

CRUISE REPORT

Oshoro Maru Cruise 87
18 July - 1 August, 1998
FOCI Cruise 1OM98

1.0 Introduction

Fisheries Oceanography Coordinated Investigations (FOCI) is a joint effort by NOAA scientists (National Oceanic and Atmospheric Administration) at the Pacific Marine Environmental Laboratory (PMEL) and the Alaska Fisheries Science Center (AFSC) to understand the processes which cause recruitment variability of commercially important fish and shellfish stocks in Alaskan waters. The FOCI program is studying the effects of environmental variability on early life stages of walleye pollock spawned in the Bering Sea. This report represents a summary of FOCI operations conducted during a cooperative cruise between FOCI and the Faculty of Fisheries, Hokkaido University.

1.1 Cruise Objectives

- (1) conduct survey of juvenile fishes on the eastern Bering Sea shelf,
- (2) obtain samples to determine: abundance, age, length, and stomach contents of juvenile (age-0) pollock,
- (3) collect tissue samples of the scyphomedusa, *Chrysaora* spp. and their prey for stable isotope (trophic level) analysis,
- (4) collect plankton samples to determine the abundance and stage distribution (nauplii to adults) of *Calanus marshallae*,
- (5) estimate egg production by female *Calanus marshallae* at ambient temperatures,
- (6) collect rockfish larvae for identification by molecular genetics techniques,
- (7) sample phyto- and zooplankton inside and outside a coccolithophore bloom to determine micro- and mesozooplankton community composition and trophic pathways,
- (8) collect temperature, salinity, and chlorophyll profiles in the study area as ancillary data for all projects.

2.0 Operations Summary

We departed Seattle, Washington, USA, Saturday, 18 July and crossed the Gulf of Alaska on our way to the southeastern Bering Sea. On two separate occasions we stopped to test our equipment after optics casts. We arrived at the first station on Friday evening, 25 July and began sampling a grid of pre-determined stations with station spacing of 30 nm (Fig. 1). The grid was continually updated to account for changes in sample requests and available time. Methot Beam Trawls were conducted at almost every station, while AFSC plankton net sampling (CalVET, Ring0.8, 20 and 60 cm Bongo) was conducted at selected stations. After the main grid was completed (B3 - G3), a north-south transect (G4 - I4) was occupied to make measurements inside a coccolithophore

bloom.

2.1 Results Summary

Standardized catches of age-0 walleye pollock, based on rough counts at sea, were the highest on the northern most transect line (Fig. 2). Relatively few fish were caught in the southern portion of the grid. In general, age-0 pollock abundance was lower this year than the past three years over the same sampling grid.

The distribution of the scyphomedusa, *Chrysaora* spp. (the dominant jellyfish taxon) was highest in the northern and eastern lines of the sampling grid (Fig. 3). There was no relationship between the abundance of juvenile pollock and wet weight of *Chrysaora* spp. Past research by FOCI (R. Brodeur) has found a commensal relationship between juvenile pollock and scyphomedusae.

Micro- and mesozooplankton samples were collected over the Middle Shelf Domain (Fig. 4). The sampling gears and net mesh sizes were chosen to quantitatively capture all stages of *Calanus marshallae* (CalVET {nauplii}, 20 cm bongo {early copepodites}, and 60 cm bongo {late stage copepodites}). The samples will be processed during this winter at the Polish Plankton Sorting and Identification Center in Szczecin, Poland.

We were unable to accomplish any egg production experiments by *Calanus marshallae*; we did not find any female *C. marshallae* in the Ring0.8m net tows. We did obtain samples of C5 copepodites to determine regional differences (including inside and outside of coccolithophore bloom) of nutritional health (dry weight and carbon, hydrogen, and nitrogen).

We first encountered aquamarine water (indicative of high concentrations of coccolithophores) between stations G8 and G7. Stations G6 to G4 were occupied in the darkness, so it is not known if the water color changed. A north-south transect (G4 – I4) was then occupied and the water color intensified as we steamed north, away from G4. Secchi disk readings at stations 10 and 20 nm north of H4 were 3m, and the water column had a pronounced thermo- and halocline (45 and 41 m water depth, respectively) indicating that we had not yet entered the Coastal Domain. Samples for phytoplankton, and micro- and mesozooplankton community composition were taken in the bloom-affected waters (H4 and I4) and at various “control” stations outside the bloom. These samples will be analyzed in Seattle.

3.0 FOCI Personnel

July 18- August 1

Dr. Jeffrey Napp

NOAA/AFSC

Mr. Jay Clark

NOAA/AFSC

Ms. Christine Baier

UW/Joint Inst. For Study
of Atmosphere and
Oceans

Mr. Lorenzo Ciannelli

UW/School of Fisheries

4.0 Cruise Statistics

Gear or Sample Type	Number of Casts/Tows	Number of Samples
Methot Beam Trawl	27	25
CalVET	11	11
Bongo (20 & 60 cm)	11	22
Water Bottles for Phytoplankton	4	15
Juvenile Pollock Otoliths	4	81 (fish)
Juvenile Pollock Caloric Value	3	60 (fish)
Jellyfish for Stable Isotope Analysis	8	36 (specimens)
Juvenile pollock for Stable Isotope Analysis	1	30 (fish)
<i>C. marshallae</i> C5 dry weight	5	35

5.0 Acknowledgments

We sincerely thank Captain Anna, the officers, crew, and cadets of the *Oshoro Maru* for their assistance in sampling and making our stay on the vessel safe and enjoyable. We thank our collaborator and host, Chief Scientist Dr. Sei-ichi Saitoh, of the Faculty of Fisheries, Hokkaido University for his invitation to work together on the *Oshoro Maru*. We look forward to future productive collaborations with him and his laboratory. Mr. Jun Yamamoto's assistance with sampling and translation was greatly appreciated. Chief Boatswain, Mr. Uemoto, deserves special thanks for his help with the Beam Trawl. We also want to thank Professor Ohtani for sharing with us his extensive knowledge of the Bering Sea and for introducing us to the Japanese tea ceremony.

