

NPAFC
Doc. 485
Rev.

THE 2000 INTERNATIONAL COOPERATIVE SALMON
RESEARCH
CRUISE OF THE *OSHORO MARU*

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Submitted by the
NORTH PACIFIC ANADROMOUSE FISH COMMISSION
by
JAPAN AND THE UNITED STATE OF AMERICA

September 2000

THIS PAPER MAY BE CITED IN THE FOLLOWING MANNER
Yamaguchi, H., Kajiwara, Y., Takagi, S., Sakaoka, K., Kimura, J., Walker, R. V.,
and Kawana, M.. The 2000 international cooperative salmon research
cruise of the *Oshoro Maru*. (NPAFC Doc. 485) Hokkaido University,
Hakodate, Hokkaido, Japan 041-8611

THE 2000 INTERNATIONAL COOPERATIVE SALMON RESEARCH
CRUISE OF THE *OSHORO MARU*

Abstract

Preliminary information is presented on international cooperative salmon research conducted during the June-July 2000 cruise of the *Oshoro Maru*. An objective of cooperative high-sea salmon research conducted under the North Pacific Anadromous Fish Commission Science Plan is salmon stock assessment through annual surveys along standard transects in the North Pacific Ocean and Bering Sea. Oceanographic surveys conducted aboard the *Oshoro Maru* along 180° longitude in the Central North Pacific Ocean since 1978 have provided a valuable time series of oceanographic data. In 2000, Salmon surveys conducted aboard the *Oshoro Maru* along 145° W and 165° W; oceanographic data were collected along 180° longitude transect in the Central Gulf of Alaska in early July. This was the seventh consecutive year of cooperative Japan-U.S. sampling for salmon and the third year of sampling along 165° W. The primary object of the 2000 cooperative research was to continue the collection of oceanographic data along 180° W, and the collection of oceanographic data and biological data along 165° W and 145° W.

In 2000, the Subarctic Boundary crossed the 180° transect at 40° 40' N and the 165° W transect at 39° 30' N. Along the 180° transect, the Subarctic Boundary was further north than 1999. Along the 165° transect, the Subarctic Boundary was at same latitude as in 1999.

Gillnet research was conducted at 14 stations. Gillnet catches included 2,302 salmonids: 192 along 165° W and 2,110 along 145° W. A salmon longline used for tagging was set at 12 stations. Longline catches included 39 salmonids: 2 along 165° W and 37 along 145° W. A total of 32 salmonids were tagged, including 24 caught by longline (1 along 165° W and 23 along 145° W) and 8 by hook-and-line. All 32 were tagged with common tags (Japanese and U.S.), and 19 that appeared healthy were also tagged with temperature and depth data (archival data) tags. Of the 32 tagged with common tags, one chum was released at 50° N along 165° W, and 31 salmon (23 using longline gear and 8 using hook-and-line) were released along 145° W in the central Gulf of Alaska. A total of 52 fish lacking adipose fins were collected by the gillnet, including 8 steelhead along 165° W and 44 salmonids along 145° W.

Biological samples and data were collected for various cooperative studies of salmon distribution, abundance, stock origin, maturity and growth, food habits, bioenergetics, and other aspect of ocean biology and ecology; these result 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 each cruise have been published by Hokkaido University in the “ *DATA RECORD OF OCEANOGRAPHIC OBSERVATIONS AND EXPLORATORY FISHING* ” since 1957. In March 2000, the 43rd annual volume of this report was published.

In 2000, the *Oshoro Maru* sampled along three transects, 180° , 165° W and 145° W in the central North Pacific Ocean and the central Gulf of Alaska. In 2000, the *Wakatake Maru* sampled salmon along 180° and the *Hokusei Maru* sampled salmon along 155° E, while the *Oshoro Maru* sampled salmon along 165° W and 145° W and collected oceanographic data along 180° .

In 2000, research on the 145° W transect was conducted by 1 scientist from the Fisheries Research Institute of the University Washington, 1 from the Institute of Ocean Sciences of Canada, 1 from HU, 1 from the Fisheries Agency of Japan (FAJ) and 4 Japanese graduate students. Their research included physical, chemical and biological studies in addition to the salmon research.

Methods

Survey Area and Cruise Schedule

Hydrographic, plankton and salmonid sampling were conducted in the central North Pacific Ocean and Gulf of Alaska (Fig.1, Table 1) in international waters. A surface longline (B-gear), a C-gear gillnet (nonselective varied research mesh; Talagi, 1975) and an A-gear gillnet (commercial mesh) were used to catch salmonids. Along the 165° W transect, sampling occurred between 52° 40' N and 35° N. Along the 145° W transect, sampling occurred between 56° N and 47° N.

