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FISHERIES-OCEANOGRAPHY COORDINATED INVESTIGATIONS – FIELD OPERATIONS 1988

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Pacific Marine Environmental Laboratory
Seattle, Washington
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Fisheries-Oceanography Coordinated Investigations – Field Operations 1988

P.D. Proctor

1. INTRODUCTION

Begun in 1984 as the Fisheries-Oceanography Experiment (FOX) (Wilson *et al.*, 1986), 1988 marks the third field year of the Fisheries-Oceanography Coordinated Investigations (FOCI). The current goal of FOCI is to understand the processes that influence the life-cycle and recruitment of walleye pollock (*Theragra chalcogramma*) into the Shelikof Strait fishery and enable projections of fish abundance prior to recruitment into the fishing stock. FOCI also incorporates research being done in the Bering Sea by the Recruitment Investigations in the Bering Sea (RIBS) project (Figs. 1 and 2). FOCI is a joint project of the Pacific Marine Environmental Laboratory (PMEL) and Northwest and Alaska Fisheries Center (NWAFC). Investigators from several universities and research facilities are also involved in the project.

FOCI-88 involved five ship cruises that continued long-term time series of Conductivity/Temperature/Depth (CTD) data; biological and chemical sampling; and studies of currents using moored current meters, ship-mounted Acoustic Data Current Profilers (ADCP) and drifting buoys. Oceanographic sampling was primarily done using a grid system originally devised for the FOX project (Fig. 3). RIBS stations follow no standard grid pattern. The ships also recovered current meter moorings deployed during the previous field season and deployed new moorings. Table 1 contains a synopsis of the activities of the ship cruises.

FOCI-88 also continued the weather monitoring that was begun in 1984 and expanded in 1986 and 1987. The number of weather stations was reduced at the end of 1988. Figure 4 shows the locations of the weather stations and current meter moorings for the 1988 field season.

Section 2 of this report is a description of the equipment and methods that were used during the 1988 FOCI field season.

Individual activities of the cruises and other phases of the project are discussed in Section 3.

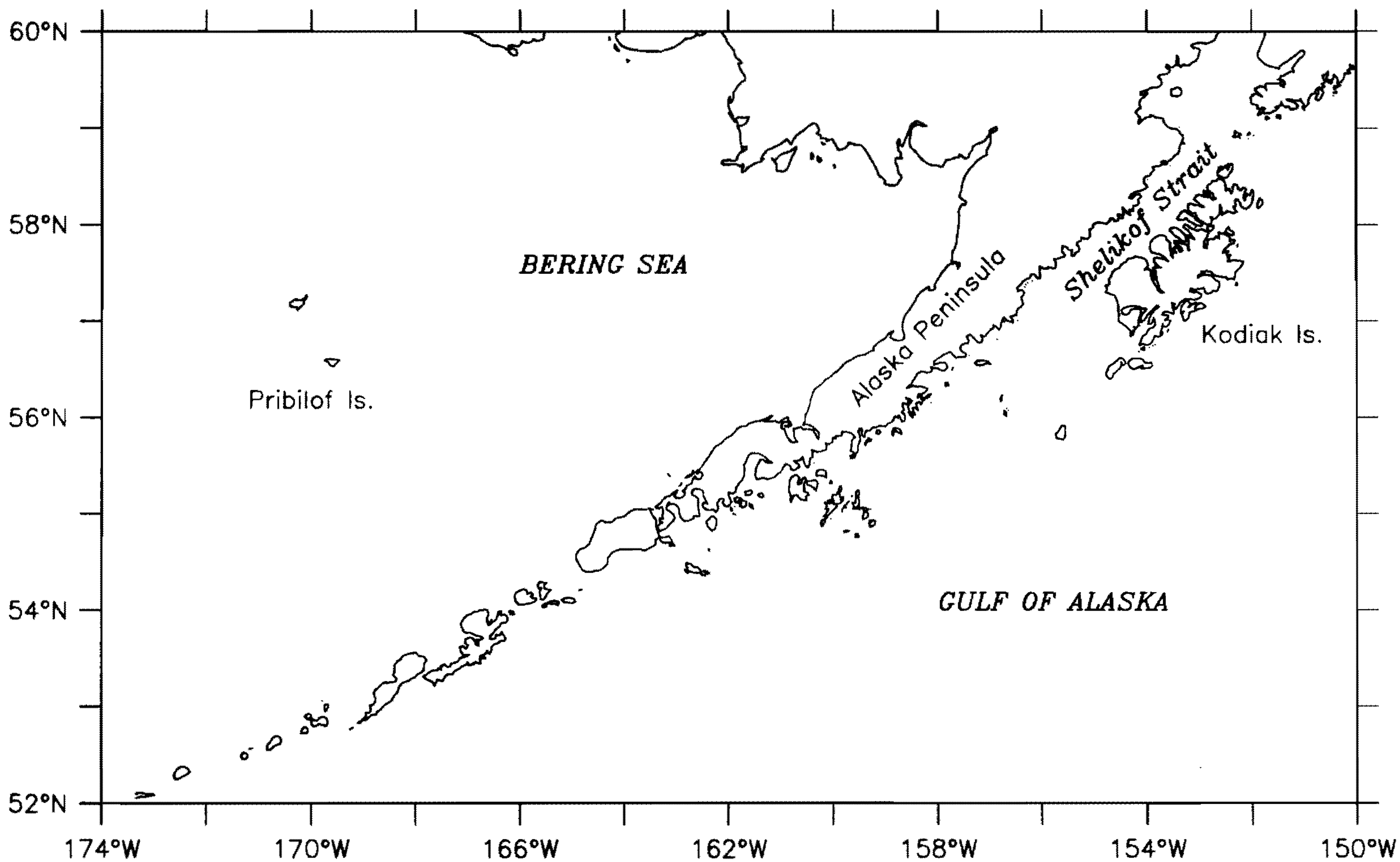


Figure 1. Principal area of FOCI research.

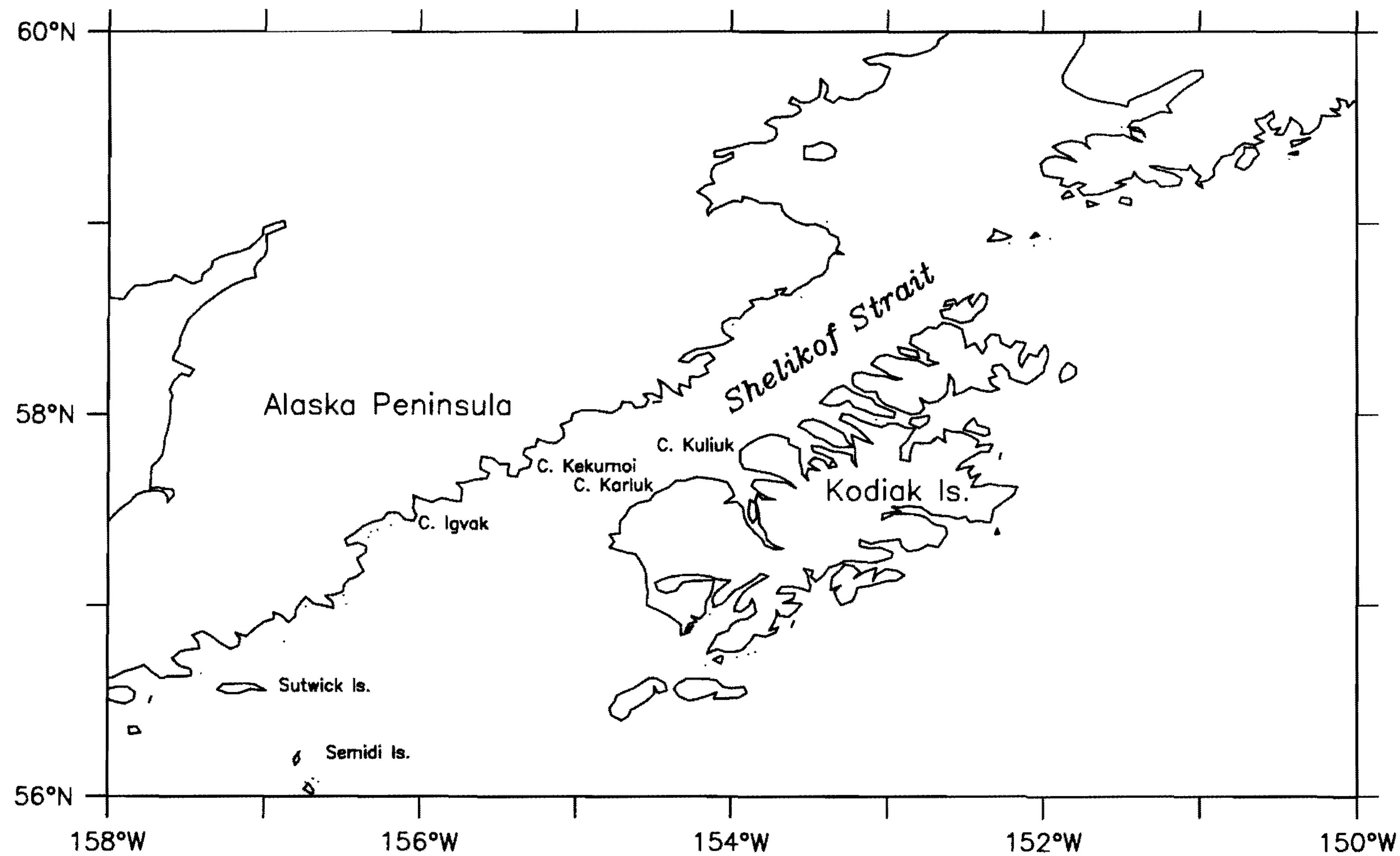


Figure 2. Shelikof Strait region.

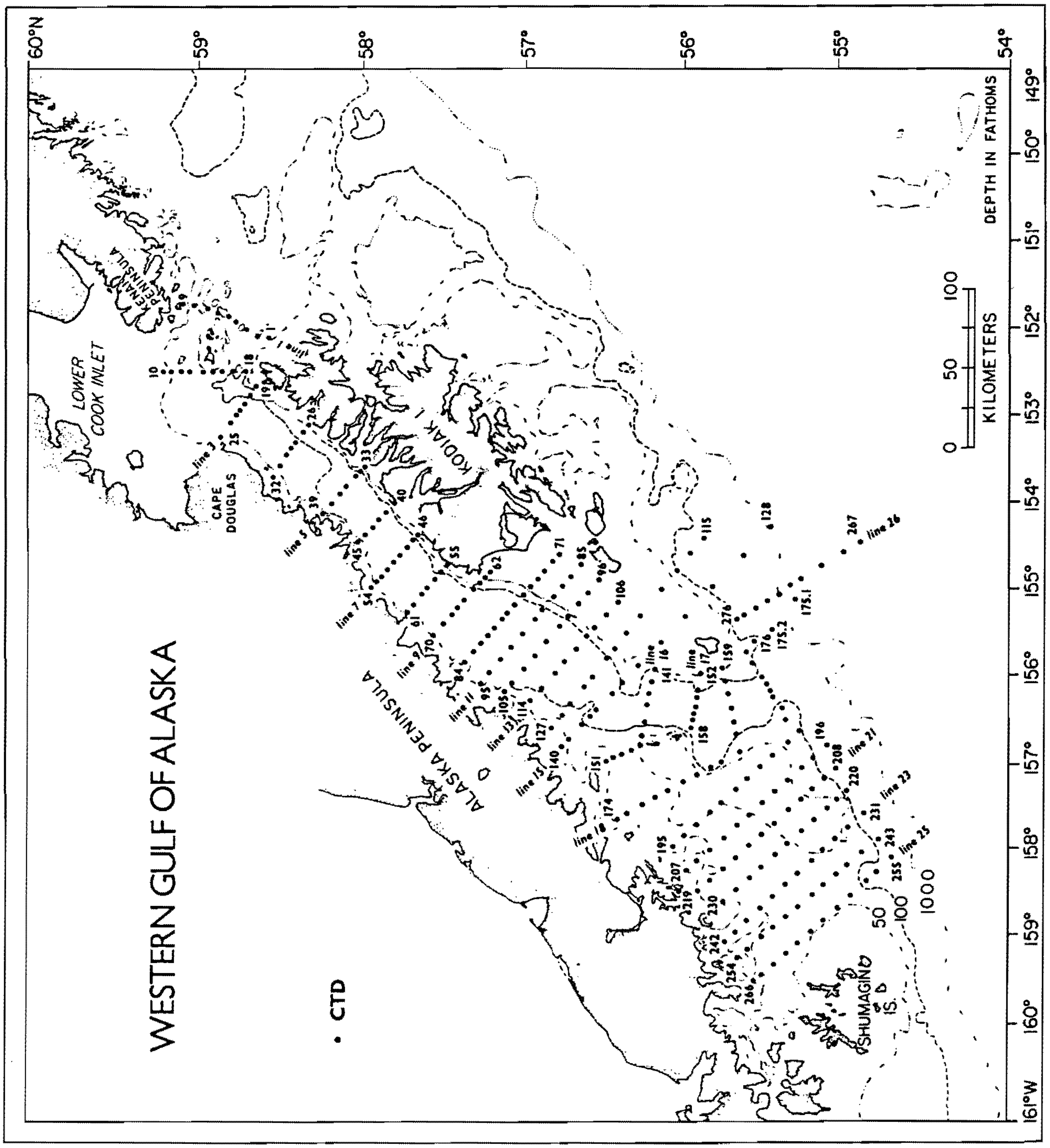


Figure 3. FOX/FOCI CTD sampling grid.

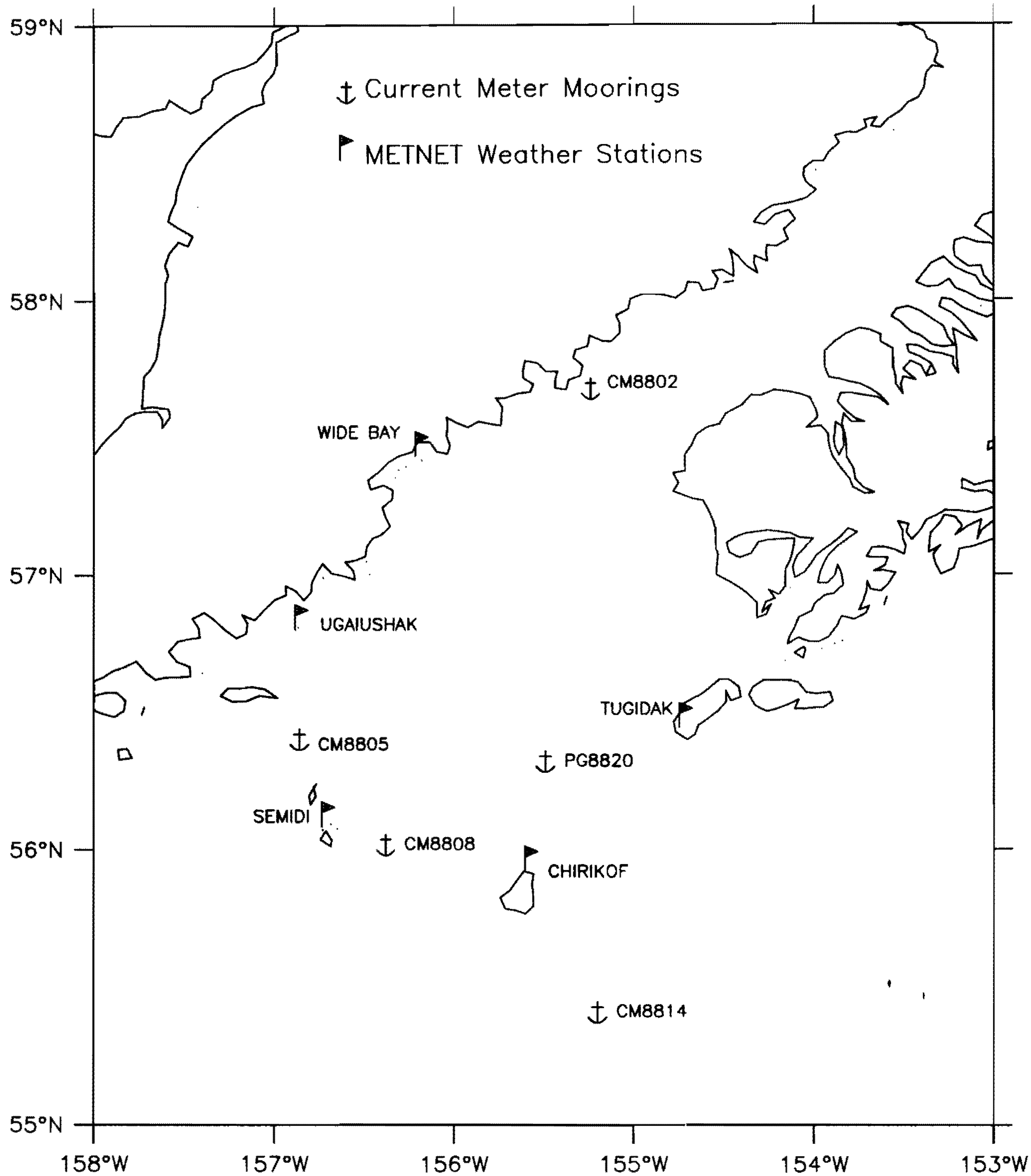


Figure 4. 1988 current meters and weather stations.

TABLE 1. FOCI research cruises and cruise sampling during FY 1988.

Vessel Vessel cruise ID Cruise dates Project cruise ID	CTD	B	b	T	MET	MOC	MWT	CAM	N	Chl	MZ	REMARKS
Oceanographer OC-88-01 15-Mar/04-Apr 1988 RIBS-88-I	107	63		4								Deployed 6 STD's Recovered 2 BPR's Deployed 2 BPR's
Miller Freeman MF-88-03 01-Apr/13-Apr 1988 FOCI-88-I	7	178	5	22			8					
Miller Freeman MF-88-04 16-Apr/02-May 1988 FOCI-88-II	144	67	11	18	5	11		13	82	56	7	Grazing chamber experiment
Miller Freeman MF-88-05 05-May/14-May 1988 FOCI-88-III		13										Mooring recovery-Bering Sea Passes
Miller Freeman MF-88-06 19-May/06-Jun 1988 FOCI-88-IV	80	6		184	7		8					LTD, CM moorings, deploy and recover

CTD = Conductivity/Temperature/Depth cast; B = 60 cm bongo sampler; b = 20 cm bongo sampler; T = Tucker trawl; MET = Methot trawl; MOC = MOCNESS (Multiple Opening-Closing Net Environmental Sampling System) sampler; MWT = Mid-water trawl; CAM = Ortner Net-Camera; N = Nutrient sample; Chl = Chlorophyll sample; MZ = Microzooplankton sample; CM = Aanderaa/Neil Brown Current Meters moorings; STD = Satellite-tracked drifter; LTD = Loran-tracked drifter; BPR = Bottom pressure recorder mooring.

2. METHODS AND MATERIALS

2.1 Shipboard Meteorological Observations

Surface meteorological measurements were conducted by shipboard personnel on all cruises. Hourly measurements included: sea-level pressure using an aneroid barometer, air temperature and wet-bulb temperature with sling psychrometer readings on the upwind bridge wing, except the ship *Miller Freeman* where the wet and dry bulbs reside in a ventilated housing on the port-side bridge-wing, wind speed and direction from a Bendix-Friez aerovane mounted on the masthead, and sea-surface temperature from the ship's seawater intake or bucket thermometer. When possible, additional estimates of visibility, cloud type, wave and swell height and direction were made. All sensors were calibrated before each ship left Seattle by the Seattle National Weather Service; calibrations are traceable to the National Bureau of Standards.

2.2 CTD

The CTD data for RIBS-88-I was acquired using the ship's Neil Brown CTD System. The data was recorded on magnetic tape and returned to PMEL for processing. The casts were processed using software written at PMEL (Mangum *et al.*, 1980).

CTD data for FOCI-88-I through IV was acquired using the PMEL Seabird system and processed onboard using the PMEL Micro-Vax "Dewey." The processing software was developed by PMEL programmers (D. Kachel, pers. comm).

Water samples were taken during the cast and analyzed using the ship's Autosal™ salinometer. The results of these samples were used to check the operation of the CTD and to provide an offset for the processing of salinity data. Since the CTD temperature sensor is inherently more accurate than the reversing thermometers normally used as a check for the temperature sensor of the CTD, and has a history of reliable operation, data from the reversing thermometers was not used to provide an offset for temperature.

The physical oceanographic data from all cruises is stored on removable disk packs, accessible through the PMEL computers, and will be sent to the National Oceanographic Data Center (NODC) for archiving.

2.3 Biology

2.3.1 Plankton

Net plankton, including eggs and larvae, were sampled with a variety of devices which included bongo nets, Tucker and Methot trawls, and the Ortner Net-Camera.

Both 20- and 60-centimeter bongo nets were used to sample for eggs, larvae, and zooplankton (Posgay and Marak, 1980). The nets were towed in accordance with procedures of MARMAP (Smith and Richardson, 1977), except for specific bongo net samples obtained by lowering and retrieving the net vertically from a stationary ship. When the 20-centimeter net was used it was towed approximately 1-meter above the 60-centimeter net on the same wire. Mesh sizes were 505 and 333 micrometer on the 60-centimeter frame and 153 micrometer on the 20-centimeter frame.

Two Tucker trawls (1- and 3-meter frames) were used to obtain multiple discrete depth samples during a haul (Clarke, 1969). The 1-meter trawl was the normal gear used with an occasional trawl using the 3-meter frame. The purpose of the Tucker trawls was to determine the vertical distribution of the subject plankton.

During cruise FOCI-88-II sampling was also accomplished using a MOCNESS (Weibe *et al.*, 1976) and a Methot trawl (Methot, 1986). Sampling for zooplanktonic predators during the cruise was also done using the Ortner Net-Camera (Ortner *et al.*, 1981).

During the FOCI-88-IV cruise tests were done to determine the relative efficiency of the bongos, 1- and 3-meter Tucker trawls and Methot trawls in catching pollock larvae. Two separate tests for different larval sizes showed that the 1-meter Tucker trawl was the most efficient.

Microzooplankton were sampled using 10-liter Niskin bottles mounted on a combination bottle rosette/CTD frame. The bottles were tripped at 10, 20, 30, 40, 50, and 60 meters. The water was filtered through 40-micrometer mesh filter bags which were then backflushed into sample jars and preserved in 3% buffered formalin.

Tables in Section 3 for each of the various cruises indicate when and where trawls were performed; Table 1 gives an overall tally of each type of sampling.

