704	139	55° 21.7' N	158° 22.5' W	Commence TO704
254	11-Sep	0728		TO704	172	55° 11.5' N	158° 21.9' W	End TO704
254	11-Sep	0733			174	55° 10.8' N	158° 22.0' W	XBT #23
254	11-Sep	0737		L24	179	55° 10.6' N	158° 22.1' W	Trawl 28 E.Q.
254	11-Sep	0822		TO705	179	55° 07.9' N	158° 22.8' W	Commence TO705
254	11-Sep	0913		TO705	187	55° 57.3' N	158° 23.5' W	End TO705
254	11-Sep	0943		N24	181	54° 56.6' N	158° 21.0' W	Trawl 29 E.Q.
254	11-Sep	1017			174	54° 56.1' N	158° 18.3' W	XBT #24
254	11-Sep	1029		TO706	172	54° 55.9' N	158° 18.3' W	Commence TO706
254	11-Sep	----		TO706	----	54° 45.6' N	158° 55.8' W	End TO706
254	11-Sep	1234		N22	080	54° 45.7' N	158° 55.8' W	XBT #25
254	11-Sep	1246		N22	----	54° 45.4' N	158° 54.8' W	Trawl 30 E.Q.
254	11-Sep	1314		TO801	080	54° 45.8' N	158° 53.8' W	Commence TO801
254	11-Sep	----		TO801	----	55° 00.6' N	158° 55.8' W	End TO801

TABLE 9. MF-90-09 CRUISE SUMMARY

Larval Survey 6 - 23 SEPTEMBER 1990

Date (JD)	Date (GMT)	Time (GMT)	Station No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
254	11-Sep	1435		L22	079	55° 00.6' N	158° 55.5' W	XBT #26
254	11-Sep	1442		L22	077	55° 00.2' N	158° 55.0' W	Trawl 31 E.Q.
254	11-Sep	1509		TO802	----	55° 00.1' N	158° 54.1' W	Commence TO802
254	11-Sep	1600		TO802	208	55° 10.6' N	158° 55.3' W	End TO802
254	11-Sep	1613		J22	203	55° 12.4' N	158° 54.2' W	XBT #27
254	11-Sep	1620		J22	201	55° 12.8' N	158° 54.0' W	Trawl 32 E.Q.
254	11-Sep	1709		TO803	194	55° 16.0' N	158° 52.5' W	Commence TO803
254	11-Sep	1749		TO803	166	55° 24.3' N	158° 53.7' W	End TO803
254	11-Sep	1756		H22	161	55° 24.8' N	158° 53.7' W	XBT #28
254	11-Sep	1802		H22	152	55° 25.2' N	158° 53.6' W	Trawl 33 E.Q.
254	11-Sep	1847		TO804	093	55° 28.2' N	158° 53.2' W	Commence TO804
254	11-Sep	----		TO804	----	55° 37.2' N	158° 54.0' W	End TO804
254	11-Sep	1936			154	55° 37.4' N	158° 53.8' W	XBT #29
254	11-Sep	1943		F22	154	55° 37.9' N	158° 53.9' W	Trawl 34 E.Q.
254	11-Sep	2107			152	55° 39.6' N	158° 54.7' W	Trawl 35 E.Q.
254	11-Sep	2247	M002A	F22	154	55° 38.7' N	158° 54.6' W	Methot
254	11-Sep	2334	M003A	F22	154	55° 38.9' N	158° 54.7' W	Methot
255	12-Sep	0013		TO805	----	55° 42.0' N	158° 55.6' W	Commence TO805
255	12-Sep	----		TO805	----	55° 51.0' N	158° 57.6' W	End TO805
255	12-Sep	0100		D22	----	55° 50.8' N	158° 57.7' W	XBT #30
255	12-Sep	0108		D22	123	55° 51.4' N	158° 58.0' W	Trawl 36 E.Q.
255	12-Sep	0200		TO806	----	55° 50.7' N	158° 59.6' W	Commence TO806
255	12-Sep	----		TO806	----	55° 39.6' N	159° 27.6' W	End TO806
255	12-Sep	0337		D20	091	55° 39.6' N	159° 27.3' W	XBT #31
255	12-Sep	0340			091	55° 39.4' N	159° 27.3' W	Trawl #37 E.Q.
255	12-Sep	0404		TO901	102	55° 37.6' N	159° 27.6' W	Commence TO901
255	12-Sep	----		TO901	----	55° 30.0' N	159° 27.0' W	End TO901
255	12-Sep	0450		F20	159	55° 29.2' N	159° 27.2' W	XBT #32
255	12-Sep	0457		F20	155	55° 28.7' N	159° 27.3' W	Trawl 38 E.Q.
255	12-Sep	0541		TO902	146	55° 26.1' N	159° 27.0' W	Commence TO902
255	12-Sep	----		TO902	----	55° 16.2' N	159° 21.0' W	End TO902
255	12-Sep	0637		H20	126	55° 16.2' N	159° 20.7' W	XBT #33
255	12-Sep	0644		H20	119	55° 15.8' N	159° 20.4' W	Trawl 39 E.Q.
255	12-Sep	0710		TO903	099	55° 13.9' N	159° 18.1' W	Commence TO903
255	12-Sep	----		TO903	----	55° 03.0' N	159° 04.2' W	End TO903
255	12-Sep	0839			079	55° 03.1' N	159° 03.9' W	XBT #34
255	12-Sep	0840		J20	082	55° 02.6' N	159° 03.8' W	Trawl 40 E.Q.
255	12-Sep	0907		TO904	077	55° 01.7' N	159° 03.0' W	Commence TO904
255	12-Sep	----		TO904	----	54° 49.8' N	159° 03.6' W	End TO904
255	12-Sep	1110		K21	069	54° 45.9' N	159° 03.4' W	XBT #35
255	12-Sep	1117		K21	069	54° 45.5' N	159° 03.4' W	Trawl 41 E.Q.
255	12-Sep	1145		TO905	----	54° 44.4' N	159° 04.1' W	Commence TO905

