FRI-UW-8910
September 1989

U.S.-JAPAN COOPERATIVE HIGH SEAS SALMONID RESEARCH IN 1989: SUMMARY OF RESEARCH ABOARD THE JAPANESE RESEARCH VESSEL *SHIN RIASU MARU*, 1 JUNE TO 20 JULY

by

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Submitted to the
International North Pacific Fisheries Commission
by the
United States National Section

THIS PAPER MAY BE CITED IN THE FOLLOWING MANNER:

Davis, N. D. 1989. U.S.-Japan cooperative high seas salmonid research in 1989: summary of research aboard the Japanese research vessel *Shin Riasu maru*, 1 June to 20 July. (Document submitted to the International North Pacific Fisheries Commission.) 14 pp. FRI-UW-8910. Fisheries Research Instititute, University of Washington, Seattle.

ABSTRACT

A U. S. scientist participated in the cruise of the Japanese research vessel *Shin Riasu maru* from 1 June to 20 July, 1989. Twenty-five longline sets were made in the North Pacific Ocean southwest of 46°N latitude, 173°W longitude, and the catch was 1,284 salmonids. Chum (*Oncorhynchus keta*) and pink salmon (*O. gorbuscha*) were the most abundant species, and sockeye salmon (*O. nerka*) was the least abundant species caught. A total of seventeen steelhead trout (*O. mykiss*, formerly *Salmo gairdneri*) missing adipose fins were caught, and one of these fish may carry a coded-wire tag (CWT) because it produced a positive response from the wire tag detector. A total of 80 salmon were required for experiments and so could not be released, but an overall average of 53% of the salmonids caught were tagged and released. This percentage is substantially higher than the 30.6% reported by this vessel last year. Six gillnet operations were made southwest of 50°N latitude, 170°E longitude where a total of 872 salmonids was caught. Sockeye and pink salmon were the most abundant species, and chinook salmon (*O. tshawytscha*) was the least abundant species caught. Observations on short term hooking mortality of chum salmon showed that 100% of lightly hooked fish (n=18) survived for at least 23 hours after tagging. Among fish that were deeply hooked, 65% (n=23) without the hook removed and 80% (n=5) with the hook removed survived for at least 23 hours after tagging. Shipboard experiments to determine if a wire tag detector could reliably determine the presence of CWTs in the snouts of salmon showed in four trials that the detector worked with 100% reliability. Recommendations for future cruises include the following: (1) that guidelines issued by the Fisheries Agency of Japan to research vessels for 1989 be used in next year's salmonid tagging operations because the guidelines allow for the release of deeply hooked fish without removing longline hooks, which results in a larger percentage of fish being released than in previous years, (2) that short term mortality experiments on deeply hooked salmonids be continued next year to further elucidate when the longline hook should or should not be removed, and (3) that an adequate handling method be developed for screening live steelhead that have missing adipose fins for the presence of CWTs so that fish without a CWT can be tagged with a high seas tag and released.

INTRODUCTION

In accordance with the 1986 Memorandum of Understanding (MoU) on research of the International North Pacific Fisheries Commission (INPFC), in 1989 one U.S. scientist participated in salmon research aboard the Japanese research vessel *Shin Riasu maru*. This report summarizes the results of my observations on the short term mortality of hooked chum salmon (*Oncorhynchus keta*) and the results of experiments on the reliability of shipboard detection of coded-wire tags (CWT). Other INPFC-related research conducted during this cruise, which included disk tagging of salmonids south of 46° north latitude, tracking of chum and coho salmon (*O. kisutch*) with ultrasonic tags, comparing catch efficiencies of barbed versus barbless hooks, and fishing research gillnets to collect catch per unit effort data, will be reported by the Japan National Section.