The *Oshoro Maru* departed Hakodate on 3 June 2000. From 9 to 15 June, oceanographic research was conducted southward along 180° . From 18 to 28 June, oceanographic and salmon research were conducted northward along 165° W in the central North Pacific Ocean. The vessel made a port call in Kodiak, Alaska, from 30 June to 3 July, where scientists participating in the Gulf of Alaska cruise leg boarded. During 4-14 July, salmon and oceanographic research were conducted southward along 145° W in the central Gulf of Alaska. On 17

July, the Oshoro Maru arrived in Victoria, Canada, where all Gulf of Alaska participants disembarked. On 19 July, the scientists held the seminar at the Institute of Ocean Sciences, Sydney, B.C., Canada

Oceanographic Sampling

Oceanographic research conducted in 2000 including hydrographic (water sampling), plankton and larval fish sampling (Table 1, A-D). Oceanographic stations were occupied along 180° at an interval of 1 degree (60 nautical miles) from 49° to 38° N, along 165° W at an interval of 1 degree from 35° to 44° N and 45 nautical miles from 44° to 50° N, and along 145° W at an interval of 30 nautical miles from 56° to 47° N. In the Alaskan Stream area close to the Aleutian Islands, oceanographic observation were conducted at 15-20 nautical miles intervals along the 180° and 165° W transects. Data collected by CTD and XBT on each transect were used to plot the temperature and salinity sections.

Gillnet Sampling

Gillnet samplings were conducted at 14 stations (Table 1E). Gillnet gear was set in the evening, allowed to soak overnight, and retrieved the following morning. As the gillnet was hauled, 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 catch mesh size on biological data forms. The catch by mesh size and species was recorded in an operation book and later entered into a computer file.

Longline Research, Hook-and-Line Sampling and Tagging

All viable salmonids caught on longline were double-tagged with both 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. 1998b). Data on species, length, and tag number of each fish were recorded on data forms. To collect salmonids for tagging, hook-and-line gear used in addition to the longline. Data storage tags, and FAJ and FRI disk tags were attached at 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 in the standard methods.

Fish Lacking Adipose Fins

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

Scale Sampling

Scale samples were collected for verification of species identification, and for age, growth and stock origin studies (Table 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 used in each set. All scales were collected from the International North Pacific Fisheries Commission (INPFC) preferred body area (identified by the letter " A " on data form; Davis et al. 1990), except in cases where all preferred scale were missing (identified by the letter " C " on data form) 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, including collection of whole salmon, salmonid stomachs, otoliths, muscles, liver, heart, kidney and scales for energetics, food habits, growth, maturity and stock identification studies (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 OBSERVATIONS AND EXPLORATORY FISHING NO.44 " no later than early March 2001.

Oceanographic Conditions

Temperature and salinity sections (0-500 m) are shown in Figure 2 (A; 180° , B; 165° W, C; 145° W). The position of the Subarctic Boundary was determined by the vertical isohaline of 34.00 psu at 100 m depth as defined by Favorite et al. (1976). The Boundary position occurred at 40° 30' N on 180° and at 39° 30' N on 165° W.

Gillnet Catches

Different gillnet configurations were used along the 165° W and 145° W transects. Salmonid samplings were conducted at 14 gillnet stations (Fig. 1 ;Table 4). Because of rough sea conditions, gillnet sampling was not conducted at 48° 30´ N along the 165° W transect. Salmonids were caught at all stations. The total number of salmonids caught were 2,302 (2,919 in 1999),including 662 sockeye (543 in 1999), 645 chum (644 in 1999), 515 pink (1,122 in 1999), 361 coho (469 in 1999), 3 chinook (25 in 1999)and 116 steelhead (116 in 1999). Along the 165° W transect (44° N to 50° N, stations), chum, pink, chinook and steelhead catches were lower, coho catches were higher , and sockeye catches were the same as in 1999. Along the 145° W transect (56° N to 47° N, 10 stations), sockeye, chum and steelhead catches were higher, and pink, coho and chinook catches were lower than in 1999.

Longline and Hook-and-Line Sampling

Salmonids were collected for tagging at 12 longline stations and by use of hook-and-line at each gillnet station and oceanographic station along 165° W and 145° W (Fig. 1, Table 5). Of the 48 salmonids collected, 32 (106 in 1999) were tagged and release, including 1 (26 in 1999) collected along 165° W by longline, 39 (64 in 1999) collected along 145° W by longline and 8 collected along 145° W by hook-and-line. Of these, 32 that appeared healthy were also each tagged with a temperature and depth data (archival data) tag along 145° W line. The serial numbers of tags released at each station are reported annually to NPAFC by FAJ, and the recoveries of tagged fish and releases of archival tags are reported by FRI and FAJ.

