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Results of 2006 Salmon Research Cruise of the *Oshoro maru*

by

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## ABSTRACT

In order to continue to collect oceanographic and biological data included for salmonids, oceanographic observations and mainly gillnet surveys were conducted along 155° E, 165° E, and 165° W in the northern North Pacific Ocean. Each survey was conducted during Cruise #168 (May), and Cruise #169 (June-July) in 2006.

In May along 155° E, the Polar Front occurred near at 43.5° N and the Subarctic Boundary occurred near at 40.3° N.

In early June along 165° E, the Polar Front occurred near at 45.5° N.

In early July along 165° W, the Polar Front did not observe clearly along 165° W line.

Gillnet survey was conducted at five stations along 155° E in May during Cruise #168. Three gillnet surveys were conducted along 165° E in early June, and one survey was conducted at 50° N, 165° W in early July during Cruise #169.

In May along 155° E, a total of 2 sockeye, 38 chum, 154 pink, and one chinook salmon was collected. Chum salmon was most abundant at 41° N, but pink salmon was most abundant at 42.5° N. This distribution pattern about chum salmon and pink salmon was also observed in 2002, 2003, 2004 and 2005.

In early June along 165° E, a total of 500 sockeye, 223 chum, 275 pink, 32 coho, and five chinook salmon was collected. Sockeye salmon was the most abundant at 47.5° N among all stations. Pink salmon was abundant at 47.5° N and 49° N. Chum salmon was most abundant at 44.5° N.

In early July along 165° W, the only one drift gillnet survey was conducted at 50° N owing to the bad weather. 89 sockeye, 28 chum, 24 pink, 56 coho, 4 chinook salmon and fourteen steelhead were collected.

Fork length frequency distribution of sockeye salmon collected at 165° E line in early June were divided into two size groups. Immature fish were dominant collected along 165° E in early June, but mature fish were dominant collected at 50° N, 165° W in early July.

Chum salmon collected in May along 155° E were all mature fish ranged between 500-620mm F.L.. Chum salmon collected along 165° E in early June ranged between 340-680mm F.L., and 77% of them were matured. Chum salmon collected at 50° N, 165° W in early July widely ranged between 280-660mm F.L., and 92% of them were immature.

Fork length frequency distributions of pink salmon were different among three research areas as sampling season advances.

## INTRODUCTION

The *Oshoro maru* has conducted pelagic nekton research and studied the oceanic structure and marine biology in the North Pacific Ocean, Bering Sea and/or Chukuchi Sea every summer since 1953. Collected data has been published annually since 1957 (Hokkaido University, 1957-2007).

Since 1978, several transects have been repeatedly sampled to study long-term changes in the North Pacific Ocean ecosystem.

These researches included for salmonids have been conducted along three transects during two summer cruises in the North Pacific in 2006.

Cruise #168 in May along 155° E,

Cruise #169 in early June along 165° E, and in early July along 165° W.

The primary objects of these cruises are to continue several years and collecting oceanographic and biological data along these transects.

This document reports the preliminary results of the 2006 research cruises of the *Oshoro maru* in the North Pacific Ocean.

## METHODS

### 1. Survey Area and Cruise Schedule

Oceanographic, gillnet, surface long-line, and hook-and-line research were conducted along the 155° E, 165° E and 165° W in the northern North Pacific during two cruises: #168 (9-22 May), and #169 (2 June - 31 July). (Fig. 1)

### 2. Oceanographic Observation

For salmon research during each cruise, oceanographic observations were conducted at 45 nautical mile intervals. They were occupied from 38° N to 44° N along 155° E in Cruise #168, from 42.3° N to 49° N along 165° E, and from 50° N to 44° N along 165° W in Cruise #169 (Fig. 1, Table 1).

Data collected by CTD instruments were used to plot the temperature and salinity.

### 3. Drift Gillnet Sampling

A drift gillnet was used to collect salmonids and the other organisms at 9 stations (Fig. 1, Table 2). The gillnet configurations is shown in Table 3. The net comprised of 30 tans of C-Gear gillnet (non-selective varied research mesh, Takagi, 1975), 12 tans of A-Gear gillnet (commercial mesh), and 7 tans of F-Gear gillnet (special mesh). Each tan was 50m long.

Gillnet gear was set in the evening, allowed to soak overnight, and retrieved the following morning.

The number of organisms caught was counted by species for each mesh size.

Fork length (F.L.), body weight, and gonad weight by sex of a maximum 60 fishes for each salmon species of each mesh size were measured, and scale samples were collected from the International North Pacific Fisheries Commission (INPFC) preferred body area and placed on gummed cards for verification of species identification, and for age, growth and stock origin studies.

Sockeye salmon (*Oncorhynchus nerka*), and chum salmon (*Oncorhynchus keta*) were classified as mature or immature based on gonad weight (Takagi, 1961).

By prior arrangement with the FAJ, snouts were collected from each salmonid lacking an adipose fin. These snouts were labeled with catch and biological information and frozen. Snout samples were sent to the FRA (Japan), Hokkaido National Fisheries Research Institute, where they will be examined for coded-wire tags.

#### **4. Additional Biological Sampling**

To collect blood samples from viable salmonids, six surface longline samplings and one hook-and-line gear sampling were operated along 165° E and 165° W in Cruise #169 (Fig.1, Table 4).

##### Surface Longline Sampling:

Ten hachi (baskets) were used under normal conditions.

One hachi; mainline: 127m long; 34 branch lines/hachi; 3m between branch lines;

Fishing depth: 2m ; Bait: Salted anchovies.

The scale collection method and data recorded on length and species were the same as those in standard methods.

Additional research activities included collection of salmonids stomachs, muscle tissues, blood samples, and egg samples for studies of food habits, growth, stock identification, and female-specific serum proteins.

## RESULTS AND DISCUSSION

Details of oceanographic data and biological data collected during the cruises were published in the “*DATA RECORDER OF OCEANOGRAPHIC OBSERVATIONS AND EXPLORATORY FISHING NO. 50*” of Hokkaido University in March 2007.

### 1. Oceanographic Conditions

Temperature and salinity sections (0-500db) on Cruise #168 and #169 are shown in Figure 2.

The geographic positions of the Polar Front and the Subarctic Boundary (Dodimead et al., 1963, Favorite et al., 1976, Roden, 1991) were as follows.

[155° E line ]

In May, the Polar Front which is indicated by the vertical 4°C isotherm at 100m depth occurred near at 43.5° N and the Subarctic Boundary that is indicated by the vertical 34.0 psu isohaline occurred near at 40.3° N. In May 2006, the Subarctic Boundary occurred more northern area than that in 2002, 2003, 2004, and 2005 (Meguro et al., 2003, 2004, 2005, 2006). It is considered that the warm core ring was created by the Kuroshio extension's meander south from 40.3° N in surrounding area.

