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AGE COMPOSITION OF SALMON AND STEELHEAD IN 1990 PORT SAMPLES OF THE JAPANESE TRADITIONAL LANDBASED DRIFTNET SALMON FISHERY

by

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AGE COMPOSITION OF SALMON AND STEELHEAD IN 1990 PORT SAMPLES OF THE JAPANESE TRADITIONAL LANDBASED DRIFTNET SALMON FISHERY

ABSTRACT

Scale samples collected by the Fisheries Agency of Japan (FAJ) during port sampling of sockeye salmon (*Oncorhynchus nerka*), coho salmon (*O. kisutch*), chinook salmon (*O. tshawytscha*), and steelhead trout (*O. mykiss*) landed by the Japanese traditional landbased driftnet (LBDN) salmon fishery at Hanasaki and Kushiro, Japan, in 1990 were analyzed by the Fisheries Research Institute (FRI), School of Fisheries, University of Washington. The samples included scales from 1,087 sockeye, 788 coho, 1,054 chinook, and 648 steelhead. Of these, 78% of the sockeye, 59% of the coho and chinook, and 26% of the steelhead had usable scales (i.e., scales for which both a freshwater and an ocean age could be determined). The percentage of fish with usable scales was higher in the Hanasaki sample (60.9% usable) than in the Kushiro sample (55.5% usable) because more scales per fish were collected at Hanasaki (two) than at Kushiro (one). The predominant age groups in the 1990 port samples were ages 1.3 and 2.3 (69%) for sockeye salmon, ages 1.1 and 2.1 (92%) for coho salmon, ages 1.2 and 1.3 (89%) for chinook salmon, and ages 1.2 and 2.2 (76%) for steelhead. The Hanasaki sample had a substantially larger percentage of older (ocean ages .3 and .4) chinook and sockeye salmon (41% and 96%, respectively, of the usable scales) than the Kushiro sample (9% and 60%, respectively, of the usable scales). For coho and chinook, the predominant age groups in the 1990 fishery samples were the same age groups that predominated in previous analyses based on research vessel data. Results for sockeye salmon differed markedly from the literature, which had indicated that the majority of sockeye salmon harvested by the fishery were ocean age .2 fish. Because 1990 was the first year that samples were collected directly from the LBDN fishery, it is not known how representative the research gillnet and mothership fishery age/maturity data used in earlier studies were of the LBDN fishery or whether or not there has been a shift over the years in the predominant age groups of sockeye salmon harvested by the LBDN fishery. FAJ age determinations for sockeye salmon were similar to those obtained by FRI, except that FRI assigned considerably more of the scales aged by FAJ as 1.3 fish to the x.3 group ("x." indicates that the freshwater age could not be determined). FRI assigned substantially more coho salmon (390 fish) to the older freshwater age categories (ages 2. and 3.) than FAJ (290 fish). FRI age determinations for chinook salmon were in good agreement with those made by FAJ.

There are no previously reported estimates for the age composition of steelhead in catches by the LBDN fishery, but studies of the age composition of steelhead collected during research vessel operations with longline, purse seine, and gillnet gear had shown that ages 3.1, 2.1, and 3.2 steelhead predominated in offshore samples. The high proportion of ocean age .2 steelhead in the 1990 LBDN fishery samples is likely due to the selectivity of commercial gillnet gear for larger and, therefore, older fish than the steelhead collected during research vessel sampling. FAJ scale readers identified many fewer (28 fish) freshwater age 1. steelhead than FRI readers (89 fish). Further work needs to be done with samples of known age steelhead to develop criteria for identification of freshwater age 1. hatchery steelhead in mixed samples of hatchery and wild fish.

