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SUMMARY OF COOPERATIVE U.S.-JAPAN HIGH SEAS SALMONID RESEARCH ABOARD THE JAPANESE RESEARCH VESSEL OSHORO MARU, 1994

by

Robert V. Walker and Katherine W. Myers
Fisheries Research Institute
School of Fisheries WH-10
College of Ocean and Fishery Sciences
University of Washington
Seattle, WA 98195

and

Gen Anma and Seiji Sasaki
Faculty of Fisheries
Hokkaido University
Hakodate, Hokkaido

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ABSTRACT

Preliminary information is presented from salmon research conducted in June and July, 1994 aboard the Oshoro maru by scientists of the Fisheries Research Institute (FRI), School of Fisheries, University of Washington, and the Faculty of Fisheries, Hokkaido University. The research was focused on various aspects of salmon growth and ecology. Seventeen stations were fished along two transects: along 180° between 39°N and 46°N, and in the Gulf of Alaska along 50°N from 157°W to 145°W, then north along 145°W from 50°N to 56°N. Variable mesh gillnet took 420 salmonids from 39° to 43° N along 180°, and took 2,240 salmonids in the Gulf of Alaska. Ten coho salmon and three chum salmon were tagged and released at 43°N and 46°N along 180°. Fifty-eight salmonids were tagged and released in the Gulf of Alaska (8 sockeye, 28 chum, 9 pink, 11 coho, and 2 steelhead).

Coded-wire tags were found in two coho and one steelhead lacking adipose fins caught in the Gulf of Alaska. The coho, caught at 50°N, 148°W and 56°N, 145°W, were released from hatcheries near Kenai and Ketchikan, Alaska. The steelhead had been tagged at a hatchery on the Hoh River, Washington, and was caught at 50°N, 157°W.

In the Gulf of Alaska, 650 stomachs (136 sockeye, 172 chum, 160 pink, 124 coho, 18 chinook, and 40 steelhead) were collected for salmon food habit studies. Samples of eye, heart, liver, and muscle tissues were collected from 105 chum salmon in the Gulf of Alaska for genetic studies of stock mixing. Otoliths were collected from 164 salmonids in the Gulf of Alaska (24 sockeye, 110 chum, 23 pink, 3 coho, and 5 steelhead) for age and growth studies. Muscle samples collected from 121 fish (21 sockeye, 70 chum, 18 pink, 4 coho and 8 steelhead) in the Gulf of Alaska will be dried to determine moisture content as an indirect measure of the condition of the fish. Results of genetic, condition, and age and growth studies will be reported later. Salmon feeding studies are reported elsewhere.

INTRODUCTION

The Faculty of Fisheries, Hokkaido University, and scientists from the University of Washington have participated in cooperative salmon research aboard the training and research vessel T/S Oshoro maru for several years (Walker 1993). In 1994 two scientists from the Fisheries Research Institute (FRI), School of Fisheries, University of Washington, conducted salmon research aboard the Oshoro maru in cooperation with faculty of Hokkaido University. This report is a preliminary account of that research.

The focus of FRI research on this cruise was on various aspects of salmon growth and ecology. Scale samples were collected for growth studies and for comparison with scales collected in the same areas in the past. Stomach contents and samples and data related to condition factors, such as moisture content of muscle tissue and weight and length data, were collected to assess the effects of oceanographic conditions, possible interactions between salmonid species and between wild and hatchery production, and changes from previous years.

METHODS

The Oshoro maru departed Hakodate on June 3, 1994, made a port call in Dutch Harbor June 22-24, and arrived in Seward on July 10. FRI scientists boarded in Dutch Harbor for the Gulf of Alaska leg. Salmon research was conducted along two transects: at seven stations along 180° between 39°N and 47°N, and at ten stations in the Gulf of Alaska starting eastward along 50°N from 157°W to 145°W, then continuing north along 145°W from 50°N

to 56°N (Fig. 1; Table 1). Fishing at three stations was canceled due to adverse weather conditions (two along 180° at 44°N and 47°N, and one in the Gulf of Alaska at 50°N, 154° W). Oceanographic sampling (CTD casts and water samples for numerous chemical analyses) was conducted by Hokkaido University scientists at each station before the gillnet set and between each station. The Subarctic Boundary as defined by Favorite et al. (1976; vertical 34‰ isohaline, which corresponds closely to the location of the 34‰ isohaline at 100m) and Roden (1991; outcrop of 33.8‰ isohaline) was crossed at about 41°30'N. In the Gulf of Alaska, gillnet stations 8-14 were in the Subarctic Current System. North of about 53°N, stations 15-17 were on the boundary between the Ridge Domain (4°C isotherm at 100m) and the Dilute Domain (33.0‰ isohaline at 100m) as defined by Favorite et al. (1976). Evidence of the Ridge Domain was more clear at oceanographic stations on a parallel transect along 146°W, one degree further west.

