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# Results of 2004 Salmon Research Cruise of the *Oshoro maru*

by

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## ABSTRACT

In order to elucidate the distribution and abundance of pelagic nekton, gillnet surveys and oceanographic observations were conducted along 155° E, 165° E, and 165° W in the northern North Pacific Ocean. Each survey was conducted in Cruise #146 (mid-May along 155° E), Cruise #147 (early-June along 155° E), and Cruise #148 (early-July along 165° E and mid-July along 165° W), 2004.

Along 155° E in mid-May in 2004, the Polar Front and the Subarctic Boundary occurred near 43.2° N and 38.4° N. In early-June, the Polar Front and the Subarctic Boundary occurred near 43.5° N and 38° N. The geographic position of the Subarctic Boundary was in the south of 2003. The sea surface temperatures in the Transition Domain were 1-2°C higher than in 2003.

Along 165° E (early-July), the Polar Front occurred near 45.5° N and the sea surface temperatures were 1°C colder than in 2003.

Along 165° W (mid-July), the vertical 4°C isotherm which indicates the Polar Front occurred near 200m, did not reach 100m depth. The sea surface temperatures in 2004 (mid-July) were 2-3°C colder than in 2003 (late-July).

Gillnet survey was conducted at 14 stations. A total of 1,459 salmonids was caught by gillnet surveys, including 149 sockeye salmon (*Oncorhynchus nerka*), 474 chum (*O. keta*), 567 pink (*O. gorbuscha*), 224 coho (*O. kisutch*), 20 chinook (*O. tshawytscha*) and, 25 steelhead trout (*O. mykiss*).

In mid-May along 155° E, chum salmon abundance was high at 41° N in the Transition Domain and more abundant than in 2003. Japanese anchovy (*Engraulis japonicus*) abundance was very high at 36.5° N. In early-June along 155° E, the most dominant was pink salmon (74.0%). But the abundance of pink salmon was much lower than in 2003. Pacific saury (*Cololabis saira*) abundance was high at 39.5° N.

Along 155° E, the mean sizes of fork length of pink salmon were longer in 2004 than in 2003. Then the proportions of males were higher in 2004 than 2003.

Along 165° W in 2003 (late-July), salmonids were collected only at 50° N, sockeye and chum salmon were abundant, pink salmon was not collected. In 2004 (mid-July), a total of 149 sockeye, 275 chum, 244 pink, 244 coho, 17 chinook salmon, and 25 steelhead trout were collected. The fork length frequency of sockeye salmon was bimodal with peaks at 375mm and 465mm. These two peaks are thought to be composed of ocean age .1 fish and ocean age .2 fish, respectively. The almost of sockeye salmon was caught in 2003 (late-July) was ocean age .2 fish. Pacific saury abundance was high at 42.5° N and 41° N. Pacific pomfret (*Brama japonica*) was abundant and widely distributed between 49° N and 41° N.

## INTRODUCTION

The *Oshoro maru* and the *Hokusei maru* have 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. Data collected by the *Oshoro maru* and the *Hokusei maru* have been published annually since 1957 (Hokkaido University, 1957-2004).

Since 1978, several transects have been repeatedly sampled to study long-term changes in the North Pacific Ocean ecosystem. These transects include 180°, 165° W, 145° W by the *Oshoro maru* and 155° E, 170° E, 175° 30'E by the *Hokusei maru*.

The *Hokusei maru* was decommissioned in March 2002, so our salmon research cruises in the North Pacific Ocean are conducted by three cruises of the *Oshoro Maru* since 2002.

In 2004, the cruises have sampled along 155° E from 36.5° N to 44° N since 1982, along 165° W from 41° N to 51° N since 1998 and along 165° E from 40° N to 47° N since 2003. 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 2004 research cruises of the *Oshoro maru* in the North Pacific Ocean.

## METHODS

### 1. Survey Area and Cruise Schedule

Oceanographic, gillnet, and surface long-line research were conducted along the 155° E, 165° E and 165° W in the northern North Pacific Ocean during three cruises: #146 (8-21 May), #147 (1-14 June), and #148 (25 June - 23 Aug.). (Fig. 1)

### 2. Oceanographic Observation

Oceanographic stations were occupied from 36.5° N to 44° N along 155° E in Cruise #146 and #147. In Cruise #148, oceanographic stations were occupied from 41° N to 47° N along 165° E and from 41° N to 51° N along 165° W ( Table 1).