TABLE 9. MF-90-09 CRUISE SUMMARY

Larval Survey 6 - 23 SEPTEMBER 1990

Date (JD)	Date (GMT)	Time (GMT)	Station No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
255	12-Sep	----			----	54° 42.6' N	159° 21.6' W	End TO905
255	12-Sep	1328		L20	059	54° 42.2' N	159° 25.8' W	XBT #36
255	12-Sep	1336		L20	059	54° 42.0' N	159° 26.5' W	Trawl 42 E.Q.
255	12-Sep	1346		TO906	059	54° 41.8' N	159° 27.3' W	Commence TO906
255	12-Sep	----			----	54° 33.6' N	159° 26.4' W	End TO906
255	12-Sep	1539		N20	091	54° 33.6' N	159° 26.5' W	XBT #37
255	12-Sep	1546		N20	----	54° 33.1' N	159° 26.9' W	Trawl 43 E.Q.
255	12-Sep	1620		TO907	106	54° 31.3' N	159° 30.5' W	Commence TO907
255	12-Sep	1812		N18	285	54° 21.3' N	159° 59.0' W	XBT #38
255	12-Sep	1815		N18	289	54° 21.3' N	159° 59.3' W	Trawl 44 E.Q.
255	12-Sep	1910		T1001	305	54° 20.7' N	160° 03.4' W	Commence T1001
255	12-Sep	----		T1001	----	54° 37.2' N	160° 00.0' W	End T1001
255	12-Sep	2041			086	54° 37.2' N	159° 60.0' W	XBT #39
255	12-Sep	2044		L18	084	54° 37.4' N	159° 59.9' W	Trawl 45 E.Q.
255	12-Sep	2109		T1002	086	54° 38.8' N	159° 59.2' W	Commence T1002
255	12-Sep	----		T1002	----	54° 50.4' N	160° 00.0' W	End T1002
255	12-Sep	2211		J18	059	54° 50.4' N	160° 00.0' W	Trawl 46 E.Q.
255	12-Sep	2335		J19	----	54° 58.6' N	159° 42.5' W	XBT #40
255	12-Sep	2338		J19	048	54° 58.7' N	159° 42.2' W	Trawl 47 E.Q.
256	13-Sep	0209		F18	----	55° 20.5' N	159° 54.9' W	XBT #41
256	13-Sep	0213		F18	115	55° 20.7' N	159° 55.0' W	Trawl 48 E.Q.
256	13-Sep	0317		F18	134	55° 21.3' N	159° 55.6' W	Trawl 49 E.Q.
256	13-Sep	0400		T1005	143	55° 21.8' N	159° 55.8' W	Commence T1005
256	13-Sep	0436		T1005	062	55° 29.1' N	159° 59.5' W	End T1005
256	13-Sep	0438		D18	064	55° 29.2' N	159° 59.5' W	XBT #42
256	13-Sep	0445		D18	059	55° 29.7' N	159° 59.7' W	Trawl 50 E.Q.
256	13-Sep	0528		D18	059	55° 30.3' N	160° 00.0' W	Trawl 51 E.Q.
256	13-Sep	0637			148	55° 35.4' N	159° 54.7' W	XBT #43
256	13-Sep	0703			117	55° 36.5' N	159° 53.9' W	Trawl 52 E.Q.
256	13-Sep	0749			119	55° 37.7' N	159° 53.7' W	Trawl 53 E.Q.
256	13-Sep	0905			000	55° 36.4' N	159° 53.8' W	Trawl 54 E.Q.
256	13-Sep	1000		T1007	124	55° 39.1' N	159° 53.0' W	Commence T1007
256	13-Sep	----		T1007	----	55° 43.2' N	159° 51.6' W	End T1007
256	13-Sep	1024			123	55° 42.9' N	159° 51.4' W	XBT #44
256	13-Sep	1030			119	55° 43.2' N	159° 51.2' W	Trawl 55 E.Q.
256	13-Sep	1128		B18	----	55° 44.4' N	159° 50.1' W	Trawl 56 E.Q.
256	13-Sep	1201		T1008	----	55° 42.8' N	159° 52.4' W	Commence T1008
256	13-Sep	----		T1008	134	55° 26.4' N	160° 28.8' W	End T1008
256	13-Sep	1400		T1009	134	55° 26.5' N	160° 28.7' W	Commence T1009
256	13-Sep	1419		T1009	----	55° 26.7' N	160° 35.6' W	End T1009
256	13-Sep	1419		T1010	----	55° 26.7' N	160° 35.6' W	Commence T1010
256	13-Sep	1442		T1010	----	55° 31.2' N	160° 36.5' W	End T1010

TABLE 9. MF-90-09 CRUISE SUMMARY

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Date (JD)	Date (GMT)	Time (GMT)	Station No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
256	13-Sep	1457		B16	093	55° 31.7' N	160° 36.6' W	XBT #46
256	13-Sep	1512		B16	----	55° 30.7' N	160° 36.5' W	Trawl 57 E.Q.
256	13-Sep	1632		B16	101	55° 30.9' N	160° 36.6' W	Trawl 58 E.Q.
256	13-Sep	1708		T1101	108	55° 26.7' N	160° 36.0' W	Commence T1101
256	13-Sep	1822		T1101	084	55° 21.5' N	160° 11.2' W	End T1101
256	13-Sep	1956			159	55° 05.9' N	160° 20.1' W	XBT #47
256	13-Sep	2002		F16	148	55° 05.5' N	160° 20.5' W	Trawl 59 E.Q.
256	13-Sep	2056		T1102	128	55° 03.1' N	160° 23.1' W	Commence T1102
256	13-Sep	----		T1102	----	54° 54.0' N	160° 31.8' W	End T1102
256	13-Sep	2150		H16	069	54° 54.2' N	160° 31.9' W	XBT #48
256	13-Sep	2158		H16	071	54° 53.7' N	160° 32.5' W	Trawl 60 E.Q.
256	13-Sep	2224		T1103	101	54° 52.4' N	160° 33.3' W	Commence T1103
256	13-Sep	----		T1103	----	54° 43.2' N	160° 33.0' W	End T1103
256	13-Sep	2318			099	54° 43.2' N	160° 32.8' W	XBT #49
256	13-Sep	2332		J16	101	54° 40.2' N	160° 32.6' W	Trawl 61 E.Q.
257	14-Sep	0011		T1104	121	54° 37.6' N	160° 32.8' W	Commence T1104
257	14-Sep	----		T1104	----	54° 24.6' N	160° 31.2' W	End T1104
257	14-Sep	0116		L16	119	54° 24.7' N	160° 30.9' W	XBT #50
257	14-Sep	0126			115	54° 24.8' N	160° 31.8' W	Trawl 62 E.Q.
257	14-Sep	0200		T1105	----	54° 25.4' N	160° 34.2' W	Commence T1105
257	14-Sep	0330		T1105	----	54° 28.6' N	161° 03.0' W	End T1105
257	14-Sep	0338		J14	128	54° 28.8' N	161° 04.6' W	XBT #51
257	14-Sep	0346		J14	130	54° 28.8' N	161° 05.5' W	Trawl 63 E.Q.
257	14-Sep	0420		T1201	135	54° 29.7' N	161° 07.4' W	Commence T1201
257	14-Sep	0517		T1201	082	54° 40.8' N	161° 06.0' W	End T1201
257	14-Sep	0527		H14	069	54° 42.0' N	161° 05.9' W	XBT #52
257	14-Sep	0533		H14	079	54° 42.4' N	161° 05.7' W	Trawl 64 E.Q.
257	14-Sep	0602		T1202	090	54° 44.0' N	161° 05.2' W	Commence T1202
257	14-Sep	0659		T1202	097	54° 53.3' N	161° 05.9' W	End T1202
257	14-Sep	0659			097	54° 53.3' N	161° 05.9' W	XBT #53
257	14-Sep	0706		F14	102	54° 52.8' N	161° 05.9' W	Trawl 65 E.Q.
257	14-Sep	0801		F14	110	54° 54.8' N	161° 05.8' W	XBT #54
257	14-Sep	0804		F14	110	54° 55.0' N	161° 05.8' W	Trawl 66 E.Q.
257	14-Sep	0853		F14	110	54° 55.7' N	161° 05.7' W	Trawl 67 E.Q.
257	14-Sep	0945		T1203	121	54° 55.5' N	161° 05.7' W	Commence T1203
257	14-Sep	----		T1203	----	55° 08.4' N	161° 03.0' W	End T1203
257	14-Sep	1053			128	55° 08.4' N	161° 02.7' W	XBT #55
257	14-Sep	1101		D14	134	55° 08.8' N	161° 02.4' W	Trawl 68 E.Q.
257	14-Sep	1155		D14	132	55° 08.8' N	161° 02.6' W	Trawl 69 E.Q.
257	14-Sep	1325		D14	----	55° 09.1' N	161° 02.9' W	Methot
257	14-Sep	1418		T1204	069	55° 12.7' N	161° 00.3' W	Commence T1204
257	14-Sep	----		T1204	----	55° 21.6' N	161° 04.2' W	End T1204

