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by

Masa-aki Fukuwaka [1], Shigehiko Urawa [2], Ikuo Ono [2]
Katsuhiro Umeda [2], Morihiko Kawana [2], and R. V. Walker [3]

[1] Hokkaido National Fisheries Research Institute, Fisheries Agency of Japan
116 Katsurakoi, Kushiro 085-0802
[2] National Salmon Resources Center, Fisheries Agency of Japan
2-2 Nakanoshima, Toyohira-ku, Sapporo 062-0922
[3] Fisheries Research Institute, University of Washington
Box 355020, Seattle, WA 98195-5020

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Recoveries of High-Seas Tags in Japan, 1998, and 1999 Tag Releases and Recoveries of Fin-Clipped Salmon Collected by Japanese Research Vessels in the North Pacific Ocean

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[1] Hokkaido National Fisheries Research Institute, Fisheries Agency of Japan
[2] National Salmon Resources Center, Fisheries Agency of Japan
[3] Fisheries Research Institute, University of Washington

ABSTRACT

In the fall of 1998, 69 of 734 tagged-and-released chum salmon in the Bering Sea were recovered along the Japanese coast. Recoveries included 5 fish with external temperature tags, 3 fish with internal archival tags, and 61 fish with disk tags. The number of recoveries and the recovery rate of chum salmon released in the Bering Sea in 1998 were the largest in the 1995-1998 period. In 1999, two Japanese salmon research vessels conducted 36 longline and 8 hook-and-line operations in the North Pacific Ocean and its marginal seas. A total of 353 salmonids (9 sockeye, 226 chum, 116 pink, and 2 chinook salmon) in the Bering Sea, 106 salmonids (8 sockeye, 29 chum, 39 pink, 28 coho salmon, and 2 steelhead trout) in the eastern North Pacific, and 45 salmonids (7 sockeye, 15 chum, 18 pink, and 5 coho salmon) in the central North Pacific, were tagged with two disk tags (FAJ and FRI) and released. Of these, 55 fish were tagged externally with archival tags, and archival tags were inserted internally in 26 chum salmon in the Bering Sea. Four Japanese salmon research vessels recovered 67 salmonids lacking the adipose fin and/or other fins.

INTRODUCTION

The Japan-U.S. cooperative high-seas tagging experiment was conducted in 1998 and 1999. We summarize tag recoveries in the fall of 1998 in Japan, releases of high seas tags in 1999, and recoveries of fin-clipped salmon collected by the Japanese

salmon research vessels in the North Pacific Ocean in 1999.

MATERIALS AND METHODS

Recovery of high seas tags in 1998

In June-July 1998, a total of 756 salmonids (9 sockeye, 734 chum, 4 pink, and 9 chinook salmon) in the Bering Sea, 28 salmonids (3 sockeye, 7 chum, 13 pink, and 4 coho salmon, and 1 steelhead) in the Gulf of Alaska, and 178 salmonids (15 sockeye, 115 chum, 9 pink, 25 coho, 1 chinook salmon, and 13 steelhead trout) in the central North Pacific Ocean, were tagged and released by two Japanese salmon research vessels, *Wakatake maru* and *Oshoro maru* (Ueno and Ishida 1998). A subset of the disk-tagged fish was released with an externally attached temperature tag, including 12 steelhead and one sockeye released in the central North Pacific Ocean, 3 sockeye, one chum, 4 pink, 3 coho, and one steelhead released in the Gulf of Alaska, and 23 chum salmon released in the central Bering Sea. Another subset of 25 disk-tagged chum salmon was released in the Bering Sea with internally inserted archival tags.

Fish were tagged with two disk tags: one issued by the Fisheries Agency of Japan (FAJ) and a second disk tag issued by the Fisheries Research Institute (FRI). Both disk tags were placed on one plastic cinch strap and applied to the fish anterior to the dorsal fin. A few of the disk-tagged fish were selected for tagging with archival tags. Two types of archival tags were used. One type of archival tag, manufactured by the Kiwi Group, North Falmouth, MA, records seawater temperature (temperature tag). The temperature tag used by FRI was attached on the dorsal of fish externally. A second type of archival tag manufactured by Northwest Marine Technology (NMT), Shaw Island, WA, records the fish's internal temperature, seawater temperature, light levels (for location), and depth (NMT tag). The NMT tag used by FAJ was inserted into the peritoneal cavity of fish.

From fall of 1998 to spring of 1999, the National Salmon Resources Center collected archival tags, disk tags, and data on recovery locations from salmon hatcheries, private fishermen, fishing cooperative unions, or prefectural governments along the coast of northern Japan.

We compared recovery rate (number of recovered fish / number of tagged-and-released fish) with past data. The National Research Institute of Far Seas Fisheries (NRIFSF) conducted tagging experiments in the Bering Sea and the central North Pacific using the research vessel *Wakatake maru* from 1995 to 1998. Numbers of tagged fish and recovered fish were provided by NRIFSF (Ito 1995, Myers et al. 1995-1998,

Ito and Ishida 1996, 1998, Walker et al. 1998, Ueno and Ishida 1999).