Fish Lacking Adipose Fins

Snouts were collected from 45 steelhead and 7 coho lacking adipose fins (Table 2C). Information on coded-wire tags that may be found in the 8 steelhead caught along 165° W will be reported later.

Scale Sampling

After the cruise (Leg. II), U.S. scientists made two sets of acetate impressions (one for FRI and one for FAJ) of all scales collected by Oshoro Maru personnel. The original gummed scale cards and one set of acetate impressions were sent to FAJ, Hokkaido National Fisheries Research Institute, Kushiro, for

age determination and laboratory verification of species identification. Age determination and laboratory verification of species identification were performed by FRI and FAJ after the cruise. The results of these studies will be reported later.

Additional Biological Sampling

Along 165° W and 145° W, biological samples were collected for stock identification, feeding, growth, maturity and migration studies (Table 2). Japanese scientists collected heart, liver and muscle tissues for genetic studies from 316 chum salmon. Thermal marked otoliths were collected by Japanese scientists from 364 chum and 351 pink salmon for stock identification studies. Kidney tissue samples were collected from 45 sockeye and 9 steelhead trout for inspection of pathogenetic organisms. A Japanese-U.S. cooperative research group collected stomach samples from 108 sockeye, 118 chum, 104 pink, 88 coho, 3 chinook and 86 steelhead trout and zooplankton samples. The purpose of this research is to elucidate the mechanisms of growth, feeding and sexual maturation in Pacific salmon. U.S. scientists collected and analyzed stomach from 1,078 salmonids for feeding studies. The result of these studies will be reported later.

Acknowledgment

The *Oshoro Maru* and *Hokusei Maru* of the Japanese Ministry of Education, Science and Culture are training vessels for students, officers and fisheries technicians. We thank the NPAFC and their affiliated scientists for helping us to conduct salmon research in the North Pacific Ocean for many years. Your cooperation has helped us train and teach many scientists and leaders in the fishing industry through our salmon research program.

For facilitating cooperative salmon study between *Hokkaido University* and the *University of Washington*, we thank Director David A. Armstrong, School of Fisheries, University of Washington. The other officers, crew, graduate students and cadets of the *Oshoro Maru* are acknowledged for their outstanding assistance and cooperation in sample and data collection under sometimes severe conditions. We also thank Dr. John R. Bower for his reading of the text. Funding for FRI's participation in the cruise was provided by the Auke Bay Laboratory of the Alaska Fisheries Science Center, U.S. National Marine Fisheries Service.