TABLE 9. MF-90-09 CRUISE SUMMARY

Larval Survey 6 - 23 SEPTEMBER 1990

Date (JD)	Date (GMT)	Time (GMT)	Station No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
257	14-Sep	1537		B14	000	55° 21.5' N	161° 04.2' W	XBT #56
257	14-Sep	1547		B14	031	55° 21.3' N	161° 05.2' W	Trawl 70 E.Q.
257	14-Sep	1600		T1205	031	55° 21.1' N	161° 06.2' W	Commence T1205
257	14-Sep	----		T1205	----	55° 25.2' N	161° 34.2' W	End T1205
257	14-Sep	1755		B12	069	55° 25.1' N	161° 34.1' W	XBT #57
257	14-Sep	1759		B12	071	55° 25.4' N	161° 34.1' W	Trawl 71 E.Q.
257	14-Sep	1841		B12	071	55° 25.8' N	161° 34.3' W	Trawl 72 E.Q.
257	14-Sep	1924		B12	071	55° 25.2' N	161° 34.0' W	Trawl 73 E.Q.
257	14-Sep	2110		T1206	000	55° 26.3' N	161° 34.0' W	Commence T1206
257	14-Sep	2153		T1206	036	55° 34.8' N	161° 28.3' W	End T1206
257	14-Sep	2153		T1207	036	55° 34.8' N	161° 28.3' W	Commence T1207
257	14-Sep	2202		T1207	026	55° 35.7' N	161° 30.8' W	End T1207
257	14-Sep	2202		T1208	026	55° 35.7' N	161° 30.8' W	Commence T1208
258	15-Sep	0445		T1208	115	54° 56.2' N	161° 31.3' W	End T1208
258	15-Sep	0456		D12	113	54° 55.5' N	161° 33.1' W	XBT #58
258	15-Sep	0458		D12	112	54° 55.5' N	161° 33.3' W	Trawl 74 E.Q.
258	15-Sep	0530		T1210	059	54° 54.3' N	161° 35.1' W	Commence T1210
258	15-Sep	0627		T1210	068	54° 44.9' N	161° 35.8' W	End T1210
258	15-Sep	0640			084	54° 44.0' N	161° 38.8' W	XBT #59
258	15-Sep	0707		F12	101	54° 43.6' N	161° 39.4' W	Trawl 75 E.Q.
258	15-Sep	0725		T1211	049	54° 41.7' N	161° 41.0' W	Commence T1211
258	15-Sep	----		T1211	----	54° 30.6' N	161° 39.0' W	End T1211
258	15-Sep	0830		H12	079	54° 30.4' N	161° 39.0' W	XBT #60
258	15-Sep	0834		H12	077	54° 30.8' N	161° 38.8' W	Trawl 76 E.Q.
258	15-Sep	0900		T1212	075	54° 31.2' N	161° 38.7' W	Commence T1212
258	15-Sep	----		T1212	----	54° 18.6' N	161° 39.0' W	End T1212
258	15-Sep	1008		J12	135	54° 18.5' N	161° 38.8' W	XBT #61
258	15-Sep	1014		J12	132	54° 18.1' N	161° 38.8' W	Trawl 77 E.Q.
258	15-Sep	1050		T1213	088	54° 16.2' N	161° 38.9' W	Commence T1213
258	15-Sep	1130		T1213	-----	54° 07.9' N	161° 38.6' W	End T1213
258	15-Sep	1217		L12	874	54° 03.5' N	161° 39.6' W	XBT #62
258	15-Sep	1229		L12	759	54° 04.1' N	161° 38.6' W	Trawl 78 E.Q.
258	15-Sep	1346		L12	320	54° 05.8' N	161° 38.7' W	Trawl 79 E.Q.
258	15-Sep	1453		L12	335	54° 06.2' N	161° 45.6' W	Trawl 80 E.Q.
258	15-Sep	1554			241	54° 05.8' N	161° 51.7' W	Trawl 81 E.Q.
258	15-Sep	1712			185	54° 06.1' N	162° 00.1' W	Trawl 82 E.Q.
258	15-Sep	1829			413	54° 04.9' N	162° 01.5' W	Trawl 83 E.Q.
258	15-Sep	2006			199	54° 07.4' N	161° 12.5' W	XBT #63
258	15-Sep	2014		J10	155	54° 07.5' N	162° 11.9' W	Trawl 84 E.Q.
258	15-Sep	2058		T1401	093	54° 08.4' N	162° 07.4' W	Commence T1401
258	15-Sep	----		T1401	----	54° 20.4' N	162° 12.0' W	End T1401
258	15-Sep	2205		H10	055	54° 20.4' N	162° 11.8' W	XBT #64

TABLE 9. MF-90-09 CRUISE SUMMARY

Larval Survey 6 - 23 SEPTEMBER 1990

Date (JD)	Date (GMT)	Time (GMT)	Station No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
258	15-Sep	2209		H10	062	54° 20.4' N	162° 11.4' W	Trawl 85 E.Q.
258	15-Sep	2230		T1402	059	54° 20.4' N	162° 09.8' W	Commence T1402
258	15-Sep	----		T1402	----	54° 24.6' N	162° 10.2' W	End T1402
258	15-Sep	2353		F10	108	54° 33.0' N	162° 12.5' W	XBT #65
259	16-Sep	0003		F10	112	54° 32.6' N	162° 10.1' W	Trawl 86 E.Q.
259	16-Sep	0030		T1403	091	54° 32.5' N	162° 09.4' W	Commence T1403
259	16-Sep	----		T1403	----	54° 34.2' N	162° 13.2' W	End T1403
259	16-Sep	0303		D10	044	54° 49.0' N	162° 28.2' W	XBT #66
259	16-Sep	0320		D10	046	54° 49.5' N	162° 26.0' W	Trawl 87 E.Q.
259	16-Sep	0440		B8	049	54° 49.9' N	162° 45.1' W	XBT #67
259	16-Sep	0442		B8	048	54° 49.9' N	162° 45.3' W	Trawl 88 E.Q.
259	16-Sep	0506		T1501	055	54° 49.5' N	162° 47.2' W	Commence T1501
259	16-Sep	----		T1501	----	54° 42.0' N	162° 44.4' W	End T1501
259	16-Sep	0609			101	54° 41.7' N	162° 44.6' W	XBT #68
259	16-Sep	0612			102	54° 41.8' N	162° 44.6' W	Trawl 89 E.Q.
259	16-Sep	0723		D8	095	54° 35.8' N	162° 44.7' W	XBT #69
259	16-Sep	0729		D8	069	54° 35.5' N	162° 44.0' W	Trawl 90 E.Q.
259	16-Sep	0812	B004A	D8	108	54° 34.9' N	162° 41.5' W	Bongo
259	16-Sep	0850		T1503	128	54° 34.1' N	162° 39.3' W	Commence T1503
259	16-Sep	----		T1503	----	54° 28.2' N	162° 25.2' W	End T1503
259	16-Sep	1044			143	54° 26.8' N	162° 19.0' W	XBT #70
259	16-Sep	1058			115	54° 26.2' N	162° 18.3' W	Trawl 91 E.Q.
259	16-Sep	1155		T1505	053	54° 23.1' N	162° 17.0' W	Commence T1505
259	16-Sep	1346		T1505	----	54° 09.1' N	162° 45.5' W	End T1505
259	16-Sep	1412			071	54° 10.5' N	162° 42.2' W	XBT #71
259	16-Sep	1410			073	54° 10.7' N	162° 41.9' W	Trawl 92 E.Q.
259	16-Sep	1505		H8	069	54° 09.4' N	162° 45.4' W	XBT #72
259	16-Sep	1509		H8	069	54° 09.2' N	162° 45.4' W	Trawl 93 E.Q.
259	16-Sep	1546		T1506	075	54° 06.8' N	162° 48.3' W	Commence T1506
259	16-Sep	1720		T1506	095	53° 58.2' N	163° 16.5' W	End T1506
259	16-Sep	1731		H6	----	53° 57.8' N	163° 18.2' W	XBT #73
259	16-Sep	1736		H6	097	53° 57.9' N	163° 18.8' W	Trawl 94 E.Q.
259	16-Sep	1813		T1601	110	53° 58.8' N	163° 20.8' W	Commence T1601
259	16-Sep	1916		T1601	073	54° 10.2' N	163° 18.0' W	End T1601
259	16-Sep	1924		F6	071	54° 10.5' N	163° 18.4' W	XBT #74
259	16-Sep	1929		F6	073	54° 10.7' N	163° 19.0' W	Trawl 95 E.Q.
259	16-Sep	2004		T1602	069	54° 11.5' N	163° 21.0' W	Commence T1602
259	16-Sep	----		T1602	----	54° 16.8' N	163° 19.2' W	End T1602
259	16-Sep	2108			068	54° 23.5' N	163° 18.9' W	XBT #75
259	16-Sep	2111		D6	068	54° 23.5' N	163° 19.2' W	Trawl 96 E.Q.
259	16-Sep	2142		T1603	099	54° 23.4' N	163° 21.5' W	Commence T1603
259	16-Sep	----		T1603	----	54° 27.6' N	163° 20.4' W	End T1603