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

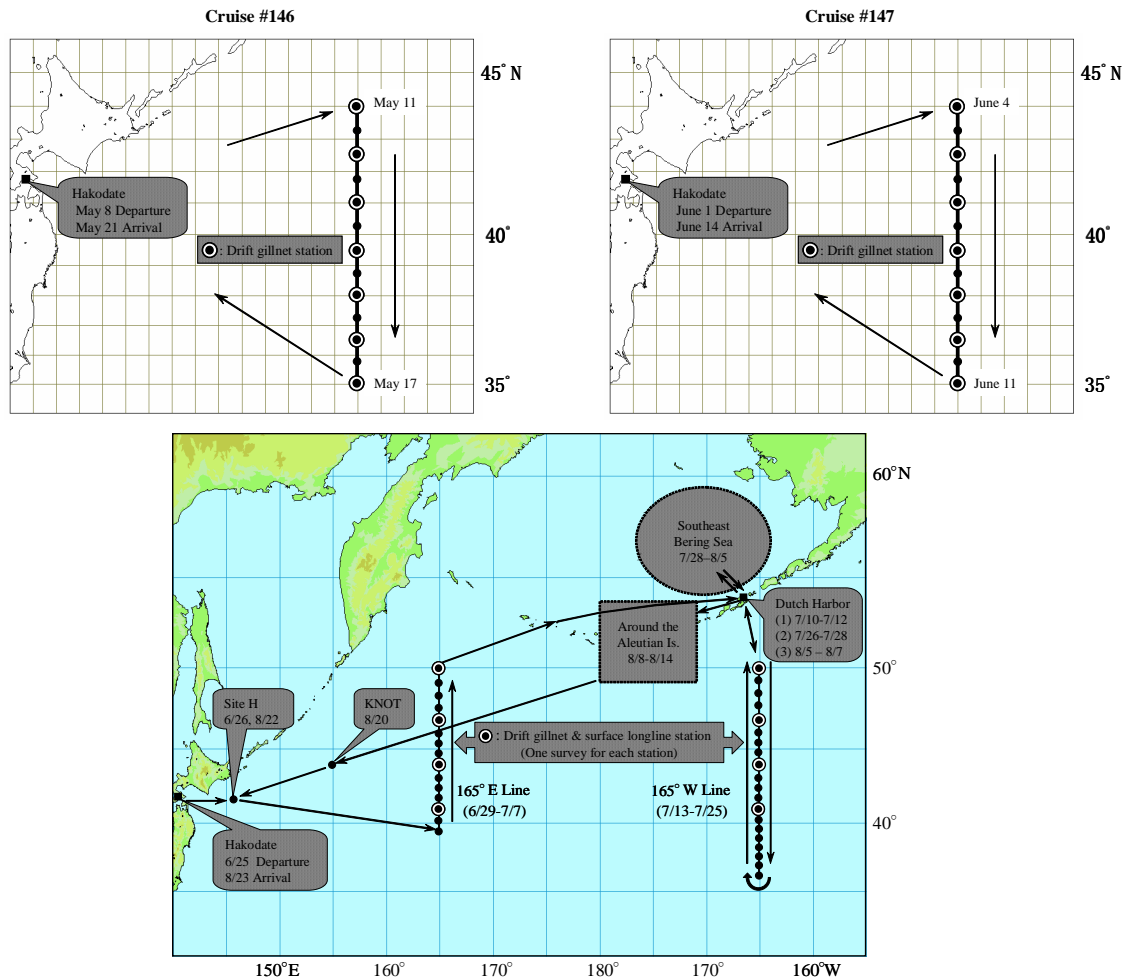


Fig. 1. Cruises plan of the *Oshoro maru* (#146), (#147) in the western North Pacific, and (#148) in the North Pacific in 2004.

### 3. Drift Gillnet Sampling

A drift gillnet was used to catch salmonids and the other organisms at 14 stations (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.

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. Surface Longline Sampling and Tagging**

Three surface longline samplings were operated to tag and release viable salmonids along 165° E and 165° W in Cruise #148 (Table 4). Ten hachi (baskets) were used at each station.

One hachi; mainline: 127m long; 34 branch lines/hachi; 3m between branch lines;  
Fishing depth: 2m ; Bait: Salted anchovies.

All viable salmonids were double-tagged with FAJ (red and white, 1.6 cm in diameter) and FRI Petersen (red and white, 2.0 cm in diameter) disk tags.

Data on species, length and tag number of each fish were recorded on data forms. The scale collection method and data recorded on length, species and tag number were the same as those in standard methods.

#### **5. Additional Biological Sampling**

At gillnet stations, additional research activities included collection of whole salmon, salmonid stomachs, muscle tissues, and blood samples for studies of food habits, growth, stock identification, and female-specific serum proteins.

## **RESULTS AND DISCUSSION**

Final oceanographic data and biological data collected during the cruises will be published in the “*DATA RECORDE OF OCEANOGRAPHIC OBSERVATIONS AND EXPLORATORY FISHING NO. 48*” of Hokkaido University no later than March 2005.

The data of 2004 was compared with data of 2003 (Meguro et al., 2004).

### **1. Oceanographic Conditions**

Temperature and salinity sections (0-800db) are shown in Figure 2.

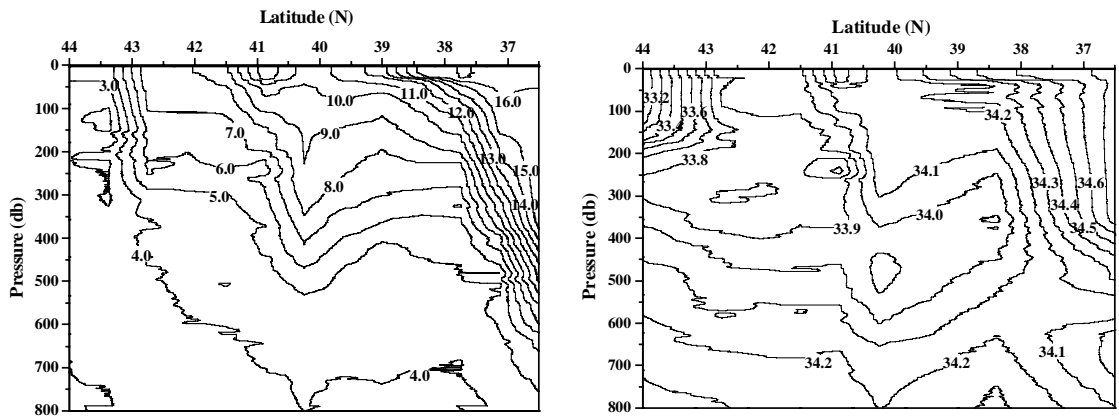
The geographic positions of the Polar Front and the Subarctic Boundary (Dodimead et al., 1963, Favorite et al., 1976, Roden, 1991) were as follows.

[155° E line ]

In mid-May, the Polar Front which is indicated by the vertical 4°C isotherm at 100m depth occurred near 43.2° N and the Subarctic Boundary that is indicated by the vertical 34.0 psu isohaline occurred near 38.4° N. In early-June, the Polar Front and the Subarctic Boundary

occurred near 43.5° N and 38° N. The geographic position of the Subarctic Boundary in 2004 was in the south in 2003. The sea surface temperatures north of 38° N in early-June were 1-2°C higher than in mid-May, then the thermocline appeared between 30-50db north of 38° N. The sea surface temperatures in 2004 were 1-2°C higher than in 2003 in the Transition Domain. [165° E line ]