Tagging and recovery on the high seas in 1999

In June-July of 1999, two Japanese research vessels, the *Wakatake maru* and *Oshoro maru*, conducted 36 longline (865 hachi) and 8 hook-and-line operations to attach archival and disk tags on Pacific salmon. The internal archival tag and disk tags used in 1999 were the same types used in 1998. Two types of external archival tags manufactured by Conservation Devices, Inc., Watertown, MA, were used in 1999: the type used on the *Wakatake maru* was the Kiwi Ready Logger RL-05T that records seawater temperature (temperature tag), and that used on the *Oshoro maru* was the Model 31 temperature and pressure logger (CDI tag).

Four salmon research vessels, the *Wakatake maru*, *Oshoro maru*, *Hokusei maru*, and *Hokko maru*, caught 19,345 salmonids in the western and central North Pacific, the Bering Sea, and the Gulf of Alaska from June to August in 1998. Salmon lacking the adipose fin were recovered during biological measurements. Snout samples were collected from these fish for later examination for coded wire tags (CWT).

RESULTS AND DISCUSSION

Recovery of high seas tags in 1998

In the fall of 1998, 69 tagged chum salmon were recovered along the Japanese coast (Table 1). Those include 5 fish with external temperature tags, 3 fish with internal archival tags, and 61 fish with disk tags. The number of recoveries and the recovery rate of chum salmon released in the Bering Sea in 1998 were the largest in the 1995-1998 period (Table 2).

Tagging and recovery on the high seas in 1999

In June-July 1999, 353 salmonids (9 sockeye, 226 chum, 116 pink, and 2 chinook salmon) in the Bering Sea, 106 salmonids (8 sockeye, 29 chum, 39 pink, and 28 coho salmon, and 2 steelhead trout) in the eastern North Pacific, and 45 salmonids (7 sockeye, 15 chum, 18 pink, and 5 coho salmon) in the central North Pacific, were tagged and released by two Japanese salmon research vessels, the *Wakatake maru* and *Oshoro maru* (Table 3). Of these, 10 fish with temperature tags externally attached were released in the central North Pacific and the Bering Sea, 45 fish with CDI tags attached were released in the eastern North Pacific, and 26 chum salmon with NMT tags inserted internally were released in the Bering Sea (Table 4).

A total of 67 fin-clipped salmonids (2 sockeye, 1 pink, 12 coho, 1 chinook salmon, and 61 steelhead trout) was recovered by Japanese salmon research vessels (Table 5). Snout samples were collected from these fish and provided to the U.S. for CWT examination.

ACKNOWLEDGMENTS

We thank the captains, officers and crew of the *Wakatake maru, Oshoro maru, Hokusei maru*, and *Hokko maru,* for their careful collection of data and samples.

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Table 1. Releases and recoveries of high seas tagged chum salmon returning to Japan in the fall of 1998. A hyphen indicates the information is not available. Age designation is the European method, where the first number is the number of freshwater annuli, and the second number is the number of ocean annuli. FL: fork length, BW: body weight. Two recoveries, MM1222 (LL2170) and MM1333 (LL2281) were reported previously in Myers et al. (1998). (Myers et al. 1998 gave the recovery longitude of tag MM1222 incorrectly as 143°31E.)