6.0 Tables and Figures

Table 1. Station and sample summary for 10M98

Figure 1. Locations of southeastern Bering Sea FOCI sample stations.

Figure 2. Standardized catch of age-0 pollock based from rough counts.

Figure 3. Standardized catch of the scyphomedusa, *Chrysaora* spp.

Figure 4. Locations of plankton stations for stage composition of *Calanus marshallae*.

Date (GMT)	Time (GMT)	Grid	OM Station	FOCI Station	Haul	Latitude	Longitude	Bottom Depth	Gear	Sample Type	Sample Number	Comments
7/25/98	7:18 'B5'		'96'	1	1	55	0.6 166 59.6	158	'MBT'	'Furuno'	1	'none'
7/25/98	7:18 'B5'		'96'	1	1	55	0.6 166 59.6	158	'MBT'	'JellyGut'	1	'none'
7/25/98	7:18 'B5'		'96'	1	1	55	0.6 166 59.6	158	'MBT'	'QToWF'	2	'none'
7/25/98	7:18 'B5'		'96'	1	1	55	0.6 166 59.6	158	'MBT'	'RCountJ'	0	'none'
7/25/98	10:55 'C5'		'97'	2	1	55	29.7 166 58.3	135	'MBT'	'Furuno'	1	'none'
7/25/98	10:55 'C5'		'97'	2	1	55	29.7 166 58.3	135	'MBT'	'QToWF'	4	'none'
7/25/98	10:55 'C5'		'97'	2	1	55	29.7 166 58.3	135	'MBT'	'RCountJ'	113	'none'
7/25/98	14:55 'C4'		'98'	3	1	55	29.6 165 59.4	120	'MBT'	'Furuno'	1	'none'
7/25/98	14:55 'C4'		'98'	3	1	55	29.6 165 59.4	120	'MBT'	'JellyGut'	7	'none'
7/25/98	14:55 'C4'		'98'	3	1	55	29.6 165 59.4	120	'MBT'	'QToWF'	2	'none'
7/25/98	14:55 'C4'		'98'	3	1	55	29.6 165 59.4	120	'MBT'	'RCountJ'	37	'none'
7/25/98	18:12 'B4'		'99'	4	1	55	1 165 59.8	134	'MBT'	'Discard'	1	'Net hit bottom; full of mud'
7/25/98	18:12 'B4'		'99'	4	1	55	1 165 59.8	134	'MBT'	'Furuno'	1	'Net hit bottom; full of mud'
7/26/98	0:36 'B3'		'100'	5	1	54	59.1 165 0.5	99	'MBT'	'Furuno'	1	'none'
7/26/98	0:36 'B3'		'100'	5	1	54	59.1 165 0.5	99	'MBT'	'JellyGut'	5	'none'
7/26/98	0:36 'B3'		'100'	5	1	54	59.1 165 0.5	99	'MBT'	'QToWF'	1	'none'
7/26/98	0:36 'B3'		'100'	5	1	54	59.1 165 0.5	99	'MBT'	'RCountJ'	7	'none'
7/26/98	2:00 'B3'		'100'	5	2	55	2.5 164 57.5	104	'CalVet'	'MZ'	1	No MOA bridge log; estimate time and position from bongo log
7/26/98	2:18 'B3'		'100'	5	3	55	2.5 164 57.5	104	'20Bon'	'QToWF'	1	'none'
7/26/98	2:18 'B3'		'100'	5	3	55	2.5 164 57.5	104	'60Bon'	'QToWF'	1	'none'
7/26/98	7:03 'D3'		'101'	6	1	55	58.9 164 59.7	94	'MBT'	'Furuno'	1	'none'
7/26/98	7:03 'D3'		'101'	6	1	55	58.9 164 59.7	94	'MBT'	'QToWF'	5	'none'
7/26/98	7:03 'D3'		'101'	6	1	55	58.9 164 59.7	94	'MBT'	'RCountJ'	21	'none'
7/26/98	7:56 'D3'		'101'	6	2	56	0.3 164 59.8	94	'CalVet'	'MZ'	1	'none'
7/26/98	8:05 'D3'		'101'	6	3	56	0.3 164 59.8	94	'Ring.8'	'BioOther'	1	No MOA entry -- used position from Haul 2. Collection of experimental animals'
7/26/98	8:05 'D3'		'101'	6	3	56	0.3 164 59.8	94	'Ring.8'	'zoopDW'	7	No MOA entry -- used position from Haul 2. Collection of experimental animals'
7/26/98	8:27 'D3'		'101'	6	4	56	0.6 164 59.6	93	'20Bon'	'QToWF'	1	'none'
7/26/98	8:27 'D3'		'101'	6	4	56	0.6 164 59.6	93	'60Bon'	'QToWF'	1	'none'
7/26/98	17:34 'D4'		'102'	7	1	56	0 166 1.3	110	'MBT'	'JellyGut'	5	'none'
7/26/98	17:34 'D4'		'102'	7	1	56	0 166 1.3	110	'MBT'	'QToWF'	3	'none'
7/26/98	17:34 'D4'		'102'	7	1	56	0 166 1.3	110	'MBT'	'RCountJ'	231	'none'
7/26/98	17:34 'D4'		'102'	7	1	56	0 166 1.3	110	'MBT'	'Furuno'	1	'none'
7/26/98	15:12 'D5'		'103'	8	1	55	59.8 166 58.3	130	'MBT'	'Furuno'	1	'none'
7/26/98	15:12 'D5'		'103'	8	1	55	59.8 166 58.3	130	'MBT'	'QToWF'	1	'none'
7/26/98	15:12 'D5'		'103'	8	1	55	59.8 166 58.3	130	'MBT'	'RCountJ'	0	'none'
7/26/98	19:25 'D6'		'104'	9	1	56	0.1 167 57	134	'MBT'	'Discard'	1	'Net hit bottom'
7/26/98	19:25 'D6'		'104'	9	2	56	0.7 167 56.3	134	'MBT'	'Furuno'	1	'Net hit bottom'
7/26/98	21:39 'D6'		'104'	9	2	56	0.7 167 56.3	135	'MBT'	'Discard'	1	'Bottom fell out of cod end - Was second attempt so did not re-tow'
7/26/98	21:39 'D6'		'104'	9	2	56	0.7 167 56.3	135	'MBT'	'Furuno'	1	'Bottom fell out of cod end - Was second attempt so did not re-tow'
7/27/98	2:03 'E7'		'105'	10	1	56	28.3 168 58.5	102	'MBT'	'Furuno'	1	'none'
7/27/98	2:03 'E7'		'105'	10	1	56	28.3 168 58.5	102	'MBT'	'QToWF'	1	'none'
7/27/98	2:03 'E7'		'105'	10	1	56	28.3 168 58.5	102	'MBT'	'RCountJ'	0	'none'
7/27/98	8:03 'E8'		'106'	11	1	56	28.3 170 7.2	105	'MBT'	'Furuno'	1	Stopwatch stopped during ascent. Calculated total time as sinking time plus elapsed clock time since ascent began.'
7/27/98	8:03 'E8'		'106'	11	1	56	28.3 170 7.2	105	'MBT'	'QToWF'	1	Stopwatch stopped during ascent.