TABLE 9. MF-90-09 CRUISE SUMMARY

Larval Survey — 6 - 23 SEPTEMBER 1990

Date (JD)	Date (GMT)	Time (GMT)	Station No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
259	16-Sep	2300		B6	073	54° 37.9' N	163° 19.2' W	XBT #76
259	16-Sep	2310		B6	075	54° 37.8' N	163° 20.4' W	Trawl 97 E.Q.
260	17-Sep	0000		T1701	079	54° 37.3' N	163° 20.5' W	Commence T1701
260	17-Sep	0132		T1701	086	54° 43.5' N	162° 54.8' W	End T1701
260	17-Sep	0156			091	54° 43.9' N	162° 55.7' W	XBT 78(77 misfired)
260	17-Sep	0203			093	54° 44.0' N	162° 56.5' W	Trawl 98 E.Q.
260	17-Sep	0244		T1702	093	54° 44.4' N	162° 57.3' W	Commence T1702
260	17-Sep	----		T1702	090	54° 52.2' N	162° 45.6' W	End T1702
260	17-Sep	0530			099	55° 00.5' N	162° 16.4' W	XBT #79
260	17-Sep	0542			101	55° 00.6' N	162° 20.9' W	Trawl 99 E.Q.
260	17-Sep	0838			119	55° 12.2' N	161° 54.1' W	XBT #80
260	17-Sep	0944			106	55° 14.2' N	161° 44.6' W	XBT #81
260	17-Sep	0952			123	55° 13.9' N	161° 45.4' W	Trawl 100 E.Q.
260	17-Sep	1028		T1703	115	55° 13.7' N	161° 47.8' W	Commence T1703
260	17-Sep	1741		T1703	104	55° 37.9' N	159° 25.5' W	End T1703
260	17-Sep	1755		D20	110	55° 39.0' N	159° 24.7' W	XBT #82
260	17-Sep	1803			108	55° 38.7' N	159° 25.6' W	Trawl 101 E.Q.
260	17-Sep	1834		T1704	080	55° 37.1' N	159° 27.8' W	Commence T1704
260	17-Sep	1909		T1704	155	55° 29.9' N	159° 27.1' W	End T1704
260	17-Sep	1922		F20	157	55° 28.8' N	159° 26.5' W	XBT #83
260	17-Sep	1929		F20	154	55° 28.8' N	159° 27.3' W	Trawl 102 E.Q.
260	17-Sep	2004		T1705	152	55° 28.6' N	159° 30.5' W	Commence T1705
260	17-Sep	----		T1705	----	55° 24.0' N	159° 20.4' W	End T1705
260	17-Sep	2116		H20	108	55° 15.2' N	159° 20.5' W	XBT #84
260	17-Sep	2121		H20	101	55° 15.4' N	159° 20.3' W	Trawl 103 E.Q.
260	17-Sep	2149		T1706	091	55° 13.9' N	159° 19.8' W	Commence T1706
260	17-Sep	----		T1706	----	55° 07.2' N	159° 10.2' W	End T1706
260	17-Sep	2303		J20	082	55° 02.7' N	159° 03.9' W	XBT #85
260	17-Sep	2310		J20	080	55° 02.2' N	159° 03.9' W	Trawl 104 E.Q.
260	17-Sep	2330		T1707	088	55° 01.1' N	159° 04.0' W	Commence T1707
261	18-Sep	0040		T1707	059	54° 46.8' N	159° 03.5' W	End T1707
261	18-Sep	0045		K21	----	54° 46.4' N	159° 03.5' W	XBT #86
261	18-Sep	0059		K21	069	54° 45.5' N	159° 03.8' W	Trawl 105 E.Q.
261	18-Sep	0122		T1708	075	54° 44.8' N	159° 04.4' W	Commence T1708
261	18-Sep	----		T1708	----	54° 45.6' N	158° 55.2' W	End T1708
261	18-Sep	0204		N22	080	54° 45.7' N	158° 54.9' W	XBT #87
261	18-Sep	0204		N22	080	54° 45.7' N	158° 54.9' W	Trawl 106 E.Q.
261	18-Sep	0228		T1801	071	54° 46.8' N	158° 55.4' W	Commence T1801
261	18-Sep	0331		T1801	----	54° 59.2' N	158° 54.9' W	End T1801
261	18-Sep	0336		L22	075	54° 59.7' N	158° 54.8' W	XBT #88
261	18-Sep	0344		L22	075	55° 00.0' N	158° 54.7' W	Trawl 107 E.Q.
261	18-Sep	0406		T1802	088	55° 01.4' N	158° 54.4' W	Commence T1802

TABLE 9. MF-90-09 CRUISE SUMMARY

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Date (JD)	Date (GMT)	Time (GMT)	Station No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
261	18-Sep	0456		T1802	088	55° 10.9' N	158° 54.1' W	End T1802
261	18-Sep	0504		J22	207	55° 11.6' N	158° 54.0' W	XBT #89
261	18-Sep	0512		J22	207	55° 12.3' N	158° 53.0' W	Trawl 108 E.Q.
261	18-Sep	0601		T1803	196	55° 15.0' N	158° 52.9' W	Commence T1803
261	18-Sep	0644		T1803	165	55° 23.6' N	158° 53.4' W	End T1803
261	18-Sep	0702		H22	141	55° 25.4' N	158° 53.5' W	Trawl 109 E.Q.
261	18-Sep	0702		H22	141	55° 25.4' N	158° 53.5' W	XBT #90
261	18-Sep	0743		T1804	086	55° 28.8' N	158° 53.6' W	Commence T1804
261	18-Sep	0830		T1804	155	55° 36.9' N	158° 53.3' W	End T1804
261	18-Sep	0843		F22	155	55° 38.1' N	158° 53.7' W	XBT #91
261	18-Sep	0848		F22	154	55° 38.5' N	158° 53.5' W	Trawl 110 E.Q.
261	18-Sep	0932		T1805	152	55° 40.6' N	158° 55.1' W	Commence T1805
261	18-Sep	1030		T1805	124	55° 52.1' N	158° 58.0' W	End T1805
261	18-Sep	1038		D22	123	55° 51.8' N	158° 58.0' W	XBT #92
261	18-Sep	1045		D22	124	55° 51.4' N	158° 58.1' W	Trawl 111 E.Q.
261	18-Sep	1232		D22	126	55° 50.5' N	158° 58.0' W	Trawl 112 E.Q.
261	18-Sep	1407	M005A	D22	126	55° 49.9' N	158° 58.2' W	Methot
261	18-Sep	1541	B005A	D22	115	55° 50.8' N	158° 59.3' W	Bongo
261	18-Sep	1726	M006A	D22	119	55° 50.9' N	159° 00.1' W	Methot
261	18-Sep	1726	M006A	D22	119	55° 50.9' N	159° 00.1' W	Methot
261	18-Sep	1831		D22	121	55° 49.6' N	159° 00.0' W	Trawl 113 E.Q.
261	18-Sep	1937		D22	121	55° 50.3' N	158° 60.0' W	Trawl 114 E.Q.
261	18-Sep	2116		D22	124	55° 50.8' N	158° 58.4' W	Trawl 115 E.Q.
261	18-Sep	2154		D22	124	55° 49.7' N	158° 59.4' W	XBT #93
261	18-Sep	2204		D22	126	55° 50.3' N	158° 58.9' W	Trawl 116 E.Q.
261	18-Sep	2332		T1806	102	55° 51.7' N	158° 54.6' W	Commence T1806
262	19-Sep	0038		T1806	069	55° 44.1' N	158° 52.6' W	End T1806
262	19-Sep	0059			144	55° 43.2' N	158° 57.9' W	XBT #94
262	19-Sep	0150			139	55° 43.8' N	158° 55.1' W	Trawl 117 E.Q.
262	19-Sep	0230		T1807	069	55° 43.8' N	158° 52.8' W	Commence T1807
262	19-Sep	0447		T1807	126	55° 52.2' N	158° 23.0' W	End T1807
262	19-Sep	0447		D24	126	55° 52.2' N	158° 23.0' W	XBT #95
262	19-Sep	0504		D24	124	55° 52.8' N	158° 22.8' W	Trawl 118 E.Q.
262	19-Sep	0550		T1901	080	55° 54.6' N	158° 20.8' W	Commence T1901
262	19-Sep	----		T1901	-----	55° 56.4' N	158° 10.8' W	End T1901
262	19-Sep	1235			066	56° 21.0' N	158° 04.0' W	XBT #96
262	19-Sep	1240			060	56° 21.0' N	158° 04.7' W	Trawl 119 E.Q.
262	19-Sep	1700			-----	56° 12.3' N	158° 17.6' W	Anchor in Castle Bay
263	20-Sep	0202			-----	56° 12.3' N	158° 17.6' W	CTD-3 (Castle Bay)
263	20-Sep	0441			068	56° 13.9' N	158° 15.0' W	XBT #97
263	20-Sep	0446			053	56° 14.1' N	158° 14.4' W	Trawl 120 E.Q.
263	20-Sep	0532			075	56° 15.3' N	158° 13.0' W	Trawl 121 E.Q.