U.S. Tag. No.	Japan Tag No.	Arch. Tag # (Kiwi)	Arch. Tag # (NWMT)	Release					Recovery							
				Date	Lat	Long	FL (mm)	Age	Date	Lat	Long	Gear	Sex	FL (mm)	BW (g)	Location
LL2170	MM1222	259	-	3 Jul	52°30N	179°30W	622	0.3	4 Sep	42°39N	143°37E	setnet	M	650	3000	Pacific, Hokkaido
LL2186	MM1238	-	-	4 Jul	53°30N	179°30W	526	0.2	2 Nov	44°03N	144°16E	setnet	-	-	-	Okhotsk Sea, Hokkaido
LL2214	MM1266	-	-	4 Jul	53°30N	179°30W	530	0.3	14 Oct	41°56N	143°16E	setnet	M	570	1760	Pacific, Hokkaido
LL2222	MM1274	255	-	4 Jul	53°30N	179°30W	560	0.3	10 Oct	44°13N	143°40E	setnet	M	610	2110	Okhotsk Sea, Hokkaido
LL2253	MM1305	-	-	5 Jul	54°30N	179°30W	610	0.3	21 Sep	43°39N	145°10E	setnet	M	635	2500	Nemuro St., Hokkaido
LL2259	MM1311	-	-	5 Jul	54°30N	179°30W	530	0.3	27 Oct	44°02N	144°48E	setnet	-	-	-	Okhotsk Sea, Hokkaido
LL2281	MM1333	-	256	5 Jul	54°30N	179°30W	670	0.4	10 Sep	43°23N	145°48E	setnet	F	690	3700	Nemuro St., Hokkaido
LL2292	MM1344	-	-	6 Jul	55°30N	179°30W	582	0.3	12 Sep	44°02N	144°48E	setnet	F	610	2200	Okhotsk Sea, Hokkaido
LL2340	MM1392	-	-	6 Jul	55°30N	179°30W	589	0.4	31 Oct	43°24N	145°13E	fish trap	F	605	2000	Nishibetsu R, Hokkaido
LL2346	MM1398	-	-	6 Jul	55°30N	179°30W	619	0.4	1 Oct	-	-	setnet	-	-	-	Nemuro St., Hokkaido
LL2348	MM1400	271	-	6 Jul	55°30N	179°30W	592	0.3	31 Oct	36°47N	137°05E	fish trap	M	610	1800	Sho R., Japan Sea, Toyama
LL2367	MM1419	-	-	7 Jul	56°30N	179°30W	580	0.3	8 Oct	43°11N	145°37E	setnet	M	630	2200	Pacific, Hokkaido
LL2368	MM1420	-	-	7 Jul	56°30N	179°30W	610	0.4	10 Oct	43°57N	144°25E	setnet	-	-	-	Okhotsk Sea, Hokkaido
LL2371	MM1423	-	-	7 Jul	56°30N	179°30W	578	0.3	10 Oct	44°09N	145°07E	setnet	-	-	-	Okhotsk Sea, Hokkaido
LL2376	MM1428	-	-	7 Jul	56°30N	179°30W	534	0.3	5 Oct	43°17N	145°41E	setnet	M	520	1550	Nemuro St., Hokkaido
LL2391	MM1443	-	-	7 Jul	56°30N	179°30W	582	0.3	14 Sep	44°38N	142°54E	setnet	F	590	2400	Okhotsk Sea, Hokkaido
LL2393	MM1445	-	-	7 Jul	56°30N	179°30W	576	0.3	10 Oct	44°05N	145°01E	setnet	F	-	-	Okhotsk Sea, Hokkaido