	OM	FOCI	Position	Bottom	Sample	Number	Comments
7/27/98	'106'	11	28.3 170 7.2	105 'MBT'	'RCountJ'	10	Calculated total time as sinking time plus elapsed clock time since ascent began. Stopwatch stopped during ascent.
7/27/98	'107'	12	1.5 169 57.8	132 'MBT'	'Furuno'	1	'none'
7/27/98	'107'	12	1.5 169 57.8	132 'MBT'	'QTowF'	2	'none'
7/27/98	'107'	12	1.5 169 57.8	132 'MBT'	'RCountJ'	4	'none'
7/27/98	'108'	13	1.7 168 59.2	1270 'MBT'	'Furuno'	1	'none'
7/27/98	'108'	13	1.7 168 59.2	1270 'MBT'	'QTowF'	2	'none'
7/27/98	'108'	13	1.7 168 59.2	1270 'MBT'	'RCountJ'	1	'none'
7/28/98	'110'	14	30.3 167 52.3	110 'MBT'	'Furuno'	1	'none'
7/28/98	'110'	14	30.3 167 52.3	110 'MBT'	'QTowF'	1	'none'
7/28/98	'110'	14	30.3 167 52.3	110 'MBT'	'RCountJ'	12	'none'
7/28/98	'111'	15	30.5 166 58	103 'MBT'	'Furuno'	1	'none'
7/28/98	'111'	15	30.5 166 58	103 'MBT'	'QTowF'	1	'none'
7/28/98	'111'	15	30.5 166 58	103 'MBT'	'RCountJ'	44	'none'
7/28/98	'112'	16	29.8 166 2.7	86 'MBT'	'Furuno'	1	'none'
7/28/98	'112'	16	29.8 166 2.7	86 'MBT'	'JellyGut'	5	'none'
7/28/98	'112'	16	29.8 166 2.7	86 'MBT'	'QTowF'	1	'none'
7/28/98	'112'	16	29.8 166 2.7	86 'MBT'	'RCountJ'	0	'none'
7/28/98	'112'	16	30 166 0.8	86 'CalVet'	'QTowF'	1	'none'
7/28/98	'112'	16	30.1 166 0.6	86 'Ring.8'	'BioOther'	1	'Collection of experimental animals'
7/28/98	'112'	16	30.1 166 0.6	86 'Ring.8'	'zoopDW'	7	'Collection of experimental animals'
7/28/98	'112'	16	30.1 166 0.6	86 '20Bon'	'QTowF'	1	'Hit bottom'
7/28/98	'112'	16	30.1 166 0.6	86 '60Bon'	'QTowF'	1	'Hit bottom'
7/28/98	'115'	17	0 165 57.7	69 'MBT'	'Furuno'	5	'none'
7/28/98	'115'	17	0 165 57.7	69 'MBT'	'JellyGut'	1	'none'
7/28/98	'115'	17	0 165 57.7	69 'MBT'	'QTowF'	1	'none'
7/28/98	'115'	17	0 165 57.7	69 'MBT'	'RCountJ'	18	'none'
7/28/98	'115'	17	0.5 165 59.4	68 'Bottles'	'Lugolis'	5	Multiple casts of Van Doran bottles (20 l) to collect phytoplankton.
7/28/98	'115'	17	0.5 165 59.4	68 'Bottles'	'PhytoF'	5	Multiple casts of Van Doran bottles (20 l) to collect phytoplankton.
7/28/98	'115'	17	0.9 165 58.4	68 'CalVet'	'MZ'	1	'none'
7/28/98	'115'	17	1.1 165 58.2	68 '20Bon'	'QTowF'	1	'none'
7/28/98	'115'	17	1.1 165 58.2	68 '60Bon'	'QTowF'	1	'none'
7/29/98	'116'	18	59.7 167 0.1	70 'MBT'	'Furuno'	1	'none'
7/29/98	'116'	18	59.7 167 0.1	70 'MBT'	'QTowF'	1	'none'
7/29/98	'116'	18	59.7 167 0.1	70 'MBT'	'RCountJ'	50	'none'
7/29/98	'117'	19	0.1 167 57.6	76 'MBT'	'Furuno'	1	'none'
7/29/98	'117'	19	0.1 167 57.6	76 'MBT'	'J-Oto'	21	'none'
7/29/98	'117'	19	0.1 167 57.6	76 'MBT'	'QTowF'	1	'none'
7/29/98	'117'	19	0.1 167 57.6	76 'MBT'	'RCountJ'	492	'none'
7/29/98	'117'	19	0.2 167 59.2	76 'CalVet'	'MZ'	1	'none'
7/29/98	'117'	19	0.3 167 58.8	76 '20Bon'	'QTowF'	1	'none'
7/29/98	'117'	19	0.3 167 58.8	76 '60Bon'	'QTowF'	1	'none'
7/29/98	'118'	20	59.7 168 59.5	76 'MBT'	'Furuno'	1	1 adult Rock sole caught in net -- discarded
7/29/98	'118'	20	59.7 168 59.5	76 'MBT'	'QTowF'	1	1 adult Rock sole caught in net -- discarded
7/29/98	'118'	20	59.7 168 59.5	76 'MBT'	'RCountJ'	184	1 adult Rock sole caught in net -- discarded