Gillnet sampling

Gillnet sampling was conducted at all 17 stations. Total amount of gillnet gear used was 49 tans (19 tans of commercial mesh, 30 tans of research mesh; each tan is 50 m long), with mesh sizes ranging from 48 to 157 mm (Table 2). Amount of net and arrangement of different-sized mesh panels were the same as in 1993 sampling. Gillnet gear was set in the evening, allowed to soak overnight, and was retrieved the following morning.

Longline sampling

Longline sampling was conducted at four stations along 180° and at seven stations in the Gulf of Alaska (Table 1). Total amount of longline gear fished was 10 hachi (6 stations) or 12 hachi (5 stations), each hachi consisting of 34 hooks and gangions attached to 127 m of mainline. Longlines were set in the early morning, fished for one and one-half to two and one-half hours, and retrieved after retrieval of the gillnet.

Tagging

All viable fish caught on longlines were tagged with 1/2" and 3/4" red and white Petersen disk tags and released. Tags provided by FRI were used in addition to Fisheries Agency of Japan (FAJ) tags, in order to test whether presence of a North American return address would improve return of tags by U.S. and Canadian fishermen.

Fish lacking adipose fins

By prior arrangement with FAJ, heads were collected from salmonids lacking adipose fins caught in the Gulf of Alaska. Heads were frozen aboard the Oshoro maru and taken to FRI in Seattle, where they were salted, and snouts were sent to Auke Bay Laboratory, U.S. National Marine Fisheries Service (NMFS), for examination for coded-wire tags.

Biological sampling

Scale sampling. Scale samples were collected by Oshoro maru personnel from all longline-caught fish and from up to 60 fish of each species caught in each mesh size of gillnet used in each set. FRI personnel also collected scales from all longline-caught fish in the Gulf of Alaska, from chum salmon sampled for tissues for genetic analysis, and from most fish sampled for otoliths.

Stomach contents. Stomach contents were examined from up to 23 fish of each species from each gillnet set. The methods are described in Walker and Myers (1994).

Genetic samples. Samples of muscle, heart, eye, and liver tissue were collected from chum salmon in the Gulf of Alaska for protein electrophoretic analysis. At the first two Gulf of Alaska stations (8 and 9), samples were taken only from damaged fish and longline mortalities. When it seemed these sources would not provide large enough numbers to achieve an overall sample of 100 fish, additional fish (approximately 10 per set) were set aside from the gillnet catch for later genetic sampling. Samples were collected and frozen immediately after gillnet retrieval, and were transported frozen to Seattle.

Otoliths. Otoliths were collected in the Gulf of Alaska as available from damaged individuals of all species of salmonids and from chum salmon sampled for genetic materials. Samples were placed in envelopes and preserved dry.

Condition factors. Muscle samples were collected from salmon in the Gulf of Alaska to determine moisture content. Water content of muscle is inversely related to fat content and is an indirect measure of the condition of the fish. A transverse section approximately 1.5-3 cm thick was taken from just behind the pectoral fins. Muscle samples were weighed to the nearest gram, frozen, and taken to FRI for drying in a drying oven.

RESULTS AND DISCUSSION

Gillnet sampling

Along 180°, 420 salmonids (113 chum, 48 pink, 229 coho, 2 chinook, and 28 steelhead) were caught at four stations from 42° to 46°N (Table 3). Highest catches of chum and coho occurred at 43°N, slightly north of the Subarctic Boundary, while catches of pink continued to increase as the ship moved north. Catches of steelhead and chinook were low, and no sockeye were caught.

In the Gulf of Alaska, 2,240 salmonids (821 sockeye, 343 chum, 671 pink, 332 coho, 19 chinook, and 54 steelhead; Table 3) were caught at ten stations. Some chum salmon and damaged fish were set aside from gillnet catches and longline mortalities for later sampling for otoliths, tissues for genetic analysis, and heads from fish missing the adipose fin; it was not possible to assign these fish to a specific gear or mesh size. These samples accounted for 153 fish (14 sockeye, 105 chum, 25 pink, 1 coho, 1 chinook, and 7 steelhead) and are not included in the catch totals.