To increase the effectiveness of high seas salmonid tagging, the Sub-Committee on Salmon recommended in 1988 that salmon be experimentally released without removing longline hooks. In accordance with this recommendation, in 1989 the Fisheries Agency of Japan (FAJ) suggested that Japanese research vessels cut deeply hooked salmonids from longlines rather than forcibly removing the hook (see Appendix A). To evaluate the benefit of not removing deeply embedded hooks, I observed chum salmon in a live tank and compared the mortality rates of tagged fish among three categories of hooking treatment.

Because the chance of catching a salmonid carrying a CWT, tagging it with a high seas tag, and recapturing the same fish again is extremely small, the Sub-Committee on Salmon also recommended in 1988 that all salmonids with missing adipose fins be sacrificed to examine the snout for the presence of a CWT. The salmonid most often encountered during high seas tagging operations with missing adipose fins are steelhead (*O. mykiss*, formerly *Salmo gairdneri*), but the proportion of steelhead later found to carry a CWT has decreased in recent years (Light et al. 1988). Although a clipped adipose fin indicates the presence of a CWT in chinook (*O. tshawytscha*) and coho salmon it does not necessarily indicate the presence of a CWT in steelhead. The percentage of steelhead smolts with clipped adipose fins released from the Pacific Northwest, British Columbia and Alaska increased from 18% in 1981 to 60% in 1986, while the percentage of smolts with clipped adipose fins that also carried a CWT decreased from 71% to 10% over the same period (Light et al. 1988). This trend has been seen in high seas catches as well. The percentage of steelhead missing adipose fins caught on the high seas increased from 4% in 1983 to 18% in 1987, while the percentage of those that also carried a CWT decreased from 25% to 9% over the same period (Light et al. 1988). If steelhead missing adipose fins could be screened immediately as they are caught for the presence of a CWT, then a number of these steelhead (if caught in viable condition) could be tagged with high seas tags and released to watch for their return to inshore areas. To determine the shipboard reliability of CWT detection, I screened all salmonids caught with missing adipose fins for the presence of a CWT using a detector. In addition, coded-wire tags were experimentally injected into fish to determine if the detector could reliably separate fish carrying a CWT from fish that did not.

METHODS

SHORT-TERM MORTALITY OF HOOKED CHUM SALMON

Chum salmon were selected for this study because they were frequently caught in longline operations. The procedure used to remove fish from the longline was to dipnet the fish from the water and land them on deck on a foam rubber mattress. Fish were then removed from the branch line either by removing the hook using a dehooking tool (a curved blunted nail secured to a wooden handle) or by cutting the line and leaving the hook in the fish.

There were three categories of hooking treatment used in this study. Treatment group I comprised lightly hooked chum that had the hook removed. Lightly hooked fish are defined as fish that have the hook located in the front of the mouth (often the lips) and where the hook was easily removed either by hand or with the dehooking tool. Treatment groups II and III comprised chum that were deeply hooked. Deeply hooked fish are those that have the hook completely hidden from view when the fish's mouth is closed, and the hook is far enough in the mouth so that the shank of the hook is not lying immediately behind the lips. Group II comprised fish removed from the line by cutting the line and leaving the hook embedded in the fish's mouth. Group III comprised fish that had the hook removed with the dehooking device.

Fish were identified to their particular treatment group as they were removed from the longline by placing color-coded rubber bands around the caudal peduncle. After removal from the longline, all fish were put into a live tank to evaluate their condition. Only fish caught on barbed hooks were used in the mortality study. These fish were treated in exactly the same manner as fish destined to be tagged and released. The criteria used to evaluate whether a fish was suitable for tagging were also applied to fish in the mortality study (see Appendix A). Briefly summarized, these criteria require taking several minutes to evaluate the fish's condition including orientation, bleeding, reddening of the eyes, and damage to the cartilage around the mouth. This ensured that the fish used in the mortality study were in the same condition as fish that were tagged and released. Fish in the mortality study were measured for length, a scale sample removed and a disk tag applied, but instead of being released to the sea, they were placed in a large covered plastic live tank well-supplied with circulating seawater.

Fish were observed for approximately 23 hours, although on several occasions it was possible to observe the fish for up to 3.5 days. After each observation period, the fish were dissected to inspect the mouth for hooking injuries.