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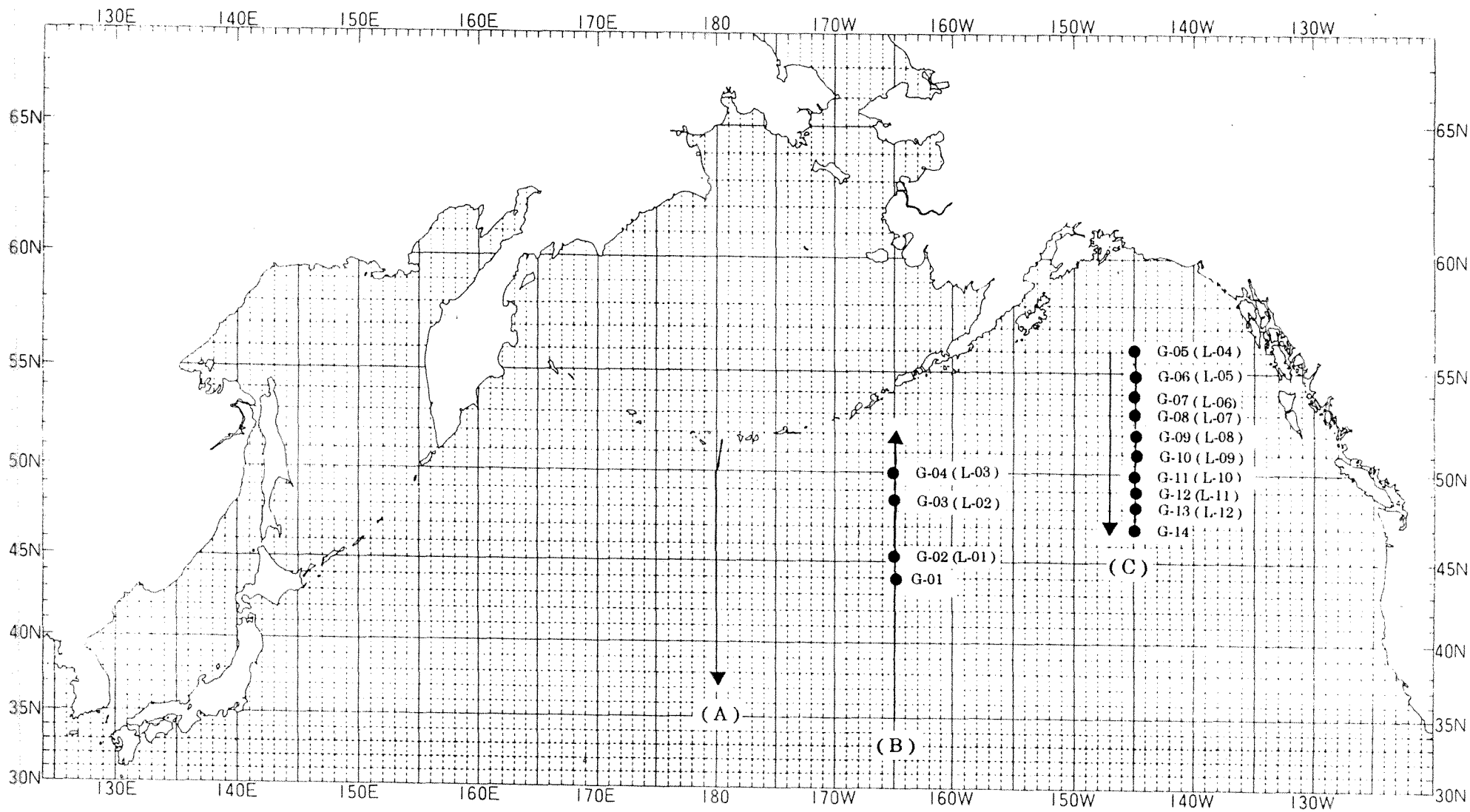
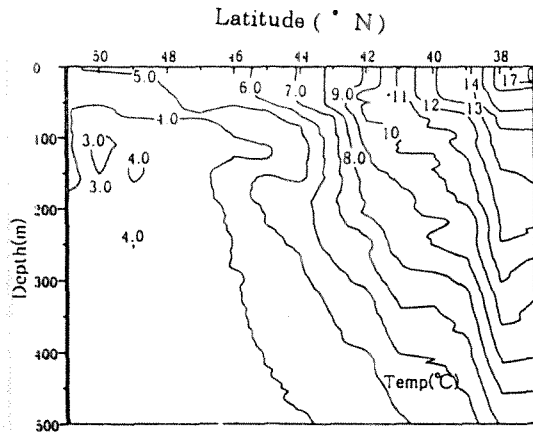


Figure 1. Locations of sampling stations and transects sampled by the *Oshoro Maru*.

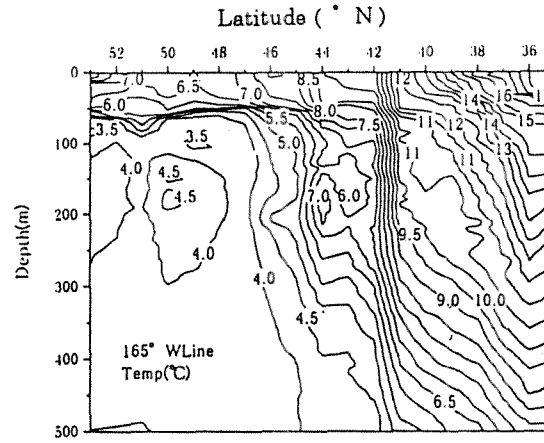
From 9 June to 14 July, 2000

(G = Gillnet stations, L= Longline stations, ↑ ↓ = transect)