	OM	FOCI	Position	Bottom	Sample	Number	Comments
7/29/98	'118'	20	59.7 168	76	'MZ'	1	'none'
7/29/98	'118'	20	59.6 168	76	'CalVet'	1	'Collection of experimental animals'
7/29/98	'118'	20	59.6 168	76	'BioOther'	7	'Collection of experimental animals'
7/29/98	'118'	20	59.6 168	76	'Ring.8'	7	'Collection of experimental animals'
7/29/98	'118'	20	59.6 168	76	'zoopDW'	1	'none'
7/29/98	'118'	20	59.6 168	76	'QToWF'	1	'none'
7/29/98	'118'	20	59.6 168	76	'20Bon'	1	'none'
7/29/98	'118'	20	59.6 168	76	'60Bon'	1	'none'
7/29/98	'119'	21	56 169	65	'QToWF'	1	'none'
7/29/98	'119'	21	56 169	65	'Furuno'	1	'none'
7/29/98	'119'	21	56 169	65	'MBT'	1	'none'
7/29/98	'119'	21	56 169	65	'MBT'	1	'none'
7/29/98	'119'	21	56 169	65	'QToWF'	1	'none'
7/29/98	'120'	22	57 170	99	'RCountJ'	43	'none'
7/29/98	'120'	22	57 170	99	'Furuno'	1	'none'
7/29/98	'120'	22	57 170	99	'QToWF'	1	'none'
7/29/98	'120'	22	57 170	99	'RCountJ'	2	'none'
7/29/98	'121'	23	29.3 170	64	'Furuno'	1	'none'
7/29/98	'121'	23	29.3 170	64	'MBT'	20	'none'
7/29/98	'121'	23	29.3 170	64	'J-Calori'	20	'none'
7/29/98	'121'	23	29.3 170	64	'J-Oto'	20	'none'
7/29/98	'121'	23	29.3 170	64	'QToWF'	1	'none'
7/29/98	'121'	23	29.3 170	64	'RCountJ'	269	'none'
7/30/98	'121'	23	29.3 169	65	'Live'	1	'To collect experimental animals'
7/30/98	'121'	23	29.3 169	65	'Ring.8'	7	'To collect experimental animals'
7/30/98	'121'	23	29.3 169	65	'zoopDW'	1	'none'
7/30/98	'121'	23	29.3 169	65	'CalVet'	1	'none'
7/30/98	'121'	23	29.3 169	65	'QToWF'	1	'none'
7/30/98	'121'	23	29.3 169	65	'20Bon'	1	'none'
7/30/98	'121'	23	29.3 169	65	'60Bon'	1	'none'
7/30/98	'122'	24	29.9 169	68	'MBT'	1	'Hauled in galley garbage.'
7/30/98	'122'	24	29.9 169	68	'MBT'	1	'Only picked juvenile fish from codend. Do not sort for zooplankton.'
7/30/98	'122'	24	29.9 169	68	'J-Calori'	20	'Hauled in galley garbage.'
7/30/98	'122'	24	29.9 169	68	'MBT'	3	'Only picked juvenile fish from codend. Do not sort for zooplankton.'
7/30/98	'122'	24	29.9 169	68	'J-Gut'	3	'Hauled in galley garbage.'
7/30/98	'122'	24	29.9 169	68	'J-Oto'	20	'Only picked juvenile fish from codend. Do not sort for zooplankton.'
7/30/98	'122'	24	29.9 169	68	'QToWF'	1	'Only picked juvenile fish from codend. Do not sort for zooplankton.'
7/30/98	'122'	24	29.9 169	68	'RCountJ'	369	'Hauled in galley garbage.'
7/30/98	'122'	24	29.9 169	68	'MBT'	1	'Only picked juvenile fish from codend. Do not sort for zooplankton.'
7/30/98	'123'	25	29.94 168	68	'PhytoF'	1	'Surface bucket for coccolithophores'
7/30/98	'123'	25	30 168	68	'BioOther'	30	'Spit catch; preserved subsample = 0.3982 of total (weight). 'Ancillary samples (including Rcount) from discarded fraction. Bio-other = pollock stable isotope analysis (H. Sugisaki)'
7/30/98	'123'	25	30 168	68	'Furuno'	1	'Spit catch; preserved subsample = 0.3982 of total (weight). 'Ancillary samples (including Rcount) from discarded fraction. Bio-other = pollock stable isotope analysis (H. Sugisaki)'
7/30/98	'123'	25	30 168	68	'J-Calori'	20	'Spit catch; preserved subsample = 0.3982 of total (weight). 'Ancillary samples (including Rcount) from discarded fraction. Bio-other = pollock stable isotope analysis (H. Sugisaki)'
7/30/98	'123'	25	30 168	68	'J-Oto'	20	'Spit catch; preserved subsample = 0.3982 of total (weight). 'Ancillary samples (including Rcount) from discarded fraction. Bio-other = pollock stable isotope analysis (H. Sugisaki)'
7/30/98	'123'	25	30 168	68	'JellyGut'	3	'Spit catch; preserved subsample = 0.3982 of total (weight). 'Ancillary samples (including Rcount) from discarded fraction. Bio-other = pollock stable isotope analysis (H. Sugisaki)'