RELIABILITY OF SHIPBOARD DETECTION OF CODED-WIRE TAGS

All salmonids caught during fishing operations that were missing their adipose fin were screened for the presence of a CWT using a field sampling detector (manufactured by Northwest Marine Technology, Inc.). The CWT detector is a rectangular metal box (dimensions approximately 36 cm long, 23 cm wide, and 18 cm tall; weight approximately 3 kg) with one v-shaped side so that the head of the fish can be brought into close proximity with the sensors inside the detector. Each fish was screened twice for the presence of a CWT, first before the head was removed and again after the head was removed, to determine if detector response was consistent. No remagnetization procedure was used.

To expand the sample size of fish carrying CWTs, sixty fish were selected from four morning gillnet operations in which half of the fish were injected with a CWT. A mixture of sizes and fish species were used including chum, pink (*O. gorbuscha*), sockeye (*O. nerka*), and coho salmon. Fish were individually labelled and then screened using the CWT detector to insure that initially all fish were negative for the presence of a CWT. Half of the fish were randomly selected and a CWT was injected into the snout and the presence or absence of a CWT was recorded for each fish. After injection, the fish were screened again using the detector to ensure the tag was properly injected. Fish carrying wire tags were mixed randomly in baskets with fish not carrying tags and then all fish were screened for the presence of the tags by an individual who did not know which fish contained tags. No remagnetization procedure was used.

RESULTS AND DISCUSSION

FISHING AND TAGGING OPERATIONS

Longline operations. Twenty-five longline operations were made at 13 stations between June 7 and July 7, 1989 (Fig. 1). Thirty hachi (49 hooks per hachi) were fished at all morning and evening sets except the last set (July 7, a.m.) when 40 hachi were fished. The longline was set approximately 15 minutes before sunrise or sunset and allowed to fish for approximately 30 minutes before the crew commenced to haul it aboard. In total, 1,284 salmonids were caught and 638 fish were disk tagged and released (Table 1). Chum salmon were the most abundant species (69% of the catch) followed by pink (16%) and coho salmon (9%). Sockeye salmon were the least abundant species (less than 1% of the catch). Salmonid catches were generally small with more than half (60%) of the operations catching 40 fish or fewer (Table 2). The daily percent tagged was highly variable and ranged from 21% to 73%. This variability was likely due to conditions such as the small catches and weather and sea conditions while fishing on a particular day. Experiments during the research cruise required the use of a total of 80 fish that could not be released. Subtracting these 80 fish from the total catch gives an overall average of 53% for the fish tagged and released. This percentage is substantially higher than the 30.6% reported by this vessel last year (Light 1988). The guidelines issued by FAJ on fish condition allowing salmon research vessels to release deeply hooked fish without removing longline hooks (Appendix A) is thought to be the cause of this increase (M. Ogura, personal communication).

Gillnet operations. Gillnet operations were made at six stations between July 9 and July 14, 1989 (Fig. 1). The gillnet comprised 20 tans of commercial mesh and 30 tans of research mesh sizes ranging from 48 mm to 157 mm. The gillnet was set approximately 1.5 hours before sunset and allowed to fish approximately 11 hours before the crew commenced to haul it aboard. An exception to this routine was the first gillnet operation (7-9 a.m.) when the gillnet was hauled aboard after only 8.5 hours due to deteriorating weather conditions. In total, 872 salmonids were caught (Table 3). Sockeye salmon was the most abundant species (45% of the catch) followed by pink (28%), chum, (22%) and coho (5%) salmon. Chinook salmon were the least abundant species (less than 1% of the catch). No steelhead were caught during gillnet operations.