[165° E line ]

The Polar Front occurred near at 45.5° N. The halocline was distributed 130-170db.

[165° W line]

The vertical 4°C isotherm occurred from about 170m to 250m depth near at 47.4° N, but it did not reach 100m depth. Therefore the Polar Front did not observe clearly along 165° W line. The thermocline was distributed 30-60db in the survey area.

### 2. Distribution and abundance of organisms caught by drift gillnet

The number of organisms caught by the drift gillnet at each station are shown in Table 5-(1) (Cruise #168), and 5-(2) (Cruise #169).

[155° E line: May]

A total of 2 sockeye (*Oncorhynchus nerka*), 38 chum (*O. keta*), 154 pink (*O. gorbuscha*) and one chinook salmon (*O. tshawytscha*) were collected.

Chum salmon was the most abundant at 41° N. On the other hand, pink salmon was the most abundant at 42.5° N. This distribution pattern about chum salmon and pink salmon in May along 155° E line was also observed in 2002, 2003, 2004, and 2005 (Meguro et al., 2003, 2004, 2005, 2006).

Over 89% of organisms caught by C-gear gillnet were salmonids from 41° N to 44° N where were in the Subarctic and Transition Domain, on the other hand, a small number of salmonids were collected at 39.5° N and 38° N where were in the Subtropical Water. In the Subtropical Water, pacific pomfret (*Brama japonica*) (26.4% of C-gear) and boreal clubhook squid (*Onychoteuthis*

*borealijaponicus*) (37.7% of C-gear) were collected in high ratio at 39.5° N, and pacific pomfret was abundant at 38° N (87.1% of C-gear).

[165° E line : early June]

A total of 500 sockeye, 223 chum, 275 pink, 32 coho (*O.kisutch*) and 5 chinook salmon were collected.

Over 97% of organisms caught by C-gear gillnet were salmonids at all stations. Sockeye salmon was the most abundant at 47.5° N among all stations. Pink salmon was abundant at 47.5° N and 49° N. Chum salmon was most abundant at 44.5° N. Coho salmon was collected only at 49° N.

[165° W line : early-July]

The drift gillnet survey was conducted only at 50° N owing to the bad weather along 165° W in Cruise #169. A total of 215 salmonids were collected at this station (89 sockeye salmon, 28 chum, 24 pink, 56 coho, 4 chinook salmon, and 14 steelhead (*O. mykiss*)). The 97.7% of organisms caught by C-gear gillnet were salmonids. Only three (2.3% of C-gear) eight-armed squid (*Gonatopsis borealis*) were collected by drift gillnet except salmonids at this station.

### **3.Biological characteristics of salmonids**

Fork length frequency and maturity ratio (except pink and coho salmon) of sockeye, chum, pink, and coho salmon caught by C-gear gillnet at each longitude line in Cruise #168 and #169 are shown in Figure 3.

[Sockeye salmon]

Fork length frequency at 165° E line in early June was divided into following two ranges:

200-400mm F.L. (41.5%), 400-620mm F.L. (58.5%). 38% of them were adult fish.

Sockeye salmon collected by C-gear gillnet at 50° N, 165° W ranged between 360-680mm F.L., 94% of them were over 440mm F.L. and 59% of them were mature fish.

[Chum salmon]

A total of 17 chum salmon collected by C-gear gillnet at 155° E line in May ranged between 500-620mm F.L., and all were mature fish that were thought to be over ocean age .3 (Meguro et. al., 2004).

A total of 119 chum salmon were collected by C-gear gillnet at 165° E line in early June. Their fork lengths distribute extensively between 340-680mm. A total of 77% fish were mature.

From these results, in early June at 165° E line, chum salmon consists of various age but adult chum salmon still distributes in high ratio, compared with in early July, 2005 (Meguro et. al., 2006).

A total of 24 chum salmon were collected by C-gear gillnet at 50° N, 165° W. Their fork lengths dispersed extensively between 280-660mm. They were almost immature.

These results indicate that in early July, chum salmon at this sampling area occur in a small number and immature fish are dominant.

[Pink salmon]

Statistical data for fork length frequency distributions of pink salmon were as follows:

155° E, in May: mean±STD=376.2±30.50mm, mode=368mm, median=370.5mm F.L.

165° E, in June: mean±STD=462.1±27.36mm, mode=455mm, median=461.5mm F.L.

165° W, in early July: mean±STD=475.0±16.63mm, mode=481mm, median=480mm F.L.

It is considered that sampling seasons caused size differences among three research areas.

[Coho salmon]

Statistical data for fork length frequency distributions of coho salmon were as follows:

165° E, in June mean±STD=531.7±29.14mm, mode=529mm, median=529mm F.L.

165° W, in early July: mean±STD=547.1±36.27mm, mode=569mm, median=551mm F.L.

#### **4. Surface long-line and hook-and-line sampling**

The number of organisms caught by the surface longline and hook-and-line gear at each station is shown in Table 6.

A total of 4 sockeye, 4 chum, 23 pink, 26 coho and 3 steelhead salmon were collected to collect blood samples during cruise #169.

#### **5. Fish lacking adipose fins**

Snouts were collected from 4 steelhead salmons lacking adipose fins for coded-wire tag detection by gillnet samplings during two cruises (Table 7).

### **ACKNOWLEDGMENTS**

We thank the INPFC, NPAFC and their affiliated scientists who have helped us to conduct salmon-research in the North Pacific Ocean over many years. Your cooperation has helped us to train and teach many scientists and leaders in the fishing industry through our salmon research program.

Also we thanks the other officers, crew, guest scientists, graduate students, and cadets of the *Oshoro Maru* for their outstanding assistance and cooperation in sampling and data collection under sometimes severe conditions.

