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**THE 2001 INTERNATIONAL COOPERATIVE SALMON RESEARCH  
CRUISE OF THE *OSHORO MARU***

by

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## THE 2001 INTERNATIONAL COOPERATIVE SALMON RESEARCH CRUISE OF THE *OSHORO MARU*

### Abstract

Preliminary information is presented on salmon research conducted during the June-July 2001 cruise of the *Oshoro maru* along 145° and 165°W in the North Pacific. This was the eighth consecutive year of cooperative U.S.-Japan sampling for salmon along 145° and the fourth year of sampling along 165°W. The primary objective of this cruise was to continue the collection of oceanographic and biological data. Gillnet research was conducted at 9 stations. Gillnet catches included 2,262 salmonids: 525 along 165°W and 1,737 along 145°W. A salmon longline used to collect specimens for tagging was set at 6 stations along 145°W and caught 54 salmonids. A total of 58 salmonids were tagged, including 47 caught by longline and 11 caught by hook-and-line. All 58 were tagged with common tags (Japanese and U.S.), and 45 that appeared healthy were also tagged with temperature and depth archival data tags. The 58 ragged fish were all released along 145° W in the central Gulf of Alaska. A total 38 fish lacking adipose fins were collected by the gillnet. The Subarctic Boundary occurred at 40°10'N along 165°W. Sea surface temperatures at gillnet stations were 0.5°C warmer than in 2000 along 165°W, and 0.1 -3.5 °C cooler than in 2000 along 145°W. Biological samples and data were collected for various other cooperative studies of salmon distribution, abundance, stock origins, maturity, growth, food habits, bioenergetics and other aspects of ocean biology and ecology. These results will be reported later.

### Introduction

The *Oshoro maru* and *Hokusei maru* have conducted salmon research and studies of the oceanic structure and marine biology in the North Pacific Ocean, Bering Sea and/or Chukchi Sea every summer since 1953. Data collected during these cruises have been published annually (Hokkaido University, 1957-2001).

In 2001, three Japanese ships conducted sampling in the North Pacific: the *Oshoro maru*, the *Wakatake maru* and the *Hokusei maru*. The *Oshoro maru* sampled along 145° and 165°W, the *Wakatake maru* sampled along 180°, and the *Hokusei maru* sampled along 155°E. This paper reports on the salmon research conducted during the *Oshoro maru* cruise.

## Methods

### *Survey Area and Cruise Schedule*

Hydrographic, plankton and salmonid sampling was conducted in the central North Pacific Ocean and the Gulf of Alaska (Fig. 1, Table 1) in international waters. Hydrographic and plankton sampling was also conducted within the U.S. 200-mile zone. A surface longline (B-gear), a C-gear gillnet (nonselective varied research mesh; Takagi, 1975) and an A-gear gillnet (commercial mesh) were used to catch salmonids. Sampling was conducted along 165°W between 35° and 52°40'N, and along 145°W between 50° and 56°N.

The *Oshoro maru* departed Hakodate on 4 June 2001. From 12 to 23 June (Leg 1), oceanographic and salmon researches were conducted northward along 165°W. Three scientists from Hokkaido University and 7 Japanese graduate students conducted this sampling. The vessel made a port call during 25-28 June to Kodiak, Alaska, where 4 scientists participating in the next leg of the cruise boarded. They included 1 scientist from the Fisheries Research Institute (FRI) at the University of Washington, 1 from the Auke Bay Laboratory NMFS/NOAA, 1 from the Institute of Ocean Sciences (Canada), and 1 from the Fisheries Agency of Japan (FAJ). During 29 June – 7 July (Leg 2), salmon and oceanographic researches were conducted southward along 145°W in the central Gulf of Alaska. On 10 July, the *Oshoro Maru* arrived at Seattle, U.S.A., where most of the Gulf of Alaska participants disembarked. On 11 July, the scientists held a seminar at the School of Aquatic and Fishery Science, University of Washington.

### *Oceanographic Sampling*

Oceanographic research included hydrographic (water sampling), plankton and larval-fish sampling (Table 1,A-C). Oceanographic stations were occupied along 165°W at 1-degree (60-nautical-mile) intervals from 35°N to 45°N and 30-mile intervals from 45° to 50° N. Near the Aleutian Islands, oceanographic observations were conducted at intervals of 15-20 miles. Stations were sampled along 145°W at 30-mile intervals from 50° to 56° N. Data collected by CTD, XTD and XBT casts on each transect were used to plot temperature and salinity sections.