SHORT-TERM MORTALITY OF HOOKED CHUM SALMON

A total of 46 chum were collected for the mortality study from barbed hooks during longline operations, and observations from this study are summarized in Table 4. All 18 fish in treatment group I survived the 23 hour observation period. Eight of the 23 fish in treatment group II died during this period. Among the 15 that survived, four appeared to loose their hooks because the hooks were not recovered from the fish during dissection, but were found later in the bottom of the tank. Five fish were collected in treatment group III. Few fish were collected that were deeply hooked and that had the hook removed because of the small catches generally, and also because in at least five cases fish were collected that were deeply hooked but when the hook was removed, the fish bled immediately and therefore were unsuitable for tagging. The opportunity to observe 13 fish for a longer period (3.5 days) occurred twice during the cruise (group I n=5, group II n=6, group III n=2). All fish survived in good condition and the experiment ended with the fish being sacrificed rather than dying at the end of the 3.5 days.

The percent survival for groups I, II, and III was 100%, 65%, and 80%, respectively (Table 4). This indicates that if the fish's condition falls satisfactorily within the FAJ quidelines (Appendix A) then it has a good chance of surviving one day, especially if it is lightly hooked. The survival is likely to decrease (at least 20%) for fish that are deeply hooked. Because these observations are based on small sample sizes, it is difficult to make many conclusions regarding whether to remove or not remove the hooks from deeply hooked fish. Also note that for this study, only fish meeting the condition criteria for tagging were used. Exclusion of fish that were bleeding after removal of deep hooks may have biased the results. However, if the objective of tagging experiments is to tag as many fish as possible with a minimum of handling and if by not removing deep hooks more fish can be released, then this procedure is a useful one. This is true because the short term survival of the fish in treatment group II was relatively high (65%) and because some fish loose the hooks after a short time (one day) even before corrosion has a chance to destroy the hook.

For hooks that do not fall out or rust quickly, it is possible that an adverse effect of embedded hooks on feeding and behavior may increase mortality of fish in the longer term.

The size of fish used in these experiments was generally small (mean=398 mm, standard deviation=64), and was limited by the vessel's catches, which were small both in numbers and fish size. Occasionally in small fish, hooking damage was sustained deep in the mouth or gullet, or the whole gullet was blocked with bait lodged on a snagged hook. This condition occurred more frequently among small fish than among larger fish, perhaps the result of the size of the hook relative to the fish's body. A fish with the gullet completely blocked would have difficulty feeding until the hook rusted out. This may cause even greater stress in small fish especially if energy demand is high while stored energy is low resulting in the requirement of frequent feeding. For these reasons, it is possible that deep hooks in small fish cause a higher mortality than in large fish.

After each daily experiment the chum were dissected to see where the hooking injuries occurred so that the quick external evaluation by the person removing the fish from the longline could be described in more detail. The lightly hooked fish (group I) either had no visible injury or showed some injury to the lips, tongue or the roof of the mouth. Deeply hooked fish (groups II and III) generally had damage to the gillrakers and the gullet. Fish that would have had extensive damage to the gills were probably removed from the experiment before tagging because of the no-bleeding criterion used to evaluate fish condition (Appendix A).

Although the practice of removing deeply hooked fish from the longline by cutting the line rather than forcible removal of the hook appears reasonable, this pertains only to deeply hooked fish (i.e., the hook not visible outside the mouth). Fish hooked at the front of the mouth and lips should have the hook carefully removed by hand or a dehooking tool because fish caught in this condition had the highest short term survival rate among those observed (100%).

RELIABILITY OF SHIPBOARD DETECTION OF CODED-WIRE TAGS

Salmonids missing their adipose fins. Seventeen salmonids missing adipose fins (all steelhead) were caught during longline operations (Table 5). One fish produced a positive signal from the CWT detector (fish number 6, Table 5). Examination of all snouts for the presence of coded-wire tags by the National Marine Fisheries Service Laboratory in Auke Bay, Alaska, has not yet been completed so is not included in this report. However, the distribution of fish missing adipose fins that are listed in Table 5 is well within the North American steelhead distribution (Light et al. 1988) and does not provide any new evidence of westward extensions of steelhead oceanic distribution.