LL2396	MM1448	-	-	7 Jul	56°30N	179°30W	556	0.3	1 Oct	44°03N	144°16E	setnet	-	-	-	Okhotsk Sea, Hokkaido
LL2400	MM1452	-	-	7 Jul	56°30N	179°30W	572	0.3	21 Oct	44°40N	142°52E	setnet	-	-	-	Okhotsk Sea, Hokkaido
LL2403	MM1455	274	-	7 Jul	56°30N	179°30W	680	0.4	24 Sep	44°19N	145°21E	gillnet	M	716	-	Shiretoko Pen., Hokkaido
LL2412	MM1464	-	-	8 Jul	57°30N	179°30W	539	0.3	16 Oct	44°03N	144°16E	setnet	-	620	2300	Okhotsk Sea, Hokkaido
LL2421	MM1473	-	-	8 Jul	57°30N	179°30W	530	0.3	26 Sep	44°07N	145°16E	setnet	-	-	-	Nemuro St., Hokkaido
LL2423	MM1475	-	-	8 Jul	57°30N	179°30W	510	0.3	16 Nov	40°10N	141°53E	setnet	M	530	1100	Pacific, Iwate
LL2429	MM1481	-	-	8 Jul	57°30N	179°30W	594	0.3	26 Oct	43°48N	145°06E	setnet	F	620	2000	Nemuro St., Hokkaido
LL2439	MM1491	-	-	8 Jul	57°30N	179°30W	556	0.3	7 Oct	43°38N	145°12E	setnet	F	580	2300	Nemuro St., Hokkaido
LL2446	MM1498	-	-	8 Jul	57°30N	179°30W	508	0.2	26 Oct	43°34N	145°22E	setnet	-	-	-	Nemuro St., Hokkaido
LL2465	MM1517	-	-	8 Jul	57°30N	179°30W	575	0.3	26 Oct	43°36N	145°21E	setnet	-	-	-	Nemuro St., Hokkaido
LL2478	MM1530	-	-	8 Jul	57°30N	179°30W	554	0.3	2 Oct	44°09N	145°07E	setnet	-	-	-	Okhotsk Sea, Hokkaido
LL2479	MM1531	-	-	8 Jul	57°30N	179°30W	590	0.3	2 Oct	44°18N	145°18E	setnet	-	-	-	Okhotsk Sea, Hokkaido
LL2486	MM1538	-	-	8 Jul	57°30N	179°30W	543	0.3	13 Oct	44°12N	145°21E	setnet	M	-	2000	Nemuro St., Hokkaido
LL2487	MM1539	-	-	8 Jul	57°30N	179°30W	666	0.4	20 Oct	43°43N	145°07E	setnet	M	670	2400	Nemuro St., Hokkaido
LL2489	MM1541	-	-	8 Jul	57°30N	179°30W	634	0.4	5 Oct	43°25N	145°21E	setnet	F	672	2900	Nemuro St., Hokkaido
LL2491	MM1543	-	-	8 Jul	57°30N	179°30W	583	0.4	25 Sep	43°56N	144°28E	setnet	M	620	2700	Okhotsk Sea, Hokkaido
LL2496	MM1548	-	-	8 Jul	57°30N	179°30W	604	0.3	7 Oct	44°06N	144°16E	setnet	-	-	-	Okhotsk Sea, Hokkaido
LL2505	MM1557	-	-	8 Jul	57°30N	179°30W	564	X.X	22 Sep	44°22N	145°22E	setnet	F	-	3000	Nemuro St., Hokkaido

Table 1. Continued.