(A) 180°



(B) 165° W



(C) 145° W

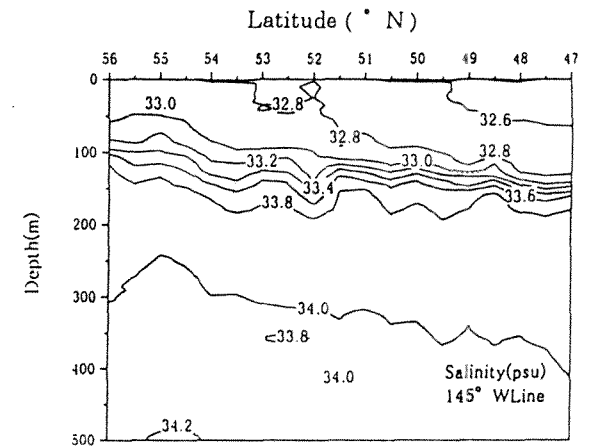
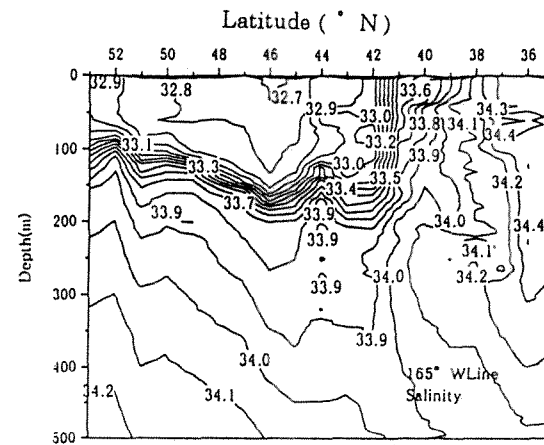
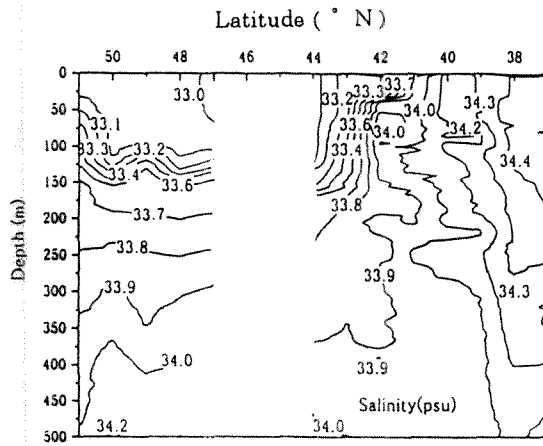
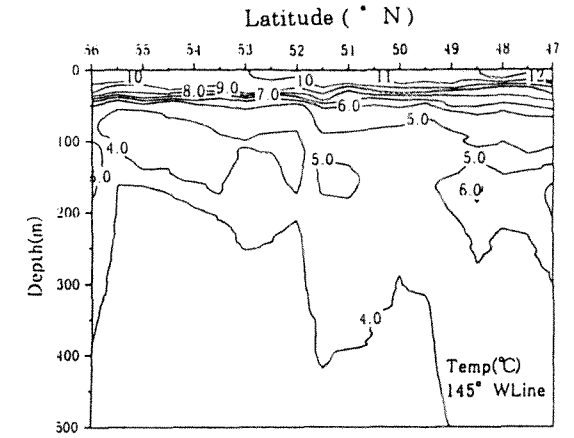


Fig. 2 Temperature and salinity section from surface to 500m depth along 180° , 145° W and 145° W transects in 2000.

Table 1. Description of research gear and fishing operation aboard the *Oshoro Maru* in 2000.

Research Item/Gear	Purpose	Specifications	Deployment	Sample/Data	Comments
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 since 1978 along the 180° transect, in 1980-81 and 1994- present on the 145° W transect, and in 1998- present on the 165° W transect.	CTD winch;Hydraulic 1t×72m/min 6.4 φ mm×4000m	Vertical hauls, to 1500m 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 students. Data processing was conducted by officers.	Salinity, temperature and dynamic depth anomaly were measured at depths from 0-1500m, 0-3000m or 0-bottom. Water samples were collected at depth of 800, 500, 300, 200, 150, 125, 100, 75, 50, 30, 20, 10m. Water samples were analyzed for nutrients and nitrates.	Sigma-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 section 180° and 165° W longitude.	A XBT(XCTD) probe thrown into seawater transmits an analog signal to a digital computer, which convert the signal to digital data. The computer records the digital data transmitted from the converter every 5×10 second. Measurements can be performed from the surface to a depth of 760m (1000m) and require about 2(5) minutes.	Measurements were performed every 15 nautical miles except at station where CTD cast were performed. XBT(XCTD) probes were thrown from the ship's wing. The ship course was set so that the wire attached to each probe did not touch 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	Specifications	Deployment	Sample/Data	Comment
A. Hydrographic					
Van Dorn Water Sampling Sounding machine; 0.6t × 120m/min. 5 φ × 4000m, HYD.	To obtain large seawater samples for analysis of the chemical compounds related to biological activity.	A 10-l Van Dorn bottle was used collect sample from particular depths.	10-l water samples were collected from the depth determined by the Optical observation.	The samples were filtered onto different pore size filters and stored at -80° C. They were later analyzed for particulate organic carbon (POC), chl. and ATP.	This sampling method allows for sampling of very small particles that cannot be collected in nets.
PRR Optical Sensing	To obtain light spectra data from 0-100m depth to validate (sea-truth) SeaWiFS satellite data.	PRR equipment senses light level of spectra recorded by the SeaWiFS satellite.	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 algorithms for high latitude ocean color remote sensing.
B. Plankton					
Single Norpac Net Sounding machine; 0.6t × 120m/min. 5 φ × 4000m, HYD.	To estimated 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 stations; Vertical 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.	Copepods 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: 0.56 m; 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 5% formaldehyde and stored for biomass work to be completed after the cruise.	