Experimental injection of coded-wire tags into salmonid snouts. Results from the experimental injection of coded-wire tags into the snouts of fish are shown in Table 6. In each of the four experiments, the detector was able to indicate which fish contained a tag with 100% reliability. The detector was used on deck during fishing operations. Placement of the detector away from interference by moving ferrous objects was not a problem. However, this vessel has a raised secondary deck composed of loose planks that rocked slightly when walked upon or in heavy seas. Finding a stable place on deck was a small challenge. In addition to locating the detector away from foot traffic, some care was taken to keep the detector's electronic panel dry. These precautions included storing the detector in a warm, dry location, and when the detector was on deck during the retrieval of fishing gear, it was placed under a covered portion of the deck. Also, a plastic sheet was taped over the panel to keep rain and spray off the detector when it was used on deck and exposed to weather. With these small precautions, I never had a problem with moisture in the control panel.

If the detector were to be used to screen live fish for the presence of coded-wire tags, the reliability of the detector in a shipboard environment is not the limiting factor. Instead, the limiting factor is to find an adequate way to restrain the live fish in such a way that scale loss is minimized and so that the struggling fish does not frequently touch the sides of the detector producing many false positive signals. A tube-type detector where the fish is sent through the tube by water movement may be less injurious to the fish. In addition, the hook must be removed from the fish in order that the hook itself does not produce false signals from the detector. Hook removal from deeply hooked fish can cause bleeding, but steelhead are often relatively large and removal of hooks from large fish may be fairly easy to accomplish.

RECOMMENDATIONS

1. Guidelines issued to Japanese research vessels on how to handle fish for tagging (Appendix A) should be extended for use in next year's salmonid tagging operation because the guidelines allow for the release of deeply hooked fish without removing longline hooks. This resulted in a larger percentage of fish being released than in previous years. Several of these guidelines should be emphasized. Careful removal of the fish from the water using a dipnet, releasing deeply hooked fish by cutting the line, and leaving the hook in the fish were very important. However, lightly hooked fish should have the hook carefully removed by hand or a dehooking tool because fish caught in this condition had the highest short term survival rate among those observed (100%, Table 6). In addition, once the fish is placed in the live tank it is important that enough time be taken to allow for observations of the fish's behavior. Often fish put into the tank appear to be stunned, and they may take several moments to recover normal swimming behavior.

2. Short term mortality experiments on deeply hooked salmonids should be continued next year to more fully explore when the hook should or should not be removed from a deeply hooked fish, e.g., hook location, or fish size, as well as improving the definition of a deeply hooked fish, so that a fish can be evaluated quickly as it is brought aboard. In addition, experiments could be performed to evaluate different hook designs including hook size, length of the shank, and use of barbless hooks to minimize hooking injury to the fish. It might be useful for the National Sections to work toward a common set of guidelines for determining the fish's fitness for tagging, and specific suggestions about how to quickly evaluate whether to leave the hook in the fish.

3. An adequate handling method should be developed for screening live steelhead for CWTs so that more fish could be tagged with a high seas tag and released. Use of the detector could be limited to steelhead because so few of these fish are also carrying a CWT. Because relatively few snouts from species other than steelhead are returned for close inspection, this could significantly decrease both the expense of transporting heads and reduce the laboratory time required for examination of the snouts.

ACKNOWLEDGMENTS

I am grateful to the Government of Japan for providing me the opportunity to participate in the research cruise of the *Shin Riasu maru*. I thank Mr. Miki Ogura of the Fisheries Agency of Japan for very effectively coordinating my research objectives with the operations of the vessel and for his extensive help in facilitating my travel arrangements. I also thank Mr. Kunio Sato and the principal of the Miyako Fisheries High School for their graciousness in Miyako. I thank Captian Yosinobu Muraki and all the officers, crew, and students of the *Shin Riasu maru* for their generous assistance in carrying out my research and for their kind hospitality. And I am greatly endebted to Dr. Keith Jefferts and Mr. Jan Kallshian of Northwest Marine Technology, Inc. for their generous loan of all the equipment required for the coded-wire tag detection experiments.