**Cruise #146: 155° E, May**



**Cruise #147: 155° E, June**

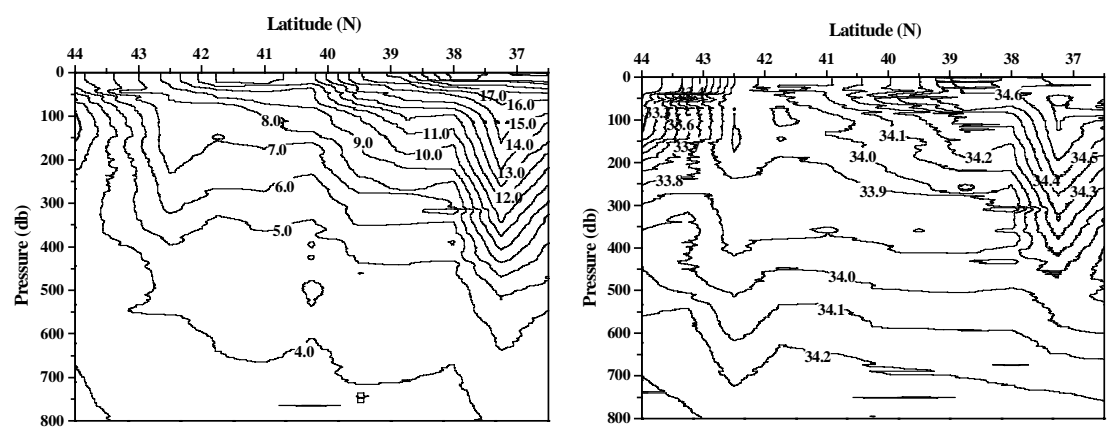
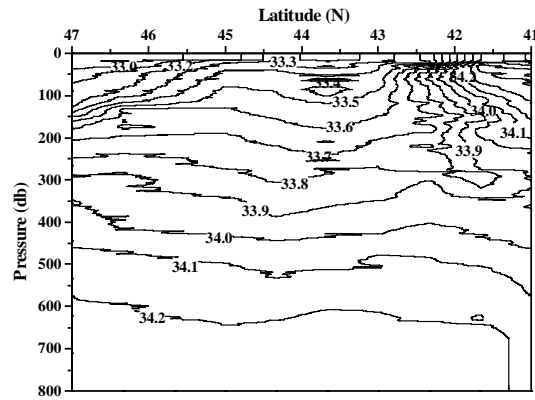
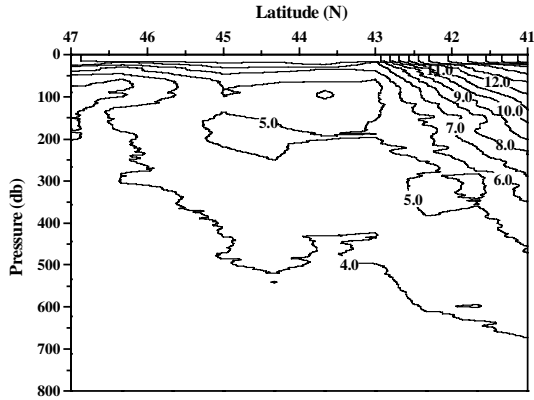


Fig.2-1 Temperature and salinity from surface to 800db pressure along the 155° E transect in the *Oshoro maru* Cruise #146 and #147, 2004.

**Cruise #148: 165° E, Early July**



**Cruise #148: 165° W, Mid July**

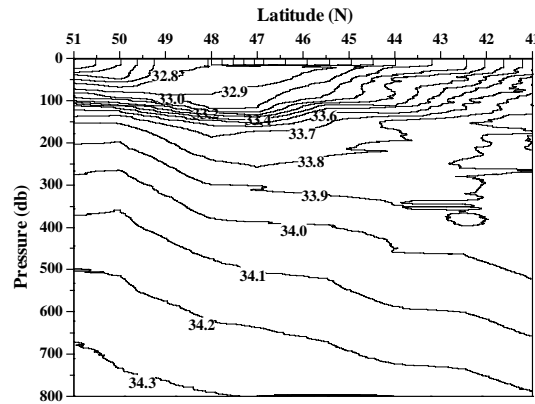
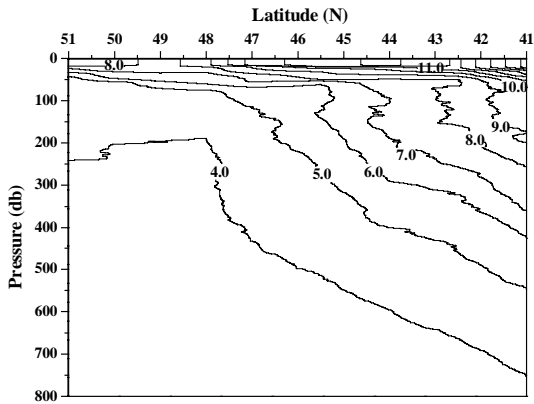


Fig.2-2 Temperature and salinity from surface to 800db pressure along the 165° E and 165° W transect in the *Oshoro maru* Cruise #148, 2004.

The Polar Front occurred near 45.5° N. The sea surface temperatures in 2004 were 1°C colder than in 2003. The thermocline was distributed 30-50db north of 41° N .

[165° W line]

The vertical 4°C isotherm which indicates the Polar Front occurred near 200m, did not reach 100m depth. The sea surface temperatures in 2004 (mid-July) were 2-3°C colder than in 2003 (late-July). The thermocline was distributed 30-50db north of 41° N .

## **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 #146), 5-(2) (Cruise #147), and 5-(3) (Cruise #148).

[155° E line : mid-May]

A total of 129 chum (*Oncorhynchus keta*) and 115 pink salmon (*O.gorbuscha*) were collected. Chum salmon abundance was high at 41° N(N=126) then chum salmon was more abundant than in 2003. As for dominant non-salmonids species, neon flying squid (*Ommastrephes bartramii*, N=47), pacific saury (*Cololabis saira*, N=54) were collected at 36.5° N. Pacific pomfret (*Brama japonica*) was collected at 41° N (N=38). Japanese anchovy (*Engraulis japonicus*, N=5376) abundance was very high at 36.5° N.

[155° E line : early-June]

A total of 70 chum, 208 pink and three chinook salmon (*O. tshawytscha*) were collected in this cruise. The abundance of pink salmon was much lower in 2004 than in 2003. As for dominant non-salmonids species, neon flying squid (N=131) was collected at 39.5° N and 36.5° N. Pacific saury (N=1684) abundance was high at 39.5° N(N=1414). Japanese anchovy (N=29) abundance was low.

[165° E line : early-July]

Along 165° E in Cruise #148, the drift gillnet survey was conducted only one time at 41.5° N. Salmonids were not collected. As for dominant non-salmonids species, a total of 185 neon flying squid, 331 pacific saury, 193 pacific pomfret, and ten blue shark (*Prionace glauca*).

[165° W line : mid-July]

A total of 149 sockeye, 275 chum, 244 pink, 244 coho salmon (*Oncorhynchus kisutch*), 17 chinook salmon, and 25 steelhead trout (*Oncorhynchus mykiss*) were collected in this research line. Pink salmon was not collected in 2003. As for dominant non-salmonids species, neon flying squid (N=63) was collected at 42.5° N and 41° N, also pacific saury (N=1805) abundance was high at 42.5° N and 41° N. Pacific pomfret (N=479) was widely distributed between 49° N and 41° N. 75 blue shark was collected at 41° N.