U.S. Tag. No.	Japan Tag No.	Arch. Tag # (Kiwi)	Arch. Tag # (NWMT)	Release					Recovery							
				Date	Lat	Long	FL (mm)	Age	Date	Lat	Long	Gear	Sex	FL (mm)	BW (g)	Location
LL2510	MM1562	-	-	9 Jul	58°30N	179°30W	567	0.3	8 Oct	44°30N	142°39E	setnet	M	610	2400	Okhotsk Sea, Hokkaido
LL2514	MM1566	-	-	9 Jul	58°30N	179°30W	571	0.3	4 Dec	42°18N	140°17E	setnet	M	600	1850	Pacific, Hokkaido
LL2540	MM1592	-	-	9 Jul	58°30N	179°30W	533	0.4	7 Oct	45°30N	142°30E	setnet	M	590	2100	Okhosk Sea, Hokkaido
LL2541	MM1593	-	-	9 Jul	58°30N	179°30W	569	0.3	8 Oct	44°01N	144°15E	setnet	-	-	-	Okhotsk Sea, Hokkaido
LL2547	MM1599	-	-	9 Jul	58°30N	179°30W	570	0.3	13 Oct	43°21N	145°48E	setnet	F	570	1900	Nemuro St., Hokkaido
LL2550	MM1602	-	-	9 Jul	58°30N	179°30W	545	0.3	20 Oct	44°02N	145°14E	setnet	M	570	1780	Nemuro St., Hokkaido
LL2554	MM1606	-	-	9 Jul	58°30N	179°30W	598	0.3	26 Oct	42°08N	141°02E	setnet	M	620	1800	Pacific, Hokkaido
LL2562	MM1614	-	-	9 Jul	58°30N	179°30W	589	0.3	1 Oct	43°57N	144°22E	setnet	M	640	2700	Okhotsk Sea, Hokkaido
LL2570	MM1622	-	-	9 Jul	58°30N	179°30W	580	0.3	18 Nov	44°38N	142°54E	fish trap	-	-	-	Shari R., Hokkaido
LL2572	MM1624	-	-	9 Jul	58°30N	179°30W	587	0.3	7 Oct	41°57N	143°12E	setnet	F	620	2480	Pacific, Hokkaido
LL2586	MM1638	-	-	10 Jul	57°30N	178°24W	594	0.3	26 Nov	39°59N	139°42E	setnet	F	640	2000	Japan Sea, Akita
LL2606	MM1658	-	-	10 Jul	57°30N	178°24W	544	0.3	14 Oct	43°37N	145°15E	setnet	M	-	-	Nemuro St., Hokkaido
LL2642	MM1694	-	-	10 Jul	57°30N	178°24W	574	0.3	4 Nov	40°57N	141°23E	setnet	-	-	-	Pacific, Aomori
LL2649	MM1701	-	-	10 Jul	57°30N	178°24W	600	0.4	1 Oct	44°10N	145°19E	setnet	M	-	2700	Nemuro St., Hokkaido
LL2651	MM1703	-	-	10 Jul	57°30N	178°24W	608	0.3	5 Oct	42°35N	143°34E	setnet	-	-	-	Pacific, Hokkaido
LL2653	MM1705	-	-	10 Jul	57°30N	178°24W	590	0.3	16 Oct	44°09N	145°07E	setnet	-	-	-	Okhotsk Sea, Hokkaido
LL2677	MM1729	-	-	11 Jul	57°30N	177°30W	585	0.3	5 Oct	40°10N	141°53E	setnet	F	590	2100	Pacific, Iwate
LL2696	MM1748	-	-	11 Jul	57°30N	177°30W	563	0.3	24 Oct	42°11N	143°19E	setnet	M	580	1900	Pacific, Hokkaido
LL2698	MM1750	-	-	11 Jul	57°30N	177°30W	556	0.3	26 Oct	43°42N	145°07E	setnet	M	550	2200	Nemuro St., Hokkaido
LL2707	MM1759	-	-	11 Jul	57°30N	177°30W	564	0.3	16 Oct	43°59N	144°19E	setnet	-	640	2400	Okhotsk Sea, Hokkaido
LL2709	MM1761	-	-	11 Jul	57°30N	177°30W	524	0.3	27 Oct	44°22N	145°22E	setnet	-	-	-	Nemuro St., Hokkaido
LL2727	MM1779	-	-	12 Jul	56°30N	177°30W	559	0.3	22 Oct	43°38N	145°12E	setnet	F	580	1400	Nemuro St., Hokkaido
LL2730	MM1782	-	-	12 Jul	56°30N	177°30W	524	0.2	27 Oct	43°39N	145°10E	setnet	-	-	1800	Nemuro St., Hokkaido
LL2739	MM1791	-	-	12 Jul	56°30N	177°30W	544	0.3	26 Oct	43°39N	145°10E	setnet	F	560	1800	Nemuro St., Hokkaido
LL2772	MM1824	299	-	12 Jul	56°30N	177°30W	577	0.3	5 Oct	43°41N	145°09E	setnet	F	590	2400	Nemuro St., Hokkaido
LL2773	MM1825	-	895	12 Jul	56°30N	177°30W	590	0.3	3 Oct	43°20N	145°22E	setnet	F	598	2000	Nemuro St., Hokkaido
LL2774	MM1826	-	894	12 Jul	56°30N	177°30W	570	0.3	10 Oct	43°51N	145°06E	setnet	F	590	2200	Nemuro St., Hokkaido
LL2805	MM1857	-	-	14 Jul	56°30N	179°30E	600	0.3	24 Sep	44°57N	142°36E		F	635	2600	Okhosk Sea, Hokkaido
LL2811	MM1863	-	-	14 Jul	56°30N	179°30E	443	0.4	4 Nov	43°41N	145°08E	setnet	M	510	2000	Nemuro St., Hokkaido
LL2827	MM1879	-	-	15 Jul	56°30N	178°30E	523	0.2	21 Oct	43°55N	144°42E	setnet	F	530	2900	Okhotsk Sea, Hokkaido
LL2829	MM1881	-	-	15 Jul	56°30N	178°30E	552	0.3	27 Oct	44°12N	145°21E	setnet	M	-	-	Nemuro St., Hokkaido
LL2848	MM1900	-	-	15 Jul	56°30N	178°30W	645	0.4	18 Sep	43°55N	144°42E	setnet	-	-	-	Okhotsk Sea, Hokkaido
LL2858	MM1910	-	-	15 Jul	56°30N	178°30E	630	0.3	18 Sep	44°18N	145°17E	setnet	M	670	3100	Okhotsk Sea, Hokkaido
LL2884	MM1934	-	-	16 Jul	56°30N	177°36E	492	0.2	28 Oct	-	-	-	M	515	1800	Nemuro St., Hokkaido