### *Gillnet Sampling*

Gillnet sampling was conducted at 9 stations (Table 1D). Gillnet gear was set in the evening, allowed to soak overnight, and retrieved the following morning. As the gillnet was hauled aboard, the catch was sorted into baskets by mesh size and species. Fork length (mm), body weight (g), sex and gonad weight (g) were recorded for fish in each mesh size on biological data forms. The catches by mesh size and species were recorded in an operation book and later entered into computer files.

### *Longline Research, Hook-and-Line Sampling and Tagging*

All viable salmonids caught on longline 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 (Table 1E). Some salmonids were also tagged with data-storage archival tags, which record temperature and depth (Walker et al. 1998). Data on species, length and

tag number of each fish were recorded on data forms. To collect salmonids for tagging, hook-and-line gear was used in addition to the longline. Data-storage tags, and FAJ and FRI disk tags were attached to the dorsal side of each fish just anterior to the dorsal fin. The scale collection method and data recorded on length, species and tag number were the same as those in standard methods.

#### *Fish Lacking Adipose Fins*

By prior arrangement with FAJ, snouts were collected from each salmonid lacking an adipose fin (Table 2C). These snouts were labeled with catch and biological information and frozen. During the Seattle port call, snout samples were sent to the U.S. National Marine Fisheries Service, Auke Bay Laboratory, where they will be examined for coded-wire tags. The FRI will report the release and recovery information on coded-wire tags to the NPAFC.

#### *Scale Sampling*

Scale samples were collected for verification of species identification, and for age, growth and stock origin studies (Tables 1 and 2). Scale samples were collected by *Oshoro maru* personnel from all longline-caught fish and from up to 30 fish of each species caught in each gillnet mesh size at each station. All scales were collected from the International North Pacific Fisheries Commission (INPFC) preferred body area (identified by the letter "A" on data forms; Davis et al. 1990), except in cases where all preferred scale were missing (identified by the letter "C" on data forms) and placed on gummed cards.

#### *Additional Biological Sampling*

At gillnet and longline stations in the Gulf of Alaska, additional research activities by U.S. and Japanese scientists included collection of whole salmon, salmonid stomachs, otoliths, muscle tissue and scales for studies of energetics, food habits, growth, maturity and stock identification (Table 2).

## **Results and Discussion**

Final oceanographic data and biological data on salmonids collected during the cruise will be published by Hokkaido University in the "*Data Record of Oceanographic Observation and Exploratory Fishing, No. 45*" no later than early March 2002.

#### *Oceanographic Conditions*

Temperature and salinity sections are shown in Figure 2 (A; 165°W, B; 145°W). The position of the Subarctic Boundary was determined by where the 34.00-psu vertical isohaline crossed 100-m depth, as defined by Favorite et al. (1976). The Boundary position occurred at 40°10'N along 165°W. Sea surface temperatures at gillnet stations were 0.5°C warmer than in 2000 along 165°W, and 0.1 -3.5 °C cooler than in 2000 along 145°W.

### *Gillnet Catches*

Salmonids sampling was conducted at 9 gillnet stations (Fig. 1, Table 4). Different gillnet configurations were used along the two transects. Salmonids were caught all stations. The total number of salmonids caught were 2,282 (vs. 2,302 in 2000), including 895 sockeye (662 in 2000), 559 pink (515 in 2000), 440 chum (645 in 2000), 218 coho (361 in 2000), 138 steelhead (116 in 2000), and 16 chinook (3 in 2000). Along 165°W (from 48° to 50°N), chum, pink and steelhead catches were higher than in 2000, coho catches were lower than in 2000, and sockeye and chinook catches were the same as in 2000. Along 145°W (from 50° to 56°N), sockeye and chinook catches were higher than in 2000, and chum, pink, coho, steelhead catches were lower than in 2000.

### *Longline and Hook-and-Line Sampling*

Salmonids were collected for tagging at 6 longline stations and by use of hook-and-line at each gillnet station and oceanographic station along 145°W (Fig.1, Table 5). Of the 65 salmonids collected, 58 (vs. 32 in 2000) were tagged and released, including 54 (39 in 2000) collected by longline and 11 collected by hook-and-line. Of these, 45 that appeared healthy were also each tagged with a temperature-and-depth (archival) data tag. The serial numbers of tags released at each station are reported annually to the NPAFC by the FAJ, and the recoveries of tagged fish and releases of archival tags are reported by the FRI and FAJ.

### *Fish Lacking Adipose Fins*

Snouts were collected from 34 steelhead, 2 chinook and 1 coho lacking adipose fins (Table 2C, Table 6). Information on coded-wire tag will be reported later.

### *Scale Sampling*

After Leg 2, U.S. scientists made one set of acetate impressions of all scales collected by *Oshoro maru* personnel. The original gummed scale cards were sent to the FAJ, Hokkaido National Fisheries Research Institute, Kushiro, for age determination, and laboratory verification of species identification were performed by the FRI and FAJ after the cruise. The results of these studies will be reported later.