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

Fork length frequency of salmonids were caught by C-gear gillnet at each longitude line in Cruise #146, #147, and #148 are shown in Figure 3.

[Sockeye salmon]

Along 165° W, the fork length frequency was bimodal with peaks at 375mm and 465mm. These two peaks are thought to be composed of ocean age .1 fish and ocean age .2 fish,



respectively. The almost of sockeye salmon was caught in 2003 (late-July) was ocean age .2 fish.

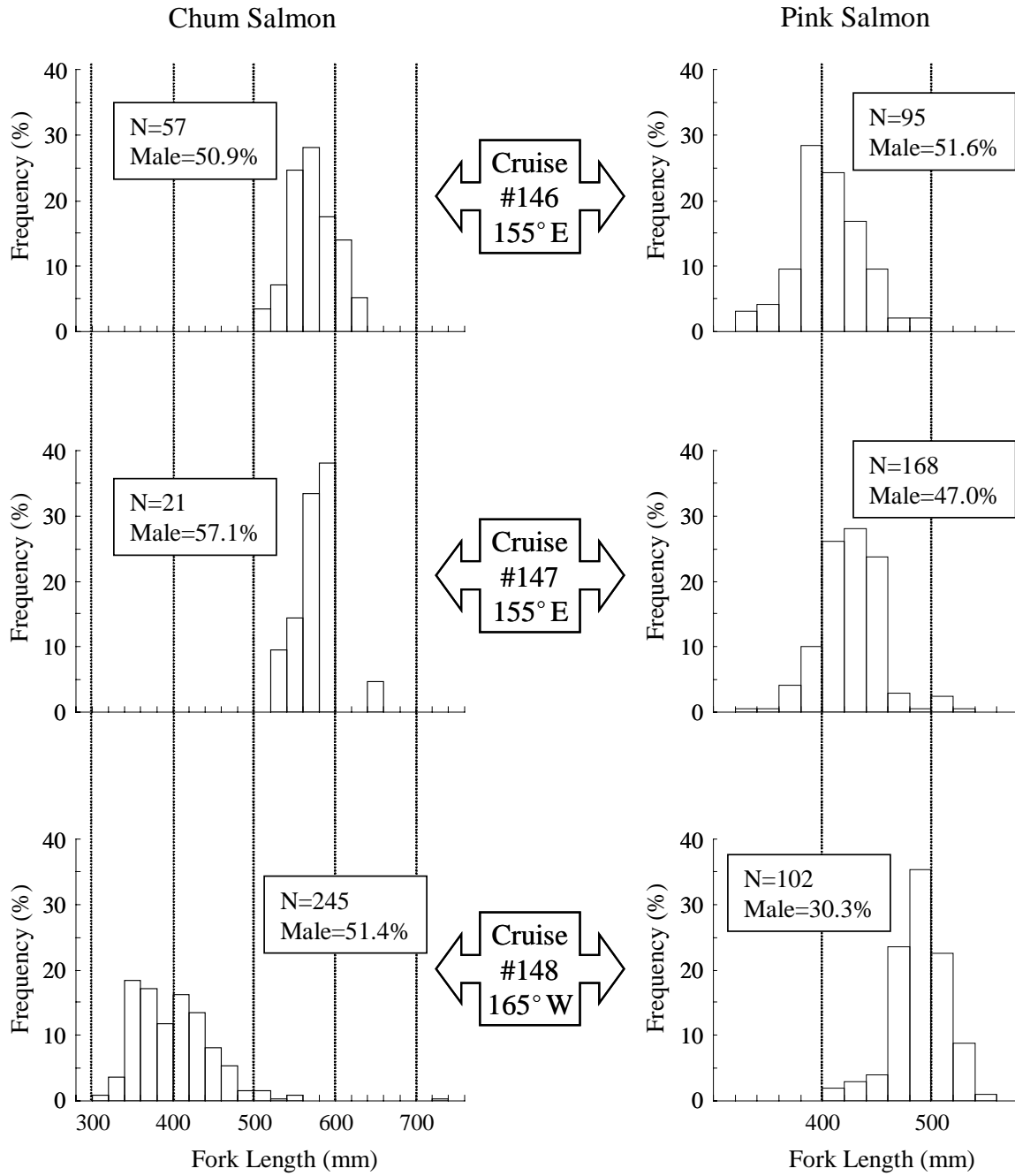


Fig. 3 Fork length frequency and male ratio of chum and pink salmon caught by C-gear gillnet at each longitude line in the *Oshoro Maru* Cruise #146, #147, and #148.