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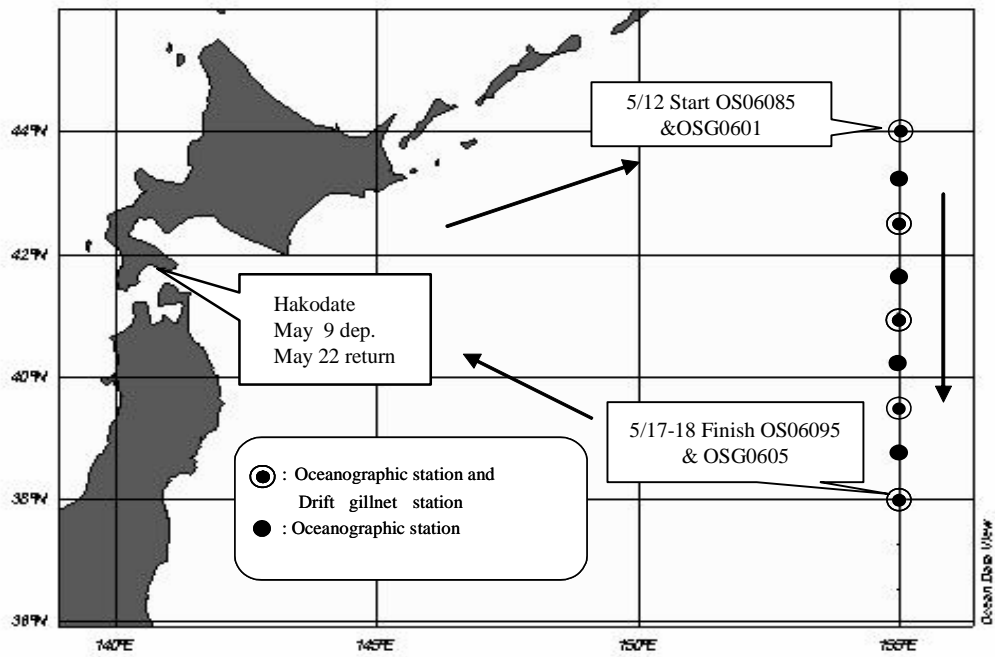


Fig.1-(1) Cruise #168(May 9-22)

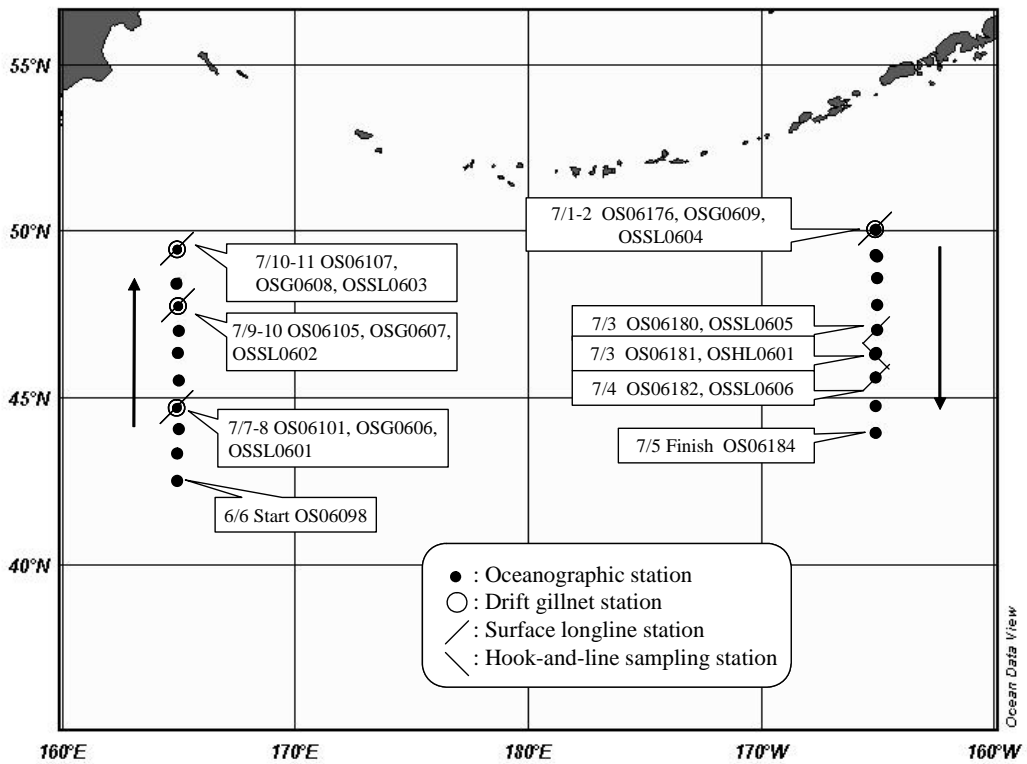


Fig. 1-(2) Cruise#169 (June 2-July 31)

Fig. 1 Location of oceanographic, drift gillnet, surface longline, and hook-and-line sampling stations during each cruise. Details for station names are shown in Table 1, 2, and 4.