TABLE 9. MF-90-09 CRUISE SUMMARY

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Date (JD)	Date (GMT)	Time (GMT)	Station No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
263	20-Sep	0613	B006A		075	56° 14.9' N	158° 13.7' W	Bongo
263	20-Sep	0625		T2001	086	56° 15.3' N	158° 12.7' W	Commence T2001
263	20-Sep	0748		T2001	238	56° 22.9' N	157° 49.0' W	End T2001
263	20-Sep	0800			256	56° 23.0' N	157° 47.7' W	XBT #98
263	20-Sep	0813		B26	298	56° 22.9' N	157° 46.2' W	Trawl 122 E.Q.
263	20-Sep	1000		B26	293	56° 23.5' N	157° 45.8' W	Trawl 123 E.Q.
263	20-Sep	1700			066	56° 14.6' N	158° 13.7' W	Lay-to in Castle Bay
264	21-Sep	0031		T2101	121	56° 13.6' N	157° 57.4' W	Commence T2101
264	21-Sep	0703			090	55° 32.2' N	159° 42.6' W	XBT #99
264	21-Sep	0703		T2101	090	55° 32.2' N	159° 42.6' W	End T2101
264	21-Sep	0718			077	55° 32.1' N	159° 40.5' W	Trawl 124 E.Q.
264	21-Sep	0747		T2102	183	55° 31.8' N	159° 40.2' W	Commence T2102
264	21-Sep	2238		T2102	073	54° 27.6' N	163° 51.4' W	End T2102
264	21-Sep	2240		B4	073	54° 26.8' N	163° 53.6' W	XBT #100
264	21-Sep	2305		B4	073	54° 26.6' N	163° 53.8' W	Trawl 125 E.Q.
264	21-Sep	2345		B4	075	54° 26.4' N	163° 54.9' W	Trawl 126 E.Q.
265	22-Sep	0022		T2103	082	54° 25.1' N	163° 55.1' W	Commence T2103
265	22-Sep	----		T2103	-----	54° 18.0' N	163° 52.2' W	End T2103
265	22-Sep	0125		D4	106	54° 13.2' N	163° 52.2' W	XBT #101
265	22-Sep	0131		D4	106	54° 12.8' N	163° 52.8' W	Trawl 127 E.Q.
265	22-Sep	0218		D4	-----	54° 12.2' N	163° 52.5' W	Trawl 128 E.Q.
265	22-Sep	0303		T2104	106	54° 13.4' N	163° 52.5' W	Commence T2104
265	22-Sep	0403		T2104	088	54° 00.9' N	163° 52.1' W	End T2104
265	22-Sep	0411		F4	090	53° 60.0' N	163° 52.1' W	XBT #102
265	22-Sep	0418		F4	090	53° 59.5' N	163° 52.2' W	Trawl 129 E.Q
265	22-Sep	0505		F4	090	53° 59.3' N	163° 51.8' W	Trawl 130 E.Q.
265	22-Sep	0531		T2105	082	54° 00.3' N	163° 52.0' W	Commence T2105
265	22-Sep	0714		T2105	088	53° 48.7' N	164° 22.9' W	End T2105
265	22-Sep	0723			093	53° 48.1' N	164° 24.5' W	XBT #103
265	22-Sep	0730		F2	097	53° 47.9' N	164° 25.3' W	Trawl 131 E.Q
265	22-Sep	0814		F2	106	53° 47.4' N	164° 25.7' W	Trawl 132 E.Q.
265	22-Sep	0849		T2201	088	53° 48.5' N	164° 23.8' W	Commence T2201
265	22-Sep	0949		T2201	099	54° 00.1' N	164° 25.1' W	End T2201
265	22-Sep	0955		D2	101	54° 01.3' N	164° 25.1' W	XBT #104
265	22-Sep	1005		D2	097	54° 01.9' N	164° 25.1' W	Trawl 133 E.Q
265	22-Sep	1055		D2	099	54° 02.2' N	164° 25.1' W	Trawl 134 E.Q.
265	22-Sep	1127		T2202	080	54° 02.4' N	164° 25.2' W	Commence T2202
265	22-Sep	1230		T2202	082	54° 14.9' N	164° 27.8' W	End T2202
265	22-Sep	1248		B2	075	54° 16.0' N	164° 26.2' W	XBT #105
265	22-Sep	1253		B2	075	54° 15.9' N	164° 25.6' W	Trawl 135 E.Q
265	22-Sep	1333		B2	088	54° 15.8' N	164° 27.0' W	Trawl 136 E.Q
265	22-Sep	1520		T2301	-----	54° 21.4' N	164° 25.8' W	Commence T2301

