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NOAA Data Report ERL PMEL-55



**FISHERIES-OCEANOGRAPHY COORDINATED INVESTIGATIONS:
1993 FIELD OPERATIONS REPORT**

C. DeWitt

Pacific Marine Environmental Laboratory
Seattle, Washington
July 1995

noaa NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION / Environmental Research Laboratories

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**NATIONAL OCEANIC AND
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Fisheries-Oceanography Coordinated Investigations: 1993 Field Operations Report

C. DeWitt

INTRODUCTION

This data report summarizes the goals and accomplishments of the Fisheries-Oceanography Coordinated Investigations (FOCI) 1993 field season (October 1992–September 1993). It is intended that this report be an easy-to-use reference to cruise reports, station positions, and operations.

The report is divided into eight primary sections: one for each of the seven 1993 cruises and the eighth section devoted to moorings. Each of the cruise sections begins with a list of scientific personnel, a brief summary of the cruise operations, and a compilation of cruise statistics. This is followed by a summary of operations. The summary is the cruise report written by the Chief Scientist. Next, figures depicting the sampling sites are provided for most operations. Finally a summary of the Marine Operations Abstract (MOA) is provided with date, time, station number, FOCI I.D., depth, latitude, longitude, and gear code. The mooring section has a summary of mooring deployments and recoveries, followed by a diagram of each mooring.

FOCI 93 Research Cruises

The 1993 field operations were conducted aboard the NOAA ships *Miller Freeman* and *Surveyor*. Shipboard operations included plankton and larval sampling, CTD's, deployment and recovery of moorings, drifter studies, and satellite observations of the sea surface. There were seven cruises during FY93, designated as follows:

Table 1. 1993 Cruise Summary

FOCI No.	Ship No.	Area	Dates	Project	Chief Scientist
FOCI-93-01	MF93-03	Shelikof/Bering Sea	Mar 25-Apr 1	Physical Oc.	Ned Cokelet
FOCI-93-02	MF93-04	Shelikof	Apr 1-11	Egg Survey	Ric Brodeur
FOCI-93-03	MF93-05	Bering Sea	Apr 13-30	Feeding Larvae	Bill Rugen
FOCI-93-04	MF93-06	Shelikof	May 1-16	Larval Survey	Jeff Napp
FOCI-93-05	MF93-08	Shelikof	May 25-Jun 2	Larval Survey	Kevin Bailey
FOCI-93-06	MF93-10	Shelikof	Sep 5-18	Age-0 Study	Matt Wilson
FOCI-93-07	SU93-03	Bering Sea	Sep 1-23	Physical Oc.	Ron Reed

A summary of the primary objectives of each cruise is:

FOCI-93-01:

- deploy two current meter moorings; conduct CTD and ADCP transects in areas of interest to transport studies; collect zooplankton and microzooplankton samples in support of modeling and other biological studies

FOCI-93-02:

- conduct an ichthyoplankton survey in Shelikof Strait to determine the horizontal patterns of distribution and abundance of walleye pollock eggs and locate the area of maximum concentration; collect adult pollock to obtain eggs for rearing on board and in Seattle/Newport; investigate vertebrate and invertebrate predation on pollock eggs; examine vertical distribution of pollock eggs in the water column; investigate the settling of unfertilized pollock eggs using moored sediment traps and shipboard settling columns

FOCI-93-03:

- conduct large-scale and small-scale ichthyoplankton and zooplankton surveys in the Bogoslof Island area to determine horizontal patterns of distribution and abundance of walleye pollock larvae and locate areas of high concentrations

FOCI-93-04:

- examine physical and biological gradients (which are relevant to larval pollock) from the shelf to the Alaskan Stream, southwest of the exit to Shelikof Strait; map the distribution of larval pollock between Mitrofanina Island and the middle region of Shelikof Strait for estimates of larval mortality

FOCI-93-05:

- conduct a survey of larval pollock for use in estimating distribution, drift, and mortality rates; collect samples of larval pollock for studies on growth and condition; trawl for midwater predators on larval pollock; recover three sediment trap/current meter moorings in Shelikof Strait

FOCI-93-06:

- study and sample age-0 pollock

FOCI-93-07:

- gain understanding of circulation along the south and north sides of the Aleutian Islands and through the island passes; examine circulation and slope-shelf exchange along the eastern boundary of the deep basin

TABLE 2. 1993 STATISTICS SUMMARY

	TOTAL	MF-93-03	MF-93-04	MF-93-05	MF-93-06	MF-93-08	MF-93-10	SU-93-03
Acoustic transects (nm)	226						226	
ADCP lines	12	1			9	2		
ADCP Backtrack-L	5	1	1	1	1	1		
Bongos, 60 cm	399		90	63	133	113		
Bongos, 20 and 60 cm	128		6	58	48	16		
Bongos, surface tows	2			2				
Bongos, vertical (live tows)	25			25				
CaVET	64				46	18		
CTDs	318	17	10	31	44	18	14	184
Drifters, satellite tracked	12			6	5			1
EK 500 Dedicated Transects	21		13		8			
Epibenthic Sled	6		6					
Hydrotrack	7	1		1	4	1		
Methot Trawls	11		3		3	5		
MOCNESS Tows	28			23	5			
Mooring deployments	9	2	3					4
Mooring recoveries	5					3		2
Neuston Trawls	2		2					
Ring Tows (live tows)	11			6	5			
Trawls, Anchovy	12						12	
Trawls, Nor'eastern	2		2					
Trawls, Shrimp	22						22	
Tuckers	51	2	17	8	10		13	1

TABLE 2. 1993 STATISTICS SUMMARY

	TOTAL	MF-93-03	MF-93-04	MF-93-05	MF-93-06	MF-93-08	MF-93-10	SU-93-03
Age-0 pollock lengths	2119						2119	
Age-0 pollock frozen	1600						1600	
Age-0 pollock 10% formalin	429						429	
Chlorophyll samples	272	5	30	35	143	48		11
Larvae for gut and otolith analysis	12315			11215		1100		
Larvae for histology	32			16		16		
Macrozooplankton, size fractionated	5			5				
Microzooplankton samples	111		36	9		66		
Nutrient samples	842	11	20		125	70		616
Plankton samples	23						23	
Pollock eggs	36000		36000					
Predator samples	787		787	0				
Protozoans	7			7				
Stomach samples	68		68					

MF93-03 (FOCI-93-01): 25 March–1 April, 1993

SCIENTIFIC PERSONNEL

<u>Name</u>	<u>Title</u>	<u>Organization</u>
Ned Cokelet	Chief Scientist	PMEL/NOAA
Steven Bograd		PMEL/NOAA
Carol DeWitt		PMEL/NOAA
Douglas Hankins		WET Labs
Dave Kachel		PMEL/NOAA
John Shanley		PMEL/NOAA

CRUISE STATISTICS

ADCP tracklines	1
ADCP backtrack “L”	1
Chlorophyll samples	5
CTD casts	17
Hydrotrack	1
Mooring deployments	2
Nutrient samples	11
Tucker trawls	2

OBJECTIVES

The objectives of MF93-03 (FOCI-93-01) were to:

- deploy two current-meter moorings—Peggy Bering Sea (a surface PROTEUS mooring) and a subsurface ADCP mooring
- conduct CTD and ADCP transects in areas of interest to transport studies
- collect zooplankton and microzooplankton samples in support of modeling and other biological studies
- continue acquisition of long-term biological and physical time series

CRUISE REPORT

Acoustic Doppler Current Profiler (ADCP)

The 150 kHz RDI VM-ADCP collected data for the entire cruise. There was one dedicated ADCP transect from the north side of the Aleutians to the Peggy site and a backtrack-L calibration maneuver near the end of the cruise. The gyrocompass was calibrated with sextant sightings when possible with the result that one must subtract 1.5° from the gyro to obtain the true direction.

CTD Casts

Seventeen CTD casts were made on this cruise. The first eleven casts were a time series at the Peggy Bering Sea site with a nominal spacing of 1.5 hr and to a depth of 1000 m. Cast 12 was intended to be for calibration at Peggy, but it had to be aborted due to a bad CTD termination. Casts 13–16 to bottom or 1500 m constituted a widely spaced transect of the Aleutian north slope flow. A finer spacing was planned for this transect, but we had to interrupt sampling due to a storm and take shelter behind Unalaska Island. Cast 17 to 400 m was taken at the Peggy site for calibration purposes. It included light meter and fluorometer measurements, and chlorophyll samples at 0, 11, 20, 30, 39, 50, 60, 70, 80, 90 and 100 m.

The CTD wire on the port winch had to be spooled off and reterminated at the winch end twice in Kodiak to locate and fix an open circuit. This put the Chief Survey Technician behind in his tasks, and as a result we were not as prepared for some of the biological sampling as we could have been.

The port CTD winch hydraulic motor was replaced near the beginning of the cruise owing to excessive noise and vibration. On the next CTD cast the replacement motor would not work at all. The CTD was moved to the starboard winch which worked better than in the recent past. (Its controls are still touchy, and the winch operator cannot see the spool turning.) After the port winch had been fixed we moved the CTD back to there. Unfortunately the seaward CTD termination leaked due to a slight nick in the wire insulation that showed up as the CTD was lowered under pressure. We had to abandon the station because a storm was upon us, and there was not time to reterminate the wire and resume the cast. Thus we lost some scientific sampling time. Experiments by the Chief Scientist and Electronics Technician revealed how difficult it is to strip several feet of firmly bonded, black, polypropylene shielding from the wires. Perhaps a different brand of wire or a better termination method should be considered.

Discrete Sample Data Base (DSDB)

This was the first cruise to use the newly modified FOCI DSDB forms and R:Base PC program application. The forms worked well with an all-encompassing array of data and sampling types to circle, but the R:Base application would not work. Consequently the data forms had to be entered into the data base back at the Seattle lab.

GPS

In the past both bridge and plot room Magnavox 4200 GPS receivers were programmed to output the same NMEA 0183 sentences—GGA for position and VTG for course and speed. However, the plot room (GPS #1) messages were recorded once per second by SCS in support of the ADCP measurements, and the bridge (GPS #2) messages were recorded once per 30 seconds to save disk storage space. This has the advantage that should GPS #1 fail, SCS could be reprogrammed to record GPS #2 at the higher rate for ADCP use.

However, this year the SeaPlot navigation display system was installed and hooked to GPS #2, which was then reprogrammed to output a set of Transit sentences incompatible with ADCP needs. Therefore, should GPS #1 fail, GPS #2 would not be available as a backup for ADCP use. To overcome this we reprogrammed GPS #2 via the Control Port and SCS program SETUP_4200.FOR with configuration file 4200_NAVSOFT_GGA_VTG.CFG to output the GGA and VTG sentences from its Control and Equipment Ports. Then we successfully reconfigured SeaPlot to read these messages. Thus the potential for SCS and the ADCP to rely on GPS #2, should GPS #1 fail, was restored. But for some reason the GPS #2 messages could not be read by SCS. We suspect that the GPS #2 messages were not making it onto the VAX network, perhaps owing to a bad connection. This needs to be fixed.

JRC Colorscope

The water depth for the Peggy Bering Sea mooring had to be estimated accurately so that the mooring line could be cut to the correct length. The error tolerance was ± 20 m. To best estimate the depth it was imperative to know what sound velocity is assumed by the JRC Colorscope in converting acoustic travel time to depth. It was also useful to scale the Colorscope output so that it displayed the correct sound-velocity-adjusted depth. Before the cruise, we contacted the manufacturer and found that the assumed sound velocity was 1500 m s^{-1} . Appropriate depth scaling was implemented.

Mooring Deployments

The Peggy Bering Sea mooring was deployed on the second attempt at 0854 29 Mar 93 UTC. It settled at $54^{\circ} 47.48' \text{N}$, $168^{\circ} 32.05' \text{W}$ in 2139 m of water. The first mooring deployment failed because the 5/8-inch stainless steel ring attaching the acoustic release bridle to the anchor chain broke, dropping the anchor and allowing the emergency flotation to rise to the surface. This ring's design strength (approx. 70,000 lbs) was much greater than the anchor weight (approx. 6,000 lbs) and the calculated forces. Since the ring itself was not recovered, the reason for failure cannot be determined. Subsequent to the deployment, two identical rings were pull-tested at PMEL with loads of 20,000 lbs. They did not break, but rather distorted into long ovals. With the railroad-wheel anchors lost, the 6-month-long buoy deployment was in jeopardy. Special thanks are due CDR Robert J. Pawlowski, Commanding Officer of the *Miller Freeman*, and the deck crew led by Chief Boatswain Rick Pietrusiak for suggesting and fashioning a new anchor from two spare trawl doors and the subsurface mooring's railroad-wheel anchor.

The subsurface ADCP mooring was deployed at 0504 30 Mar 93 UTC at $54^{\circ} 47.49' \text{N}$, $168^{\circ} 36.57' \text{W}$ in 2155 m of water. Its deployment was in jeopardy because we used the anchor on Peggy's second deployment. However, we were able to use three sediment trap anchors that were aboard for the next cruise. Thanks to Bill Parker's (PMEL) arrangements, spares were built in Dutch Harbor and delivered to the ship at the next port call so that no scientific observations were lost.

A preliminary data analysis from the 1992 deployment indicated that the region has energetic internal waves with 15 to 20 min. periods. Since most of the instruments sampled at 10-minute to hourly intervals, this posed the possibility of frequency aliasing. Battery capacity and internal storage limitations dictated that the sampling frequency could not be increased to once every 5 minutes. Therefore, as a compromise, the Seacats were programmed to sample once per 10 minutes, plus to burst sample once per 2 minutes for 24 hours every 42 days. Similarly, the Neil Brown Acoustic Current Meter at 38 m was programmed to calculate 1-minute averages, as opposed to 10-minute averages on the other Neil Brown's, for the duration of the deployment.

Tucker Trawls

Two sorts of net tows were planned at the Peggy site—CalVET tows and Tucker trawls. However, a storm interrupted the biological sampling from 1826 30 March to 1935 31 March. No CalVET tows were made, one Tucker depth test, and two Tucker trawls were taken. On the Tuckers, net 1 nominally sampled from 1000 to 100 m, and net 2 sampled from 100 m to the surface. Unfortunately the storm moved in rapidly, and the cod end from the shallow sample of the second Tucker trawl was lost as it hit the side of the ship in rough seas.

We conducted an experiment to determine the relationship of the Tucker trawl depth to the winch wire out. It is difficult to know the depth of the Tucker trawl since it has no pressure-measuring capability. A pressure sensor cannot be hung on the wire above the nets because it will block the transit of the messenger weights. A pressure sensor attached directly to the net frame is at risk of being smashed by chains controlling the opening/closing mechanism. We deployed the Tucker with three 333 μm mesh nets with cod ends attached. A Seacat with pressure sensor was attached just above the Tucker, and the first net remained open throughout the tow. We recorded depth as a function of wire-out during the descent of 50 m/minute, while the winch was held steady for 30 seconds as the net stabilized, and during the ascent at 20 m/minute. The wire angle varied between 40 and 50°.

For both descent and ascent there is a near-linear relationship between depth and wire-out. The deepest two points were excluded from the ascent fits as the net depth adjusted. To a very good approximation the depth on descent at 50 m/min is 86% of the wire out, and on ascent at 20 m/min the depth is 80% of the wire out.

Miscellaneous Comments

The steam heating system sprang about three new leaks per day. Although this did not lead directly to lost sampling time on this cruise, it kept the engineers so busy that their capacity to deal with repairs to scientifically important gear was reduced.

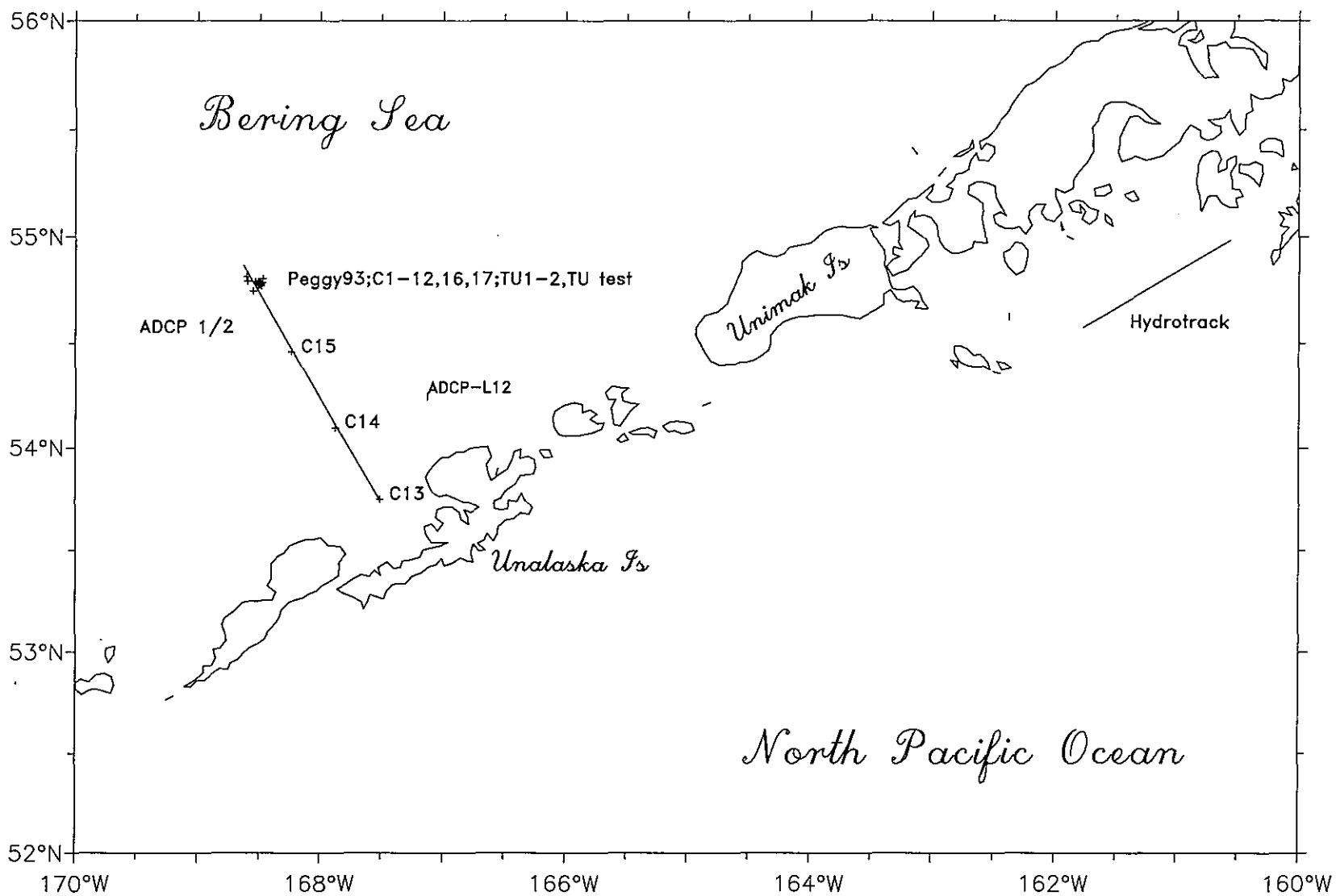


Fig. 1.1. MF93-03 ADCP, CTD (C), Mooring and Tucker (TU) stations.

TABLE 3. MF93-03 CRUISE SUMMARY

Physical Oceanography

25 March - 01 April 1993

Date (JD)	Date (GMT)	Time (GMT)	Station No.	FOCI Grid No.	Depth (m)	Latitude	Longitude	Gear Code
084	25-Mar	2300				57° 43.8' N	152° 30.7' W	Depart Kodiak
085	26-Mar	0348			149	57° 42.5' N	152° 07.8' W	Lowered centerboard
086	27-Mar	0900			91	54° 59.1' N	160° 34.0' W	Start hydrotrack
086	27-Mar	1300			138	54° 34.5' N	161° 46.2' W	End hydrotrack
087	28-Mar	0453			843	53° 59.6' N	167° 04.1' W	Fish sign (120-180 m)
087	28-Mar	0529			730	53° 55.4' N	167° 12.4' W	End of fish sign
087	28-Mar	0627			1075	53° 47.4' N	167° 26.7' W	Set depth snder/ sound vel corr
087	28-Mar	0645	001	ADCP1	848	53° 45.1' N	167° 31.1' W	ADCP, start
087	28-Mar	1314	002	ADCP1	2284	54° 51.9' N	168° 38.0' W	ADCP, end
087	28-Mar	1911	003	PEGGY93	2246	54° 49.9' N	168° 41.0' W	Moor, begin deployment
088	29-Mar	0229	003	PEGGY93	2131	54° 47.4' N	168° 31.2' W	Moor, end deployment
088	29-Mar	0400	003	PEGGY93	2133	54° 47.5' N	168° 31.3' W	Maneuvering to retrieve mrg
088	29-Mar	0854	003	PEGGY93	2132	54° 47.4' N	168° 32.3' W	Moor, redeployed
088	29-Mar	1109	004	CTD001	2123	54° 46.6' N	168° 30.1' W	CTD
088	29-Mar	1241	004	CTD002	2140	54° 46.7' N	168° 30.3' W	CTD
088	29-Mar	1422	004	CTD003	2148	54° 46.5' N	168° 30.5' W	CTD
088	29-Mar	1552	004	CTD004	2126	54° 47.0' N	168° 30.3' W	CTD
088	29-Mar	1743	004	CTD005	2128	54° 46.7' N	168° 29.5' W	CTD
088	29-Mar	1901	004	CTD006	2123	54° 47.0' N	168° 29.9' W	CTD
088	29-Mar	2020	004	CTD007	2106	54° 46.6' N	168° 29.7' W	CTD
088	29-Mar	2134	004	CTD008	2082	54° 46.1' N	168° 29.1' W	CTD
088	29-Mar	2249	004	CTD009	2106	54° 46.4' N	168° 30.6' W	CTD
089	30-Mar	0020	004	CTD010	2092	54° 46.4' N	168° 29.5' W	CTD
089	30-Mar	0141	004	CTD011	2129	54° 47.0' N	168° 30.6' W	CTD
089	30-Mar	0236	005	PEGGY93	2203	54° 47.5' N	168° 36.2' W	Setting up to deploy mooring
089	30-Mar	0504	005	PEGGY93	2150	54° 47.5' N	168° 36.0' W	Moor, deployed subsurface
089	30-Mar	0700			2073	54° 44.7' N	168° 33.3' W	1Tuck test
089	30-Mar	1155	006	Tuck1	2127	54° 47.1' N	168° 28.6' W	1Tuck
089	30-Mar	1441	006	Tuck2	2103	54° 48.3' N	168° 28.4' W	1Tuck
089	30-Mar	1720	006	CTD012	2120	54° 47.4' N	168° 30.7' W	CTD (aborted)
089	30-Mar	1826	006		2120	54° 47.4' N	168° 30.7' W	Broke off ops (storm warning)
090	31-Mar	0255			190	53° 43.7' N	166° 53.8' W	Raised centerboard
090	31-Mar	0413			75	53° 44.8' N	166° 53.1' W	Anchored in Humpback Bay

TABLE 3. MF93-03 CRUISE SUMMARY

Physical Oceanography									25 March - 01 April 1993	
Date (JD)	Date (GMT)	Time (GMT)	Station No.	FOCI Grid No.	Depth (m)	Latitude		Longitude	Gear Code	
090	31-Mar	1709			80	53°	44.8' N	166°	53.2' W	Anchor aweigh
090	31-Mar	1900			879	53°	45.0' N	167°	30.0' W	Lowered centerboard
090	31-Mar	1935	007	CTD013	850	53°	44.9' N	167°	30.7' W	CTD
090	31-Mar	2253	008	CTD014	1640	54°	05.9' N	167°	52.7' W	CTD
091	1-Apr	0234	009	CTD015	1351	54°	27.5' N	168°	14.0' W	CTD
091	1-Apr	0614	010	CTD016	2183	54°	48.8' N	168°	36.5' W	CTD
091	1-Apr	0745	011	CTD017	2131	54°	47.4' N	168°	31.1' W	CTD - Chl: 10,20, 30,40,50 m Nuts: 0,10,20,30, 40,50,60,70,80, 90,100 m
091	1-Apr	1325	012	ADCP-L	1389	54°	15.8' N	167°	07.6' W	Begin ADCP Backtrack-L
091	1-Apr	1503	012	ADCP-L	1497	54°	13.7' N	167°	07.9' W	End ADCP Backtrack- L
091	1-Apr	1702			103	54°	02.4' N	166°	36.6' W	Raised centerboard

MF93-04 (FOCI-93-02): 1–11 April, 1993

SCIENTIFIC PERSONNEL

<u>Name</u>	<u>Title</u>	<u>Organization</u>
Ric Brodeur	Chief Scientist	AFSC/NOAA
Debbie Blood		AFSC/NOAA
Carol DeWitt		PMEL/NOAA
Leslie Lawrence		PMEL/NOAA
Nazila Merati		AFSC/NOAA
Steve Porter		AFSC/NOAA
Bill Rugen		AFSC/NOAA
Dave Tennant		PMEL/NOAA

CRUISE STATISTICS

Acoustic Transects	13
ADCP backtrack "L"	1
Bongos, 20 cm	6
Bongos, 60 cm	96
Chlorophyll	30
CTD casts	10
Epibenthic Sled	6
Fishing Trawls, Nor' eastern	2
Methot Trawls	3
Microzooplankton	36
Mooring deployments	3
Neuston Trawls	2
Nutrients	20
Pollock eggs collected	36,000
Predators collected	787
Stomach Samples	68
Tucker Trawls	17

OBJECTIVES

The objectives of MF93-04 (FOCI-93-02) were to:

- continue acquisition of long-term biological and physical time series
- conduct an ichthyoplankton survey in Shelikof Strait to determine the horizontal patterns of distribution and abundance of walleye pollock eggs and locate the area of maximum concentration
- collect adult pollock to obtain eggs for rearing on board and in Seattle/Newport
- investigate vertebrate and invertebrate predation on pollock eggs
- examine vertical distribution of pollock eggs in the water column
- investigate the settling of unfertilized pollock eggs using moored sediment traps and shipboard settling columns

CRUISE REPORT

We proceeded to Line 8 transect to deploy sediment trap moorings to investigate the settling of unfertilized pollock eggs. Three sediment trap moorings, each containing two traps, current meters, and CTD's, were successfully deployed at sites situated 0.5 km apart in the deepest part of the trough off Cape Kekurnoi. Tucker trawls and epibenthic sled tows were made to examine the vertical distribution of eggs and incidence of predation by zooplankton upon eggs. A CTD cast was done at each of the three mooring sites to calibrate the mooring CTD probes.

We next did five acoustic transects with the EK-500 in the northern part of Shelikof Strait off Cape Kuliak looking for spawning concentrations of pollock. Additional collections of zooplankton predators on pollock eggs using a 1-m Tucker trawl were obtained on April 4 in areas of high and low egg abundance. Samples were taken from between 250–150 m and 150 m to surface during both daylight and nighttime hours. A small plankton net was suspended within the Tucker trawl to verify the presence or absence of eggs. Three Methot trawl collections (for larger predators) and two small-mesh Tucker Trawls (for zooplankton) were also made in this area. A backtrack-L calibration of the ADCP was also conducted.

Line 8 time series stations (FOX 55-61) were occupied on April 4–5. Tucker trawls were used for collecting predators and zooplankton biomass on the first pass; CTD's, chlorophylls, microzooplankton, nutrients, and 20- and 60-cm bongos containing samples on the second pass. We were unable to trawl for spawning adult pollock during the Line 8 sampling because of generator problems. We dropped off Dave Tennant at Larsen Bay on the morning of 5 April between the two passes.

The egg survey in Shelikof Strait using 60 cm (333 μ m mesh) bongo nets started on April 6 and was completed on April 10. A Seacat CTD was incorporated into the bongo array to provide physical data during the tow. We broke off operations for about 6 hours on April 7 to pick up generator parts in Larsen Bay.

On April 8 the Nor'eastern bottom trawl was fished just north of Cape Kekurnoi. Adult pollock were successfully spawned, obtaining fertilized eggs for the shipboard experiments studying the predation of eggs by zooplankton predators and length at hatch. Unfertilized eggs were also

collected to study sinking rates. Stomach samples of 50 adult pollock and other fish predators were collected, and a CTD was taken. Length and maturity data were taken on a subsample of adult pollock. On April 10, another bottom trawl was fished to provide a fresh batch of fertilized pollock eggs for further studies back in Seattle and Newport, OR. Length and maturity data were taken from walleye pollock during both hauls.

SUMMARY

Spawning aggregations of adult pollock were found in the deep trough along the Alaska Peninsula side of Shelikof Strait from Cape Kuliak to Cape Kekurnoi. The egg distribution data suggest that spawning may have occurred farther up Shelikof Strait than usual. Analysis of the bongo samples will be necessary before further results are available. Spawning of adult pollock was still in progress at the end of the cruise as evidenced by a large number of mature and spawning individuals collected in the last trawl taken.

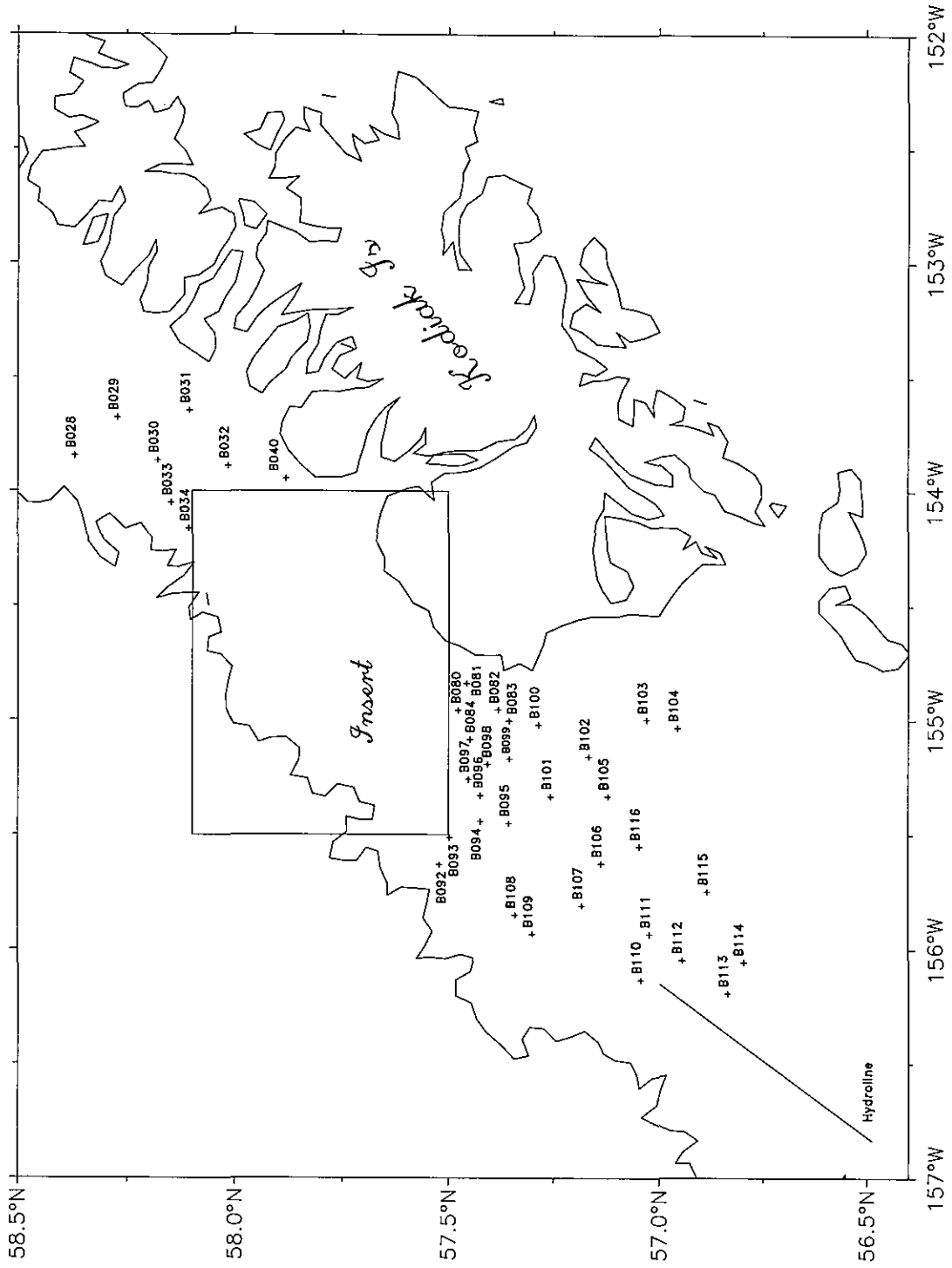


Fig. 2.1. MF93-04 60 cm Bongo (B) stations.