### *Additional Biological Sampling*

Along 145° and 165°W, biological samples were collected for stock identification, feeding, growth, maturity, migration and echo-sounding studies (Table 2). Japanese scientists collected muscle tissue from 61 chum salmon. A Japanese scientist collected thermally marked otoliths from 477 pink and 399 chum salmon for stock identification studies. One Japanese scientist collected 22 whole-body chum in order to elucidate trophic levels of salmon in the summer feeding area, and muscle tissue from 50 pink salmon to analyze the stable isotope compositions. One Japanese scientist collected 30 salmonids for an echo-sounding study. A Japanese- U.S. cooperative research group collected stomach samples along 145° W from 186 sockeye, 147 coho, 88 steelhead, 139 chum, 148 pink, and 13 chinook, scales and muscle tissues from 60 sockeye, 52 chum, 52 pink, 52 coho, 12 chinook and 48 steelhead trout, liver tissue

from 203 chum, and zooplankton samples. The purpose of this research is to elucidate the mechanism of growth, feeding and sexual maturity in Pacific salmon. U.S. scientists also analyzed stomachs from 105 salmonids from 165° W for a feeding study, and collected muscle tissue from 360 salmonids for isotope analysis. The results of these studies will be reported later.

### Acknowledgments

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Table 1. Description of research gear and fishing operation aboard the *Oshoro Maru* in 2001.

Research Item/Gear	Purpose	Specifications	Deployment	Sample/Data	Comment
A. Hydrographic					
CTD Neil Brown Mark III B	To measure temperature And salinity, and to collect water samples along the cruise tracks. These data have been collected in the North Pacific along the 165° W transect, in 1998- present and 1994- present on the 145° W transect.	CTD winch; Hydraulic 1 t × 72 m/min. 6.4 φ mm × 4000 m	Vertical hauls, to 1500 m ,3000m or to the sea bottom at shallow stations. Work on deck was conducted by deck officers, crew, cadets and graduate students Water samples were collected by graduate student. Data processing was conducted by officers.	Temperature, salinity and dynamic depth anomaly were measured at depths from 0-1500m, 0-3000m or 0-bott50m. Water samples were collected at depth of 800, 500, 300, 200, 150, 125, 100, 75, 50, 30, 20,10m. Water samples were analyzed for nutrient and nitrates	Sigm-t, thermosteric anomaly, specific volume anomaly and geopotential anomaly were calculated using a shipboard computer.  Bucket samples were collected for sea surface temperature and salinity measurement.
XBT (XCTD ) TS-MK-130 system Version 2.0 (XCTD/XBT Digital converter) TSK/XBT Model T-7 TSK/XCTD	XBT(XCTD) probes were used to obtain temperature( temperature and salinity) data along the section 165° W longitude.	A XBT(XCTD) probe thrown into seawater transmits an analog signal to digital computer, which convert the signal to digital data. The computer records The digital data Transmitted from the Converter every 5 × 10 scond. Measurements can be Performed from the 760m(1000m) and require about 2(5) minutes.	Measurement were performed every 15 nauticl miles except at station where CTD cast were performed. XBT(XCTD) probes thrown from the ship' stern. The ship course was set so that the wire attached to each probe did not touch the ship.	Temperature(temperature and salinity) from the surface to 760m(1000m) depth.	Information given in Parentheses is for the XCTD probes. Salinity was calculated from temperature and conductivity measurement.



Table 1. continued

Research Item/Gear	Purpose	Specification	Deployment	Sample/Data	Comment
A. Hydrographic ( continued )					
MER-2040 Optical Sensing	To obtain light spectra data from 0-100m depth.	MER equipment senses light level of spectra.	Light spectra were . observed from 0-100m at daylight oceanographic stations.	Data were recorded on the amount of light and spectrum.	Data will be used in conjunction with satellite data to develop bio-optical algorithm fo rhigh latitude ocean color Remote sensing.
B. Plankton					
Single Norpac Net  Sounding machine; 0.6t × 120m/min. 5 φ × 4000m.HYD.	TO estimate biomass and identify zooplankton.  A time series of these collections in the Gulf of Alaska covers; 1956-62, 1980-85 and 1987-present.	Ring diameter: 0.45m; Mesh Size: 0.35mm Filtering Cloth;# 200; Length: 1.8m	At the gillnet stations: Vertical tow; 0-500m. At the oceanographic ststions; Verticl tow: 0- 150m. The ship held position so that the tow remained vertical. Net lowered at a speed less than 1.0m/s and retrieved at 1.0m/s.	Samples were fixed in 5% formaldehyde and stored for biomass work to be completed after the cruise.	Copepoda were the predominant taxa collected by this Gear.
MTD Net  Sounding machine; 0.6t × 120m/min. 5 φ × 4000m,HYD.	To estimate biomass and identify zooplankton.  These data will be added to a time series of collection along the 165° W and 145° W transect.	Ring diameter: 0.56m; Mesh Size: 0.35mm; Filtering Cloth: # 60; Length: 2.0m.	Horizontal tows with 4 MTD net were performed with 45° wire angle	Samples were fixed in 0.5% formaldehyde and stored for biomass work to be completed after cruise.	