2.3.2 Fishing

Fishing for adult fish was done on two cruises, FOCI-88-I & IV, to investigate the age and stage of spawning during cruise I, and the effects of fish predation on the egg and larval population during both I & IV. Fishing was done using Diamond or Marinovich mid-water trawls (Nelson and Nunnalee, 1986) on locations where an echosounder showed signs of fish. Trawls were made in accordance with the ship's established procedures and were about one half-hour in duration.

2.4 Current Measurements

Current measurements were accomplished using several methods. Eulerian measurements were done using moored current meter strings. A ship-mounted acoustic current profiler provided non-stationary current measurements. Lagrangian methods included satellite-tracked drifting buoys, LORAN-C tracked drifting buoys and satellite imaging.

2.4.1 Moored Current Meters

Aanderaa RCM-4 current meters with paddle-wheel rotors measured current speeds. Speed was measured continuously for the entire sample period and was recorded on magnetic tape along with an instantaneous sample of current direction, water temperature, pressure, and conductivity. The sample interval on all instruments was 60 minutes. Moorings 8802, 8805, and 8808 also had an Aanderaa WLR-5 pressure recording instrument mounted on the acoustic release for measuring near bottom pressure. Mooring 8820 consisted of a single WLR-5 pressure instrument. Mooring 8814 only had current meters due to the depth of the water in which it was moored. Table 2 contains time and location for moorings recovered and processed during 1988. Table 3 contains deployment time and location for moorings deployed during 1988.

2.4.2 Shipboard Current Measurements

Cruises RIBS-88-I and FOCI-88-II had a ship-mounted acoustic doppler current profiler from RD Instruments. It was intended that currents would be measured concurrently with sampling evolutions. The instrument was in use for the entire RIBS cruise, acquiring data of varying quality. During the FOCI cruise the instrument never performed satisfactorily and no data was obtained.

2.4.3 Lagrangian Drifters

2.4.3.1 LORAN-C-tracked drifters

Cruise FOCI-88-IV employed three Sea-Rover 2, LORAN-C-tracked, drifting current buoys to obtain Lagrangian measurements of currents in Shelikof Strait. The buoys consist of an aluminum float which houses the instrumentation and power supply and a 10-meter long, 1-meter diameter "Holey Sock" drogue attached with a Bungi cord sized to place the top of the drogue at 35 meters. The buoys use LORAN-C to determine their position, which was stored internally and also transmitted to the ship at selected intervals.

The use of the buoys this year was intended primarily as a field test of the equipment. During the testing, one buoy failed completely with no data transmitted to the ship or recorded; the data from the other two buoys was of limited value, being of poor quality and quantity. It was determined that more software development was necessary before the buoys could be fully operational, in addition to resolving the mechanical/electrical problems of the buoys themselves.

2.4.3.2 Satellite-tracked drifters

RIBS-88-I and FOCI-88-IV operations included deployment of several satellite-tracked, drifting buoys from Horizon Marine Inc. These buoys also used a "holey-sock" type drogue. The buoys reported their position via the Argos satellite system. RIBS-88-I deployed six drifters in the Bering Sea, and FOCI-88-IV deployed one in Shelikof Strait. Two of the Bering Sea drifters were deployed to monitor the drift of a larval patch as was the single deployment in Shelikof Strait. The other four drifters in the Bering Sea were deployed to monitor shelf/slope water exchange. Table 4 lists deployment time and location for the drifters deployed during 1988.

TABLE 2. Current meters recovered and processed in 1988.

Mooring	Deployment JD	Deployment Date	Recovery JD	Recovery Date	Lat (dd mm.mm)	Long (ddd mm.mm)	Depth Meters
BG-701*	155	04JUN87			54 18.33N	164 46.19W	81
BG-702*	156	05JUN87			52 24.40N	171 28.10W	433
BG-703	159	08JUN87	219	06AUG88	51 46.09N	179 30.67W	1189
8702	188	07JUL87	150	29MAY88	57 36.91N	155 05.75W	258
8705	181	30JUN87	146	25MAY88	56 21.65N	156 54.38W	127
8708*	182	01JUL87			55 57.01N	156 22.25W	223
8714	183	02JUL87	147	26MAY88	55 20.79N	155 12.00W	1185

Mooring	Meter #	Meter[1] Type	Record[2] Start	Record End	Length Hours	Depth Meters
BG-701*	3128	AA				41
	3210	NB				61
BG-702*	1261	NB				43
	1253	NB				203
	1276	NB				383
BG-703	1277	NB	871590300	881700340	54149	39
	1275	NB	871590300	881801910	55682	199
	1272	NB	871590300	881731619	54657	379
	1273†	NB				899
8702	3434	AA	871882200	881501700	7844	56
	6525	AA	871882200	881501700	7844	82
	1982‡	AA				132
	2248‡	AA				191
	1960	AA	871882200	873240400	3247	243
	0856	PG	871882100	8815001700	7845	257

[1] AA = Aanderaa current meter
NB = Neil Brown acoustic current meter
PG = Aanderaa pressure gauge

[2] Julian date and time--yydddhhmm

* Mooring was not recovered
‡ Recording mechanism malfunctioned, no data recorded
† Instrument malfunction caused data to be unacceptable

TABLE 2. (continued).

Mooring	Meter #	Meter[1] Type	Record[2] Start	Record End	Length Hours	Depth Meters
8705	2096	AA	871820300	881461300	7907	27
	1973	AA	871820300	872991600	2822	53
	6497	AA	871820300	881461300	7907	127
	0037	PG	871820000	881461200	7909	127
8708*	5208	AA				28
	6505	AA				54
	6572	AA				104
	2492	AA				163
	0600	AA				208
	1060	PG				223
8714	6502	AA	871840400	881472200	7891	101
	2477	AA	871840400	881472200	7891	160
	1807†	AA				195
	3336	AA	871840400	881472200	7891	495
	3145	AA	871840400	881472200	7891	995

[1] AA = Aanderaa current meter
NB = Neil Brown acoustic current meter
PG = Aanderaa pressure gauge

[2] Julian date and time--yydddhhmm

* Mooring was not recovered
‡ Recording mechanism malfunctioned, no data recorded
† Instrument malfunction caused data to be unacceptable

TABLE 3. Current meters deployed in 1988.

Mooring JD	Deployment Date	Lat (dd mm.mm)	Long (ddd mm.mm)	Depth Meters
8802	150 29MAY88	57 36.91N	155 05.84W	259
8805	146 25MAY88	56 20.38N	156 51.68W	127
8808	147 26MAY88	55 57.43N	156 22.64W	227
8814	148 27MAY88	57 20.74N	155 12.02W	1202
8820	144 23MAY88	56 15.71N	155 29.58W	59

Mooring	Meter #	Meter Type	Depth Meters
8802	5257	AA	27
	2358	AA	53
	2157	AA	103
	2117	AA	162
	2477	AA	214
	0853	PG	257
8805	5261	AA	27
	3710	AA	53
	3132	AA	112
	1058	PG	124
8808	5431	AA	23
	6571	AA	49
	3286	AA	98
	3352	AA	157
	5214	AA	202
	1059	PG	224
8814	6006	AA	118
	5955	AA	172
	5950	AA	212
	0603	AA	512
	2265	AA	1012
8820	0209	PG	59

TABLE 4. Satellite-tracked drifters deployed in 1988.

Serial #	Deployment Date	End of Data	Days	Location[1]
7212	21MAR88	02NOV88	226	BS
7213	21MAR88	20MAY88	60	BS
7214	23MAR88	12APR88	20	BS
7256	24MAR88	07DEC88	258	BS
7210	26MAR88	04APR89	371	BS
7211	26MAR88	28APR88	31	BS
7207	24MAY88	31JUL88	49	GA

[1] BS = Bering Sea
GA = Gulf of Alaska

3. PROJECTS AND CRUISES

3.1 FOCI-88 Meteorology

Investigators: S. Allen Macklin
Carol Dewitt
Nora Jenkins

The FOCI meteorology program reached a milestone this fiscal year with completion of an intensive, 21-month survey of regional weather patterns. The survey was conducted using METNET--five automated weather stations sited on the coastal Alaska Peninsula and offshore islands south of Kodiak Island (Fig. 4). In July, much of this network was dismantled, leaving only stations at Ugaiushak Island and at Chowiet Island in the Semidis.

Figure 5 is a synopsis of the data returned by the various METNET stations in operation during fiscal year 1988. Specific details of the maintenance and performance of METNET during FY 1988 are contained in the chronology below.

METNET chronology

1987 Oct 13 Maintenance visit to Semidi. Random Access Memory (RAM) dump, new SAFT batteries installed, new pressure offset determined. Elevation estimate from hand-held altimeter is 66.5 meters.

1987 Oct 13 Recovery of Semidi-2. RAM dump.

1987 Oct 13 Maintenance visit to Tugidak. RAM dump, new SAFT batteries installed. Pressure drift of −.87 millibars noted.

1987 Oct 15 Maintenance visit to Chirikof. Tower had been damaged by cows, reconstructed using existing materials--new wind height is 3 meters. RAM dump, SAFT batteries replaced. New pressure offset entered. Hand-held altimeter estimate of station elevation is 35.5 meters.

1987 Oct 16 Maintenance visit to Ugaiushak. Synergetics modules swapped to solve windspeed threshold problem. Pressure drift of −0.2 millibars noted, total correction to transmitted pressure to obtain SLP is 2.8 millibars.

1987 Oct 16 Maintenance visit to Wide Bay. Bear damage again to battery and cable. RAM dump. Data Collection Platform (DCP) swapped, new SAFT batteries installed, Temperature/Relative Humidity sensor removed.

1987 Oct 25 Wide Bay wind speed fails.

1987 Dec 26 Wide Bay station fails.

1988 Jan 08 Tugidak wind speed threshold increases.

1988 Apr 10 Ugaiushak winds intermittent.

1988 Apr 25 Ugaiushak winds fail.

1988 Apr 25 Repair visit to Ugaiushak. Winds not fixed.

1988 Apr 26 Repair visit to Tugidak. RAM dump. Winds not fixed.

1988 May 16 Recovery of Tugidak station. RAM dump.

1988 Jun 12 Chirikof wind speed fails.

1988 Jul 11 Maintenance visit to Ugaiushak. Recovery of Synergetics station. Handar station installed. Second station installed to east of first station and about 1 meter lower. Cross arm misaligned by 10°. This bias is programmed into software (range −10 to 350°), so transmitted wind directions are accurate; u and v components, however, are erroneous.

1988 Jul 13 Recovery of Wide Bay station. More bear damage to DCP connectors, battery box and cable, and antenna and cable.

1988 Jul 13 Chirikof station dies.

1988 Jul 15 Maintenance visit to Semidi. RAM dump, two car batteries installed, replacing SAFT. Wind cross arm was determined to be parallel to 342/162 T, implying transmitted wind directions were too large by 18°, and u and v components were in error. This bias was not corrected at the site nor in the DCP software.

1988 Jul 15 Semidi-2 Handar station installed. Wind direction sensor has non-linear potentiometer and appears erroneous by about 5 to 10° when wind is from the east.

1988 Jul 15 Recovery of Chirikof station. Much additional cow damage to station. Wind cross arm had rotated about 30° out of the vertical.

1988 Aug 01 Pressure sensor malfunction at Ugaiushak.

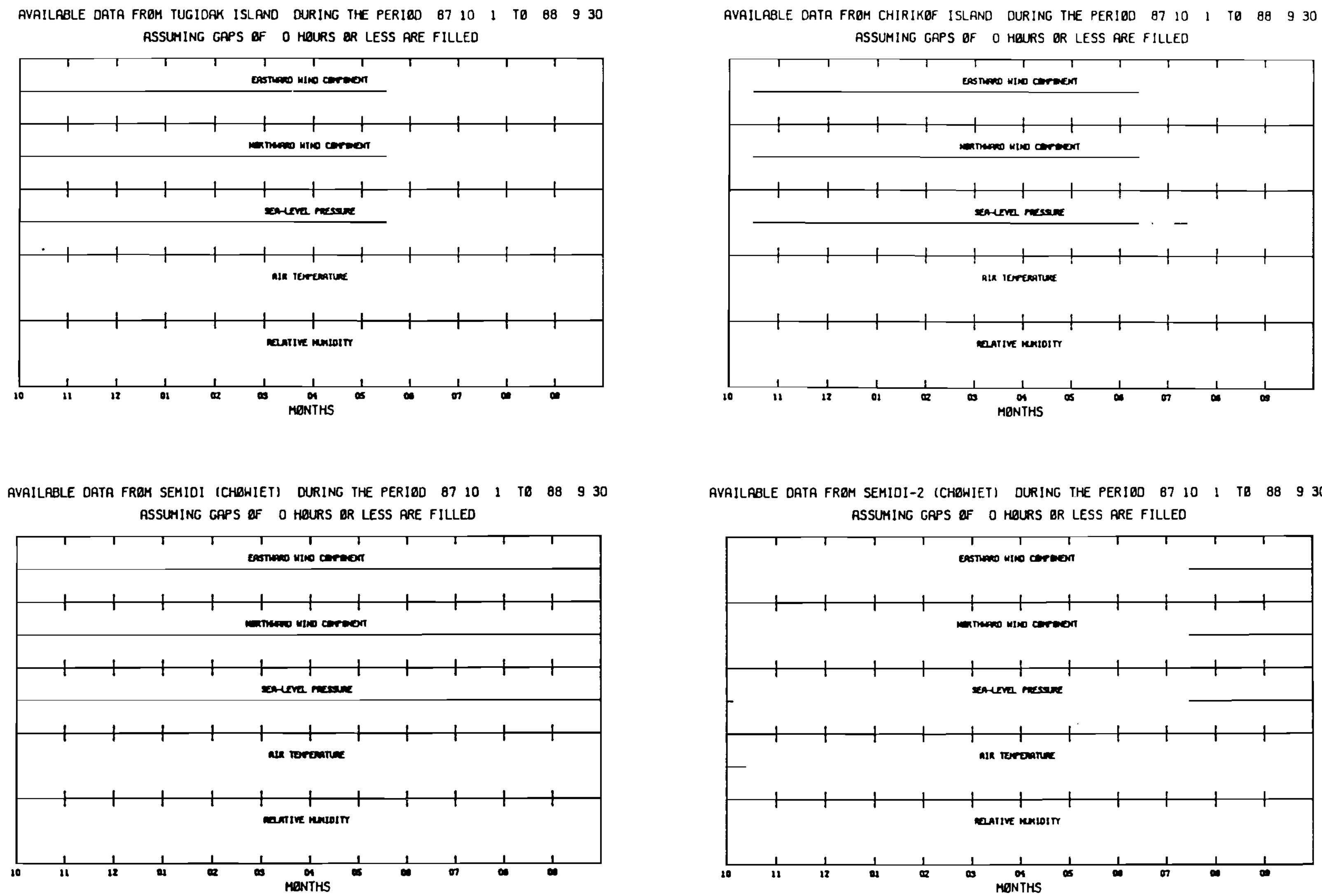
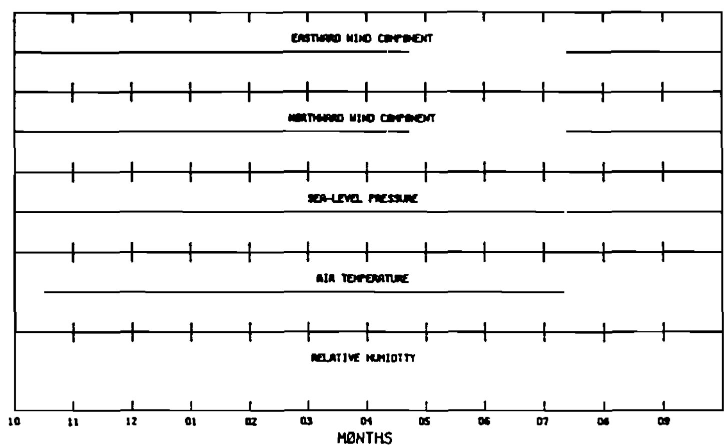
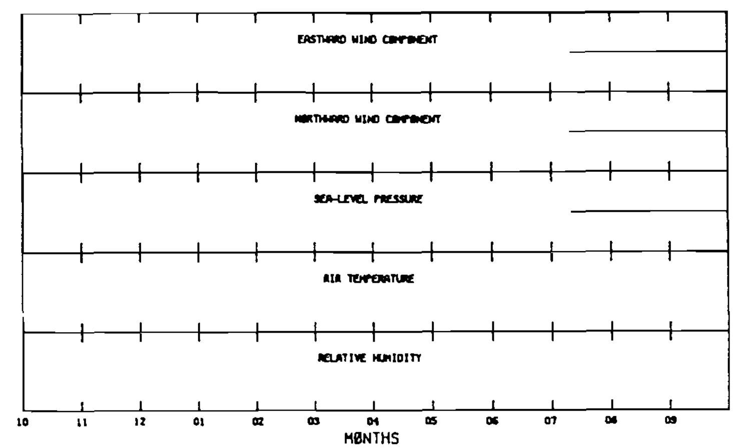


Figure 5. Data return from METNET stations during fiscal year 1988. Variables observed were eastward and northward wind components, sea-level pressure, air temperature and relative humidity. Periods of missing data are indicated by gaps in the solid line across the middle of a variable's window. An empty window signifies that no data were collected. The stations are: a) Tugidak Island, b) Chirikof Island, c) Semidi Islands, d) Semidi-2 Islands, e) Ugaiushak Island, f) Ugaiushak-2 Island and g) Wide Bay.

AVAILABLE DATA FRØM UGAIUSHAK ISLAND DURING THE PERIØD 87 10 1 TØ 88 9 30
ASSUMING GAPS ØF 0 HØURS ØR LESS ARE FILLED



AVAILABLE DATA FRØM UGAIUSHAK 2 DURING THE PERIØD 87 10 1 TØ 88 9 30
ASSUMING GAPS ØF 0 HØURS ØR LESS ARE FILLED



AVAILABLE DATA FRØM WIDE BAY DURING THE PERIØD 87 10 1 TØ 88 9 30
ASSUMING GAPS ØF 0 HØURS ØR LESS ARE FILLED

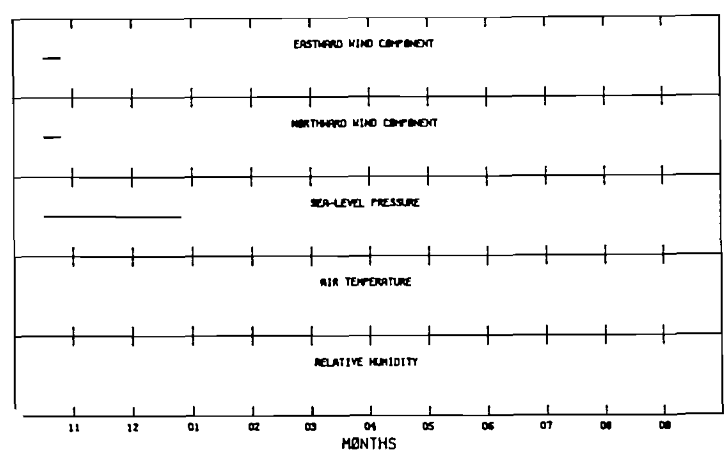


Figure 5. (continued)

3.2 Satellite Analysis

Investigators: Andrew Vastano
Tiffany Vance
Marie Schall
Judith Gray

Satellite analyses support the FOCI research project with the development of an independent physical data base pertaining to coastal and oceanic surface water structure and dynamics, and examination of the joint relationship between the physical and biological elements of fisheries in the northern Pacific Ocean. This research is conducted to:

1. establish pertinent correspondences between quantitative satellite analyses and surface-acquired observations and results;

2. study relationships between forcing mechanisms and mesoscale/sub-mesoscale physical features of the coastal and adjacent waters; and

3. investigate the effect of these environmental factors on the distribution of larval fish.

The following activities were carried out during the past year for the Shelikof Pollock Fishery.

- 105 NOAA-9 and NOAA-10 satellite Advanced Very High Resolution Radiometer (AVHRR) scenes for April through May 1987 were ingested, navigated, atmospherically corrected and remapped to produce 630 (channel four, eleven microns) sea surface temperature (SST) distribution images in six contiguous regions spanning the Fishery (Incze *et al.*, 1986).

- 137 Gilmore Creek AVHRR scenes for 1986 were copied to new tapes and two SST distribution browse scenes for each tape were archived on a library tape.

- Eight volumes of satellite images for 1986 and 1987 were prepared in color and gray scale versions for FOCI project scientists.

- A comparison of Lagrangian satellite surface flow estimates with Eulerian current meter counterparts at a depth of 56 meters (mooring 8619) for the May 1987 period showed similarities in speed and direction that are equivalent within observational errors.

- Adaptation, testing and implementation of a feature tracking algorithm was completed to provide a means for estimating advective surface flow vectors by sub-mesoscale temperature pattern displacements.

- A mensuration algorithm for closed features was adapted to estimate the geographic location, size, shape, and orientation of satellite image SST and pigment concentration patterns in terms of best-fit circular and elliptical approximations to frontal perimeters.

- The feature tracking algorithm was applied to seven sequential pairs of 1987 SST images in Shelikof Strait and the fisheries region at the southern strait entrance to extract flow-vector distributions (Figs. 6 and 7).

- An analysis of 1986 and 1987 flow distributions in the southern entrance region established the presence of a cold water plume off Wide Bay during the April-May period of each year when flow of the Alaska Coastal Current was restricted by flow instabilities.

- A study of the relationship between the 1986 and 1987 satellite velocity estimates for the cold plumes off Wide Bay and drift computations utilizing wind data for the area at the image times provided evidence for a wind-based plume generation mechanism.

- Comparison of a larval distribution obtained just after the 1986 satellite SST and flow studies in the southern entrance region established close correlations between the cold waters of the Wide Bay plume, the anti-cyclonic flow around the plume, and the contoured values of pollock larvae concentration ($\#/m^2$).

- Comparison of larval distributions and satellite SST observation for 1987 gathered further evidence for the positive correlation between colder water derived from Lower Cook Inlet and the presence of high concentrations of pollock larvae in the surface waters.

- The 1986 and 1987 data analyses showed the satellite capability for useful estimates of surface water structure and flow dynamics, linked atmospheric forcing with the generation of cold water mesoscale plumes, extracted generation and residence times for a mesoscale cold core eddy, and demonstrated the presence and the maintenance of pollock larvae within the colder and fresher waters of mesoscale features on the continental shelf in the southern entrance region.