INTRODUCTION

Historical information on age composition of Pacific salmon and steelhead (*Oncorhynchus* spp.) in the area of the Japanese traditional landbased driftnet (LBDN) salmon fishery (southwest of 46°N, 175°W) is based on age determinations from scales collected during high-seas research vessel cruises (e.g., Godfrey et al. 1975, French et al. 1976, Major et al. 1978). In 1990, the first samples of salmon and steelhead scales were collected directly from the LBDN fishery from fish landed at Hanasaki and Kushiro ports in Japan (Fisheries Agency of Japan 1990). In this document, age composition estimates for sockeye salmon (*O. nerka*), coho salmon (*O. kisutch*), chinook salmon (*O. tshawytscha*), and steelhead trout (*O. mykiss*) in the 1990 port samples are presented and compared to previously published information. Age determinations by the Fisheries Research Institute (FRI), School of Fisheries, University of Washington, are compared to age determinations by the Fisheries Agency of Japan (FAJ).

METHODS

Scale Samples

The scale samples were collected by FAJ during port sampling (June 4 to 21, 1990) for coded-wire tagged fish (Fisheries Agency of Japan 1990). The fish were landed at two ports (Hanasaki and Kushiro) by 81 traditional landbased salmon fishing vessels (45 vessels in Hanasaki port and 36 vessels in Kushiro port, which was 70% of the 116 vessels that fished in 1990). The landed fish were sampled randomly with the objective of obtaining samples from 15 fish from each vessel. FAJ (1990) reported that scales were collected from 1,104 sockeye salmon, 819 coho salmon, 1,073 chinook salmon, and 692 steelhead trout. Acetate impressions of scale samples and biological data, consisting of species and age determinations by FAJ scale readers, were provided to FRI by FAJ. One scale per fish was collected in the Kushiro sample and two scales per fish were collected in the Hanasaki sample.

Species and Age Determinations

Species and age were determined for all fish in the samples by viewing acetate impressions of scales at 40-100x on a microfiche reader. Well-established visual criteria, described by Koo (1962a), Bilton et al. (1964), and Mosher (1969), were used to determine species from scales. All of the scales in the samples were aged by FRI biologists using standard visual criteria (Davis et al. 1990). Age was designated by the European formula (Koo 1962b), whereby the number preceding the period is the number of freshwater annuli, and the number following the period is the number of ocean annuli. Usable scales were defined as those for which both a freshwater and an ocean age could be determined. In some cases, scales that met this criteria were too dirty to make accurate age determinations, and these scales were also considered to be unusable. The letter "x" was used to designate unreadable portions of the scale. For steelhead, spawning checks on the scale were designated using the method described by Davis and Light (1985).

Age Composition Estimates

Age determinations by both FRI and FAJ scale readers were tabulated on computer spreadsheets. Age determinations for species that were incorrectly identified in the FAJ samples were not included in tabulations for FAJ age determinations. In a few cases, scales that FAJ had been able to age were missing from the acetate impressions that were provided to FRI; age determinations for these fish were tabulated only in the FAJ data. Scales from species other than sockeye salmon, coho salmon, chinook salmon, and steelhead (e.g., chum salmon) and scales that were unidentifiable as to species were not included in the tabulations for either agency.

Estimates of age composition of sockeye, coho, chinook, and steelhead in the 1990 LBDN fishery were calculated from FRI age determinations as the percentage of fish in each age group (usable scales only) in the total sample of usable scales. We also calculated age composition estimates from FRI and FAJ data for the entire sample (both usable and unusable scales) and for individual ports.

RESULTS

Unless otherwise indicated, all statements made are based on FRI data.

Sample Size and Quality

The samples included scales from 1,087 sockeye, 788 coho, 1,054 chinook, and 648 steelhead (Table 1). Of these, 78% of the sockeye, 59% of the coho and chinook, and 26% of the steelhead had usable scales. Differences in the percentage of usable scales among the species are due primarily to interspecific differences in the rate of scale regeneration. The overall quality or condition of the scales collected at Kushiro was superior to those collected at Hanasaki. The scales in the Kushiro sample were cleaner and fewer scales were mounted upside-down. However, the percentage of fish with usable scales was higher in the Hanasaki sample (60.9% usable) than in the Kushiro sample (55.5% usable) because more scales per fish were collected at Hanasaki (two) than at Kushiro (one).