Table 2. Number of chum salmon tagged-and–released in the Bering Sea and the central North Pacific by the research vessel *Wakatake maru*, and recovered along the Japanese coast in 1995-1998. In 1995, no fish was released in the central North Pacific. Number in parenthesis indicates number of archival-tagged fish.

Year	Region	Number of release	Number of recovery	Recovery rate (%)
1995	Bering Sea	128	4	3.1
1996	Bering Sea	619	9	1.4
	Central North Pacific	36	2	5.6
	Total	655	11	1.6
1997	Bering Sea	399	12	3.0
	Central North Pacific	5	0	0
	Total	404	12	3.0
1998	Bering Sea	734 (48)	69 (8)	9.4 (16.7)
	Central North Pacific	75	0	0
	Total	809	69	8.5

Table 3. Number of salmon caught by longline and hook-and-line operations, and number of tagged and released fish by the research vessels *Wakatake maru* and *Oshoro maru* in the summer of 1999. H&L: hook-and-line operation.

Region					Number of fish caught							Number of fish released					
Vessel	Date	Location		Hachi	Sock	Chum	Pink	Coho	Chin	Steel		Sock	Chum	Pink	Coho	Chin	Steel
Central	Jun 15	38°58N	179°59E	30	0	0	0	0	0	0		0	0	0	0	0	0
North	Jun 16	40°03N	179°58W	30	0	0	0	0	0	0		0	0	0	0	0	0
Pacific	Jun 17	40°59N	179°57W	30	0	0	0	0	0	0		0	0	0	0	0	0
	Jun 18	42°02N	179°58W	30	0	3	0	4	0	1		0	1	0	4	0	0
Wakatake	Jun 25	47°04N	179°59W	30	2	3	2	0	0	0		2	1	1	0	0	0
maru	Jun 26	47°27N	179°58E	30	1	2	4	0	0	1		0	1	1	0	0	0
	Jun 27	48°30N	180°00	30	1	11	4	0	0	0		0	6	1	0	0	0
	Jun 28	49°30N	180°00	30	3	3	4	0	0	0		1	2	0	0	0	0
	Jun 29	50°30N	180°00	30	3	8	9	0	0	0		1	4	4	0	0	0
	Jun 30	51°29N	179°58W	30	6	2	22	1	0	0		3	0	11	1	0	0
		Total		300	16	32	45	5	0	2		7	15	18	5	0	0
Bering	Jul 1	52°30N	180°00	30	4	2	15	1	0	0		3	1	8	0	0	0
Sea	Jul 2	53°31N	180°00	30	1	3	25	0	1	0		1	2	14	0	1	0
	Jul 3	54°30N	180°00	30	0	10	6	0	0	0		0	3	2	0	0	0
Wakatake	Jul 4	55°32N	179°59E	30	3	26	10	0	0	0		3	19	4	0	0	0
maru	Jul 5	56°34N	180°00	30	1	28	19	0	0	0		1	16	7	0	0	0
	Jul 6	57°30N	180°00	30	2	10	16	0	0	0		0	7	8	0	0	0
	Jul 7	58°34N	179°54W	30	2	2	34	0	0	0		1	1	17	0	0	0
	Jul 8	57°32N	179°02W	30	1	10	3	0	0	0		0	5	1	0	0	0
	Jul 9	57°31N	178°02W	30	0	1	15	0	0	0		0	1	6	0	0	0
	Jul 10	56°30N	178°00W	30	1	73	23	0	2	0		0	44	8	0	1	0
	Jul 11	56°30N	179°05W	30	1	69	78	0	1	0		0	52	14	0	0	0
	Jul 12	56°29N	179°57E	30	0	29	11	0	0	0		0	25	4	0	0	0
	Jul 13	56°30N	178°57E	30	0	41	7	0	3	0		0	32	5	0	0	0
	Jul 14	56°27N	177°53E	30	0	24	41	0	0	0		0	18	18	0	0	0
		Total		420	16	328	303	1	7	0		9	226	116	0	2	0
Eastern	Jun 23	52°40N	165°00W	10	0	0	0	0	0	0		0	0	0	0	0	0
North	Jun 24	51°40N	165°00W	15	0	2	7	0	0	0		0	2	5	0	0	0
Pacific	Jun 26	50°00N	164°56W	10	0	13	4	0	0	2		0	10	4	0	0	2
	Jun 28	47°02N	165°00W	10	0	2	1	0	0	0		0	2	0	0	0	0
Oshoro	Jun 30	44°02N	165°00W	10	0	0	1	0	0	0		0	0	1	0	0	0
maru	Jul 9	49°59N	145°00W	10	2	0	1	1	0	0		2	0	0	1	0	0
	Jul 9	50°30N	145°00W	H&L	0	0	0	2	0	0		0	0	0	2	0	0
	Jul 9	51°00N	145°00W	H&L	1	0	0	1	0	0		1	0	0	1	0	0
	Jul 10	51°02N	144°57W	10	1	1	2	2	0	0		1	1	2	2	0	0
	Jul 10	52°00N	145°00W	H&L	0	0	2	0	0	0		0	0	2	0	0	0
	Jul 11	52°02N	144°58W	15	1	6	3	2	0	0		1	5	3	2	0	0
	Jul 11	52°30N	145°00W	H&L	0	0	0	1	0	0		0	0	0	1	0	0
	Jul 12	53°00N	144°58W	15	1	4	1	10	0	0		1	3	1	8	0	0
	Jul 13	54°00N	144°58W	15	0	3	5	3	0	0		0	3	4	3	0	0
	Jul 13	54°30N	145°00W	H&L	0	0	0	1	0	0		0	0	0	1	0	0
	Jul 13	55°00N	145°00W	H&L	1	0	0	0	0	0		1	0	0	0	0	0
	Jul 14	55°04N	144°57W	15	0	1	1	4	0	0		0	1	1	3	0	0
	Jul 14	55°30N	145°00W	H&L	0	0	1	1	0	0		0	0	1	1	0	0
	Jul 14	56°00N	145°00W	H&L	0	0	4	1	0	0		0	0	4	1	0	0
	Jul 15	56°10N	154°04W	10	2	2	15	3	0	0		1	2	11	2	0	0
		Total		145	9	34	48	32	0	2		8	29	39	28	0	2
	Total			865	41	394	396	38	7	4		24	270	173	33	2	2

Table 4. Tag numbers of disk, internal, and external archival tags attached and released by the research vessels *Wakatake maru* and *Oshoro maru* in the summer of 1999.