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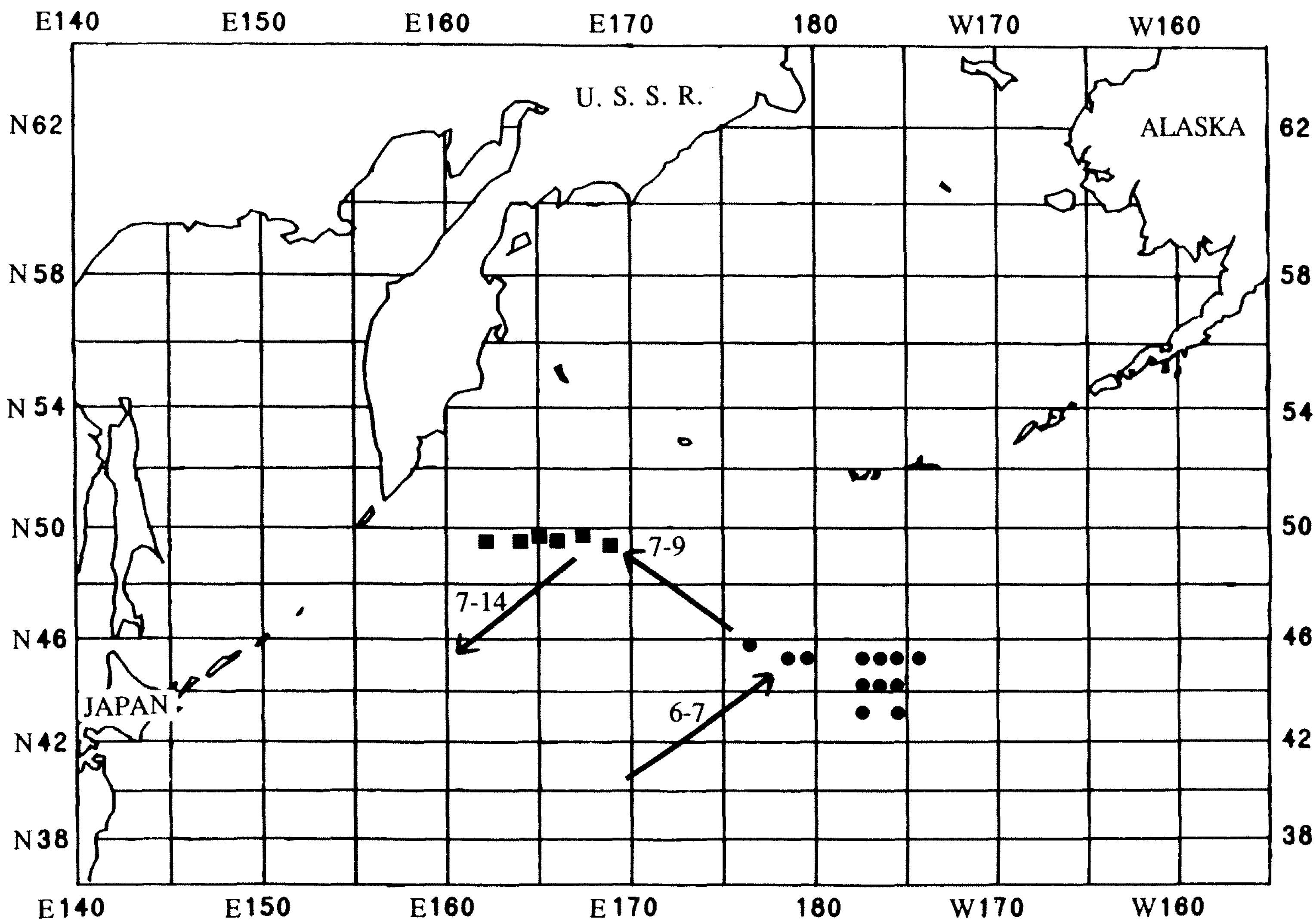

Figure 1. Location of the longline and gillnet stations for the summer 1989 salmon research cruise of the *Shin Riasu maru* .
● = longline operations set and hauled at sunrise and sunset. ■ = gillnet operations set at sunset and hauled at sunrise.