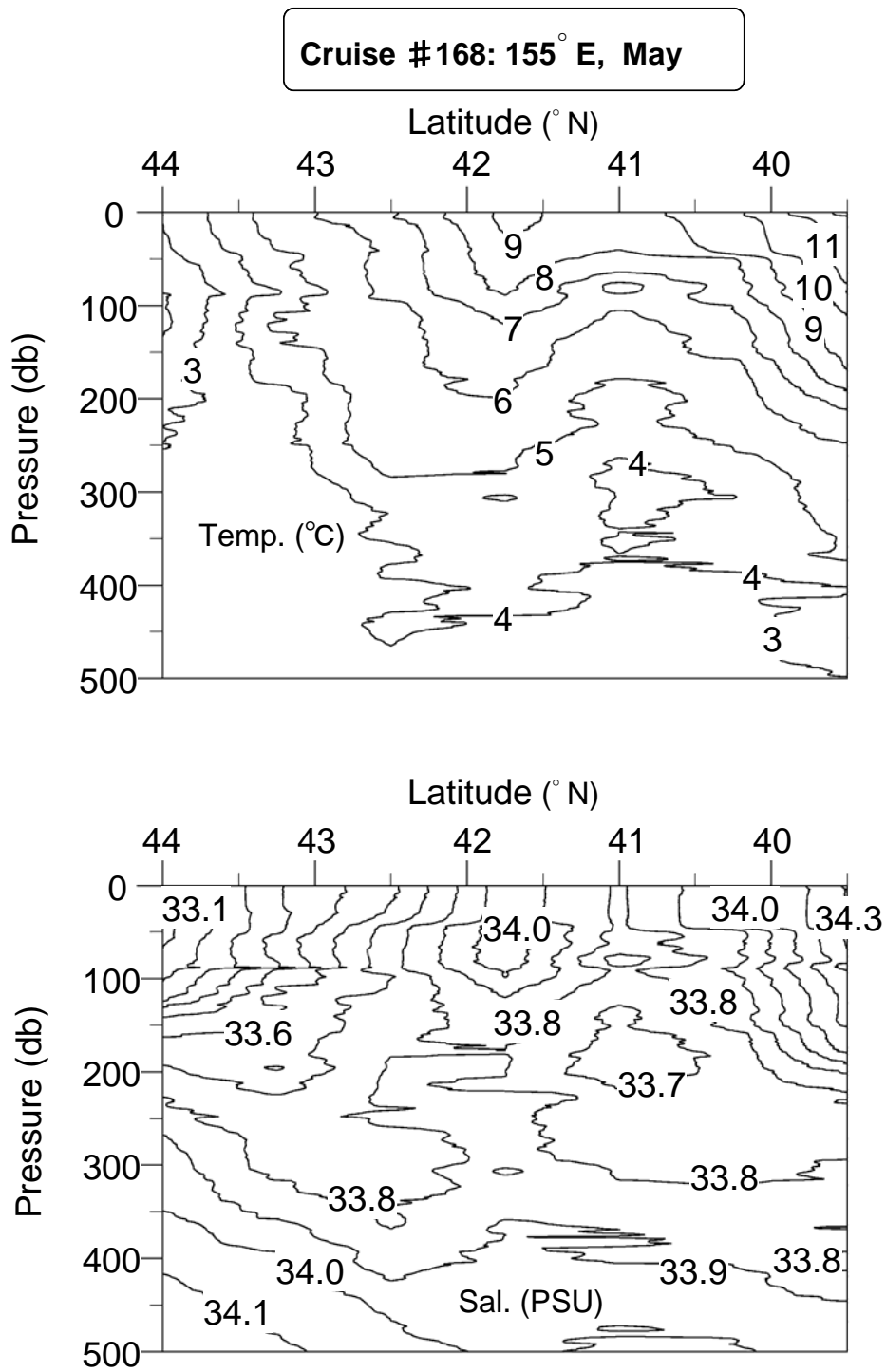


Fig. 2-(1) Temperature and Salinity from surface to 500db pressure along the 155°E Transect in the *Oshoro maru* Cruise #168, 2006

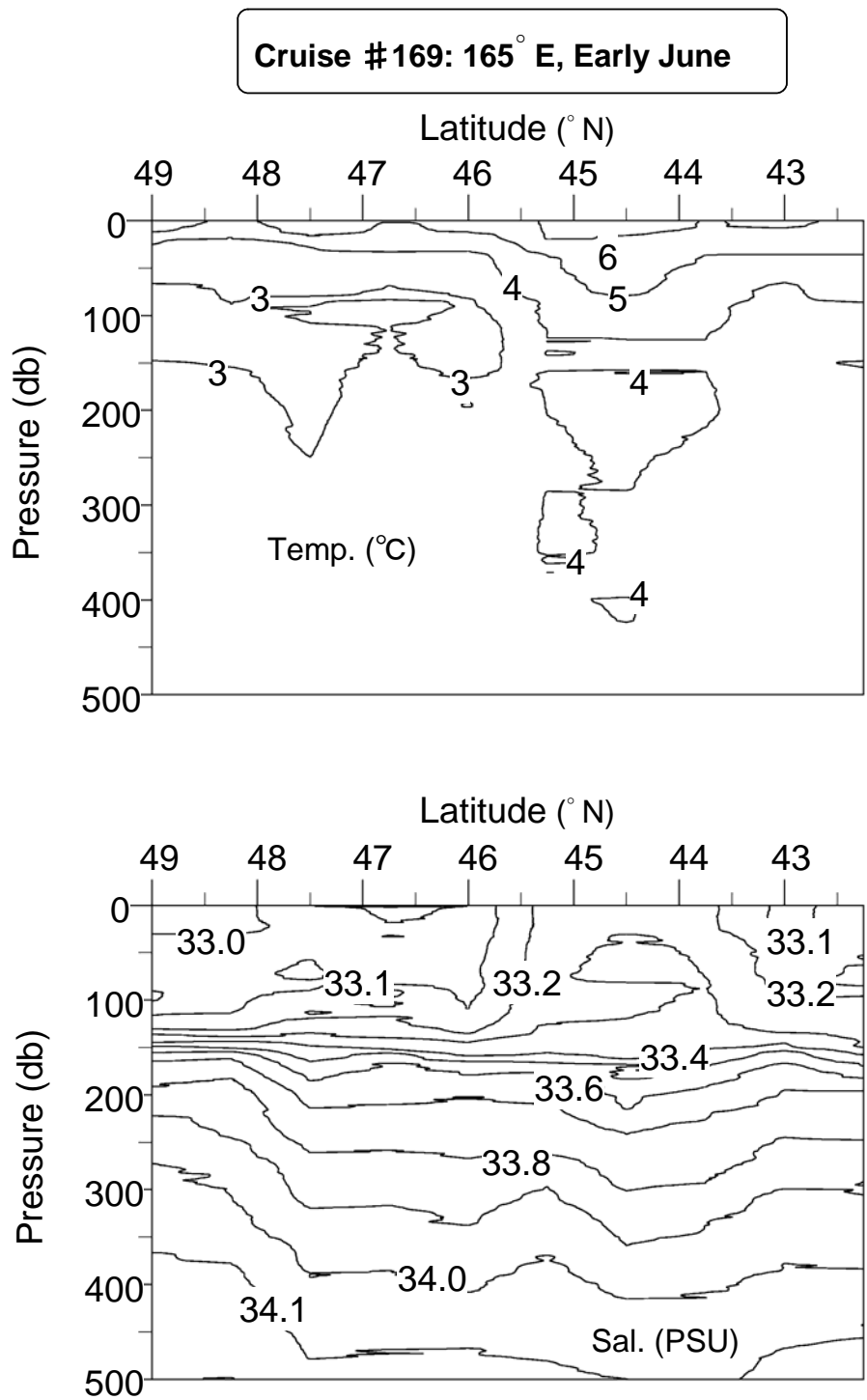


Fig. 2-(2) Temperature and Salinity from surface to 500db pressure along the 165°E Transect in the *Oshoro maru* Cruise #169, 2006