Region				Disk tag number			Internal arch. tag		External arch. tag	
Vessel	Date	Location		FAJ tag	FRI tag	No. fish	Tag No.	No. Fish	Tag No.	No. fish
Central	Jun 18	42°02N	179°58W	HH2133-2137	LL2904-2908	5				
North	Jun 25	47°04N	179°59W	HH2138-2143	LL2909-2914	4			225	1
Pacific	Jun 26	47°27N	179°58E	HH2144-2145	LL2915-2916	2				
	Jun 27	48°30N	180°00	HH2146-2153	LL2917-2924	7				
Wakatake	Jun 28	49°30N	180°00	HH2154-2157	LL2925-2928	3			231	1
maru	Jun 29	50°30N	180°00	HH2158-2166	LL2929-2937	9			239	1
	Jun 30	51°29N	179°58W	HH2167-2182	LL2938-2953	15				
Bering	Jul 1	52°30N	180°00	HH2183-2194	LL2954-2965	12				
Sea	Jul 2	53°31N	180°00	HH2195-2212	LL2966-2983	18			236, 247	2
	Jul 3	54°30N	180°00	HH2213-2217	LL2984-2988	5				
Wakatake	Jul 4	55°32N	179°59E	HH2218-2244	LL2989-3015	26	1238, 1239	2	253, 256	2
maru	Jul 5	56°34N	180°00	HH2245-2268	LL3016-3039	24	1183, 1198	2		
	Jul 6	57°30N	180°00	HH2269-2283	LL3040-3054	15	1182-1220	3	263	1
	Jul 7	58°34N	179°54W	HH2284-2302	LL3055-3073	19				
	Jul 8	57°32N	179°02W	HH2303-2308	LL3074-3079	6	1179	1		
	Jul 9	57°31N	178°02W	HH2309-2315	LL3080-3086	7	1241	1		
	Jul 10	56°30N	178°00W	HH2316-2368	LL3087-3139	53	1033-1231	4	270, 284	2
	Jul 11	56°30N	179°05W	HH2369-2434	LL3140-3205	66	1036-1065	4		
	Jul 12	56°29N	179°57E	HH2435-2463	LL3206-3234	29	948-1051	4		
	Jul 13	56°30N	178°57E	HH2464-2500	LL3235-3271	37	256-1120	4		
	Jul 14	56°27N	177°53E	HH2501-2536	LL3272-3307	36	894	1		
Eastern	Jun 24	51°40N	165°00W	BB2501-2507	LL1301-1307	7				
North	Jun 26	50°00N	164°56W	BB2508-2524	LL1301-1324	16			752	1
Pacific	Jun 28	47°02N	165°00W	BB2525-2526	LL1325-1326	2				
	Jun 30	44°02N	165°00W	BB2527	LL1327	1				
Oshoro	Jul 9	49°59N	145°00W	BB2528-2530	LL1328-1330	3			754, 755	2
maru	Jul 9	50°30N	145°00W	BB2531-2532	LL1331-1332	2			756, 758	2
	Jul 9	51°00N	145°00W	BB2533-2534	LL1333-1334	2			759, 760	2
	Jul 10	51°02N	144°57W	BB2535-2540	LL1335-1440	6			779-786	5
	Jul 10	52°00N	145°00W	BB2541-2542	LL1341-1342	2			785, 787	2
	Jul 11	52°02N	144°58W	BB2543-2553	LL1343-1353	11			788-792	4
	Jul 11	52°30N	145°00W	BB2554	LL1354	1			757	1
	Jul 12	53°00N	144°58W	BB2555-2567	LL1355-1367	13			775-796	5
	Jul 13	54°00N	144°58W	BB2568-2678	LL1368-1378	10			773-797	4
	Jul 13	54°30N	145°00W	BB2579	LL1379	1			803	1
	Jul 13	55°00N	145°00W	BB2580	LL1380	1			804	1
	Jul 14	55°04N	144°57W	BB2581-2585	LL1381-1385	5			799	1
	Jul 14	55°30N	145°00W	BB2586-2587	LL1386-1387	2			802, 806	2
	Jul 14	56°00N	145°00W	BB2588-2592	LL1388-1392	5			704-768	3
	Jul 15	56°10N	154°04W	BB2593-2611	LL1393-1410	16			711-809	9

Table 5. Catch location and biological data for fin-clipped salmonids caught by Japanese salmon research vessels in 1999. Ad: adipose fin, LV: left ventral fin, RV: right ventral fin.