Table 1. Continued

Research Item/Gear	Purpose	Specifications	Deployment	Sample/Data	Comments
B. Larval fish and squid					
Bongo Net Sounding machine: 0.6t × 120m/min 5 φ × 4000m, HYD	To collect paralarval cephalopods and other zooplankton.	Paired 70 cm diameter Bongo net with 0.334 mm mesh and equipped with paired flowmeters and a time-depth recorder were used.	Six 15-minute double oblique tows to about 100m depth were conducted at night station of 180° transect, each gillnet stations at 165° W and 145° W transect.	Samples were fixed in 5% formaldehyde sea water solution and then preserved in 50% isopropyl alcohol.	Samples will be used to estimate the abundance and growth of gonatid squid paralarva.
D. Other non-salmon					
Micronekton Gillnet (F-net, see Table 3)	To collect pelagic species that occur near the surface along 165° W transect.	The net were connected to C and A nets. Each 1 tan (mesh size; 22, 25, 33, 37, 42mm).	See table 3.	All fish except salmonids were measured for body length, body weight and stomach contents were collected.	
E. Salmonids					
Research Gillnet (see Table 3 and 4)	Salmon abundance and biological data for ocean ecology and stock assessment; non-selective 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, 1994-2000; the 165° W transect has been sampled during 1998-present.	Net configuration varied at different stations (Table 3); overall length; 2.45km (49 tans , 50m/tan); depth approx. 6m; hydraulic net hauler: 0.3 t × 177m/min.	Set (Ship ' s time) ; sunset approximately 1800 hrs; Haul (Ship ' s time) sunrise, approximately 0500 hrs.	No. 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 2000 only 13 chum and 33 pink were whole body sampled by FAJ.	2 scales per all salmonids (1 scale from each side of body)

Table 1. continued

Research Item/Gear	Purpose	Specifications	Deployment	Sample/Data	Comments
Surface Longline (see Table 5)	Live capture 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.	No. of hachi (basket) per operation varied in 2000. 1 hachi; mainline :127m long; 34 branch lines/hachi; 3m between branch lines; fishing depth: 2m ; bait: small salted anchovies.	Set (Ship time) : 0430 at morning. Haul (Ship time) : after hauling the gillnet.	No. of fish by species; mortalities: fork length, body weight, scales; for viable fish: fork length, scales, tag nos.	Fish were double tagged with two red and white, approx. 1.6-2.0cm Petersen disk tags (one Japan tag, one FRI tag) attached to the fish in front of the dorsal fin with a plastic cinch. Some fish were tagged with data storage tags.
Hook-and-line (see Table 5)	Live capture of fish for high seas tagging research.	Various type of gear were used.	Drift periods at gillnet stations and mid-stations for oceanographic observation.	Same as tagging by longline.	This year only 8 healthy fish were caught and tagged.

Table 2. Additional salmonid research activities conducted aboard the *Oshoro maru* in 2000.

Subject	Sample (no. collected)	Fishing Gear	Method	Data or Samples collected
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A. Salmonid Food Habits and Feeding Ecology

Stomach contents	Stomachs examined from 1,078 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; 108 sockeye 118 chum 104 pink 88 coho 3 chinook 86 steelhead	Gillnet	Stomachs of up to 40 fish per species in each operation preserved in 10 % formaldehyde	Prey weight, % composition by volume of each prey type, fullness and digestion indices; specimens of prey for caloric content analysis.
Feeding ecology	Collected about 1 g zooplankton	NORPAC net; 0-100m vertical tow.	Frozen for isotope analysis	Preserved contents identified, counted and analyzed later