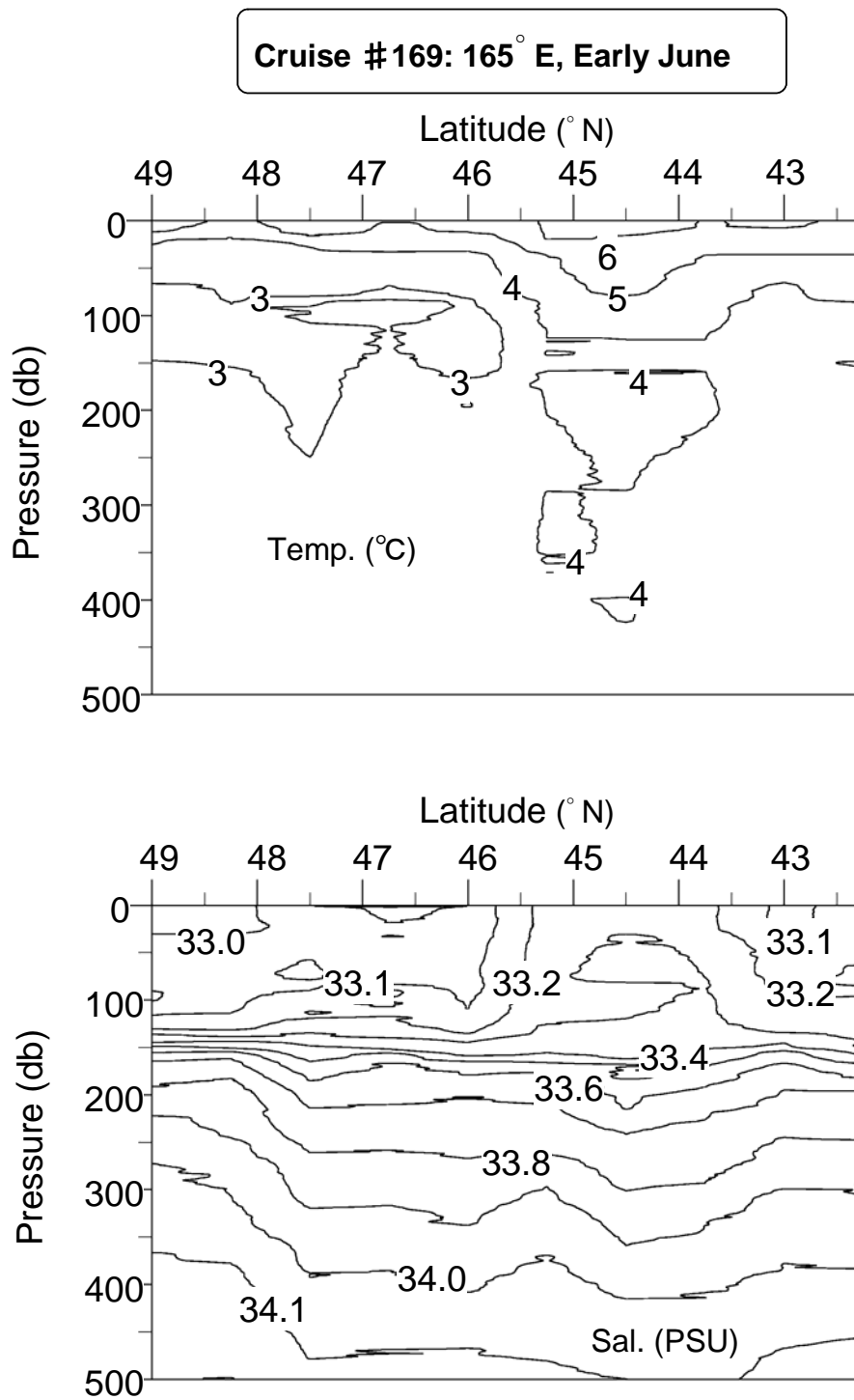


Fig. 2-(2) Temperature and Salinity from surface to 500db pressure along the 165°E Transect in the *Oshoro maru* Cruise #169, 2006

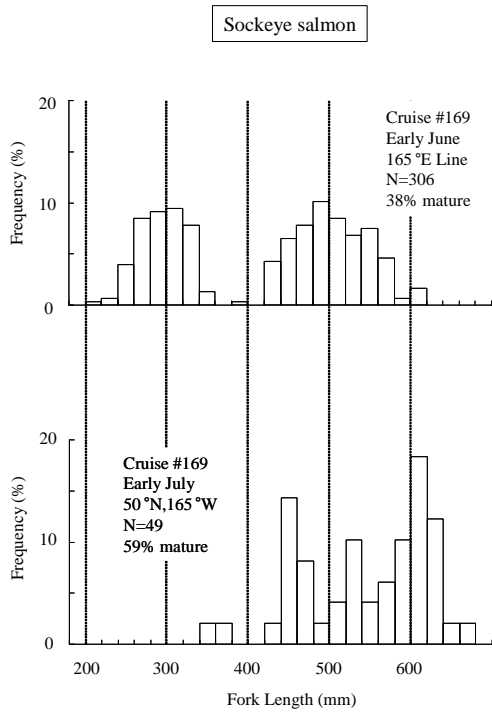


Fig. 3-(1) Fork length frequency and maturity ratio of sockeye salmon caught by C-gear gillnet at 165° E and 165° W in the *Oshoro Maru* Cruise #169

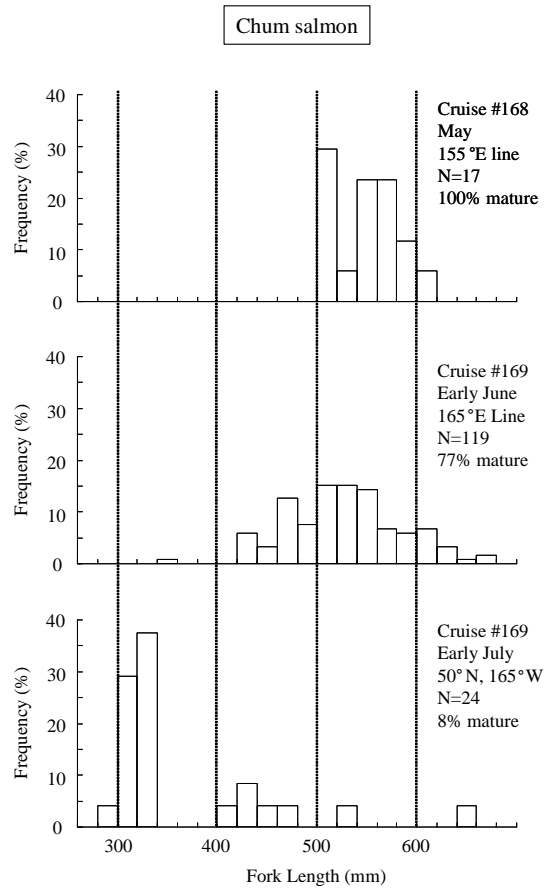


Fig. 3-(2) Fork length frequency and maturity ratio of chum salmon caught by C-gear gillnet at 155° E, 165° E, and 165° W in the *Oshoro Maru* Cruise #168 and #169