Research vessel	Date	Location		Mesh (mm)	Species	Fork length (mm)	Body weight (g)	Sex	Gonad weight (g)	Clipped fin
Wakatake maru	20-Jun	43°00N	180°00	115	Steelhead	562	1770	Male	6	Ad+L or RV
	23-Jun	45°00N	180°00	115	Steelhead	797	1830	Male	3	Ad+LV
	25-Jun	46°00N	180°00	115	Steelhead	695	2900	Female	10	Ad
	25-Jun	46°00N	180°00	115	Steelhead	704	3250	Female	10	Ad
	25-Jun	46°00N	180°00	82	Steelhead	545	1640	Male	2	Ad+LV
	25-Jun	46°00N	180°00	121	Steelhead	749	4050	Female	50	Ad
	26-Jun	47°00N	180°00	106	Steelhead	740	3150	Male	5	Ad
	27-Jun	47°30N	180°00	115	Steelhead	626	2100	Female	25	Ad
Hokusei maru	2-Aug	47°30N	175°29E	118	Steelhead	661	3050	Male	90	Ad
Oshoro maru	26-Jun	50°00N	165°00W	115	Steelhead	600	1960	Male	1	Ad
	26-Jun	50°00N	165°00W	115	Steelhead	558	1680	Male	1	Ad
	26-Jun	50°00N	165°00W	121	Steelhead	494	2100	Female	12	Ad
	26-Jun	50°00N	165°00W	121	Steelhead	486	2040	Male	1	Ad+RV
	26-Jun	50°00N	165°00W	121	Steelhead	580	2860	Female	14	Ad
	26-Jun	50°00N	165°00W	93	Steelhead	606	1920	Male	3	Ad
	29-Jun	45°30N	165°00W	115	Steelhead	540	1470	Female	6	Ad
	29-Jun	45°30N	165°00W	115	Steelhead	572	1900	Female	7	Ad
	29-Jun	45°30N	165°00W	115	Steelhead	550	1790	Female	2	Ad
	29-Jun	45°30N	165°00W	121	Steelhead	600	2100	Male	17	Ad
	29-Jun	45°30N	165°00W	121	Steelhead	620	2270	Male	15	Ad
	29-Jun	45°30N	165°00W	72	Steelhead	568	1720	Male	2	Ad
	29-Jun	45°30N	165°00W	82	Steelhead	452	1610	Female	15	Ad
	29-Jun	45°30N	165°00W	93	Steelhead	592	2050	Male	1	Ad
	29-Jun	45°30N	165°00W	106	Steelhead	538	1600	Female	2	Ad
	29-Jun	45°30N	165°00W	106	Steelhead	596	2150	Male	1	Ad
	30-Jun	44°01N	165°01W	115	Steelhead	602	2300	Male	1	Ad
	30-Jun	44°01N	165°01W	115	Steelhead	544	1560	Female	3	Ad
	30-Jun	44°01N	165°01W	121	Steelhead	558	1990	Female	8	Ad
	30-Jun	44°01N	165°01W	121	Steelhead	594	2050	Female	1	Ad
	30-Jun	44°01N	165°01W	121	Steelhead	542	1600	Female	2	Ad
	9-Jul	49°58N	144°58W	115	Coho	590	2860	Male	100	Ad
	9-Jul	49°58N	144°58W	115	Coho	620	3250	Female	50	Ad
	9-Jul	49°58N	144°58W	121	Steelhead	590	1980	Male	2	Ad
	9-Jul	49°58N	144°58W	93	Coho	610	2900	Male	14	Ad
	9-Jul	49°58N	144°58W	106	Coho	470	1330	Female	23	Ad
	10-Jul	51°00N	144°59W	115	Coho	582	2700	Female	40	Ad
	10-Jul	51°00N	144°59W	115	Coho	606	2780	Female	34	Ad
	10-Jul	51°00N	144°59W	121	Steelhead	560	1960	Male	5	Ad
	10-Jul	51°00N	144°59W	93	Steelhead	562	1760	Female	8	Ad
	11-Jul	52°00N	145°00W	115	Coho	590	2370	Male	16	Ad
	11-Jul	52°00N	145°00W	55	Steelhead	305	255	Male	1	Ad
	11-Jul	52°00N	145°00W	72	Steelhead	310	285	Female	2	Ad
	11-Jul	52°00N	145°00W	106	Steelhead	548	1580	Female	12	Ad
	12-Jul	53°01N	145°00W	115	Sockeye	594	3000	Female	130	Ad
	12-Jul	53°01N	145°00W	115	Steelhead	540	1780	Female	10	Ad
	12-Jul	53°01N	145°00W	121	Steelhead	590	1860	Male	1	Ad
	12-Jul	53°01N	145°00W	121	Steelhead	586	1860	Female	4	Ad
	12-Jul	53°01N	145°00W	121	Steelhead	610	2320	Female	14	Ad
	12-Jul	53°01N	145°00W	121	Steelhead	534	1750	Female	3	Ad
	12-Jul	53°01N	145°00W	72	Steelhead	312	320	Male	1	Ad
	12-Jul	53°01N	145°00W	72	Steelhead	318	355	Male	1	Ad
	12-Jul	53°01N	145°00W	82	Steelhead	346	430	Male	1	Ad
	12-Jul	53°01N	145°00W	93	Sockeye	454	1080	Male	1	Ad
	12-Jul	53°01N	145°00W	93	Steelhead	578	1880	Male	10	Ad
	12-Jul	53°01N	145°00W	93	Steelhead	562	1720	Female	9	Ad
	13-Jul	54°00N	145°00W	48	Pink	468	1340	Male	9	Ad
	13-Jul	54°00N	145°00W	93	Chinook	642	3480	Male	2	Ad
	13-Jul	54°00N	145°00W	106	Coho	614	2620	Female	42	Ad
	13-Jul	54°00N	145°00W	138	Steelhead	564	1600	Male	10	Ad
	14-Jul	55°00N	145°00W	115	Coho	644	2970	Female	49	Ad
	14-Jul	55°00N	145°00W	63	Coho	638	3100	Female	58	Ad
	14-Jul	55°00N	145°00W	82	Steelhead	592	1860	Male	4	Ad
	14-Jul	55°00N	145°00W	106	Coho	560	2240	Female	58	Ad
	15-Jul	56°00N	145°00W	115	Coho	606	2720	Female	60	Ad
	15-Jul	56°00N	145°00W	115	Steelhead	592	2180	Male	1	Ad
	15-Jul	56°00N	145°00W	63	Steelhead	300	260	Female	3	Ad
	15-Jul	56°00N	145°00W	63	Steelhead	298	240	Male	1	Ad