- The April-May, 1987 SST image sequence provided a case study documenting the generation of a cold core eddy by an instability in the Lower Cook Inlet/Alaska Coastal Current Front in the Strait, and the presence of this eddy in the southern entrance region off Wide Bay for a least 21 days.

Table 5 is a list of 1988 images to be processed during fiscal year 1989.

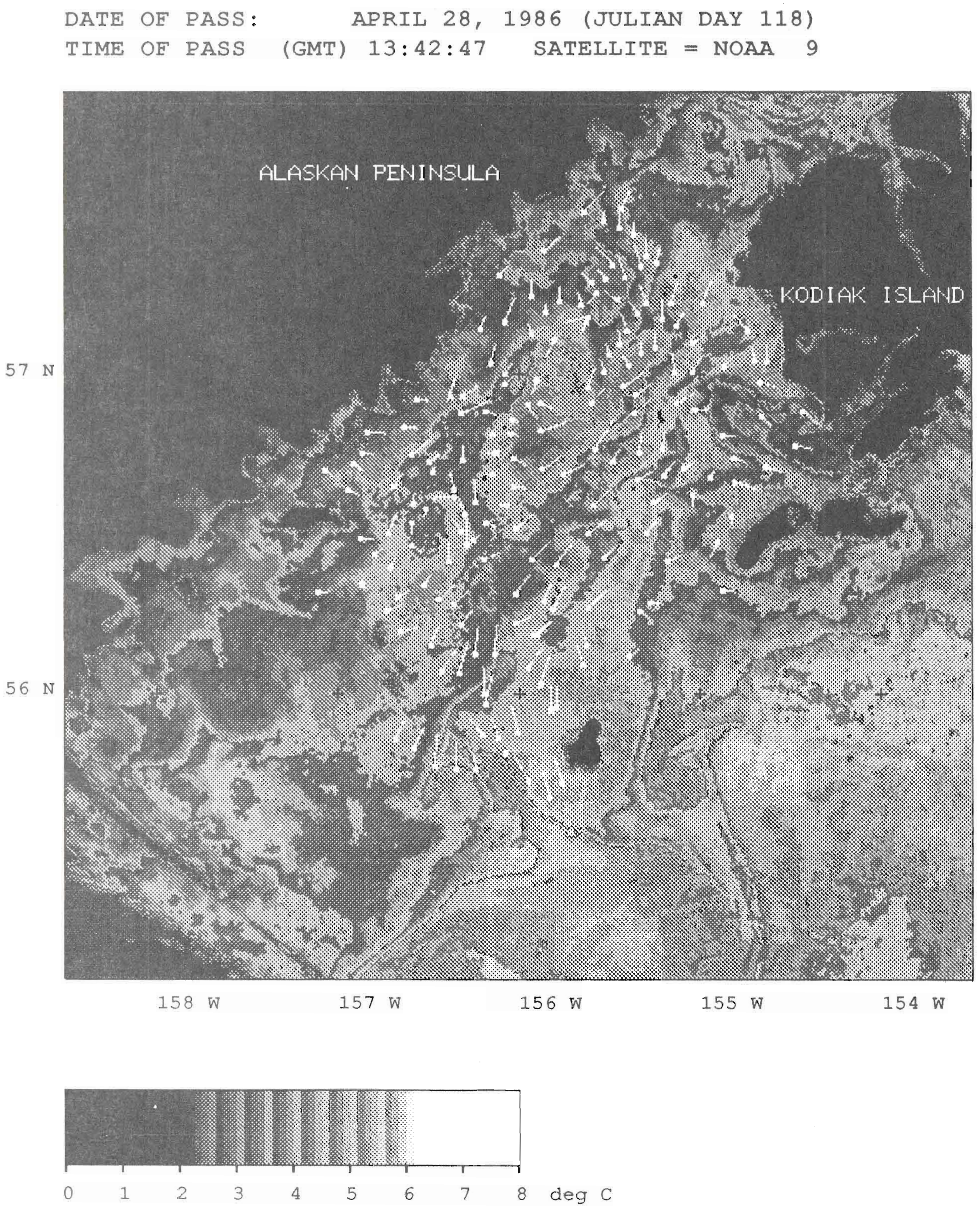


Figure 6. Sea-surface temperature satellite image.

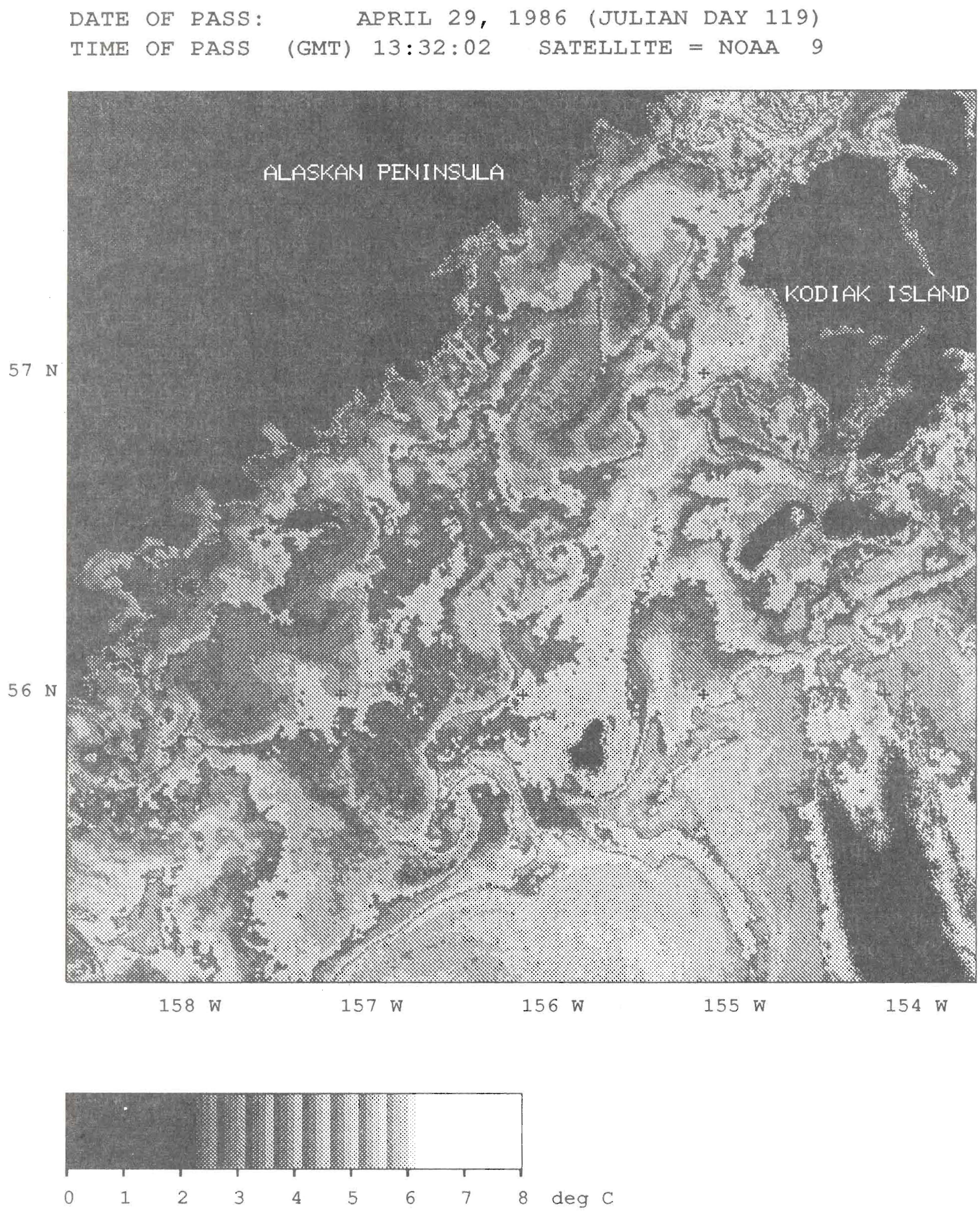


Figure 7. Sea-surface temperature satellite image.

TABLE 5. 1988 satellite images.

JDat	Date	Time	Orbit	Sat. #	Equ. Crs.
094	03-Apr	021618	17036	N9	152W
094	03-Apr	182740	8020	N10	25E
095	04-Apr	001512	17049	N9	124W
095	04-Apr	020519	17050	N9	140W
095	04-Apr	194629	8035	N10	5E
097	06-Apr	013524	17078	N9	144W
097	06-Apr	052308	8055	N10	141W
097	06-Apr	152900	17086	N9	11E
098	07-Apr	012426	17092	N9	141W
099	08-Apr	043121	8083	N10	130W
099	08-Apr	011355	17106	N9	138W
100	09-Apr	011004	17120	N9	135W
100	09-Apr	150001	17128	N9	19E
101	10-Apr	005158	17134	N9	133W
101	10-Apr	053258	8112	N10	144W
112	21-Apr	142624	17297	N9	27E
113	22-Apr	002126	17303	N9	125W
113	22-Apr	181449	8290	N10	28E
116	25-Apr	012928	17346	N9	142W
120	29-Apr	004614	17402	N9	131W
120	29-Apr	190214	8390	N10	16E
121	30-Apr	003439	17416	N9	128W
126	05-May	012113	17487	N9	140W
138	17-May	005242	17656	N9	132W
138	17-May	191034	8646	N10	14E
139	18-May	004123	17670	N9	129E
142	21-May	154249	17721	N9	9E
143	22-May	013900	17727	N9	143W
143	22-May	051432	8709	N10	140W
143	22-May	153209	17735	N9	12E
144	23-May	012726	17741	N9	140W
144	23-May	045323	8723	N10	135W
144	23-May	152459	17749	N9	14E
145	24-May	011655	17755	N9	138W
148	27-May	185645	8788	N10	18E
149	28-May	183044	8802	N10	24E
149	28-May	003252	17811	N9	127W
149	28-May	021413	17812	N9	152W
154	02-Jun	012026	17882	N9	138W
154	02-Jun	151248	17890	N9	17E
155	03-Jun	010857	17896	N9	135W
155	03-Jun	041222	8879	N10	125W
155	03-Jun	055335	8880	N10	150W
155	03-Jun	150149	17904	N9	20E
155	03-Jun	180009	8887	N10	31E
155	03-Jun	194030	8888	N10	6E
156	04-Jun	005815	17910	N9	133W

TABLE 5. (continued).

JDat	Date	Time	Orbit	Sat. #	Equ. Crs.
156	04-Jun	053129	8894	N10	145W
170	18-Jun	014700	18108	N9	145W
171	19-Jun	013556	18122	N9	142W
177	25-Jun	043424	9192	N10	130W
178	26-Jun	015954	18221	N9	148W
182	30-Jun	042423	9263	N10	128W
182	30-Jun	151356	18285	N9	18E

3.3 RIBS-88-I Cruise Summary – 03 March-04 April, 1988

Scientific Party:	Judith Gray (Chief Scientist (CS))	PMEL
	Sarah Hinckley	NWAFC
	David Mattens, Ltjg	PMEL
	William Rugen	NWAFC

The objectives of this cruise were to address the processes of air-ocean-biology interaction in the pollock fishery of the southwestern Bering Sea. This objective was accomplished by:

1) conducting bongo tows to determine the areas of highest concentration of pollock larvae;

2) occupying a large CTD grid;

3) deploying two satellite-tracked drifters (STD) to track larval movement and four STD's to examine the interaction of currents along the continental slope between Unimak Pass and the Pribilof Islands.

The biological component of the cruise was divided into two parts. Two occupations of the grid were conducted, separated by 10 days. Bongo-net tows, designed to show the horizontal distribution of eggs and larvae, were completed at 55 stations (Fig. 8; Table 6). One station in each grid occupation was chosen for additional sampling via live tows (vertical bongo tows), Tucker trawls, and a CTD. These were at M21 in the first occupation, where two STD's drogued at 45 meters were deployed, and at H22 in the second occupation, the station nearest the STD locations. The grid for the second occupation was centered on the grid station nearest the 31 March positions of the STDs. Many stations were eliminated because of bad weather, resulting in an asymmetrical grid. Six bongo tows were conducted on the CTD grid at stations 32, 38, 54, 59, 81, and 87.

Three vertical live tows, two at M21 and one at H22, were accomplished with the bongo net. Vertical distribution of eggs and larvae was measured with a 1-meter Tucker trawl series. There were equipment and deployment problems with the Tucker trawls in the first grid occupation at M21, so a series of five bongo tows was conducted at 50-meter depth intervals down to 250 meters in order to approximate the depth distribution. One successful Tucker trawl series was conducted later at H22 at 50-meter increments from 100 to 250 meters.

A total of 107 CTD stations (Fig. 9; Table 6) were occupied using the ship's Neil Brown CTD and the PMEL CTD processing system. One CTD was conducted at the Tsunami BPR #7 mooring site in the Gulf of Alaska. Six CTDs were located on the biological grid. Shelf-slope exchange was investigated by CTD and the deployment of four satellite-tracked drifters drogued at 45 meters. Two of the drifters were deployed at the 400-meter isobath north of Unimak Pass and two at the 400-meter isobath in Pribilof Canyon.

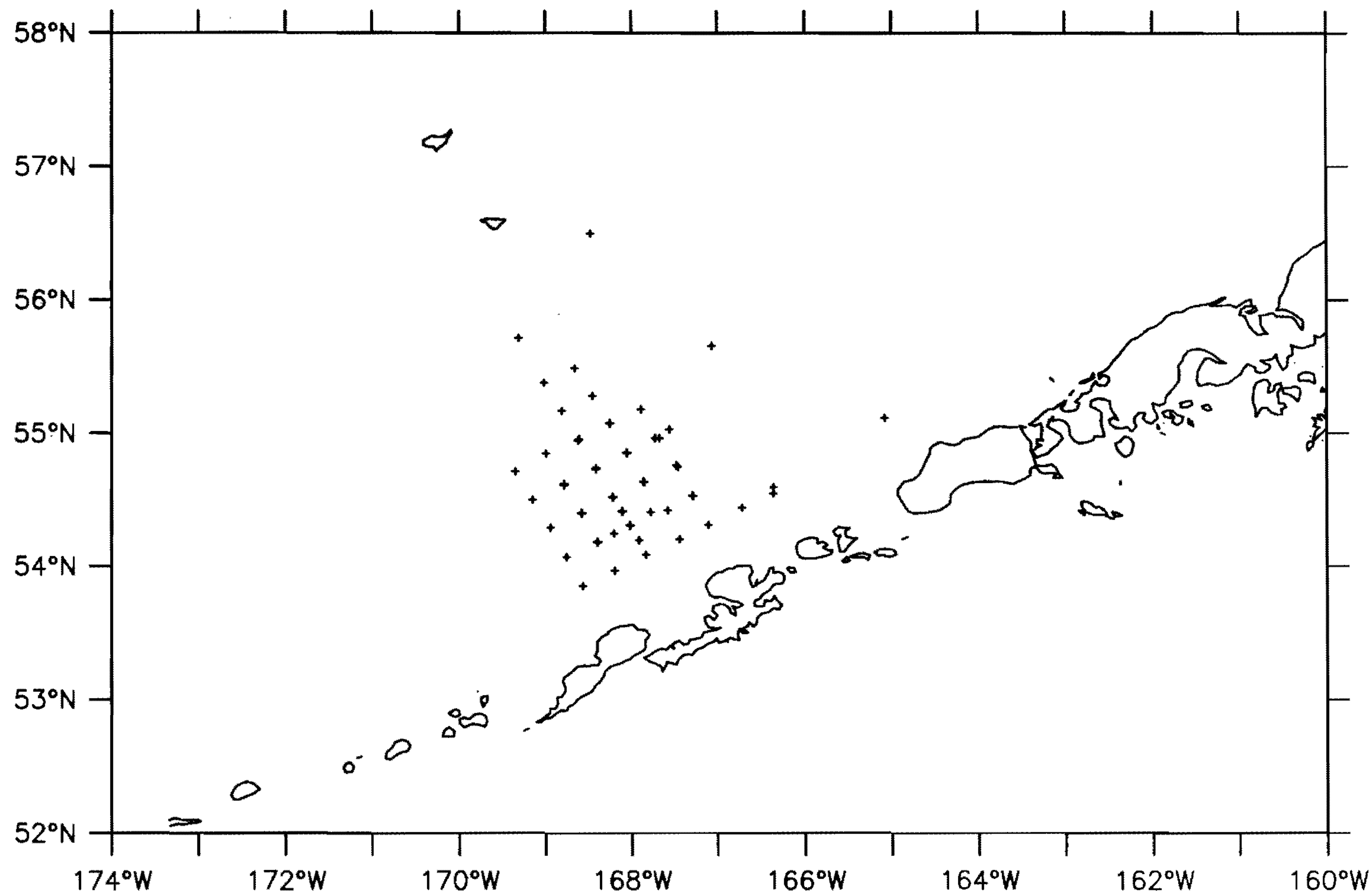


Figure 8. RIBS-88-1 bongo tows.

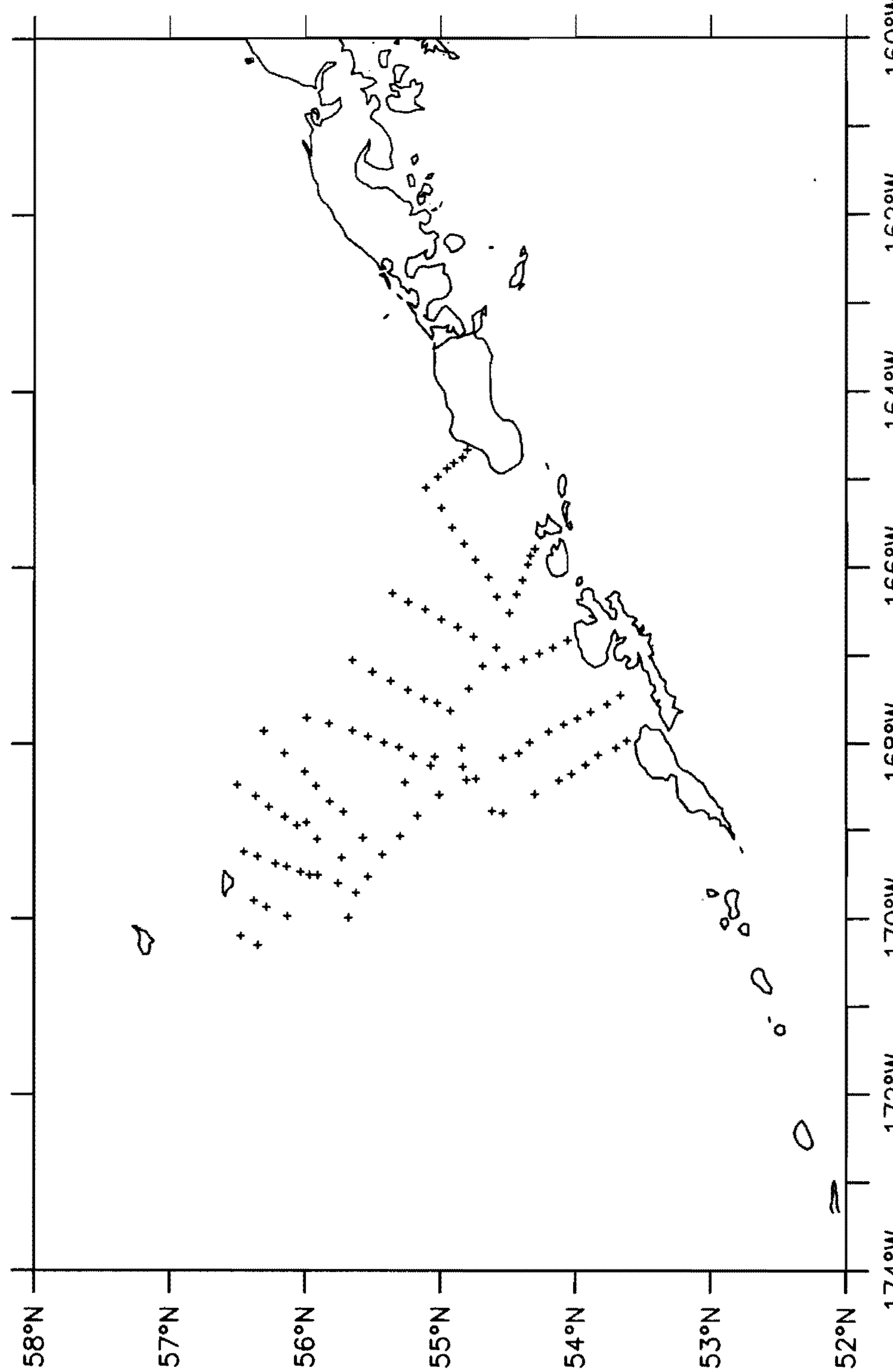


Figure 9. RIBS-88-I CTD stations.

TABLE 6. RIBS-88-I Cruise activities.

GMT JD	Date	GMT	Sta. No.	FOCI Sta. No.	Lat. N. (dd mm.m)	Long. W. (ddd mm.m)	Activity & Comments
075	15 Mar	1745	K25		52 43.9N	156 28.5W	BPR #8 (r)ecover
		2052			52 43.4N	156 28.3W	BPR #12 (d)eploy
076	16 Mar	0319			52 43.3N	155 00.1W	BPR #11 (d)
		0209			52 42.9N	155 00.3W	CTD
		0700			52 43.3N	155 00.1W	BPR #7 (r)
077	17 Mar	1610	K25		54 32.8N	166 21.7W	B
		1813	K24		54 26.2N	166 43.0W	B
		2014	K23		54 18.5N	167 06.0W	B
		2217	K22		54 12.1N	167 26.4W	B
078	18 Mar	0052	K21		54 05.3N	167 50.2W	B
		0352	J21		54 17.9N	168 01.4W	B
		0544	I21		54 31.1N	168 12.5W	B
		0759	H21		54 43.6N	168 24.6W	B
		0955	H20		54 36.3N	168 46.7W	B
		1210	I20		54 23.6N	168 34.3W	B
		1435	J20		54 10.6N	168 23.9W	B
		1645	K20		53 57.9N	168 11.9W	B
		2112	J22		54 25.1N	167 34.8W	B
		2320	I22		54 38.1N	167 50.9W	B
079	19 Mar	0135	H22		54 50.7N	168 03.4W	B
		0412	G22		55 04.3N	168 15.1W	B
		0750	G23		55 10.6N	167 53.6W	B
		0950	H23		54 57.8N	167 40.4W	B
		1219	I23		54 44.8N	167 27.4W	B
		1430	J23		54 31.5N	167 16.7W	B
		1724	N22		54 24.3N	167 46.4W	B
		2207	I19		54 17.3N	168 56.8W	B
080	20 Mar	0042	H19		54 29.9N	169 09.2W	B
		0300	G19		54 42.9N	169 21.3W	B
		0517	G20		54 50.7N	168 59.7W	B
		0719	G21		54 57.3N	168 36.3W	B
		1145	J19		54 04.8N	168 45.2W	B
		1351	K19		53 51.0N	168 33.7W	B
		1745	M21		54 24.8N	168 06.8W	B
		1944	N20		54 14.8N	168 12.2W	B
		2129	O21		54 11.5N	167 54.9W	B
		2359	M21		54 24.6N	168 06.9W	B (vert. to 45 m.)