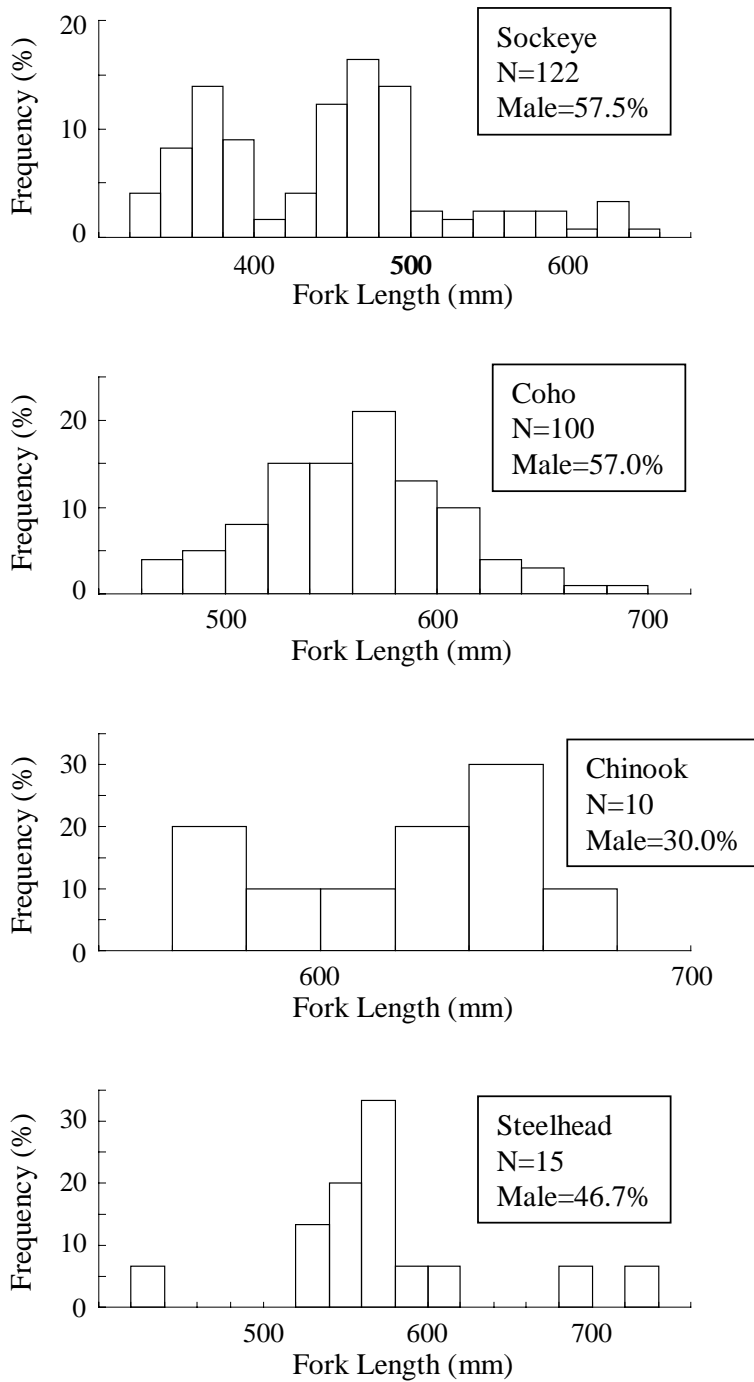


Fig. 4 Fork length frequency and male ratio of sockeye, coho, chinook, and steelhead salmon caught by C-gear gillnet at 165°W line in the *Oshoro Maru* Cruise #148.

[Coho salmon]

Fork length frequency distributions and the proportions of males were as follows:

165° W: mean ± STD =563.0±44.7mm, mode=570mm F.L. male=57%.

[Chinook salmon]

Fork length frequency distributions and the proportions of males were as follows:

165° W: mean ± STD =626.1±31.4mm, mode=650mm F.L. male=30%.

[Steelhead trout]

Fork length frequency distributions and the proportions of males were as follows:

165° W: mean ± STD =573.4±66.1mm, mode=570mm F.L. male=47%.

[Chum salmon]

Fork length frequency distributions and the proportions of males were as follows:

155° E (mid-May): mean ± STD =574.0±29.5mm, mode=570mm F.L. male=51%.

155° E (early-June): mean ± STD =580.1±25.6mm, mode=590mm F.L. male=57%.

165° W(mid-July): mean ± STD =403.1±49.8mm, mode=350mm, 410mm F.L. male=51%.

[Pink salmon]

Fork length frequency distributions and the proportions of males were as follows:

155° E (mid-May): mean ± STD =407.6±32.0mm, mode=390mm F.L. male=52%.

155° E (early-June): mean ± STD =427.1±28.6mm, mode=430mm F.L. male=47%.

165° W(mid-July): mean ± STD =490.1±24.6mm, mode=490mm F.L. male=30%.

Along 155° E, the mean sizes of fork length were longer in 2004 than in 2003. Then the proportions of males were higher in 2004 than 2003.

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

Due to the poor condition of the long-line-caught samples, none were tagged during the cruise.

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

Snouts were collected from 4 steelhead lacking adipose fins for coded-wire tag detection (Table 6).

### **ACKNOWLEDGMENTS**

The *Oshoro Maru* belongs to the Ministry of Education, Science, Sports and Culture, National University Corporation of Japan, and is a training vessel for students and fisheries technicians. 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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Table 1. List of oceanographic stations along the 155° E , 165° E and 165° W

Cruise #146

Station	Lat.	Long.	Date	S.M.T. *1	T.D. *2	Remark
OS04050	44-00	155-00E	5/11	1450	+10	CTD
OS04051	43-15	155-00E	5/12	0614	+10	XBT
OS04052	42-30	155-00E	5/12	1415	+10	CTD
OS04053	41-45	155-00E	5/13	1000	+10	CTD
OS04054	41-00	155-00E	5/13	2250	+10	CTD
OS04055	40-15	155-00E	5/14	1000	+10	CTD
OS04056	39-30	154-56E	5/14	1905	+10	CTD
OS04057	39-00	155-00E	5/15	2315	+10	XBT
OS04058	38-30	155-00E	5/16	220	+10	XBT
OS04059	38-00	155-00E	5/16	500	+10	XCTD
OS04060	37-30	155-00E	5/16	755	+10	XBT
OS04061	37-00	155-00E	5/16	1035	+10	XBT
OS04062	36-30	155-00E	5/16	1325	+10	CTD

Cruise #147

Station	Lat.	Long.	Date	S.M.T. *1	T.D. *2	Remark
OS04066	44-00	155-00E	6/4	1300	+10	CTD
OS04067	43-15	155-00E	6/5	0940	+10	CTD
OS04068	42-30	155-00E	6/5	1510	+10	CTD
OS04069	41-45	155-00E	6/6	0915	+10	CTD
OS04070	41-00	155-00E	6/6	1452	+10	CTD
OS04071	40-15	155-00E	6/7	0857	+10	CTD
OS04072	39-30	155-00E	6/7	1410	+10	CTD
OS04073	38-45	155-00E	6/8	0855	+10	CTD
OS04074	38-00	155-00E	6/8	1418	+10	CTD
OS04075	37-15	155-00E	6/9	0230	+10	CTD
OS04076	36-30	155-00E	6/9	1300	+10	CTD

\*1: S.M.T.= Ship's Mean Time

\*2: T.D.= Time Difference between G.M.T. and Ship Time

Table 2 Position and research conditions of drift gillnet at each station in the *Oshoro maru* Cruise #146, #147, and #148

Cruise #146												
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 0401	May 12	1756-1825	May 13	0435-0535	+10:00	42-32.6	155-03.0	130	5260	c	SW-4	OS 0462
OSG 0402	13	1755-1818	14	0426-0536	+10:00	41-00.2	155-01.0	20	5500	o	South-4	OS 0454
OSG 0403	16	1752-1818	17	0438-0609	+10:00	36-30.1	155-00.7	30	5697	o	SSW-7	OS 0452