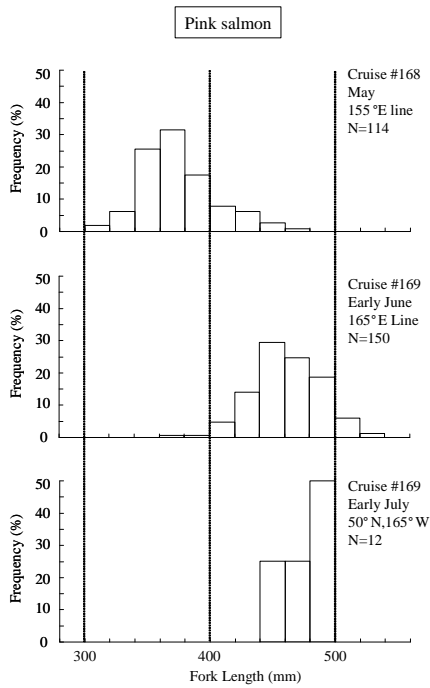


Fig. 3-(3) Fork length frequency of pink salmon caught by C-gear gillnet at 155° E, 165° E and 165° W in the *Oshoro Maru* Cruise #168 and #169

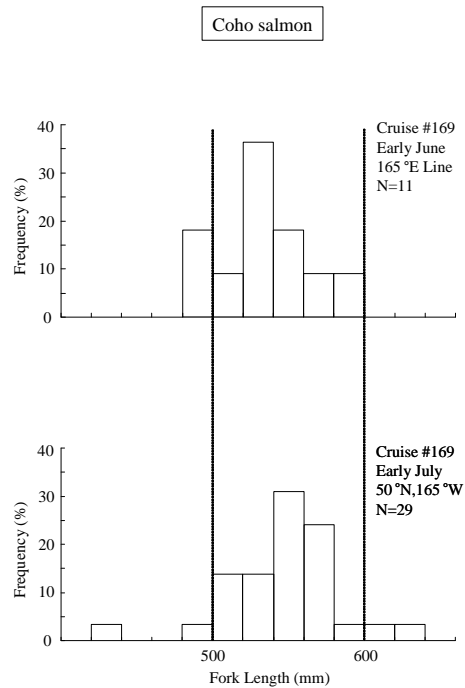


Fig. 3-(4) Fork length frequency of coho salmon caught by C-gear at 165° E and 165° W in the *Oshoro Maru* Cruise #169

Table 1 List of oceanographic station along the 155° E 165° E and 165° W

Cruise #168

Station	Lat.	Long.	Date	S.M.T.*1	T.D*2	Remark
OS06087	44-00.0N	155-00.0E	5/12	1505	10	CTD
OS06088	43-15.0N	155-00.0E	5/13	0942	10	CTD
OS06089	42-30.0N	155-00.0E	5/13	1600	10	CTD
OS06090	41-45.0N	155-00.0E	5/14	1050	10	CTD
OS06091	41-00.0N	155-00.0E	5/15	1515	10	CTD
OS06092	40-15.0N	155-00.0E	5/16	0958	10	CTD
OS06093	39-30.0N	155-00.0E	5/16	1503	10	CTD
OS06094	38-45.0N	155-00.0E	5/17	0846	10	CTD
OS06095	37-58.8N	155-59.4E	5/17	1510	10	CTD

Cruise #169

Station	Lat.	Long.	Date	S.M.T.	T.D.	Remark
OS06098	42-15.0N	165-00.0E	6/6	1515	11	CTD
OS06099	43-00.0N	165-00.0E	6/6	2102	11	CTD
OS06100	43-45.0N	165-00.1E	6/7	0745	11	CTD
OS06101	44-30.0N	165-00.1E	6/7	1320	11	CTD
OS06102	45-15.0N	165-00.0E	6/8	1020	11	CTD
OS06103	45-57.8N	165-00.0E	6/8	1935	11	CTD
OS06104	46-45.1N	165-00.1E	6/9	0235	11	CTD
OS06105	47-30.1N	165-00.1E	6/9	0730	11	CTD
OS06106	48-15.0N	165-00.2E	6/10	1130	11	CTD
OS06107	48-59.7N	165-04.5E	6/10	1839	11	CTD
OS06176	50-00.1N	164-59.9W	7/1	1412	-10	CTD
OS06177	49-15.1N	165-00.5W	7/2	1230	-10	CTD
OS06178	48-29.9N	165-00.0W	7/2	1830	-10	CTD
OS06179	47-44.7N	165-00.5W	7/3	0135	-10	CTD
OS06180	47-00.1N	165-00.0W	7/3	0810	-10	CTD
OS06181	46-15.1N	165-00.0W	7/3	2200	-10	CTD
OS06182	45-30.0N	165-00.0W	7/4	0920	-10	CTD
OS06183	44-45.1N	165-00.0W	7/4	2150	-10	CTD
OS06184	44-00.0N	165-00.0W	7/5	0235	-10	CTD

\*1 S.M.T. = Ship Mean Time

\*2 T.D.: Time Difference between Greenwich Mean Time (G.M.T.) and S.M.T.

Table 2 Position and research conditions of drift gillnet at each station in the *Oshoro maru* Cruise #168 and #169

Cruise #168										
Station	Date and Time (S.M.T.)		T.D.	Set Position		D.S.	Bottom depth (m)	Wr	Wind (Force)	Oceanographic station No.
	Net set	Net haul		Lat. (N)	Long. (E)					
OSG 0601	May 12 1753-1820	May 13 0423-0515	+10:00	44-00.1	155-00.4	090	5305	bc	WSW-4	OS 06087
OSG 0602	13 1750-1815	14 0421-0543	+10:00	42-30.2	155-00.1	030	5154	c	South-3	OS 06089
OSG 0603	15 1749-1816	16 0430-0532	+10:00	41-00.6	155-00.2	120	5760	bc	WSW-3	OS 06091
OSG 0604	16 1747-1812	17 0422-0525	+10:00	39-29.7	154-59.8	190	5628	c	West-3	OS 06093
OSG 0605	17 1749-1814	18 0419-0523	+10:00	37-59.9	154-59.8	230	5709	bc	NNE-4	OS 06095
Cruise #169										
Station	Date and Time (S.M.T.)		T.D.	Set Position		D.S.	Bottom depth (m)	Wr	Wind (Force)	Oceanographic station No.
	Net set	Net haul		Lat. (N)	Long.					
OSG 0606	June 7 1754-1821	July 8 0425-0530	+11:00	44-29.9	164-59.7E	240	5907	c	ENE-3	OS 06101
OSG 0607	9 1745-1810	10 0450-0555	+11:00	47-30.0	165-00.3E	230	5908	o	NE-5	OS 06105
OSG 0608	10 1749-1820	11 0428-0534	+11:00	49-00.1	165-00.3E	120	5389	o	West-5	OS 06107
OSG 0609	July 1 1749-1815	July 2 0500-0600	-10:00	50-00.0	165-00.0W	010	5015	o	SE-4	OS 06176

T.D. : Time Difference between Greenwich Mean Time (G.M.T.) and Ship's Mean Time (S.M.T.)