TABLE 9. MF-90-09 CRUISE SUMMARY

Larval Survey 6 - 23 SEPTEMBER 1990

Date (JD)	Date (GMT)	Time (GMT)	Station No.	FOCI ID	Depth (m)	Latitude	Longitude	Comments
265	22-Sep	1859		T2301	055	54° 21.1' N	163° 18.6' W	End T2301
265	22-Sep	1859		T2401	055	54° 21.1' N	163° 18.6' W	Commence T2401
265	22-Sep	1920		T2401	060	54° 16.6' N	163° 13.3' W	End T2401
265	22-Sep	1920		T2402	060	54° 16.6' N	163° 13.3' W	Commence T2402
265	22-Sep	2000		T2402	060	54° 18.1' N	163° 04.0' W	End T2402
265	22-Sep	2000		T2403	060	54° 18.1' N	163° 04.0' W	Commence T2403
265	22-Sep	2030		T2403	057	54° 16.0' N	162° 56.2' W	End T2403
265	22-Sep	2030		T2404	057	54° 16.0' N	162° 56.2' W	Commence T2404
265	22-Sep	2152		T2404	059	54° 15.8' N	162° 34.3' W	End T2404
265	22-Sep	2152		T2405	059	54° 15.8' N	162° 34.3' W	Commence T2405
265	22-Sep	2212		T2405	048	54° 18.3' N	162° 29.7' W	End T2405
265	22-Sep	2212		T2406	048	54° 18.3' N	162° 29.7' W	Commence T2406
265	22-Sep	2234		T2406	055	54° 18.5' N	162° 23.9' W	End T2406
265	22-Sep	2234		T2407	055	54° 18.5' N	162° 23.9' W	Commence T2407
265	22-Sep	2304		T2407	053	54° 22.0' N	162° 17.2' W	End T2407
265	22-Sep	2304		T2408	053	54° 22.0' N	162° 17.2' W	Commence T2408
265	22-Sep	2315		T2408	-----	54° 24.1' N	162° 17.2' W	End T2408
265	22-Sep	2315		T2409	-----	54° 24.1' N	162° 17.2' W	Commence T2409
265	22-Sep	2340		T2409	-----	54° 26.4' N	162° 23.7' W	End T2409
265	22-Sep	2340		T2410	-----	54° 26.4' N	162° 23.7' W	Commence T2410
265	22-Sep	2349		T2410	-----	54° 27.8' N	162° 26.4' W	End T2410
265	22-Sep	2349		T2411	-----	54° 27.8' N	162° 26.4' W	Commence T2411
265	22-Sep	2359		T2411	-----	54° 27.4' N	162° 30.0' W	End T2411
265	22-Sep	2359		T2412	-----	54° 27.4' N	162° 30.0' W	Commence T2412
266	23-Sep	0004		T2412	-----	54° 28.1' N	162° 31.1' W	End T2412
266	23-Sep	0004		T2413	-----	54° 28.1' N	162° 31.1' W	Commence T2413
266	23-Sep	0009		T2413	-----	54° 28.0' N	162° 33.0' W	End T2413
266	23-Sep	0009		T2414	-----	54° 28.0' N	162° 33.0' W	Commence T2414
266	23-Sep	0018		T2414	-----	54° 29.3' N	162° 35.2' W	End T2414
266	23-Sep	0018		T2415	-----	54° 29.3' N	162° 35.2' W	Commence T2415
266	23-Sep	0036		T2415	-----	54° 30.6' N	162° 41.6' W	End T2415
266	23-Sep	0036		T2416	-----	54° 30.6' N	162° 41.6' W	Commence T2416
266	23-Sep	0048		T2416	-----	54° 32.7' N	162° 44.1' W	End T2416
266	23-Sep	0048		T2417	-----	54° 32.7' N	162° 44.1' W	Commence T2417
266	23-Sep	0229		T2417	104	54° 32.2' N	163° 21.8' W	End T2417
266	23-Sep	0229		T2418	104	54° 32.2' N	163° 21.8' W	Commence T2418
266	23-Sep	1514		T2418	077	54° 03.7' N	166° 23.3' W	End T2418

MOORING INFORMATION

Table 10. Summary of FOCI's 1990 Shelikof Strait Mooring Recoveries

Summary of equipment recovered

No. of RCM-4s: 6
No. of Neil Browns: 0
No. of Seacats: 1
No. of RDI ADCPs: 2
No. of WLR-7s: 0
No. of releases: 5

Mooring I.D.	8902	8904	9026	9027	8931	9032
Location	mid-Line 8 57° 36.90' N 155° 05.84' W	mid-Sutwik/Semidi 56° 27.61' N 156° 58.27' W	9026/27 deployed btwn Tugidak & Wide Bay 56° 46.90' N 155° 29.23' W	 56° 46.94' N 155° 29.16' W	Kennedy 59° 02.15' N 152° 04.21' W	mid-Sutwik/Semidi 56° 21.34' N 156° 53.78' W
Duration	4/25/89-5/24/90	4/11/89 - 5/21/90	4/17 - 8/14 1990	4/17 - 8/14 1990	RECOVERY FAILURE	5/21 - 8/14 1990
Depth	263	78 m	254 m	254 m	200 m	126 m
Instruments	RCM-4 40 m RCM-4 105 m RCM-4 155 m	RCM-4 63 m RCM-4 38 m	150 KHz ADCP- 247 m	RCM-4 80 m	RCM-4 60 m RCM-4 160 m	600 KHz ADCP- 60 m Seacat 65.5 m
Release	AR-191	8242	8242	8242	AR-191	8242
Press Gage	none	none	none	none	none	none

Table 11. Summary of FOCI's 1990 Shelikof Strait Mooring Deployments

Summary of equipment deployed

No. of RCM-4s: 2
No. of Neil Browns: 4
No. of Seacats: 1
No. of RDI ADCPs: 2
No. of WLR-7s: 1
No. of releases: 5

Mooring I.D.	9005	9026	9027	9031	9032
Location	Sutwik 56° 21.58' 156° 53.97'	9026/27 deployed between Tugidak & Wide Bay 56° 46.90' 155° 29.23'	 56° 46.94' 155° 29.16'	Kennedy 59° 03.36' 152° 03.36'	Sutwik 56° 21.34' 156° 53.78'
Duration	4/17 - 1991 recovery	4/17 - 8/14 1990	4/17 - 8/14 1990	not recovered	5/21 - 8/14 1990
Depth	128 m	254 m	254 m	188 m	126 m
Instruments	Neil Brown 48 m Neil Brown 113 m	150 KHz ADCP- 247 m	RCM-4 80 m	Neil Brown 47 m RCM-4 49 m Neil Brown 148 m	600 KHz ADCP - 60 m Seacat 65.5 m
Release	8242	8242	8242	AR-191	8242
Press Gage	none	none	none	WLR-7	none