Cruise #147												
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 0404	June 4	1746-1812	June 5	0420-0515	+10:00	43-59.9	154-59.7	205	5330	f	calm	OS 0466
OSG 0405	5	1747-1809	6	0435-0535	+10:00	42-30.6	155-00.0	20	5155	bc	SSW-5	OS 0468
OSG 0406	6	1747-1807	7	0425-0515	+10:00	41-00.4	155-00.1	40	5500	f	SSW-2	OS 0470
OSG 0407	7	1748-1810	8	0420-0550	+10:00	39-29.9	155-01.2	30	5600	o	SSE-5	OS 0472
OSG 0408	9	1748-1809	10	0420-0530	+10:00	36-30.0	154-59.6	50	5684	d	SSE-3	OS 0476

Cruise #148												
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.	Long.					
OSG 0409	June 30	1754-1819	July 1	0452-0607	+11:00	41-37.0	165-00.5E	10	5293	o	North-3	OS 04080
OSG 0410	July 13	1755-1826	14	0427-0533	-11:00	49-59.9	165-00.0W	210	5014	o	West-3	OS 04103
OSG 0411	14	1748-1815	15	0355-0515	-11:00	48-59.7	165-00.1W	225	5110	r	SE-6	OS 04104
OSG 0412	15	1750-1812	16	0415-0515	-11:00	48-00.0	164-59.9W	40	5124	o	SSW-4	OS 04105
OSG 0413	19	1752-1815	20	0423-0530	-11:00	42-29.4	164-00.2W	190	5793	o	North-4	OS 04109
OSG 0414	20	1750-1813	21	0445-0612	-11:00	40-59.9	164-59.8W	200	5279	o	NW-3	OS 04111

T.D. : Time Difference between G.M.T. and S.M.T.    D.S. : Direction in which net was set  
 Wr. : Weather (b: 0-25% clouded, bc: 25-75% clouded, c: over 75%-99% clouded, o:100% clouded, f: fog, r: rain)

Table 3 Gillnet configurations used in the *Oshoro maru* Cruise #135, #136, and #137.

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
#146	OSG 0401	6	-	6	-	3	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	1	49
	OSG 0402	6	-	6	-	3	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	1	49
	OSG 0403	6	-	6	-	3	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	1	49
#147	OSG 0404	6	-	6	-	3	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	1	49
	OSG 0405	6	-	6	-	3	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	1	49
	OSG 0406	6	-	6	-	3	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	1	49
	OSG 0407	0	-	6	-	3	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	1	43
	OSG 0408	6	-	6	-	3	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	1	49
#148	OSG 0409	-	4	2	6	3	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	1	49
	OSG 0410	-	4	2	6	3	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	1	49
	OSG 0411	-	4	2	6	3	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	1	49
	OSG 0412	-	4	2	6	3	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	1	49
	OSG 0413	-	4	2	6	3	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	1	49
	OSG 0414	-	4	2	6	3	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	1	49

Table 4 List of surface longline station during the *Oshoro maru* Cruise #148

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 0401	July 1	0352-0409	July 1	0627-0647	41-03.7	164-54.8E	010	340	o	North-3	OS04080	OSG 0409
OSSL 0402	14	0350-0410	14	0555-0615	49-54.6	164-56.5W	270	340	c	West-3	OS04103	OSG0410
OSSL 0403	20	0347-0402	20	0558-0616	42-28.4	165-00.8W	000	340	o	North-4	OS04109	OSG0413

D.S. : Direction of Set toward      Wr. : Weather (o: 100% clouded, r: rain)

Table 5-(1) Data on number of organisms caught by drift gillnet during the *Oshoro maru* Cruise # 146

Station		OSG 0401					OSG 0402					OSG 0403					
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>	0	0	-	0	0	0	0	-	0	0	0	0	0	-	0	0
Chum salmon	<i>Oncorhynchus keta</i>	2	1	(1.8)	0	3	70	56	(45.2)	0	126	0	0	-	0	0	
Pink salmon	<i>Oncorhynchus gorbuscha</i>	3	49	(89.1)	0	52	5	57	(46.0)	1	63	0	0	-	0	0	
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	0	-	0	0	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	4	(7.3)	0	4	0	11	(8.9)	0	11	0	0	-	0	0	
Neon flying squid	<i>Ommastrephes bartramii</i>	0	0	-	0	0	0	0	-	0	0	6	41	(58.6)	0	47	
Japanese anchovy	<i>Engraulis japonicus</i>	0	0	-	0	0	0	0	-	0	0	0	0	-	5376	5376	
Lanternfishes	Myctophidae	0	0	-	3	3	0	0	-	38	38	0	0	-	0	0	
Pacific saury	<i>Cololabis saira</i>	0	0	-	0	0	0	0	-	0	0	0	0	-	54	54	
Yellowtail amberjack	<i>Seriola lalandi</i>	0	0	-	0	0	0	0	-	0	0	1	0	-	0	1	
Pacific pomfret	<i>Brama japonica</i>	0	0	-	0	0	0	0	-	0	0	6	29	(41.4)	0	35	
Kittlitz's Murrelet	<i>Brachyramphus brevirostris</i>	0	1	(1.8)	0	1	0	0	-	0	0	0	0	-	0	0	
Short-tailed Shearwater	<i>Puffinus tenuirostris</i>	0	0	-	0	0	1	0	(0.0)	0	1	0	0	-	0	0	