D.S. : Direction in which net was set

Wr : Weather (bc: 25-75% clouded, c: over 75-99% clouded, o: 100% clouded)

Table 3 Gillnet configurations used in the *Oshoro maru* Cruise #168 and #169

Cruise No.	Station	Number of tan for each mesh size (mm)																			Total			
		A-Gear				C-Gear									F-Gear									
		112	115	118	121	48	55	63	72	82	93	106	121	138	157	19	22	25	29	33		37	42	
#168	OSG 0601	6	-	6	-	3	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	1	1	49
	OSG 0602	6	-	6	-	3	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	1	1	49
	OSG 0603	6	-	6	-	3	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	1	1	49
	OSG 0604	6	-	6	-	3	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	1	1	49
	OSG 0605	6	-	6	-	3	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	1	1	49
#169	OSG 0606	-	6	-	6	3	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	1	1	49
	OSG 0607	-	6	-	6	3	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	1	1	49
	OSG 0608	-	6	-	6	3	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	1	1	49
	OSG 0609	-	6	-	6	3	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	1	1	49

Table 4 List of surface longline (OSSL 06XX) and hook-and-line sampling (OSHL 06XX) station during the *Oshoro maru* Cruise #169

Station	Date and Time (S.M.T.)		Set Position		D.S.	No. of hooks	Wr	Wind (Force)	Oceanographic Station No.	Gillnet Station No.
	Line set	Line haul	Lat.	Long.						
OSSL 0601	Jun. 8 0350-0410	Jun. 8 0605-0630	44-30.0N	164-57.2E	045	340	o	NE-3	OS 06101	OSG 0606
OSSL 0602	Jun.10 0350-0400	Jun.10 0648-0700	47-29.2N	164-56.8E	090	204	bc	North-3	OS 06105	OSG0607
OSSL 0603	Jun.11 0347-0408	Jun.11 0616-0635	48-55.2N	165-04.7E	260	340	o	West-5	OS 06107	OSG 0608
OSSL 0604	July 2 0423-0442	July 2 0640-0705	50-05.3N	164-58.1W	155	340	f	SE-6	OS 06176	OSG 0609
OSSL 0605	July 3 1203-1217	July 3 1625-1650	46-59.9N	164-59.7W	350	340	f	SSE-4	OS 06180	-
OSHL 0601	July 3 22:10	July 4 04:30	46-15.0N	165-00.0W	hook-and-line sampling				OS 06181	-
OSSL 0606	July 4 1221-1235	July 4 1652-1720	45-30.3N	165-00.1W	020	340	f	SSE-4	OS 06182	-

S.M.T. : Ship's Mean Time D.S. : Direction in which line was set

Wr : Weather (bc: 25-75% clouded, o: 100% clouded, f: fog)

Table 5-(1) Data on number of organisms caught by drift gillnet during the *Oshoro maru* Cruise # 168

Station		OSG 0601				OSG 0602				OSG 0603						
Common name	Scientific name	Gear				Total	Gear				Total	Gear				Total
		A	C	(%)	F		A	C	(%)	F		A	C	(%)	F	
Sockeye salmon	<i>Oncorhynchus nerka</i>	2	0	-	0	2	0	0	-	0	0	0	0	-	0	0
Chum salmon	<i>Oncorhynchus keta</i>	6	4	(25.0)	0	10	5	5	(4.4)	0	10	9	7	(14.3)	0	16
Pink salmon	<i>Oncorhynchus gorbuscha</i>	7	10	(62.5)	0	17	0	97	(85.1)	0	97	0	37	(75.5)	0	37
Coho salmon	<i>Oncorhynchus kisutch</i>	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
Chinook salmon	<i>Oncorhynchus tshawytscha</i>	0	1	(6.3)	0	1	0	0	-	0	0	0	0	-	0	0
Steelhead	<i>Oncorhynchus mykiss</i>	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
Boreal clubhook squid	<i>Onychoteuthis borealijaponicus</i>	0	0	-	0	0	0	8	(7.0)	0	8	0	2	(4.1)	0	2
Eight-armed squid	<i>Gonatopsis borealis</i>	0	0	-	0	0	0	1	(0.9)	0	1	0	0	-	0	0
Japanese common squid	<i>Todarodes pacificus</i>	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
Neon flying squid	<i>Ommastrephes bartramii</i>	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
Blue shark	<i>Prionace glauca</i>	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
Salmon shark	<i>Lamna ditropis</i>	0	0	-	0	0	0	0	-	0	0	0	1	-	0	1
Japanese anchovy	<i>Engraulis japonicus</i>	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
Pacific saury	<i>Cololabis saira</i>	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
Pacific pomfret	<i>Brama japonica</i>	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
Smalleye squaretail	<i>Tetragonurus cuvieri</i>	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
Ragfish	<i>Icosteus aenigmaticus</i>	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
Ocean sunfish	<i>Mola mola</i>	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
Common Dolphin	<i>Delphinus delphis</i>	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
Laysan Albatross	<i>Diomedea immutabilis</i>	0	0	-	0	0	0	0	-	0	0	0	1	(2.0)	0	1
Short-tailed shearwater	<i>Puffinus tenuirostris</i>	1	1	(6.3)	0	2	0	2	(1.8)	0	2	0	0	-	0	0
Tufted puffin	<i>Fratercula cirrhata</i>	0	0	-	0	0	0	1	(0.9)	0	1	0	1	(2.0)	0	1

(%) indicates % of total numeric catch by C-gear gillnet in each station.

Table 5-(1) Continued.