NOAA Data Summary Table
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	OM	FOCI	Position	Bottom	Sample Number	Comments
7/30/98	'123'	25	1 57 30 168	68	'QToWF'	Bio-other = pollock stable isotope analysis (H. Sugisaki) 1 Split catch; preserved subsample = 0.3982 of total (weight). 'Ancillary samples (including Rcount) from discarded fraction.'
7/30/98	'123'	25	1 57 30 168	68	'RCountJ'	Bio-other = pollock stable isotope analysis (H. Sugisaki) 873 Split catch; preserved subsample = 0.3982 of total (weight). 'Ancillary samples (including Rcount) from discarded fraction.'
7/30/98	'123'	25	2 57 29.9 167 59.4	68	'CalVel'	Bio-other = pollock stable isotope analysis (H. Sugisaki) 1 'none'
7/30/98	'123'	25	3 57 30 167 59.1	68	'20Bon'	1 'none'
7/30/98	'123'	25	3 57 30 167 59.1	68	'60Bon'	1 'none'
7/30/98	'124'	26	1 57 30 167 0.7	67	'MBT'	1 'none'
7/30/98	'124'	26	1 57 30 167 0.7	67	'MBT'	1 'none'
7/30/98	'124'	26	1 57 30 167 0.7	67	'JellyGut'	5 'none'
7/30/98	'124'	26	1 57 30 167 0.7	67	'QToWF'	1 'none'
7/30/98	'124'	26	1 57 30 167 0.7	67	'RCountJ'	57 'none'
7/30/98	'125'	27	1 57 29.8 166 1.5	64	'Furuno'	1 'none'
7/30/98	'125'	27	1 57 29.8 166 1.5	64	'MBT'	2 'none'
7/30/98	'125'	27	1 57 29.8 166 1.5	64	'QToWF'	10 'none'
7/30/98	'125'	27	2 57 29.4 165 58.6	64	'RCountJ'	1 'none'
7/30/98	'125'	27	3 57 29.5 165 59.2	75	'CalVel'	1 'none'
7/30/98	'125'	27	3 57 29.5 165 59.2	75	'20Bon'	1 'none'
7/30/98	'126'	28	1 58 10.1 165 57.7	45	'60Bon'	1 'none'
7/30/98	'126'	28	1 58 10.1 165 57.7	45	'Bottles'	5 Water collection at 0 10 20 30 & 40 meters
7/30/98	'126'	28	2 58 10.1 165 57.7	45	'Bottles'	5 Water collection at 0 10 20 30 & 40 meters
7/30/98	'126'	28	2 58 10.1 165 57.7	45	'CalVel'	1 'none'
7/30/98	'126'	28	3 58 10.2 165 57.3	45	'MBT'	1 '60Bon net 2 codend taped for collection of experimental animals'
7/30/98	'126'	28	3 58 10.2 165 57.3	45	'20Bon'	1 '60Bon net 2 codend taped for collection of experimental animals'
7/30/98	'126'	28	3 58 10.2 165 57.3	45	'60Bon'	1 '60Bon net 2 codend taped for collection of experimental animals'
7/30/98	'126'	28	3 58 10.2 165 57.3	45	'60Bon'	7 '60Bon net 2 codend taped for collection of experimental animals'
7/31/98	'128'	29	1 58 29.4 165 58.7	43	'Live'	4 Water collection at 0 10 20 & 30 meters
7/31/98	'128'	29	1 58 29.4 165 58.7	43	'Bottles'	4 Water collection at 0 10 20 & 30 meters
7/31/98	'128'	29	2 58 29.4 165 58.7	43	'Bottles'	4 Water collection at 0 10 20 & 30 meters
7/31/98	'128'	29	2 58 29.4 165 58.7	43	'CalVel'	1 'none'
7/31/98	'128'	29	3 58 29.4 165 58.5	43	'MBT'	1 '60Bon net 2 taped codend for collection of experimental animals'
7/31/98	'128'	29	3 58 29.4 165 58.5	43	'20Bon'	1 '60Bon net 2 taped codend for collection of experimental animals'
7/31/98	'128'	29	3 58 29.4 165 58.5	43	'60Bon'	1 '60Bon net 2 taped codend for collection of experimental animals'
7/31/98	'128'	29	3 58 29.4 165 58.5	43	'60Bon'	1 '60Bon net 2 taped codend for collection of experimental animals'
7/31/98	'130'	30	2 56 0.2 165 59	53	'Live'	1 'Water collection at zero meters'
7/31/98	'130'	30	2 56 0.2 165 59	53	'Bottles'	1 '60BON Net 2 codend taped. Collection of experimental animals.'
7/31/98	'130'	30	2 56 0.2 165 59	53	'20Bon'	1 '60BON Net 2 codend taped. Collection of experimental animals.'
7/31/98	'130'	30	2 56 0.2 165 59	53	'60Bon'	1 '60BON Net 2 codend taped. Collection of experimental animals.'
7/31/98	'130'	30	3 58 0.4 165 58.7	53	'QToWF'	1 'Codends taped on nets 1 and 2. Collection of experimental animals.'
7/31/98	'130'	30	3 58 0.4 165 58.7	53	'Live'	