TABLE 4. MF93-04 CRUISE SUMMARY

Egg Survey

1 - 11 April, 1993

Date (JD)	Date (GMT)	Time (GMT)	Station Number	FOCI ID No.	Depth (m)	Latitude	Longitude	Gear Code
091	1-Apr	0117			336	53° 56.7' N	166° 32.8' W	Lowered centerboard
092	2-Apr	1640			91	54° 34.9' N	161° 49.1' W	Begin Hydroline
092	2-Apr	2100			128	55° 01.3' N	160° 30.4' W	End Hydroline
093	3-Apr	0930			85	56° 29.3' N	156° 50.2' W	Begin Hydroline
093	3-Apr	1240			124	56° 59.9' N	156° 09.1' W	End Hydroline
093	3-Apr	1905	001		282	57° 41.8' N	155° 12.2' W	Sled
093	3-Apr	2040	001		285	57° 41.6' N	155° 12.6' W	Moor
093	3-Apr	2156	002		298	57° 38.8' N	155° 17.1' W	Sled/lg-CB
093	3-Apr	2347	002		298	57° 38.3' N	155° 15.7' W	Moor
094	4-Apr	0035	002		306	57° 38.5' N	155° 16.4' W	Sled/lg-CB (redo)
094	4-Apr	0203	003		321	57° 36.9' N	155° 19.8' W	Sled/lg-CB
094	4-Apr	0327	003		318	57° 36.5' N	155° 19.8' W	Moor
094	4-Apr	0414	003	Tuck1	320	57° 36.4' N	155° 20.6' W	1Tuck/lg-CB
094	4-Apr	0506	004	Tuck2	302	57° 38.3' N	155° 16.3' W	1Tuck/lg-CB
094	4-Apr	0000	005	Tuck3	295	57° 41.6' N	155° 12.9' W	1Tuck/lg-CB
094	4-Apr	0659	005	CTD001	293	57° 41.2' N	155° 12.5' W	CTD
094	4-Apr	0742	006	CTD002	301	57° 38.9' N	155° 15.2' W	CTD
094	4-Apr	0823	007	CTD003	318	57° 36.6' N	155° 19.5' W	CTD
094	4-Apr	1102			240	57° 50.5' N	154° 39.1' W	Begin transect TS 3-12
094	4-Apr	1140			217	57° 56.0' N	154° 45.4' W	End TS 3-12/ begin TS 3-12.1
094	4-Apr	1154			191	57° 57.6' N	154° 41.4' W	End TS 3-12.1/ begin TS 3-11.0
094	4-Apr	1229			239	57° 52.2' N	154° 34.4' W	End TS 3-11.0/ begin TS 3-11.1
094	4-Apr	1245			235	57° 53.4' N	154° 29.7' W	End TS 3-11.1/ begin TS 3-10.0
094	4-Apr	1316			48	57° 59.1' N	154° 35.7' W	End TS 3-10.0/ begin TS 3-10.1
094	4-Apr	1331			114	58° 00.0' N	154° 30.7' W	End TS 3-10.1/ begin TS 3-9.0
094	4-Apr	1358			237	57° 55.8' N	154° 25.0' W	End TS 3-9.0/ begin TS 3-9.1
094	4-Apr	1413			235	57° 57.3' N	154° 20.6' W	End TS 3-9.1/ begin TS 3-8.0
094	4-Apr	1440			128	58° 01.6' N	154° 26.1' W	End TS 3-8.0
094	4-Apr	1545	008	Tuck4	231	57° 58.9' N	154° 29.2' W	1Tuck/lg-CB
094	4-Apr	1714	009	Tuck5	268	57° 54.6' N	154° 36.7' W	1Tuck/lg-CB
094	4-Apr	1820	010	Tuck6	223	57° 51.2' N	154° 30.2' W	1Tuck/lg-CB
094	4-Apr	1923	011	Tuck7	256	57° 51.5' N	154° 39.4' W	1Tuck
094	4-Apr	2104	012	Tuck8	222	57° 55.8' N	154° 20.5' W	1Tuck

TABLE 4. MF93-04 CRUISE SUMMARY

Egg Survey

1 - 11 April, 1993

Date (JD)	Date (GMT)	Time (GMT)	Station Number	FOCI ID No.	Depth (m)	Latitude	Longitude	Gear Code
094	4-Apr	2327	013		271	57° 56.9' N	154° 27.6' W	Meth
095	5-Apr	0035	014		217	57° 59.1' N	154° 29.3' W	Meth/Ig-CB
095	5-Apr	0143			277	57° 56.2' N	154° 27.4' W	Begin ADCP Backtrack-L
095	5-Apr	0323			275	57° 55.3' N	154° 31.7' W	End ADCP Backtrack-L
095	5-Apr	0536	015		264	57° 57.3' N	154° 28.5' W	Meth/Ig-CB
095	5-Apr	0831	016	Tuck9	155	57° 43.1' N	155° 15.9' W	1Tuck/Ig-CB
095	5-Apr	0926	017	Tuck10	291	57° 41.2' N	155° 10.7' W	1Tuck/Ig-CB
095	5-Apr	1021	017	Tuck11	288	57° 40.6' N	155° 10.6' W	1Tuck
095	5-Apr	1117	018	Tuck12	254	57° 38.6' N	155° 04.3' W	1Tuck
095	5-Apr	1204	018	Tuck13	254	57° 38.5' N	155° 04.1' W	1Tuck/Ig-CB
095	5-Apr	1308	019	Tuck14	234	57° 36.5' N	155° 00.8' W	1Tuck/Ig-CB
095	5-Apr	1419	020	Tuck15	259	57° 33.2' N	154° 52.6' W	1Tuck/Ig-CB
095	5-Apr	1519	021	Tuck16	207	57° 30.8' N	154° 46.8' W	1Tuck/Ig-CB
095	5-Apr	1840			176	57° 37.3' N	153° 54.9' W	In Larsen Bay
095	5-Apr	2130			57	57° 40.7' N	154° 02.1' W	Out of Uyak Passing/Bear Is
095	5-Apr	2140			52	57° 40.9' N	154° 05.2' W	Lowered centerboard
095	5-Apr	2357	022	CTD004	211	57° 31.0' N	154° 47.0' W	CTD - Chl: 10,20, 30,40,50 m Nuts: 10,20,30, 40,50 m MZ: 10,20,30,40, 50,60 m
096	6-Apr	0039	022		210	57° 30.7' N	154° 47.5' W	20/60Bon
096	6-Apr	0136	023	CTD005	226	57° 32.9' N	154° 52.1' W	CTD - Chl: 10,20, 30,40,50 m MZ: 10,20,30,40, 50,60 m
096	6-Apr	0208	023		227	57° 33.0' N	154° 52.3' W	20/60Bon
096	6-Apr	0310	024	CTD006	230	57° 36.1' N	155° 00.1' W	CTD - Chl: 10,20, 30,40,50 m Nuts: 10,20,30, 40,50 m MZ: 10,20,30,40, 50,60 m
096	6-Apr	0340	024		228	57° 36.0' N	154° 59.4' W	20/60Bon
096	6-Apr	0432	025	CTD007	248	57° 38.1' N	155° 03.8' W	CTD - Chl: 10,20, 30,40,50 m MZ: 10,20,30,40, 50,60 m

TABLE 4. MF93-04 CRUISE SUMMARY

Egg Survey

1 - 11 April, 1993

Date (JD)	Date (GMT)	Time (GMT)	Station Number	FOCI ID No.	Depth (m)	Latitude	Longitude	Gear Code
096	6-Apr	0509	025		250	57° 38.3' N	155° 03.8' W	20/60Bon
096	6-Apr	0606	026	CTD008	286	57° 41.3' N	155° 10.0' W	CTD - Chl: 10,20, 30,40,50 m Nuts: 10,20,30, 40,50 m MZ: 10,20,30,40, 50,60 m
096	6-Apr	0641	026		285	57° 41.1' N	155° 09.6' W	20/60Bon
096	6-Apr	0741	027	CTD009	295	57° 42.6' N	155° 15.4' W	CTD - Chl: 10,20, 30,40,50 m Nuts: 10,20,30, 40,50 m MZ: 10,20,30,40, 50,60 m
096	6-Apr	0836	027		253	57° 42.9' N	155° 15.7' W	20/60Bon
096	6-Apr	1447	028		217	58° 22.3' N	153° 50.7' W	60Bon
096	6-Apr	1557	029		178	58° 16.4' N	153° 40.6' W	60Bon
096	6-Apr	1701	030		195	58° 10.8' N	153° 51.9' W	60Bon
096	6-Apr	1838	031		195	58° 06.4' N	153° 38.6' W	60Bon
096	6-Apr	1950	032		192	58° 00.9' N	153° 53.2' W	60Bon
096	6-Apr	2105	033		257	58° 08.9' N	154° 03.1' W	60Bon
096	6-Apr	2152	034		288	58° 06.4' N	154° 09.8' W	60Bon
096	6-Apr	2239	035		263	58° 04.9' N	154° 07.8' W	60Bon
096	6-Apr	2340	036		247	58° 02.1' N	154° 11.8' W	60Bon
097	7-Apr	0038	037		288	57° 59.0' N	154° 22.3' W	60Bon
097	7-Apr	0133	038		214	57° 58.2' N	154° 13.9' W	60Bon
097	7-Apr	0210	039		205	57° 56.8' N	154° 11.6' W	60Bon
097	7-Apr	0321	040		207	57° 52.9' N	153° 56.7' W	60Bon
097	7-Apr	0410	041		185	57° 49.5' N	154° 03.7' W	60Bon
097	7-Apr	0452	042		194	57° 47.2' N	154° 09.7' W	60Bon/Neu
097	7-Apr	0550	043		202	57° 48.0' N	154° 21.3' W	60Bon
097	7-Apr	0656	044		252	57° 55.0' N	154° 29.6' W	60Bon
097	7-Apr	0732	045		247	57° 54.0' N	154° 31.1' W	60Bon
097	7-Apr	0814	046		241	57° 52.5' N	154° 34.5' W	60Bon
097	7-Apr	0900	047		260	57° 55.1' N	154° 39.2' W	60Bon
097	7-Apr	0950	048		233	57° 56.0' N	154° 43.4' W	60Bon
097	7-Apr	1034	049		129	57° 55.2' N	154° 49.1' W	60Bon
097	7-Apr	1107	050		42	57° 55.2' N	154° 54.6' W	60Bon
097	7-Apr	1145	051		91	57° 52.4' N	154° 59.5' W	60Bon
097	7-Apr	1222	052		245	57° 51.3' N	154° 57.5' W	60Bon
097	7-Apr	1312	053		295	57° 49.9' N	154° 54.6' W	60Bon
097	7-Apr	1405	054		280	57° 48.3' N	154° 52.4' W	60Bon

TABLE 4. MF93-04 CRUISE SUMMARY

Egg Survey									1 - 11 April, 1993
Date (JD)	Date (GMT)	Time (GMT)	Station Number	FOCI ID No.	Depth (m)	Latitude	Longitude	Gear Code	
097	7-Apr	1509	055		273	57° 52.2' N	154° 44.8' W	60Bon	
097	7-Apr	1701	056		201	57° 43.3' N	154° 19.6' W	60Bon	
097	7-Apr	1800			71	57° 40.8' N	154° 02.1' W	Raised centerboard	
097	7-Apr	1900			54	57° 33.3' N	153° 54.7' W	In Uyak Bay	
097	7-Apr	2237			98	57° 40.5' N	154° 00.8' W	Lowered centerboard	
098	8-Apr	0014	057		215	57° 41.0' N	154° 36.4' W	60Bon	
098	8-Apr	0056	058		222	57° 42.4' N	154° 46.3' W	60Bon	
098	8-Apr	0203	059		272	57° 45.1' N	154° 47.4' W	60Bon	
098	8-Apr	0243	060		315	57° 46.6' N	155° 00.2' W	60Bon	
098	8-Apr	0338	061		252	57° 47.9' N	155° 07.0' W	60Bon	
098	8-Apr	0417	062		284	57° 44.8' N	155° 07.9' W	60Bon	
098	8-Apr	0455	063		290	57° 43.8' N	155° 05.7' W	60Bon	
098	8-Apr	0606	064		225	57° 39.7' N	154° 52.5' W	60Bon	
098	8-Apr	0644	065		220	57° 38.2' N	154° 49.8' W	60Bon	
098	8-Apr	0736	066		207	57° 34.2' N	154° 42.0' W	60Bon	
098	8-Apr	0842	067		245	57° 32.6' N	154° 49.3' W	60Bon	
098	8-Apr	0925	068		224	57° 31.5' N	154° 52.3' W	60Bon	
098	8-Apr	1010	069		232	57° 33.7' N	154° 57.8' W	60Bon	
098	8-Apr	1051	070		236	57° 35.4' N	154° 56.2' W	60Bon	
098	8-Apr	1155	071		276	57° 41.0' N	155° 05.6' W	60Bon	
098	8-Apr	1239	072		285	57° 43.2' N	155° 07.8' W	60Bon	
098	8-Apr	1318	073		293	57° 43.8' N	155° 10.4' W	60Bon	
098	8-Apr	1400	074		293	57° 42.0' N	155° 13.9' W	60Bon	
098	8-Apr	1445	075		301	57° 40.3' N	155° 15.8' W	60Bon	
098	8-Apr	1538	076		294	57° 41.0' N	155° 13.1' W	60Bon	
098	8-Apr	1639	077		259	57° 35.2' N	155° 09.6' W	60Bon	
098	8-Apr	1738	078		233	57° 34.2' N	155° 03.0' W	60Bon	
098	8-Apr	1815	079		234	57° 32.6' N	155° 05.2' W	60Bon	
098	8-Apr	1917	080		229	57° 28.7' N	154° 57.4' W	60Bon	
098	8-Apr	2007	081		186	57° 27.4' N	154° 50.3' W	60Bon	
098	8-Apr	2100	082		216	57° 22.9' N	154° 57.3' W	60Bon	
098	8-Apr	2134	083		231	57° 21.4' N	155° 00.2' W	60Bon	
098	8-Apr	2229	084		237	57° 27.0' N	155° 05.1' W	60Bon	
098	8-Apr	2347	085		285	57° 35.3' N	155° 15.7' W	60Bon	
099	9-Apr	0029	086		311	57° 36.6' N	155° 18.4' W	60Bon	
099	9-Apr	0111	087		333	57° 37.5' N	155° 20.2' W	60Bon	
099	9-Apr	0157	088		71	57° 36.7' N	155° 28.1' W	60Bon	
099	9-Apr	0240	089		315	57° 33.8' N	155° 23.4' W	60Bon	
099	9-Apr	0000			268	57° 47.5' N	155° 00.0' W	Searching for fish	
099	9-Apr	0551	090	Tuck17	289	57° 43.7' N	155° 09.0' W	1Tuck - Surface Tow	
099	9-Apr	0747	091		291	57° 43.8' N	155° 09.1' W	Nor - Bottom Net Trawl (EQ)	

TABLE 4. MF93-04 CRUISE SUMMARY

Egg Survey

1 - 11 April, 1993

Date (JD)	Date (GMT)	Time (GMT)	Station Number	FOCI ID No.	Depth (m)	Latitude	Longitude	Gear Code
099	9-Apr	0849	091	CTD010	291	57° 43.8' N	155° 08.5' W	CTD
099	9-Apr	1048	092		72	57° 31.3' N	155° 37.9' W	60Bon
099	9-Apr	1129	093		304	57° 29.9' N	155° 30.8' W	60Bon
099	9-Apr	1229	094		279	57° 25.5' N	155° 26.5' W	60Bon
099	9-Apr	1322	095		269	57° 21.4' N	155° 27.1' W	60Bon
099	9-Apr	1427	096		258	57° 25.5' N	155° 19.7' W	60Bon
099	9-Apr	1517	097		250	57° 27.2' N	155° 15.6' W	60Bon
099	9-Apr	1620	098		239	57° 24.5' N	155° 11.6' W	60Bon
099	9-Apr	1707	099		239	57° 21.4' N	155° 10.3' W	60Bon (mud tow)
099	9-Apr	1805	099		237	57° 21.3' N	155° 10.2' W	60Bon
099	9-Apr	1907	100		220	57° 17.2' N	155° 01.3' W	60Bon
099	9-Apr	2017	101		246	57° 15.4' N	155° 20.1' W	60Bon
099	9-Apr	2132	102		228	57° 10.1' N	155° 09.6' W	60Bon
099	9-Apr	2317	103		145	57° 01.8' N	154° 59.9' W	60Bon
099	9-Apr	2357	104		114	56° 57.4' N	155° 02.1' W	60Bon
100	10-Apr	0128	105		255	57° 07.4' N	155° 20.0' W	60Bon
100	10-Apr	0245	106		273	57° 08.3' N	155° 37.6' W	60Bon
100	10-Apr	0351	107		265	57° 11.0' N	155° 48.6' W	60Bon
100	10-Apr	0432	108		230	57° 20.5' N	155° 51.0' W	60Bon
100	10-Apr	0538	109		221	57° 18.1' N	155° 56.0' W	60Bon
100	10-Apr	0720	110		85	57° 02.7' N	156° 08.0' W	60Bon
100	10-Apr	0813	111		243	57° 01.4' N	155° 56.0' W	60Bon
100	10-Apr	0912	112		210	56° 56.8' N	156° 02.9' W	60Bon
100	10-Apr	1019	113		193	56° 50.2' N	156° 11.6' W	60Bon
100	10-Apr	1116	114		240	56° 47.9' N	156° 03.4' W	60Bon
100	10-Apr	1240	115		292	56° 53.1' N	155° 45.0' W	60Bon
100	10-Apr	1416	116		271	57° 02.8' N	155° 33.1' W	60Bon
100	10-Apr	1818	117		321	57° 36.0' N	155° 22.5' W	Sled/lg-CB
100	10-Apr	1923	117		321	57° 36.2' N	155° 20.8' W	60Bon
100	10-Apr	2038	118		303	57° 39.5' N	155° 15.8' W	Sled/lg-CB
100	10-Apr	2130	118		309	57° 38.7' N	155° 16.8' W	60Bon
100	10-Apr	2258	119		286	57° 43.8' N	155° 10.5' W	Trawl (EQ)
101	11-Apr	0110	120	Tuck18	298	57° 41.3' N	155° 12.7' W	1Tuck
101	11-Apr	0148	120		294	57° 41.4' N	155° 12.1' W	60Bon
101	11-Apr	0530	120		46	57° 01.2' N	154° 41.5' W	Raised centerboard

MF93-05 (FOCI-93-03): 13–30 April, 1993

SCIENTIFIC PERSONNEL

<u>Name</u>	<u>Title</u>	<u>Organization</u>
Bill Rugen	Chief Scientist	AFSC/NOAA
Doug Schleiger		PMEL/NOAA
Stella Spring		AFSC/NOAA
Lisa Britt		AFSC/NOAA
Leslie Lawrence		PMEL/NOAA
Sigrid Salo		PMEL/NOAA
William Flerx		AFSC/NOAA
Patricia Dell'Arciprete		Univ. Wash
Lewis Haldorson		Univ. AK, Fairbanks
Nicola Hilgruber		Univ. AK, Fairbanks

CRUISE STATISTICS

ADCP backtrack "L"	1
Bongos, 20 cm	58
Bongos, 60 cm	63
Bongo, live tows	25
Bongo, surface tows	2
Chlorophyll samples	35
CTD casts	31
Drifters, satellite-tracked	6
Hydroline	1
Larvae for histology	16
Larvae for gut and otolith analysis	11,215
Macrozooplankton samples,	
size fractionated	5
Microzooplankton	9
MOCNESSes	24
Protozoans (frozen)	2
Protozoans (lugols)	5
Ring 1—Live Tows	6
Tucker trawls	8

OBJECTIVES

The objectives of MF93-05 (FOCI-93-03) were to:

- continue acquisition of long-term biological and physical time series
- conduct large-scale and small-scale ichthyoplankton and zooplankton surveys in the Bogoslof Island area to determine horizontal patterns of distribution and abundance of walleye pollock larvae and locate areas of high concentrations
- collect larvae for age and feeding analysis
- collect larvae and microzooplankton to study horizontal feeding patterns
- release satellite-tracked drifter buoys in areas of high larval concentrations so that the currents affecting larval advection and dispersal may be studied
- collect vertical distribution information for calibration of ADCP backscatter
- collect protozoa as prey for larvae
- collect macrozooplankton to study biochemical composition

CRUISE REPORT

We proceeded to the study area in the Bering Sea and began exploratory bongo tows to determine the variability in larval depth distribution. This work enabled us to adjust the depth of bongo tows during large- and small-scale grid work. Because of problems with the MOCNESS gear, a series of Tucker trawls was done to determine the larval depth distribution. The sampling scheme was:

tow #	Net 1	Net 2
1	500–400 m	400–0 m
2	400–300 m	300–0 m
3	300–200 m	200–0 m
4	200–100 m	100–0 m

The Scanmar was used to determine the sampling depths on the first of the two Tucker series, but because of battery failure, we used wire-out from the first series to determine net depths during the second series. Because of the number of larvae found deeper in the water column, it was decided that the bongo tows would be done to 400 m. Pollock larvae were removed for future gut and otolith analyses.

Next, we did a large-scale bongo grid of 54 stations spaced 15 nm apart. This lasted from April 16–21. Pollock larvae were removed for future gut and otolith analysis.

The MOCNESS was fished once during the large-scale grid to assure that it was working properly and again once the large-scale grid was finished. It was rigged with 153 μ m mesh nets and fished obliquely and sampled the depths 500–400 m, 400–300 m, 300–200 m, 200–100 m, 100–75 m, 75–50 m, 50–25 m. Pollock larvae were removed for future gut and otolith analysis.

We then began a small-scale bongo grid of 25 stations situated 3.75 nm apart. As with the large-scale grid, the target tow depth was 400 m. However, because of problems with the Seacat, tow depths were estimated based on wire out readings taken during the large-scale grid. The wire out used was 520 m. Pollock larvae were removed for future gut and otolith analysis.

OBJECTIVES

The objectives of MF93-05 (FOCI-93-03) were to:

- continue acquisition of long-term biological and physical time series
- conduct large-scale and small-scale ichthyoplankton and zooplankton surveys in the Bogoslof Island area to determine horizontal patterns of distribution and abundance of walleye pollock larvae and locate areas of high concentrations
- collect larvae for age and feeding analysis
- collect larvae and microzooplankton to study horizontal feeding patterns
- release satellite-tracked drifter buoys in areas of high larval concentrations so that the currents affecting larval advection and dispersal may be studied
- collect vertical distribution information for calibration of ADCP backscatter
- collect protozoa as prey for larvae
- collect macrozooplankton to study biochemical composition

CRUISE REPORT

We proceeded to the study area in the Bering Sea and began exploratory bongo tows to determine the variability in larval depth distribution. This work enabled us to adjust the depth of bongo tows during large- and small-scale grid work. Because of problems with the MOCNESS gear, a series of Tucker trawls was done to determine the larval depth distribution. The sampling scheme was:

tow #	Net 1	Net 2
1	500–400 m	400–0 m
2	400–300 m	300–0 m
3	300–200 m	200–0 m
4	200–100 m	100–0 m

The Scanmar was used to determine the sampling depths on the first of the two Tucker series, but because of battery failure, we used wire-out from the first series to determine net depths during the second series. Because of the number of larvae found deeper in the water column, it was decided that the bongo tows would be done to 400 m. Pollock larvae were removed for future gut and otolith analyses.

Next, we did a large-scale bongo grid of 54 stations spaced 15 nm apart. This lasted from April 16–21. Pollock larvae were removed for future gut and otolith analysis.

The MOCNESS was fished once during the large-scale grid to assure that it was working properly and again once the large-scale grid was finished. It was rigged with 153 μ m mesh nets and fished obliquely and sampled the depths 500–400 m, 400–300 m, 300–200 m, 200–100 m, 100–75 m, 75–50 m, 50–25 m. Pollock larvae were removed for future gut and otolith analysis.

We then began a small-scale bongo grid of 25 stations situated 3.75 nm apart. As with the large-scale grid, the target tow depth was 400 m. However, because of problems with the Seacat, tow depths were estimated based on wire out readings taken during the large-scale grid. The wire out used was 520 m. Pollock larvae were removed for future gut and otolith analysis.

salinity. The evidence suggests that an eddy was present in that area. Larvae found at the shelf station appeared to be larger than those found in other areas of the basin. The vertical distribution of the larvae shows that they are generally confined to the upper 50 m of the water column both on the shelf and in the basin.

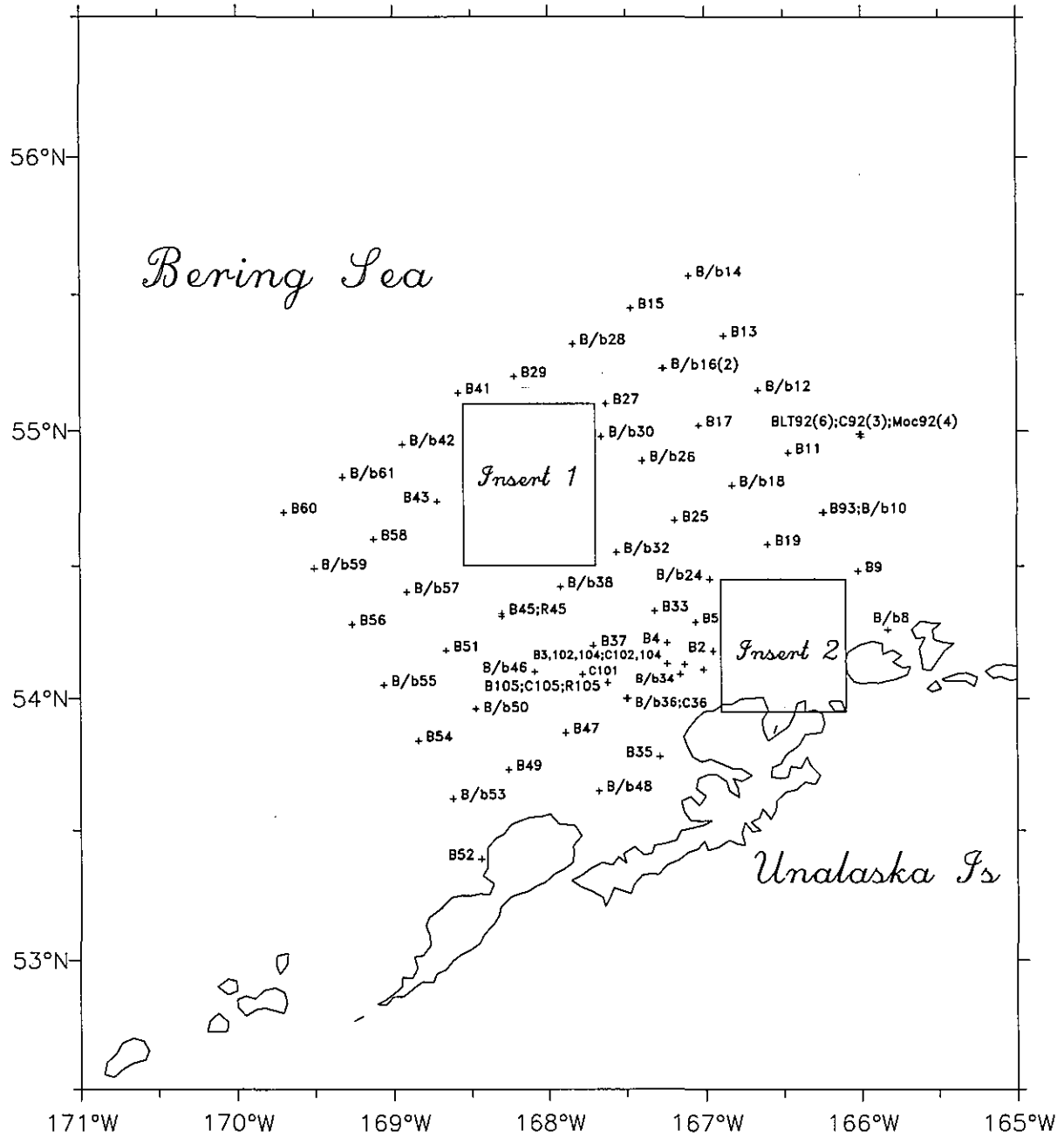


Fig. 3.1. MF93-05 60 cm Bongo (B), 20/60 cm Bongo (B/b), Bongo Live Tow (BLT), CTD (C), MOCNESS (Moc) and Ring (R) stations.

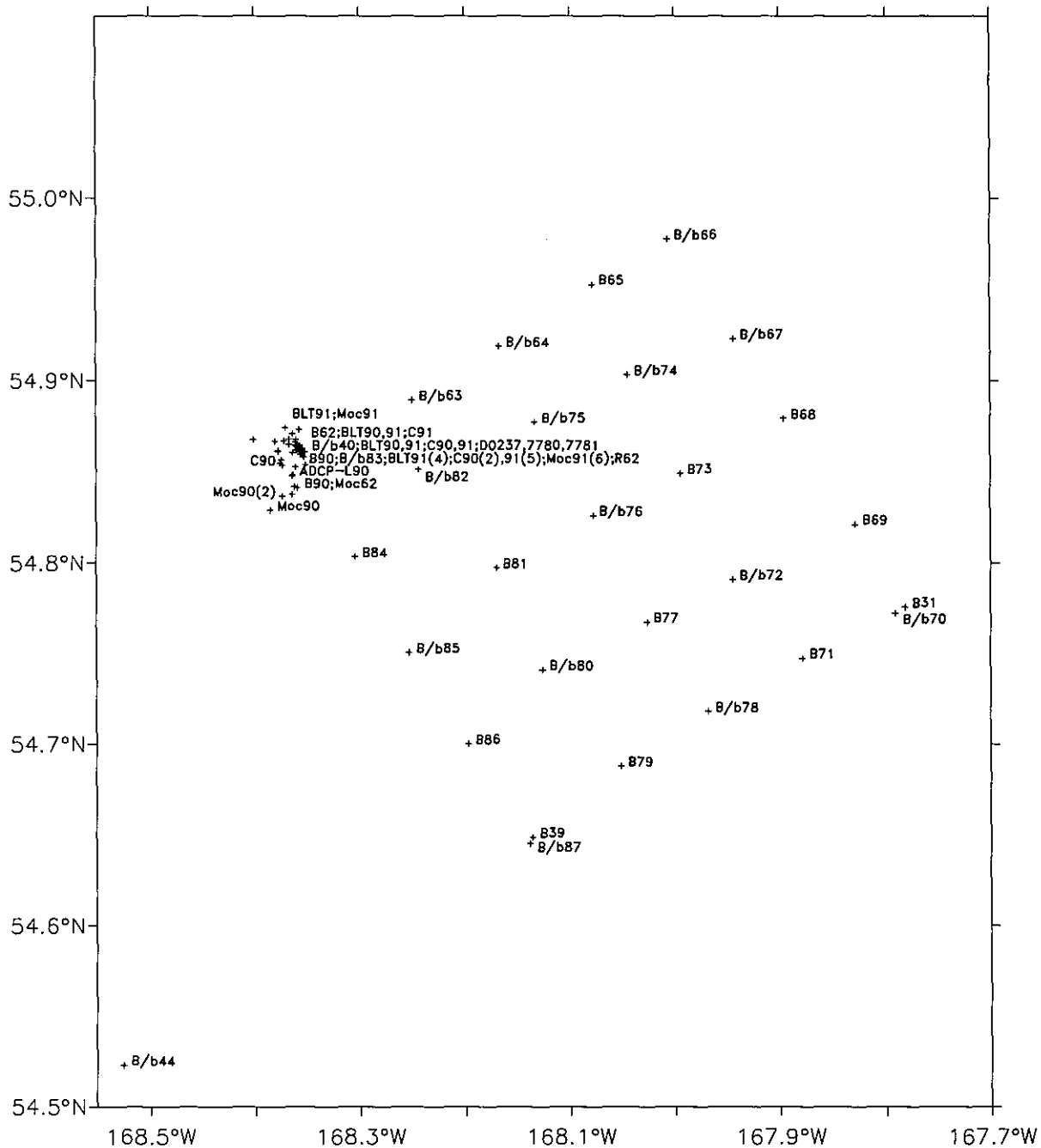


Fig. 3.2. MF93-05 Insert 1—ADCP, 60 cm Bongo (B), 20/60 cm Bongo (B/b), CTD (C), Drifter (D), MOCNESS (Moc), and Ring (R) stations.