Age Composition Estimates

The predominant age groups in the 1990 port samples were ages 1.3 and 2.3 (69%) for sockeye salmon, ages 1.1 and 2.1 (92%) for coho salmon , ages 1.2 and 1.3 (89%) for chinook salmon, and ages 1.2 and 2.2 (76%) for steelhead (Table 2).

FAJ age determinations for sockeye salmon were similar to those obtained by FRI, except that FRI assigned considerably more scales aged by FAJ as 1.3 fish to the x.3 group (Table 3). Five species identification errors (sockeye that were incorrectly identified as other species by FAJ) were detected by FRI in the Kushiro sample; these scales were included in FRI age determinations. The Hanasaki sample had a substantially larger percentage of older sockeye salmon (ocean ages .3 and .4, 96% of the usable scales) than the Kushiro sample (60% of the usable scales).

FRI assigned substantially more coho salmon (390 fish) to the older freshwater age categories (ages 2. and 3.) than FAJ (290 fish, Table 4). Sixteen errors in species identification (coho salmon that were incorrectly identified as other species by FAJ) were detected in the data provided by FAJ; hence, the lower total sample size for FAJ data (772 fish) than for FRI data (788 fish).

FRI age determinations for chinook salmon were in good agreement with those made by FAJ (Table 5). Eighteen errors in species identification (chinook salmon that were incorrectly identified as other species by FAJ) were detected in the data provided by FAJ, thus resulting in the sample size difference between FRI (1,054 fish) and FAJ (1,036 fish) data. The Hanasaki sample had a substantially higher percentage of older chinook salmon (ocean ages .3 and .4, 41% of the usable scales) than the Kushiro sample (9% of the usable scales).

FRI age determinations for steelhead differed from those of FAJ primarily for age groups 1.2, 2.2, x.2, and x.x (Table 6). These differences occurred because FRI assigned more of the scales aged by FAJ as 2.2 fish to the x.2 or 1.2 age groups, and because FAJ tended to assign non-regenerated scales with patterns that were difficult to interpret to the x.x group. Three errors in species identification (steelhead that were incorrectly identified as other species by FAJ) were detected in the data provided by FAJ. This error count, when coupled with the loss of five scales from the Hanasaki sample that was provided to FRI, is responsible for the difference in sample sizes between FRI (648) and FAJ (650).

Spawning Checks

Of the total steelhead scale sample provided (648 fish), 580 fish had scales with readable ocean ages, and of these, 4% (21 fish) had observable spawning checks (Tables 6 and 7). By ocean age, 52% of the kelts were .3 fish, 36% were .2, and 10% were .4 (Table 7). This data contrasts with that obtained from maidens, which indicated 83% to be of ocean age .2. Within kelts, 14% spawned initially after their first summer of ocean growth, 67% had spawned after their second summer, and 19% after their third summer. There were no indications of multiple spawning events (repeat spawning) on any of the kelt scales examined. Of the 21 kelts recorded in the total scale sample (combined ports), 19 (90%) were from the Hanasaki sample, while only two (10%) were from the Kushiro sample. Of the total Hanasaki sample, kelts composed 5%, while for Kushiro they made up only 1% of the total sample.