Table 1. continued

Research Item/Gear	Purpose	Specification	Deployment	Sample/Data	Comment
B. Plankton ( continued )					
Comparison Norpac net to Scor net.  Sounding machine; 0.6t × 120m/min. 5 φ × 4000m, HYD.	To sample dormant populations of the large copepods Neoclanus.	Norpac: 0.42m; Mesh: white 0.335mm; Length: 1.8m Flowmeter in the center of ring. Scor: ring: 0.56m; Mesh: black 0.335mm; Length: 2.8m Flowmeter in the center of ring.	Various depth Vertical tow: 0-50m, 0-150m, 0-250m, 0-1200m. Nets lowered sequentially at a speed of 0.5m/s and retrieved at 1.0m/s. Sampling were conducted at oceanographic and gillnet stations. Ship holds position so The tow stays vertical.	The samples were stored In formaldehyde and latter analyzed for species and biomass.	Samples will be analyzed at Institute of Ocean Science, Canada.
C. Laval fish and squid					
Bongo Net  Sounding machine; 0.6 × 120n/min. 5 φ × 4000m, HYD,	To collect paralarval cephalopds and other zooplankton.	Paired 70cm diameter Bongo net with 0.334mm mesh and equipped with paired flowmeters and a time-depth recorder were used.	Three 15-minute double oblique tow about 100m depth were conducted at night station and gillnet station at 165° W and 145° W transect.	Samples were fixed 5% formaldehyde sea water solution and then preserved 50% isoprophyl alcool.	Samples will be used to estimate the abundance and growth of gonatid squid paralarval.
Beam Trawl	This oblique tow collects species throughout the water column after setting Gillnet.	Net length: 17m; cod end length: 0.5m; mouth opening: 2.0m on one side, 2.5m on other side	The oblique tow depth was determined by scientific echo sounder	Samples were fixed 5% Formaldehyde sea water.	Samples will be analyzed at Laboratory of Marine Environment and Resource Sensing, H.U.

Table 1. continued

Research Item/Gear	Purpose	Specification	Deployment	Sample/Data	Comment
D. Salmonids					
Research Gillnet ( see Table 3 and 4 )	Salmon abundance and biological data for ocean ecology and stock assessment; nonselective research ( C-net ) introduced in 1971; systematic surveys with gillnet for abundance estimation commenced in 1972; the 145° W transect has been sampled during 1980-81, 1994-2001; the 165° W transect has been sampled during 1998-2001.	Net configuration varied at different station ( Table 3); overall length; 2.45km ( 49 tans, 50m per tan); depth approx. 6m; hydraulic net hauler; 0.3t × 177m/min.	Set ( Ship's time ); sunset ,approximately 1800 hrs; Haul ( Ship's time ); sunrise, approximately 0500 hrs.	Number of fish by mesh and species; for each mesh size in C-net ; fork length, body weight, sex, gonad weight, scale(s) for up to 60 fish of each species; A-net ( commercial meshes ) same data as C-net , except in 2001 only 22 chum were whole body sampled by FAJ	1 scale per sockeye, chum, pink salmon. 2 scales per coho, chinook, steelhead ( 1 scale from each side of body )
Surface Longline ( see Table 5 )	Live captured of fish for high seas tagging research: a long time series of data has been collected during 1978-present in the North Pacific Ocean and central Of the Gulf of Alaska.	Number of hachi (basket) per operation was 10 hachi in 2001. 1 hachi; mainline: 127m long; 34 branch lines/ hachi; 3m between branchlines; fishing depth: 2m ; bait: small salted anchovies.	Set ( Ship' time ): 0430 at morning. Haul ( Ship's time ) : After hauling the gillnet.	Number of fish by species; mortalities: fork length, body weight, scales; for viable fish: fork length scales, tag number.	Fish were double tagged with tow red and white , approx. 1.6-2.0cm Peterson disk tags ( one FAJ tag, one FRI tag ) attaché to the fish in front of the dosal fin with a plastic cinch. Some fish were tagged with data strage tagged.
Hook-and line ( see Table 5 )	Live captured of fish for high seas tagging research.	Various type of gear were Used.	Drift period at gillnet Stations and mid-station For oceanographic observatin.	Same at tagging by longline.	This year 11 healthy fish were caught and tagged.