TABLE 6. (continued).

GMT JD	Date	GMT	Sta. No.	FOCI Sta. No.	Lat. N. (dd mm.m)	Long. W. (ddd mm.m)	Activity & Comments
081	21 Mar	0015	M21		54 24.8N	168 06.2W	B (vert. to 75 m.)
		0243	M21		54 24.9N	168 06.2W	STD #7212
		0451	M21		54 25.3N	168 06.6W	CTD
		0607	M21-1		54 24.5N	168 06.5W	B (to 50 m.)
		0610	M21		54 24.5N	168 06.3W	STD #7213
		0637	M21-2		54 24.4N	168 06.6W	B (to 100 m.)
		0713	M21-3		54 24.3N	168 06.9W	B (to 150 m.)
		0749	M21-4		54 24.3N	168 06.8W	B (to 200 m.)
		0836	M21-5		54 24.3N	168 06.7W	B (to 250 m.)
		1341	1		53 37.2N	167 58.4W	CTD
		1536	2		53 41.9N	168 03.2W	CTD
		1741	3		53 50.0N	168 07.9W	CTD
		1955	4		53 55.6N	168 15.0W	CTD
		2155	5		54 01.8N	168 21.3W	CTD
		2351	6		54 07.4N	168 26.0W	CTD
082	22 Mar	0205	7		54 18.2N	168 35.2W	CTD
		0448	8		54 32.2N	168 48.4W	CTD
		0738	9		54 48.3N	168 25.6W	CTD
		1032	10		54 32.3N	168 10.2W	CTD
		1250	11		54 20.5N	167 59.3W	CTD
		1518	12		54 11.9N	167 52.3W	CTD
		1723	13		54 05.1N	167 47.2W	CTD
		1926	14		53 59.2N	167 43.5W	CTD
		2126	15		53 53.1N	167 38.5W	CTD
		2339	16		53 46.1N	167 33.4W	CTD
083	23 Mar	0023	17		53 40.0N	167 27.5W	CTD
		0354	18		54 03.4N	166 49.6W	CTD
		0527	19		54 10.1N	166 54.7W	CTD
		0717	20		54 16.1N	166 58.6W	CTD
		0901	21		54 23.0N	167 02.7W	CTD
		1030	22		54 31.0N	167 08.3W	CTD
		1445	26		54 18.2N	165 47.7W	CTD
		1532	27		54 20.0N	165 52.2W	CTD
		1600			54 20.4N	165 55.5W	STD #7214
		1600			54 20.4N	165 55.5W	STD #7256
		1635	28		54 21.0N	165 58.1W	CTD
		1813	29		54 23.6N	166 08.5W	CTD
		1934	30		54 26.3N	166 18.3W	CTD
		2107	31		54 29.2N	166 30.7W	CTD
		2307	32		54 34.7N	166 19.8W	CTD
		2351	32		54 35.7N	166 21.6W	B

TABLE 6. (continued).

GMT JD	Date	GMT	Sta. No.	FOCI Sta. No.	Lat. N. (dd mm.m)	Long. W. (ddd mm.m)	Activity & Comments
084	24 Mar	0142	33		54 38.6N	166 06.6W	CTD
		0301	34		54 44.3N	165 54.9W	CTD
		0420	35		54 49.5N	165 44.2W	CTD
		0542	36		54 54.7N	165 32.9W	CTD
		0701	37		54 59.5N	165 19.8W	CTD
		0827	38		55 06.5N	165 05.4W	CTD
		0900	38		55 06.9N	165 04.8W	B
		1008	39		55 01.2N	164 58.3W	CTD
		1104	40		54 57.1N	164 52.5W	CTD
		1200	41		54 54.2N	164 48.6W	CTD
		1255	42		54 50.2N	164 44.8W	CTD
		1336	43		54 48.1N	164 39.9W	CTD
		1944	44		55 21.3N	166 17.2W	CTD
		2056	45		55 14.2N	166 23.3W	CTD
		2208	46		55 06.9N	166 28.5W	CTD
		2330	47		54 59.5N	166 35.1W	CTD
085	25 Mar	0045	48		54 52.1N	166 40.5W	CTD
		0201	49		54 45.2N	166 47.0W	CTD
		0334	50		54 35.1N	166 54.3W	CTD
		0502	51		54 41.3N	167 07.5W	CTD
		0629	52		54 47.4N	167 22.7W	CTD
		0757	53		54 55.5N	167 37.9W	CTD
		0907	54		55 01.5N	167 32.6W	CTD
		0934	54		55 01.6N	167 33.2W	B
		1051	55		55 07.3N	167 29.6W	CTD
		1200	56		55 14.3N	167 23.3W	CTD
		1301	57		55 22.0N	167 17.3W	CTD
		1408	58		55 30.2N	167 11.2W	CTD
		1517	59		55 39.1N	167 03.3W	CTD
		1538	59		55 39.2N	167 03.9W	B
		1831	60		55 59.2N	167 42.4W	CTD
		1955	61		55 49.2N	167 46.4W	CTD
		2123	62		55 39.1N	167 51.4W	CTD
		2223	63		55 32.1N	167 55.4W	CTD
		2325	64		55 25.0N	167 59.3W	CTD
086	26 Mar	0033	65		55 18.3N	168 02.7W	CTD
		0210	66		55 12.2N	168 08.8W	CTD
		0423	67		55 02.5N	168 09.3W	CTD
		0625	68		54 49.9N	168 16.4W	CTD
		0947	69		55 00.6N	168 35.8W	CTD
		1215	70		55 10.3N	168 50.1W	CTD
		1430	71		55 17.9N	169 04.2W	CTD
		1643	72		55 25.7N	169 17.1W	CTD
		1904	73		55 34.4N	169 05.2W	CTD

TABLE 6. (continued).

GMT JD	Date	GMT	Sta. No.	FOCI Sta. No.	Lat. N. (dd mm.m)	Long. W. (ddd mm.m)	Activity & Comments
		2045	74		55 59.4N	168 54.5W	CTD
		2114			55 40.0N	168 53.5W	STD #7210
		2114			55 40.0N	168 53.5W	STD #7211
		2152	75		55 43.1N	168 47.5W	CTD
		2303	76		55 49.2N	168 40.4W	CTD
087	27 Mar	0004	77		55 55.0N	168 29.6W	CTD
		0055	78		56 00.2N	168 19.9W	CTD
		0209	79		56 09.2N	168 06.4W	CTD
		0328	80		56 18.3N	167 51.5W	CTD
		0555	81		56 30.2N	168 28.7W	CTD
		0638	81		56 29.8N	168 28.7W	B
		0747	82		56 21.9N	168 36.7W	CTD
		0849	83		56 16.0N	168 43.9W	CTD
		1000	84		56 09.0N	168 50.8W	CTD
		1130	85		56 03.6N	168 56.9W	CTD
		1338	86		55 54.8N	169 06.4W	CTD
		1623	87		55 43.8N	169 18.9W	CTD
		1735	87		55 42.9N	169 19.0W	B
		2024	88		55 32.1N	169 31.8W	CTD
		2217	90		55 37.4N	169 42.5W	CTD
088	28 Mar	0014	89		55 40.6N	169 59.3W	CTD
		0244	91		55 45.5N	169 36.3W	CTD
		0457	92		55 54.4N	169 30.7W	CTD
		0641	93		55 58.0N	169 30.5W	CTD
		0804	94		56 01.9N	169 28.7W	CTD
		0925	95		56 08.1N	169 24.8W	CTD
		1032	96		56 13.3N	169 22.8W	CTD
		1145	97		56 21.2N	169 18.1W	CTD
		1236	98		56 27.2N	169 14.7W	CTD
		1439	99		56 22.9N	169 48.0W	CTD
		1532	100		56 17.0N	169 52.5W	CTD
		1653	101		56 07.8N	169 58.7W	CTD
		2356	111		56 28.5N	170 11.7W	CTD
089	29 Mar	0105	110		56 20.9N	170 18.3W	CTD
091	31 Mar	1740	J23		54 31.9N	167 17.3W	B
		1953	I23		54 45.4N	167 28.7W	B
		2203	I22		54 38.0N	167 51.6W	B
		2358	H22		54 50.7N	168 03.1W	B

TABLE 6. (continued).

GMT JD	Date	GMT	Sta. No.	FOCI Sta. No.	Lat. N. (dd mm.m)	Long. W. (ddd mm.m)	Activity & Comments
092	01 Apr	0121	H22		54 50.7N	168 03.1W	CTD
		0159	H22		54 51.2N	168 02.9W	B (vert. to 60m)
		0305	H22-1		54 50.9N	168 03.8W	T
		0358	H22-2		54 50.4N	168 03.4W	T
		0448	H22-3		54 50.7N	168 02.9W	T
		0543	H22-4		54 50.5N	168 02.8W	T
		0747	G22		55 04.2N	168 15.2W	B
		0905	G22		55 04.2N	168 15.4W	CTD
		1051	F22		55 16.5N	168 27.0W	CTD
		1121	F22		55 16.8N	168 26.9W	B
		1324	E22		55 29.3N	168 39.3W	B
		1525	E21		55 22.9N	169 01.0W	B
		1736	F21		55 09.9N	168 48.5W	B
		1939	G21		54 56.6N	168 37.1W	B
		2148	H21		54 44.1N	168 24.9W	CTD
		2223	H21		54 44.2N	168 24.6W	B
093	02 Apr	0029	I21		54 31.2N	168 13.3W	B
		0212	M21		54 24.5N	168 06.9W	B
		0508	J21		54 18.5N	168 01.1W	B
		0721	J20		54 11.0N	168 23.7W	B
095	04 Apr	0124	I20		54 24.2N	168 34.9W	B
		0313	H20		54 36.8N	168 46.8W	B
		0426	H20		54 37.0N	168 47.1W	CTD
		0842	H23		54 57.8N	167 43.6W	B

3.4 FOCI-88-I Cruise Summary – 01 April-13 April 1988

Scientific Party:	Ann Matarese (CS)	NWAFC
	Jay Clark	NWAFC
	Mary Yoklavich	NWAFC
	Annette Brown	NWAFC
	David Savage	NWAFC
	Carol Dewitt	PMEL

The principal objectives of this cruise to Shelikof Strait were to determine the horizontal patterns of distribution of walleye pollock eggs and locate an area of maximum abundance. A total of 37 bongo stations in Shelikof Strait, from Cape Kuliak to Cape Igvak, were completed as part of a "pre-survey" (Fig. 10; Table 4). Egg abundances were moderate, especially along the gully off Cape Kekurnoi. During the "main survey" 105 bongo stations were completed. Although the numbers appeared lower than previous years, relative abundances increased from the numbers encountered during the pre-survey. Eggs were mostly in the early stages of development, suggesting that spawning was ongoing. The 31 stations sampled during the "post-survey" continued to show higher relative abundances and eggs were in the early and middle stages of development.

A total of five bongo tows and seven CTD casts were made on FOCI line 8 as part of an ongoing time series for water properties and zooplankton (Fig. 11). Live pollock eggs were collected and brought back to Seattle for studies on the specific gravity of eggs and yolksac larvae.

Special studies on the potential predators of walleye pollock were conducted at two sites off Cape Kekurnoi (Fig. 12; Table 7), at locations determined by egg abundances during the pre-survey and main survey. At the first location 15 Tucker trawls were completed over a 24-hour period. More than 400 invertebrate predators were collected and immediately frozen (–80°C) for laboratory analysis. Predators were also collected for experiments using the live tank. In the same area of high egg abundance, four mid-water trawls (two day, two night), were made to collect stomachs from potential predators of walleye pollock eggs. The trawls were composed of mainly 2- and 3-year-old walleye pollock (20–40 centimeter) along with small amounts of smelt. Subsamples were taken and the stomachs were removed and immediately preserved for analysis.

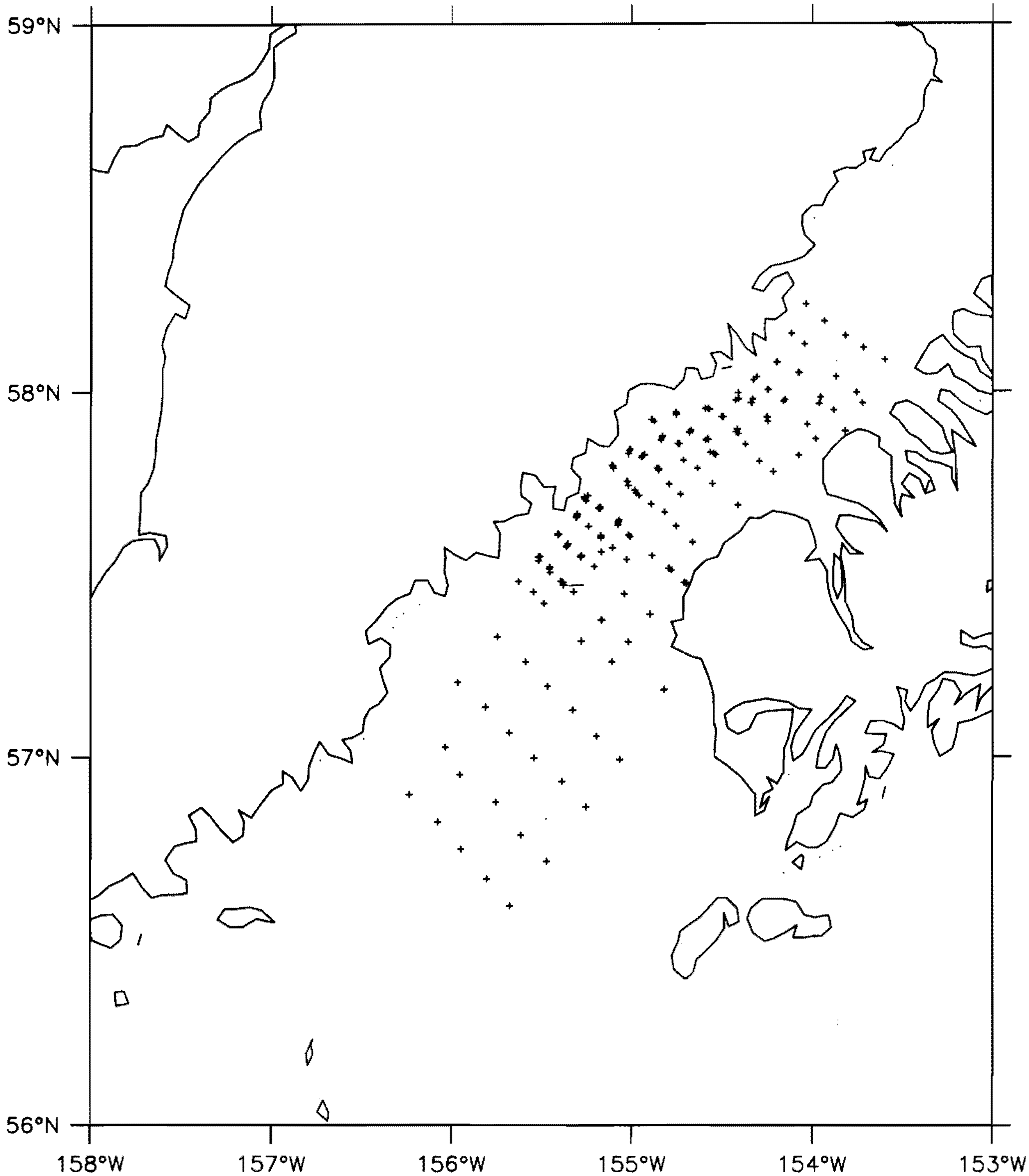


Figure 10. FOCI-88-I bongo tows.

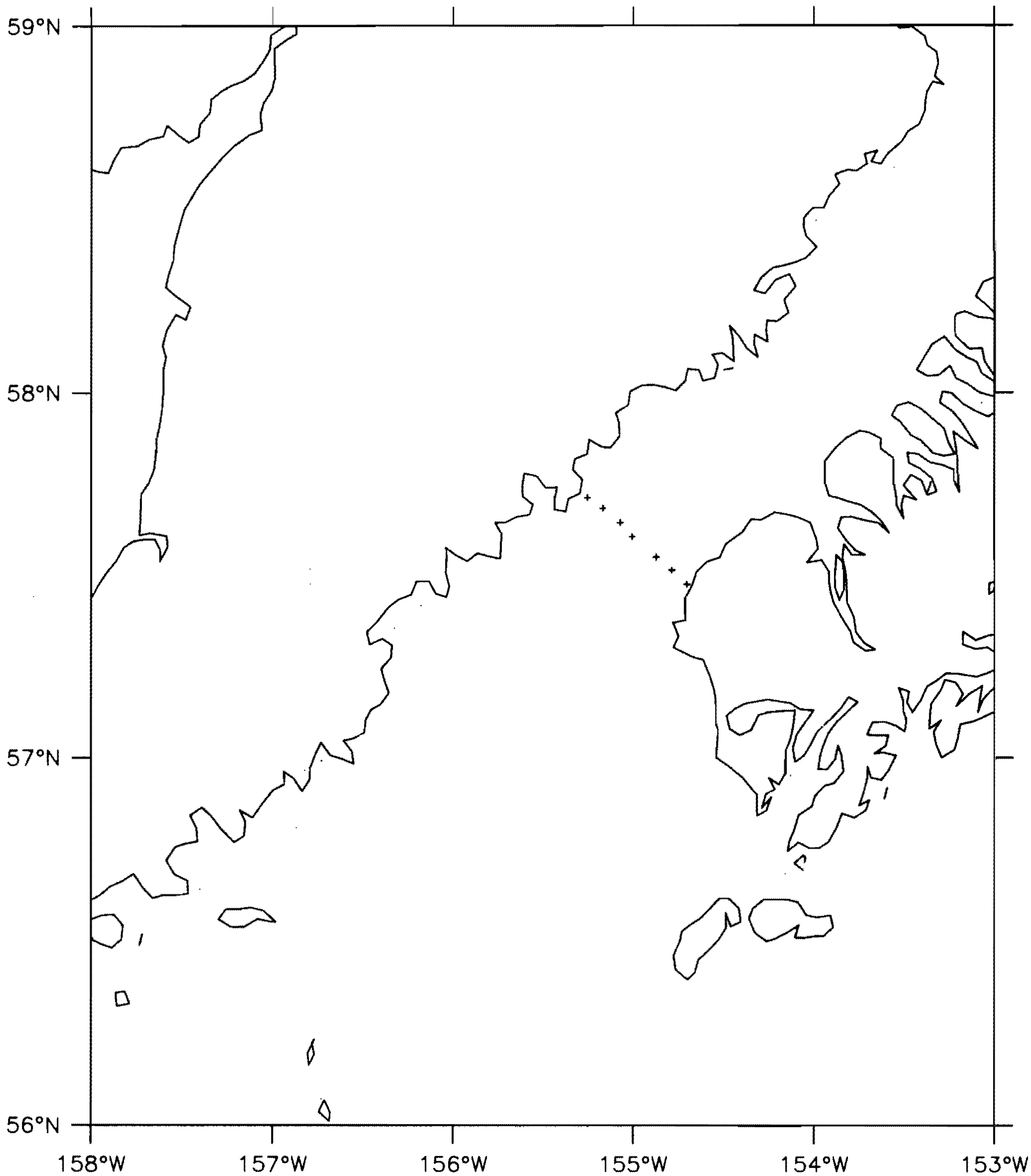


Figure 11. FOCI-88-I CTD stations.

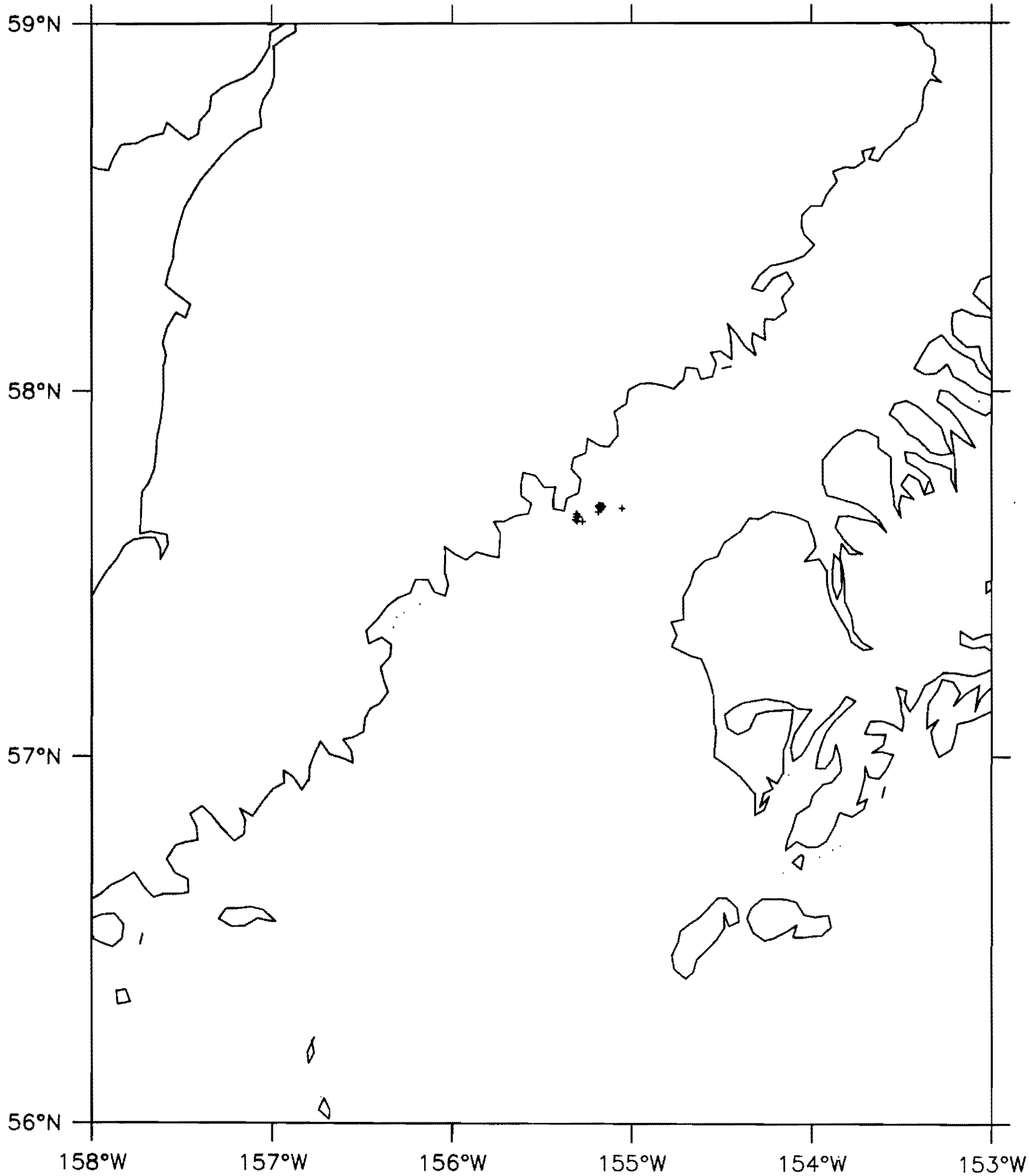


Figure 12. FOCI-88-I miscellaneous stations.