B. Salmonide Ocean Growth, Maturity and Mechanisms of Migration

Growth and maturation	Muscle and liver samples; 108 sockeye 118 chum 104 pink 88 coho 3 chinook 86 steelhead 86 pink	Gillnet	Frozen for isotope analysis	Preserved contents analyzed later
Growth and ageing analysis	gummed cards from 2,248 salmonids	Gillnet and longline	Gummed and acetate cards	Determination of age, identified and counted later.
Lipid analysis to estimate salmon feeding condition	Muscle and liver; 125 chum 153 pink	Gillnet	Samples frozen at -80° C	Preserved contents analyzed later

Table 2. Cont'd

Subject	Sample (No. collected)	Fishing Gear	Method	Data or Samples collected
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B. Salmonid Ocean Growth, Maturity and Mechanisms of Migration (continued)

Temperature and depth recording archival data tagging	19 tagged live fish.	Longline 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
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C. Stock Identification

Genetic stock identification	Muscle, liver and heart collected from 316 chum.	Gillnet	Samples frozen for isozyme analysis.	Accompanying biological and oceanographic data
Inspection of pathogenic organisms	Kidney tissues from 45 sockeye and 9 steelhead	Gillnet	Samples frozen	Taken to National Salmon Resources Center, Sapporo for analysis
High seas coded-wire tag recovery	Snouts from fish lacking the adipose fin (44 steelhead, 7 coho)	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 364 chum and 153 pink	Gillnet	Otolith cleaned and preserved dry	Accompanying biological data and scale samples; otoliths taken to National Salmon Resource Center Sapporo, for detection and decoding.
Double tagging experiment	Tagged fish (24 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.

Table 3. Gillnet configurations used in 2000.
 1 tan = 50-m long section of gillnet

Station numbers Type*	Size (mm)	165° W	145° W
		G01~G04 No. of tans	G05~G14 No. of tans
A	115	6	9
F	19	1	0
F	29	1	0
F	37	1	0
C	48	3	3
C	93	3	3
C	157	3	3
C	106	3	3
C	63	3	1
C	121	3	3
C	72	3	3
C	138	3	3
C	82	3	3
C	55	3	3
F	42	1	0
F	33	1	0
F	25	1	0
F	22	1	0
A	121	6	10
Total		49	47

*A=traditional salmon commercial gillnet

C=salmon research gillnet

F=experimental gillnet (non-salmon research)

Table 4. Salmon caught in 2000 *Oshoro Maru* gillnet operation. Location, sea surface temperature(SST°C), surface salinity (psu, practical salinity units) number of 50-m tans and catch by research - mesh and commercial- mesh gillnets for each fishing station.

Station	Recovery		SST.		Gear	Tans	Sockeye	Chum	Pink	Coho	Chinook	Steelhead	Total Salmon	
	Date	Location	Salinity											
G-01	6/20/00	44°01'N 165°00'W	9.4	Commercial	12	0	0	0	0	7	0	3	10	
			32.88	Research	30	0	2	3	6	0	2	13		
				Total	42	0	2	3	13	0	5	23		
G-02	6/22/00	45°30'N 165°00'W	7.5	Commercial	12	2	0	3	13	0	1	19		
			32.71	Research	30	0	22	6	21	0	4	53		
				Total	42	2	22	9	34	0	5	72		
G-03	6/24/00	48°29'N 165°00'W	6.6	Commercial	12	4	2	1	0	0	0	7		
			32.78	Research	30	21	7	3	1	0	32			
				Total	42	25	9	4	1	0	39			
G-04	6/26/00	50°00'N 165°00'W	7	Commercial	12	6	1	3	0	0	0	10		
			32.81	Research	30	28	14	4	2	0	48			
				Total	42	34	15	7	2	0	58			
165°W Transect Total					Commercial	48	12	3	7	20	0	4	46	
					Research	120	49	45	16	30	0	6	146	
					Total	168	61	48	23	50	0	10	192	
G-05	7/5/00	56°01'N 144°58'W	10.4	Commercial	19	38	61	8	15	0	4	126		
			32.88	Research	27	35	59	18	12	0	10	134		
				Total	46	73	120	26	27	0	14	260		
G-06	7/6/00	55°02'N 145°02'W	9.5	Commercial	19	57	93	36	87	0	10	283		
			32.93	Research	27	60	107	104	42	1	9	323		
				Total	46	117	200	140	129	1	19	606		
G-07	7/7/00	54°00'N 144°57'W	9.4	Commercial	19	25	32	26	55	0	4	142		
			32.89	Research	27	27	66	92	31	0	8	224		
				Total	46	52	98	118	86	0	12	366		
G-08	7/8/00	53°00'N 144°58'W	9.8	Commercial	19	21	19	23	20	1	4	88		
			32.85	Research	27	24	34	28	12	0	8	106		
				Total	46	45	53	51	32	1	12	194		
G-09	7/9/00	52°00'N 145°00'W	11.1	Commercial	19	52	19	17	15	1	10	114		
			32.81	Research	27	49	50	19	9	0	14	141		
				Total	46	101	69	36	24	1	24	255		
G-10	7/10/00	51°00'N 145°00'W	10.7	Commercial	19	58	7	43	7	0	4	119		
			32.74	Research	27	33	8	20	1	0	6	68		
				Total	46	91	15	63	8	0	10	187		
G-11	7/11/00	50°00'N 145°00'W	11.4	Commercial	19	23	0	17	2	0	3	45		
			32.65	Research	27	22	20	30	2	0	0	74		
				Total	46	45	20	47	4	0	3	119		
G-12	7/12/00	49°00'N 145°00'W	11.4	Commercial	19	56	0	4	1	0	2	63		
			32.51	Research	27	16	14	6	0	0	1	37		
				Total	46	72	14	10	1	0	3	100		
G-13	7/13/00	48°00'N 145°00'W	12.4	Commercial	19	4	0	0	0	0	6	10		
			32.49	Research	27	1	8	1	0	0	0	10		
				Total	46	5	8	1	0	0	6	20		
G-14	7/14/00	47°00'N 145°00'W	12.9	Commercial	19	0	0	0	0	0	3	3		
			32.48	Research	27	0	0	0	0	0	0	0		
				Total	46	0	0	0	0	0	3	3		
145°W Transect Total					Commercial	190	334	231	174	202	2	50	993	
					Research	270	267	366	318	109	1	56	1117	
					Total	460	601	597	492	311	3	106	2110	
Total Salmon Catch Stations G01- G14							Sockeye	Chum	Pink	Coho	Chinook	Steelhead	Total	
					Commercial		238	346	234	181	222	2	54	1039
					Research		390	316	411	334	139	1	62	1263
					Total		628	662	645	515	361	3	116	2302