DISCUSSION

The same age groups that predominated in our analysis of coho (ages 1.1 and 2.1, Tables 2 and 4) and chinook salmon (ages 1.2 and 1.3, Tables 2 and 5) were predominant in previous age composition estimates for the LBDN fishery (e.g., Godfrey et al. 1975, Major et al. 1978), but our results for sockeye salmon (69% ages 1.3 and 2.3 fish, Table 2) differ markedly from information reported in the literature. According to French et al. (1976), who used data from samples collected by research gillnets, catches of both maturing and immature sockeye by the LBDN fishery in 1961-1970 were predominantly age .2 fish (77% in May and 81% in June). Furthermore, averages of annual (1972-1984) estimates reported by Harris (1989) show that approximately 75% of the sockeye harvested by the fishery (east of 160°E) in May-June were of ocean age .2 (immature and maturing 1.2 and 2.2 age groups combined), 8% were age .3 (maturing 1.3 and 2.3 age groups combined), and other age/maturity groups composed 17%. Harris's (1989) estimates were based on Japanese research gillnet and mothership fishery data. Harris (1989) noted a shift in the maturing component between the 1972-1977 and 1978-1984 periods toward a higher proportion of age .3 sockeye in the 1978-1984 period, but concluded that "it likely resulted from use of age/maturity data for the southern mothership area to prorate a large fraction of the landbased catches." Because 1990 was the first year that samples were collected directly from the LBDN fishery, we do not know how representative the research gillnet and mothership fishery data used in earlier studies were of the LBDN fishery or whether or not there has been a shift over the years in the predominant age groups of sockeye salmon harvested by the fishery.

There are no previously reported estimates for the age composition of steelhead in catches by the LBDN fishery, but the age composition of steelhead collected offshore during research vessels operations has been reported by Sutherland (1973; for samples collected between 1955-1967), by Okazaki (1984; for samples collected between 1972-1982), and by Burgner et al. (in press; for samples collected between 1955-1985); ages 3.1, 2.1, and 3.2 steelhead predominated in all three studies. Most of the steelhead in our study were ocean age .2 (80.8% of the total sample; 91% of the usable scales; Tables 2 and 6), whereas ocean age .1 fish predominated (61.9%) in the analysis by Burgner et al. (in press). The research vessel data reported by Burgner et al. were collected by a variety of sampling gear including purse seines, longlines, and gillnets. The high proportion of ocean age .2 steelhead in the 1990 LBDN fishery samples is likely due to the selectivity of commercial gillnet gear for larger and, therefore, older fish than the fish collected during research vessel sampling.

The proportion of freshwater age 1. steelhead was large in our analysis (53%, Table 2) compared to the results of Sutherland (1973; 1% age l. fish), Okazaki (1984; 4%), and Burgner et al. (in press; 17%). Burgner et al. thought that the higher proportion of age 1. fish in their analysis compared to the results of Sutherland (1973) and Okazaki (1984) might be explained partially by the increase in production of hatchery steelhead over the period 1955-1985. Wild steelhead generally spend two or more winters in freshwater prior ocean emigration, and most hatchery steelhead are released as freshwater age 1. smolts. Burgner et al. also suggested that there may have been differences in age interpretations among the three studies because age 1. hatchery fish can easily be misinterpreted as age 2. fish (Davis and Light 1985). In our analysis, FAJ scale readers identified many fewer (28 fish) freshwater age 1. steelhead than FRI readers (89 fish; Table 6). Further work needs to be done with samples of known age steelhead to develop criteria for identification of freshwater age 1. hatchery steelhead in mixed samples of hatchery and wild fish.

We compared the results of our examination of steelhead scales for spawning checks with those of Burgner et al. (in press). The percentage of kelts (4%) was somewhat lower in our analysis (21 of 580 fish with readable ocean ages, Tables 6 and 7) than that reported by Burgner et al. (7%, or 709 of 9,863 fish with readable ocean ages), and a higher percentage of the kelts in our analysis were age .3 or older (62%) than was reported by Burgner et al. (38%). Burgner et al. reported that repeat spawners composed approximately 29% of the kelts, while we found no repeat spawners (i.e., no more than one spawning check was observed in any of the scales). However, the percentages of fish that had spawned for the first time after their first, second, or third summer at sea were similar in both studies (14%, 67%, and 19%, respectively, in our analysis; 11%, 69%, and 19% in Burgner et al.).