Oshoro Maru 1998 FOCI Stations

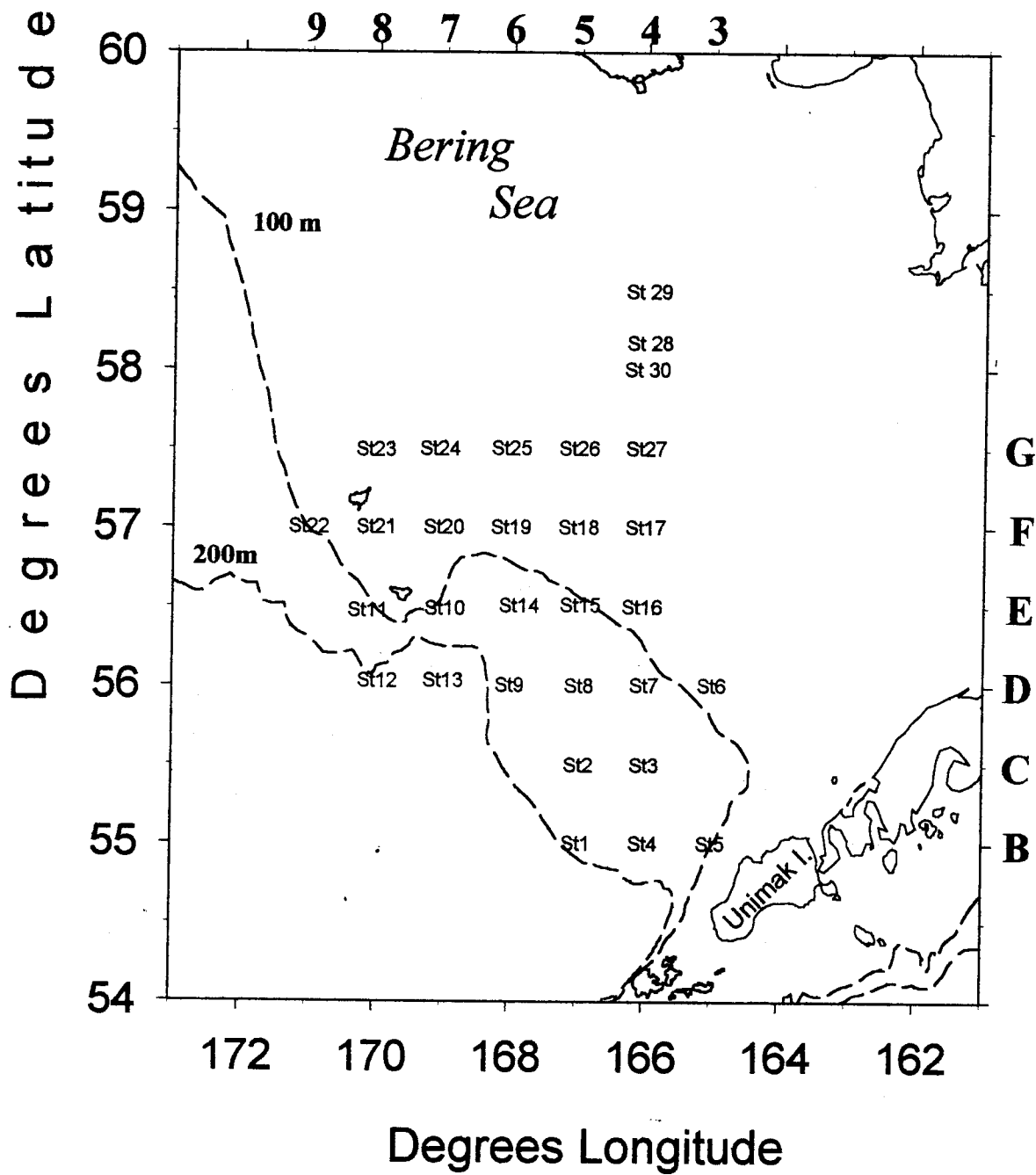


Figure 1

Oshoro Maru 1998 Juvenile Pollock (No. 10m⁻²)