(%) 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 # 147

Common name	Scientific name	Station		OSG 0404					OSG 0405					OSG 0406				
		Gear				Total	Gear				Total	Gear				Total		
		A	C	(%)	F		A	C	(%)	F		A	C	(%)	F			
Sockeye salmon	<i>Oncorhynchus nerka</i>	0	0	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chum salmon	<i>Oncorhynchus keta</i>	34	13	(11.5)	0	47	15	7	(6.3)	0	22	0	0	-	0	0	0	
Pink salmon	<i>Oncorhynchus gorbuscha</i>	2	100	(88.5)	0	102	15	77	(69.4)	0	92	7	7	(3.9)	0	14	0	
Coho salmon	<i>Oncorhynchus kisutch</i>	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	
Chinook salmon	<i>Oncorhynchus tshawytscha</i>	0	0	-	0	0	2	1	(0.9)	0	3	0	0	-	0	0	0	
Steelhead	<i>Oncorhynchus mykiss</i>	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	
Boreal clubhook squid	<i>Onychoteuthis borealijaponicus</i>	0	0	-	0	0	0	6	(5.4)	0	6	0	0	-	0	0	0	
Eight-armed squid	<i>Gonatopsis borealis</i>	0	0	-	1	1	0	0	-	0	0	0	57	(31.8)	0	57	0	
Japanese common squid	<i>Todarodes pacificus</i>	0	0	-	0	0	0	0	-	0	0	0	0	-	4	4	0	
Neon flying squid	<i>Ommastrephes bartramii</i>	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	
Blue shark	<i>Prionace glauca</i>	0	0	-	0	0	1	0	-	0	1	0	0	-	0	0	0	
Japanese anchovy	<i>Engraulis japonicus</i>	0	0	-	0	0	0	0	-	0	0	0	0	-	1	1	0	
Longnose lancetfish	<i>Alepisaurus ferox</i>	0	0	-	1	1	0	0	-	0	0	0	0	-	0	0	0	
Lanternfishes	Myctophidae	0	0	-	1	1	0	0	-	32	32	0	0	-	3	3	0	
Pacific saury	<i>Cololabis saira</i>	0	0	-	0	0	0	0	-	0	0	0	19	(10.6)	29	48	0	
Flyingfishes	Exocoetidae	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	
Pilotfish	<i>Naucrates ductor</i>	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	
Yellowtail amberjack	<i>Seriola lalandi</i>	0	0	-	0	0	0	0	-	0	0	0	2	(1.1)	0	2	0	
Pacific pomfret	<i>Brama japonica</i>	0	0	-	0	0	1	20	(18.0)	2	23	7	44	(24.6)	5	56	0	
Ragfish	<i>Icosteus aenigmaticus</i>	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	
Barracudas	Sphyraenidae	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	
Snake mackerel	<i>Gempylus serpens</i>	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	
Pacific mackerel	<i>Scomber japonicus</i>	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	
Albacore	<i>Thunnus alalunga</i>	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	
Japanese butterfish	<i>Hyperoglyphe japonica</i>	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	50	(27.9)	0	50	0	
Common Dolphin	<i>Delphinus delphis</i>	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	
Short-tailed shearwater	<i>Puffinus tenuirostris</i>	0	0	-	0	0	2	0	-	0	2	0	0	-	0	0	0	

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



Table 5-(2) Continued.

Station		OSG 0407					OSG 0408				
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>	0	1	(0.4)	0	1	0	0	-	0	0
Pink salmon	<i>Oncorhynchus gorbusha</i>	0	0	-	0	0	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	5	(2.1)	7	12	0	0	-	1	1
Eight-armed squid	<i>Gonatopsis borealis</i>	0	0	-	0	0	0	0	-	0	0
Japanese common squid	<i>Todarodes pacificus</i>	0	0	-	0	0	0	0	-	0	0
Neon flying squid	<i>Ommastrephes bartramii</i>	43	55	(23.1)	0	98	1	30	(21.3)	2	33
Blue shark	<i>Prionace glauca</i>	0	1	(0.4)	0	1	4	14	(9.9)	0	18
Japanese anchovy	<i>Engraulis japonicus</i>	0	0	-	3	3	0	0	-	28	28
Longnose lancetfish	<i>Alepisaurus ferox</i>	0	0	-	0	0	0	0	-	0	0
Lanternfishes	Myctophidae	0	0	-	11	11	0	0	-	1	1
Pacific saury	<i>Cololabis saira</i>	0	5	(2.1)	1409	1414	0	2	(1.4)	220	222
Flyingfishes	Exocoetidae	0	0	-	0	0	0	5	(3.5)	0	5
Pilchard	<i>Naucrates ductor</i>	0	0	-	0	0	0	1	(0.7)	0	1
Yellowtail amberjack	<i>Seriola lalandi</i>	0	0	-	0	0	0	0	-	0	0
Pacific pomfret	<i>Brama japonica</i>	34	156	(65.5)	3	193	13	80	(56.7)	5	98
Ragfish	<i>Icosteus aenigmaticus</i>	1	1	(0.4)	0	2	0	0	-	0	0
Baracudas	Sphyraenidae	0	0	-	0	0	0	0	-	5	5
Snake mackerel	<i>Gempylus serpens</i>	0	1	(0.4)	0	1	0	0	-	0	0
Pacific mackerel	<i>Scomber japonicus</i>	0	0	-	0	0	0	0	-	8	8
Albacore	<i>Thunnus alalunga</i>	0	0	-	0	0	0	2	(1.4)	0	2
Japanese butterfish	<i>Hyperoglyphe japonica</i>	0	0	-	0	0	0	7	(5.0)	1	8
Smalleye squaretail	<i>Tetragonurus cuvieri</i>	0	13	(5.5)	0	13	0	0	-	0	0
Common Dolphin	<i>Delphinus delphis</i>	0	0	-	0	0	1	0	-	0	1
Short-tailed shearwater	<i>Puffinus tenuirostris</i>	0	0	-	0	0	0	0	-	0	0

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

Table 5-(3) Data on number of organisms caught by drift gillnet during the *Oshoro maru* Cruise # 148