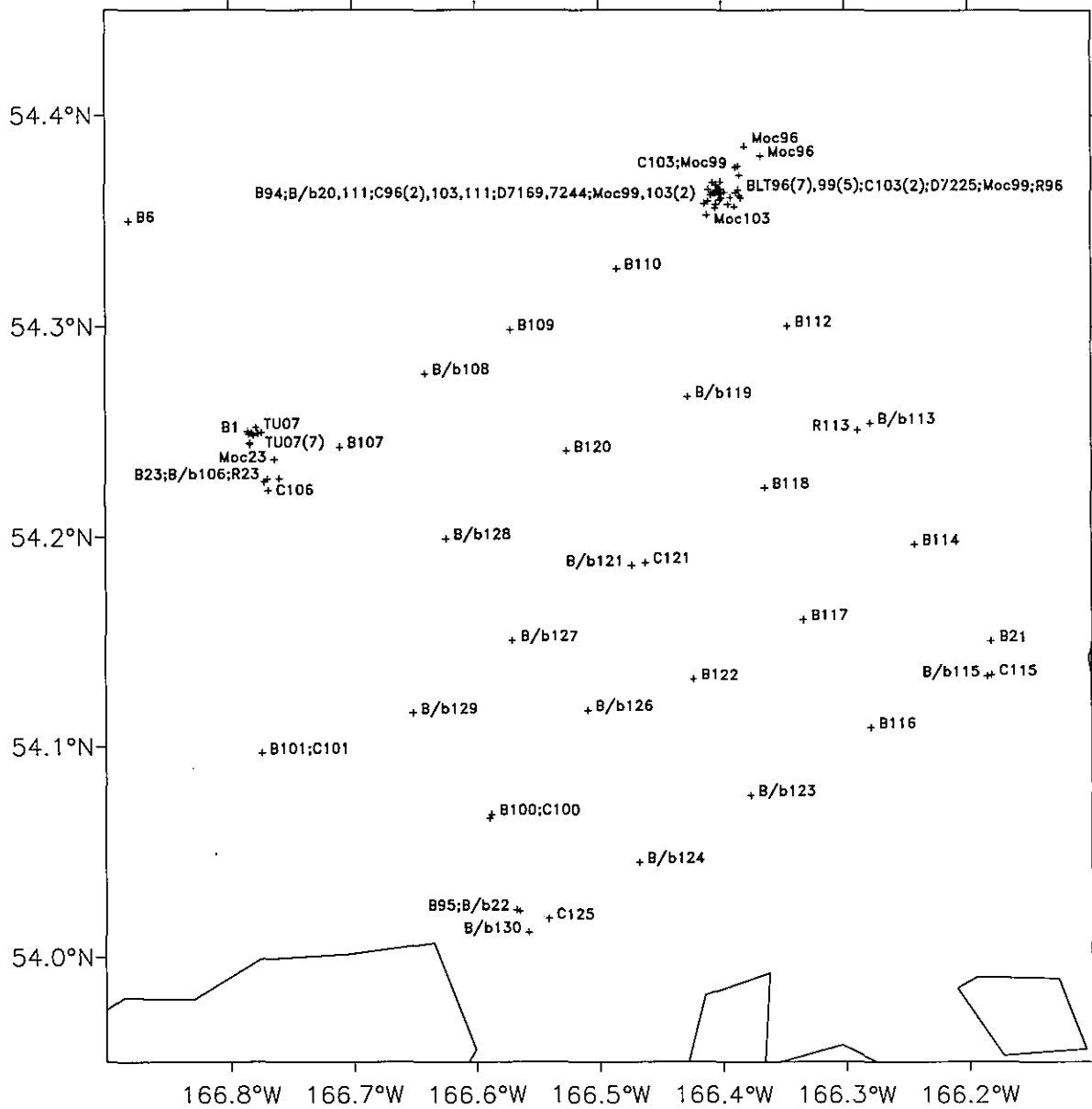


Fig. 3.3. MF93-05 Insert 2—60 cm Bongo (B), 20/60 cm Bongo (B/b), CTD (C), Drifter (D), MOCNESS (Moc), and Ring (R) stations.

TABLE 5. MF93-05 CRUISE SUMMARY

Feeding Larvae

13 - 30 April, 1993

Date (JD)	Date (JD)	Time (GMT)	Station Number	FOCI ID No.	Depth (m)	Latitude	Longitude	Gear Code
104	14-Apr	0103			112	57° 44.0' N	152° 20.7' W	Departing Marmot Bay
104	14-Apr	0141			152	57° 41.2' N	152° 07.4' W	Lowered centerboard
105	15-Apr	0420		HYDRO1	110	54° 58.8' N	160° 31.4' W	Begin Hydroline
105	15-Apr	0800			145	54° 34.7' N	161° 43.7' W	End Hydroline
105	15-Apr	2143	1		1203	54° 15.0' N	166° 47.1' W	60Bon (Presurvey)
105	15-Apr	2245	2		1527	54° 11.0' N	166° 56.8' W	60Bon (Presurvey)
105	15-Apr	2351	3		1456	54° 07.7' N	167° 08.0' W	60Bon (Presurvey)
106	16-Apr	0044	4		1770	54° 12.5' N	167° 14.6' W	60Bon (Presurvey)
106	16-Apr	0148	5		1310	54° 17.2' N	167° 03.5' W	60Bon (Presurvey)
106	16-Apr	0246	6		704	54° 21.0' N	166° 52.8' W	60Bon (Presurvey)
106	16-Apr	0739	7	TUCK1	1200	54° 15.0' N	166° 46.5' W	1Tuck
106	16-Apr	0902	7	TUCK2	1214	54° 14.7' N	166° 47.0' W	1Tuck
106	16-Apr	1011	7	TUCK3	1187	54° 15.1' N	166° 46.7' W	1Tuck
106	16-Apr	1108	7	TUCK4	1214	54° 14.6' N	166° 47.0' W	1Tuck
106	16-Apr	1211	7	TUCK5	1195	54° 15.0' N	166° 46.6' W	1Tuck
106	16-Apr	1342	7	TUCK6	1208	54° 14.9' N	166° 47.1' W	1Tuck
106	16-Apr	1456	7	TUCK7	1202	54° 14.9' N	166° 46.9' W	1Tuck
106	16-Apr	1555	7	TUCK8	1204	54° 15.0' N	166° 47.0' W	1Tuck
106	16-Apr	1934	8		79	54° 15.8' N	165° 49.6' W	20/60Bon
106	16-Apr	2120	9		529	54° 29.1' N	166° 01.5' W	60Bon
106	16-Apr	2323	10		285	54° 42.0' N	166° 14.9' W	20/60Bon
107	17-Apr	0114	11		151	54° 55.1' N	166° 28.0' W	60Bon
107	17-Apr	0254	12		139	55° 09.0' N	166° 39.8' W	20/60Bon
107	17-Apr	0428	13		136	55° 20.8' N	166° 52.8' W	60Bon
107	17-Apr	0601	14		134	55° 34.2' N	167° 05.7' W	20/60Bon
107	17-Apr	0726	15		137	55° 27.0' N	167° 28.1' W	60Bon
107	17-Apr	0905	16		147	55° 13.9' N	167° 15.9' W	20/60Bon
107	17-Apr	0945	16		146	55° 13.8' N	167° 15.4' W	20/60Bon
107	17-Apr	1118	17		156	55° 01.2' N	167° 02.6' W	60Bon
107	17-Apr	1256	18		284	54° 47.9' N	166° 50.0' W	20/60Bon
107	17-Apr	1452	19		410	54° 34.9' N	166° 36.0' W	60Bon
107	17-Apr	1652	20		659	54° 21.6' N	166° 24.0' W	20/60Bon
107	17-Apr	1834	21		79	54° 09.0' N	166° 10.9' W	60Bon
107	17-Apr	2004	22		121	54° 01.4' N	166° 34.1' W	20/60Bon
107	17-Apr	2153	23		1281	54° 13.6' N	166° 46.3' W	60Bon
107	17-Apr	2247	23		1268	54° 13.7' N	166° 45.6' W	Ring1 - Live Tow
107	17-Apr	2357	23		1231	54° 14.2' N	166° 45.9' W	MOC1
108	18-Apr	0225	24		512	54° 26.8' N	166° 58.4' W	20/60Bon
108	18-Apr	0425	25		458	54° 40.1' N	167° 11.7' W	60Bon
108	18-Apr	0616	26		412	54° 53.5' N	167° 23.7' W	20/60Bon
108	18-Apr	0800	27		291	55° 06.2' N	167° 37.7' W	60Bon
108	18-Apr	0943	28		217	55° 19.3' N	167° 50.5' W	20/60Bon

TABLE 5. MF93-05 CRUISE SUMMARY

13 - 30 April, 1993

Feeding Larvae

Date (JD)	Date (JD)	Time (GMT)	Station Number	FOCI ID No.	Depth (m)	Latitude	Longitude	Gear Code
108	18-Apr	1131	29		1438	55° 12.0' N	168° 13.1' W	60Bon
108	18-Apr	1337	30		1238	54° 59.0' N	167° 39.7' W	20/60Bon
108	18-Apr	1533	31		1385	54° 46.5' N	167° 46.9' W	60Bon
108	18-Apr	1734	32		702	54° 33.3' N	167° 33.5' W	20/60Bon
108	18-Apr	1934	33		822	54° 19.6' N	167° 19.5' W	60Bon
108	18-Apr	2129	34		1383	54° 05.6' N	167° 09.5' W	20/60Bon
108	18-Apr	2300	34		1272	54° 05.6' N	167° 06.1' W	MOC1 (aborted)
109	19-Apr	0051	35		144	53° 46.9' N	167° 17.5' W	60Bon
109	19-Apr	0228	36		1630	54° 00.0' N	167° 29.9' W	20/60Bon
109	19-Apr	0338	36	CTD001	1611	54° 00.0' N	167° 29.5' W	CTD
109	19-Apr	0528	37		1450	54° 12.3' N	167° 42.4' W	60Bon
109	19-Apr	0732	38		1067	54° 25.2' N	167° 55.4' W	20/60Bon
109	19-Apr	0936	39		1697	54° 38.9' N	168° 08.2' W	60Bon
109	19-Apr	1135	40		2100	54° 51.7' N	168° 22.6' W	20/60Bon
109	19-Apr	1342	41		1947	55° 08.2' N	168° 34.9' W	60Bon
109	19-Apr	1552	42		2191	54° 57.0' N	168° 56.3' W	20/60Bon
109	19-Apr	1743	43		2080	54° 44.4' N	168° 43.5' W	60Bon
109	19-Apr	1932	44		1471	54° 31.4' N	168° 31.5' W	20/60Bon
109	19-Apr	2128	45		1531	54° 18.9' N	168° 18.2' W	60Bon
109	19-Apr	2219	45		1601	54° 18.4' N	168° 18.0' W	Ring1 - Live Tow
110	20-Apr	0007	46		2143	54° 05.8' N	168° 05.5' W	20/60Bon
110	20-Apr	0203	47		1550	53° 52.3' N	167° 53.7' W	60Bon
110	20-Apr	0429	48		1260	53° 39.2' N	167° 40.6' W	20/60Bon
110	20-Apr	0704	49		1622	53° 44.1' N	168° 15.7' W	60Bon
110	20-Apr	0915	50		2087	53° 57.4' N	168° 28.2' W	20/60Bon
110	20-Apr	1125	51		2578	54° 10.8' N	168° 39.4' W	60Bon
110	20-Apr	2224	52		49	53° 23.4' N	168° 26.4' W	60Bon
110	20-Apr	2359	53		1281	53° 36.9' N	168° 37.3' W	20/60Bon
111	21-Apr	0149	54		1885	53° 50.4' N	168° 50.7' W	60Bon
111	21-Apr	0339	55		2187	54° 02.9' N	169° 03.5' W	20/60Bon
111	21-Apr	0541	56		2756	54° 16.8' N	169° 15.5' W	60Bon
111	21-Apr	0737	57		1740	54° 23.9' N	168° 54.5' W	20/60Bon
111	21-Apr	0932	58		1582	54° 36.2' N	169° 06.9' W	60Bon
111	21-Apr	1149	59		2703	54° 29.2' N	169° 29.8' W	20/60Bon
111	21-Apr	1339	60		2450	54° 41.9' N	169° 41.7' W	60Bon
111	21-Apr	1534	61		2155	54° 49.5' N	169° 19.1' W	20/60Bon
111	21-Apr	1848	62		2195	54° 51.6' N	168° 21.3' W	60Bon
111	21-Apr	2056	62	MOC1	2220	54° 50.5' N	168° 21.5' W	MOC1
111	21-Apr	2220	62		2116	54° 51.9' N	168° 21.4' W	Ring1 - Live Tow
111	21-Apr	2321	63		1962	54° 53.4' N	168° 15.0' W	20/60Bon
112	22-Apr	0026	64		1781	54° 55.1' N	168° 10.0' W	20/60Bon
112	22-Apr	0125	65		1532	54° 57.2' N	168° 04.7' W	60Bon

TABLE 5. MF93-05 CRUISE SUMMARY

Feeding Larvae

13 - 30 April, 1993

Date (JD)	Date (JD)	Time (GMT)	Station Number	FOCI ID No.	Depth (m)	Latitude	Longitude	Gear Code
112	22-Apr	0233	66		1289	54° 58.7' N	168° 00.4' W	20/60Bon
112	22-Apr	0330	67		1604	54° 55.4' N	167° 56.6' W	20/60Bon
112	22-Apr	0459	68		1818	54° 52.8' N	167° 53.7' W	60Bon
112	22-Apr	0609	69		1691	54° 49.3' N	167° 49.7' W	60Bon
112	22-Apr	0720	70		1284	54° 46.3' N	167° 47.4' W	20/60Bon
112	22-Apr	0824	71		1496	54° 44.8' N	167° 52.7' W	60Bon
112	22-Apr	0926	72		1640	54° 47.5' N	167° 56.7' W	20/60Bon
112	22-Apr	1021	73		1750	54° 51.0' N	167° 59.7' W	60Bon
112	22-Apr	1116	74		1751	54° 54.2' N	168° 02.7' W	20/60Bon
112	22-Apr	1218	75		1746	54° 52.6' N	168° 08.0' W	20/60Bon
112	22-Apr	1327	76		1745	54° 49.6' N	168° 04.7' W	20/60Bon
112	22-Apr	1435	77		1444	54° 46.0' N	168° 01.6' W	60Bon
112	22-Apr	1557	78		1263	54° 43.1' N	167° 58.1' W	20/60Bon
112	22-Apr	1702	79		1501	54° 41.3' N	168° 03.1' W	60Bon
112	22-Apr	1813	80		1641	54° 44.5' N	168° 07.6' W	20/60Bon
112	22-Apr	1909	81		1897	54° 47.8' N	168° 10.2' W	60Bon
112	22-Apr	2008	82		2118	54° 51.1' N	168° 14.7' W	20/60Bon
112	22-Apr	2100			2157	54° 51.5' N	168° 18.1' W	Seacat test
112	22-Apr	2130	83		2204	54° 51.2' N	168° 21.1' W	20/60Bon
112	22-Apr	2229	84		2062	54° 48.2' N	168° 18.2' W	60Bon
112	22-Apr	2320	85		1831	54° 45.0' N	168° 15.2' W	20/60Bon
113	23-Apr	0025	86		1620	54° 42.0' N	168° 11.8' W	60Bon
113	23-Apr	0122	87		1725	54° 38.7' N	168° 08.3' W	20/60Bon
113	23-Apr	0302	88	D7780	2187	54° 51.7' N	168° 21.1' W	SatBuoy 7780
113	23-Apr	0312	89	D0237	2205	54° 51.7' N	168° 22.6' W	SatBuoy 0237
113	23-Apr	0324	90	D7781	2220	54° 50.9' N	168° 21.8' W	SatBuoy 7781
113	23-Apr	0349	90	CTD002	2221	54° 51.2' N	168° 22.3' W	CTD - Chl: 10,20, 30,40,50 m
113	23-Apr	0513	90	MOC2	2182	54° 49.7' N	168° 23.1' W	MOC1
113	23-Apr	0715	90		2212	54° 51.2' N	168° 21.6' W	60Bon - Live Tow
113	23-Apr	0750	90		2203	54° 50.5' N	168° 21.7' W	60Bon - Live Tow
113	23-Apr	0838	90	MOC3	2202	54° 50.3' N	168° 21.8' W	MOC1
113	23-Apr	1020	90	MOC4	2205	54° 50.2' N	168° 22.4' W	MOC1
113	23-Apr	1152	90	CTD003	2180	54° 51.8' N	168° 21.5' W	CTD - Chl: 10,20, 30,40,50 m
113	23-Apr	1257	90		2186	54° 51.7' N	168° 21.1' W	60Bon - Live Tow
113	23-Apr	1327	90		2198	54° 51.6' N	168° 21.2' W	60Bon - Live Tow
113	23-Apr	1400	90	CTD004	2180	54° 51.6' N	168° 21.8' W	CTD - Protozoans: 10,20,30,40,50,70,80,90, 100 m

TABLE 5. MF93-05 CRUISE SUMMARY

Feeding Larvae

13 - 30 April, 1993

Date (JD)	Date (JD)	Time (GMT)	Station Number	FOCI ID No.	Depth (m)	Latitude	Longitude	Gear Code
113	23-Apr	1451	90	CTD005	2175	54° 51.8' N	168° 21.3' W	CTD - Protozoans: 10,20,30,40,50, 60(2),70,80,90 m
113	23-Apr	1520	90		2215	54° 50.9' N	168° 21.8' W	Begin ADCP Backtrack-L
113	23-Apr	1730	90		2195	54° 51.7' N	168° 21.8' W	End ADCP Backtrack-L
113	23-Apr	1811	91	CTD006	2190	54° 52.0' N	168° 22.8' W	CTD - MZ: 5,10,20, 30,40,50,70,90 m (U of Alaska)
113	23-Apr	1900	91	CTD007	2173	54° 51.8' N	168° 21.5' W	CTD - MZ: 5,10, 20(2),30,40,50,70,90 m (U of Alaska)
113	23-Apr	1956	91		2115	54° 52.4' N	168° 21.4' W	60Bon - Live Tow
113	23-Apr	2033	91	MOC5	2142	54° 52.5' N	168° 22.2' W	MOC1
113	23-Apr	2231	91	CTD008	2171	54° 51.8' N	168° 21.2' W	CTD - MZ: 5,10,20, 30,40,50,70,90 m
113	23-Apr	2319	91	MOC6	2162	54° 51.9' N	168° 21.5' W	MOC1
114	24-Apr	0039	91	CTD009	2131	54° 52.3' N	168° 21.8' W	CTD - MZ: 5,10,20, 30,40,50,70,90 m
114	24-Apr	0128	91	MOC7	2180	54° 51.9' N	168° 22.0' W	MOC1
114	24-Apr	0248	91	CTD010	2218	54° 51.4' N	168° 22.4' W	CTD - Protozoans: 10,20,30,40,50,60,70,80, 90,100 m
114	24-Apr	0352	91	CTD011	2148	54° 52.1' N	168° 22.0' W	CTD - Chl: 10,20, 30,40,50 m
114	24-Apr	0445	91	MOC8	2222	54° 51.3' N	168° 22.5' W	MOC1
114	24-Apr	0642	91	MOC9	2141	54° 52.1' N	168° 21.6' W	MOC1
114	24-Apr	0921	91	MOC10	2214	54° 52.1' N	168° 24.1' W	MOC1
114	24-Apr	1126	91	CTD012	2181	54° 51.7' N	168° 21.5' W	CTD - Chl: 10,20, 30,40,50 m
114	24-Apr	1206	91		2167	54° 52.0' N	168° 22.3' W	60Bon - Live Tow
114	24-Apr	1234	91		2195	54° 51.5' N	168° 21.1' W	60Bon - Live Tow
114	24-Apr	1256	91		2192	54° 51.6' N	168° 21.3' W	60Bon - Live Tow
114	24-Apr	1323	91		2180	54° 51.8' N	168° 21.4' W	60Bon - Live Tow
114	24-Apr	1347	91		2170	54° 51.9' N	168° 21.6' W	60Bon - Live Tow
114	24-Apr	1404	91		2172	54° 52.0' N	168° 21.6' W	60Bon - Live Tow
114	24-Apr	1842	91	MOC11	2164	54° 51.9' N	168° 21.4' W	MOC1
115	25-Apr	0200	92	MOC12	135	54° 59.6' N	166° 00.0' W	MOC1
115	25-Apr	0258	92	MOC13	135	54° 59.4' N	165° 59.9' W	MOC1

TABLE 5. MF93-05 CRUISE SUMMARY

Feeding Larvae

13 - 30 April, 1993

Date (JD)	Date (JD)	Time (GMT)	Station Number	FOCI ID No.	Depth (m)	Latitude	Longitude	Gear Code
115	25-Apr	0336	92	CTD013	136	54° 59.4' N	166° 00.1' W	CTD - Chl: 10,20,30, 40,50 m; Protozoans: 10,20,30, 40,50,60,70,80, 90,100 m
115	25-Apr	0413	92	CTD014	136	54° 59.6' N	166° 00.2' W	CTD - Protozoans: 10,20,30,40,50,60, 70,80,90,100 m
115	25-Apr	0516	92	CTD015	136	54° 59.2' N	166° 00.0' W	CTD - Protozoans: 10,20,30,40,50,60,70, 80,90,100 m
115	25-Apr	0552	92		136	54° 59.2' N	165° 59.8' W	60Bon - Live Tow
115	25-Apr	0615	92		136	54° 59.3' N	166° 00.2' W	60Bon - Live Tow
115	25-Apr	0639	92		137	54° 59.2' N	166° 00.5' W	60Bon - Live Tow
115	25-Apr	0711	92		136	54° 59.1' N	166° 00.8' W	60Bon - Live Tow
115	25-Apr	0735	92		137	54° 59.1' N	166° 00.2' W	60Bon - Live Tow
115	25-Apr	0757	92		136	54° 59.2' N	166° 00.2' W	60Bon - Live Tow
115	25-Apr	0841	92	MOC14	136	54° 59.4' N	165° 59.9' W	MOC1
115	25-Apr	1005	92	MOC15	135	54° 58.9' N	165° 59.8' W	MOC1
115	25-Apr	1213	93		278	54° 42.1' N	166° 14.3' W	60Bon
115	25-Apr	1419	94		659	54° 21.7' N	166° 23.1' W	60Bon
115	25-Apr	1626	95		120	54° 01.3' N	166° 33.9' W	60Bon
115	25-Apr	1800			12	53° 51.1' N	166° 34.4' W	Moored Captain's Bay
117	27-Apr	0628			54	53° 54.9' N	166° 35.2' W	Outbound Captain's Bay
117	27-Apr	0730			246	54° 06.4' N	166° 30.3' W	Lowered centerboard
117	27-Apr	0930			666	54° 21.8' N	166° 23.7' W	MOC1 tech difficulties
117	27-Apr	1128	96	MOC16	629	54° 22.8' N	166° 22.1' W	MOC1
117	27-Apr	1324	96	CTD016	650	54° 21.5' N	166° 23.7' W	CTD - Chl: 10,20, 30,40,50 m
117	27-Apr	1425	96		635	54° 22.0' N	166° 24.2' W	60Bon - Surface Tow
117	27-Apr	1449	96		654	54° 21.8' N	166° 24.0' W	60Bon - Live Tow
117	27-Apr	1542	96		650	54° 21.9' N	166° 24.0' W	60Bon - Live Tow
117	27-Apr	1608	96		652	54° 21.9' N	166° 24.1' W	60Bon - Live Tow
117	27-Apr	1632	96		652	54° 21.9' N	166° 24.2' W	60Bon - Live Tow
117	27-Apr	1653	96		656	54° 21.7' N	166° 24.1' W	60Bon - Live Tow
117	27-Apr	1719	96		654	54° 21.8' N	166° 24.2' W	60Bon - Live Tow
117	27-Apr	2003	96	MOC17	612	54° 23.1' N	166° 22.9' W	MOC1
117	27-Apr	2040	96		652	54° 21.8' N	166° 23.8' W	Ring1 - Live Tow

TABLE 5. MF93-05 CRUISE SUMMARY

Feeding Larvae

13 - 30 April, 1993

Date (JD)	Date (JD)	Time (GMT)	Station Number	FOCI ID No.	Depth (m)	Latitude	Longitude	Gear Code
117	27-Apr	2336	96	CTD017	656	54° 21.7' N	166° 23.5' W	CTD - Chl: 10,20,30, 40,50 m; Protozoans: 10,20,30, 40,50,60,70,80, 90,100 m
117	27-Apr	2309	96	D7244	658	54° 21.7' N	166° 23.0' W	SatBuoy 7244
117	27-Apr	2318	97	D7169	668	54° 21.4' N	166° 23.3' W	SatBuoy 7169
117	27-Apr	2323	98	D7225	650	54° 21.9' N	166° 23.1' W	SatBuoy 7225
118	28-Apr	0200	99	MOC18	650	54° 21.5' N	166° 24.8' W	MOC1
118	28-Apr	0249	99		641	54° 22.1' N	166° 24.4' W	60Bon - Surface Tow
118	28-Apr	0306	99		640	54° 21.7' N	166° 24.5' W	60Bon - Live Tow
118	28-Apr	0332	99		647	54° 21.9' N	166° 24.6' W	60Bon - Live Tow
118	28-Apr	0524	99	MOC19	641	54° 22.1' N	166° 24.0' W	MOC1
118	28-Apr	0710	99		666	54° 21.8' N	166° 24.3' W	60Bon - Live Tow
118	28-Apr	0728	99		652	54° 21.8' N	166° 24.2' W	60Bon - Live Tow
118	28-Apr	0854	99	MOC20	631	54° 22.6' N	166° 23.2' W	MOC1
118	28-Apr	1208	100		91	54° 04.1' N	166° 35.2' W	60Bon
118	28-Apr	1232	100	CTD018	91	54° 04.0' N	166° 35.3' W	CTD
118	28-Apr	1327	101		929	54° 05.8' N	166° 46.5' W	60Bon
118	28-Apr	1424	101	CTD019	808	54° 05.6' N	167° 47.0' W	CTD
118	28-Apr	1532	102		1187	54° 06.8' N	167° 00.4' W	60Bon
118	28-Apr	1634	102	CTD020	1156	54° 06.6' N	167° 00.6' W	CTD
118	28-Apr	1904	103	CTD021	661	54° 21.6' N	166° 24.1' W	CTD - MZ: 5,10,20, 30,40,50,70,90 m
118	28-Apr	2039	103	CTD022	654	54° 21.8' N	166° 24.4' W	CTD - MZ: 5,10,20, 30,40,50,70,90 m
118	28-Apr	2107	103	MOC21	679	54° 21.2' N	166° 24.7' W	MOC1
118	28-Apr	2200	103	CTD023	635	54° 22.3' N	166° 23.1' W	CTD - MZ: 5,10,20, 30,40,50,70,90 m
118	28-Apr	2240	103	MOC22	654	54° 21.6' N	166° 24.6' W	MOC1
118	28-Apr	2330	103	CTD024	628	54° 22.5' N	166° 23.3' W	CTD - MZ: 5,10,20, 30,40,50,70,90 m
119	29-Apr	0040	103	MOC23	651	54° 21.8' N	166° 23.3' W	MOC1
119	29-Apr	0412	104		1554	54° 07.6' N	167° 14.2' W	60Bon
119	29-Apr	0506	104	CTD025	1573	54° 07.6' N	167° 14.2' W	CTD
119	29-Apr	0704	105		2027	54° 03.8' N	167° 37.4' W	Ring1 - Live Tow
119	29-Apr	0742	105		2026	54° 03.9' N	167° 37.2' W	60Bon
119	29-Apr	0846	105	CTD026	2019	54° 03.7' N	167° 37.1' W	CTD
119	29-Apr	1152	106		1281	54° 13.7' N	166° 46.2' W	20/60Bon
119	29-Apr	1254	106	CTD027	1281	54° 13.3' N	166° 46.1' W	CTD
119	29-Apr	1340	107		1225	54° 14.6' N	166° 42.7' W	60Bon
119	29-Apr	1449	108		1075	54° 16.7' N	166° 38.5' W	20/60Bon

TABLE 5. MF93-05 CRUISE SUMMARY

13 - 30 April, 1993

Feeding Larvae

Date (JD)	Date (JD)	Time (GMT)	Station Number	FOCI ID No.	Depth (m)	Latitude	Longitude	Gear Code
119	29-Apr	1604	109		938	54° 17.9' N	166° 34.3' W	60Bon
119	29-Apr	1708	110		751	54° 19.7' N	166° 29.1' W	60Bon
119	29-Apr	1805	111		669	54° 21.4' N	166° 24.3' W	20/60Bon
119	29-Apr	1904	111	CTD028	666	54° 21.5' N	166° 24.2' W	CTD
119	29-Apr	1955	112		997	54° 18.0' N	166° 20.8' W	60Bon
119	29-Apr	2106	113		756	54° 15.0' N	166° 17.4' W	Ring1 - Live Tow
119	29-Apr	2154	113		620	54° 15.3' N	166° 16.8' W	20/60Bon
119	29-Apr	2304	114		251	54° 11.8' N	166° 14.6' W	60Bon
119	29-Apr	2345	115		84	54° 08.0' N	166° 11.1' W	20/60Bon
120	30-Apr	0004	115	CTD029	83	54° 08.1' N	166° 10.9' W	CTD - MZ: 10(3), 30(3),50(3) m
120	30-Apr	0058	116		90	54° 06.5' N	166° 16.8' W	60Bon
120	30-Apr	0131	117		166	54° 09.7' N	166° 20.1' W	20/60Bon
120	30-Apr	0219	118		800	54° 13.4' N	166° 21.9' W	60Bon
120	30-Apr	0322	119		983	54° 16.0' N	166° 25.7' W	20/60Bon
120	30-Apr	0439	120		1218	54° 14.5' N	166° 31.6' W	60Bon
120	30-Apr	0543	121		960	54° 11.2' N	166° 28.4' W	20/60Bon
120	30-Apr	0642	121	CTD030	912	54° 11.3' N	166° 27.8' W	CTD
120	30-Apr	0739	122		669	54° 07.9' N	166° 25.4' W	60Bon
120	30-Apr	0849	123		83	54° 04.6' N	166° 22.6' W	20/60Bon
120	30-Apr	0926	124		143	54° 02.7' N	166° 28.1' W	20/60Bon
120	30-Apr	1016	125	CTD031	195	54° 01.1' N	166° 32.5' W	CTD
120	30-Apr	1112	126		566	54° 07.0' N	166° 30.6' W	20/60Bon
120	30-Apr	1208	127		914	54° 09.1' N	166° 34.2' W	20/60Bon
120	30-Apr	1311	128		1241	54° 12.0' N	166° 37.4' W	20/60Bon
120	30-Apr	1420	129		778	54° 07.0' N	166° 39.1' W	20/60Bon
120	30-Apr	1615	130		116	54° 00.7' N	166° 33.5' W	20/60Bon

MF93-06 (FOCI-93-04): 01–16 May, 1993

SCIENTIFIC PERSONNEL

<u>Name</u>	<u>Title</u>	<u>Organization</u>
Jeff Napp	Chief Scientist	NOAA/AFSC
Lisa Britt		NOAA/AFSC
Annette Brown		NOAA/AFSC
Richard Davis		NOAA/AFSC
Dan Dougherty		NOAA/PMEL
Al Hermann		NOAA/PMEL
Nazi Merati		NOAA/AFSC
Stella Spring		NOAA/AFSC

CRUISE STATISTICS

ADCP backtrack-L	1
ADCP tracklines	9
Bongos, 20 cm	48
Bongos, 60 cm	133
CalVET	46
Chlorophyll samples	9
CTD Casts	44
Drifters, satellite-tracked	5
EK 500 Dedicated Transects	8
Methot Trawls	3
Microzooplankton samples	9
MOCNESS Tows	5
Nutrient samples	125
Ring Tows (live tows)	5
Tucker Trawls	10
Photosynthetically Active Radiation	Continuous
Sea Surface Fluorescence, Temp. and Salinity	Continuous

OBJECTIVES

The objectives of MF93-06 (FOCI-93-04) were to:

- examine physical and biological gradients (which are relevant to larval pollock) from the shelf to the Alaskan Stream, southwest of the exit to Shelikof Strait
- map the distribution of larval pollock between Mitrofanina Island and the middle region of Shelikof Strait for estimates of larval mortality
- obtain physical and biological samples from traditional FOCI time series stations
- collect underway surface chlorophyll and PAR measurements for modeling and mapping the timing of the spring bloom
- collect samples of first-feeding larval pollock for age and condition factor analyses

CRUISE REPORT

Phase 1 was a biophysical survey of the water leaving Shelikof Strait and mixing with the northern edge of the Alaska Stream over the continental slope. We occupied two transects in the southwest portion of our operations area. The following operations were performed:

- 1) underway measurements for current velocity and backscatter intensity (ADCP and EK500); sea surface temperature, salinity, and fluorescence,
- 2) CTD casts, and
- 3) plankton tows (20-cm and 60-cm bongo, CalVET and 1-m² Tucker).