Table 1. Total number of salmonids listed by species that were caught and tagged in longline operations.

Species	Total Catch	Number Tagged
Sockeye	2	2
Chum	884	424
Pink	209	113
Coho	121	67
Chinook	26	13
Steelhead	42	19
Total	1,284	638

Table 2. Daily salmonid catch from longlines and percent of salmonids tagged and released after the number available for tagging was reduced because of shipboard experiments.

Date	Time	Location	Total Catch	Number Required for Experimentation*	Number Available for Tagging**	Number of Fish Tagged	Percent Fish Tagged***
6-7	p.m.	45°30'N 178°30'E	60	4	56	30	54
6-9	a.m.	45°30'N 178°30'E	87	8	79	48	61
6-9	p.m.	45°30'N 179°30'E	108	0	108	49	45
6-10	a.m.	45°30'N 179°30'E	318	4	314	168	54
6-10	p.m.	45°30'N 177°30'W	50	0	50	19	38
6-11	a.m.	45°30'N 177°30'W	55	7	48	28	58
6-11	p.m.	45°32'N 175°30'W	68	0	68	29	43
6-12	a.m.	45°31'N 175°31'W	115	10	105	75	71
6-15	p.m.	44°30'N 177°30'W	15	0	15	6	40
6-16	a.m.	44°29'N 177°27'W	15	0	15	10	67
6-16	p.m.	44°29'N 175°29'W	48	2	46	18	39
6-17	a.m.	44°32'N 175°30'W	61	8	53	32	60
6-18	p.m.	43°30'N 177°30'W	26	0	26	19	73
6-21	a.m.	43°31'N 177°30'W	18	0	18	7	39
6-22	p.m.	43°29'N 175°30'W	26	4	22	12	55
6-23	a.m.	43°28'N 175°29'W	27	6	21	12	57
6-25	p.m.	44°30'N 176°30'W	25	2	23	12	52
6-26	a.m.	44°29'N 176°30'W	24	5	19	13	68
6-27	p.m.	45°30'N 174°29'W	20	1	19	4	21
6-28	a.m.	45°30'N 174°30'W	40	3	37	12	32
6-28	p.m.	45°30'N 175°30'W	10	0	10	6	60
6-29	a.m.	45°32'N 175°30'W	4	0	4	1	25
6-29	p.m.	45°31'N 176°32'W	14	3	11	8	73
6-30	a.m.	45°33'N 176°31'W	40	11	29	17	59
7-7	a.m.	45°55'N 176°30'E	10	2	8	3	38
TOTAL			1,284	80	1,204	638	53

* Chum salmon required for short term mortality study, chum and coho salmon required for tracking of ultrasonic tags, and steelhead required for examination of snouts from fish missing their adipose fins.

** Number of fish available for tagging equals total catch minus number of fish required for experiments.

*** Percent fish tagged equals number of fish tagged divided by number of fish available for tagging.

Table 3. Number of salmonids caught in gillnet operations.

Date	Time	Location	Total Catch	Sockeye	Chum	Pink	Coho	Chinook	Steelhead
7-9	a.m.	49°29'N 168°29'E	84	30	25	25	4	0	0
7-10	a.m.	49°45'N 166°07'E	138	64	48	24	2	0	0
7-11	a.m.	49°42'N 164°17'E	144	54	30	48	12	0	0
7-12	a.m.	49°46'N 163°10'E	196	78	27	77	11	3	0
7-13	a.m.	49°54'N 165°09'E	205	116	22	54	10	3	0
7-14	a.m.	49°56'N 167°04'E	105	50	37	14	3	1	0
TOTAL			872	392	189	242	42	7	0

Table 4. Summary of observations on the short term mortality of hooked chum salmon.