Catch per unit effort (CPUE) was examined to estimate relative abundance between stations in the Gulf of Alaska (Fig. 2). Sockeye salmon were relatively more abundant at northern stations (Ridge Domain), whereas chum had higher CPUEs at western and southern stations (Subarctic Current). Pink and coho abundance was relatively even across all stations. Both chinook and steelhead were low in abundance, with higher catches in the Subarctic Current stations. No chinook were caught at Ridge Domain stations.

In 1993 the Gulf of Alaska transect of the Oshoro maru was quite different from that in 1994 (Walker 1993). It trended generally southwest to northeast from 51°N, 160°W to 56°N, 142°W. The transect ran along the Ridge Domain for most of its length, entering the Alaska Current at the last few stations. Stations 9-11 in 1993 were slightly north of station 8 in 1994, and stations 14 and 15 were slightly west and east of stations 16 and 17. CPUEs were about the same (chum and chinook), slightly higher (sockeye and steelhead), or much higher (coho) in 1994 at station 8 than the previous year at stations 9-11. At northern Gulf of Alaska stations, the reverse was true: CPUEs for most species were higher in 1993, and those for chum and pink salmon were much higher. Steelhead and chinook were in very low abundance or absent in both years.

An interesting feature of the 1994 catch was the presence of 14 ocean age .0 steelhead trout caught at stations 11-14 and 17 (50°-53°N and 56°N, 145°W). Average length and weight of 12 of these fish was 320 mm and 354 g; two were 400 mm (700 g and 560 g). Six of these small steelhead were missing the adipose fin, indicating origin in hatcheries in North America. The scale patterns of most of the fish also showed the relatively even freshwater growth pattern typical of hatchery fish. They most likely migrated out of freshwater just a few months before they were caught.

Longline sampling and tagging

Ten coho salmon and three chum salmon were caught, tagged, and released at stations along 180° at 43°N and 46°N. Fifty-eight salmonids were caught, tagged, and released in the Gulf of Alaska (8 sockeye, 28 chum, 9 pink, 11 coho, and 2 steelhead) (Table 4). Serial

numbers of tags released at each station are reported elsewhere (Azuma 1994; Myers and Walker 1994).

Fish lacking adipose fins

Twenty-one heads were collected from salmonids lacking adipose fins (Table 5): sixteen steelhead, three coho, and two pink salmon. All were caught in the Gulf of Alaska. Snouts from these salmonids were sent to the Auke Bay Laboratory, NMFS, for detection of coded-wire tags that may have been present. One of the steelhead and two coho contained coded-wire tags. The steelhead had been tagged at a hatchery on the Hoh River, Washington, and was caught at 50°00'N, 157°W. The coho were caught at 50°00'N, 148°W, and 56°00'N, 145°W, and carried tags from Skilak Lake, near Kenai, Alaska, and from Neets Bay, near Ketchikan, Alaska (Dahlberg et al. 1994).

One steelhead trout lacking the adipose fin was caught on longline gear at 50°03'N, 156°55'W, tagged with disc tags, and released, because of the low probability that it contained a coded-wire tag (Table 5; see Table 9 in Dahlberg et al. 1994).

Biological sampling

Scale collection. Scale cards were sent to the National Research Institute of Far Seas Fisheries, Fisheries Agency of Japan, for producing acetate impressions and reading ages of salmonids. Acetate impressions of scale cards were also made at FRI after a second Dutch Harbor port call. Scale samples will be analyzed later.

Stomach contents. In the Gulf of Alaska, 650 stomachs (136 sockeye, 172 chum, 160 pink, 124 coho, 18 chinook, and 40 steelhead) were collected (Table 6). Analysis of salmonid food habits is reported in more detail elsewhere (Walker and Myers 1994). Samples of 10 fish from prey items in stomachs were frozen and brought to Seattle for later identification.

Genetic samples. Genetic samples were collected from 105 chum salmon in the Gulf of Alaska for studies of stock mixing (Table 7). Chum salmon caught at all 10 stations contributed to the samples. Tissues will be analyzed using protein electrophoretic techniques and results will be compared to the chum salmon genetic baseline for North Pacific stocks, for information on mixing of stocks in the Gulf of Alaska. These results will be reported later.

Otoliths. Otoliths were collected from 164 salmonids in the Gulf of Alaska (24 sockeye, 110 chum, 23 pink, 3 coho, and 5 steelhead; Table 8). At a later date ages will be determined from the samples and compared to those from scale samples from the same fish.