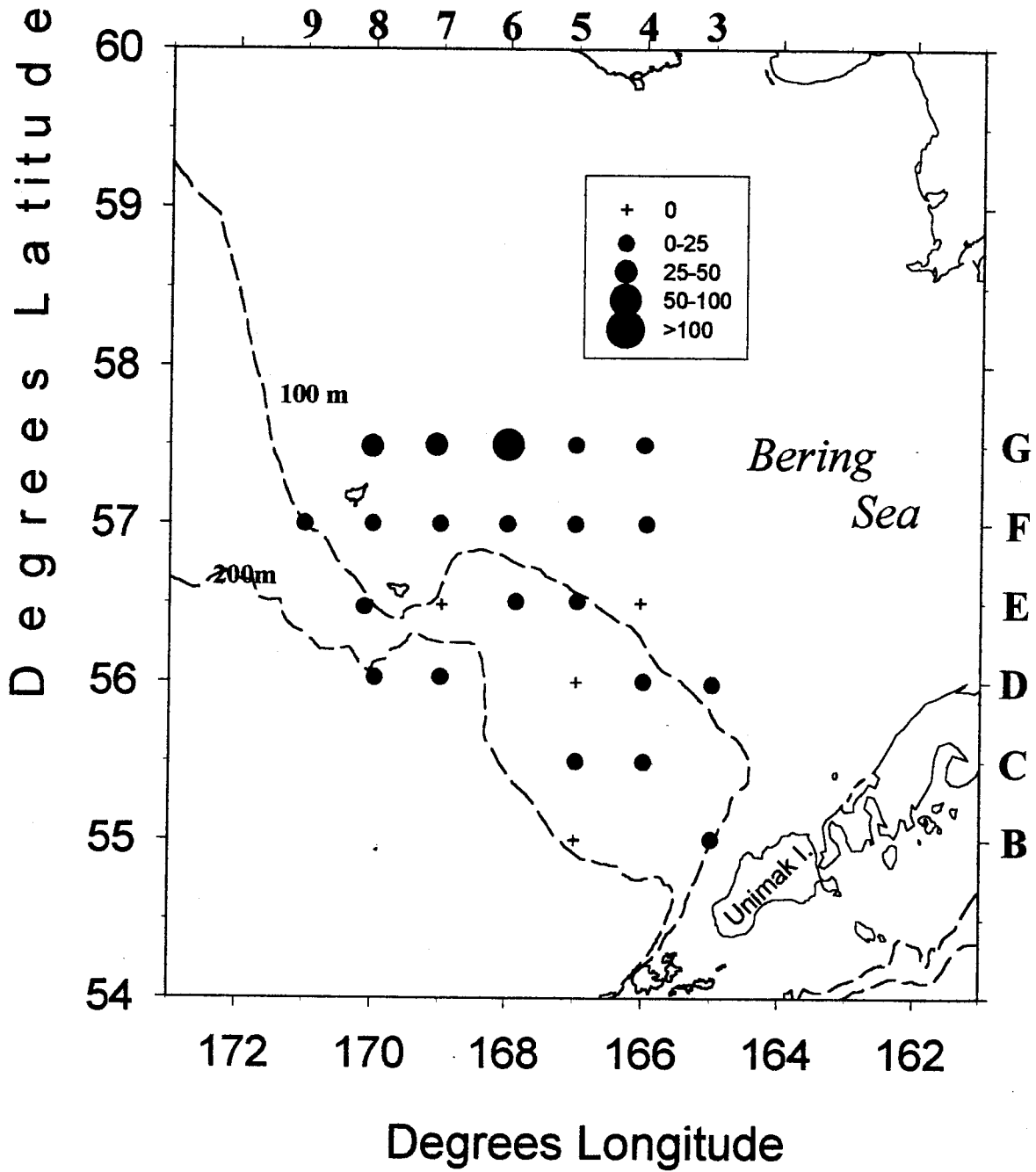


Figure 2

Oshoro Maru 1998

Chrysaora (kg 10m⁻²)