Phase 2 was a large-scale survey of larval pollock. The survey began at FOCI Grid Station B5 (south of Chiniak Bay) and ended in Shelikof Strait off Cape Ilktugiak, north of Line 8. During the survey we deployed two satellite-tracked drifters, accomplished a dedicated ADCP transect across the sea valley, and occupied FOCI Time Series Lines 16 and 17. It was during this large-scale survey that zooplankton were collected for egg production studies and larvae were obtained for nutritional condition assays.

Phase 3 was an unexpected sea surface mapping operation. Based on information sent to the ship from PMEL, we conducted ADCP, EK500, and surface thermosalinograph and fluorescence mapping to determine whether or not an eddy-like feature occupied the Strait northeast of Line 8. AVHRR Imagery obtained by PMEL suggested that there might be an eddy-like feature occupying 2/3 the width of the Strait. Two satellite-tracked drifters and four bongo tows were taken in the region where the eddy was hypothesized to exist.

Phase 4 was the occupation of FOCI Line 8 (Stations 56-61). CTD casts (with bottles for chlorophyll, nutrients, and microzooplankton samples) and bongo tows were taken. At the conclusion of the occupation we accomplished an ADCP/EK500 transect across Line 8. An ADCP backtrack maneuver was done between Phases 4 and 5.

Phase 5 was sampling inside a “patch” of larval pollock marked by the RADAR-tracked drogue for studies of growth, condition, food availability, larval gut evacuation, larval and zooplankton vertical distributions, and predator abundance. Sampling gear included: 60-cm bongo nets for larval condition, CalVET casts for microzooplankton, CTD casts for chlorophyll and light,

MOCNESS tows, and Tucker and Methot trawls. At the end of the operation the satellite-tracked drogue attached to the RADAR-tracked buoy was cut loose to mark the “patch” for the last FOCI cruise (MF93-08).

Phase 6 was to be a hydrographic examination of the water around the “patch.” Given the very slow speed at which the drifter moved, we suspected that we might have been in an eddy-like feature. This operation was aborted after two casts due to failure of the ship’s main generator.

Phase 7 of the cruise was to be an ADCP background noise determination. This was canceled when the main generator failed.

CONCLUSION

Almost all of our objectives were met; luckily the main generator failure occurred during the last 4 to 6 hours of scientific operations. This year’s low larval abundance (or uniformly distributed larvae) made it difficult to pick a “patch” to conduct our “in patch” experiments. On the other hand, our onshore-off shelf transects were very successful. We thank the Captain and the crew for their diligent efforts to help us meet all of our objectives. We look forward to analyzing the results of this year’s experiments and contrasting them to last year’s observations when pollock larvae were relatively more abundant in Shelikof Strait.

FOR FUTURE CONSIDERATION

During the FOCI field season, valuable samples are stored (preserved) in two separate freezers: a scientific -70°C and a -20°C ship’s blast freezer. During the period when we operated with only emergency power, both sets of samples were in jeopardy of being lost due to heating. After approx. 3–4 hrs., the temperature in the -70°C freezer had risen to -40°C (contrary to expectation and text in the Cruise Instructions). At this point, when the samples were on the verge of being destroyed, the ship was able to supply power from a nonessential circuit. The freezer cooled to -70°C within 1 hour and although we will not know until the samples are processed, we believe that the samples were saved in time. Samples in the blast freezer were not so lucky. The freezer temperature was -2°C after 24 hrs. without power, warm enough to ruin the physiological samples stored there. Thirty-six hours after the generator failed, the ship arrived at the Coast Guard Base and switched to shore power. Unfortunately, no one checked this freezer; it failed to operate once power was restored. Forty-eight hours after the generator failed, the remaining onboard scientist noticed that the freezer was not working and notified the Survey Department. Engineering quickly recharged the freezer to make it operational. It is not known whether or not the nutrient samples which were stored there and which thawed are still good. Unfortunately, we will have to process the samples and try to determine if the nutrient concentrations are “reasonable.”

Between now and next field season, FOCI, the ship’s command, and PMC should discuss the availability of power for these freezers during non life-threatening emergencies. If it is decided that ship’s power will not be available to either or both freezers during one of these emergencies, then

FOCI will need help planning for such an event so that valuable (expensive) samples will not be ruined.

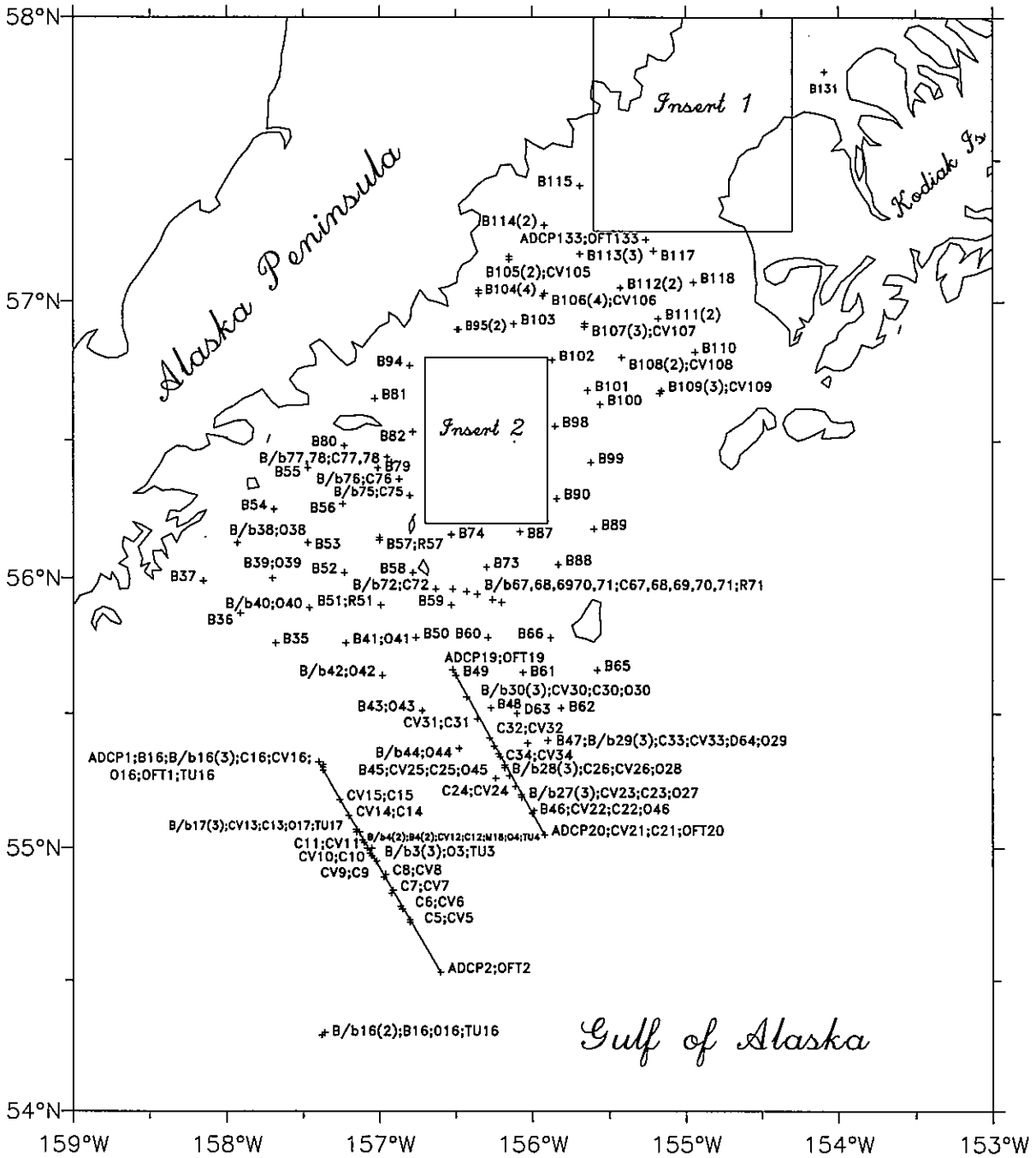


Fig. 4.1. MF93-06 ADCP, 60 cm Bongo (B), 20/60 cm Bongo (B/b), CTD (C), CalVET (CV), large Clarke-Bumpus (CB), Drifter (D), Methot (M), MOCNESS (Moc), Other (O), Ring (R), Sea Surface Fluorescence (F), Thermosalinograph (T), and Tucker (TU) stations.

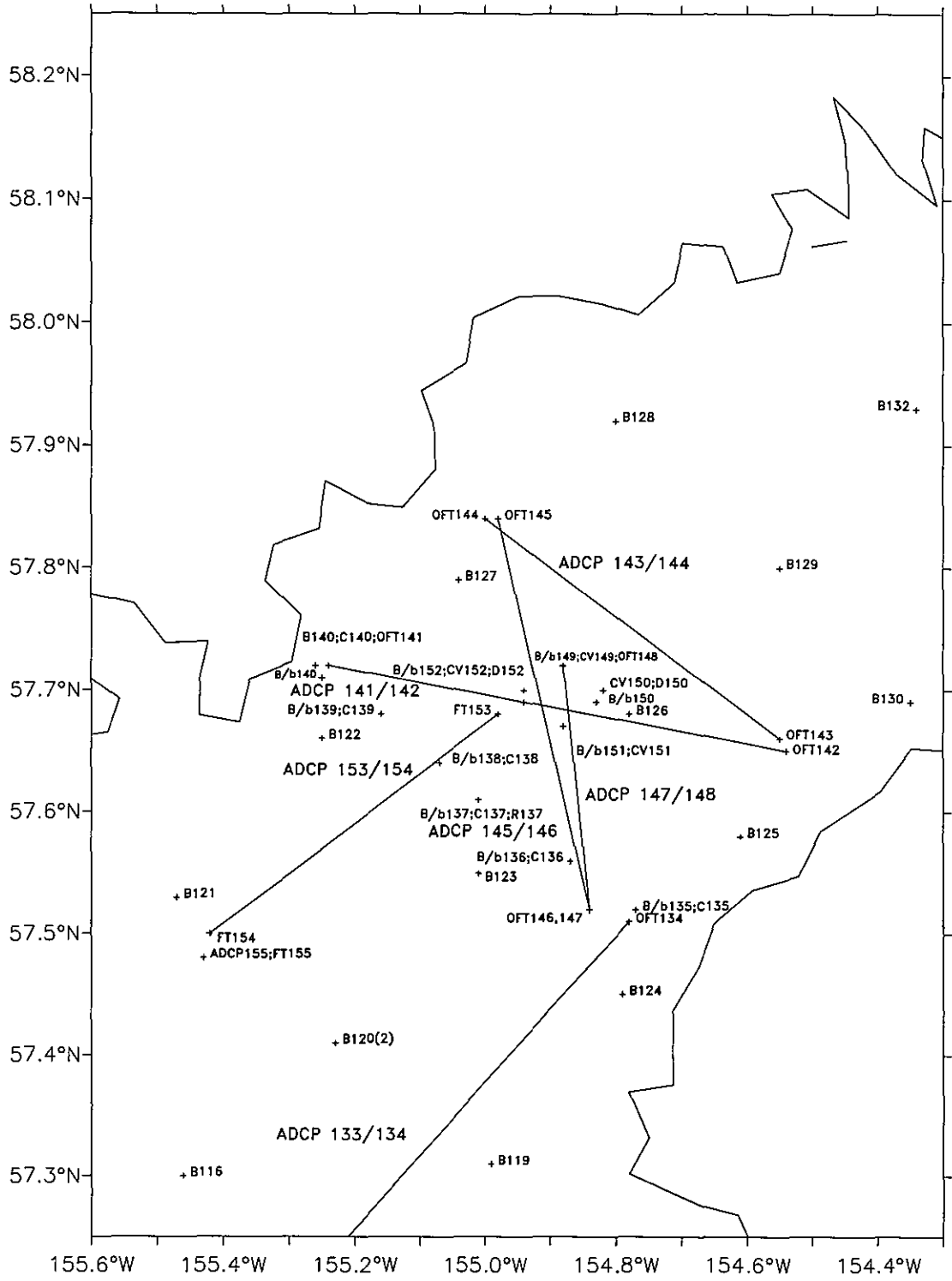


Fig. 4.2. MF93-06 Insert 1—ADCP, 60 cm Bongo (B), 20/60 cm Bongo (B/b), CTD (C), CalVET (CV), Drifter (D), Other (O), Ring (R), Sea Surface Fluorescence (F), and Thermosalinograph (T) stations.

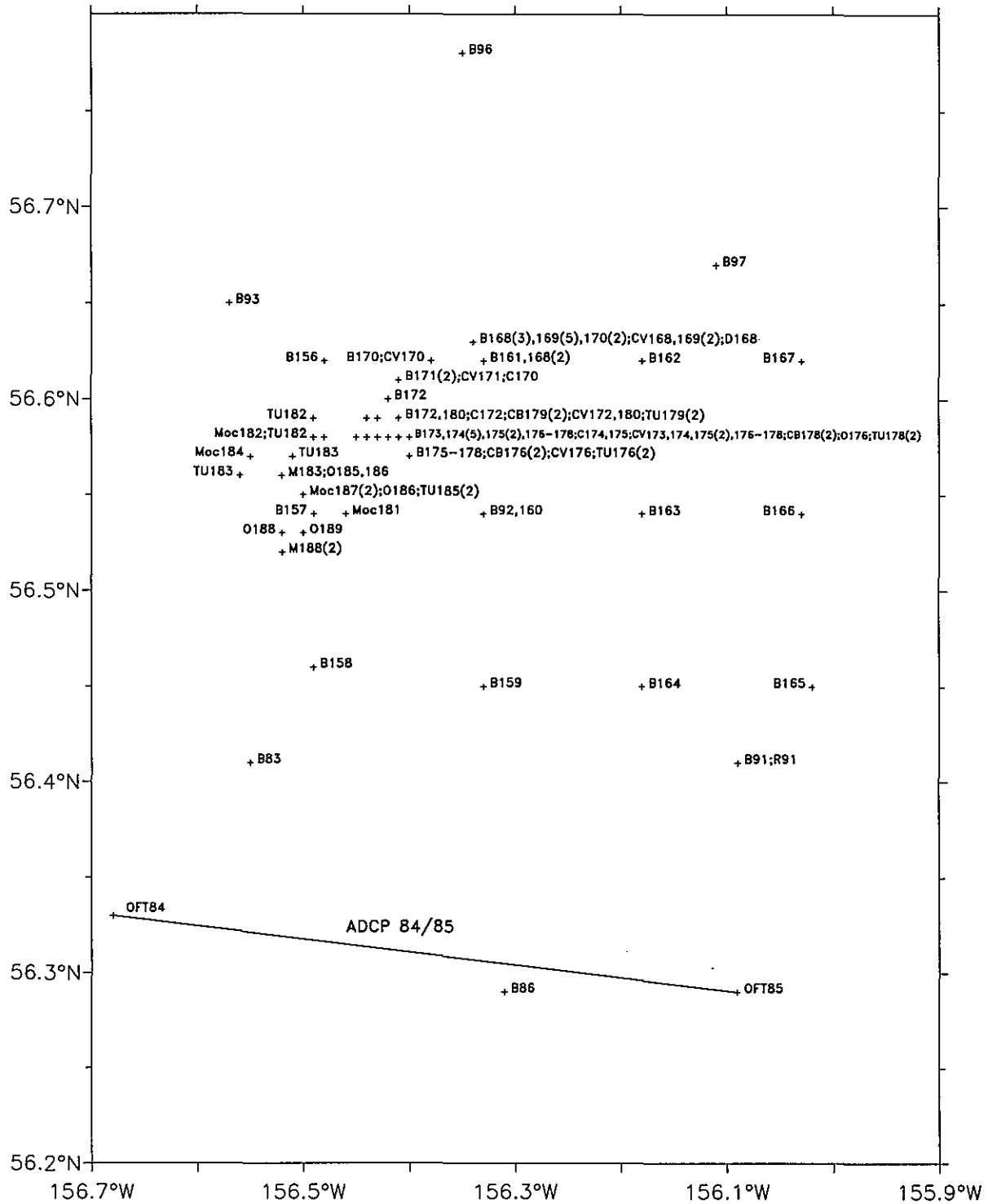


Fig. 4.3. MF93-06 Insert 2—ADCP, Bongo (B), CTD (C), CalVET (CV), large Clarke-Bumpus (CB), Drifter (D), Methot (M), MOCNESS (Moc), Other (O), Ring (R), Sea Surface Fluorescence (F), Thermosalinograph (T), and Tucker (TU) stations.

TABLE 6. MF93-06 CRUISE SUMMARY

Larval Survey

1 - 16 May, 1993

Date (JD)	Date (JD)	Time (GMT)	Station Number	FOCI ID No.	Depth (m)	Latitude	Longitude	Comments
122	02-May	1430			49	54° 40.2' N	161° 38.5' W	Begin Hydro Trackline
122	02-May	1750			98	55° 01.2' N	160° 34.8' W	End Hydro Trackline
122	02-May	2149			171	55° 20.3' N	159° 22.0' W	CTD Test Cast
122	02-May	2204			171	55° 20.3' N	159° 22.0' W	Seacat Test
122	02-May	2300			186	55° 20.2' N	159° 04.2' W	Begin Hydro Trackline
122	02-May	2310			184	55° 20.1' N	159° 00.3' W	Abort Hydro Trackline
122	02-May	2320			185	55° 20.0' N	158° 56.4' W	Restart Hydro Trackline
123	03-May	0310			84	55° 19.1' N	157° 29.9' W	End Hydro Trackline
123	03-May	0331	1		86	55° 19.0' N	157° 24.1' W	Begin ADCP transect; TSG; SSF; Other
123	03-May	0750	2		4000	54° 31.7' N	156° 35.9' W	End ADCP transect; TSG; SSF; Other
123	03-May	1041	3		829	54° 58.6' N	157° 03.4' W	20/60Bon
123	03-May	1109	3		787	54° 58.9' N	157° 03.7' W	20/60Bon; Other
123	03-May	1139	3		793	54° 58.7' N	157° 03.7' W	20/60Bon
123	03-May	1217	3		810	54° 58.7' N	157° 03.5' W	1Tuck
123	03-May	1303	4		406	55° 01.8' N	157° 06.5' W	20/60Bon
123	03-May	1323	4		420	55° 01.7' N	157° 06.3' W	20/60Bon
123	03-May	1343	4		408	55° 01.7' N	157° 06.5' W	20/60Bon; Other
123	03-May	1407	4		395	55° 01.8' N	157° 06.6' W	1Tuck
123	03-May	1632	5	CTD001	2104	54° 44.0' N	156° 48.2' W	CTD - Chl: 0,10,20, 30,40,50 m; Nutrients: 0,50, 150,250,350,441 m
123	03-May	1731	5		2215	54° 43.0' N	156° 47.4' W	Calvet
123	03-May	1825	6	CTD002	1571	54° 46.3' N	156° 51.1' W	CTD
123	03-May	1857	6		1510	54° 46.6' N	156° 51.3' W	Calvet
123	03-May	1947	7	CTD003	1154	54° 49.8' N	156° 54.9' W	CTD
123	03-May	2020	7		1119	54° 50.4' N	156° 54.8' W	Calvet
123	03-May	2110	8	CTD004	1037	54° 53.5' N	156° 58.2' W	CTD - Chl: 0,10,20, 25,30,40,50 m; Nutrients: 0,50, 150,250,350,450 m
123	03-May	2201	8		1019	54° 53.8' N	156° 57.7' W	Calvet
123	03-May	2250	9	CTD005	912	54° 56.8' N	157° 01.6' W	CTD
123	03-May	2320	9		885	54° 57.2' N	157° 01.0' W	Calvet
123	03-May	2358	10	CTD006	858	54° 58.3' N	157° 03.0' W	CTD - Chl: 0,10,20, 25,30,40,50 m; Nutrients: 0,50, 150,250,350,450 m

TABLE 6. MF93-06 CRUISE SUMMARY

Larval Survey

1 - 16 May, 1993

Date (JD)	Date (JD)	Time (GMT)	Station Number	FOCI ID No.	Depth (m)	Latitude		Longitude		Comments
124	04-May	0049	10		853	54°	58.3' N	157°	03.1' W	Calvet
124	04-May	0129	11	CTD007	680	54°	59.9' N	157°	05.1' W	CTD - Chl: 0,10,20, 30,40,50,60 m; Nutrients: 0,50, 150,250,350,450 m
124	04-May	0208	11		703	54°	59.8' N	157°	05.1' W	Calvet
124	04-May	0249	12	CTD008	394	55°	01.7' N	157°	06.9' W	CTD - Chl: 0.5,10,20, 30,40,50 m; Nutrients: 0,50, 150,250,350 m
124	04-May	0327	12		370	55°	02.0' N	157°	06.7' W	Calvet
124	04-May	0408	13	CTD009	238	55°	03.7' N	157°	08.1' W	CTD
124	04-May	0438	13		239	55°	03.7' N	157°	08.1' W	Calvet
124	04-May	0515	14	CTD010	132	55°	07.1' N	157°	11.8' W	CTD - Chl: 0,10,20, 30,40,50,60 m; Nutrients: 0,50, 120 m
124	04-May	0539	14		131	55°	07.2' N	157°	12.0' W	Calvet
124	04-May	0615	15	CTD011	107	55°	10.8' N	157°	15.2' W	CTD
124	04-May	0636	15		105	55°	11.0' N	157°	15.4' W	Calvet
124	04-May	0741	16	CTD012	87	55°	18.0' N	157°	22.3' W	CTD - Chl: 0,10,20, 30,40,50 m; Nutrients: 0, 50(2) m
124	04-May	0802	16		89	55°	18.3' N	157°	22.5' W	Calvet
124	04-May	0834	16		90	55°	17.7' N	157°	22.1' W	20/60Bon
124	04-May	0900	16		87	55°	17.7' N	157°	21.7' W	20/60Bon; Other
124	04-May	0930	16		87	55°	17.9' N	157°	21.9' W	20/60Bon
124	04-May	0959	16		86	55°	17.5' N	157°	22.6' W	1Tuck
124	04-May	1215	17		219	55°	03.8' N	157°	09.0' W	1Tuck
124	04-May	1244	17		212	55°	04.0' N	157°	08.9' W	20/60Bon
124	04-May	1309	17		212	55°	04.0' N	157°	09.0' W	20/60Bon
124	04-May	1332	17		217	55°	04.1' N	157°	08.8' W	20/60Bon; Other
124	04-May	1508	18		474	55°	01.4' N	157°	05.9' W	Meth
124	04-May	1640			189	55°	07.4' N	157°	01.6' W	Begin Hydro Trackline
124	04-May	1920			223	55°	35.0' N	156°	38.8' W	End Hydro Trackline
124	04-May	2006	19		239	55°	39.6' N	156°	31.4' W	Begin ADCP transect; TSG; SSF; Other
124	04-May	2334	20		1956	55°	03.3' N	155°	55.3' W	End ADCP transect; TSG; SSF; Other
125	05-May	0032	21	CTD013	1893	55°	03.2' N	155°	55.1' W	CTD
125	05-May	0109	21		1900	55°	03.1' N	155°	55.0' W	Calvet

TABLE 6. MF93-06 CRUISE SUMMARY

Larval Survey

1 - 16 May, 1993

Date (JD)	Date (JD)	Time (GMT)	Station Number	FOCI ID No.	Depth (m)	Latitude	Longitude	Comments
125	05-May	0201	22	CTD014	1672	55° 07.5' N	155° 59.9' W	CTD - Chl: 0,10,20, 30,40,50,60 m; Nutrients: 0,50, 150,250,350,450 m
125	05-May	0235	22		1675	55° 07.6' N	155° 59.8' W	Calvet
125	05-May	0327	23	CTD015	1099	55° 11.8' N	156° 04.3' W	CTD
125	05-May	0401	23		1084	55° 11.8' N	156° 04.7' W	Calvet
125	05-May	0441	24	CTD016	810	55° 14.0' N	156° 06.4' W	CTD - Chl: 0,10,20, 30,40,50,60 m; Nutrients: 0,50, 150,250,350,450 m
125	05-May	0513	24		789	55° 14.1' N	156° 06.5' W	Calvet
125	05-May	0549	25	CTD017	493	55° 16.4' N	156° 08.7' W	CTD - Chl: 0,10,20, 30,40,50,60 m; Nutrients: 0,50, 150,250,350,450 m
125	05-May	0627	25		475	55° 16.5' N	156° 08.8' W	Calvet
125	05-May	0654	26	CTD018	231	55° 18.8' N	156° 10.5' W	CTD - Chl: 0,10,20, 30,40,50 m; Nutrients: 0,50, 150 m
125	05-May	0721	26		229	55° 18.7' N	156° 10.7' W	Calvet
125	05-May	0818	27		1000	55° 11.7' N	156° 04.4' W	20/60Bon
125	05-May	0842	27		1090	55° 11.6' N	156° 04.3' W	20/60Bon
125	05-May	0902	27		1129	55° 11.9' N	156° 04.0' W	20/60Bon; Other
125	05-May	1004	28		241	55° 18.5' N	156° 10.5' W	20/60Bon
125	05-May	1032	28		259	55° 18.0' N	156° 10.8' W	20/60Bon
125	05-May	1052	28		266	55° 18.2' N	156° 10.5' W	20/60Bon; Other
125	05-May	1140	29		188	55° 22.6' N	156° 14.7' W	20/60Bon
125	05-May	1201	29		188	55° 22.5' N	156° 14.2' W	20/60Bon; Other
125	05-May	1221	29		185	55° 22.5' N	156° 14.7' W	20/60Bon
125	05-May	1346	30		254	55° 33.4' N	156° 25.8' W	20/60Bon
125	05-May	1403	30		255	55° 33.5' N	156° 26.1' W	20/60Bon; Other
125	05-May	1421	30		254	55° 33.6' N	156° 26.3' W	20/60Bon
125	05-May	1503	30	CTD019	252	55° 33.4' N	156° 25.8' W	CTD - Chl: 0,10,20, 30,40,50 m; Nutrients: 0,50, 150,244 m
125	05-May	1542	30		234	55° 33.6' N	156° 26.1' W	Calvet
125	05-May	1625	31	CTD020	205	55° 29.0' N	156° 21.6' W	CTD
125	05-May	1643	31		205	55° 28.9' N	156° 21.6' W	Calvet
125	05-May	1727	32	CTD021	190	55° 24.8' N	156° 16.9' W	CTD

TABLE 6. MF93-06 CRUISE SUMMARY

Larval Survey

1 - 16 May, 1993

Date (JD)	Date (JD)	Time (GMT)	Station Number	FOCI ID No.	Depth (m)	Latitude	Longitude	Comments
125	05-May	1745	32		190	55° 24.7' N	156° 17.0' W	Calvet
125	05-May	1819	33	CTD022	186	55° 22.6' N	156° 15.0' W	CTD - Chl: 0,10,20, 30,50,60 m; Nutrients: 0,50, 150,178 m
125	05-May	1842	33		186	55° 22.7' N	156° 14.9' W	Calvet
125	05-May	1926	34	CTD023	195	55° 20.7' N	156° 13.0' W	CTD
125	05-May	1954	34		193	55° 20.6' N	156° 12.7' W	Calvet
125	05-May	2020			184	55° 21.6' N	156° 16.5' W	Begin Hydro Trackline
126	06-May	0030			129	55° 44.1' N	157° 37.2' W	End Hydro Trackline
126	06-May	0052	35		130	55° 45.4' N	157° 41.0' W	60Bon
126	06-May	0157	36		99	55° 52.0' N	157° 54.8' W	60Bon
126	06-May	0303	37		120	55° 59.7' N	158° 08.9' W	60Bon
126	06-May	0413	38		143	56° 07.5' N	157° 55.9' W	20/60Bon;Chl
126	06-May	0521	39		73	56° 00.3' N	157° 41.8' W	60Bon; Chl
126	06-May	0625	40		90	55° 53.1' N	157° 27.9' W	20/60Bon;Chl
126	06-May	0738	41		82	55° 45.5' N	157° 12.9' W	60Bon; Chl
126	06-May	0843	42		84	55° 38.5' N	156° 58.5' W	20/60Bon;Chl
126	06-May	1010	43		126	55° 30.5' N	156° 43.4' W	60Bon; Chl
126	06-May	1120	44		167	55° 22.4' N	156° 28.7' W	20/60Bon;Chl
126	06-May	1229	45		254	55° 15.7' N	156° 14.6' W	60Bon; Chl
126	06-May	1338	46		1614	55° 08.3' N	155° 59.6' W	60Bon; Chl
126	06-May	1526	47		203	55° 23.2' N	156° 02.1' W	60Bon
126	06-May	1649	48		208	55° 31.1' N	156° 16.1' W	60Bon
126	06-May	1819	49		242	55° 38.5' N	156° 30.0' W	60Bon
126	06-May	1924	50		179	55° 46.7' N	156° 45.4' W	60Bon
126	06-May	2044	51		125	55° 53.8' N	156° 59.2' W	60Bon
126	06-May	2059	51		125	55° 54.2' N	156° 59.3' W	Ring.5 - Live Tow
126	06-May	2208	52		112	56° 01.3' N	157° 13.8' W	60Bon
126	06-May	2316	53		146	56° 07.9' N	157° 28.0' W	60Bon
127	07-May	0025	54		108	56° 14.9' N	157° 41.5' W	60Bon
127	07-May	0140	55		165	56° 23.9' N	157° 28.1' W	60Bon
127	07-May	0251	56		133	56° 16.1' N	157° 14.2' W	60Bon
127	07-May	0358	57		99	56° 08.9' N	157° 00.0' W	60Bon
127	07-May	0412	57		96	56° 08.6' N	157° 00.0' W	Ring.5 - Live Tow
127	07-May	0453			77	56° 04.1' N	156° 38.4' W	Raised centerboard
127	07-May	0516	58		77	56° 01.3' N	156° 47.0' W	60Bon
127	07-May	0558			194	55° 56.6' N	156° 38.4' W	Lowered centerboard
127	07-May	0634	59		222	55° 54.3' N	156° 31.9' W	60Bon
127	07-May	0745	60		243	55° 46.8' N	156° 17.4' W	60Bon
127	07-May	0905	61		237	55° 39.0' N	156° 03.3' W	60Bon
127	07-May	1027	62		230	55° 31.3' N	155° 48.3' W	60Bon