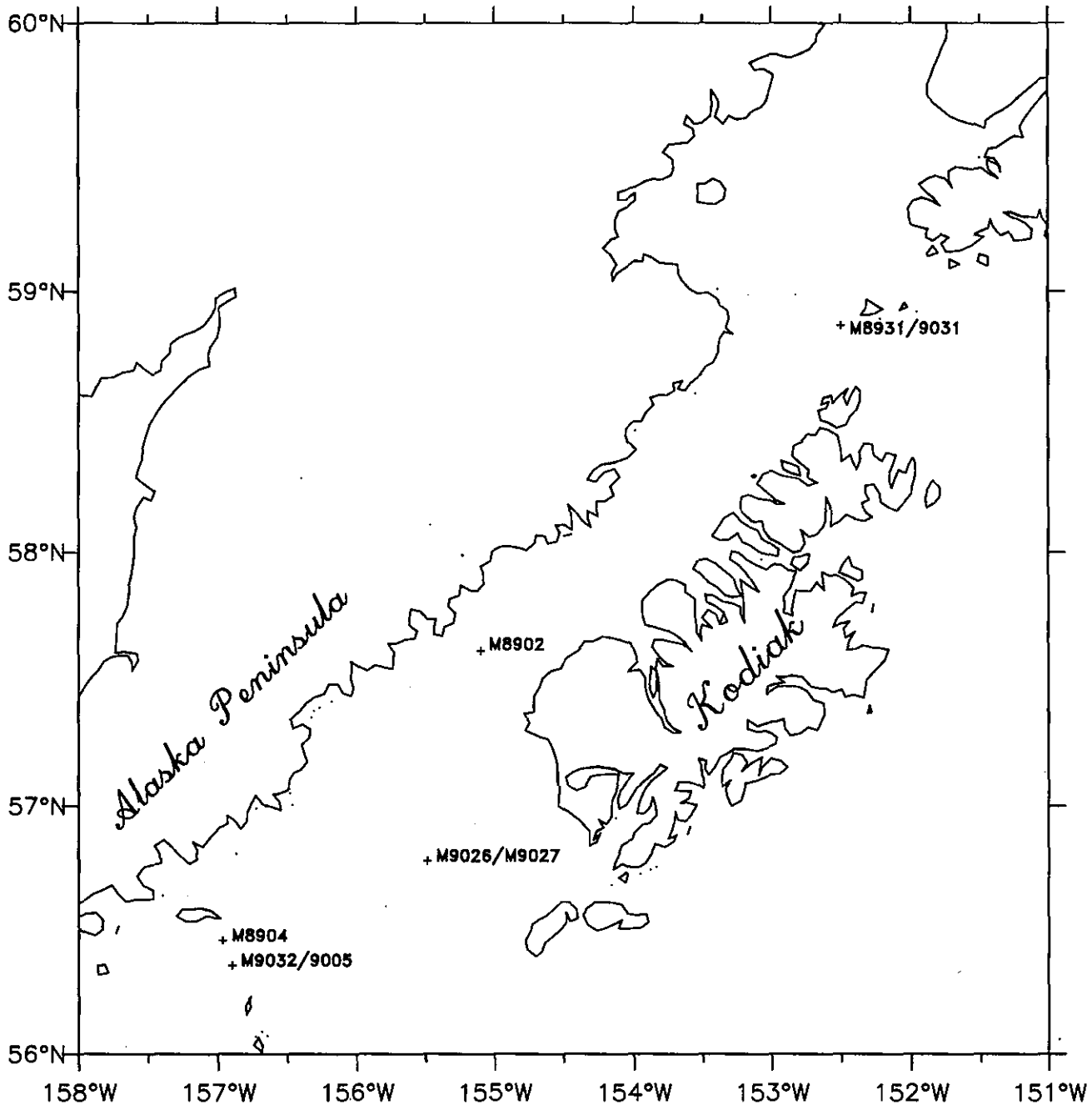
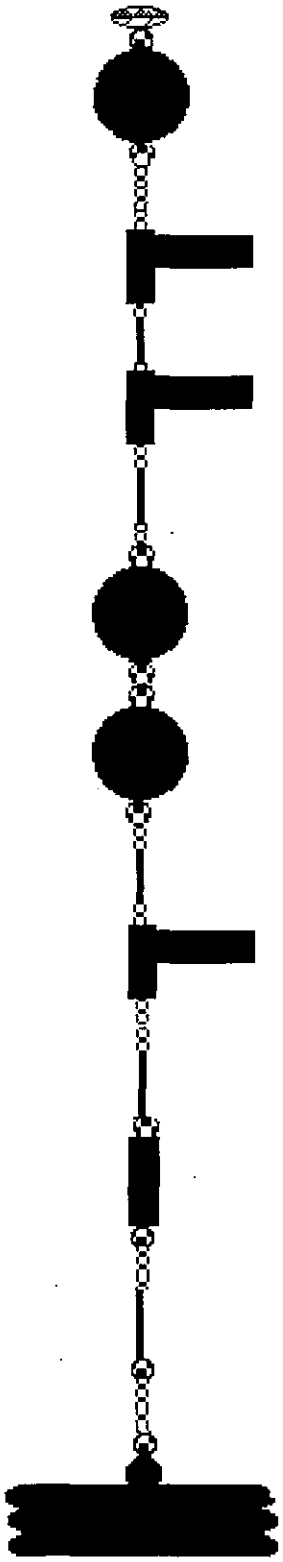


Fig. 8. 1990 mooring deployment/recovery sites.



MOORING 8902
POSITION 57° 36.9' N
155° 05.84' W
LORAN X: 32550.2
Y: 44099.6
Z: 18754.0
DEPTH 263 METERS

CURRENT METERS
DEPTHS AND
SERIAL NUMBERS

RCM S/N 3214
40 METERS

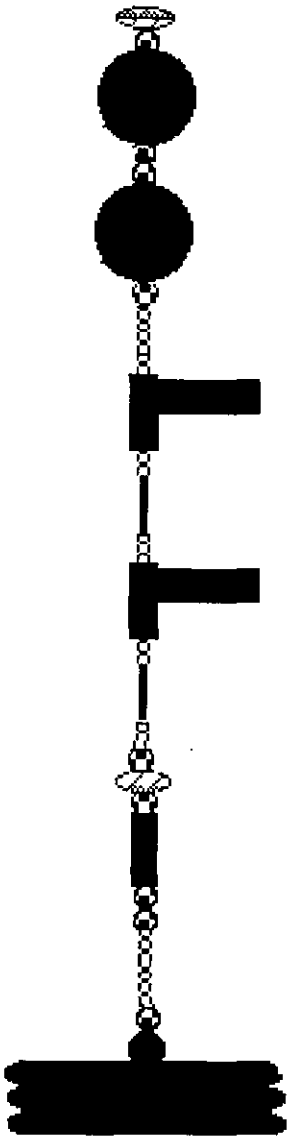
RCM S/N 6525
105 METERS

RCM S/N 2359
155 METERS

RELEASE 191 S/N 92U
170 METERS

Fig. 8.1. Mooring 8902.

MOORING	8904
POSITION	56° 27.61' N
	156° 58.27' W
LORAN	X: 18697.3
	Y: 33076.5
	Z: 44878.2
DEPTH	78 METERS



CURRENT METERS
DEPTHS AND
SERIAL NUMBERS

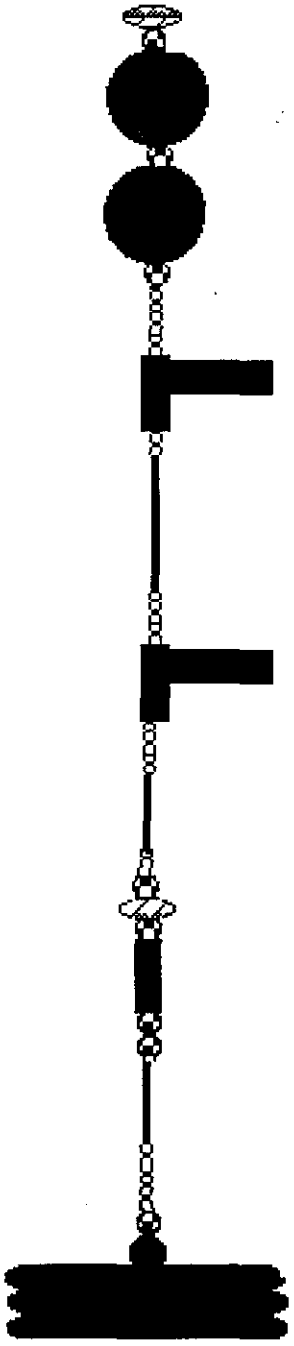
RCM S/N 3434
38 METERS

RCM S/N 5988
63 METERS

RELEASE 8242
S/N 902618
73 METERS

Fig. 8.2. Mooring 8904.

MOORING	8931
POSITION	59° 02.15' N
	152° 04.21' W
LORAN	X: 18750.1
	Y: 31884.6
	Z: 43552.6
DEPTH	200 METERS



CURRENT METERS
DEPTHS AND
SERIAL NUMBERS

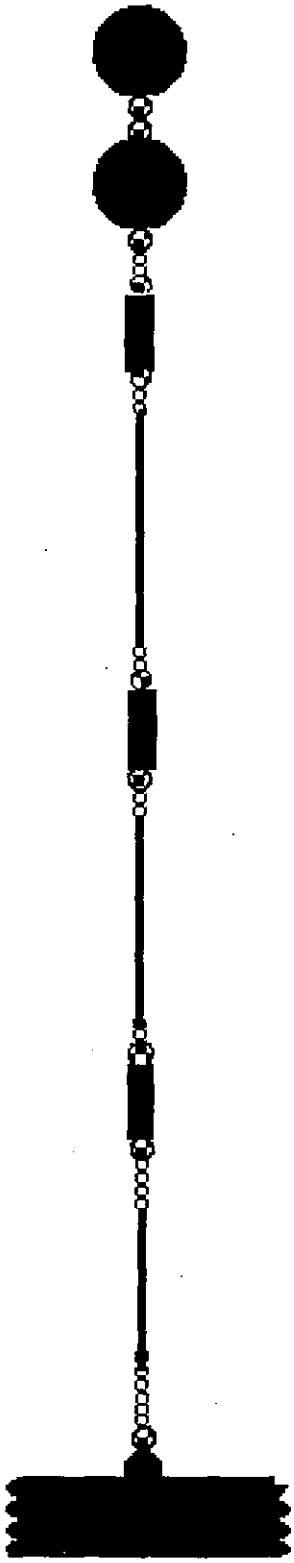
RCM S/N 1809
60 METERS

RCM S/N 1828
160 METERS

RELEASE 191 S/N 88U
175 METERS

Fig. 8.3. Mooring 8931.