Condition factors. Muscle samples were collected from 121 fish (21 sockeye, 70 chum, 18 pink, 4 coho and 8 steelhead; Table 9) in the Gulf of Alaska to determine moisture content. The samples will be dried and results will be reported later.

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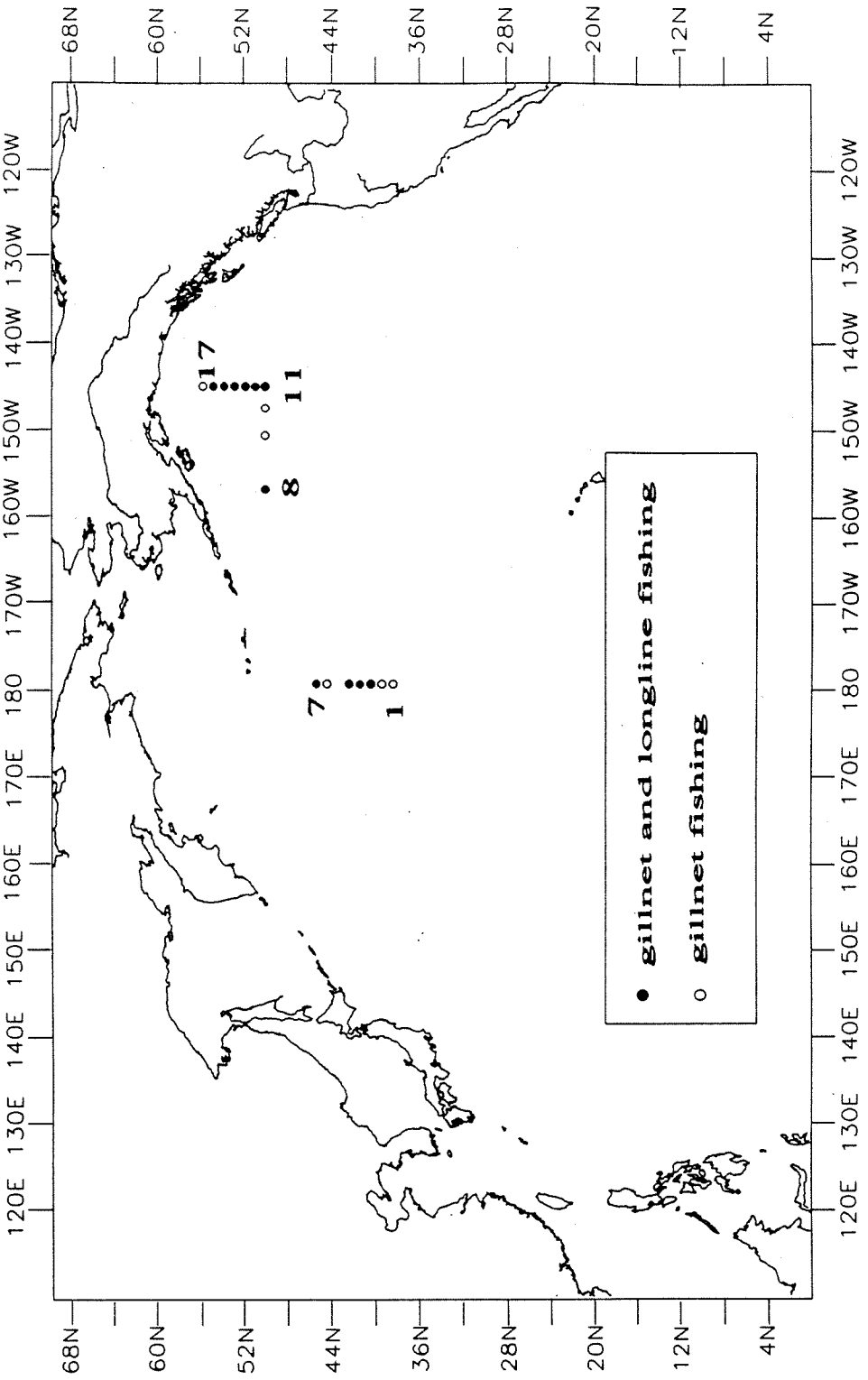

Figure 1. Location of fishing stations, T/S Oshoro maru cruise, 3 June to 10 July, 1994. Numbers are those of gillnet stations.