TABLE 6. MF93-06 CRUISE SUMMARY

Larval Survey

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Date (JD)	Date (JD)	Time (GMT)	Station Number	FOCI ID No.	Depth (m)	Latitude		Longitude		Comments
127	07-May	1139	63		204	55°	29.9' N	156°	05.7' W	SatBuoy 7243
127	07-May	1219	64		196	55°	24.2' N	155°	54.2' W	SatBuoy 7238
127	07-May	1411	65		143	55°	39.5' N	155°	34.9' W	60Bon
127	07-May	1550	66		81	55°	47.1' N	155°	52.6' W	60Bon
127	07-May	1726	67		200	55°	54.5' N	156°	12.1' W	20/60Bon
127	07-May	1803	67	CTD024	205	55°	54.4' N	156°	12.4' W	CTD - Nutrients: 0, 10,30,50,75,125, 175 m
127	07-May	1850	68		220	55°	55.4' N	156°	15.8' W	20/60Bon
127	07-May	1937	68	CTD025	220	55°	55.5' N	156°	15.7' W	CTD - Chl: 0,10,20, 30,40,50,60 m; MZ: 10,20,30,40, 50,60 m; Nutrients: 0,10,30, 50,75,125,175, 200 m
127	07-May	2017	69		228	55°	56.2' N	156°	21.1' W	20/60Bon
127	07-May	2100	69	CTD026	227	55°	56.2' N	156°	21.3' W	CTD - Chl: 0,10,20, 30,40,50,60 m; MZ: 10,20,30,40, 50,60 m; Nutrients: 0,10,30, 50,75,125,175, 200 m
127	07-May	2137	70		204	55°	56.8' N	156°	26.0' W	20/60Bon
127	07-May	2214	70	CTD027	204	55°	56.9' N	156°	26.1' W	CTD - Chl: 0,10,20, 30,40,50,60 m; MZ: 10,20,30,40, 50,60 m; Nutrients: 0,10,30, 50,75,125,175, 200 m
127	07-May	2253	71		196	55°	57.3' N	156°	31.2' W	20/60Bon
127	07-May	2328	71	CTD028	196	55°	57.3' N	156°	31.0' W	CTD - Chl: 0,10,20, 30,40,50,60 m; MZ: 10,20,30,40, 50,60 m; Nutrients: 0,75,125, 175,190 m
127	07-May	2349	71		196	55°	57.5' N	156°	30.1' W	Ring.5 - Live Tow
128	08-May	0034	72		193	55°	57.8' N	156°	37.5' W	20/60Bon

TABLE 6. MF93-06 CRUISE SUMMARY

Larval Survey										1 - 16 May, 1993
Date (JD)	Date (JD)	Time (GMT)	Station Number	FOCI ID No.	Depth (m)	Latitude		Longitude		Comments
128	08-May	0105	72	CTD029	193	55°	57.8' N	156°	37.5' W	CTD - Nutrients: 0, 10,30,50,75,125, 175,186 m
128	08-May	0241	73		208	56°	02.2' N	156°	18.1' W	60Bon
128	08-May	0347	74		215	56°	09.3' N	156°	31.8' W	60Bon
128	08-May	0511	75		100	56°	18.1' N	156°	47.9' W	20/60Bon
128	08-May	0536	75	CTD030	107	56°	18.1' N	156°	47.7' W	CTD - Chl: 0,10,20, 30,40,50,60 m; MZ: 10,20,30,40, 50,60 m; Nutrients: 0,10,30, 50,75,85 m
128	08-May	0615	76		123	56°	21.5' N	156°	52.3' W	20/60Bon
128	08-May	0639	76	CTD031	131	56°	21.6' N	156°	52.2' W	CTD - Chl: 0,10,20, 30,40,50,60 m; MZ: 10,20,30,40, 50,60 m; Nutrients: 0,10,30, 50,75,85 m
128	08-May	0718	77		116	56°	24.1' N	156°	55.0' W	20/60Bon
128	08-May	0744	77	CTD032	115	56°	24.2' N	156°	54.9' W	CTD - Chl: 0,10,20, 30,40,50,60 m; MZ: 10,20,30,40, 50,60 m; Nutrients: 0,10,30, 50,75,85 m
128	08-May	0821	78		106	56°	26.4' N	156°	56.9' W	20/60Bon
128	08-May	0845	78	CTD033	108	56°	26.6' N	156°	56.9' W	CTD - Chl: 0,10,20, 30,40,50,60 m; MZ: 10,20,30,40, 50,60 m; Nutrients: 0,10,30, 50,75,80 m
128	08-May	0934	79		159	56°	23.9' N	157°	00.3' W	60Bon
128	08-May	1011			70	56°	25.7' N	157°	05.5' W	Raised centerboard
128	08-May	1123	80		41	56°	29.1' N	157°	14.0' W	60Bon
128	08-May	1340			125	56°	35.9' N	156°	56.3' W	Lowered centerboard
128	08-May	1411	81		136	56°	39.0' N	157°	02.1' W	60Bon
128	08-May	1530	82		109	56°	31.7' N	156°	46.7' W	60Bon
128	08-May	1646	83		202	56°	24.8' N	156°	33.1' W	60Bon
128	08-May	1741	84		102	56°	20.0' N	156°	40.8' W	Begin ADCP transect; TSG; SSF; Other

TABLE 6. MF93-06 CRUISE SUMMARY

Larval Survey

1 - 16 May, 1993

Date (JD)	Date (JD)	Time (GMT)	Station Number	FOCI ID No.	Depth (m)	Latitude	Longitude	Comments
128	08-May	1938	85		229	56° 17.5' N	156° 05.1' W	End ADCP transect; TSG; SSF; Other
128	08-May	2033	86		279	56° 17.4' N	156° 18.8' W	60Bon
128	08-May	2156	87		235	56° 10.3' N	156° 04.7' W	60Bon
128	08-May	2317	88		63	56° 03.0' N	155° 49.5' W	60Bon
129	09-May	0026	89		56	56° 11.0' N	155° 36.1' W	60Bon
129	09-May	0140	90		92	56° 17.6' N	155° 50.3' W	60Bon
129	09-May	0302	91		256	56° 24.9' N	156° 05.4' W	60Bon
129	09-May	0321	91		257	56° 24.7' N	156° 05.7' W	Ring.5 - Live Tow
129	09-May	0446	92		209	56° 32.1' N	156° 19.9' W	60Bon
129	09-May	0605	93		156	56° 39.2' N	156° 34.4' W	60Bon
129	09-May	0722	94		86	56° 46.3' N	156° 47.9' W	60Bon
129	09-May	0902	95		113	56° 54.2' N	156° 29.1' W	60Bon
129	09-May	0938	95		103	56° 53.9' N	156° 28.7' W	Live Tow
129	09-May	1045	96		193	56° 47.1' N	156° 21.1' W	60Bon
129	09-May	1205	97		268	56° 40.0' N	156° 06.4' W	60Bon
129	09-May	1328	98		238	56° 33.0' N	155° 51.3' W	60Bon
129	09-May	1452	99		72	56° 25.4' N	155° 36.9' W	60Bon
129	09-May	1611	100		63	56° 33.4' N	155° 23.4' W	60Bon
129	09-May	1726	101		238	56° 40.8' N	155° 38.2' W	60Bon
129	09-May	1850	102		294	56° 47.5' N	155° 52.0' W	60Bon
129	09-May	2028	103		195	56° 55.0' N	156° 07.0' W	60Bon
129	09-May	2152	104		69	57° 01.9' N	156° 21.3' W	60Bon
129	09-May	2215	104		48	57° 01.9' N	156° 21.1' W	Live Tow
129	09-May	2231	104		46	57° 02.1' N	156° 21.0' W	Live Tow
129	09-May	2249	104		62	57° 02.0' N	156° 20.8' W	Live Tow
129	09-May	2354	105		88	57° 09.2' N	156° 09.0' W	60Bon
130	10-May	0014	105		85	57° 09.6' N	156° 08.9' W	Live Tow
130	10-May	0028	105		84	57° 09.7' N	156° 08.7' W	Calvet - Live Tow
130	10-May	0135	106		256	57° 01.8' N	155° 55.3' W	60Bon
130	10-May	0156	106		252	57° 01.4' N	155° 55.5' W	60Bon - Live Tow
130	10-May	0333	106		263	57° 01.6' N	155° 55.2' W	Calvet - Live Tow
130	10-May	0342	106		263	57° 01.4' N	155° 55.2' W	60Bon - Live Tow (aborted)
130	10-May	0402	106		254	57° 01.4' N	155° 55.5' W	60Bon - Live Tow
130	10-May	0506	107		281	56° 55.0' N	155° 39.7' W	60Bon
130	10-May	0525	107		281	56° 54.7' N	155° 39.3' W	60Bon - Live Tow
130	10-May	0546	107		281	56° 55.0' N	155° 39.7' W	Calvet
130	10-May	0555	107		280	56° 54.9' N	155° 39.5' W	60Bon - Live Tow
130	10-May	0659	108		238	56° 48.1' N	155° 25.3' W	60Bon
130	10-May	0718	108		235	56° 47.9' N	155° 24.9' W	60Bon - Live Tow
130	10-May	0745	108		238	56° 48.2' N	155° 25.3' W	Calvet - Live Tow

TABLE 6. MF93-06 CRUISE SUMMARY

Larval Survey

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Date (JD)	Date (JD)	Time (GMT)	Station Number	FOCI ID No.	Depth (m)	Latitude	Longitude	Comments
130	10-May	0857	109		69	56° 40.9' N	155° 10.2' W	60Bon
130	10-May	0924	109		69	56° 40.9' N	155° 09.6' W	60Bon
130	10-May	0947	109		68	56° 41.0' N	155° 09.8' W	60Bon - Live Tow
130	10-May	1004	109		69	56° 41.2' N	155° 09.6' W	Calvet
130	10-May	1114	110		56	56° 49.1' N	154° 56.2' W	60Bon
130	10-May	1235	111		217	56° 56.1' N	155° 11.0' W	60Bon
130	10-May	1259	111		217	56° 56.1' N	155° 10.8' W	60Bon - Live Tow
130	10-May	1414	112		264	57° 02.9' N	155° 26.0' W	60Bon
130	10-May	1448	112		203	57° 02.7' N	155° 26.1' W	60Bon - Live Tow
130	10-May	1604	113		274	57° 10.1' N	155° 41.2' W	60Bon
130	10-May	1636	113		274	57° 10.1' N	155° 40.5' W	60Bon - Live Tow
130	10-May	1659	113		274	57° 09.9' N	155° 41.1' W	60Bon - Live Tow
130	10-May	1815	114		235	57° 16.4' N	155° 55.0' W	60Bon
130	10-May	1842	114		234	57° 16.4' N	155° 54.8' W	60Bon - Live Tow
130	10-May	2001	115		279	57° 24.6' N	155° 41.4' W	60Bon
130	10-May	2135	116		262	57° 17.9' N	155° 27.3' W	60Bon
130	10-May	2318	117		232	57° 11.0' N	155° 12.7' W	60Bon
131	11-May	0041	118		133	57° 04.0' N	154° 57.1' W	60Bon
131	11-May	0219	119		215	57° 18.5' N	154° 59.5' W	60Bon
131	11-May	0335	120		245	57° 24.8' N	155° 14.0' W	60Bon
131	11-May	0356	120		243	57° 24.5' N	155° 13.4' W	60Bon - Live Tow
131	11-May	0519	121		309	57° 32.1' N	155° 28.4' W	60Bon
131	11-May	0634	122		299	57° 39.5' N	155° 15.2' W	60Bon
131	11-May	0747	123		229	57° 33.0' N	155° 00.7' W	60Bon
131	11-May	0858	124		133	57° 26.8' N	154° 47.6' W	60Bon
131	11-May	1005	125		166	57° 35.1' N	154° 36.6' W	60Bon
131	11-May	1105	126		221	57° 40.2' N	154° 46.5' W	60Bon
131	11-May	1225	127		263	57° 47.3' N	155° 02.4' W	60Bon
131	11-May	1338	128		230	57° 54.9' N	154° 47.7' W	60Bon
131	11-May	1451	129		221	57° 48.0' N	154° 32.9' W	60Bon
131	11-May	1557	130		173	57° 41.0' N	154° 20.9' W	60Bon
131	11-May	1712	131		167	57° 48.5' N	154° 05.1' W	60Bon
131	11-May	1840	132		217	57° 55.7' N	154° 20.3' W	60Bon
131	11-May	2130	133		200	57° 43.3' N	155° 15.5' W	Begin ADCP transect; TSG; SSF; Other
131	11-May	2306	134		209	57° 30.9' N	154° 46.9' W	End ADCP transect; TSG; SSF; Other
131	11-May	2329	135		209	57° 31.1' N	154° 46.4' W	20/60Bon

TABLE 6. MF93-06 CRUISE SUMMARY

Larval Survey									1 - 16 May, 1993
Date (JD)	Date (JD)	Time (GMT)	Station Number	FOCI ID No.	Depth (m)	Latitude	Longitude	Comments	
132	12-May	0003	135	CTD034	209	57° 31.3' N	154° 46.0' W	CTD - Chl: 0,10,20, 30,40,50,60 m; MZ: 10,20,30,40, 50,60 m; Nutrients: 0,10,30, 40,50,100,150, 200 m	
132	12-May	0058	136		227	57° 33.4' N	154° 52.2' W	20/60Bon	
132	12-May	0134	136	CTD035	228	57° 33.3' N	154° 52.1' W	CTD - Chl: 0,10,20, 30,40,50,60 m; MZ: 10,20,30,40, 50,60 m; Nutrients: 0,10,20, 40,50,100,150, 200,228 m	
132	12-May	0234	137		234	57° 36.5' N	155° 00.4' W	20/60Bon	
132	12-May	0315	137	CTD036	234	57° 36.5' N	155° 00.1' W	CTD - Chl: 0,10,20, 30,40,50,60 m; MZ: 10,20,30,40, 50,60 m; Nutrients: 0,10,30, 40,50,100,150, 200,234 m	
132	12-May	0339	137		233	57° 36.6' N	155° 00.1' W	Ring.5 - Live Tow	
132	12-May	0422	138		252	57° 38.6' N	155° 04.1' W	20/60Bon	
132	12-May	0456	138	CTD037	251	57° 38.7' N	155° 04.1' W	CTD - Chl: 0,10,20, 30,40,50,60 m; MZ: 10,20,30,40, 50,60 m; Nutrients: 0,10,30, 40,50,100,150, 200,244 m	
132	12-May	0549	139		286	57° 41.0' N	155° 09.6' W	20/60Bon	
132	12-May	0624	139	CTD038	283	57° 40.7' N	155° 09.6' W	CTD - Chl: 0,10,20, 30,40,50,60 m; MZ: 10,20,30,40, 50,60 m; Nutrients: 0,10,30, 40,50,100,150, 200,250 m	
132	12-May	0718	140		196	57° 43.1' N	155° 15.6' W	60Bon (aborted)	
132	12-May	0747	140		293	57° 42.9' N	155° 14.9' W	20/60Bon	

TABLE 6. MF93-06 CRUISE SUMMARY

Larval Survey									1 - 16 May, 1993
Date (JD)	Date (JD)	Time (GMT)	Station Number	FOCI ID No.	Depth (m)	Latitude	Longitude	Comments	
132	12-May	0846	140	CTD039	224	57° 43.1' N	155° 15.5' W	CTD - Chl: 0.10,20,30,40,50,60 m; MZ: 10,20,30,40,50,60 m; Nutrients: 0,10,30,40,50,100,150,200,220 m	
132	12-May	0939	141		211	57° 43.2' N	155° 14.7' W	Begin ADCP transect; TSG; SSF; Other	
132	12-May	1132	142		204	57° 39.3' N	154° 32.3' W	End ADCP transect; TSG; SSF; Other	
132	12-May	1139	143		210	57° 39.3' N	154° 33.3' W	Begin ADCP transect; TSG; SSF; Other	
132	12-May	1303	144		233	57° 50.4' N	154° 59.7' W	End ADCP transect; TSG; SSF; Other	
132	12-May	1309	145		231	57° 50.7' N	154° 58.6' W	Begin ADCP transect; TSG; SSF; Other	
132	12-May	1448	146		233	57° 31.2' N	154° 50.2' W	End ADCP transect; TSG; SSF; Other	
132	12-May	1451	147		234	57° 31.0' N	154° 50.5' W	Begin ADCP transect; TSG; SSF; Other	
132	12-May	1551	148		239	57° 43.2' N	154° 52.9' W	End ADCP transect; TSG; SSF; Other	
132	12-May	1624	149		240	57° 43.4' N	154° 52.8' W	20/60Bon	
132	12-May	1701	149		240	57° 43.5' N	154° 52.9' W	Calvet	
132	12-May	1739	150		226	57° 41.6' N	154° 49.5' W	20/60Bon	
132	12-May	1809	150		226	57° 41.9' N	154° 49.4' W	Calvet	
132	12-May	1826	150		226	57° 41.8' N	154° 49.3' W	SatBuoy 7165	
132	12-May	1854	151		227	57° 39.9' N	154° 53.0' W	20/60Bon	
132	12-May	1921	151		227	57° 40.2' N	154° 53.4' W	Calvet	
132	12-May	1949	152		240	57° 41.7' N	154° 56.3' W	20/60Bon	
132	12-May	2012	152		240	57° 41.7' N	154° 56.3' W	Calvet	
132	12-May	2027	152		238	57° 41.6' N	154° 56.1' W	SatBuoy 7170	
132	12-May	2036	153		243	57° 40.6' N	154° 58.6' W	Begin ADCP transect; TSG; SSF	
132	12-May	2157	154		290	57° 30.0' N	155° 25.2' W	End ADCP transect; TSG; SSF	
132	12-May	2157	154		290	57° 30.0' N	155° 25.2' W	Begin ADCP Backtrack-L; TSG; SSF	
132	12-May	2337	155		287	57° 28.9' N	155° 25.7' W	End ADCP Backtrack-L; TSG; SSF	

TABLE 6. MF93-06 CRUISE SUMMARY

Larval Survey				1 - 16 May, 1993						
Date (JD)	Date (JD)	Time (GMT)	Station Number	FOCI ID No.	Depth (m)	Latitude	Longitude	Comments		
133	13-May	0459	156		198	56° 37.2' N	156° 28.7' W	60Bon		
133	13-May	0540	157		204	56° 32.4' N	156° 29.2' W	60Bon		
133	13-May	0621	158		216	56° 27.3' N	156° 29.1' W	60Bon		
133	13-May	0700	159		220	56° 27.0' N	156° 20.1' W	60Bon		
133	13-May	0746	160		202	56° 32.5' N	156° 20.0' W	60Bon		
133	13-May	0833	161		187	56° 37.1' N	156° 20.0' W	60Bon		
133	13-May	0918	162		253	56° 37.1' N	156° 10.8' W	60Bon		
133	13-May	1000	163		274	56° 32.2' N	156° 10.8' W	60Bon		
133	13-May	1044	164		270	56° 27.2' N	156° 10.9' W	60Bon		
133	13-May	1126	165		248	56° 27.2' N	156° 01.9' W	60Bon		
133	13-May	1209	166		269	56° 32.2' N	156° 01.8' W	60Bon		
133	13-May	1251	167		290	56° 37.1' N	156° 01.8' W	60Bon		
133	13-May	1407	167		188	56° 37.2' N	156° 20.1' W	Live Tow		
133	13-May	1424	168		187	56° 37.3' N	156° 20.1' W	Live Tow		
133	13-May	1504	168		187	56° 37.3' N	156° 20.1' W	Live Tow		
133	13-May	1521	168		187	56° 37.5' N	156° 20.3' W	Live Tow		
133	13-May	1536	168		187	56° 37.7' N	156° 20.3' W	Calvet		
133	13-May	1551	168		187	56° 37.6' N	156° 20.5' W	Deploy "Pietrusiak" buoy		
133	13-May	1611	169		188	56° 37.5' N	156° 20.8' W	60Bon - Live Tow		
133	13-May	1626	169		191	56° 37.5' N	156° 21.1' W	60Bon - Live Tow		
133	13-May	1655	169		190	56° 37.8' N	156° 21.3' W	Calvet		
133	13-May	1703	169		191	56° 37.8' N	156° 21.5' W	60Bon - Live Tow		
133	13-May	1716	169		191	56° 37.7' N	156° 21.7' W	60Bon - Live Tow		
133	13-May	1729	169		192	56° 37.7' N	156° 21.8' W	Calvet		
133	13-May	1739	169		193	56° 37.7' N	156° 21.8' W	60Bon - Live Tow		
133	13-May	1813	170		199	56° 37.5' N	156° 22.8' W	60Bon - Live Tow		
133	13-May	1826	170		199	56° 37.6' N	156° 22.9' W	60Bon - Live Tow		
133	13-May	1843	170		197	56° 37.4' N	156° 22.9' W	60Bon - Live Tow		
133	13-May	1907	170		202	56° 37.2' N	156° 23.2' W	Calvet		
133	13-May	1945	170	CTD040	202	56° 36.9' N	156° 24.0' W	CTD		
133	13-May	2013	171		202	56° 36.7' N	156° 24.5' W	60Bon - Live Tow		
133	13-May	2032	171		202	56° 36.6' N	156° 24.6' W	Calvet		
133	13-May	2047	171		202	56° 36.5' N	156° 24.5' W	60Bon		
133	13-May	2105	172		200	56° 35.8' N	156° 25.5' W	60Bon - Live Tow		
133	13-May	2230	172		200	56° 35.7' N	156° 26.1' W	Calvet		
133	13-May	2245	172		201	56° 35.6' N	156° 26.1' W	60Bon - Live Tow		
133	13-May	2307	172	CTD041	200	56° 35.4' N	156° 26.5' W	CTD		
134	14-May	0008	173		200	56° 34.8' N	156° 27.0' W	60Bon - Live Tow		
134	14-May	0020	173		201	56° 34.2' N	156° 26.6' W	Calvet		
134	14-May	0052	174		201	56° 34.9' N	156° 26.6' W	60Bon - Live Tow		
134	14-May	0152	174	CTD042	201	56° 34.8' N	156° 27.0' W	CTD		

TABLE 6. MF93-06 CRUISE SUMMARY

Larval Survey

1 - 16 May, 1993

Date (JD)	Date (JD)	Time (GMT)	Station Number	FOCI ID No.	Depth (m)	Latitude	Longitude	Comments
134	14-May	0219	174		203	56° 35.0' N	156° 26.3' W	60Bon - Live Tow
134	14-May	0233	174		203	56° 35.0' N	156° 26.1' W	Calvet
134	14-May	0242	174		204	56° 35.0' N	156° 25.9' W	60Bon - Live Tow
134	14-May	0302	174		204	56° 35.0' N	156° 25.7' W	60Bon - Live Tow
134	14-May	0408	174		204	56° 34.9' N	156° 25.9' W	60Bon - Live Tow
134	14-May	0423	175		206	56° 34.8' N	156° 25.6' W	Calvet
134	14-May	0456	175	CTD043	205	56° 34.6' N	156° 25.8' W	CTD
134	14-May	0606	175		205	56° 34.6' N	156° 25.2' W	60Bon - Live Tow
134	14-May	0617	175		206	56° 34.6' N	156° 25.0' W	Calvet
134	14-May	0627	175		207	56° 34.5' N	156° 25.1' W	60Bon - Live Tow
134	14-May	0648	175		207	56° 34.5' N	156° 24.9' W	60Bon - Live Tow
134	14-May	0706	176		206	56° 34.5' N	156° 24.7' W	Seacat/CTD
134	14-May	0809	176		206	56° 34.5' N	156° 24.6' W	60Bon - Live Tow
134	14-May	0828	176		205	56° 34.6' N	156° 24.4' W	Calvet
134	14-May	0841	176		205	56° 34.5' N	156° 24.2' W	60Bon - Live Tow
134	14-May	0922	176		206	56° 34.4' N	156° 24.7' W	1Tuck/Ig-CB
134	14-May	1012	177		204	56° 34.4' N	156° 23.8' W	60Bon - Live Tow
134	14-May	1108	177		203	56° 34.8' N	156° 24.1' W	60Bon - Live Tow
134	14-May	1125	177		205	56° 34.8' N	156° 24.0' W	Calvet
134	14-May	1148	178		205	56° 34.7' N	156° 24.9' W	1Tuck/Ig-CB
134	14-May	1210	178		205	56° 34.4' N	156° 25.2' W	60Bon - Live Tow
134	14-May	1228	178		205	56° 34.6' N	156° 25.1' W	Calvet
134	14-May	1257	178		204	56° 34.9' N	156° 25.4' W	60Bon - Live Tow
134	14-May	1332	179		203	56° 35.1' N	156° 25.7' W	1Tuck/Ig-CB
134	14-May	1410	180		202	56° 35.6' N	156° 25.5' W	60Bon - Live Tow
134	14-May	1432	180		202	56° 35.6' N	156° 25.6' W	Calvet
134	14-May	1738	181		200	56° 36.2' N	156° 27.7' W	MOC1
134	14-May	2003	182		201	56° 35.2' N	156° 29.2' W	1Tuck
134	14-May	2105	182		201	56° 34.7' N	156° 29.0' W	MOC1
134	14-May	2236	183		190	56° 34.2' N	156° 30.7' W	1Tuck
134	14-May	2354	183		189	56° 33.9' N	156° 31.0' W	Meth
135	15-May	0202	184		174	56° 34.3' N	156° 33.0' W	MOC1
135	15-May	0256	185		191	56° 33.3' N	156° 31.7' W	CTD (Seacat only)
135	15-May	0334	185		192	56° 33.1' N	156° 31.7' W	1Tuck
135	15-May	0510	186		194	56° 33.3' N	156° 31.0' W	CTD (Seacat only)
135	15-May	0708	186		196	56° 33.1' N	156° 31.2' W	CTD (Seacat only)
135	15-May	0858	187		197	56° 32.8' N	156° 30.0' W	MOC1
135	15-May	1033	187		198	56° 32.8' N	156° 30.0' W	MOC1
135	15-May	1141	188		200	56° 31.9' N	156° 30.9' W	CTD (Seacat only)
135	15-May	1245	188		200	56° 31.5' N	156° 31.0' W	Meth
135	15-May	1351	188		200	56° 31.5' N	156° 31.1' W	Meth
135	15-May	1448	189		203	56° 31.8' N	156° 29.9' W	CTD (Seacat only)

TABLE 6. MF93-06 CRUISE SUMMARY

Larval Survey

1 - 16 May, 1993

Date (JD)	Date (JD)	Time (GMT)	Station Number	FOCI ID No.	Depth (m)	Latitude	Longitude	Comments
135	15-May	1621	190		203	56° 32.2' N	156° 29.2' W	CTD (Seacat only)
135	15-May	1830	191		250	56° 12.0' N	156° 12.0' W	SatBuoy 7211

MF93-08 (FOCI-93-05): 25 May–02 June, 1993

SCIENTIFIC PERSONNEL

<u>Name</u>	<u>Title</u>	<u>Organization</u>
Kevin Bailey	Chief Scientist	AFSC/NOAA
Trish Brown		AFSC/NOAA
Morgan Busby		AFSC/NOAA
Carol DeWitt		PMEL/NOAA
Leslie Lawrence		PMEL/NOAA
Bern Megrey		AFSC/NOAA
Matt Wilson		AFSC/NOAA
Hank Dietz		Aloha, OR/High School

CRUISE STATISTICS

ADCP backscatter calibration	1
ADCP transects	2
Bongos, 20 cm	16
Bongos, 60 cm	113
CalVETs	18
Chlorophyll samples	48
CTD casts	18
Drifters, radar-tracked	2
Larvae for histology	16
Larvae for gut analysis	355
Larvae for otolith analysis	695
Larvae frozen for biochemical analysis	50
Methots	5
Microzooplankton	66
Moorings, recovered	3
Nutrient samples	70

OBJECTIVES

The objectives of MF93-08 (FOCI-93-05) were to:

- continue acquisition of long-term biological and physical time series
- conduct a survey of larval pollock for use in estimating distribution, drift and mortality rates
- collect samples of larval pollock for studies on growth and condition
- trawl for midwater predators on larval pollock
- recover three sediment trap/current meter moorings in Shelikof Strait

CRUISE REPORT

Sampling with bongo tows began just outside of Chiniak Bay and continued until the ship arrived at Stevenson Entrance. The initial bongo tows were done with 333 μm mesh netting. At Stevenson Entrance an ADCP transect was conducted. After the ADCP transect, bongo sampling was resumed on a transect through Shelikof Strait until we reached the FOX time series line 8. At line 8, three stations were occupied for 60- and 20-cm bongos, CalVET tows, and CTD's. Immediately after line 8 sampling, three sediment trap moorings were recovered from their deployment locations in Shelikof Strait.

Bongo sampling was continued on a nearshore transect down to the vicinity of Mitrofanina Island. At the beginning of this transect the bongo netting was changed to 505 μm to prevent clogging. At the end of the transect the regular FOCI grid of bongo stations was established and sampling of the grid commenced.

There were several minor prescheduled interruptions to the normal grid activities. On sampling line 3, bongo tows were supplemented with bucket nutrient samples, 20-cm bongos and CalVETs. At FOX lines 16 and 17, three stations at each line were occupied for 20- and 60-cm bongos, CTD's with microzooplankton, nutrient and chlorophyll samples, and CalVETs.

At two locations on the grid a radar-tracked drogue (a window-shade type drogue was used, the bottom edge of the drogue was at 50 m, and it was 20 m high) was deployed. The drogue deployment was timed to commence sampling around it before dawn. Each deployment lasted about 6 hours. Around the drogue there was continuous sampling of water column properties with the CTD, including microzooplankton, light levels and temperature, CalVETs, and live-tow bongos for pollock larvae. Pollock larvae were sampled for gut analysis and biochemical composition. Drogue experiments occurred on days of unusually calm and sunny conditions.

At the completion of the normal FOCI grid sampling, an experiment was conducted to calibrate ADCP backscatter after eliminating as much other ship-related noise as possible. During this experiment the ship's main engines were shut off as well as the 12 KHz and 50 KHz sounders and the EK-500 system. They were turned back on sequentially while monitoring the ADCP system.

The ship headed back to Kodiak while completing a set of bongo stations on the outer shelf of Kodiak Island along the way. The scientists disembarked on June 2. After leaving Kodiak, the

ship sampled a grid of bongo stations overlying Portlock Bank and Amatuli Trough. Finally, on the way back to Seattle, an ADCP transect was run across a segment of the Gulf of Alaska.