TABLE 7. FOCI-88-I Cruise activities.

GMT JD	Date	GMT	Sta. No.	FOCI Sta. No.	Lat. N. (dd mm.m)	Long. W. (ddd mm.m)	Activity & Comments
092	Apr 01	0733	G001A		57 55.8N	154 15.1W	B
		0819	G002A		57 58.8N	154 19.7W	B
		0914	G003A		57 59.8N	154 24.6W	B
		1032	G004A		57 57.1N	154 34.1W	B
		1115	G005A		57 55.8N	154 29.7W	B
		1209	G006A		57 53.8N	154 24.9W	B
		1304	G007A		57 49.6N	154 32.1W	B
		1348	G008A		57 52.1N	154 34.5W	B
		1434	G009A		57 53.4N	154 40.7W	B
		1523	G010A		57 56.2N	154 45.2W	B
		1611	G011A		57 55.4N	154 53.4W	B
		1645	G012A		57 52.7N	154 49.7W	B
		1732	G013A		57 51.4N	154 44.0W	B
		1837	G014A		57 47.3N	154 50.9W	B
		1924	G015A		57 49.6N	154 55.8W	B
		2017	G016A		57 50.5N	155 00.5W	B
		2021	G017A		57 47.9N	155 06.6W	B
		2239	G018A		57 45.2N	155 01.5W	B
		2339	G019A		57 43.8N	154 58.9W	B
093	02 Apr	0046	G020A		57 38.4N	155 04.6W	B
		0138	G021A		57 40.8N	155 11.0W	B
		0248	G022A		57 42.0N	155 15.3W	B
		0339	G023A		57 39.4N	155 18.2W	B
		0431	G024A		57 37.8N	155 14.2W	B
		0521	G025A		57 36.0N	155 10.2W	B
		0615	G026A		57 33.0N	155 16.7W	B
		0702	G027A		57 35.0N	155 21.2W	B
		0750	G028A		57 36.5N	155 24.2W	B
		0858	G029A		57 32.9N	155 30.5W	B
		1010	G030A		57 31.2N	155 27.2W	B
		1113	G031A		57 28.8N	155 23.6W	B
		1606	G032A		57 58.7N	154 09.0W	B
		1654	G033A		58 00.3N	154 14.6W	B
		1738	G034A		58 02.4N	154 18.4W	B
		1829	G035A		58 04.8N	154 11.6W	B
		1917	G036A		58 03.1N	154 04.3W	B
		2015	G037A		57 59.1N	153 57.3W	B

TABLE 7. (continued).

GMT JD	Date	GMT	Sta. No.	FOCI Sta. No.	Lat. N. (dd mm.m)	Long. W. (ddd mm.m)	Activity & Comments
094	03 Apr	0116	S021A		57 41.2N	155 11.1W	T(t,d)[1]
		0246	S021B		57 41.1N	155 11.0W	T(m,d)
		0614	S021C		57 41.1N	155 10.7W	T(m,n)
		0718	S021D		57 41.1N	155 10.3W	T(t,n)
		1000	S021E		57 41.2N	155 10.3W	T(t,n)
		1059	S021F		57 41.2N	155 10.3W	T(m,n)
		1211	S021G		57 41.1N	155 09.5W	T(m,n)
		1316	S021H		57 40.9N	155 10.0W	T(t,n)
		1616	S021I		57 40.6N	155 10.3W	T(t,d)
		1709	S021J		57 41.1N	155 10.7W	T(t,d)
		1842	S021K		57 40.8N	155 10.4W	T(m,d)
		2032	S021L		57 41.2N	155 10.1W	T(m,d)
		2210	S021M		57 40.9N	155 10.7W	T(t) Slow tow
		2302	S021N		57 41.1N	155 10.6W	T(t) Slow tow
		2347	S021O		57 41.1N	155 10.3W	T, Live eggs.
095	04 Apr	0937	G022Z		57 42.7N	155 15.7W	B, b
		1045	G021Z		57 41.0N	155 10.5W	B, b
		1158	G038Z		57 36.1N	155 00.5W	B, b
		1316	G040Z		57 30.6N	154 46.7W	B, b
		1354	G041Z		57 28.5N	154 41.8W	B, b
		1645		55	57 28.5N	154 42.2W	CTD
		1713		56	57 30.8N	154 47.2W	CTD
		1751		57	57 32.9N	154 52.4W	CTD
		1841		58	57 36.2N	155 00.4W	CTD
		1916		59	57 38.5N	154 04.2W	CTD
		1958		60	57 40.9N	155 10.1W	CTD
		2048		61	57 42.7N	155 15.2W	CTD
		2217	S021		57 41.2N	155 09.8W	MWT(d)
		2339	S021		57 40.2N	155 11.1W	MWT(d)
096	05 Apr	0623	S021		57 40.8N	155 09.3W	MWT(n)
		1253	S021		57 41.3N	155 10.7W	MWT(n)
		1838	G042B		58 14.2N	154 02.0W	B
		1931	G043B		58 11.4N	153 56.0W	B
		2026	G044B		58 09.1N	153 48.9W	B
		2114	G045B		58 07.2N	153 43.1W	B
		2209	G046B		58 05.2N	153 35.9W	B
		2321	G047B		57 58.1N	153 43.2W	B
		2355	G048B		57 59.8N	153 45.2W	B

[1] t = taped plastic cod end, m = 1500 Jm mesh, d = Daytime tow, n = Nighttime tow

TABLE 7. (continued).

GMT JD	Date	GMT	Sta. No.	FOCI Sta. No.	Lat. N. (dd mm.m)	Long. W. (ddd mm.m)	Activity & Comments
097	06 Apr	0045	G049B		58 02.4N	153 52.1W	B
		0145	G050B		58 07.7N	154 02.5W	B
		0231	G051B		58 09.5N	154 06.8W	B
		0323	G035B		58 04.8N	154 11.9W	B
		0413	G036B		58 03.0N	154 04.4W	B
		0502	G037B		57 58.9N	153 57.8W	B
		0550	G052B		57 56.9N	153 52.9W	B
		0635	G053B		57 53.5N	153 49.1W	B
		0724	G054B		57 52.1N	153 58.9W	B
		0818	G055B		57 54.6N	154 01.8W	B
		0921	G032B		57 58.4N	154 09.6W	B
		1008	G033B		58 00.3N	154 14.8W	B
		1104	G034B		58 01.9N	154 19.5W	B
		1203	G003B		57 58.6N	154 25.4W	B
		1303	G002B		57 58.2N	154 20.4W	B
		1359	G001B		57 55.7N	154 15.0W	B
		1508	G056B		57 49.5N	154 04.4W	B
		1602	G057B		57 46.8N	154 12.9W	B
		1643	G058B		57 48.5N	154 17.6W	B
		1724	G059B		57 51.3N	154 22.2W	B
		1805	G006B		57 53.3N	154 25.3W	B
		1849	G005B		57 55.9N	154 30.1W	B
		1933	G004B		57 57.2N	154 35.5W	B
		2026	G010B		57 56.6N	154 45.2W	B
		2138	G009B		57 53.6N	154 40.3W	B
		2231	G008B		57 52.2N	154 34.8W	B
		2319	G007B		57 50.0N	154 32.9W	B
098	07 Apr	0103	G060B		57 41.2N	154 24.7W	B
		0154	G061B		57 44.8N	154 33.1W	B
		0237	G062B		57 47.4N	154 38.1W	B
		0331	G063B		57 48.7N	154 42.8W	B
		0416	G013B		57 51.4N	154 44.7W	B
		0500	G012B		57 52.4N	154 49.9W	B
		0546	G011B		57 55.1N	154 52.5W	B
		0634	G016B		57 50.3N	155 00.8W	B
		0722	G015B		57 49.4N	154 56.4W	B
		0826	G014B		57 47.4N	154 51.5W	B
		0928	G064B		57 44.8N	154 47.7W	B
		1021	G065B		57 43.1N	154 43.7W	B
		1142	G066B		57 35.2N	154 39.7W	B
		1230	G067B		57 37.8N	154 45.2W	B
		1321	G068B		57 40.1N	154 49.1W	B
		1405	G069B		57 41.5N	154 53.6W	B
		1457	G019B		57 43.3N	154 58.5W	B
		1556	G018B		57 45.3N	155 01.5W	B

TABLE 7. (continued).

GMT JD	Date	GMT	Sta. No.	FOCI Sta. No.	Lat. N. (dd mm.m)	Long. W. (ddd mm.m)	Activity & Comments
		1648	G017B		57 47.8N	155 06.3W	B
		1812	G022B		57 42.9N	155 14.6W	B
		1908	G021B		57 40.7N	155 10.5W	B
		2007	G020B		57 38.8N	155 04.3W	B
		2100	G038B		57 36.4N	155 01.1W	B
		2204	G039B		57 33.1N	154 53.1W	B
		2258	G040B		57 31.0N	154 47.5W	B
		2343	G041B		57 28.6N	154 42.5W	B
099	08 Apr	0101	G070B		57 32.4N	155 01.6W	B
		0144	G071B		57 34.3N	155 06.2W	B
		0228	G025B		57 36.3N	155 10.3W	B
		0307	G024B		57 37.8N	155 14.4W	B
		0354	G023B		57 39.8N	155 18.1W	B
		0450	G028B		57 36.6N	155 24.6W	B
		0540	G027B		57 34.7N	155 21.5W	B
		0633	G026B		57 33.1N	155 16.7W	B
		0725	G072B		57 31.2N	155 12.4W	B
		0833	G073A		57 26.7N	155 02.5W	B
		0941	G074B		57 23.4N	154 53.7W	B
		1051	G075B		57 18.9N	155 01.1W	B
		1156	G076B		57 22.5N	155 10.0W	B
		1302	G077B		57 27.1N	155 19.3W	B
		1347	G031B		57 28.7N	155 22.9W	B
		1438	G030B		57 30.9N	155 27.4W	B
		1532	G029B		57 32.8N	155 31.0W	B
		1631	G078B		57 28.8N	155 37.8W	B
		1735	G079B		57 27.1N	155 32.7W	B
		1826	G080B		57 25.2N	155 29.3W	B
		2001	G081B		57 19.0N	155 16.8W	B
		2109	G082B		57 15.6N	155 06.6W	B
		2211	G083B		57 11.1N	154 49.3W	B
		2346	G084B		56 59.6N	155 03.9W	B
100	09 Apr	0118	G085B		57 03.4N	155 11.6W	B
		0250	G086B		57 07.7N	155 19.6W	B
		2103	G087B		57 19.7N	155 44.7W	B
		2251	G088B		57 15.6N	155 35.4W	B
101	10 Apr	0031	G089B		57 11.6N	155 28.1W	B
		0257	G090B		57 12.3N	155 58.0W	B
		0408	G091B		57 08.2N	155 48.8W	B
		0519	G092B		57 04.0N	155 40.7W	B
		0628	G093B		56 59.9N	155 32.4W	B
		0733	G094B		56 56.0N	155 23.1W	B
		0846	G095B		56 51.9N	155 15.2W	B

TABLE 7. (continued).

GMT JD	Date	GMT	Sta. No.	FOCI Sta. No.	Lat. N. (dd mm.m)	Long. W. (ddd mm.m)	Activity & Comments
		1017	G096B		56 43.0N	155 28.3W	B
		1120	G097B		56 47.3N	155 36.9W	B
		1226	G098B		56 52.7N	155 45.3W	B
		1337	G099B		56 57.1N	155 57.2W	B
		1436	G100B		57 01.6N	156 02.1W	B
		1547	G101B		56 53.9N	156 14.1W	B
		1648	G102B		56 49.5N	156 04.6W	B
		1752	G103B		56 45.0N	155 56.8W	B
		1909	G104B		56 40.1N	155 48.3W	B
		2029	G105B		56 35.7N	155 40.5W	B
102	11 Apr	0505	G001C		57 55.1N	154 14.7W	B
		0601	G002C		57 58.1N	154 20.1W	B
		0648	G003C		57 58.8N	154 24.4W	B
		0754	G004C		57 57.2N	154 34.6W	B
		0845	G005C		57 55.8N	154 29.5W	B
		0939	G006C		57 53.1N	154 24.5W	B
		1041	G007C		57 49.8N	154 32.7W	B
		1131	G008C		57 52.0N	154 35.4W	B
		1215	G009C		57 53.2N	154 40.7W	B
		1308	G010C		57 56.4N	154 45.2W	B
		1351	G011C		57 55.4N	154 53.2W	B
		1427	G012C		57 52.0N	154 50.2W	B
		1515	G013C		57 51.5N	154 44.6W	B
		1612	G014C		57 47.1N	154 51.0W	B
		1704	G015C		57 49.2N	154 56.7W	B
		1753	G016C		57 49.8N	155 01.1W	B
		1839	G017C		57 47.4N	155 06.1W	B
		1933	G018C		57 44.5N	155 01.3W	B
		2030	G019C		57 42.9N	154 57.6W	B
		2129	G020C		57 38.0N	155 04.6W	B
		2288	G021C		57 40.7N	155 10.6W	B
		2325	G022C		57 42.4N	155 15.7W	B
103	12 Apr	0012	G023C		57 39.7N	155 18.3W	B
		0112	G024C		57 37.7N	155 14.3W	B
		0214	G025C		57 35.6N	155 10.1W	B
		0257	G026C		57 32.8N	155 17.0W	B
		0350	G027C		57 34.5N	155 21.7W	B
		0444	G028C		57 36.4N	155 24.6W	B
		0546	G029C		57 32.2N	155 31.0W	B
		0637	G030C		57 30.3N	155 27.3W	B
		0727	G031C		57 28.2N	155 22.7W	B
		0937	S023		57 38.7N	155 18.2W	MWT(n)
		1042	S023		57 39.5N	155 17.7W	MWT(n)
		1212	S023A		57 38.9N	155 18.7W	T(t,n)

TABLE 7. (continued).

GMT JD	Date	GMT	Sta. No.	FOCI Sta. No.	Lat. N. (dd mm.m)	Long. W. (ddd mm.m)	Activity & Comments
		1322	S023B		57 39.4N	155 18.4W	T(m,n)
		1602	S023C		57 39.9N	155 18.2W	T(t,d)
		1648	S023D		57 39.9N	155 18.4W	T(m,d)
		2048	S023		57 38.6N	155 16.4W	MWT(d)
		2208	S023		57 39.4N	155 17.8W	MWT(d)
104	13 Apr	0009	S023E		57 39.4N	155 18.0W	T(t,d)
		0142	S023		57 39.3N	155 18.5W	Bottle cast
		0213	S023F		57 39.4N	155 18.2W	T(t,d)
		0321	S023G		57 39.4N	155 18.2W	T(m,d)

3.5 FOCI-88-II Cruise Summary – 16 April-2 May, 1988

Scientific Party:		
	Lewis Incze (CS)	BLOS
	Jay Clark	NWAFC
	Shailer Cummings	AOML
	Carol Dewitt	PMEL
	David Niemann	Univ. Miami/AOML
	William Rugen	NWAFC
	Deborah Siefert	NWAFC

This cruise had the following objectives:

1) To examine the variability of hydrographic conditions at the southwestern end of Shelikof Strait (FOCI CTD grid lines 8–10) at the time that eggs were hatching into larvae, and to survey yolk-sac larval distribution during one of the hydrographic grids;

2) To obtain fine-scale (order of 20-meter depth interval and less) data on the vertical distribution of eggs and yolk-sac larvae;

3) To obtain fresh yolk-sac larvae for otolith reading, histological exam, RNA/DNA ratios, and Electron-Transport System (ETS) analysis;

4) To obtain fresh pollock eggs for hatching and subsequent experimentation (immunoassay) on board;

5) To sample potential predators of larvae for immunoassay exam;

6) To obtain time-series data for zooplankton on FOCI line 8;

7) To test operation of an in-situ grazing chamber and to evaluate a "search-light sonar" package in front of the Ortner Net-Cam.

The cruise was conducted in three phases: a hydrographic survey of the southwestern region of Shelikof Strait using CTD, nutrient, and chlorophyll data; a second CTD survey combined with biological sampling for eggs, larvae, and zooplankton; and a third hydrographic survey with microzooplankton and bongo samples added (Figs. 13, 14, and 15, Table 8). Due to the failure of the ADCP, no current profile data was obtained during the cruise.

The first phase surveyed the area encompassed by FOCI lines 8, 9, and 10, plus two intermediate lines--8.5 and 9.5. Line 8 was surveyed both before and after a storm passed through the area to examine the storm's effects.

Phase II repeated the CTD grid of phase I. This was supplemented by samples for zooplankton and eggs, using the Net-Cam, bongo-nets, MOCNESS, and Tucker trawls.

Phase III again repeated the CTD grid of the previous phases with CTD, nutrient and chlorophyll sampling. These were accompanied by microzooplankton and bongo samples. The final two days were occupied with collecting larvae, collecting predators, and testing the SONAR unit and grazing chambers.

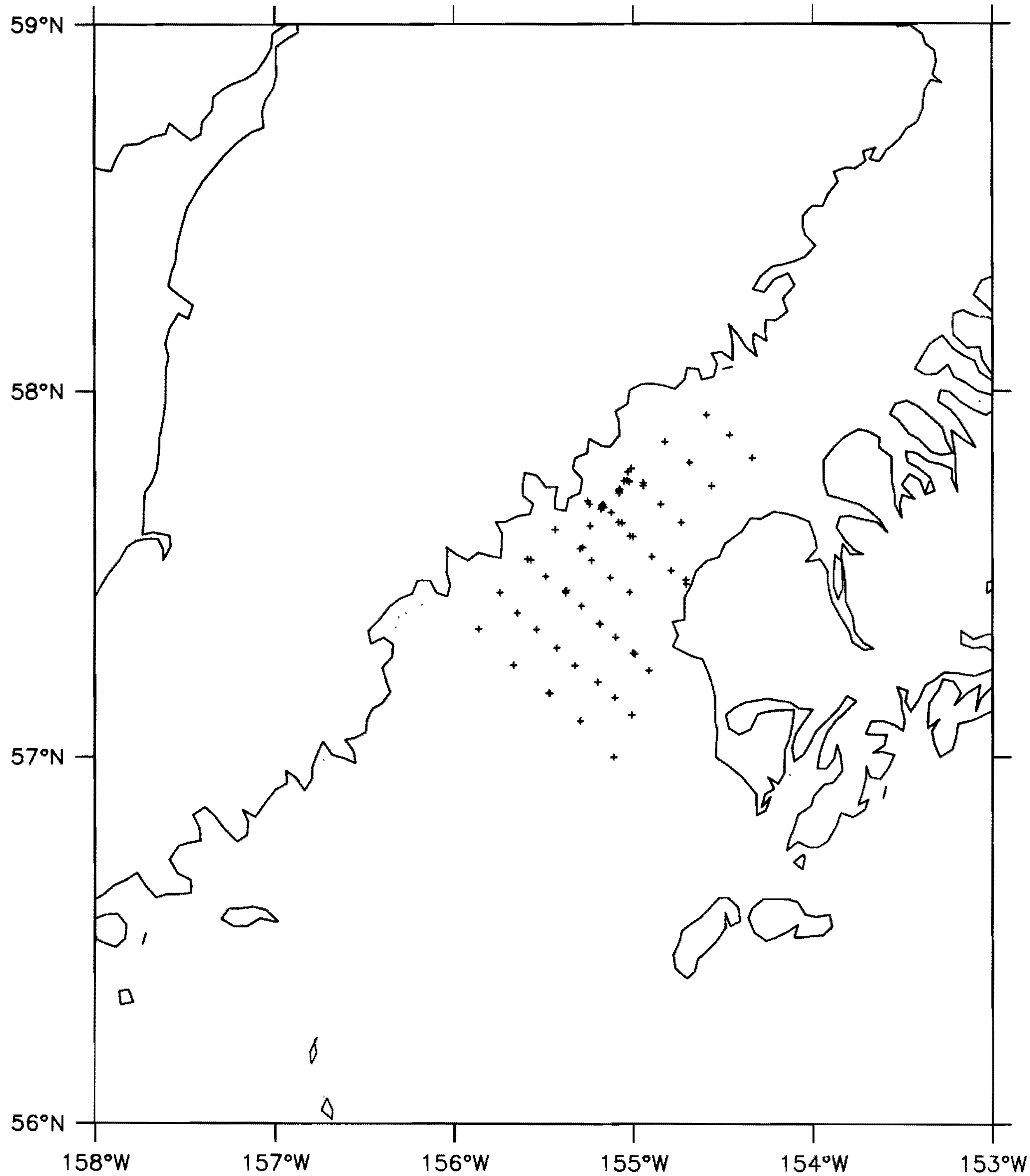


Figure 13. FOCI-88-II bongo tows.