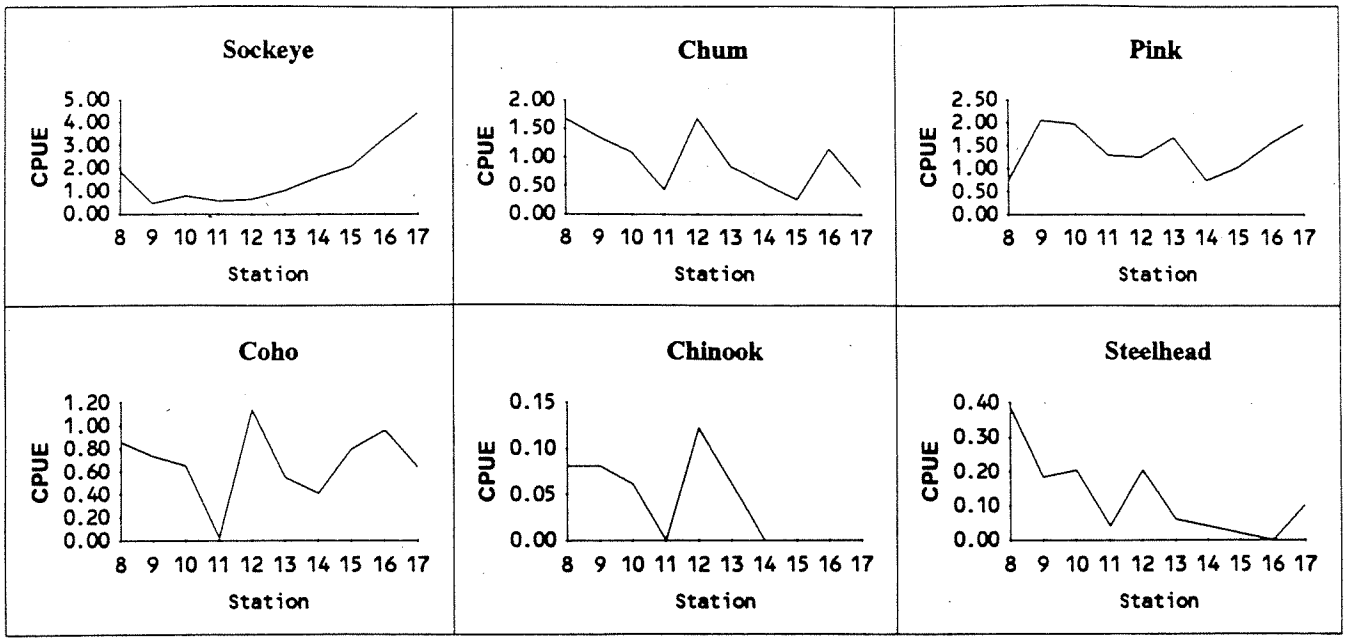

Figure 2. Catch per unit effort (CPUE) at gillnet stations in the Gulf of Alaska, T/S Oshoro maru cruise, June-July 1994. CPUE units are numbers of fish per tan. Commercial and research mesh catches are combined. Note different scales for CPUE for each species of salmonid.

Table 1. Fishing stations of T/S Oshoro maru cruise, June-July 1994. Station numbers are those of gillnet sets. Dates are local dates. Locations are rounded to nearest minute of latitude and longitude.

Gillnet Station	Date	Location	Gear	Sea Temperature (°C) Surface	Sea Temperature (°C) 100 m	Salinity (‰) Surface	Salinity (‰) 100 m
1	6/10-11	39°00'N, 179°58'W	Gillnet	13.7	11.1	34.1	34.2
2	6/11-12	40°00'N, 180°00'	Gillnet	13.2	11.4	34.1	34.2
3	6/12-13	41°00'N, 180°00'	Gillnet	12.0	10.7	34.1	34.2
	6/13	41°00'N, 179°57'E	Longline	11.9			
4	6/13-14	42°00'N, 180°00'	Gillnet	10.1	8.7	33.9	33.9
	6/14	42°00'N, 179°59'E	Longline	10.0			
5	6/14-15	43°00'N, 180°00'	Gillnet	9.6	8.0	33.8	33.8
	6/15	43°00'N, 179°57'E	Longline	9.6			
6	6/16-17	45°00'N, 180°00'	Gillnet	8.0	7.2	33.3	33.6
7	6/17-18	46°00'N, 180°00'	Gillnet	6.0	4.2	33.0	33.0
	6/17	46°01'N, 179°57'E	Longline	6.0			
8	6/27-28	50°00'N, 157°00'W	Gillnet	8.3	4.6	32.6	33.4
	6/28	50°03'N, 156°56'W	Longline	8.2			
9	6/29-30	50°00'N, 151°00'W	Gillnet	8.6	5.1	32.4	33.4
10	6/30-7/1	50°00'N, 148°00'W	Gillnet	10.0	6.2	32.5	32.9
11	7/1-2	50°00'N, 144°58'W	Gillnet	10.5	6.5	32.6	33.3
	7/2	49°58'N, 144°58'W	Longline	10.2			
12	7/2-3	51°00'N, 145°00'W	Gillnet	10.6	5.6	32.5	32.7
	7/2	51°00'N, 144°55'W	Longline	10.5			
13	7/3-4	52°00'N, 145°00'W	Gillnet	11.0	5.8	32.4	32.7
	7/4	52°01'N, 145°00'W	Longline	10.9			
14	7/4-5	53°00'N, 145°00'W	Gillnet	10.5	5.5	32.5	32.9
	7/5	52°59'N, 144°49'W	Longline	10.3			
15	7/5-6	54°00'N, 145°00'W	Gillnet	11.3	5.4	32.2	33.1
	7/6	54°01'N, 145°02'W	Longline	11.3			
16	7/6-7	55°00'N, 145°00'W	Gillnet	11.5	4.8	32.4	33.2
	7/7	55°00'N, 145°06'W	Longline	11.4			
17	7/7-8	56°00'N, 145°00'W	Gillnet	11.8	6.3	32.2	33.1