SUMMARY

Larvae were relatively low in abundance compared with other recent years such as 1990 and 1992, but were more abundant compared with the stormy year of 1991. Most larvae were concentrated downstream of the exit region of the Strait in the sea valley and around the Semidis and Sutwik Island. Larvae were not especially abundant at nearshore stations. Very few larvae were found in the areas of the Strait proper, Stevenson Pass, Portlock Bank, Amatuli Trough, or outside shelf of Kodiak Island. Radar-tracked drogue experiments were successful, and sediment-trap mooring recoveries were successful.

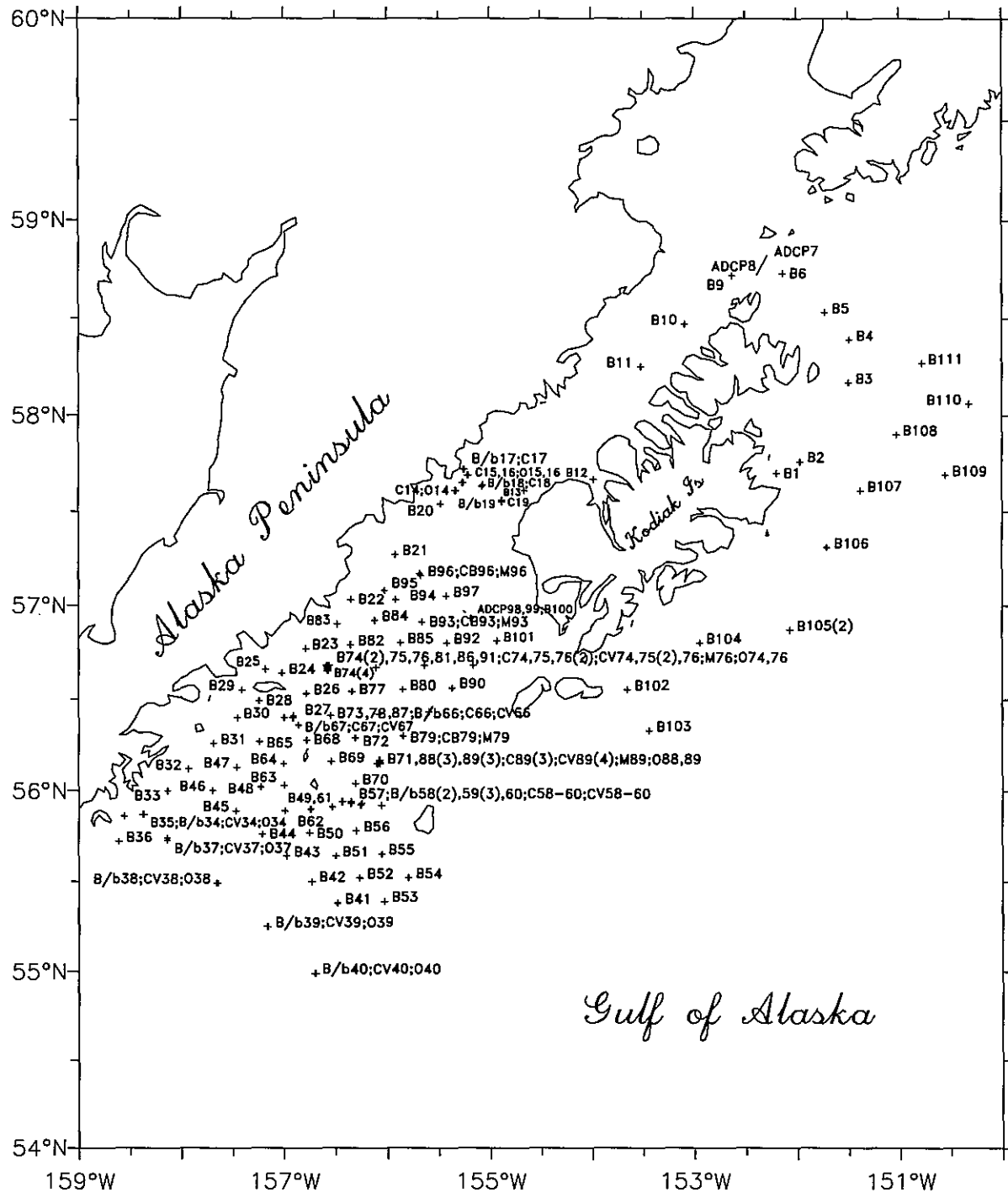


Fig. 5.1. MF93-08 ADCP, 60 cm Bongo (B), 20/60 cm Bongo (B/b), CTD (C), CalVET (CV), large Clarke-Bumpus (CB), Drifter (D), Methot (M), MOCNESS (Moc), Other (O), Ring (R), Sea Surface Fluorescence (F), Thermosalinograph (T), and Tucker (TU) stations.

TABLE 7. MF93-08 CRUISE SUMMARY

Larval Survey									25 May - 2 June, 1993
Date (JD)	Date (JD)	Time (GMT)	Station Number	FOCI ID No.	Depth (m)	Latitude	Longitude	Gear Code	
145	25-May	2221	1		110	57° 42.0' N	152° 11.8' W	60Bon	
145	25-May	2325	2		75	57° 45.5' N	151° 58.1' W	60Bon	
146	26-May	0149	3		146	58° 10.1' N	151° 29.7' W	60Bon	
146	26-May	0307	4		157	58° 23.1' N	151° 29.3' W	60Bon	
146	26-May	0427	5		175	58° 31.8' N	151° 43.7' W	60Bon	
146	26-May	0621	6		126	58° 43.5' N	152° 08.6' W	60Bon	
146	26-May	0713	7		130	58° 49.1' N	152° 17.4' W	Begin ADCP transect	
146	26-May	0742	8		124	58° 43.2' N	152° 23.5' W	End ADCP transect	
146	26-May	0832	9		200	58° 43.1' N	152° 38.0' W	60Bon	
146	26-May	1028	10		170	58° 28.4' N	153° 05.6' W	60Bon	
146	26-May	1219	11		177	58° 15.0' N	153° 31.1' W	60Bon	
146	26-May	1417	12		200	57° 60.0' N	153° 58.8' W	60Bon	
146	26-May	1700	13		220	57° 36.8' N	154° 39.8' W	60Bon	
146	26-May	1930	14	CTD001	327	57° 36.6' N	155° 20.6' W	CTD	
146	26-May	2015	14	9303	318	57° 36.6' N	155° 19.8' W	Moor	
146	26-May	2202	15	CTD002	305	57° 38.8' N	155° 16.4' W	CTD	
146	26-May	2226	15	9302	300	57° 38.8' N	155° 16.4' W	Moor	
147	27-May	0020	16	CTD003	298	57° 41.5' N	155° 13.2' W	CTD	
147	27-May	0048	16		298	57° 41.2' N	155° 12.5' W	Moor	
147	27-May	0145	17	CTD004	152	57° 43.4' N	155° 15.4' W	CTD - Chl: 10,20, 30,40,50,60 m; Nutrients: 10,20, 30,50,75,100, 146 m	
147	27-May	0228	17		296	57° 42.9' N	155° 14.7' W	20/60Bon	
147	27-May	0338	18	CTD005	254	57° 38.3' N	155° 04.4' W	CTD - Chl: 10,20, 30,40,50,60 m; Nutrients: 10,20, 30,50,75,100,150, 200,247 m	
147	27-May	0416	18		253	57° 37.6' N	155° 04.5' W	20/60Bon	
147	27-May	0555	19	CTD006	227	57° 33.3' N	154° 52.8' W	CTD - Chl: 10,20, 30,40,50,60 m; Nutrients: 10,20, 30,50,75,100,150, 200,215 m	
147	27-May	0632	19		228	57° 32.9' N	154° 52.7' W	20/60Bon	
147	27-May	0847	20		308	57° 32.1' N	155° 28.5' W	60Bon	
147	27-May	1048	21		240	57° 16.4' N	155° 55.1' W	60Bon	
147	27-May	1246	22		77	57° 01.8' N	156° 20.9' W	60Bon	
147	27-May	1454	23		86	56° 46.0' N	156° 47.2' W	60Bon	
147	27-May	1613	24		140	56° 38.5' N	157° 01.3' W	60Bon	

TABLE 7. MF93-08 CRUISE SUMMARY

Larval Survey					25 May - 2 June, 1993				
Date (JD)	Date (JD)	Time (GMT)	Station Number	FOCI ID No.	Depth (m)	Latitude	Longitude	Gear Code	
147	27-May	1703	25		179	56° 39.5' N	157° 10.8' W	60Bon	
147	27-May	1836	26		116	56° 31.5' N	156° 46.7' W	60Bon	
147	27-May	1947	27		150	56° 24.2' N	157° 00.2' W	60Bon	
147	27-May	2052	28		40	56° 29.1' N	157° 14.3' W	60Bon	
147	27-May	2207	29		136	56° 32.8' N	157° 24.4' W	60Bon	
147	27-May	2306	30		159	56° 23.9' N	157° 27.8' W	60Bon	
148	28-May	0024	31		106	56° 15.3' N	157° 41.4' W	60Bon	
148	28-May	0141	32		188	56° 07.4' N	157° 55.6' W	60Bon	
148	28-May	0251	33		101	55 59.9' N	158° 08.5' W	60Bon	
148	28-May	0407	34		131	55° 52.1' N	158° 22.6' W	Calvet; Other	
148	28-May	0418	34		127	55° 52.2' N	158° 22.4' W	20/60Bon	
148	28-May	0509	35		131	55° 51.4' N	158° 33.8' W	60Bon	
148	28-May	0608	36		109	55° 43.4' N	158° 36.9' W	60Bon	
148	28-May	0745	37		120	55° 44.0' N	158° 08.6' W	Calvet; Other	
148	28-May	0756	37		120	55° 44.1' N	158° 08.3' W	20/60Bon	
148	28-May	1002	38		95	55° 29.2' N	157° 39.6' W	Calvet; Other	
148	28-May	1017	38		94	55° 29.2' N	157° 39.2' W	20/60 Bon	
148	28-May	1233	39		100	55° 15.0' N	157° 10.2' W	Calvet; Other	
148	28-May	1247	39		100	55° 15.0' N	157° 09.8' W	20/60Bon	
148	28-May	1515	40		1408	54° 59.5' N	156° 41.4' W	Calvet; Other	
148	28-May	1527	40		1375	54° 59.6' N	156° 41.7' W	20/60Bon	
148	28-May	1748	41		165	55° 22.8' N	156° 28.7' W	60Bon	
148	28-May	1910	42		115	55° 30.2' N	156° 43.7' W	60Bon	
148	28-May	2029	43		81	55° 38.2' N	156° 58.3' W	60Bon	
148	28-May	2138	44		79	55° 45.3' N	157° 12.7' W	60Bon	
148	28-May	2245	45		90	55° 53.1' N	157° 28.0' W	60Bon	
148	28-May	2346	46		73	56° 00.1' N	157° 42.0' W	60Bon	
149	29-May	0057	47		143	56° 07.9' N	157° 27.9' W	60Bon	
149	29-May	0203	48		109	56° 01.1' N	157° 13.5' W	60Bon	
149	29-May	0310	49		122	55° 53.5' N	156° 59.2' W	60Bon	
149	29-May	0421	50		194	55° 46.3' N	156° 44.8' W	60Bon	
149	29-May	0529	51		247	55° 38.4' N	156° 30.0' W	60Bon	
149	29-May	0757	52		206	55° 31.2' N	156° 16.1' W	60Bon	
149	29-May	0905	53		199	55° 23.3' N	156° 01.7' W	60Bon	
149	29-May	1023	54		221	55° 31.4' N	155° 48.2' W	60Bon	
149	29-May	1132	55		238	55° 39.1' N	156° 03.3' W	60Bon	
149	29-May	1245	56		242	55° 46.6' N	156° 17.7' W	60Bon	
149	29-May	1359	57		133	55° 54.9' N	156° 03.8' W	60Bon	

TABLE 7. MF93-08 CRUISE SUMMARY

Larval Survey										25 May - 2 June, 1993
Date (JD)	Date (JD)	Time (GMT)	Station Number	FOCI ID No.	Depth (m)	Latitude		Longitude		Gear Code
149	29-May	1459	58	CTD007	223	55°	55.5' N	156°	15.0' W	CTD - MZ/Chl: 10, 20,30,40,50,60 m; Nutrients: 10,20, 30,40,50,60,75, 100,150,200 m
149	29-May	1530	58		222	55°	55.6' N	156°	15.0' W	Calvet
149	29-May	1552	58		225	55°	55.4' N	156°	15.5' W	20/60Bon
149	29-May		58		226	55°	55.4' N	156°	15.3' W	20/60Bon
149	29-May	1633	59	CTD008	232	55°	56.1' N	156°	21.1' W	CTD - MZ/Chl: 10, 20,30,40,50,60 m; Nutrients: 10,20, 30,40,50,60,75, 100,150,200 m
149	29-May	1701	59		232	55°	56.0' N	156°	21.1' W	Calvet
149	29-May	1720	59		232	55°	56.4' N	156°	21.0' W	20/60Bon (aborted)
149	29-May	1740	59		232	55°	56.4' N	156°	21.0' W	20/60Bon (aborted)
149	29-May	1811	59		231	55°	56.1' N	156°	21.1' W	20/60Bon
149	29-May	2004	60	CTD009	207	55°	56.5' N	156°	25.9' W	CTD - MZ/Chl: 10, 20,30,40,50,60 m; Nutrients: 10,20, 30,40,50,60,75, 100,150,200 m
149	29-May	2042	60		208	55°	56.4' N	156°	25.9' W	Calvet
149	29-May	2053	60		209	55°	56.2' N	156°	26.3' W	20/60Bon
149	29-May	2130	61		221	55°	54.5' N	156°	31.9' W	60Bon
149	29-May	2219	62		161	55°	54.2' N	156°	44.1' W	60Bon
149	29-May	2330	63		76	56°	01.6' N	157°	00.2' W	60Bon
150	30-May	0018	64		93	56°	08.9' N	157°	00.1' W	60Bon
150	30-May	0121	65		131	56°	15.9' N	157°	14.2' W	60Bon
150	30-May	0247	66	CTD010	119	56°	24.2' N	156°	54.9' W	CTD - MZ/Chl: 10, 20,30,40,50,60 m; Nutrients: 10,20, 30,40,50,75, 100,125 m
150	30-May	0307	66		115	56°	24.3' N	156°	54.8' W	Calvet
150	30-May	0316	66		117	56°	24.2' N	156°	54.7' W	20/60Bon
150	30-May	0353	67	CTD011	131	56°	21.5' N	156°	51.8' W	CTD - MZ/Chl: 10, 20,30,40,50,60 m; Nutrients: 10,20, 30,50,75,100, 125 m
150	30-May	0410	67		128	56°	21.6' N	156°	51.7' W	Calvet

TABLE 7. MF93-08 CRUISE SUMMARY

Larval Survey									25 May - 2 June, 1993
Date (JD)	Date (JD)	Time (GMT)	Station Number	FOCI ID No.	Depth (m)	Latitude	Longitude	Gear Code	
150	30-May	0418	67		131	56° 21.5' N	156° 51.8' W	20/60Bon	
150	30-May	0503	68		82	56° 16.9' N	156° 46.8' W	60Bon	
150	30-May	0609	69		214	56° 09.4' N	156° 32.1' W	60Bon	
150	30-May	0713	70		208	56° 02.2' N	156° 18.3' W	60Bon	
150	30-May	0827	71		231	56° 09.9' N	156° 05.0' W	60Bon	
150	30-May	0935	72		276	56° 17.5' N	156° 18.6' W	60Bon	
150	30-May	1040	73		196	56° 24.5' N	156° 33.0' W	60Bon	
150	30-May	1208	74		151	56° 39.2' N	156° 34.9' W	60Bon	
150	30-May	1249	74		153	56° 39.3' N	156° 34.2' W	Deploy buoy	
150	30-May	1306	74		160	56° 39.3' N	156° 34.0' W	60Bon - Live Tow	
150	30-May	1326	74		160	56° 39.2' N	156° 34.1' W	60Bon - Live Tow	
150	30-May	1352	74		153	56° 39.1' N	156° 34.9' W	60Bon - Oblique Live Tow	
150	30-May	1426	74	CTD012	153	56° 39.4' N	156° 34.5' W	CTD - MZ: 10,20, 30,40,50,60 m	
150	30-May	1448	74		151	56° 39.5' N	156° 34.4' W	Calvet	
150	30-May	1509	74		152	56° 39.3' N	156° 34.8' W	60Bon - Oblique Live Tow	
150	30-May	1536	74		149	56° 39.1' N	156° 34.1' W	60Bon - Oblique Live Tow	
150	30-May	1608	75		148	56° 40.0' N	156° 34.4' W	Calvet	
150	30-May	1631	75	CTD013	157	56° 40.2' N	156° 34.5' W	CTD	
150	30-May	1653	75		159	56° 40.2' N	156° 34.5' W	Calvet	
150	30-May	1703	75		154	56° 40.2' N	156° 34.3' W	60Bon - Oblique Live Tow	
150	30-May	1737	76	CTD014	168	56° 40.6' N	156° 34.8' W	CTD	
150	30-May	1752	76		167	56° 40.7' N	156° 34.9' W	60Bon - Oblique Live Tow	
150	30-May	1823	76		155	56° 40.5' N	156° 34.7' W	Calvet	
150	30-May	1838	76	CTD015	156	56° 40.5' N	156° 34.7' W	CTD	
150	30-May	1930	76		94	56° 40.7' N	156° 33.5' W	Meth	
150	30-May	2030	76		143	56° 40.5' N	156° 35.2' W	Recover buoy	
150	30-May	2141	77		206	56° 32.1' N	156° 20.3' W	60Bon	
150	30-May	2247	78		250	56° 25.3' N	156° 04.7' W	60Bon	
150	30-May	2354	79		110	56° 18.0' N	155° 50.8' W	60Bon	
151	31-May	0013	79		110	56° 17.7' N	155° 51.2' W	Meth; Ig-CB	
151	31-May	0150	80		235	56° 32.9' N	155° 51.3' W	60Bon	
151	31-May	0259	81		266	56° 40.0' N	156° 06.4' W	60Bon	
151	31-May	0405	82		191	56° 47.4' N	156° 21.0' W	60Bon	
151	31-May	0500	83		86	56° 54.1' N	156° 29.0' W	60Bon	
151	31-May	0611	84		200	56° 55.1' N	156° 06.9' W	60Bon	
151	31-May	0721	85		301	56° 47.7' N	155° 52.0' W	60Bon	

MF93-10 (FOCI-93-06): 5–18 September, 1993

SCIENTIFIC PERSONNEL

<u>Name</u>	<u>Title</u>	<u>Organization</u>
Morgan Busby		AFSC/NOAA
Matt Wilson		AFSC/NOAA

CRUISE STATISTICS

Acoustic transect miles (excl. transits)	226
CTD casts	14
Trawls, Anchovy	12
Trawls, Shrimp	22
Tucker Trawls	13
Age-0 pollock lengths	2119
Age-0 pollock, frozen	approx 1600
Age-0 pollock, 10% formalin	429
Plankton samples	23

OBJECTIVES

The objectives of MF93-10 (FOCI-93-06) were to:

- test the utility of an electronic multiple plankton sampler (MPS) as a multiple codend device for collecting depth-discrete samples of age-0 pollock
- test an underwater video system
- examine the distribution of age-0 walleye pollock vertically and horizontally (inshore vs. offshore) and collect biological samples and environmental data
- compare the shrimp trawl to the anchovy trawl with regard to the number and size of age-0 pollock caught

CRUISE REPORT

All operations took place at night during September 5–18 along the east side of Kodiak Island from Chiniak Bay to Kiliuda Bay aboard the NOAA ship *Miller Freeman*. Stations were determined by monitoring an echosounder (Simrad EK-500) to locate substantial echosign when travelling to, from, and during acoustic transects. The distance transected each night was generally short (<40 nm) so enough time was left to adequately sample each station which required several operations. Scanmar or Furuno instruments were attached to each otter trawl each time they were fished to indicate net depth and area of the net mouth.

MPS test

The MPS was attached to the anchovy trawl at the end of the codend. Two deployments were attempted, but the electronic tripping device on the MPS flooded and we were not able to get the tripper working again. Therefore, we were not able to test the utility of the MPS for depth-discrete sampling of age-0 pollock.

Video test

Three deployments were made with the low-light video system (90° camera view) attached to the CTD. This took place at night in Kalsin Bay during September 17 and 18. The site was selected because age-0 pollock appeared to comprise a strong layer of echosign fairly shallow (25 to 35 m) and seas were very calm. The battery case for the light imploded on the first cast to 125 m but two subsequent casts were made to about 30 m using dive lights. Real-time viewing through the camera was not possible. From the footage obtained it was apparent that camera lighting and stability were the most important problems affecting the images although some small fish were visible.

Age-0 distribution

Trawl sampling was conducted at 22 stations across the continental shelf in bays and the outer shelf. If age-0 pollock were found at a station, plankton and CTD data were also collected. Some areas were sampled repeatedly but at different times resulting in different station numbers at the same location. Most otter trawl tows targeted layers of echosign but some were oblique in order to

quickly determine if age-0 pollock were present in any layers. Two non-quantitative tows were done (stations 6 and 10). One was to collect stomachs of adult bottom fish and the other was to check the position of the anchovy net relative to the doors.

For each haul, all age-0 pollock were separated from other species and age groups of pollock. Age-0 pollock (<125 mm FL) were easily distinguished from older age groups (≥ 200 mm FL) on the basis of size. All age-0 pollock were then weighed and counted, or, if necessary, a subsample was weighed and counted to provide an estimate of the total catch. Fork lengths of age-0 fish were measured to the nearest millimeter. Age-0 pollock collected in inner bays were of two general sizes (modal FL of about 40 and 90 mm); these were separated prior to weighing, counting, and measuring. The number measured at sea depended on the amount of time available and the number required to provide a good size composition estimate.

Unfortunately, a shortage of personnel made it necessary to discard most other species caught with only cursory notes on haul catch composition. This will make interpretation of the acoustic data difficult.

Oceanographic data were collected at each station. CTD casts were made to record salinity and temperature profiles. A single cast was done for all stations near to each other in time and space. Plankton samples were collected using a Tucker trawl equipped with 333 μm mesh nets. Many of these plankton samples were collected at the same depth as the otter trawl samples and will be used for comparison with food habits.

Gear comparison

Two pairs of tows were made at stations 3 and 4 in Kalsin Bay. Each pair was comprised of a tow by each type of trawl (shrimp and anchovy). No other comparative tows were attempted because only one of the two net reels was available to us and changing nets took too much time.

OBJECTIVES

The objectives of MF93-10 (FOCI-93-06) were to:

- test the utility of an electronic multiple plankton sampler (MPS) as a multiple codend device for collecting depth-discrete samples of age-0 pollock
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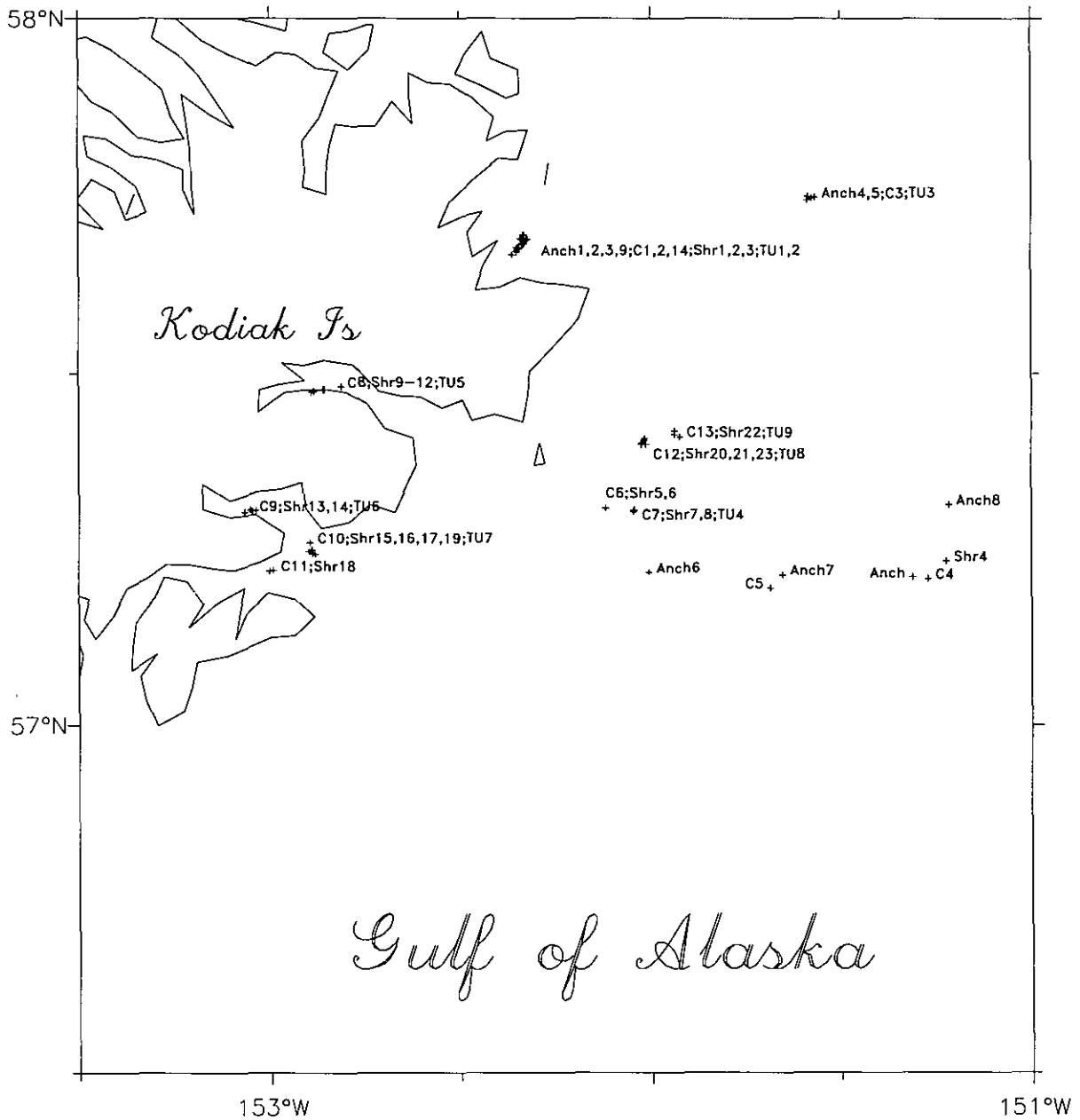


Fig. 6.1. MF93-10 Anchovy Trawl (Anch), CTD (C), Shrimp Trawl (Shr), and Tucker (TU) stations.

TABLE 8. MF93-10 CRUISE SUMMARY

Age-0 Pollock

5 - 18 September 1993

Date (JD)	Date (GMT)	Time (ADT)	Station No.	Haul No.	Depth (m)	Latitude		Longitude		Gear Code
248	5-Sep	1936	000	1		57°	41.8' N	152°	20.0' W	Scanmar test
249	6-Sep	0234	001	1	109	57°	40.1' N	152°	21.7' W	CTD
		0330	001	2	90	57°	41.8' N	152°	19.8' W	MPS failed
250	7-Sep	0128	002	1	122	57°	40.7' N	152°	20.8' W	1Tuck failed
		0203	002	2	123	57°	40.7' N	152°	20.6' W	1Tuck failed
		0245	002	3	120	57°	40.4' N	152°	20.9' W	1Tuck failed
		0400	002	4	127	57°	40.8' N	152°	21.0' W	MPS failed
		2304	003	1	116	57°	40.5' N	152°	21.0' W	Anchovy Trawl
251	8-Sep	0053	003	2	140	57°	41.4' N	152°	19.3' W	Anchovy Trawl
		0216	003	3	130	57°	41.0' N	152°	20.0' W	1Tuck
		0308	003	4	126	57°	41.0' N	152°	19.8' W	CTD
		0348	003	5	140	57°	41.4' N	152°	19.5' W	1Tuck
		0438	003	6	122	57°	40.7' N	152°	20.6' W	Shrimp trawl
252	9-Sep	0018	004	1	120	57°	40.6' N	152°	20.6' W	Shrimp trawl
		0128	004	2	131	57°	41.1' N	152°	20.2' W	Shrimp trawl
		0358	004	3	130	57°	41.1' N	152°	19.8' W	Anchovy trawl
253	10-Sep	0201	005	1	50	57°	44.9' N	151°	34.5' W	CTD
		0230	005	2	51	57°	44.7' N	151°	35.3' W	1Tuck failed
		0319	005	3	51	57°	44.7' N	151°	35.3' W	1Tuck
		0405	005	4	51	57°	45.0' N	151°	34.1' W	Anchovy trawl
		0506	005	5	50	57°	45.0' N	151°	35.1' W	Anchovy trawl
		2139	006	1	151	57°	12.6' N	157°	16.3' W	CTD
		2247	006	2	157	57°	12.7' N	151°	18.7' W	Anchovy trawl gear test
254	11-Sep	0202	007	1	73	57°	13.1' N	152°	00.3' W	Anchovy trawl
		0408	008	1	61	57°	12.9' N	151°	39.1' W	Anchovy trawl
		0530	008	2	63	57°	11.8' N	151°	41.0' W	CTD
255	12-Sep	0118	009	1	94	57°	19.0' N	151°	13.1' W	Anchovy trawl
		0453	010	1	133	57°	14.1' N	151°	13.4' W	Shrimp trawl
256	13-Sep	0031	011	1	73	57°	18.6' N	152°	07.2' W	Shrimp trawl
		125	011	2	73	57°	18.6' N	152°	07.2' W	CTD
		0208	011	3	73	57°	18.6' N	152°	07.2' W	Shrimp trawl
		0327	012	1	73	57°	18.5' N	152°	02.7' W	Shrimp trawl
		0414	012	2	74	57°	18.5' N	152°	02.8' W	Shrimp trawl
		0457	012	3	73	57°	18.4' N	152°	02.8' W	1Tuck
		0533	012	4	73	57°	18.3' N	152°	02.8' W	CTD
		2331	013	1	60	57°	28.9' N	152°	48.8' W	Shrimp trawl
257	14-Sep	0220	014	1	56	57°	28.5' N	152°	53.6' W	Shrimp trawl
		0316	014	2	69	57°	28.5' N	152°	53.1' W	Shrimp trawl
		0400	014	3	59	57°	28.7' N	152°	51.5' W	CTD
		0425	014	4	69	57°	28.7' N	152°	51.7' W	1Tuck
		0507	014	5	68	57°	28.6' N	152°	53.1' W	Shrimp trawl

TABLE 8. MF93-10 CRUISE SUMMARY

Age-0 Pollock

5 - 18 September 1993

Date (JD)	Date (GMT)	Time (ADT)	Station No.	Haul No.	Depth (m)	Latitude	Longitude	Gear Code
		2328	015	1	94	57° 18.5' N	153° 03.2' W	CTD
258	15-Sep	0034	015	2	93	57° 18.4' N	153° 02.9' W	Shrimp trawl
		0120	015	3	85	57° 18.5' N	153° 02.3' W	1Tuck
		0204	015	4	93	57° 18.3' N	153° 04.1' W	Shrimp trawl
		0348	016	1	107	57° 14.8' N	152° 53.3' W	Shrimp trawl
		0424	016	2	118	57° 15.1' N	152° 53.5' W	Shrimp trawl
		0506	016	3	111	57° 14.7' N	152° 52.9' W	Shrimp trawl
		0606	016	4	115	57° 14.9' N	152° 53.9' W	CTD
		0629	016	5	115	57° 15.1' N	152° 53.4' W	1Tuck
		2349	017	1	110	57° 13.3' N	153° 00.1' W	CTD
259	16-Sep	0041	017	2	115	57° 13.3' N	152° 59.5' W	Shrimp trawl
		0226	018	1	87	57° 15.7' N	152° 53.7' W	Shrimp trawl
		2344	019	1	72	57° 24 0' N	152° 01.5' W	Shrimp trawl
260	17-Sep	0043	019	2	80	57° 24.4' N	152° 01.1' W	Shrimp trawl
		0126	019	3	81	57° 24.5' N	152° 01.0' W	CTD
		0157	019	4	78	57° 24.2' N	152° 01.4' W	1Tuck
		0323	020	1	66	57° 24.7' N	151° 55.5' W	Shrimp trawl
		0413	020	2	69	57° 24.9' N	151° 56.3' W	CTD
		0435	020	3	69	57° 25.2' N	151° 56.3' W	1Tuck
		0534	021	1	74	57° 24.0' N	152° 00.8' W	Shrimp trawl
		2121	022	1	132	57° 41.4' N	152° 20.1' W	Video attached
		2318	022	2	150	57° 41.1' N	152° 20.1' W	Anchovy trawl
261	18-Sep	0147	022	3	90	57° 41.5' N	152° 20.0' W	Video attached
		0309	022	4	68	57° 41.5' N	152° 20.4' W	Video attached

SU93-03 (FOCI-93-07): 01–23 September, 1993

SCIENTIFIC PERSONNEL

<u>Name</u>	<u>Title</u>	<u>Organization</u>
Ron Reed	Chief Scientist	PMEL/NOAA
Carol DeWitt		PMEL/NOAA
Carrie Hadden		PMEL/NOAA
Leslie Lawrence		PMEL/NOAA
Rick Miller		PMEL/NOAA
Bill Parker		PMEL/NOAA

CRUISE STATISTICS

Chlorophyll samples	11
CTD casts	184
Drifters, satellite-tracked	1
Mooring deployments	4
Mooring recoveries	2
Nutrient samples	616
Tucker trawls	1

OBJECTIVES

The objectives of SU93-03 (FOCI-93-07) were to:

- gain understanding of circulation along the south and north sides of the Aleutian Islands and through the island passes
- examine circulation and slope-shelf exchange along the eastern boundary of the deep basin

CRUISE REPORT

The PROTEUS mooring and a subsurface ADCP mooring were recovered on 2 September. A total of 184 CTD casts were taken. Four subsurface current moorings were deployed, each at a depth of ~200 m.