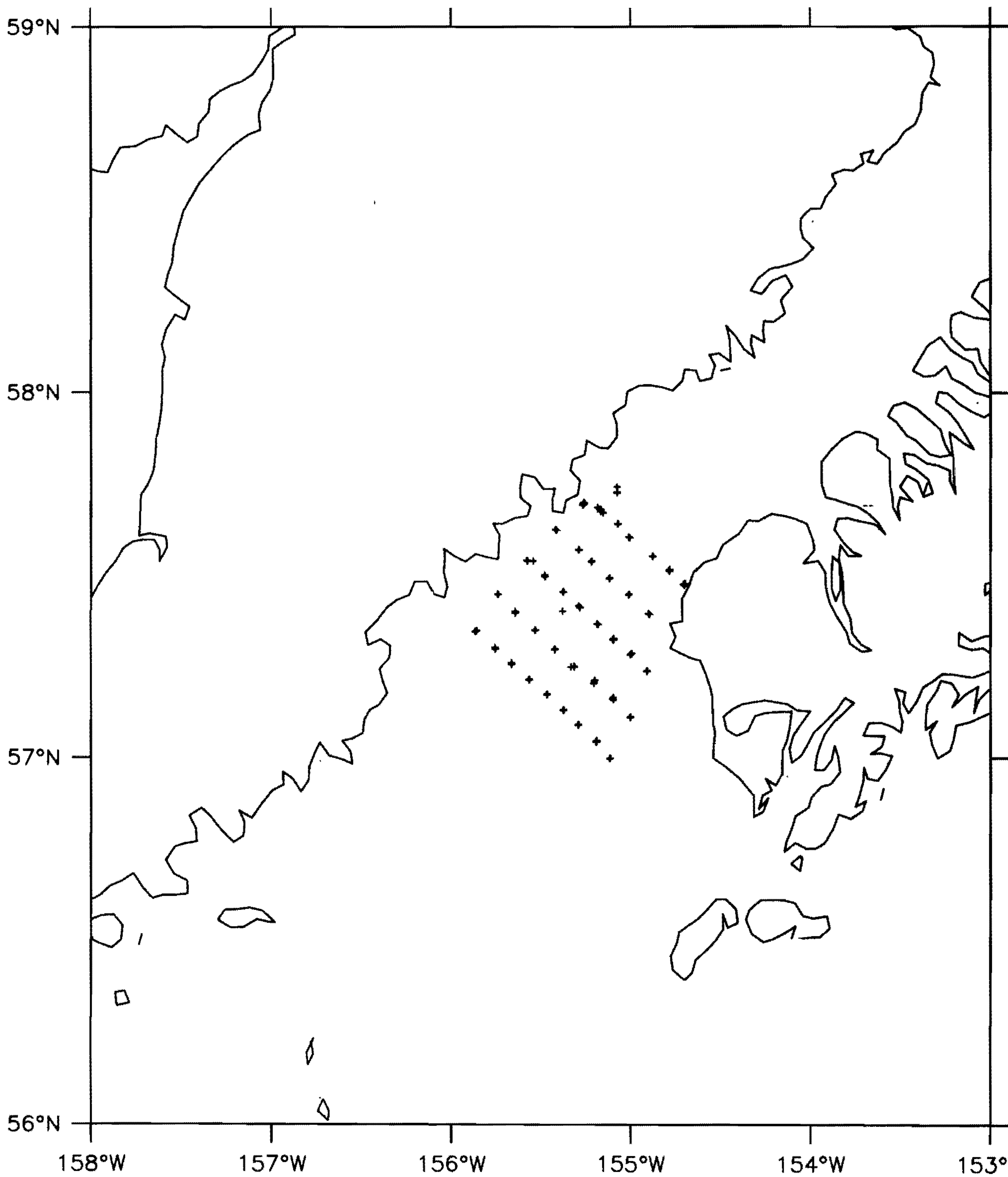


Figure 14. FOCI-88-II CTD stations.

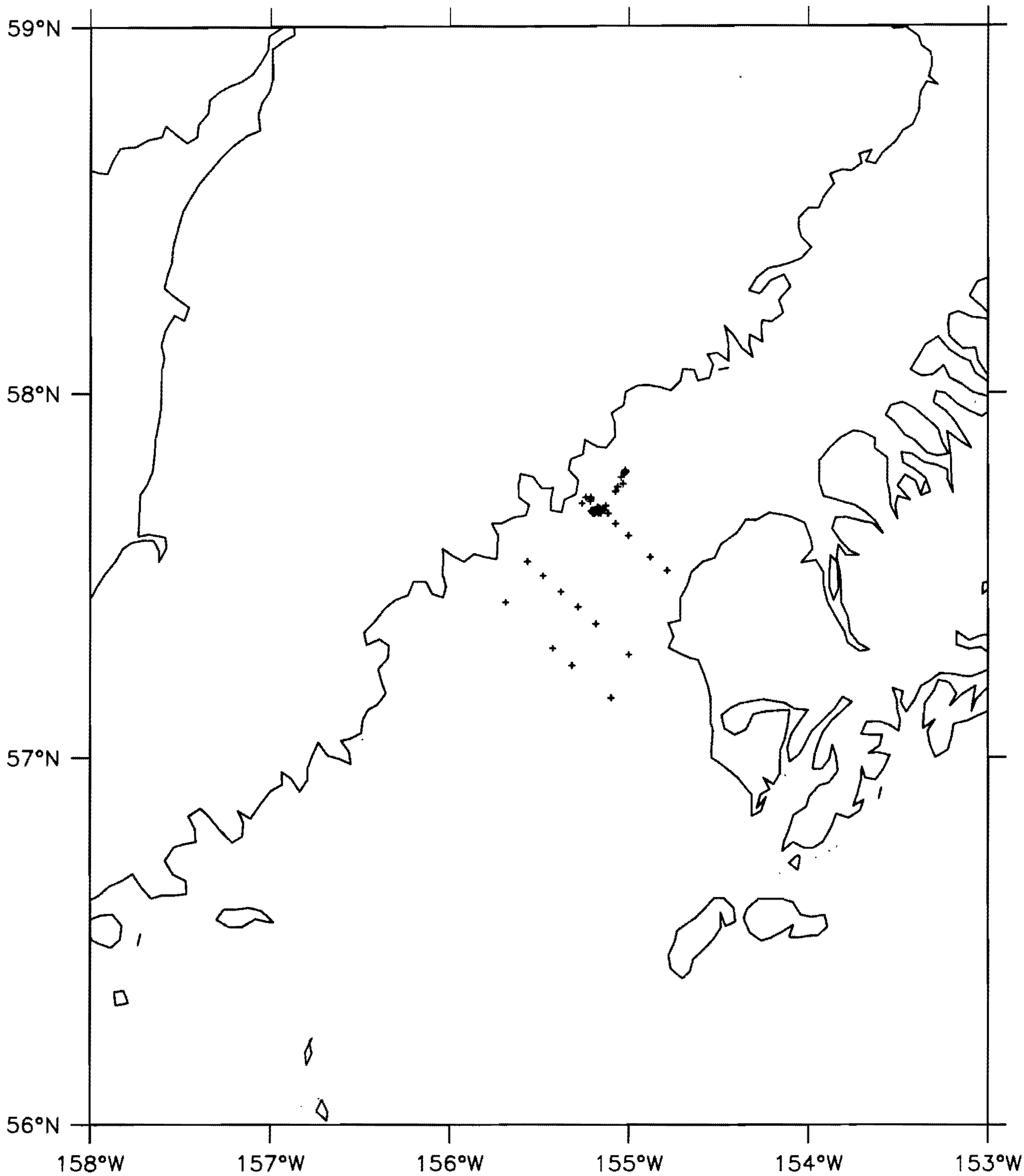


Figure 15. FOCI-88-II miscellaneous stations.

TABLE 8. FOCI-88-II Cruise activities.

GMT JD	Date	GMT	Sta. No.	FOCI Sta. No.	Lat. N. (dd mm.m)	Long. W. (ddd mm.m)	Activity & Comments
Phase I							
108	17 Apr	1120	1	55	57 28.4N	154 42.1W	CTD, N, Chl
		1215	1	55	57 29.1N	154 42.4W	B, b
		1255	2	56	57 30.9N	154 47.0W	CTD, N, Chl
		1357	3	57	57 33.2N	154 52.8W	CTD, N
		1509	4	58	57 36.2N	155 00.5W	CTD, N, Chl
		1605	4		57 36.2N	155 00.1W	B, b
		1656	5	59	57 38.6N	155 04.3W	CTD, N
		1753	6	60	57 40.9N	155 10.2W	CTD, N, Chl
		1901	6		57 41.0N	155 09.8W	B, b
		1948	7	61	57 41.7N	155 16.1W	CTD, N, Chl
		2038	7		57 42.0N	155 15.2W	B, b
		2145	8		57 37.5N	155 24.8W	CTD
		2233	9		57 34.1N	155 17.2W	CTD
		2317	10		57 32.2N	155 13.3W	CTD
109	18 Apr	0009	11		57 29.5N	155 07.3W	CTD
		0105	12		57 27.0N	155 00.5W	CTD
		0152	13		57 23.8N	154 54.0W	CTD
		0440	14	63	57 14.2N	154 54.4W	CTD, N, Chl
		0526	15	64	57 17.0N	155 00.1W	CTD, N
		0612	16	65	57 19.5N	155 06.0W	CTD, N, Chl
		0708	17	66	57 22.0N	155 11.2W	CTD, N
		0800	18	67	57 24.8N	155 17.0W	CTD, N, Chl
		0849	19	68	57 24.2N	155 22.7W	CTD, N
		0943	20	69	57 29.8N	155 28.7W	CTD, N, Chl
		1036	21	70	57 32.4N	155 34.5W	CTD, N, Chl
		1147	22		57 26.9N	155 44.4W	CTD
		1239	23		57 23.8N	155 38.6W	CTD
		1338	24		57 21.0N	155 32.0W	CTD
		1424	25		57 17.9N	155 25.4W	CTD
		1528	26	75	57 15.1N	155 18.9W	CTD
		2010	27		57 12.8N	155 12.0W	CTD
110	19 Apr	0006	28		57 09.6N	155 05.7W	CTD
		0120	29		57 06.8N	154 59.9W	CTD
		0253	30	76	57 00.0N	155 07.1W	CTD, N
		0357	31	77	57 02.7N	155 11.8W	CTD, N, Chl
		0546	32	78	57 05.5N	155 17.5W	CTD, N
		0704	33	79	57 07.9N	155 22.4W	CTD, N, Chl
		0806	34	80	57 10.5N	155 27.9W	CTD, N
		0902	35	81	57 13.0N	155 33.8W	CTD, N, Chl
		1002	36	82	57 15.4N	155 39.9W	CTD, N, Chl
		1108	37	83	57 18.1N	155 45.4W	CTD, N, Chl
		1209	38	84	57 21.0N	155 51.4W	CTD, N, Chl

TABLE 8. (continued).

GMT JD	Date	GMT	Sta. No.	FOCI Sta. No.	Lat. N. (dd mm.m)	Long. W. (ddd mm.m)	Activity & Comments
		1546	39		57 43.7N	155 04.7W	B*
		1731	40	59	57 38.4N	155 03.7W	B*
111	20 Apr	0015	41		57 44.0N	155 04.5W	B*
		0108	42		57 43.7N	155 04.6W	CTD
		1739	43	61	57 41.8N	155 15.7W	CTD, N, Chl
		1841	44	60	57 40.9N	155 10.0W	CTD, N, Chl
		1938	45	59	57 38.5N	155 04.2W	CTD, N
		2030	46	58	57 36.3N	155 00.7W	CTD, N, Chl
		2131	47	57	57 33.2N	154 52.4W	CTD, N
		2222	48	56	57 31.0N	154 46.9W	CTD, N, Chl
		2316	49	55	57 28.7N	154 42.1W	CTD, N, Chl
112	21 Apr	0119	50		57 43.8N	155 04.5W	CTD
		0305	50		57 45.1N	155 01.9W	MOC
		0332	50A		57 45.3N	155 01.3W	B(a)†
		0400	50B		57 45.5N	155 02.0W	B(b)
		0438	50C		57 45.4N	155 03.0W	B(c)
		0517	50D		57 43.4N	155 04.6W	B(d)*
		0630	51	60	57 40.7N	155 10.8W	B
		0723	51	60	57 41.0N	155 10.4W	CTD
		0917	51	60	57 40.7N	155 12.2W	MOC
		1336	52	60	57 40.6N	155 12.7W	MOC
Phase II							
		1449	53	61	57 42.0N	155 15.9W	CTD, N, Chl
		1554	54	60	57 41.0N	155 10.2W	CTD, N, Chl
		1704	55	59	57 38.6N	155 04.2W	CTD, N
		1800	56	58	57 36.4N	155 00.5W	CTD, N, Chl
		1915	57	57	57 33.1N	154 52.6W	CTD, N
		2014	58	56	57 30.8N	154 47.2W	CTD, N, Chl
		2108	59	55	57 28.7N	154 41.8W	CTD, N, Chl
		2207	60		57 23.8N	154 53.8W	CTD
		2256	61		57 27.0N	155 00.4W	CTD
		2342	62		57 29.6N	155 07.1W	CTD
113	22 Apr	0026	63		57 32.2N	155 13.0W	CTD
		0117	64		57 34.3N	155 17.2W	CTD
		0214	65		57 37.6N	155 25.2W	CTD
		0307	66	70	57 32.5N	155 34.7W	CTD, N, Chl

* Bongo tow to examine live material, sample not retained.
† Vertical bongo tows at same location.

TABLE 8. (continued).

GMT JD	Date	GMT	Sta. No.	FOCI Sta. No.	Lat. N. (dd mm.m)	Long. W. (ddd mm.m)	Activity & Comments
		0358	67	69	57 30.1N	155 28.7W	CTD, N, Chl
		0508	68	68	57 27.4N	155 22.5W	CTD, N
		0603	69	67	57 25.1N	155 17.4W	CTD, N, Chl
		0659	70	66	57 22.0N	155 10.9W	CTD, N
		0747	71	65	57 19.5N	155 06.1W	CTD, N, Chl
		0850	72	64	57 17.1N	155 00.0W	CTD, N
		0940	73	63	57 14.4N	154 54.5W	CTD, N, Chl
		1053	74		57 06.9N	155 00.0W	CTD
		1136	75		57 10.0N	155 05.7W	CTD
		1221	76		57 12.4N	155 12.2W	CTD
		1308	77		57 15.0N	155 18.8W	CTD
		1354	78		57 18.0N	155 25.2W	CTD
		1450	79		57 21.0N	155 31.8W	CTD
		1539	80		57 24.2N	155 38.4W	CTD
		1623	81		57 26.9N	155 44.6W	CTD
		1725	82	84	57 20.9N	155 51.6W	CTD, N, Chl
		1813	83	83	57 17.9N	155 45.1W	CTD, N, Chl
		1909	84	82	57 15.6N	155 39.8W	CTD, N
		2007	85	81	57 12.9N	155 34.0W	CTD, N, Chl
		2100	86	80	57 10.5N	155 28.0W	CTD, N
		2152	87	79	57 08.0N	155 22.5W	CTD, N, Chl
		2258	88	78	57 05.6N	155 17.5W	CTD, N
		2354	89	77	57 02.7N	155 11.4W	CTD, N, Chl
114	23 Apr	0057	90	76	57 00.0N	155 06.9W	CTD, N
		0331	91	64	57 16.9N	154 59.4W	B
		0600	91	64	57 17.0N	155 00.0W	CAM
		0708	92	66	57 21.8N	155 11.0W	B
		0809	92	66	57 22.0N	155 11.0W	CAM
		0957	93	67	57 24.8N	155 17.0W	CAM
		1101	94	68	57 27.0N	155 22.6W	B
		1212	94	68	57 27.3N	155 22.7W	CAM
		1505	95	69	57 30.0N	155 28.8W	CAM
		1625	96	70	57 32.4N	155 34.2W	B
		1712	96	70	57 32.3N	155 33.9W	CAM
		1804	96	70	57 32.4N	155 32.6W	CTD
		1848	97	69	57 30.0N	155 28.7W	CTD
		1941	98	68	57 27.3N	155 22.6W	CTD
		2024	99	67	57 24.8N	155 17.0W	CTD
		2106	100	66	57 22.1N	155 11.2W	CTD
		2153	101	65	57 19.6N	155 05.8W	CTD
		2234	102	64	57 17.1N	155 00.1W	CTD
		2314	103	63	57 14.3N	154 54.6W	CTD

TABLE 8. (continued).

GMT JD	Date	GMT	Sta. No.	FOCI Sta. No.	Lat. N. (dd mm.m)	Long. W. (ddd mm.m)	Activity & Comments
115	24 Apr	0120	104	68	57 27.4N	155 22.2W	B
		0234	105		57 34.4N	155 16.9W	B
		0358	106	60	57 41.5N	155 10.0W	B
		0611	106	60	57 41.0N	155 10.2W	MOC
		0933	107		57 40.2N	155 07.1W	T
		1041	108		57 40.2N	155 06.9W	T
		1201	109		57 47.4N	155 00.6W	B
		1258	110		57 45.1N	154 56.6W	B
		1417	111		57 40.1N	155 07.2W	B
		1650	112		57 47.0N	155 01.0W	MOC
		2307	113		57 46.2N	155 02.6W	MOC
116	25 Apr	0704	114		57 47.1N	155 01.3W	CAM
		0836	115	61	57 42.1N	155 15.7W	CTD, N, Chl
		0940	116	60	57 40.9N	155 10.1W	CTD, N, Chl
		1048	117	59	57 38.5N	155 04.4W	CTD, N
		1148	118	58	57 36.3N	155 00.5W	CTD, N, Chl
		1406	119	57	57 33.1N	154 52.5W	CTD, N
		1510	120	56	57 30.8N	154 47.0W	CTD, N, Chl
		1603	121	55	57 28.6N	154 41.8W	CTD, N, Chl
		1950	122		57 47.1N	155 01.0W	T
		2040	123		57 47.3N	155 01.2W	T
		2145	124		57 47.0N	155 01.5W	CAM
Phase III							
118	27 Apr	0046	125		57 49.1N	154 20.3W	B
		0146	126		57 52.8N	154 27.7W	B
		0254	127		57 56.1N	154 35.4W	B
		0411	128		57 51.7N	154 49.4W	B
		0511	129		57 48.4N	154 41.2W	B
		0605	130		57 44.5N	154 33.7W	B
		0710	131		57 38.5N	154 44.0W	B
		0807	132		57 41.5N	154 50.7W	B
		0905	133		57 44.6N	154 56.6W	B
		1001	134		57 46.9N	155 01.7W	B
		1113	134		57 46.7N	155 01.6W	MOC
		1255	135	61	57 42.0N	155 15.5W	CTD, N, Chl
		1350	135	61	57 41.9N	155 15.7W	MZ
		1420	135	61	57 41.5N	155 14.6W	B, b
		1529	136	60	57 41.0N	155 10.0W	CTD, N, Chl
		1605	136	60	57 41.0N	155 10.1W	MZ
		1629	136	60	57 41.3N	155 10.5W	B, b
		1731	137	59	57 38.6N	155 04.2W	CTD, N
		1812	137	59	57 38.5N	155 04.5W	MZ
		1832	137	59	57 38.5N	155 04.9W	B, b

TABLE 8. (continued).

GMT JD	Date	GMT	Sta. No.	FOCI Sta. No.	Lat. N. (dd mm.m)	Long. W. (ddd mm.m)	Activity & Comments
		1929	138	58	57 36.2N	155 00.4W	CTD, N, Chl
		2000	138	58	57 36.5N	155 00.3W	MZ
		2022	138	58	57 36.3N	155 01.1W	B, b
		2124	139	57	57 33.1N	154 52.7W	CTD, N
		2200	139	57	57 33.0N	154 52.9W	MZ
		2223	139	57	57 32.9N	154 53.7W	B, b
		2317	140	56	57 30.9N	154 47.3W	CTD, N, Chl
		2352	140	56	57 30.8N	154 47.3W	MZ
119	28 Apr	0013	140	56	57 30.6N	154 47.4W	B, b
		0110	141	55	57 28.6N	154 42.4W	CTD, N, Chl, MZ
		0139	141	55	57 28.4N	154 42.3W	B, b
		0233	142		57 23.7N	154 53.8W	CTD
		0330	143		57 26.8N	155 00.7W	CTD
		0358	143		57 27.1N	155 01.2W	B
		0456	144		57 29.6N	155 07.0W	CTD
		0524	144		57 29.5N	155 07.6W	B
		0609	145		57 32.4N	155 13.1W	CTD
		0641	145		57 32.3N	155 13.9W	B
		0723	146		57 34.3N	155 17.4W	CTD
		0805	146		57 34.2N	155 17.7W	B
		0901	147		57 37.6N	155 25.1W	CTD
		0925	147		57 37.3N	155 26.1W	B
		1017	148	70	57 32.5N	155 34.6W	CTD, N, Chl
		1039	148	70	57 32.5N	155 35.4W	B
		1117	149	69	57 29.9N	155 28.6W	CTD, N, Chl
		1208	149	69	57 29.7N	155 29.2W	B
		1311	150	68	57 27.3N	155 22.6W	CTD, N
		1400	150	68	57 27.3N	155 22.8W	B
		1500	151	67	57 24.8N	155 17.0W	CTD, N, Chl
		1540	151	67	57 24.8N	155 17.3W	B
		1636	152	66	57 22.1N	155 11.0W	CTD, N
		1717	152	66	57 21.9N	155 11.2W	B
		1809	153	65	57 19.5N	155 05.6W	CTD, N, Chl
		1847	153	65	57 19.6N	155 05.9W	B
		1939	154	64	57 17.2N	154 59.8W	CTD, N
		2018	154	64	57 17.1N	155 00.0W	B
		2101	155	63	57 14.3N	154 54.5W	CTD, N, Chl
		2129	155	63	57 14.2N	154 54.7W	B
		2228	156		57 06.7N	155 00.1W	CTD
		2256	156		57 06.9N	155 00.4W	B
		2341	157		57 09.8N	155 06.0W	CTD

TABLE 8. (continued).