Table 2. Arrangement of gillnet mesh sizes and amount of each mesh size fished from the T/S Oshoro maru, June-July, 1994. (1 tan = 50 m.)

Commercial or Research	(A) (C)	Mesh Size (mm)	Amount (no. of tans)
	A	115	10
	C	48	3
	C	93	3
	C	157	3
	C	106	3
	C	63	3
	C	121	3
	C	72	3
	C	138	3
	C	82	3
	C	55	3
	A	121	9
	Total		49

Table 3. Salmonid catch of T/S Oshoro maru by commercial (A) and research (C) gillnets, June-July, 1994. Dates are date of retrieval, local time. Locations are rounded to nearest minute of latitude and longitude. SST = sea surface temperature (°C).

Sta.	Date	Location	SST	Gear	Sockeye	Chum	Pink	Coho	Chinook	Steelhead	Total
180° transect:											
1	6/11	39°00'N	13.7	A	0	0	0	0	0	0	0
		179°58'W		C	0	0	0	0	0	0	0
				A+C	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2	6/12	40°00'N	13.2	A	0	0	0	0	0	0	0
		180°00'		C	0	0	0	0	0	0	0
				A+C	**0**	**0**	**0**	**0**	**0**	**0**	**0**
3	6/13	41°00'N	12.0	A	0	0	0	0	0	0	0
		180°00'		C	0	0	0	0	0	0	0
				A+C	**0**	**0**	**0**	**0**	**0**	**0**	**0**
4	6/14	42°00'N	10.1	A	0	0	0	14	0	0	14
		180°00'		C	0	6	2	18	0	0	26
				A+C	**0**	**6**	**2**	**32**	**0**	**0**	**40**
5	6/15	43°00'N	9.6	A	0	2	0	45	0	1	48
		180°00'		C	0	42	7	58	0	1	108
				A+C	**0**	**44**	**7**	**103**	**0**	**2**	**156**
6	6/17	45°00'N	8.0	A	0	4	1	43	0	14	62
		180°00'		C	0	34	14	14	0	7	69
				A+C	**0**	**38**	**15**	**57**	**0**	**21**	**131**
7	6/18	46°00'N	6.0	A	0	4	2	18	1	2	27
		180°00'		C	0	21	22	19	1	3	66
				A+C	**0**	**25**	**24**	**37**	**2**	**5**	**93**
180° transect subtotal:				A	0	10	3	120	1	17	151
				C	0	103	45	109	1	11	269
				Subtotal	**0**	**113**	**48**	**229**	**2**	**28**	**420**

continued

Table 3. Gillnet salmonid catch by T/S Oshoro maru, June-July, 1994. (continued)