One satellite-tracked drifter was released in the Alaskan Stream.

PROTEUS Mooring

Both a subsurface ADCP mooring and the surface PROTEUS mooring were recovered on 2 September. A CTD calibration cast was taken prior to recovery of the surface mooring. Eleven chlorophyll (and nutrient) samples were taken, processed, and frozen. Three Tucker trawls were planned at the site; only one was successfully taken, mainly because of problems with the electronic counter (wire out). The large catch was split and each half was preserved in formalin.

Current Moorings

Four subsurface current moorings were deployed anchor first, using a gravity release when the weight touched bottom. Each mooring had an upper (50-m depth) acoustic current meter and a lower (190-m depth) rotor/vane current meter. Moorings 1, 2, and 3 were all placed at 200 m, and mooring 4 was deployed on a steep slope at 205 m. The only major difficulty was in deploying mooring 2. Winds increased rapidly to ~30 kt; their effect on the ship produced a large wire angle, and it was difficult to get the gravity hook to release. On 15 September, 2 days after deployment of mooring 2, we were notified by PMEL that the upper meter on the mooring had been pulled up by a trawler. Consequently, we were requested to search for it, on the return to Dutch Harbor, and attempt to redeploy it. On 22 September, we located mooring 1 and determined that its range was 2.5 nm. We then searched for mooring 2, using a spacing of 2.0 nm, first around the deployment site and then along the trawl line, as reported by the trawler. The search was futile. After our return to Seattle (24 September), PMEL received a message that the bottom meter had been found by another trawler. Hence none of mooring 2 is near the original site, and only the anchor and acoustic release remain in the water.

CTD Casts

The CTD casts obtained provide a synoptic data set that shows variations in water properties and details of the circulation system. Agreement between CTD salinity, temperature, and pressure and salinometer salinities, reversing thermometer temperatures, and thermometric depths was excellent. This does not mean we had no problems with the instruments, however. On station 35, salinity oscillations were noted and found to be caused by a faulty thermistor. The thermistor was changed and the cast repeated. Later, intermittent spiking (in one, two, or all sensors) became a problem. The CTD connections were cleaned and the cable reterminated. Eventually, however, spiking became much worse, and the conductivity and pressure sensors were replaced. This essentially solved the problem. (The spikes, though bothersome, can be easily removed from the data.) We had problems with Niskin bottles, used to collect nutrient samples, tripping on a few stations. This was corrected by changing to a new rosette.

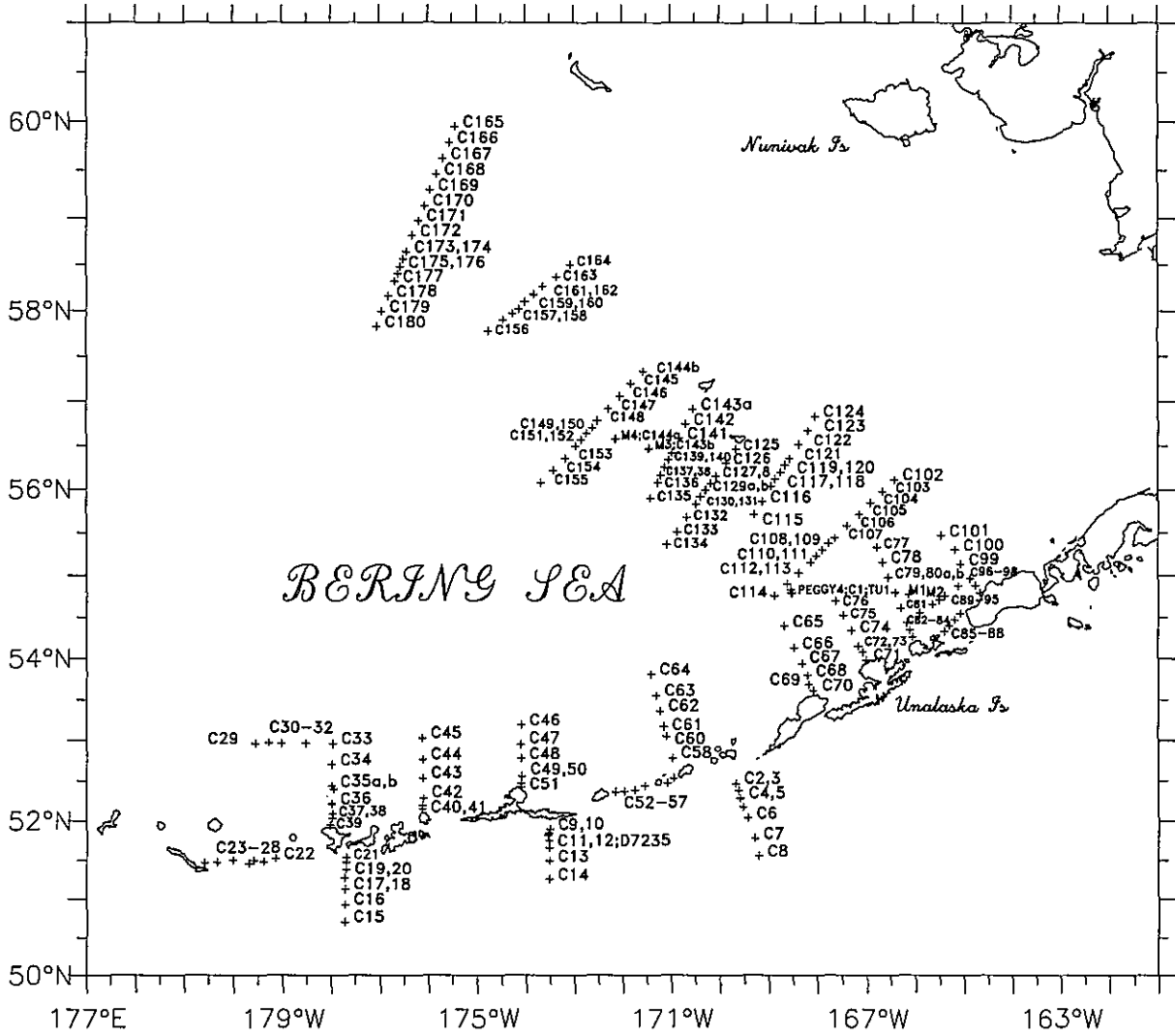


Fig. 7.1. SU93-03 CTD (C), Mooring and Tucker (TU) stations.

TABLE 9. SU93-03 CRUISE SUMMARY

Physical Oceanography								01 - 23 September 1993		
Date (JD)	Date (GMT)	Time (GMT)	Station Number	FOCI ID No.	Depth (m)	Latitude		Longitude		Gear Code
245	2-Sep	2015	001	PEGGY-4	2280	54°	49.8' N	168°	33.2' W	Depart Dutch Harbor Recover Subsurface ADCP
245	2-Sep	2138	002	CTD001	2216	54°	47.9' N	168°	32.5' W	CTD - Chl: 0,9(3), 11(3),25,38(3); Nutrients: 0,9(3), 11(3),25,38(3)
245	2-Sep	2230	003	PEGGY-4	2216	54°	47.7' N	168°	31.6' W	1Tuck
246	3-Sep	0021	004	PEGGY-4	2212	54°	47.3' N	168°	32.1' W	1Tuck
246	3-Sep	0137	005	PEGGY-4	2217	54°	47.3' N	168°	32.8' W	1Tuck
246	3-Sep	0145	005	PEGGY-4	2210	54°	47.0' N	168°	32.8' W	1Tuck
246	3-Sep	0210	006	PEGGY-4	2213	54°	47.4' N	168°	32.2' W	Moor
246	3-Sep	1800				52°	55.0' N	169°	45.0' W	Disembark sci party
247	4-Sep	0151	007	CTD002	257	52°	28.1' N	169°	40.5' W	CTD
247	4-Sep	0345	008	CTD003	935	52°	22.9' N	169°	36.9' W	CTD
247	4-Sep	0541	009	CTD004	1506	52°	17.3' N	169°	34.6' W	CTD
247	4-Sep	0757	010	CTD005	3051	52°	10.2' N	169°	31.0' W	CTD
247	4-Sep	0909	011	CTD006	3296	52°	02.1' N	169°	24.9' W	CTD
247	4-Sep	1249	012	CTD007	4618	51°	46.8' N	169°	17.3' W	CTD
247	4-Sep	1556	013	CTD008	6513	51°	33.4' N	169°	12.2' W	CTD
248	5-Sep	0426	014	CTD009	330	51°	53.8' N	173°	30.7' W	CTD
248	5-Sep	0600	015	CTD010	1489	51°	51.0' N	173°	31.9' W	CTD
248	5-Sep	0707	016	D7235	1672	51°	49.3' N	173°	32.9' W	SatBuoy 7235
248	5-Sep	0819	017	CTD011	2909	51°	45.3' N	173°	31.8' W	CTD
248	5-Sep	1017	018	CTD012	3684	51°	39.6' N	173°	31.2' W	CTD
248	5-Sep	1242	019	CTD013	4587	51°	29.6' N	173°	30.9' W	CTD
248	5-Sep	1534	020	CTD014	4724	51°	15.5' N	173°	30.9' W	CTD
249	6-Sep	0442	021	CTD015	4385	50°	42.7' N	177°	43.7' W	CTD
249	6-Sep	0714	022	CTD016	4214	50°	56.2' N	177°	42.4' W	CTD
249	6-Sep	0937	023	CTD017	3104	51°	08.0' N	177°	42.6' W	CTD
249	6-Sep	1158	024	CTD018	2347	51°	16.7' N	177°	43.6' W	CTD
249	6-Sep	1454	025	CTD019	1581	51°	23.3' N	177°	41.6' W	CTD
249	6-Sep	1652	026	CTD020	1146	51°	28.7' N	177°	41.7' W	CTD
249	6-Sep	1800	027	CTD021	354	51°	32.6' N	177°	41.4' W	CTD
249	6-Sep	2250	028	CTD022	1160	51°	31.3' N	179°	08.8' W	CTD
250	7-Sep	0045	029	CTD023	1089	51°	29.2' N	179°	23.3' W	CTD
250	7-Sep	0234	030	CTD024	1158	51°	29.9' N	179°	35.3' W	CTD
250	7-Sep	0412	031	CTD025	885	51°	27.4' N	179°	41.1' W	CTD
250	7-Sep	0612	032	CTD026	1059	51°	29.9' N	180°	00.8' W	CTD
250	7-Sep	0821	033	CTD027	1110	51°	28.3' N	180°	20.0' W	CTD
250	7-Sep	1005	034	CTD028	1347	51°	28.0' N	180°	35.0' W	CTD
250	7-Sep	1845	035	CTD029	1384	52°	57.6' N	179°	32.5' W	CTD
250	7-Sep	2035	036	CTD030	1358	52°	57.9' N	179°	16.1' W	CTD
250	7-Sep	2228	037	CTD031	3482	52°	57.7' N	179°	00.6' W	CTD
251	8-Sep	0055	038	CTD032	3724	52°	57.5' N	178°	30.6' W	CTD
251	8-Sep	0340	039	CTD033	3714	52°	57.4' N	177°	57.2' W	CTD
251	8-Sep	0605	040	CTD034	3628	52°	42.1' N	177°	59.4' W	CTD
251	8-Sep	0826	041A	CTD035a	3582	52°	26.0' N	177°	59.1' W	CTD
251	8-Sep	1000	041B	CTD035b	3524	52°	23.9' N	177°	57.2' W	CTD

TABLE 9. SU93-03 CRUISE SUMMARY

Physical Oceanography

01 - 23 September 1993

Date (JD)	Date (GMT)	Time (GMT)	Station Number	FOCI ID No.	Depth (m)	Latitude	Longitude	Gear Code
251	8-Sep	1148	042	CTD036	3283	52° 12.7' N	177° 59.0' W	CTD
251	8-Sep	1343	043	CTD037	2754	52° 05.3' N	177° 59.0' W	CTD
251	8-Sep	1524	044	CTD038	2358	52° 02.0' N	177° 59.5' W	CTD
251	8-Sep	1706	045	CTD039	950	51° 57.0' N	178° 01.8' W	CTD
251	8-Sep	2138				51° 55.0' N	176° 35.0' W	ADAK
252	9-Sep	0054	046	CTD040	1450	52° 09.6' N	176° 07.6' W	CTD
252	9-Sep	0227	047	CTD041	2148	52° 12.0' N	176° 07.6' W	CTD
252	9-Sep	0417	048	CTD042	3039	52° 17.3' N	176° 06.4' W	CTD
252	9-Sep	0646	049	CTD043	3588	52° 32.3' N	176° 07.3' W	CTD
252	9-Sep	0859	050	CTD044	3706	52° 46.2' N	176° 07.8' W	CTD
252	9-Sep	1120	051	CTD045	3739	53° 02.0' N	176° 07.2' W	CTD
252	9-Sep	1812	052	CTD046	3528	53° 11.5' N	174° 05.6' W	CTD
252	9-Sep	2047	053	CTD047	3413	52° 56.8' N	174° 05.8' W	CTD
252	9-Sep	2305	054	CTD048	3200	52° 46.5' N	174° 06.6' W	CTD
253	10-Sep	0148	055	CTD049	2080	52° 33.3' N	174° 05.1' W	CTD
253	10-Sep	0340	056	CTD050	1282	52° 27.7' N	174° 06.2' W	CTD
253	10-Sep	0502	057	CTD051	582	52° 25.1' N	174° 06.1' W	CTD
253	10-Sep	1112	058	CTD052	390	52° 21.6' N	172° 08.5' W	CTD
253	10-Sep	1300	059	CTD053	325	52° 21.7' N	171° 57.6' W	CTD
253	10-Sep	1400	060	CTD054	290	52° 23.0' N	171° 44.4' W	CTD
253	10-Sep	1532	061	CTD055	283	52° 26.0' N	171° 32.4' W	CTD
253	10-Sep	1755	062	CTD056	458	52° 27.9' N	171° 04.6' W	CTD
253	10-Sep	1903	063	CTD057	452	52° 31.7' N	170° 57.1' W	CTD
253	10-Sep	2043	064	CTD058	740	52° 46.5' N	170° 58.6' W	CTD
253	10-Sep	2303	065	CTD060	1150	53° 02.8' N	171° 05.5' W	CTD
254	11-Sep	0053	066	CTD061	1695	53° 09.8' N	171° 08.9' W	CTD
254	11-Sep	0304	067	CTD062	2301	53° 22.1' N	171° 13.7' W	CTD
254	11-Sep	0518	068	CTD063	2789	53° 33.0' N	171° 18.5' W	CTD
254	11-Sep	0740	069	CTD064	3187	53° 48.4' N	171° 24.9' W	CTD
254	11-Sep	1632	070	CTD065	1514	54° 23.8' N	168° 40.6' W	CTD
254	11-Sep	1900	071	CTD066	2419	54° 07.9' N	168° 28.4' W	CTD
254	11-Sep	2112	072	CTD067	1888	53° 56.4' N	168° 19.4' W	CTD
254	11-Sep	2310	073	CTD068	1411	53° 47.8' N	168° 12.5' W	CTD
255	12-Sep	0050	074	CTD069	1281	53° 41.2' N	168° 10.7' W	CTD
255	12-Sep	0219	075	CTD070	653	53° 36.8' N	168° 04.9' W	CTD
255	12-Sep	0612	076	CTD071	193	53° 58.8' N	167° 00.2' W	CTD - Nutrients: 5, 15,45,75,125,150, 175,187 m
255	12-Sep	0737	077	CTD072	1052	54° 04.6' N	167° 04.5' W	CTD
255	12-Sep	0913	078	CTD073	1521	54° 09.0' N	167° 10.0' W	CTD - Nutrients: 5, 15,45,75,150,250, 350,450,550, 1497 m
255	12-Sep	1127	079	CTD074	788	54° 20.5' N	167° 18.5' W	CTD - Nutrients: 5, 15,45,75,150,250, 350,450,550,764 m
255	12-Sep	1327	080	CTD075	683	54° 31.5' N	167° 28.5' W	CTD - Nutrients: 5, 15,45,75,150,250, 350,450,550,622 m

TABLE 9. SU93-03 CRUISE SUMMARY

Physical Oceanography

01 - 23 September 1993

Date (JD)	Date (GMT)	Time (GMT)	Station Number	FOCI ID No.	Depth (m)	Latitude	Longitude	Gear Code
255	12-Sep	1515	081	CTD076	849	54° 41.7' N	167° 38.0' W	CTD - Nutrients: 5, 15,45,75,150,250, 350,450,550,826 m
255	12-Sep	1940	082	CTD077	138	55° 19.9' N	166° 46.9' W	CTD - Nutrients: 5, 15,35,55,75,100, 128 m
255	12-Sep	2102	083	CTD078	141	55° 09.3' N	166° 39.7' W	CTD - Nutrients: 5, 15,35,55,75,100, 128 m
255	12-Sep	2230	084	CTD079	143	54° 58.6' N	166° 32.5' W	CTD - Nutrients: 5, 15,35,55,75,100, 125,137 m
255	12-Sep	2353	085	CTD080	192	54° 48.0' N	166° 24.9' W	CTD - Nutrients: 5, 15,35,55,75,100, 125,150,175,197 m
256	13-Sep	0125	086	CTD081	402	54° 37.3' N	166° 17.7' W	CTD - Nutrients: 5, 15,45,75,125,175, 225,275,325,341 m
256	13-Sep	0302	087	CTD082	544	54° 26.1' N	166° 09.9' W	CTD - Nutrients: 5, 15,45,75,150,250, 350,450,536 m
256	13-Sep	0416	088	CTD083	701	54° 20.7' N	166° 06.3' W	CTD
256	13-Sep	0523	089	CTD084	448	54° 15.9' N	166° 02.9' W	CTD - Nutrients: 5, 15,45,75,125,175, 225,275,325,404 m
256	13-Sep	0734	090	CTD085	81	54° 20.1' N	165° 23.8' W	CTD - Nutrients: 5, 15,35,55,74 m
256	13-Sep	0822	091	CTD086	180	54° 24.3' N	165° 17.9' W	CTD - Nutrients: 5, 15,35,55,75,100, 125,148 m
256	13-Sep	0918	092	CTD087	147	54° 28.5' N	165° 11.2' W	CTD - Nutrients: 5, 15,35,55,75,100, 125,148 m
256	13-Sep	1013	093	CTD088	72	54° 33.1' N	165° 04.2' W	CTD - Nutrients: 5,15,35,58 m
256	13-Sep	1346	094	CTD089	548	54° 26.2' N	166° 09.9' W	CTD - Nutrients: 5, 15,45,75,150,250, 350,450,512 m
256	13-Sep	1530	095	CTD090	449	54° 33.4' N	165° 54.3' W	CTD - Nutrients: 5, 15,45,75,125,175, 225,275,325,429 m
256	13-Sep	1858	096	BSSE-1	196	54° 46.5' N	166° 08.2' W	Deploy mooring
256	13-Sep	1924	097	CTD080b	194	54° 46.6' N	166° 08.1' W	CTD
256	13-Sep	2357	098	BSSE-2	195	54° 45.4' N	165° 24.2' W	Deploy mooring
257	14-Sep	0027	099	CTD093	191	54° 45.7' N	165° 23.8' W	CTD
257	14-Sep	0152	100	CTD091	325	54° 39.5' N	165° 38.9' W	CTD - Nutrients: 5, 15,45,75,125,175, 225,275,312 m

TABLE 9. SU93-03 CRUISE SUMMARY

Physical Oceanography									01 - 23 September 1993	
Date (JD)	Date (GMT)	Time (GMT)	Station Number	FOCI ID No.	Depth (m)	Latitude		Longitude		Gear Code
257	14-Sep	0253	101	CTD092	254	54°	42.8' N	165°	30.6' W	CTD - Nutrients: 5, 15,35,55,75,100, 125,150,175,240 m
257	14-Sep	0436	102	CTD094	108	54°	52.6' N	165°	07.2' W	CTD - Nutrients: 5, 15,35,55,75,103 m
257	14-Sep	0547	103	CTD095	91	54°	57.8' N	164°	51.8' W	CTD - Nutrients: 5, 15,35,55,73 m
257	14-Sep	0707	104	CTD096	47	54°	48.1' N	164°	40.1' W	CTD - Nutrients: 5, 15,35,41 m
257	14-Sep	0800	105	CTD097	62	54°	53.1' N	164°	45.8' W	CTD
257	14-Sep	0906	106	CTD098	82	54°	58.1' N	164°	51.5' W	CTD - Nutrients: 5, 15,35,55,72 m
257	14-Sep	1027	107	CTD099	109	55°	08.0' N	165°	03.6' W	CTD - Nutrients: 5, 15,35,55,75,103 m
257	14-Sep	1155	108	CTD100	111	55°	18.1' N	165°	10.6' W	CTD - Nutrients: 5, 15,35,55,75,97 m
257	14-Sep	1319	109	CTD101	110	55°	28.1' N	165°	27.9' W	CTD - Nutrients: 5, 15,35,55,75,86 m
257	14-Sep	1735	110	CTD102	116	56°	06.9' N	166°	25.0' W	CTD - Nutrients: 5, 15,35,55,75,108 m
257	14-Sep	1900	111	CTD103	126	55°	58.8' N	166°	39.8' W	CTD - Nutrients: 5, 15,35,55,75,100, 124 m
257	14-Sep	2025	112	CTD104	132	55°	50.8' N	166°	54.4' W	CTD - Nutrients: 5, 15,35,55,75,100, 122 m
257	14-Sep	2147	113	CTD105	132	55°	42.8' N	167°	09.3' W	CTD - Nutrients: 5, 15,35,55,75,100, 125 m
257	14-Sep	2316	114	CTD106	133	55°	34.6' N	167°	24.2' W	CTD - Nutrients: 5, 15,35,55,75,100, 130 m
258	15-Sep	0044	115	CTD107	139	55°	26.2' N	167°	38.8' W	CTD - Nutrients: 5, 15,35,55,75,100, 125,135 m
258	15-Sep	0138	116	CTD108	155	55°	22.4' N	167°	46.3' W	CTD
258	15-Sep	0233	117	CTD109	290	55°	18.1' N	167°	53.8' W	CTD - Nutrients: 5, 15,45,75,125,175, 225,276 m
258	15-Sep	0341	118	CTD110	757	55°	14.0' N	168°	01.3' W	CTD
258	15-Sep	0510	119	CTD111	1704	55°	09.4' N	168°	07.9' W	CTD - Nutrients: 5, 15,45,75,150,250, 350,450,550, 1478 m
258	15-Sep	0732	120	CTD112	2013	55°	01.7' N	168°	22.5' W	CTD - Nutrients: 5, 15,45,75,150,250, 350,450,1501 m

TABLE 9. SU93-03 CRUISE SUMMARY

Physical Oceanography									01 - 23 September 1993	
Date (JD)	Date (GMT)	Time (GMT)	Station Number	FOCI ID No.	Depth (m)	Latitude		Longitude		Gear Code
258	15-Sep	0947	121	CTD113	2340	54°	54.0' N	168°	37.8' W	CTD - Nutrients: 5, 15,45,75,150,250, 350,450,550, 1499 m
258	15-Sep	1230	122	CTD114	2023	54°	45.7' N	168°	53.2' W	CTD - Nutrients: 5, 15,45,75,150,250, 350,450,550, 1504 m
258	15-Sep	1808	123	CTD115	2483	55°	42.8' N	169°	18.0' W	CTD - Nutrients: 5, 15,45,75,150,250, 350,450,550, 1501 m
258	15-Sep	2030	124	CTD116	2206	55°	51.7' N	169°	07.4' W	CTD - Nutrients: 5, 15,45,75,150,250, 350,450,550, 1501 m
258	15-Sep	2244	125	CTD117	1212	56°	02.3' N	168°	56.8' W	CTD - Nutrients: 5, 15,45,75,150,250, 350,450,550, 1118 m
259	16-Sep	0014	126	CTD118	616	56°	07.3' N	168°	51.7' W	CTD - Nutrients: 5, 15,45,75,150,250, 350,450,550, 600 m
259	16-Sep	0120	127	CTD119	211	56°	11.9' N	168°	44.9' W	CTD
259	16-Sep	0208	128	CTD120	159	56°	16.7' N	168°	39.7' W	CTD
259	16-Sep	0256	129	CTD121	131	56°	21.2' N	168°	34.2' W	CTD - Nutrients: 5, 15,35,55,75,100, 122 m
259	16-Sep	0422	130	CTD122	113	56°	30.8' N	168°	22.9' W	CTD - Nutrients: 5, 15,35,55,75,100, 108 m
259	16-Sep	0540	131	CTD123	102	56°	40.2' N	168°	12.1' W	CTD - Nutrients: 5, 15,35,55,96 m
259	16-Sep	0702	132	CTD124	91	56°	49.9' N	168°	02.3' W	CTD - Nutrients: 5, 15,35,55,75,96 m
259	16-Sep	1146	133	CTD125	83	56°	27.8' N	169°	40.1' W	CTD - Nutrients: 5,15,35,59(2) m
259	16-Sep	1307	134	CTD126	107	56°	18.2' N	169°	52.4' W	CTD - Nutrients: 5,15,35,55,75, 100 m
259	16-Sep	1423	135	CTD127	119	56°	09.2' N	170°	04.4' W	CTD - Nutrients: 5,15,35,55,75, 106 m
259	16-Sep	1518	136	CTD128	127	56°	04.4' N	170°	10.6' W	CTD
259	16-Sep	1612	137	CTD129	680	55°	59.7' N	170°	16.5' W	CTD

TABLE 9. SU93-03 CRUISE SUMMARY

Physical Oceanography

01 - 23 September 1993

Date (JD)	Date (GMT)	Time (GMT)	Station Number	FOCI ID No.	Depth (m)	Latitude		Longitude		Gear Code
259	16-Sep	1650	137	CTD129b	696	55°	59.7' N	170°	17.3' W	CTD - Nutrients: 5, 15,45,75,150,250, 350,450,550, 614 m
259	16-Sep	1826	138	CTD130	1048	55°	55.1' N	170°	23.2' W	CTD
259	16-Sep	1956	139	CTD131	1404	55°	49.8' N	170°	28.5' W	CTD - Nutrients: 5, 15,45,75,150,250, 350,450,550, 1402 m
259	16-Sep	2203	140	CTD132	2847	55°	40.6' N	170°	40.9' W	CTD - Nutrients: 5, 15,45,75,150,250, 350,450,550, 1501 m
260	17-Sep	0017	141	CTD133	3318	55°	30.5' N	170°	52.7' W	CTD - Nutrients: 5, 15,45,75,150,250, 350,450,550, 1483 m
260	17-Sep	0232	142	CTD134	3235	55°	21.5' N	171°	05.3' W	CTD - Nutrients: 5, 15,45,75,150,250, 350(2),450,550, 1501 m
260	17-Sep	0717	143	CTD135	3082	55°	54.1' N	171°	24.9' W	CTD
260	17-Sep	0933	144	CTD136	2685	56°	05.0' N	171°	15.9' W	CTD
260	17-Sep	1121	145	CTD137	1300	56°	10.0' N	171°	12.8' W	CTD
260	17-Sep	1300	146	CTD138	425	56°	15.0' N	171°	08.0' W	CTD
260	17-Sep	1358	147	CTD139	130	56°	20.0' N	171°	03.3' W	CTD
260	17-Sep	1447	148	CTD140	123	56°	25.0' N	170°	59.1' W	CTD
260	17-Sep	1828	149	BSSE-3	195	56°	28.1' N	171°	27.2' W	Deploy mooring
260	17-Sep	1848	150	CTD143b	217	56°	27.8' N	171°	27.5' W	CTD
260	17-Sep	2233	151	BSSE-4	200	56°	34.5' N	172°	09.2' W	Deploy mooring
260	17-Sep	2256	152	CTD44a	204	56°	34.4' N	172°	08.3' W	CTD
261	18-Sep	0243	153	CTD141	115	56°	35.0' N	170°	50.1' W	CTD
261	18-Sep	0358	154	CTD142	106	56°	44.7' N	170°	41.4' W	CTD
261	18-Sep	0507	155	CTD143a	91	56°	54.8' N	170°	32.6' W	CTD
261	18-Sep	0853	156	CTD144b	99	57°	19.8' N	171°	34.0' W	CTD - Nutrients: 5,15,35,55,75, 88 m
261	18-Sep	1011	157	CTD145	106	57°	11.7' N	171°	49.2' W	CTD - Nutrients: 5,15,35,55,75, 94 m
261	18-Sep	1130	158	CTD146	112	57°	03.3' N	172°	02.9' W	CTD
261	18-Sep	1247	159	CTD147	120	56°	54.9' N	172°	17.0' W	CTD - Nutrients: 5,15,35,55,75, 100,108 m
261	18-Sep	1412	160	CTD148	126	56°	46.8' N	172°	30.8' W	CTD - Nutrients: 5,15,35,55,75, 100,113 m
261	18-Sep	1516	161	CTD149	129	56°	42.1' N	172°	38.0' W	CTD