GMT JD	Date	GMT	Sta. No.	FOCI Sta. No.	Lat. N. (dd mm.m)	Long. W. (ddd mm.m)	Activity & Comments
120	29 Apr	0014	157		57 09.8N	155 06.1W	B
		0112	158		57 12.3N	155 12.3W	CTD
		0149	158		57 12.3N	155 11.9W	B
		0248	159		57 15.0N	155 19.9W	CTD
		0315	159		57 15.0N	155 19.4W	B
		0412	160		57 17.8N	155 25.6W	CTD
		0459	160		57 17.9N	155 25.5W	B
		0556	161		57 21.1N	155 31.9W	CTD
		0627	161		57 20.9N	155 32.2W	B
		0727	162		57 23.9N	155 38.4W	CTD
		0804	162		57 23.6N	155 38.8W	B
		0911	163		57 26.9N	155 44.3W	CTD
		0933	163		57 27.0N	155 44.6W	B
		1031	164	84	57 20.8N	155 52.0W	CTD, N, Chl
		1100	164	84	57 21.0N	155 51.8W	B
		1144	165	83	57 18.0N	155 45.4W	CTD, N, Chl
		1239	166	82	57 15.4N	155 39.7W	CTD
		1326	166	82	57 15.1N	155 40.0W	B
		1417	167	81	57 13.0N	155 33.8W	CTD, N, Chl
		1510	168	80	57 10.5N	155 27.7W	CTD
		1541	168	80	57 10.5N	155 28.0W	B
		1631	169	79	57 07.9N	155 22.5W	CTD, N, Chl
		1730	170	78	57 05.6N	155 17.5W	CTD
		1802	170	78	57 05.9N	155 17.7W	B
		1856	171	77	57 02.9N	155 11.2W	CTD, N, Chl
		1951	172	76	57 00.0N	155 06.8W	CTD
		2022	172	76	57 00.0N	155 06.6W	B
121	30 Apr	0138	173		57 09.9N	155 05.9W	CAM
		0330	174		57 15.2N	155 19.0W	CAM
		0450	175		57 18.0N	155 25.4W	CAM
		0638	176		57 25.6N	155 41.2W	CAM
		0856	177		57 37.9N	155 14.4W	B*
		1011	178	60	57 40.9N	155 10.5W	B*
		1132	179	60	57 41.0N	155 09.7W	T
		1225	180	60	57 41.0N	155 10.0W	T
		1322	181	60	57 40.9N	155 10.0W	T
		1417	182	60	57 40.6N	155 10.1W	T
		1645	183	60	57 40.6N	155 10.1W	CTD
		1738	183	60	57 40.4N	155 10.2W	MOC
		1954	184	60	57 40.9N	155 09.9W	T
		2033	185	60	57 41.0N	155 09.9W	T
		2119	186		57 41.5N	155 07.8W	CAM w/SONAR
		2226	187		57 43.8N	155 04.5W	T
		2256	188		57 43.9N	155 04.4W	T
		2355	189		57 40.9N	155 10.5W	T

TABLE 8. (continued).

GMT JD	Date	GMT	Sta. No.	FOCI Sta. No.	Lat. N. (dd mm.m)	Long. W. (ddd mm.m)	Activity & Comments
122	01 May	0126	190	60	57 40.5N	155 11.0W	MOC
		0234	191	60	57 40.8N	155 10.1W	CTD
		0710	192	60	57 41.2N	155 10.5W	MET
		0848	193		57 42.2N	155 12.9W	MET
		0922	193		57 42.6N	155 12.8W	MET
		1017	194		57 42.9N	155 12.8W	GC #1 (10 m.)[1]
		1050	194		57 42.9N	155 14.4W	GC #2 (40 m.)
		1138	195	60	57 41.0N	155 10.0W	T
		1201	196		57 40.8N	155 10.6W	GC #1 (40 m.)
		1230	196		57 40.3N	155 12.2W	GC #2 (10 m.)
		1338	197	60	57 40.7N	155 10.5W	T
		1425	198	60	57 40.7N	155 10.4W	T
		1610	199	60	57 40.4N	155 09.3W	CTD
		1737	199	60	57 40.3N	155 09.4W	MOC
		1843	199B	60	57 40.8N	155 09.0W	MOC
		2021	200	60	57 40.2N	155 10.3W	GC #1 (40 m.)
		2044	200	60	57 40.1N	155 11.5W	GC #2 (10 m.)
		2132	201		57 40.8N	155 08.4W	MET
		2211	202	60	57 40.3N	155 09.6W	MET
		2254	203		57 40.7N	155 08.9W	T
123	02 May	0018	204	60	57 41.3N	155 11.1W	CTD, Phyto[2]
		0113	205	58	57 36.3N	155 00.2W	CTD, Phyto
		0223	206		57 44.6N	155 03.7W	T
		0251	206		57 44.7N	155 04.6W	CTD[3]

1 Grazing chamber experiment.
2 Phyto = phytoplankton (water bottle collection).
3 Hydrocast for water.

3.6 FOCI-88-III Cruise Summary – 05 May-14 May, 1988

Scientific Party:	Andrew Roach (CS)	PMEL
	Carol Dewitt	PMEL
	Noli Navaluna	NWAFC

This cruise had a primary goal of recovering current meter moorings from Unimak and Amchitka Passes, Alaska. A third mooring at Amutka Pass was apparently destroyed during the winter. A secondary goal was to measure biomass of pollock larvae in Shelikof Strait with bongo trawls during the transit to the mooring recovery area (Fig. 16, Table 9). These measurements were to be used in the planning of the following cruise.

The first mooring recovery was attempted at the Unimak Pass location. The mooring was located; however, bad weather conditions prevented recovery. The Amchitka Pass mooring recovery was also unsuccessful due to bad weather; it was later recovered by the NOAA ship *Davidson.* A second try at the Unimak Pass mooring involved a possible malfunction of the release mechanism which prevented the release of the mooring so that it was not recovered.

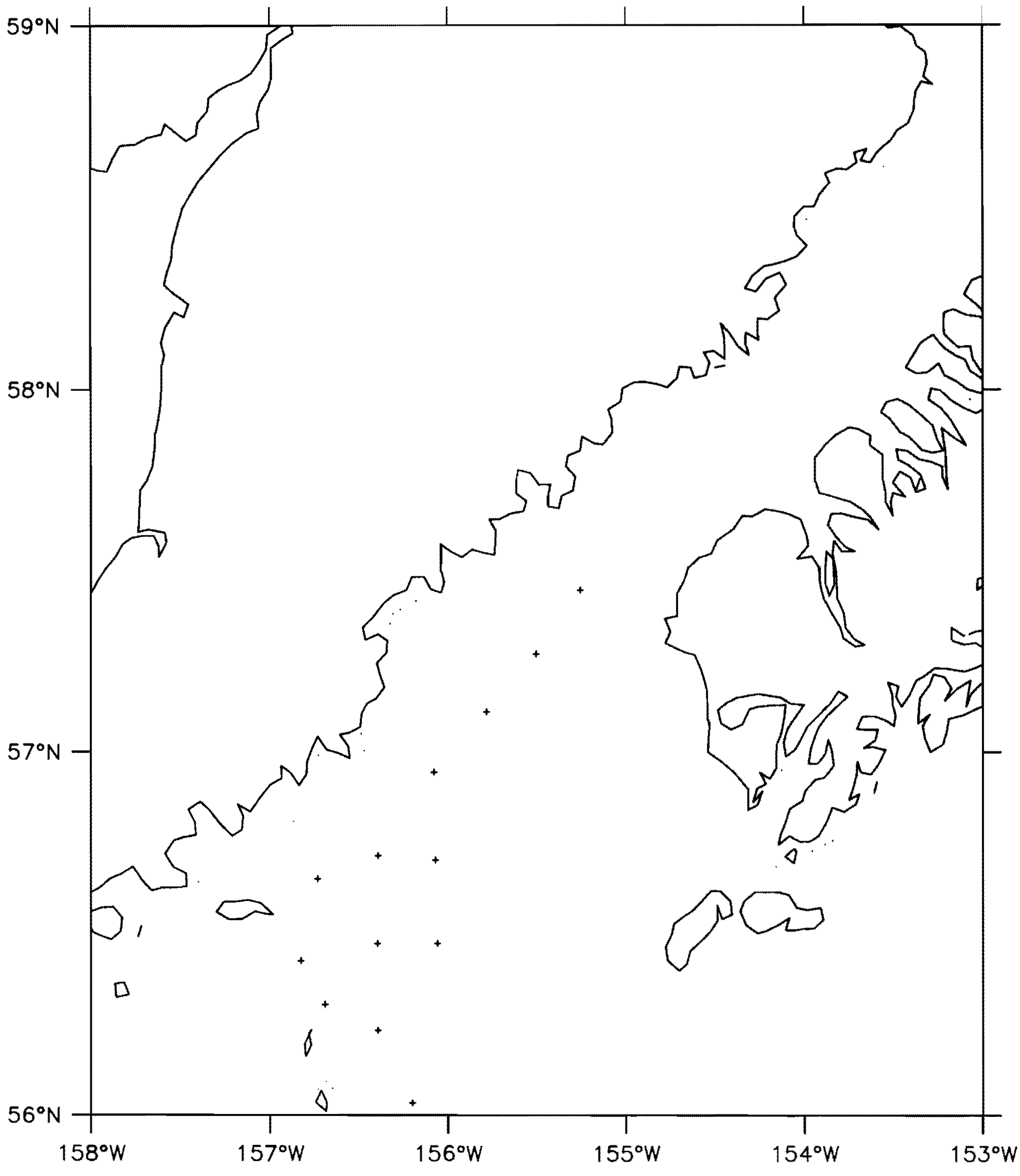


Figure 16. FOCI-88-III bongo tows.

TABLE 9. FOCI-88-III Cruise activities.

GMT JD	Date	GMT	Sta. No.	FOCI Sta. No.	Lat. N. (dd mm.m)	Long. W. (ddd mm.m)	Activity & Comments
127	06 May	0117	1		57 26.9N	155 15.4W	B
		0257	2		57 16.3N	155 30.3W	B
		0426	3		57 06.6N	155 47.0W	B
		0552	4		56 56.7N	156 04.8W	B
		0727	5		56 42.2N	156 04.2W	B
		0847	7		56 42.9N	156 23.6W	B
		1023	8		56 39.0N	156 43.9W	B
		1205	9		56 28.2N	156 23.8W	B
		1329	6		56 28.2N	156 03.6W	B
		1525	10		56 14.0N	156 23.6W	B
		1710	11		56 02.1N	156 12.0W	B
		1934	12		56 18.2N	156 41.5W	B
		2039	13		56 25.4N	156 49.6W	B

3.7 FOCI-88-IV Cruise Summary – 19 May-09 June, 1988

Scientific Party:	James Schumacher (CS Phases I&II)	PMEL
	William Parker	PMEL
	David Kachel	PMEL
	Carol Dewitt	PMEL
	Sarah Hinckley (CS Phase III)	NWAFC
	Kevin Bailey	NWAFC
	Nazila Merati	NWAFC
	Richard Brodeur	NWAFC
	John Piatt	USFWS
	Mark Holmgren	UCSB

The objectives of this cruise were to:

1. Continue acquisition of long-term time series of biological and physical characteristics in Shelikof Strait, including:

   A. transport and water properties at line 8;
   B. distribution of pollock larvae;
   C. time series of currents at Moorings 8802, 8805, 8808, and 8814;

2. Collect larval samples so that estimates of mortality could be made;

3. Field test LORAN-C tracked buoys;

4. Establish relative sampling efficiency of bongo, 1- and 3-m Tucker, and Methot nets for catching pollock larvae;

5. Conduct a CTD survey in the vicinity of the valley south of the Semidi Islands;

6. Moor a bottom pressure gauge on the shallow shelf between Kodiak and Chirikof Islands;

7. Trawl for fish as predators on larval pollock;

8. Investigate sea birds as pollock predators (piggy-back project).

This cruise was designed as a pilot experiment to estimate mortality of pollock larvae and to maintain the existing time series of currents and water properties. For convenience the cruise was divided into three phases:

I. an initial survey of pollock larvae,
II. physical oceanography,
III. a second survey of pollock larvae.

Phase I consisted of CTD casts along FOCI line 8, deployment of the LORAN-C tracked buoys, and testing of various nets for their relative efficiency for catching pollock larvae (Figs. 17, 18, 19, and Table 10). In general, the LORAN-C buoys malfunctioned either in their ability to transmit data or to give reasonable LORAN-C rates. The 1-meter Tucker trawl was determined to be the most appropriate net for capturing pollock larvae and was used for the remainder of the cruise. Four mid-water trawls were also conducted during this phase. A bottom-pressure-gauge mooring and a satellite-tracked drifter were deployed. The location of the drifter was to be used to aid in the selection of Tucker trawl stations for Phase III.

Phase II was concerned primarily with the recovery and deployment of current meter moorings. Mooring 8702 had a release failure, resulting in the release responding but not releasing. Using the ship's color scope (depth finder) it was determined that the mooring was still at its deployment site. A wire drag between the ship and a motor launch snagged the mooring for recovery. Moorings 8705 and 8714 were recovered without problems. Mooring 8708 did not respond on interrogation and a 15-hour search, including a 3-hour search over a 1-mile square centered on the deployment location using the color scope, failed to reveal any trace of it. It has been listed as "missing and presumed lost." New moorings were deployed at all four sites. CTD casts were conducted prior to recovery and subsequent to deployment to aid in processing the data from the current meters.

CTD data was collected across the boundaries of the region at lines 8 and 17, and at FOCI stations 147 to 151. This was used to estimate the flow through the pollock survey region. Line 8 was again occupied after deployment of mooring 8802.

Phase III began with another comparative gear test to determine how catchability was affected by larval growth. The 1-meter Tucker trawl was again found to be the most efficient at catching all size classes of larvae. A day/night depth series of 1-meter Tucker trawls was done for vertical distribution of larvae.

The second larval survey covered approximately the same area as the first survey. The survey area was divided into strata based on results of the first survey, and 2 trawls were done per stratum.

Upon completion of the second larval survey, a third set of comparative gear tests was completed, and a second day/night series for vertical distribution of larvae was conducted.

Five mid-water trawls were done during this phase to assess predation by pelagic fishes on the larvae. The trawl was fished at 35-40 m, the depth of maximum larval abundance. No significant catches of pelagic predators resulted. CTD data was again collected across the boundaries of the survey area.

As a piggy-back project, ornithologists from the U.S. Fish and Wildlife Service and the University of California at Santa Barbara made collections for a study of sea bird predation as source of larval pollock mortality. A total of 54 sea bird censuses were conducted at or between 33 stations in the larval study grid during Phase III for a total of 850 minutes of standardized observation time. A total of 115 birds of 15 species were collected in the vicinity of Semidi and Sutwick Islands, and Karluk, Kodiak Island.

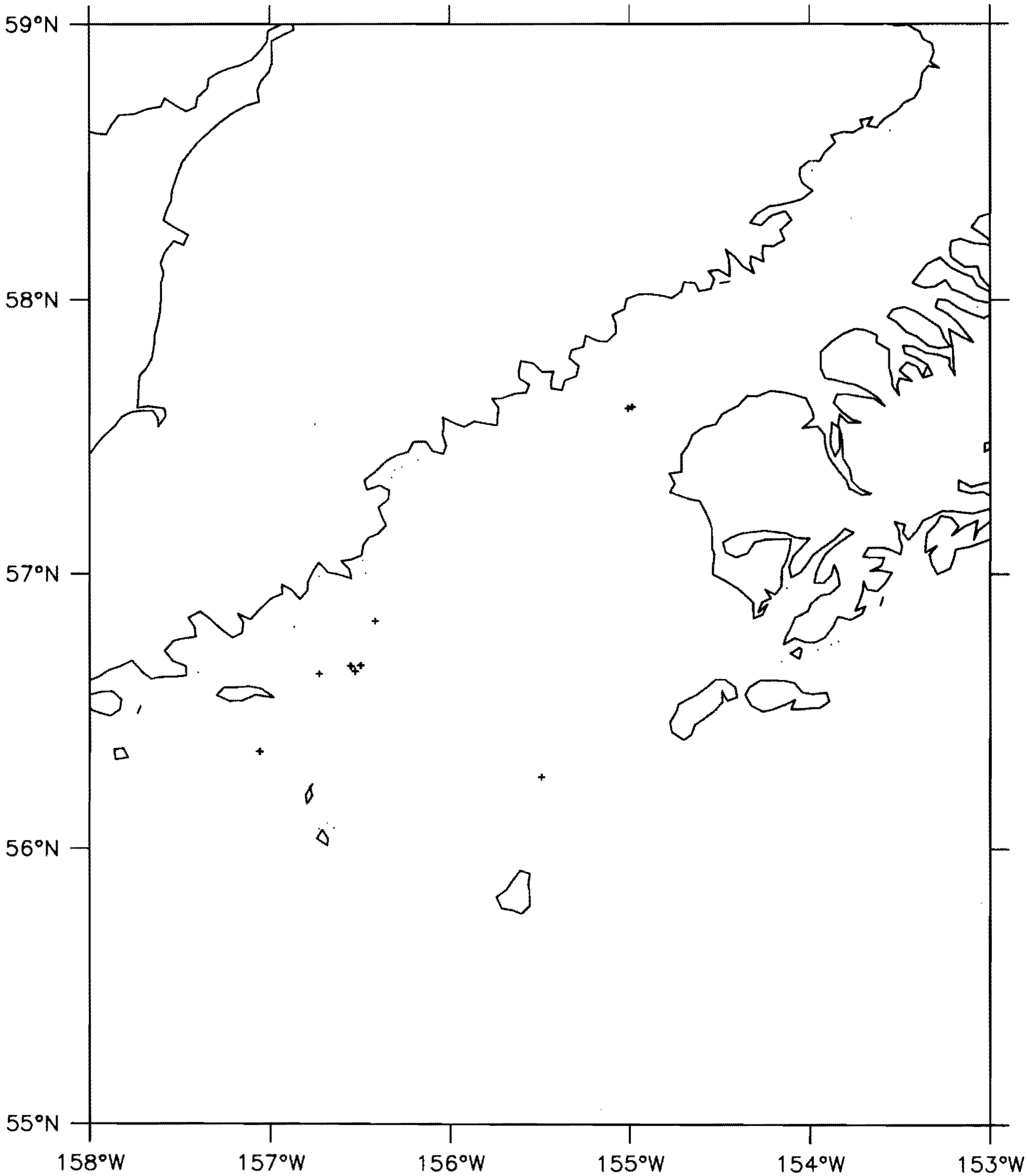


Figure 17. FOCI-88-IV bongo tows.

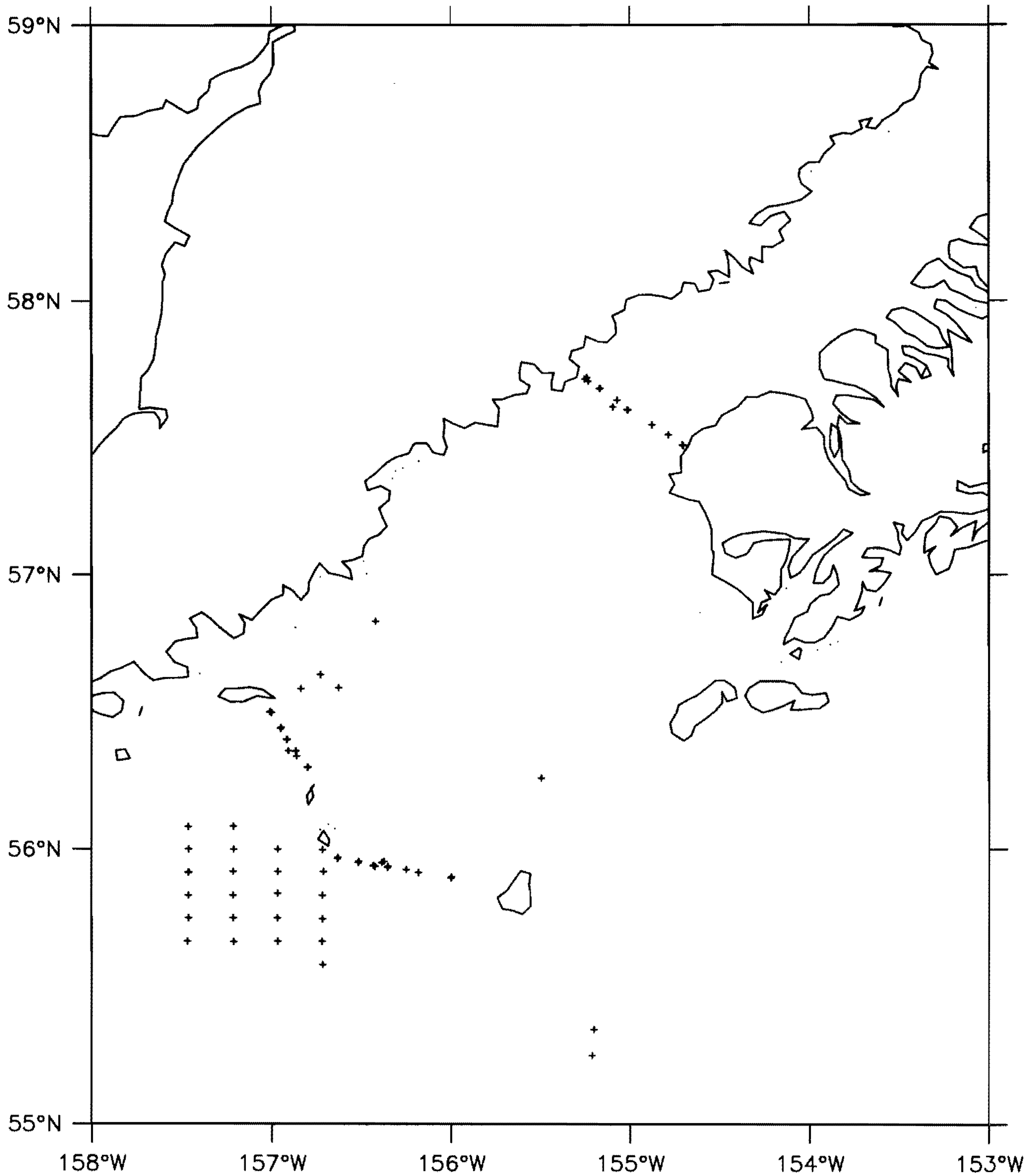


Figure 18. FOCI-88-IV CTD stations.