Table 2. Additional salmonid research activities conducted aboard the *Oshoro Maru* in 2001.

Subject	Sample ( No. of collected )	Fishing Gear	Method	Data or Samples collected
<b>A. Salmonid Food Habits and Feeding Ecology</b>				
Stomach contents	Salmonids examined from approx. 1,000 Salmonids.	Gillnet and longline.	Stomach from esophagus to pyloric valve, or entire digestive tract, collected and examined on ship from up to 20 fish of each species in each gillnet operation.	Prey weight, % composition by volume of each prey type, fullness and digestion indices; specimens of prey for caloric content analysis ( frozen )
Stomach sampling	Collected; 186 sockeye, 139 chum, 148 pink, 147 coho, 13 chinook, 88 Stellhead.	Gillnet	Stomach of up to 40 fish Per species in each operation Preserved in 10% formaldehyde	Prey weight, % composition by volume of each type, fullness and digestion indices; specimens of prey of caloric content analysis.
Feeding ecology	Collected zooplankton	Bongo net; 0-100 m oblique tow.	Frozen for isotope analysis.	Preserved contents identified, counted and Analyzed later.
<b>B. Salmonids Ocean Growth, Maturity and Mechanisms of Migration</b>				
Growth and maturation	Muscle samples; 360 salmonide	Gillnet	Frozen for isotope analysis	Carbon and nitrogen analyzed later.
Growth and ageing analysis	Gummed cards from 2,178 salmonids	Gillnet and longline	Gummed and acetate cards	Determination of age; identified and Counted later.
Lipid analysis to estimate salmon feeding condition	Liver; 203 chum	Gillnet	Samples frozen at -80°C	Preserved contents analyzed later.
Temperature and depth Recording archival data Tagging.	45 tagged live fish.	Longline and Hook-and-line	Viable maturing salmonids in longline and hook-and-line catches were tagged with data logger tags, and Japan and FRI disk tags.	Tag numbers were recorded by ship and FRI.

Table 2. Cotinued

Subject	Samples( No. of collected )	Fishing Gear	Method	Data or Samples collected
C. Stock Identification				
Genetic stock identification	Muscle and liver collected from	Gillnet	Samples were frozen for isozyme analysis.	Accompanying biological and Oceanographic data.
High sea coded-wire tag recovery ( see Table 6 )	Snout from fish lacking the adipose fin (1 coho, 2 chinook 34 steelhead)	Gillnet	All fish in the catch were examined.	Snout(frozen ) and accompanying catch, data, biological data and scale samples; snout shipped to U.S.NMFS, Auke Bay Laboratory, Juneau, for tag detection and decoding
High seas recovery of marked otolith	Otolith from 333chum 477 pink	Gillnet	Otolith cleaned and preserved dry.	Accompanying biological data and scale Samples; otolith taken to National Salmon Resource Center, Sapporo, for detection and decoding.
Double tagging experiment	Tagged fish ( 47 live fish )	Longline	All viable salmonids in longline catches were double tagged with Japan and FRI tags.	Tag numbers were recorded by ship and FRI
To elucidate trophic levels	Whole body and muscle Samplings from 22 chum 50 pink	Gillnet	Samples were frozen for isotope analysis.	Whole body and muscle samples were Taken by Hokkaido National Fisheries Research Institute, Kushiro, for detection and decoding.
Measuring for Taget Strength of individyal fish echo	Whole body samples; 30 salmpnids	Gillnet	Samples were frozen for measuring of Target Strength	Target Strength will be measured at Laboratory of Marine Environment and Resource Sensing, Graduate School of Fisheries Science, Hokkaido Univ. after the cruise.

Table 3. Gillnet configurations used in 2001. 1tan = 50 m long section of gillnet

Station Type*	Size Number ( mm )	165°W	145°W
		G01 - G03 No. of tans	G04 - G09 No. of tans
A	115	9	9
C	48	3	3
C	55	3	3
C	63	3	3
C	72	3	3
C	82	3	3
C	93	3	3
C	106	3	3
C	121	3	3
C	138	3	3
C	157	3	3
A	121	10	10
Total		49	49

\* : A = traditional salmon commercial gillnet

C = salmon research gillnet

Table 4. Salmon caught in 2001 *Oshoro Maru* gillnet operation. Location, sea surface temperature(SST, °C), surface salinity (psu, practical salinity units), number of tans, catch by research-mesh and commercial-mesh gillnet for each fishing station.