TABLE 9. SU93-03 CRUISE SUMMARY

Physical Oceanography

01 - 23 September 1993

Date (JD)	Date (GMT)	Time (GMT)	Station Number	FOCI ID No.	Depth (m)	Latitude		Longitude		Gear Code
261	18-Sep	1613	162	CTD150	128	56°	38.2' N	172°	44.9' W	CTD - Nutrients: 5,15,35,55,75, 100,119 m
261	18-Sep	1727	163	CTD151	593	56°	34.0' N	172°	51.8' W	CTD
261	18-Sep	1900	164	CTD152	2292	56°	29.8' N	172°	58.7' W	CTD - Nutrients: 5, 15,45,75,150,250, 350,450,550, 1499 m
261	18-Sep	2126	165	CTD153	2611	56°	21.3' N	173°	11.3' W	CTD - Nutrients: 5, 15,45,75,150,250, 350,450 m
262	19-Sep	0001	166	CTD154	3206	56°	13.1' N	173°	25.8' W	CTD - Nutrients: 5, 15,45,75,150,250, 350,450,550, 1392 m
262	19-Sep	0233	167	CTD155	3380	56°	04.6' N	173°	41.0' W	CTD - Nutrients: 5, 15,45,75,150,250, 350,450,550, 1502 m
262	19-Sep	1143	168	CTD156	2288	57°	46.6' N	174°	45.6' W	CTD
262	19-Sep	1359	169	CTD157	1243	57°	54.3' N	174°	27.8' W	CTD
262	19-Sep	1617	170	CTD158	1472	57°	58.1' N	174°	16.0' W	CTD
262	19-Sep	1857	171	CTD159	947	58°	00.9' N	174°	08.0' W	CTD
262	19-Sep	2002	172	CTD160	127	58°	05.9' N	174°	01.0' W	CTD
262	19-Sep	2103	173	CTD161	115	58°	10.7' N	173°	49.8' W	CTD
262	19-Sep	2214	174	CTD162	112	58°	15.9' N	173°	38.9' W	CTD
262	19-Sep	2331	175	CTD163	111	58°	22.0' N	173°	21.9' W	CTD
263	20-Sep	0054	176	CTD164	110	58°	30.0' N	173°	04.0' W	CTD
263	20-Sep	1126	177	CTD165	118	55°	56.9' N	175°	27.0' W	CTD - Nutrients: 5,15,35,55,75, 100,108 m
263	20-Sep	1247	178	CTD166	125	59°	47.2' N	175°	33.9' W	CTD - Nutrients: 5,15,35,55,75, 100,115 m
263	20-Sep	1404	179	CTD167	133	59°	37.3' N	175°	41.5' W	CTD - Nutrients: 5,15,35,55,75, 100,126 m
263	20-Sep	1526	180	CTD168	138	59°	27.6' N	175°	49.4' W	CTD - Nutrients: 5,15,35,55,75, 100,126 m
263	20-Sep	1647	181	CTD169	132	59°	17.7' N	175°	56.9' W	CTD - Nutrients: 5,15,35,55,75, 100,125 m
263	20-Sep	1805	182	CTD170	133	59°	08.1' N	176°	04.3' W	CTD - Nutrients: 5,15,35,55,75, 100,136 m
263	20-Sep	1922	183	CTD171	130	58°	58.4' N	176°	11.9' W	CTD - Nutrients: 5,15,35,55,75, 100,120 m

TABLE 9. SU93-03 CRUISE SUMMARY

Physical Oceanography

01 - 23 September 1993

Date (JD)	Date (GMT)	Time (GMT)	Station Number	FOCI ID No.	Depth (m)	Latitude	Longitude	Gear Code
263	20-Sep	2035	184	CTD172	123	58° 49.0' N	176° 19.5' W	CTD - Nutrients: 5,15,35,55,75, 100,122 m
263	20-Sep	2208	185	CTD173	140	58° 38.5' N	176° 26.7' W	CTD - Nutrients: 5,15,35,55,75, 100,125,134 m
263	20-Sep	2311	186	CTD174	458	58° 33.6' N	176° 30.3' W	CTD
264	21-Sep	0031	187	CTD175	1655	58° 28.6' N	176° 34.0' W	CTD - Nutrients: 5, 15,45,75,150,250, 350,450,550, 1512 m
264	21-Sep	0223	188	CTD176	2894	58° 24.0' N	176° 38.0' W	CTD
264	21-Sep	0359	189	CTD177	3046	58° 19.4' N	176° 41.6' W	CTD - Nutrients: 5, 15,45,75,150,250, 350,450,550, 1500 m
264	21-Sep	0605	190	CTD178	2585	58° 09.5' N	176° 49.4' W	CTD - Nutrients: 5, 15,45,75,150,250, 350,450,550, 1501 m
264	21-Sep	0811	191	CTD179	3120	57° 59.6' N	176° 57.8' W	CTD - Nutrients: 5, 15,45,75,150,250, 350,450,550, 1503 m
264	21-Sep	1009	192	CTD180	3550	57° 49.5' N	177° 03.4' W	CTD
264	21-Sep	1642	193	BSSE-1	228	54° 46.4' N	166° 08.0' W	Moor
264	21-Sep			BSSE-2				Moor
266	23-Sep							Arrive Dutch Harbor

Table 10. Summary of FOCI's 1993 Shelikof Strait Mooring Recoveries

Summary of equipment recovered	
No. of RCM-4s:	3
No. of Sediment traps:	6
No. of releases:	3

Mooring I.D.	9301	9302	9303
Location	57° 41.55' N 155° 12.57' W	57° 38.34' N 155° 15.70' W	57° 36.47' N 155° 19.83' W
Duration	4/3/93 - 5//93	4/3/93 - 5//93	4/4/93 - 5/26/93
Depth (m)	285	298	318
Instruments	Aanderaa 271 m Sediment trap 281 m Sediment trap 284 m	Aanderaa 283 m Sediment trap 288 m Sediment trap 293 m	Aanderaa 303 m Sediment trap 308 m Sediment trap 313 m
Release	RT 121 BC	RT 121 BC	ART 191
Press Gage	none	none	none

Table 11. Summary of FOCI's 1993 Shelikof Strait Mooring Deployments

Summary of equipment deployed	
No. of RCM-4s:	3
No. of Sediment traps:	6
No. of releases:	3

85

Mooring I.D.	9301	9302	9303
Location	57° 41.55' N 155° 12.57' W	57° 38.34' N 155° 15.70' W	57° 36.47' N 155° 19.83' W
Duration	4/3/93 - 5//93	4/3/93 - 5//93	4/4/93 - 5/26/93
Depth (m)	285	298	318
Instruments	Aanderaa 271 m Sediment trap 281 m Sediment trap 284 m	Aanderaa 283 m Sediment trap 288 m Sediment trap 293 m	Aanderaa 303 m Sediment trap 308 m Sediment trap 313 m
Release	RT 121 BC	RT 121 BC	ART 191
Press Gage	none	none	none

Table 12. Summary of FOCI's 1993 Bering Sea Mooring Recoveries

Summary of equipment recovered	
No. of RCM-4s:	4
No. of Seacats:	10
No. of ACMs:	6
No. of MTRs:	6
No. of CHLAMs:	2
No. of SPAAMs:	1
No. of ADCPs:	2
No. of releases:	5

Mooring I.D.	PEGGY-4	PEGGY-4 (cont)	PEGGY-4 (cont)	Subsurface ADCP	BSSE-2
Location	Bering Sea 54° 47.48' N 168° 32.05' W			Bering Sea 54° 47.52' N 168° 35.86' W	54° 46.4' N 165° 24.2' W
Duration	3/29/93 - 9/3/93			3/30/93 - 9/2/93	9/13/93 - Dragged
Depth (m)	2139			2150	196
Instruments	CLAM 10 m MTR 10 m SPAAM 14 m Neil Brown 14 m Seacat 15 m MTR 22 m Seacat 30 m Neil Brown 38 m	CLAM 38 m Seacat 40 m MTR 50 m Seacat 62 m MTR 70 m Neil Brown 78 m Seacat 79 m Seacat 102 m	MTR 125 m Neil Brown 150 m Seacat 150.5 m Seacat 197.5 m MTR 253.5 m Neil Brown 301.5 m Seacat 397.5 m	150 KHz ADCP 250 m	Neil Brown 45 m Aanderaa 180 m
Release			8242/8242	8242/191	191
Press Gage			none	none	none

Table 13. Summary of FOCI's 1993 Bering Sea Mooring Deployments

Summary of equipment deployed	
No. of RCM-4s:	4
No. of Seacats:	10
No. of ACMs:	9
No. of MTRs:	6
No. of CHLAMs:	2
No. of SPAAMs:	1
No. of ADCPs:	2
No. of releases:	8

Mooring I.D.	PEGGY-4	PEGGY-4 (cont)	PEGGY-4 (cont)	Subsurface ADCP	BSSE-1
Location	Bering Sea 54° 47.48' N 168° 32.05' W			Bering Sea 54° 47.52' N 168° 35.86' W	54° 46.5' N 166° 08.2' W
Duration	3/29/93 - 9/3/93			3/30/93 - 9/2/93	9/13/93- 3//94
Depth (m)	2139			2150	196
Instruments	CLAM 10 m MTR 10 m SPAAM 14 m Neil Brown 14 m Seacat 15 m MTR 22 m Seacat 30 m Neil Brown 38 m	CLAM 38 m Seacat 40 m MTR 50 m Seacat 62 m MTR 70 m Neil Brown 78 m Seacat 79 m Seacat 102 m	MTR 125 m Neil Brown 150 m Seacat 150.5 m Seacat 197.5 m MTR 253.5 m Neil Brown 301.5 m Seacat 397.5 m	150 KHz ADCP 250 m	Neil Brown 46 m Aanderaa 181 m
Release			8242/8242	8242/191	191
Press Gage			none	none	none

Table 13. Summary of FOCI's 1993 Bering Sea Mooring Deployments

Mooring I.D.	BSSE-2	BSSE-3	BSSE-4
Location	54° 46.4' N 165° 24.2' W	56° 28.1' N 171° 27.2' W	56° 34.51' N 172° 09.21' W
Duration	9/13/93 - Draggd	9/17/93- 3//94	9/17/93- 3//94
Depth (m)	196	200	205
Instruments	Neil Brown 45 m Aanderaa 180 m	Neil Brown 50 m Aanderaa 185 m	Neil Brown 55 m Aanderaa 190 m
Release	191	121	121
Press Gage	none	none	none

MOORING	9301
POSITION	57° 41.55' N 155° 12.57' W
LORAN	18736.6 32537.8
DEPTH	285 m

CURRENT METER DEPTHS AND SERIAL NUMBERS
Aanderaa RCM-4 S/N 7491 271 m
Sediment Traps 26 and 32 281 m
RT 121 BC Release S/N 349 283.5 m

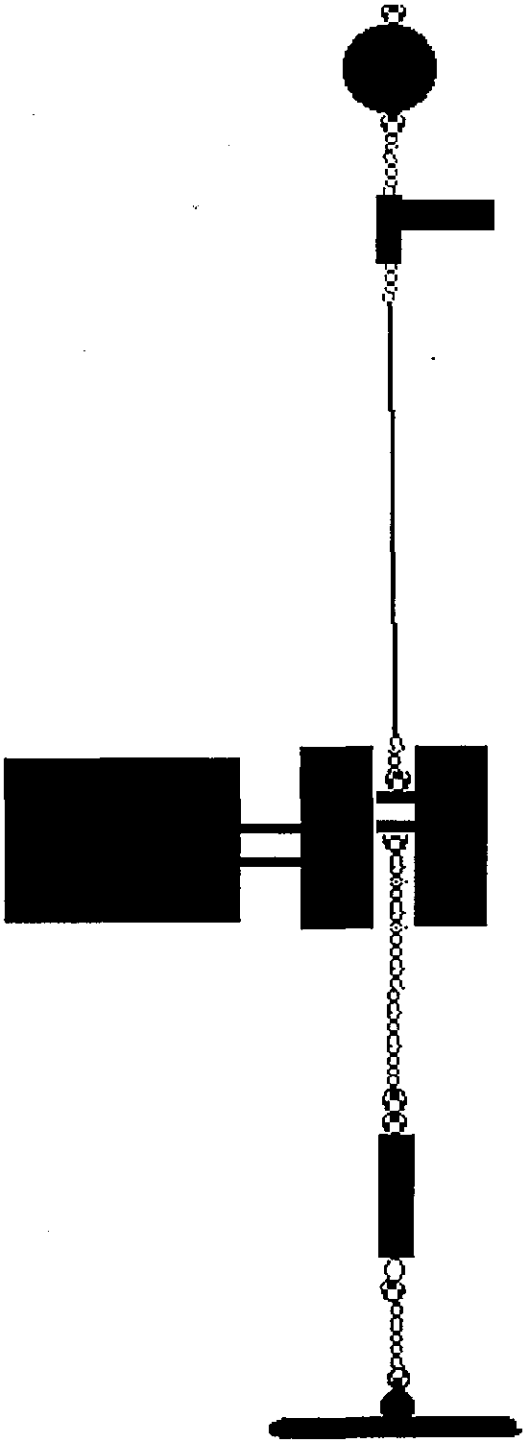
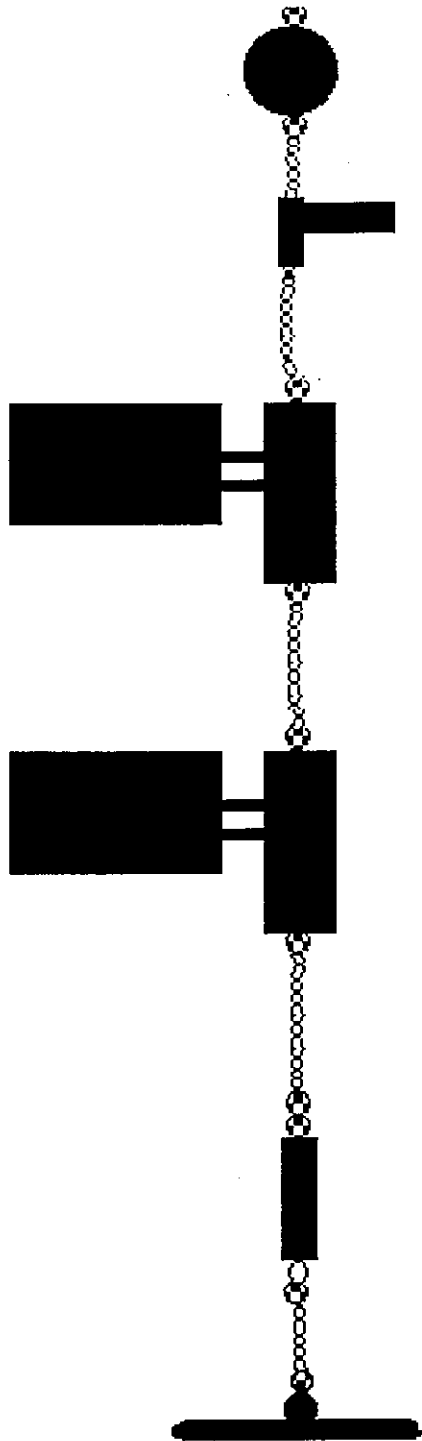


Fig. 8.1. Mooring 9301.

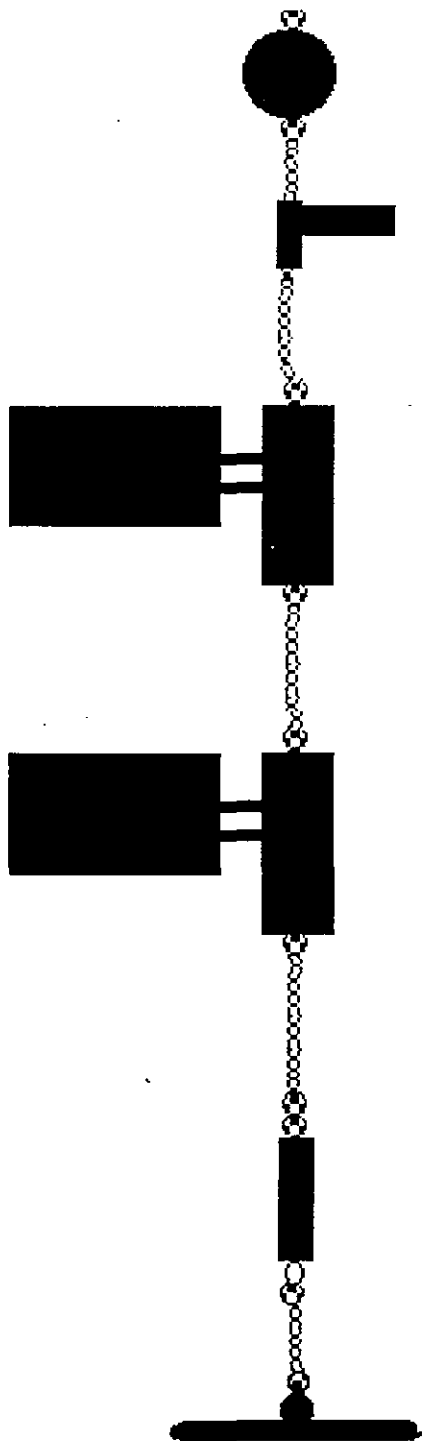
MOORING	9302
POSITION	57° 38.34' N
	155° 15.70' W
LORAN	19079.9
	32559.0
	44166.9
DEPTH	298 m



CURRENT METER DEPTHS AND SERIAL NUMBERS
Aanderaa RCM-4 S/N 5426 283 m
Sediment Trap S/N 18 288 m
Sediment Trap S/N 14 293 m
RT 121 BC Release S/N 348 m

Fig. 8.2. Mooring 9302.

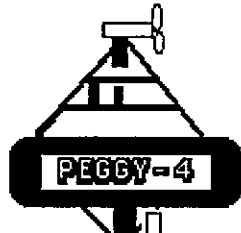
MOORING POSITION	9303 57° 36.47' N 155° 19.83' W
LORAN	
DEPTH	318 m



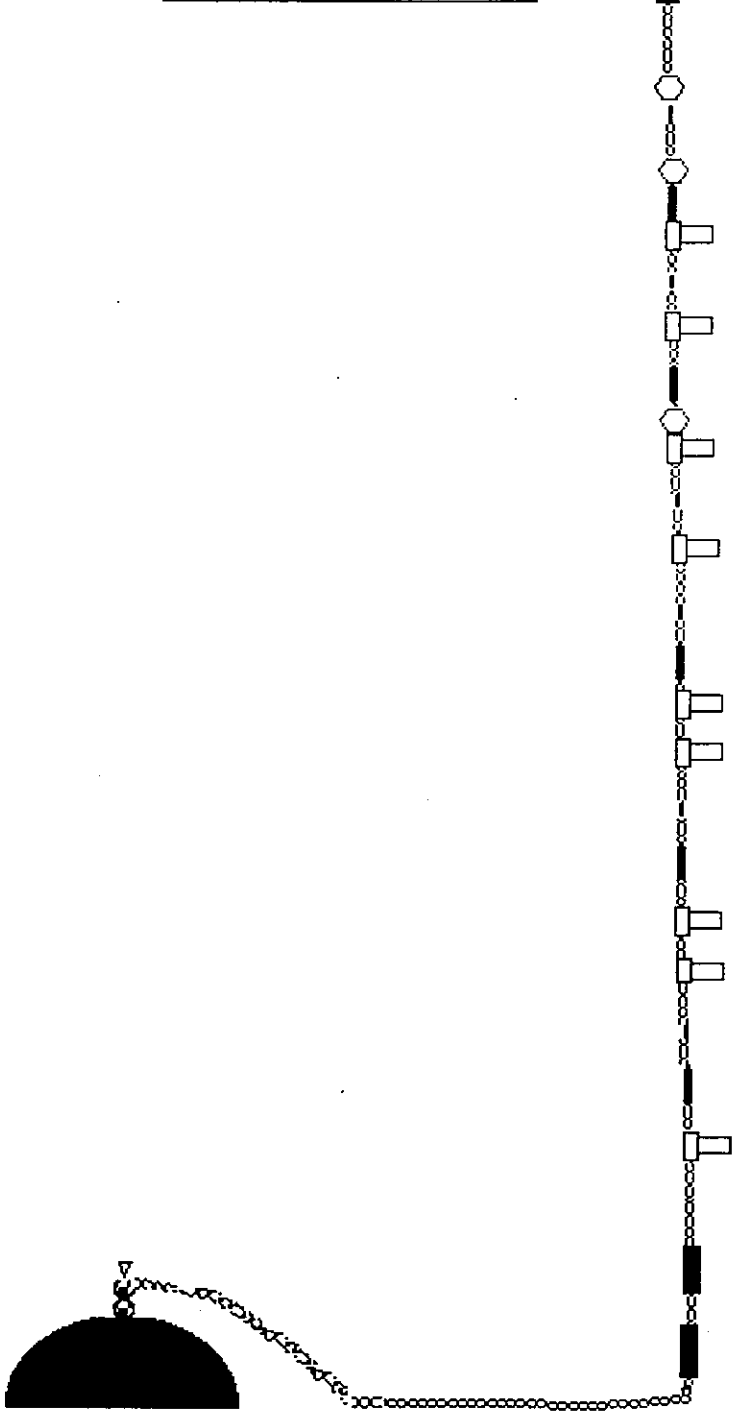
CURRENT METER DEPTHS AND SERIAL NUMBERS
Aanderaa RCM-4 S/N 6558 303 m
Sediment Trap S/N 6 308 m
Sediment Trap S/N 29 313 m
ART 191 Release S/N 68

Fig. 8.3. Mooring 9303.

PROTEUS PTT	7230
SST - AMP	208
Radiometer Eppley	29301F3
Winds RM Young	6899
AT/RH Rotronics	209
Amp PTT	7209
150 KHz RDI ADCP	542
Seacat	655



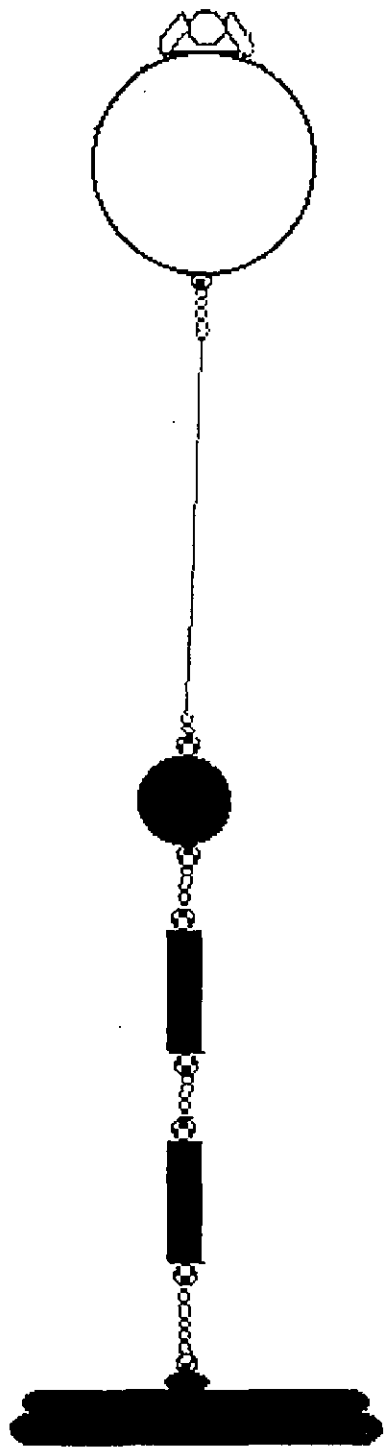
MOORING	PEGGY-4
POSITION	54° 47.48' N 168° 32.05' W
LORAN	18001.7 35020.7
DEPTH	49134.1 2139 m



- CLAM, high gain, S/N-100013, 10 m
- MTR S/N 3216, 10 m
- SPAAM, S/N 300010, 14 m
- NB ACM-2 S/N 100, 14 m
- Seacat S/N 661, 15 m
- MTR S/N 3217, 22 m
- Seacat S/N 652, 30 m
- NB ACM-2 S/N 99, 38 m
- CLAM, low gain, S/N 100014, 38 m
- Seacat S/N 657, 40 m
- MTR S/N 3200, 50 m
- Seacat S/N 654, 62 m
- MTR S/N 3219, 70 m
- NB ACM-2 S/N 1203, 78 m
- Seacat S/N 656, 79 m
- Seacat S/N 659, 102 m
- MTR S/N 3202, 125 m
- NB ACM-2 S/N 1154, 150 m
- Seacat S/N 660, 150.5 m
- Seacat S/N 651, 197.5 m
- MTR S/N 3206, 253.5 m
- NB ACM-2 S/N 095, 301.5 m
- Seacat S/N 658, 397.5 m
- 8242 Releases
- S/N 902311 (top)
- S/N 016549 (bottom)
- 2095 m

Fig. 8.4. Mooring PEGGY-4.

MOORING POSITION	Subsurface ADCP 54° 47.52' N 168° 35.86' W
LORAN	
DEPTH	2150 m



CURRENT METER DEPTHS AND SERIAL NUMBERS
150 KHz RDI ADCP S/N 461 250 m
8242 Release S/N 705645
191 Release S/N 87U

Fig. 8.5. Mooring Subsurface ADCP.

MOORING	BSSE-1
POSITION	54° 46.5' N
	166° 08.2' W
LORAN	18233.2
	34734.4
	48382.4
DEPTH	196 m

CURRENT METER DEPTHS AND SERIAL NUMBERS

Neil Brown ACM-2 S/N 087 46 m
Aanderaa RCM-4 S/N 5426 181 m
Oceano RT-191 S/N 90U 193 m

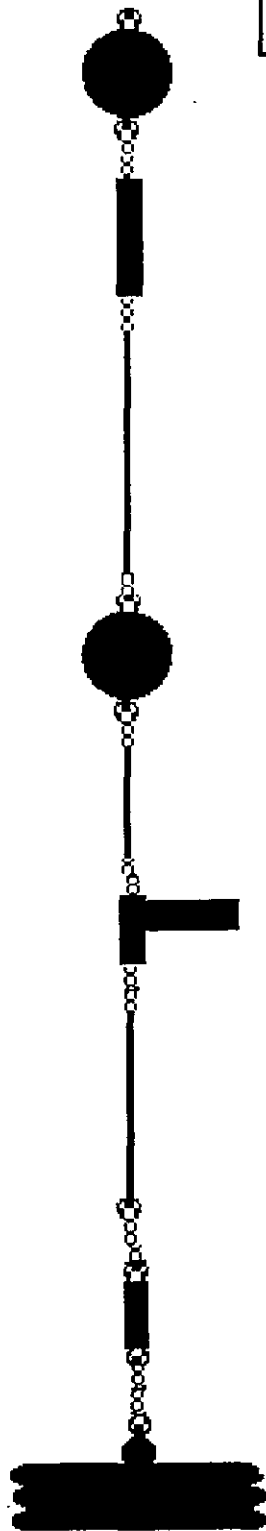


Fig. 8.6. Mooring BSSE-1.

MOORING	BSSE-2
POSITION	54° 45.4' N 165° 24.2' W
LORAN	18275.0 34633.0 48127.2
DEPTH	195 m

CURRENT METER DEPTHS AND SERIAL NUMBERS
Neil Brown ACM-2 S/N 088 45 m
Aanderaa RCM-4 S/N 6558 180 m
Oceano RT-191 S/N 72U

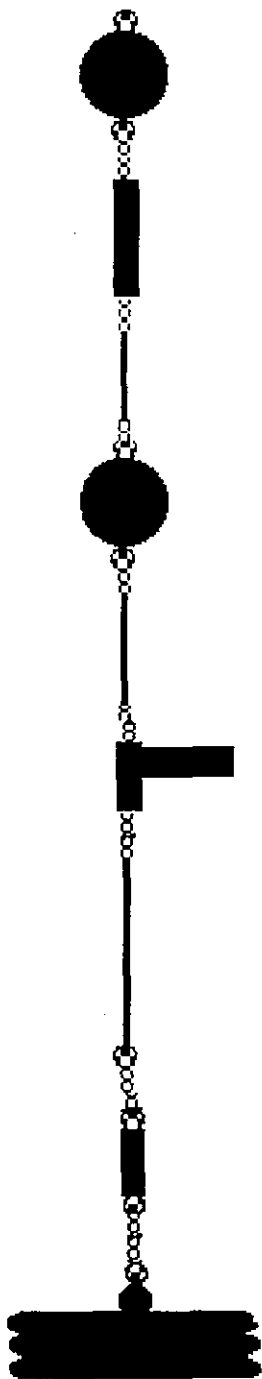


Fig. 8.7. Mooring BSSE-2.

MOORING	BSSE-3
POSITION	56° 28.1' N 171° 27.2' W
LORAN	18089.4 35081.5
DEPTH	50120.2 200 m

CURRENT METER
DEPTHS AND
SERIAL NUMBERS

Neil Brown ACM-2
S/N 051
50 m

Aanderaa RCM-4
S/N 7491
185 m

Oceano RT-121BC
S/N 348

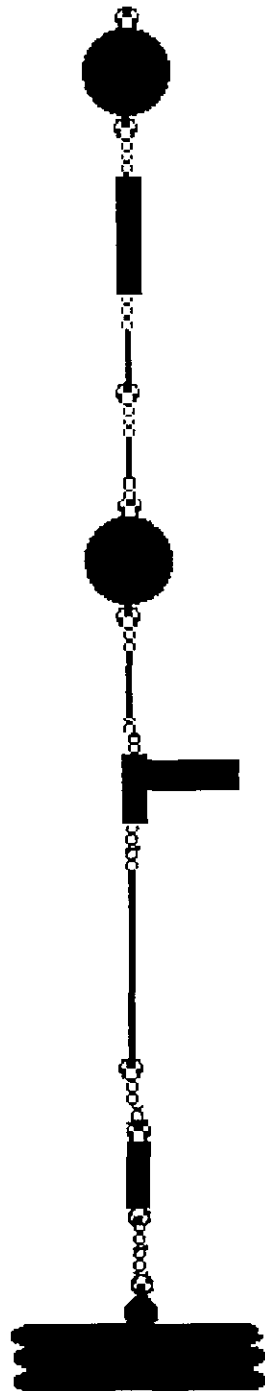


Fig. 8.8. Mooring BSSE-3.

MOORING	BSSE-4
POSITION	56° 34.51' N
	172° 09.21' W
LORAN	17873.8
	34986.2
	50161.8
DEPTH	205 m

CURRENT METER
DEPTHS AND
SERIAL NUMBERS

Neil Brown ACM-2
S/N 1275
55 m

Aanderaa RCM-4
S/N 6006
190 m

Oceanic RT-121BC
S/N 349

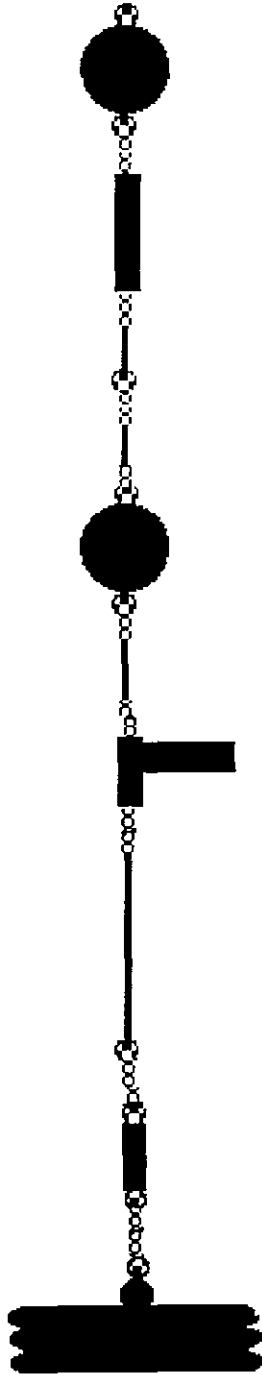


Fig. 8.9. Mooring BSSE-4.

RADIATION NETWORK (RadNet)

To support investigations of spatial and temporal variability in the spring bloom of phytoplankton in the Shelikof Strait region, FOCI maintained a station at Kodiak ($57^{\circ}04'N$, $152^{\circ}20'W$) and at Karluk ($57^{\circ}32'N$, $154^{\circ}31'W$). Observations were telemetered every 3 hours via GOES satellite to the data downlink in Wallops, VA. Data were retrieved from Wallops by phone link once a day.

The Kodiak station made hourly measurements (radiation only, with a LICOR sensor). The Kodiak station was erected on 2 April 1992. The station operated continuously until 2130 UCT on 14 January 1994.

Besides solar radiation, the Karluk station made hourly measurements of wind speed and direction, air temperature, and barometric pressure. Data was received from the Karluk station between 1 April 1992 and 26 August 1992. The Karluk station was recovered in October 1992.