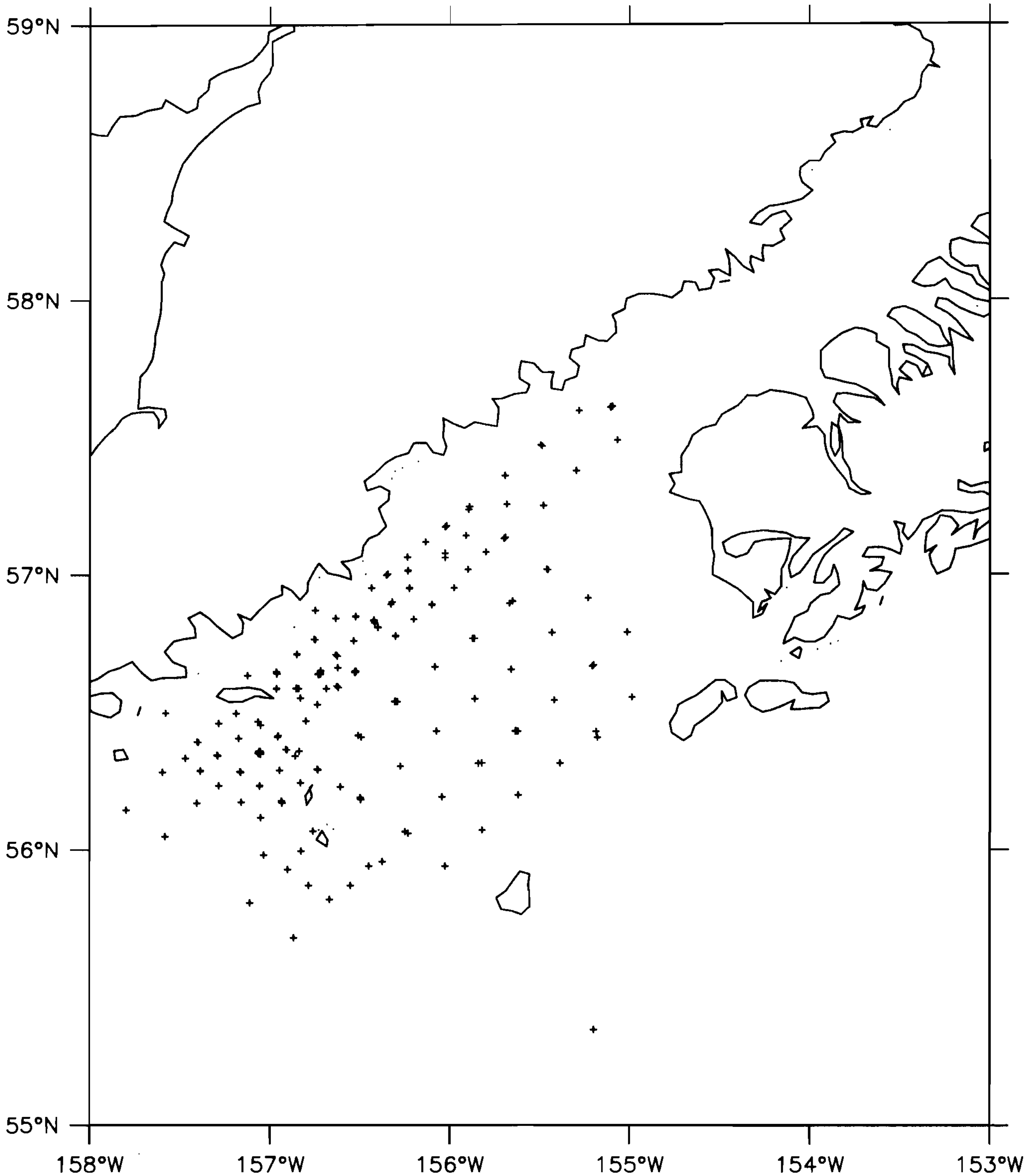


Figure 19. FOCI-88-IV miscellaneous stations.

TABLE 10. FOCI-88-IV Cruise activities.

GMT JD	Date	GMT	Sta. No.	FOCI Sta. No.	Lat. N. (dd mm.m)	Long. W. (ddd mm.m)	Activity & Comments
Phase I							
141	20 May	0524		55	57 28.6N	154 42.5W	CTD
		0559		56	57 30.9N	154 47.2W	CTD
		0642		57	57 33.0N	154 52.8W	CTD
		0732		58	57 36.4N	155 00.5W	LTD(d)eploy
		0735		58	57 36.3N	155 00.6W	CTD
		0841		59	57 38.4N	155 04.3W	CTD
		0932		60	57 41.0N	155 10.3W	CTD
		1042		61	57 43.1N	155 15.2W	CTD
		1311		58	57 36.7N	154 59.1W	LTD(r)ecover
		1933	E15		56 38.7N	156 31.9W	T
		2105			56 40.1N	156 29.7W	LTD1(d)
		2111			56 40.0N	156 29.9W	LTD2(d)
		2116			56 40.0N	156 30.1W	LTD3(d)
		2152	E15		56 38.9N	156 31.7W	T
		2308	E15		56 38.9N	156 31.7W	T (3-meter)
		2352			56 39.9N	156 33.0W	LTD3(r)
142	21 May	0001			56 39.9N	156 33.1W	LTD2(r)
		0015			56 40.0N	156 33.4W	LTD1(r)
		0141	E15		56 38.7N	156 31.8W	T (3-meter)
		0217	E15		56 38.9N	156 31.6W	T (3-meter)
		0300	E15		56 38.8N	156 31.8W	B
		0358	E15		56 38.8N	156 31.7W	B
		0502	E15		56 38.8N	156 31.7W	MET
		0548	E15		56 39.1N	156 31.6W	MET
		0633	E15		56 38.9N	156 31.7W	T
		0720	E15		56 38.8N	156 31.6W	T
		1008	G15		56 32.3N	156 17.7W	T
		1128	G13		56 24.5N	156 29.8W	T
		1245	E13		56 31.7N	156 44.5W	T
		1356	C13		56 38.8N	156 56.0W	T
		1535	C15		56 45.8N	156 45.1W	T
		1701	C17		56 50.8N	156 31.5W	T
		1803	E17		56 46.5N	156 18.3W	T
		1922	G17		56 40.0N	156 05.1W	T
		2058	I17		56 33.0N	155 51.7W	T
		2208	I15		56 25.9N	156 04.8W	T
		2319	I13		56 18.1N	156 17.0W	T

TABLE 10. (continued).

GMT JD	Date	GMT	Sta. No.	FOCI Sta. No.	Lat. N. (dd mm.m)	Long. W. (ddd mm.m)	Activity & Comments
143	22 May	0027	K13		56 11.5N	156 02.8W	T
		0134	K15		56 18.8N	155 50.6W	T
		0247	K17		56 25.9N	155 38.2W	T
		0413	K19		56 32.7N	155 25.1W	T
		0522	I19		56 39.4N	155 39.7W	T
		0632	G19		56 46.1N	155 52.5W	T
		0748	E19		56 53.2N	156 06.2W	T
		0925	C19		56 59.9N	156 21.2W	T
		1050	C21		57 07.2N	156 08.3W	T
		1209	C23		57 14.4N	155 53.8W	T
		1320	C25		57 21.9N	155 41.6W	T
		1421	C27		57 28.7N	155 29.7W	T
		1530	C29		57 36.1N	155 17.0W	T
		1639	E29		57 29.5N	155 04.2W	T
		1749	E27		57 23.0N	155 17.8W	T
		1902	E25		57 15.1N	155 29.0W	T
		2038	E23		57 08.0N	155 42.1W	T
		2143	E21		57 01.2N	155 54.1W	T
		2250	G21		56 53.8N	155 40.1W	T
144	23 May	0000	I21		56 47.3N	155 26.0W	T
		0144	G23		57 01.1N	155 27.4W	T
		0247	I23		56 54.9N	155 13.9W	T
		0354	K23		56 47.4N	155 00.8W	T
		0455	K21		56 40.1N	155 12.5W	T
		0558	M21		56 33.3N	154 59.2W	T
		0704	M19		56 25.8N	155 11.2W	T
		0800	M17		56 18.9N	155 23.2W	T
		0839	CM20		56 15.7N	155 29.6W	Mooring 8820 (d)
		0902	CM20		56 15.6N	155 29.8W	CTD
		0945	M15		56 12.0N	155 37.3W	T
		1058	M13		56 04.3N	155 49.2W	T
		1205	M11		55 56.4N	156 01.7W	T
		1313	K11		56 04.0N	156 15.1W	T
		1441	I11		56 11.4N	156 30.0W	T
		1552	G11		56 17.3N	156 44.4W	T
		1704	E11		56 24.6N	156 57.6W	T
		1804	C11		56 27.2N	157 03.2W	T
		2001	C9		56 23.3N	157 24.0W	T
		2106	E9		56 16.7N	157 10.0W	T
		2221	G9		56 10.2N	156 56.2W	T

TABLE 10. (continued).

GMT JD	Date	GMT	Sta. No.	FOCI Sta. No.	Lat. N. (dd mm.m)	Long. W. (ddd mm.m)	Activity & Comments
145	24 May	0118	D14		56 38.3N	156 43.7W	T
		0324	C16		56 50.5N	156 38.2W	T
		0437	B16		56 52.2N	156 45.0W	T
		0658	C18		56 57.1N	156 26.3W	T
		0843	C20		57 03.8N	156 14.4W	T
		1002	C22		57 10.5N	156 01.7W	T
		1055	D22		57 08.6N	155 54.7W	T
		1145	D21		57 04.7N	156 01.7W	T
		1255	D20		57 00.8N	156 14.2W	T
		1342	D19		56 57.0N	156 13.8W	T
		1445	D18		56 53.6N	156 19.9W	T
		1539	D17		56 49.8N	156 25.0W	STD #7209 (d)
		1614	D17		56 49.9N	156 25.6W	T
		1649	D17		56 49.9N	156 25.3W	CTD
		1737	D17		56 49.5N	156 25.3W	MWT
		1910	D17		56 48.5N	156 24.2W	MWT
		2051	D16		56 45.5N	156 32.3W	T
		2154	D15		56 42.3N	156 37.7W	T
		2313	E14		56 35.6N	156 37.3W	T
		2349	E14		56 35.5N	156 37.7W	CTD
146	25 May	0024	E14		56 35.6N	156 37.7W	MWT
		0225	D13		56 35.2N	156 50.6W	T
		0321	D13		56 35.2N	156 50.3W	CTD
		0351	D13		56 35.2N	156 51.5W	MWT
Phase II							
		1345	CM05		56 21.6N	156 54.5W	CTD
		1403	CM05		56 21.8N	156 54.7W	Mooring 8705 (r)
		1750	CM05		56 20.4N	156 51.7W	Mooring 8805 (d)
		1800	CM05		56 20.4N	156 51.7W	CTD
		2044	CM08		55 57.0N	156 23.3W	CTD
147	26 May	0226	CM08		55 57.4N	156 22.6W	Mooring 8808 (d)
		0303	CM08		55 57.4N	156 22.5W	CTD
		2158	CM14		55 20.6N	155 12.1W	CTD
		2317	CM14		55 20.8N	155 12.2W	Mooring 8714 (r)
148	27 May	1553	CM14		55 20.7N	155 12.0W	Mooring 8814 (d)
		1709	CM14		55 19.9N	155 12.8W	CTD
		2124		152	55 54.1N	155 59.9W	CTD
		2224		153	55 55.0N	156 11.0W	CTD
		2347		154	55 55.5N	156 15.1W	CTD

TABLE 10. (continued).

GMT JD	Date	GMT	Sta. No.	FOCI Sta. No.	Lat. N. (dd mm.m)	Long. W. (ddd mm.m)	Activity & Comments
149	28 May	0033		155	55 56.1N	156 21.2W	CTD
		0455		156	55 56.3N	156 25.4W	CTD
		0541		157	55 57.3N	156 31.0W	CTD
		0631		158	55 58.3N	156 37.9W	CTD
		0735	S1		55 59.9N	156 43.1W	CTD
		0831	S2		55 55.1N	156 42.8W	CTD
		0918	S3		55 50.0N	156 43.2W	CTD
		1012	S4		55 44.9N	156 43.1W	CTD
		1057	S5		55 39.9N	156 43.2W	CTD
		1144	S6		55 34.8N	156 43.1W	CTD
		1302	S11		55 40.0N	156 58.1W	CTD
		1358	S10		55 45.0N	156 58.1W	CTD
		1441	S9		55 50.4N	156 58.0W	CTD
		1523	S8		55 55.1N	156 58.1W	CTD
		1610	S7		56 00.0N	156 58.0W	CTD
		1716	S12		56 05.1N	157 12.9W	CTD
		1802	S13		56 00.0N	157 12.9W	CTD
		1854	S14		55 55.0N	157 12.9W	CTD
		1937	S15		55 50.0N	157 13.0W	CTD
		2017	S16		55 45.0N	157 13.0W	CTD
		2105	S17		55 39.9N	157 12.8W	CTD
		2200	S23		55 39.9N	157 28.1W	CTD
		2238	S22		55 45.0N	157 27.8W	CTD
		2323	S21		55 50.0N	157 27.8W	CTD
150	29 May	0004	S20		55 55.0N	157 27.9W	CTD
		0051	S19		56 00.0N	157 27.8W	CTD
		0140	S18		56 05.0N	157 27.9W	CTD
		0404		147	56 18.0N	156 48.0W	CTD
		0444		148	56 21.5N	156 51.9W	CTD
		0527		149	56 24.1N	156 54.8W	CTD
		0605		150	56 26.7N	156 57.0W	CTD
		0701		151	56 30.1N	157 00.7W	CTD
		1453	CM02		57 36.9N	155 05.6W	CTD
		1832	CM02		57 36.7N	155 06.4W	Mooring 8702 (r)
		2136	CM02		57 36.9N	155 05.8W	Mooring 8802 (d)
		2227		61	57 43.4N	155 14.3W	CTD
		2313		60	57 41.0N	155 10.0W	CTD
151	30 May	0011	CM02		57 36.9N	155 05.8W	CTD
		0105		58	57 36.4N	155 00.9W	CTD
		0203		57	57 33.0N	154 52.4W	CTD
		0245		56	57 30.9N	154 47.0W	CTD
		0330		55	57 28.5N	154 42.3W	CTD

TABLE 10. (continued).

GMT JD	Date	GMT	Sta. No.	FOCI Sta. No.	Lat. N. (dd mm.m)	Long. W. (ddd mm.m)	Activity & Comments
Phase III							
152	31 May	0509	D14		56 38.3N	156 44.1W	T
		0628	D14		56 38.4N	156 43.9W	T (3-meter)
		0704	D14		56 38.4N	156 43.8W	T (3-meter)
		0847	D14		56 38.4N	156 43.7W	T
		1003	D14		56 38.4N	156 43.7W	T
		1142	D14		58 38.4N	156 44.0W	T
		1300	D14		56 38.4N	156 43.5W	T
		1458	D14		56 38.3N	156 43.2W	MET
		1636	D14		56 38.3N	156 43.7W	B
		1755	D14		56 38.3N	156 43.6W	B
		1911	D14		56 38.4N	156 43.9W	MET
		2020	D14		56 38.4N	156 43.7W	T
		2113	D14		56 38.4N	156 43.6W	T
		2154	D14		56 38.5N	156 43.6W	T
		2234	D14		56 38.3N	156 43.7W	CTD
153	01 Jun	0050	W12		56 38.1N	157 07.5W	T
		0153	C13		56 38.4N	156 57.8W	T
		0308	C13		56 38.5N	156 57.9W	MWT
		0507	C14		56 42.7N	156 51.1W	T
		0544	C14		56 42.6N	156 51.3W	MWT
		0722	C15		56 45.9N	156 45.3W	T
		0854	C17		56 51.0N	156 31.5W	T
		1002	C18		56 57.2N	156 26.4W	T
		1103	C19		57 00.3N	156 20.9W	T
		1206	C20		57 03.9N	156 14.3W	T
		1319	D20		57 31.0N	156 14.1W	T
		1423	D19		56 57.3N	156 13.6W	T
		1541	D18		56 54.1N	156 19.5W	T
		1643	D17		56 50.1N	156 25.5W	T
		1815	D15		56 42.6N	156 38.2W	T
		2012	D14		56 38.6N	156 43.5W	T
		2112	D14		56 39.0N	156 43.3W	MWT
		2224	D14		56 39.1N	156 43.3W	MET
		2333	D13		56 35.3N	156 51.2W	T
154	02 Jun	0054	X12		56 35.2N	156 57.9W	T
		0207	E12		56 28.1N	156 48.2W	T
		0252	Y12		56 33.2N	156 50.0W	T
		0340	Y13		56 35.2N	156 41.5W	T
		0436	E14		56 35.7N	156 37.8W	T
		0528	Y14		56 39.7N	156 37.6W	T
		0633	E15		56 38.9N	156 31.5W	T
		0755	E17		56 46.7N	156 18.3W	T

TABLE 10. (continued).

GMT JD	Date	GMT	Sta. No.	FOCI Sta. No.	Lat. N. (dd mm.m)	Long. W. (ddd mm.m)	Activity & Comments
		0848	E18		56 50.2N	156 12.2W	T
		0944	E19		56 53.6N	156 06.1W	T
		1041	E20		56 57.2N	155 58.7W	T
		1155	G21		56 54.2N	155 39.1W	T
		1313	G19		56 46.1N	155 52.0W	T
		1427	G17		56 39.9N	156 05.3W	T
		1540	G15		56 32.3N	156 18.4W	T
		1711	G13		56 24.9N	156 30.8W	T
		1836	G11		56 17.4N	156 44.2W	T
		1941	F11		56 21.5N	156 50.4W	T
		2039	E11		56 24.9N	156 57.4W	T
		2200	D11		56 27.9N	157 04.1W	T
		2326	C11		56 29.8N	157 11.4W	T
155	03 Jun	0141	A9		56 29.8N	157 34.8W	T
		0325	D10		56 24.3N	157 10.5W	T
		0430	E10		56 20.8N	157 03.2W	T
		0553	F10		56 17.3N	156 56.9W	T
		0643	G10		56 14.5N	156 49.9W	T
		0805	I9		56 04.0N	156 45.7W	T
		0913	G9		56 10.7N	156 56.3W	T
		1009	F9		56 13.9N	157 03.6W	T
		1115	E9		56 16.9N	157 10.2W	T
		1212	D9		56 20.6N	157 17.7W	T
		1314	C9		56 23.6N	157 24.3W	T
		1427	C10		56 27.6N	157 17.2W	T
		1552	C8		56 20.0N	157 28.3W	T
		1642	D8		56 17.1N	157 23.2W	T
		1739	E8		56 13.9N	157 17.3W	T
		1834	F8		56 10.4N	157 09.7W	T
		1928	G8		56 06.9N	157 03.3W	T
		2055	I7		55 55.6N	156 54.1W	T
		2258	E7		56 10.1N	157 24.4W	T
156	04 Jun	0001	C7		56 16.8N	157 35.9W	T
		0113	C5		56 08.6N	157 47.8W	T
		0215	E5		56 02.9N	157 35.0W	T
		0408	I5		55 48.4N	157 06.8W	T
		0519	K5		55 40.8N	156 52.3W	T
		0640	K7		55 49.1N	156 40.4W	T
		0811	K9		55 56.3N	156 27.3W	T
		0942	I11		56 10.8N	156 29.9W	T
		1101	I13		56 18.1N	156 16.7W	T
		1216	I15		56 25.9N	156 04.5W	T
		1338	I17		56 32.9N	155 51.6W	T
		1500	I19		56 39.3N	155 39.4W	T

TABLE 10. (continued).

GMT JD	Date	GMT	Sta. No.	FOCI Sta. No.	Lat. N. (dd mm.m)	Long. W. (ddd mm.m)	Activity & Comments
		1624	I21		56 47.3N	155 25.9W	T
		1800	G23		57 01.3N	155 27.8W	T
		1924	E22		57 05.0N	155 48.1W	T
		2025	D21		57 03.8N	156 01.8W	T
		2132	C22		57 10.7N	156 01.3W	T
		2229	C23		57 15.0N	155 53.6W	T
		2322	D24		57 15.5N	155 41.2W	T
157	05 Jun	0055	C25		57 21.8N	155 41.9W	T
		0203	C27		57 28.4N	155 29.3W	T
		0305	E27		57 22.9N	155 18.0W	T
		0418	E25		57 15.3N	155 28.8W	T
		0533	E23		57 08.0N	155 41.6W	T
		0836	K21		56 40.3N	155 12.1W	T
		1047	K17		56 25.9N	155 37.3W	T
		1229	K15		56 18.9N	155 49.4W	T
		1532	K11		56 03.5N	156 14.0W	T
		1731		152	55 53.6N	156 00.0W	CTD
		1830		153	55 54.8N	156 11.0W	CTD
		1911		154	55 55.4N	156 15.0W	CTD
		2006		155	55 56.0N	156 21.2W	CTD
		2047		156	55 56.4N	156 26.0W	CTD
		2126		157	55 57.2N	156 31.2W	CTD
		2208		158	55 58.0N	156 38.2W	CTD
158	06 Jun	0030		147	56 17.8N	156 48.0W	CTD
		0122		148	56 21.5N	156 52.1W	CTD
		0156		149	56 24.0N	156 55.2W	CTD
		0228		150	56 26.5N	156 57.1W	CTD
		0312		151	56 30.0N	157 00.1W	CTD
		0620	I8		55 59.7N	156 49.8W	T
		0800	K8		55 52.1N	156 33.2W	T
		0857	J7		55 52.1N	156 47.3W	T
		1019	H7		55 58.9N	157 02.1W	T
		1251	D10		56 24.5N	155 10.7W	T
		1404	D9		56 20.4N	157 17.5W	T
		1542	E10		56 21.1N	157 03.7W	T
		1634	E10		56 21.2N	157 03.4W	MET
		1719	E10		56 21.1N	157 03.3W	MET
		1757	E10		56 21.1N	157 03.3W	T
		1849	E10		56 20.9N	157 03.8W	T (3-meter)
		2019	E10		56 20.9N	157 03.4W	T (3-meter)
		2119	E10		56 21.2N	157 03.6W	B
		2147	E10		56 21.1N	157 03.7W	B
		2318	E10		56 21.0N	157 03.8W	T

TABLE 10. (continued).

GMT JD	Date	GMT	Sta. No.	FOCI Sta. No.	Lat. N. (dd mm.m)	Long. W. (ddd mm.m)	Activity & Comments
159	07 Jun	0001	E10		56 21.1N	157 03.6W	T
		0100	E10		56 21.5N	157 03.4W	T
		0127	E10		56 21.0N	157 03.6W	T
		0514			56 13.7N	156 36.7W	MWT
		0853	E10		56 20.9N	157 03.7W	T
		0931	E10		56 21.0N	157 04.1W	T
		1006	E10		56 20.9N	157 03.7W	T
		1041	E10		56 21.5N	157 03.8W	T
		1839		61	57 42.6N	155 13.9W	CTD
		1929		60	57 41.0N	155 09.9W	CTD
		2015		59	57 38.4N	155 04.3W	CTD
		2100		58	57 36.2N	155 00.7W	CTD
		2153		57	57 33.0N	154 52.5W	CTD
		2243		56	57 30.9N	154 47.0W	CTD
		2330		55	57 28.5N	154 42.1W	CTD

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Judith Gray of PMEL and William Rugen of NWAFC read the manuscript and checked all the tables for accuracy and completeness. Ryan Whitney put it into its final form for publishing.

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