MOORING	9005
POSITION	56° 21.58' N
	156° 53.97' W
LORAN	X: 33094.8
	Y: 44858.3
	Z: 18747.8
DEPTH	128 METERS



CURRENT METERS
DEPTHS AND
SERIAL NUMBERS

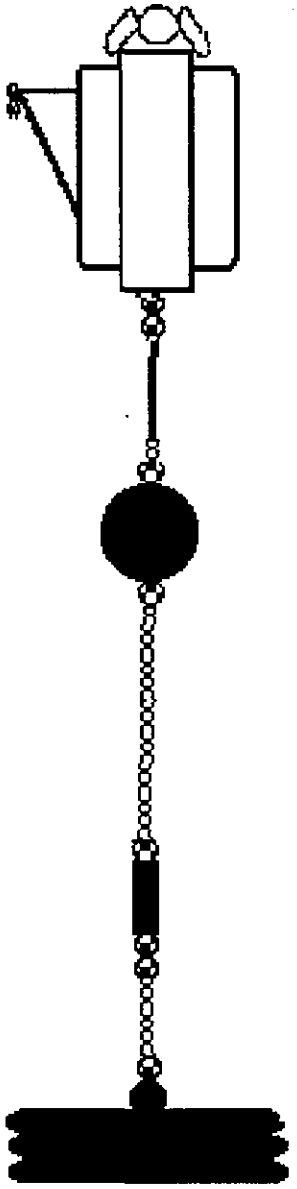
NEIL BROWN S/N 098
48 METERS

NEIL BROWN S/N 1275
113 METERS

RELEASE 8242
S/N 902718
116 METERS

Fig. 8.4. Mooring 9005.

MOORING	9026
POSITION	56° 46.90' N
	155° 29.23' W
LORAN	X: 32825.8
	Y: 44272.3
	Z: 18783.6
DEPTH	254 METERS



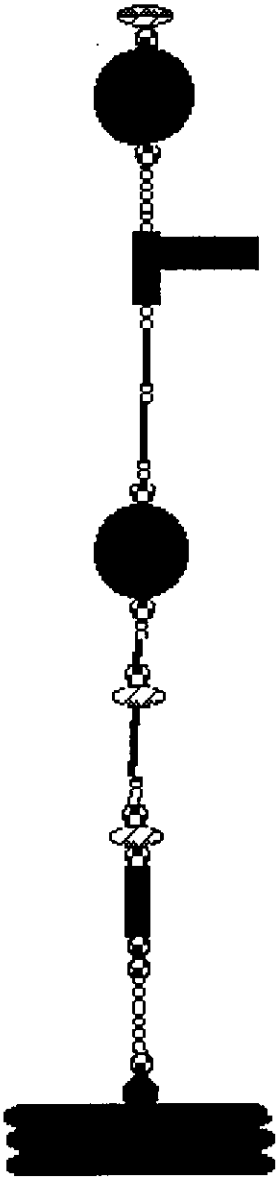
DEPTHS AND
SERIAL NUMBERS

150 KHz RD ADCP
S/N 186
247 METERS

RELEASE 8242
S/N 903318

Fig. 8.5. Mooring 9026.

MOORING	9027
POSITION	56° 46.94' N
	155° 29.16' W
LORAN	X: 32825.5
	Y: 4427_.8
	Z: 18783.5
DEPTH	254 METERS



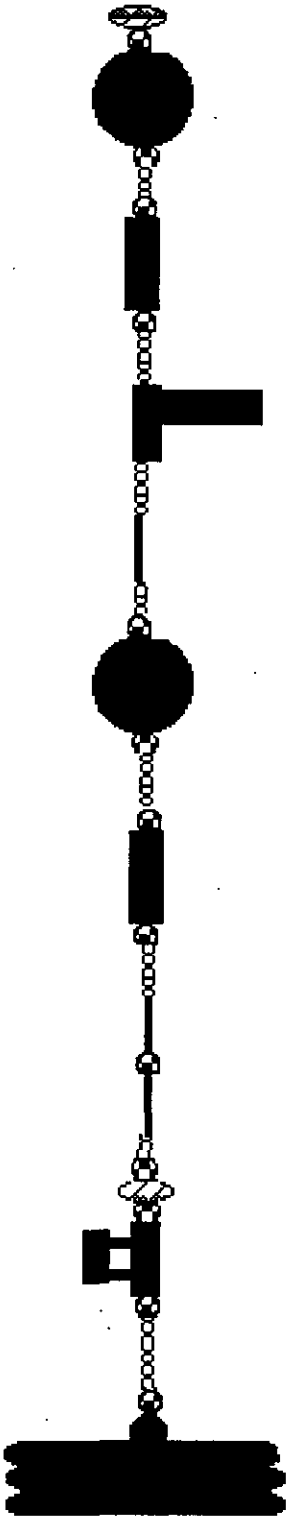
CURRENT METERS
DEPTHS AND
SERIAL NUMBERS

RCM S/N 2493
80 METERS

RELEASE 191 S/N 74U
250 METERS

Fig. 8.6. Mooring 9027.

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



CURRENT METERS
DEPTHS AND
SERIAL NUMBERS

ACM S/N 1277
47 METERS

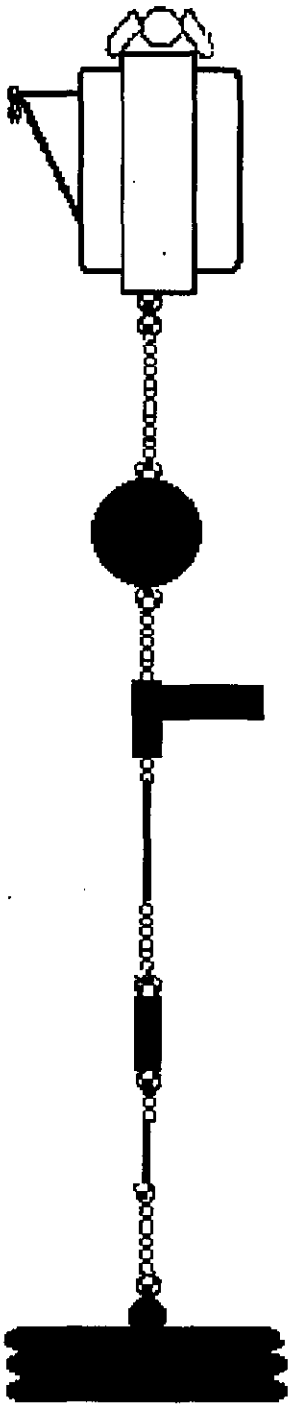
RCM S/N 1323
49 METERS

ACM S/N 1272
148 METERS

RELEASE 191 S/N 91U
183 METERS
WLR-7 PRESS GAGE
S/N 1204

Fig. 8.7. Mooring 9031.

MOORING	9032
POSITION	56° 21.34' N
	156° 53.78' W
LORAN:	33095.5
	44857.4
	18670.2
DEPTH	126 METERS



CURRENT METERS
DEPTHS AND
SERIAL NUMBERS

600 KHZ RD ADCP
S/N 144
60 METERS

SEACAT
S/N 379
65.5 METERS

RELEASE 8242
S/N 903418
DEPTH 81.5 M

Fig. 8.8. Mooring 9032.

*U.S. GOVERNMENT PRINTING OFFICE: 1992-673-025/69003