Sta.	Date	Location	SST	Gear	Sockeye	Chum	Pink	Coho	Chinook	Steelhead	Total
Gulf of Alaska transect:											
8	6/28	50°00'N	8.3	A	6	11	16	25	2	11	71
		157°00'W		C	88	54	20	17	1	4	184
				A+C	**94**	**65**	**36**	**42**	**3**	**15**	**255**
9	6/30	50°00'N	8.6	A	5	12	68	15	2	4	106
		151°00'W		C	18	53	30	20	2	5	128
				A+C	**23**	**65**	**98**	**35**	**4**	**9**	**234**
10	7/1	50°00'N	10.0	A	26	7	51	20	2	6	112
		148°00'W		C	12	28	38	12	1	3	94
				A+C	**38**	**35**	**89**	**32**	**3**	**9**	**206**
11	7/2	50°00'N	10.5	A	18	1	33	1	0	0	53
		144°58'W		C	9	10	27	0	0	2	48
				A+C	**27**	**11**	**60**	**1**	**0**	**2**	**101**
12	7/3	51°00'N	10.5	A	14	0	32	33	6	1	86
		145°00'W		C	17	68	26	24	0	7	142
				A+C	**31**	**68**	**58**	**57**	**6**	**8**	**228**
13	7/4	52°00'N	11.0	A	35	4	53	16	2	0	110
		145°00'W		C	16	25	27	11	1	3	83
				A+C	**51**	**29**	**80**	**27**	**3**	**3**	**193**
14	7/5	53°00'N	10.5	A	59	0	17	12	0	1	89
		145°00'W		C	19	17	18	8	0	1	63
				A+C	**78**	**17**	**35**	**20**	**0**	**2**	**152**
15	7/6	54°00'N	11.3	A	66	0	28	19	0	0	113
		145°00'W		C	36	2	19	20	0	1	78
				A+C	**102**	**2**	**47**	**39**	**0**	**1**	**191**
16	7/7	55°00'N	11.5	A	79	2	36	35	0	0	152
		145°00'W		C	82	40	38	12	0	0	172
				A+C	**161**	**42**	**74**	**47**	**0**	**0**	**324**
17	7/8	56°00'N	11.8	A	132	4	37	23	0	2	198
		145°00'W		C	84	5	57	9	0	3	158
				A+C	**216**	**9**	**94**	**32**	**0**	**5**	**356**
Gulf of Alaska transect subtotal:				A	440	41	371	199	14	25	1,090
				C	381	302	300	133	5	29	1,150
				Subtotal	**821**	**343**	**671**	**332**	**19**	**54**	**2,240**
Cruise grand total:				A	440	51	374	319	15	42	1,241
				C	381	405	345	242	6	40	1,419
				Total	**821**	**456**	**719**	**561**	**21**	**82**	**2,660**

Table 4. Numbers of tagged salmonids released from longline catches on board the T/S Oshoro maru, June-July, 1994. For comparison with gillnet catches and location, station numbers of gillnet stations are given in parentheses. Dates are date of set and retrieval, local time. Locations are rounded to nearest minute of latitude and longitude. SST = sea surface temperature (°C). Gear units are hachi (34 hooks/hachi).

Station LL (GN)	Date	Location	SST	Amt. Gear		Sockeye	Chum	Pink	Coho	Chinook	Steelhead	Total
1 (3)	6/13	41°00'N 179°57'E	11.9	10	Tagged	0	0	0	0	0	0	0
2 (4)	6/14	42°00'N 179°59'E	10.0	10	Tagged	0	0	0	0	0	0	0
3 (5)	6/15	43°00'N 179°57'E	9.6	10	Tagged	0	2	0	6	0	0	8
4 (7)	6/18	46°01'N 179°57'E	6.0	10	Tagged	0	1	0	4	0	0	5
5 (8)	6/28	50°03'N 156°56'W	11.1	10	Tagged	4	13	3	1	0	2	23
6 (11)	7/2	49°58'N 144°58'W	10.2	12	Tagged	0	1	1	0	0	0	2
7 (12)	7/3	51°00'N 144°55'W	10.5	12	Tagged	0	7	1	5	0	0	13
8 (13)	7/4	52°01'N 145°00'W	10.9	12	Tagged	0	1	2	1	0	0	4
9 (14)	7/5	52°59'N 144°49'W	10.3	12	Tagged	0	2	0	1	0	0	3
10 (15)	7/6	54°01'N 145°02'W	11.3	12	Tagged	2	0	1	0	0	0	3
11 (16)	7/7	55°00'N 145°06'W	11.4	10	Tagged	2	4	1	3	0	0	10
	Total	**Tagged**				**8**	**31**	**9**	**21**	**0**	**2**	**71**

Table 5. Catch location and biological data for salmonids with missing or damaged adipose fins caught by the Oshoro maru, 28 June-8 July 1994. Mesh size is given for commercial (A) and research (C) gillnet gear where known; GN designates gillnet catch where mesh size was not recorded. B designates longline gear. Date is retrieval date, local ship time.