Station		OSG 0604				OSG 0605					
Common name	Scientific name	Gear				Total	Gear				Total
		A	C	(%)	F		A	C	(%)	F	
Sockeye salmon	<i>Oncorhynchus nerka</i>	0	0	-	0	0	0	0	-	0	0
Chum salmon	<i>Oncorhynchus keta</i>	1	0	-	0	1	1	0	-	0	1
Pink salmon	<i>Oncorhynchus gorbuscha</i>	2	1	(0.9)	0	3	0	0	-	0	0
Coho salmon	<i>Oncorhynchus kisutch</i>	0	0	-	0	0	0	0	-	0	0
Chinook salmon	<i>Oncorhynchus tshawytscha</i>	0	0	-	0	0	0	0	-	0	0
Steelhead	<i>Oncorhynchus mykiss</i>	0	0	-	0	0	0	0	-	0	0
Boreal clubhook squid	<i>Onychoteuthis borealijaponicus</i>	0	40	(37.7)	0	40	0	0	-	1	1
Eight-armed squid	<i>Gonatopsis borealis</i>	0	17	(16.0)	0	17	0	0	-	0	0
Japanese common squid	<i>Todarodes pacificus</i>	0	0	-	1	1	0	0	-	0	0
Neon flying squid	<i>Ommastrephes bartramii</i>	0	0	-	0	0	18	15	(10.7)	0	33
Blue shark	<i>Prionace glauca</i>	0	0	-	0	0	3	0	-	0	3
Salmon shark	<i>Lamna ditropis</i>	1	0	-	0	1	0	0	-	0	0
Japanese anchovy	<i>Engraulis japonicus</i>	0	1	(0.9)	3	4	0	0	-	11	11
Pacific saury	<i>Cololabis saira</i>	0	0	-	208	208	0	0	-	28	28
Pacific pomfret	<i>Brama japonica</i>	9	28	(26.4)	1	38	126	122	(87.1)	0	248
Smalleye squaretail	<i>Tetragonurus cuvieri</i>	0	18	(17.0)	0	18	0	0	-	1	1
Ragfish	<i>Icosteus aenigmaticus</i>	0	1	(0.9)	0	1	0	0	-	0	0
Ocean sunfish	<i>Mola mola</i>	0	0	-	0	0	1	0	-	0	1
Common Dolphin	<i>Delphinus delphis</i>	0	0	-	0	0	0	0	-	0	0
Laysan Albatross	<i>Diomedea immutabilis</i>	0	0	-	0	0	0	0	-	0	0
Short-tailed shearwater	<i>Puffinus tenuirostris</i>	0	0	-	0	0	0	2	(1.4)	0	2
Tufted puffin	<i>Fratercula cirrhata</i>	0	0	-	0	0	0	1	(0.7)	0	1

(%) indicates % of total numeric catch by C-gear gillnet in each station.



Table 5-(2) Data on number of organisms caught by drift gillnet during the *Oshoro maru* Cruise # 169

Station		OSG 0606					OSG 0607					OSG 0608					OSG 0609				
Common name	Scientific name	Gear				Total	Gear				Total	Gear				Total	Gear				Total
		A	C	(%)	F		A	C	(%)	F		A	C	(%)	F		A	C	(%)	F	
Sockeye salmon	<i>Oncorhynchus nerka</i>	4	39	(20.9)	1	44	106	231	(70.0)	8	345	58	52	(45.6)	1	111	40	49	(37.7)	0	89
Chum salmon	<i>Oncorhynchus keta</i>	11	39	(20.9)	0	46	18	22	(6.7)	1	41	85	51	(44.7)	0	136	2	26	(20.0)	0	28
Pink salmon	<i>Oncorhynchus gorbuscha</i>	23	86	(46.0)	0	109	82	72	(21.8)	0	154	4	8	(7.0)	0	12	12	12	(9.2)	0	24
Coho salmon	<i>Oncorhynchus kisutch</i>	10	22	(11.8)	0	32	0	0	-	0	0	0	0	-	0	0	26	29	(22.3)	1	56
Chinook salmon	<i>Oncorhynchus tshawytscha</i>	1	0	-	0	1	0	2	(0.6)	0	2	1	1	-	0	2	2	2	(1.5)	0	4
Steelhead	<i>Oncorhynchus mykiss</i>	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	5	9	(6.9)	0	14
Boreal clubhook squid	<i>Onychoteuthis borealijaponicus</i>	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
Eight-armed squid	<i>Gonatopsis borealis</i>	0	0	-	3	3	0	2	(0.6)	5	7	0	2	(1.8)	1	3	0	3	(2.3)	0	3
Neon flying squid	<i>Ommastrephes bartramii</i>	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
Salmon shark	<i>Lamna ditropis</i>	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
Spiny dogfish	<i>Squalus acanthias</i>	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
Lanternfishes	Myctophidae	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
Longnose lancetfish	<i>Alepisaurus ferrox</i>	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
Pacific saury	<i>Cololabis saira</i>	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
Sticklebacks	Gasterosteidae	0	0	-	5	5	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
Pacific pomfret	<i>Brama japonica</i>	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
Rough pomfret	<i>Taractes asper</i>	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
Pelagic armorhead	<i>Pseudopentaceros richardsoni</i>	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
Smalleye squaretail	<i>Tetragonurus cuvieri</i>	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
Northern Fulmar	<i>Fulmarus glacialis</i>	0	0	-	0	0	0	0	-	0	0	0	1	(0.9)	0	1	0	0	-	0	0
Short-tailed shearwater	<i>Puffinus tenuirostris</i>	0	0	-	0	0	0	1	(0.3)	0	1	1	0	-	0	1	0	0	-	0	0
Tufted puffin	<i>Fratercula cirrhata</i>	1	1	(0.5)	0	2	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0

(%) indicates % of total numeric catch by C-gear gillnet in each station.

Table 6 Data on number of fishes caught by surface longline and hook-and-line sampling during the *Oshoro maru* Cruise # 169

Station		OSSL 0601	OSSL 0602	OSSL 0603	OSSL 0604	OSSL 0605	OSHL 0601	OSSL 0606	Total
Common name	Scientific name								
Sockeye salmon	<i>Oncorhynchus nerka</i>	0	0	2	2	0	0	0	4
Chum salmon	<i>Oncorhynchus keta</i>	0	0	2	1	0	1	0	4
Pink salmon	<i>Oncorhynchus gorbuscha</i>	1	1	0	1	4	16	0	23
Coho salmon	<i>Oncorhynchus kisutch</i>	5	0	0	4	7	3	7	26
Steelhead	<i>Oncorhynchus mykiss</i>	0	0	0	0	1	2	0	3
Pacific pomfret	<i>Brama japonica</i>	0	0	0	0	13	0	108	121
Pelagic armorhead	<i>Pseudopentaceros richardsoni</i>	0	0	0	0	0	0	3	3

Table 7 Data on salmonids lacking an adipose fin during the *Oshoro maru* Cruise #168 and #169

Station	Species	Fork Length (mm)	Body Weight (g)	Sex	Gonad Weight (g)
OSG 0609	Steelhead	530	1515	M	3
OSG 0609	Steelhead	741	4744	F	48
OSG 0609	Steelhead	567	1833	M	1
OSG 0609	Steelhead	500	1245	M	1

Station: Details are shown in Table 2.

Sex - "F": Female Sex - "M": Male