Common name	Scientific name	Station					OSG 0409					OSG 0410					OSG 0411				
		Gear				Total	Gear				Total	Gear				Total					
		A	C	(%)	F		A	C	(%)	F		A	C	(%)	F						
Sockeye salmon	<i>Oncorhynchus nerka</i>	0	0	-	0	0	13	96	(40.0)	1	110	3	23	(11.2)	0	26					
Chum salmon	<i>Oncorhynchus keta</i>	0	0	-	0	0	4	62	(25.8)	0	66	2	89	(43.4)	0	91					
Pink salmon	<i>Oncorhynchus gorbusha</i>	0	0	-	0	0	28	23	(9.6)	0	51	34	28	(13.7)	0	62					
Coho salmon	<i>Oncorhynchus kisutch</i>	0	0	-	0	0	26	26	(10.8)	2	54	56	31	(15.1)	0	87					
Chinook salmon	<i>Oncorhynchus tshawytscha</i>	0	0	-	0	0	2	7	(2.9)	0	9	4	3	(1.5)	0	7					
Steelhead	<i>Oncorhynchus mykiss</i>	0	0	-	0	0	2	8	(3.3)	0	10	5	4	(2.0)	0	9					
Boreal clubhook squid	<i>Onychoteuthis borealijaponicus</i>	0	2	(0.9)	7	9	0	0	-	0	0	0	1	(0.5)	0	1					
Eight-armed squid	<i>Gonatopsis borealis</i>	0	0	-	0	0	0	18	(7.5)	2	20	0	15	(7.3)	6	21					
Neon flying squid	<i>Ommastrephes bartramii</i>	112	73	(33.5)	0	185	0	0	-	0	0	0	0	-	0	0					
Blue shark	<i>Prionace glauca</i>	3	7	(3.2)	0	10	0	0	-	0	0	0	0	-	0	0					
Salmon shark	<i>Lamna ditropis</i>	1	2	(0.9)	0	3	0	0	-	0	0	0	0	-	0	0					
Japanese anchovy	<i>Engraulis japonicus</i>	0	1	(0.5)	52	53	0	0	-	0	0	0	0	-	0	0					
Waryfishes	Notosudidae	0	0	-	0	0	0	0	-	0	0	0	0	-	1	1					
Lanternfishes	Myctophidae	0	0	-	8	8	0	0	-	0	0	0	0	-	0	0					
Pacific saury	<i>Cololabis saira</i>	0	4	(1.8)	327	331	0	0	-	0	0	0	0	-	0	0					
Skilfish	<i>Erilepis zonifer</i>	0	0	-	0	0	0	0	-	0	0	1	0	-	0	1					
Atka mackerel	<i>Pleurogrammus monopterygius</i>	0	0	-	0	0	0	0	-	1	1	0	0	-	0	0					
Yellowtail amberjack	<i>Seriola lalandi</i>	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0					
Pacific pomfret	<i>Brama japonica</i>	62	127	(58.3)	4	193	0	0	-	0	0	6	11	(5.4)	0	17					
Ragfish	<i>Icosteus aenigmaticus</i>	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0					
Pacific mackerel	<i>Scomber japonicus</i>	0	0	-	12	12	0	0	-	0	0	0	0	-	0	0					
Albacore	<i>Thunnus alalunga</i>	2	0	-	0	2	0	0	-	0	0	0	0	-	0	0					
Japanese butterfish	<i>Hyperoglyphe japonica</i>	0	2	(0.9)	0	2	0	0	-	0	0	0	0	-	0	0					
Sooty Shearwater	<i>Puffinus griseus</i>	3	0	-	0	3	0	0	-	0	0	1	0	-	0	1					
Short-tailed shearwater	<i>Puffinus tenuirostris</i>	1	0	-	0	1	0	0	-	0	0	0	0	-	0	0					

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

Table 5-(3) Continued.

Common name	Scientific name	Station					OSG 0412					OSG 0413					OSG 0414				
		Gear				Total	Gear				Total	Gear				Total					
		A	C	(%)	F		A	C	(%)	F		A	C	(%)	F						
Sockeye salmon	<i>Oncorhynchus nerka</i>	1	12	(3.5)	0	13	0	0	-	0	0	0	0	-	0	0					
Chum salmon	<i>Oncorhynchus keta</i>	3	115	(33.8)	0	118	0	0	-	0	0	0	0	-	0	0					
Pink salmon	<i>Oncorhynchus gorbusha</i>	69	60	(17.6)	2	131	0	0	-	0	0	0	0	-	0	0					
Coho salmon	<i>Oncorhynchus kisutch</i>	36	47	(13.8)	0	83	0	0	-	0	0	0	0	-	0	0					
Chinook salmon	<i>Oncorhynchus tshawytscha</i>	0	1	(0.3)	0	1	0	0	-	0	0	0	0	-	0	0					
Steelhead	<i>Oncorhynchus mykiss</i>	4	2	(0.6)	0	6	0	0	-	0	0	0	0	-	0	0					
Boreal clubhook squid	<i>Onychoteuthis borealijaponicus</i>	0	39	(11.5)	1	40	0	35	(21.9)	30	65	0	7	(1.8)	0	7					
Eight-armed squid	<i>Gonatopsis borealis</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	23	14	(8.8)	0	37	8	18	(4.7)	0	26					
Blue shark	<i>Prionace glauca</i>	0	0	(0.0)	0	0	0	0	-	0	0	23	52	(13.6)	0	75					
Salmon shark	<i>Lamna ditropis</i>	0	0	(0.0)	0	0	0	0	-	0	0	0	0	-	0	0					
Spiny dogfish	<i>Squalus acanthias</i>	1	1	(0.3)	0	2	0	0	-	0	0	0	0	-	0	0					
Japanese anchovy	<i>Engraulis japonicus</i>	0	0	(0.0)	0	0	0	0	-	0	0	0	0	-	0	0					
Waryfishes	Notosudidae	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0					
Lanternfishes	Myctophidae	0	0	-	0	0	0	0	-	2	2	0	0	-	0	0					
Pacific saury	<i>Cololabis saira</i>	0	0	(0.0)	0	0	0	5	(3.1)	675	680	0	0	-	543	543					
Skilfish	<i>Erilepis zonifer</i>	1	0	-	0	1	0	0	-	0	0	0	0	-	0	0					
Atka mackerel	<i>Pleurogrammus monopterygius</i>	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0					
Yellowtail amberjack	<i>Seriola lalandi</i>	0	0	-	0	0	0	0	-	0	0	3	6	(1.6)	0	9					
Pacific pomfret	<i>Brama japonica</i>	39	61	(17.9)	1	101	24	104	(65.0)	4	132	50	297	(77.7)	0	347					
Ragfish	<i>Icosteus aenigmaticus</i>	0	0	-	0	0	0	0	-	0	0	0	1	(0.3)	0	1					
Pacific mackerel	<i>Scomber japonicus</i>	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0					
Albacore	<i>Thunnus alalunga</i>	0	0	-	0	0	0	1	(0.6)	0	1	1	1	(0.3)	0	2					
Japanese butterfish	<i>Hyperoglyphe japonica</i>	0	0	(0.0)	0	0	0	0	-	0	0	0	0	-	0	0					
Sooty Shearwater	<i>Puffinus griseus</i>	5	2	(0.6)	0	7	1	1	(0.6)	0	2	0	0	-	0	0					
Short-tailed shearwater	<i>Puffinus tenuirostris</i>	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 salmonids lacking an adipose fin in the *Oshoro maru* Cruise #146, #147, and #148

Station	Species	Fork Length (mm)	Body Weight (g)	Sex	Gonad Weight (g)
OSG 0410	Steelhead	544	1580	M	15
OSG 0410	Steelhead	528	1400	F	8
OSG 0410	Steelhead	564	1757	F	7
OSG 0411	Steelhead	754	4600	F	45
OSG 0411	Steelhead	612	2420	M	10
OSG 0411	Steelhead	548	1760	M	8
OSG 0411	Steelhead	564	1840	F	12
OSG 0411	Steelhead	568	1860	F	5
OSG 0412	Steelhead	574	1980	M	12

Station: Details are shown in Table 2.

Sex - "F": Female    Sex - "M": Male