station	recovery Date	Location	SST		Gear	Tans	Sockeye	Chum	Pink	Coho	Chinook	Steelhead	Total Salmon
			Salinity										
G-01	2001/6/19	47°57'N 164°58'W	6.6	Commercial	19	10	7	17	1	2	19	56	
			32.86	Research	30	16	64	29	4	0	17	130	
				Total	49	26	71	46	5	2	34	186	
G-02	2001/6/20	49°00'N 164°59'W	7.1	Commercial	19	10	7	43	1	1	0	62	
			32.91	research	30	22	65	40	3	0	1	131	
				Total	49	32	72	83	4	1	1	193	
G-03	2001/6/21	50°00'N 164°57'W	7.2	Commercial	19	6	13	39	1	0	0	59	
			32.63	research	30	4	58	25	0	0	0	87	
				Total	49	10	71	64	1	0	0	146	
165° W	Transect	Total		Commercial	57	26	27	99	3	3	19	177	
				Research	90	42	187	94	7	0	18	348	
				Total	147	68	214	193	10	3	37	525	
G-04	2001/6/30	56°01'N 145°03'W	9.3	Commercial	19	82	32	40	17	0	3	174	
			32.63	Research	30	91	33	43	12	2	5	186	
				Total	49	173	65	83	29	2	8	360	
G-05	2001/7/1	55°00'N 145°01'W	9.4	Commercial	19	40	24	31	42	1	4	142	
			32.83	Research	30	229	24	42	19	1	7	322	
				Total	49	269	48	73	61	2	11	464	
G-06	2001/7/2	53°59'N 145°02'W	9.3	Commercial	19	40	16	18	15	1	6	96	
			32.68	Research	30	189	8	56	26	0	9	288	
				Total	49	229	24	74	41	1	15	384	
G-07	2001/7/3	53°00'N 145°00'W	9.7	Commercial	19	21	5	1	18	0	4	49	
			32.63	Research	30	26	0	1	13	0	2	42	
				Total	49	47	5	2	31	0	6	91	
G-08	2001/7/4	52°00'N 145°00'W	9.1	Commercial	19	10	1	10	12	1	10	54	
			32.58	Research	30	39	6	12	13	2	18	80	
				Total	49	49	7	22	25	3	28	134	
G-09	2001/7/8	50°00'N 145°00'W	8.3	Commercial	19	32	22	37	11	2	19	162	
			32.54	Research	30	28	55	75	8	3	12	142	
				Total	49	60	77	112	19	5	31	304	
145° W	Transect	Total		Commercial	114	225	100	175	115	6	46	667	
				Research	180	602	126	191	91	7	53	1070	
				Total	294	827	226	366	206	13	99	1737	
Total Caught Salmon Station Catch	G01 - G09			Commercial	171	251	127	274	118	9	65	844	
				Research	270	644	313	285	98	7	71	1418	
				Total	441	895	440	559	216	16	136	2262	

Table 5. Salmonids tagged and released during 2001 *Oshoro Maru* longline and hook-and-line. surface temperature (SST, °C), surface salinity (psu, practical salinity units), Date and Time(SMT), Hachi is unit of longline gear (127 meters of main line with 34 hooks).

Research No.	Date	Research position		Set Time	Haul Time	SST	Hachi		Sockeye	Chum	Pink	Coho	Chinook	Steelhead	Total
		Latitude	Longitude												
						9.3		Caught	1	4	3	9	1	0	18
OSL-01	2001/6/30	56°06'N	145°05'W	4:25	7:28	32.63	10	Released	1(1)	3(3)	3(2)	9(6)	1(1)	0	17(13)
						9.4		Caught	1	1	0	0	0	1	3
OSL-02	2001/7/1	55°00'N	145°00'W	4:25	7:08	32.83	10	Released	0	1(1)	0	0	0	1(1)	2(2)
						9.3		Caught	0	0	3	5	0	0	8
OSL-03	2001/7/2	54°00'N	145°03'W	4:26	7:02	32.68	10	Released	0	0	3(2)	4(4)	0	0	7(6)
						9.3		Caught	5	0	2	2	1	0	10
OSL-04	2001/7/3	52°55'N	145°01'W	4:25	6:59	32.63	10	Released	5(4)	0	2(2)	2(1)	0	0	9(7)
						9.1		Caught	1	1	2	3	0	1	8
OSL-05	2001/7/4	51°59'N	144°56'W	4:23	7:16	32.58	10	Released	1(1)	1(1)	2(1)	3(1)	0	1(1)	8(5)
						8.3		Caught	0	6	1	0	0	0	7
OSL-06	2001/7/7	49°59'N	144°55'W	3:51	7:13	32.54	10	Released	0	3(3)	1(1)	0	0	0	4(4)
								Total Caught	8	12	11	19	2	2	54
								Total Released	7(6)	8(8)	11(8)	18(12)	1(1)	2(2)	47(37)
Hook & line								Released	3(2)	0	2(1)	5(4)	1(1)	0	11(8)

( ) of released: Attached Archival tag



Table 6. List of fish lacking adipose fins.