Species	Sta.	Date	Position	Length (mm)	Weight (gm)	Sex	Gonad Wt. (gm)	Gear
Steelhead	8	6/28	50°00'N 157°00'W	550	1800	F		GN
Steelhead	8	6/28	50°00'N 157°00'W	520	1400	M		GN
Steelhead[1]	8	6/28	50°00'N 157°00'W	570	2000	F		GN
Steelhead	8	6/28	50°00'N 157°00'W	535	1550	M		GN
Steelhead*	8	6/28	50°00'N 157°00'W	550				B
Steelhead	9	6/30	50°00'N 151°00'W	538	1610	M	10	A115
Steelhead	9	6/30	50°00'N 151°00'W	504	1300	F	1	C93
Steelhead	10	7/1	50°00'N 148°00'W	684	3500	F	29	A115
Steelhead	10	7/1	50°00'N 148°00'W	480	1100	M	3	C106
Steelhead	10	7/1	50°00'N 148°00'W	726	4500	F	34	C157
Steelhead	10	7/1	50°00'N 148°00'W	536	1900	M	1	A115
Coho[2]	10	7/1	50°00'N 148°00'W	630	3400	M	40	A115
Pink**	10	7/1	50°00'N 148°00'W	510	1850	F	44	GN
Pink**	11	7/2	50°00'N 144°58'W	490	2880	F	78	C55
Steelhead	12	7/3	51°00'N 145°00'W	320		M	1	GN
Steelhead	12	7/3	51°00'N 145°00'W	324	350	M	1	C72
Steelhead	12	7/3	51°00'N 145°00'W	320	300	M	1	C72
Steelhead	12	7/3	51°00'N 145°00'W	330	400	M	1	C82
Coho	12	7/3	51°00'N 145°00'W	580	2620	M	14	A121
Steelhead	13	7/4	52°00'N 145°00'W	330	320	F	1	C63
Steelhead	14	7/5	53°00'N 145°00'W	326	380	M	1	C72
Coho[3]	17	7/8	56°00'N 145°00'W	558	2270	F	36	A115

[1] This fish contained a coded-wire tag from a hatchery on the Hoh River, Washington

[2] This fish contained a coded-wire tag from a hatchery on the Skilak River, near Kenai, Alaska.

[3] This fish contained a coded-wire tag from a hatchery on Neets Bay, near Ketchikan, Alaska.

* This fish was caught on longline gear, tagged with disc tags CC2027 (FAJ) and EE0070 (FRI), and released.

** These fish were missing only part of adipose fin.

Table 6. Stomach content samples taken for food habits analysis.

Station	Sockeye	Chum	Pink	Coho	Chinook	Steelhead	Total
8	11	16	15	12	2	9	65
9	10	15	14	10	2	5	56
10	10	26	19	11	5	7	78
11	13	16	14	1	0	1	45
12	12	10	11	11	6	7	57
13	10	18	13	10	3	3	57
14	12	13	10	12	0	2	49
15	17	11	21	14	0	1	64
16	21	26	22	23	0	0	92
17	20	21	21	20	0	5	87
Total	136	172	160	124	18	40	650

Table 7. Chum salmon genetic samples taken for studies of stock mixing.

Station:	8	9	10	11	12	13	14	15	16	17	Total
No. samples:	10	1	18	10	10	12	9	10	12	13	105

Table 8. Otolith samples taken for studies of age composition.

Station	Sockeye	Chum	Pink	Coho	Chinook	Steelhead	Total
8	12	10	2	1	0	0	25
9	0	1	2	1	0	0	4
10	0	18	6	0	0	0	24
11	2	10	3	0	0	1	16
12	0	14	3	0	0	2	19
13	0	12	1	0	0	1	14
14	1	9	0	0	0	0	10
15	0	10	3	0	0	0	13
16	5	13	1	0	0	0	19
17	4	13	2	1	0	1	20
Total	24	110	23	3	0	5	164

Table 9. Muscle samples taken for moisture content analysis.

Station	Sockeye	Chum	Pink	Coho	Chinook	Steelhead	Total
8	12	0	2	1	0	4	19
9	1	1	1	1	0	1	5
10	0	18	7	1	0	2	28
11	2	10	4	0	0	1	17
12	0	0	0	0	0	0	0
13	0	12	1	0	0	0	13
14	1	9	0	0	0	0	10
15	1	10	3	0	0	0	14
16	3	5	0	0	0	0	8
17	1	5	0	1	0	0	7
Total	21	70	18	4	0	8	121