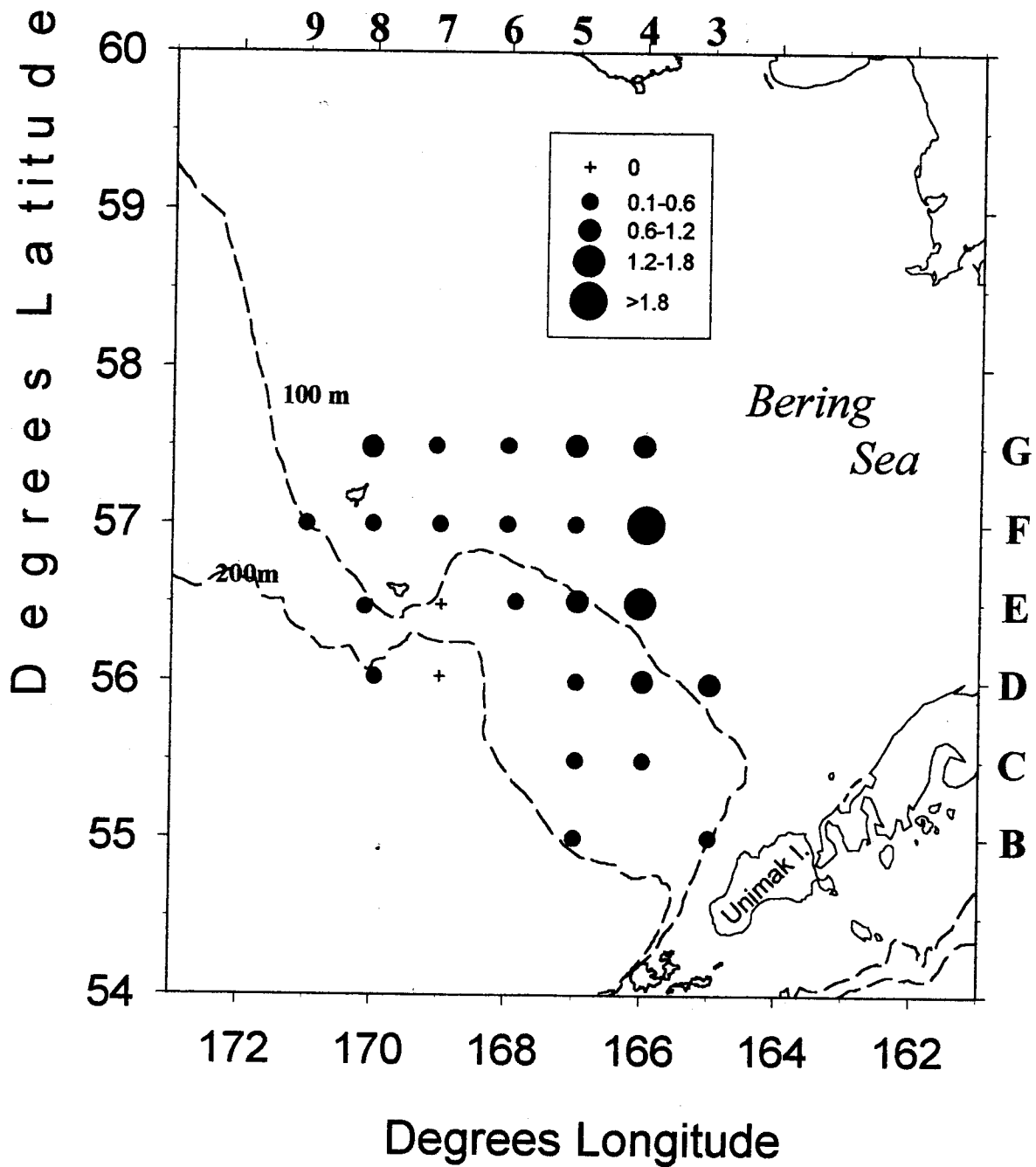


Figure 3

Oshoro Maru 1998 Bongo Stations

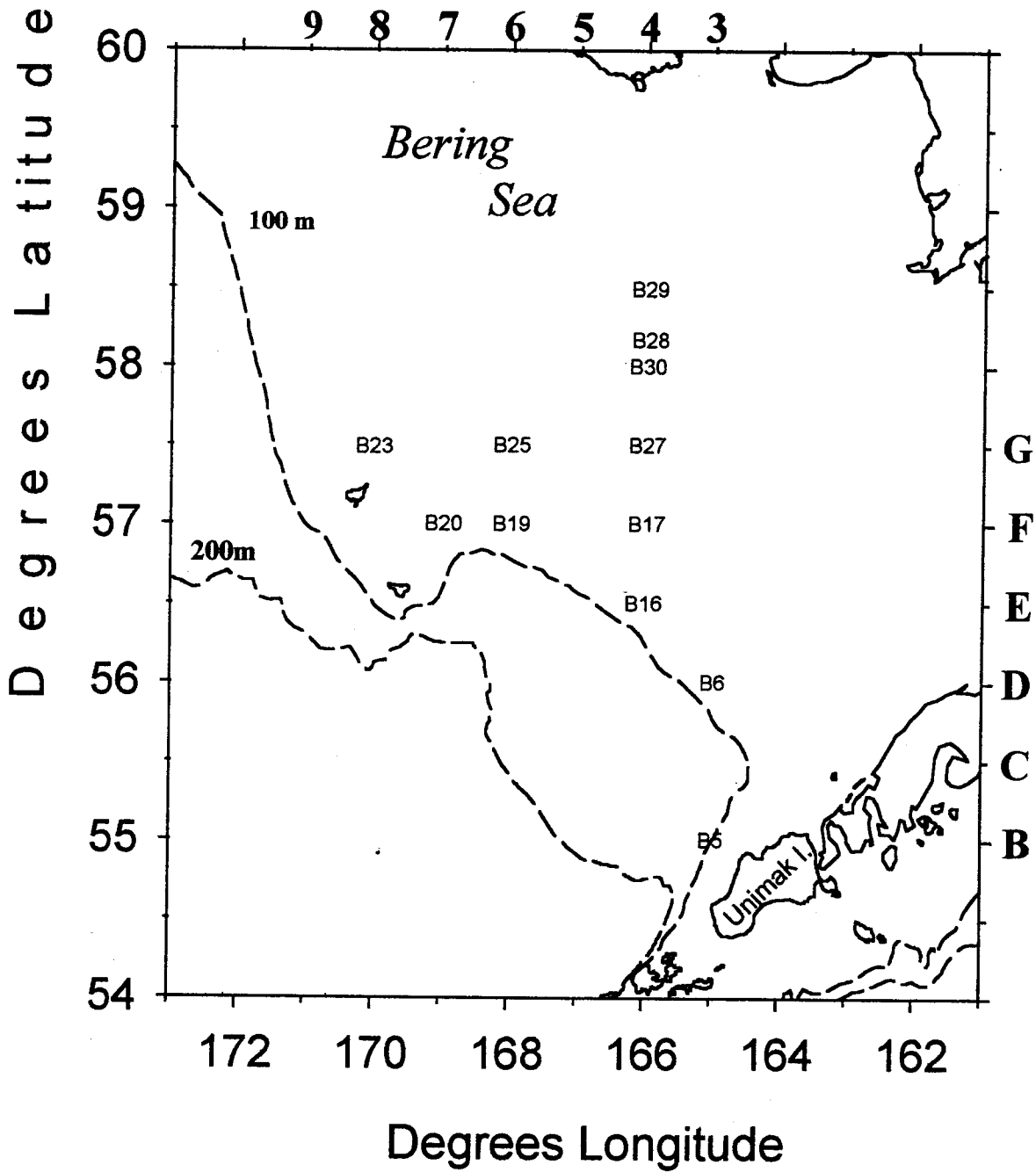


Figure 4