Number	Sheet	Mesh	Fish	Species	Recovery position		Fork length (mm)	Body weight (g)
					Lat. (N)	Long.(W)		
1	43	C-093	22	Steelhead	56°01'	145°00'	549	1680
2	52	C-082	18	Steelhead	56°01'	145°00'	554	1640
3	58	A-121	6	Coho	56°01'	145°00'	508	2500
4	63	A-115	20	Steelhead	54°59'	145°01'	611	2300
5	71	C-121	18	Steelhead	54°59'	145°01'	549	1700
6	88	A-115	5	Steelhead	53°59'	145°01'	525	1480
7	91	C-093	21	Steelhead	53°59'	145°01'	563	1740
8	96	C-063	16	Steelhead	53°59'	145°01'	330	310
9	97	C-121	16	Steelhead	53°59'	145°01'	580	2140
10	108	A-115	20	Steelhead	52°59'	144°59'	608	2500
11	108	A-115	21	Steelhead	52°59'	144°59'	510	1400
12	110	C-093	6	Steelhead	52°59'	144°59'	568	1900
13	116	C-138	6	Steelhead	52°59'	144°59'	712	3700
14	122	A-115	8	Steelhead	51°59'	144°59'	608	2740
15	122	A-115	9	Steelhead	51°59'	144°59'	532	1640
16	122	A-115	12	Steelhead	51°59'	144°59'	570	2100
17	124	C-093	14	Steelhead	51°59'	144°59'	590	2140
18	126	C-106	8	Steelhead	51°59'	144°59'	552	1820
19	129	C-072	6	Steelhead	51°59'	144°59'	565	2100
20	131	C-082	19	Steelhead	51°59'	144°59'	557	1600
21	131	C-082	20	Steelhead	51°59'	144°59'	463	1020
22	134	A-121	10	Steelhead	51°59'	144°59'	564	2000
23	134	A-121	11	Steelhead	51°59'	144°59'	604	2800
24	135	A-115	22	Chinook	50°00'	145°00'	555	2400
25	137	A-115	18	Steelhead	50°00'	145°00'	576	2460
26	137	A-115	19	Steelhead	50°00'	145°00'	558	1900
27	137	A-115	21	Steelhead	50°00'	145°00'	722	3300
28	137	A-115	22	Steelhead	50°00'	145°00'	584	2240
29	137	A-115	23	Steelhead	50°00'	145°00'	575	2300
30	140	C-093	6	Steelhead	50°00'	145°00'	583	2360
31	143	C-106	6	Steelhead	50°00'	145°00'	564	2000
32	143	C-106	7	Steelhead	50°00'	145°00'	614	2500
33	147	C-072	8	Steelhead	50°00'	145°00'	751	4300
34	151	A-121	9	Chinook	50°00'	145°00'	529	2300
35	151	A-121	10	Steelhead	50°00'	145°00'	595	2620
36	151	A-121	12	Steelhead	50°00'	145°00'	579	2360
37	151	A-121	13	Steelhead	50°00'	145°00'	608	2660