Treatment Group	Number in the Treatment Group	Number that Survived 23 Hours (%)	Number that Did Not Survive 23 Hours (%)
I (lightly hooked)	18	18 (100)	0 (0)
II (deeply hooked, hook not removed)	23	15 (65)	8 (35)
III (deeply hooked, hook removed)	5	4 (80)	1 (20)

Table 5. Capture locations, biological data, and coded wire tag detector response for salmonids with missing adipose fins.

	Species	Date	Time	Capture Location	Length (mm)	Body Weight (g)	Sex	Gonad Weight (g)	CWT Detector Positive Response
1.	Steelhead	6-11	a.m.	45°30'N 177°30'W	656	3600	F	15	No
2.	Steelhead	6-16	p.m.	44°29'N 175°29'W	555	1480	M	1	No
3.	Steelhead	6-16	p.m.	44°29'N 175°29'W	634	2140	M	1	No
4.	Steelhead	6-22	p.m.	43°29'N 175°30'W	570	740	M	1	No
5.	Steelhead	6-22	p.m.	43°29'N 175°30'W	680	3300	M	1	No
6.	Steelhead	6-22	p.m.	43°29'N 175°30'W	712	3400	M	1	Yes
7.	Steelhead	6-22	p.m.	43°29'N 175°30'W	774	4300	M	1	No
8.	Steelhead	6-23	a.m.	43°29'N 175°30'W	610	1030	M	1	No
9.	Steelhead	6-23	a.m.	43°29'N 175°30'W	836	6230	F	35	No
10.	Steelhead	6-25	p.m.	44°30'N 176°30'W	605	2480	M	1	No
11.	Steelhead	6-25	p.m.	44°30'N 176°30'W	580	1280	M	1	No
12.	Steelhead	6-29	p.m.	45°31'N 176°32'W	600	1990	M	1	No
13.	Steelhead	6-29	p.m.	45°31'N 176°32'W	574	1960	F	10	No
14.	Steelhead	6-30	a.m.	45°33'N 176°31'W	560	1800	F	2	No
15.	Steelhead	6-30	a.m.	45°33'N 176°31'W	780	4500	M	1	No
16.	Steelhead	7-7	a.m.	45°55'N 176°30'E	594	2600	M	1	No
17.	Steelhead	7-7	a.m.	45°55'N 176°30'E	601	2220	M	1	No

Table 6. Summary of results from experimental injection of coded wire tags into the snouts of chum, pink, sockeye and coho salmon.

Trial	Species	Total Number Tested	Number With CWT Injected	Number Without CWT Injected	Percent Correctly identified by the CWT Detector
Experiment I	Chum	28	14	14	
	Pink	15	7	8	
	Sockeye	17	9	8	
	TOTAL	60	30	30	100%
Experiment II	Chum	20	9	11	
	Pink	15	6	9	
	Sockeye	25	15	10	
	TOTAL	60	30	30	100%
Experiment III	Chum	10	5	5	
	Pink	11	5	6	
	Sockeye	39	20	19	
	TOTAL	60	30	30	100%
Experiment IV	Chum	16	8	8	
	Pink	10	8	2	
	Sockeye	29	12	17	
	Coho	5	2	3	
	TOTAL	60	30	30	100%

Appendix A: Fishery Agency of Japan's instructions to Japanese salmon research vessels on how to handle fish for tagging in 1989.

A. Recover fish caught on longline gear by lifting the fish from the water using a long-handled dipnet and dehook the fish on deck.

CAUTION: Drop the fish gently from the dipnet onto the deck. Dehook the fish quickly and carefully. **Deeply hooked fish may be released without removing the longline hook.**

B. Once removed from the longline, place fish in the live tank to calm the fish and examine their condition. Take enough time to observe the condition of fish in the tank.

C. Release fish that are in good condition. Do not release fish that show the following conditions:

swimming upside down
bleeding from mouth and/or gill
stunned, or with its eyes sticking out, or with blood shot eyes
dislocated cartilage around the mouth
scars on the body
damaged fins
looking lifeless in the tank