Table 5. Salmonids tagged and released during 2000 *Oshoro Maru* longline and hook-and-line operations. Location, sea surface temperature (SST °C), surface salinity (psu, practical salinity units), tagged and released number.
 S.M.T. = Ship Mean Time; hachi = unit of longline gear (34 hooks per hachi)

Station	Date	Time(S.M.T.)	Latitude	Longitude	SST	Salin.	Hachi	Sockeye	Chum	Pink	Coho	Chinook	Steelhead	Total
L-01	6/22/00	04:28-06:34	45° 32' N	164° 58' W	7.5	32.71	10	0	0	0	0	0	0	0
L-02	6/24/00	04:30-07:13	48° 26' N	164° 54' W	6.6	32.78	10	0	0	0	0	0	0	0
L-03	6/26/00	04:26-06:41	49° 58' N	165° 03' W	7.0	32.81	10	0	1	0	0	0	0	1
L-04	7/05/00	04:28-07:12	55° 59' N	145° 56' W	10.4	32.88	10	0	3(1)	2(1)	3(3)	0	0	8(5)
L-05	7/06/00	04:28-07:53	55° 02' N	144° 58' W	9.5	32.93	10	0	1	0	4(2)	0	0	5(2)
L-06	7/07/00	04:24-07:15	54° 01' N	144° 53' W	9.4	32.89	10	0	3	1(1)	4(3)	0	0	8(4)
L-07	7/08/00	04:23-06:54	53° 00' N	144° 52' W	9.8	32.85	10	0	1	0	1	0	0	2
L-08	7/09/00	04:22-07:08	51° 58' N	144° 52' W	11.1	32.81	10	0	0	0	0	0	0	0
L-09	7/10/00	04:20-97:00	50° 58' N	144° 57' W	10.7	32.74	10	0	0	0	0	0	0	0
L-10	7/11/00	04:23-06:50	49° 58' N	144° 57' W	11.4	32.65	10	0	0	0	0	0	0	0
L-11	7/12/00	04:21-06:58	48° 59' N	144° 54' W	11.4	32.51	10	0	0	0	0	0	0	0
L-12	7/13/00	04:22-06:20	47° 59' N	144° 57' W	12.4	32.49	10	0	0	0	0	0	0	0
Total							120	0	9(1)	3(2)	12(8)	0	0	24(11)
Hook-and-line	7/05/00-7/13/00		145° W transect					0	0	1(1)	5(4)	2(2)	0	8(8)

() : Numbers of salmonids with Archival tags attached