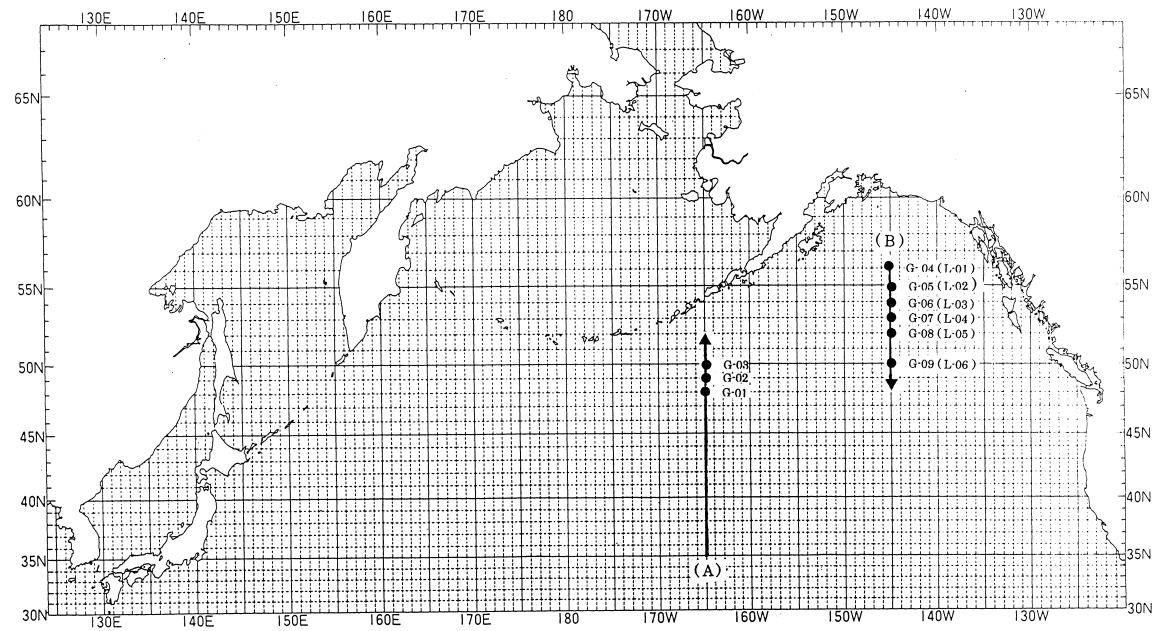


Figure 1. Locations of sampling stations and transects sampled by the Oshoro Maru from 12 June to 7 July, 2001. G = Gillnet stations, L = Longline stations,  $\uparrow\downarrow$  = transect.

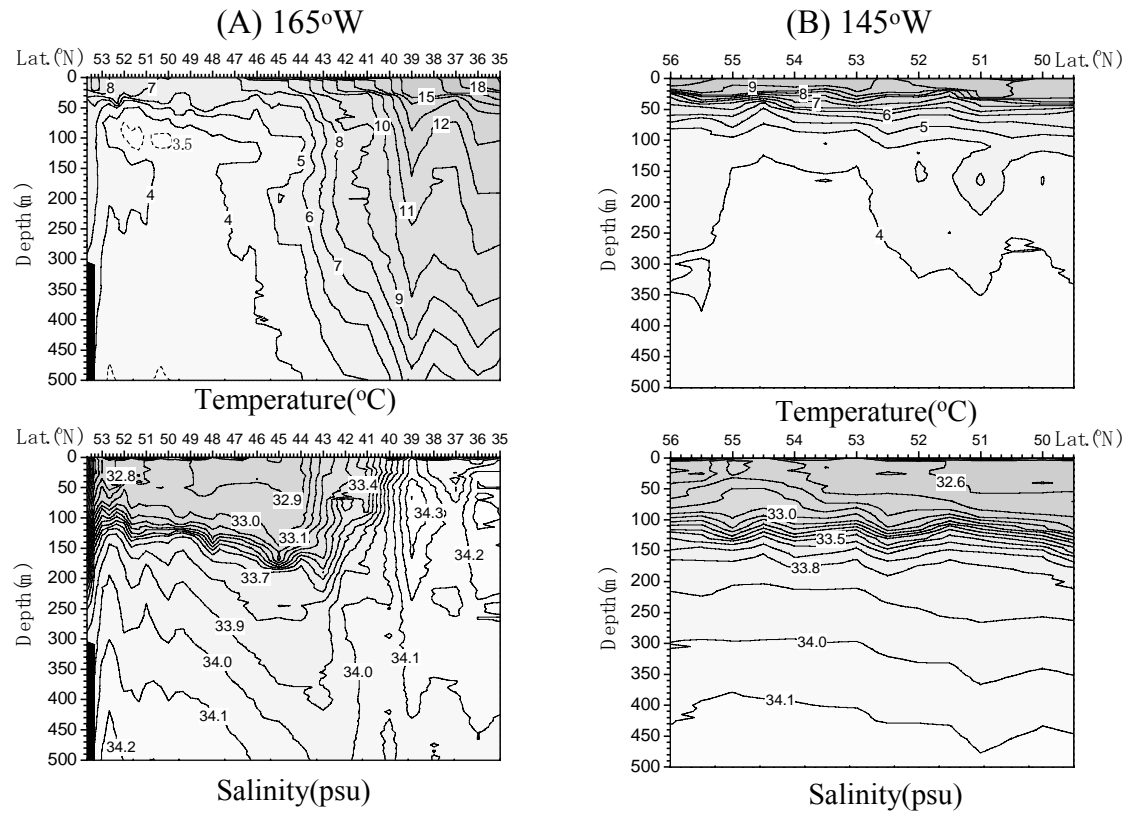


Figure 2. Temperature and salinity sections from surface to 500m depth along 165°W and 145°W transects in 2001. Figures are produced by Hiroji Onishi.