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Table 1. The total number of fish and the number of fish with usable (i.e., both a freshwater and ocean age could be determined) scales in 1990 port samples of the Japanese traditional landbased driftnet salmon fishery collected at Hanasaki and Kushiro, Japan. The data are based on species and age determinations by the Fisheries Research Institute (FRI), School of Fisheries, University of Washington.

	Hanasaki		Kushiro		Total	
Species	Total	Usable	Total	Usable	Total	Usable
Sockeye	632	487	455	359	1,087	846
Coho	448	288	340	178	788	466
Chinook	664	413	390	208	1,054	621
Steelhead	402	118	246	49	648	167
Total	2,146	1,306	1,431	794	3,577	2,100

Table 2. Age composition (%) of sockeye, coho, and chinook salmon, and steelhead trout in 1990 port samples of the Japanese traditional landbased driftnet salmon fishery. Ages were determined from scales by the Fisheries Research Institute (FRI). N= total number of fish with usable scales, that is, scales for which both a freshwater and an ocean age could be determined.

Age Group	0.2	0.3	0.4	1.1	1.2	1.3	1.4	2.1	2.2	2.3	2.4	3.1	3.2	3.3	3.4	4.2	N
Sockeye	0.1	2.2	0.7		3.3	20.2	2.0		14.7	49.2	1.4		1.2	4.9	0.1		846
Coho				16.3				76.2				7.5					466
Chinook				3.5	64.7	24.0	6.4	0.2	1.0	0.2							621
Steelhead				1.8	49.7	1.8		1.2	26.3	3.0		0.6	12.0	0.6		3.0	167

Table 3. Comparison of age determinations by the Fisheries Research Institute (FRI) and the Fisheries Agency of Japan (FAJ) for sockeye salmon (*Oncorhynchus nerka*) in port samples of the 1990 Japanese traditional landbased driftnet salmon fishery. No. = number of fish in each age group. Total = total number of fish in the sample. Error = species identification error. Usable = number fish for which both a freshwater and ocean age could be determined.

(a) Combined ports

Age Group	0.2	0.3	0.4	1.2	1.3	1.4	2.2	2.3	2.4	3.2	3.3	3.4	x.1	x.2	x.3	x.4	x.x	Total	Error
FRI No.	1	19	6	28	171	17	124	416	12	10	41	1	3	20	121	6	91	1,087	
% of total	0.1	1.7	0.6	2.6	15.7	1.6	11.4	38.3	1.1	0.9	3.8	0.1	0.3	1.8	11.1	0.6	8.4		
FAJ No.		10	2	39	255	23	121	413	8	9	32	1	3	9	49		108	1,082	5
%		0.9	0.2	3.6	23.6	2.1	11.2	38.2	0.7	0.8	3.0	0.1	0.3	0.8	4.5		10.0		

(b) Hanasaki port

Age Group	0.2	0.3	0.4	1.2	1.3	1.4	2.2	2.3	2.4	3.2	3.3	3.4	x.1	x.2	x.3	x.4	x.x	Total	Error
FRI No.		7	6	1	105	15	10	304	8	7	23	1		5	85	6	49	632	
%		1.1	0.9	0.2	16.6	2.4	1.6	48.1	1.3	1.1	3.6	0.2		0.8	13.4	0.9	7.8		
% of usable		1.4	1.2	0.2	21.6	3.1	2.1	62.4	1.6	1.4	4.7	0.2						487	
FAJ No.		1	2		173	21	14	299	4	6	18	1		2	26		65	632	
%		0.2	0.3		27.4	3.3	2.2	47.3	0.6	0.9	2.8	0.2		0.3	4.1		10.3		

(c) Kushiro port

Age Group	0.2	0.3	0.4	1.2	1.3	1.4	2.2	2.3	2.4	3.2	3.3	3.4	x.1	x.2	x.3	x.4	x.x	Total	Error
FRI No.	1	12		27	66	2	114	112	4	3	18		3	15	36		42	455	
%	0.2	2.6		5.9	14.5	0.4	25.1	24.6	0.9	0.7	4.0		0.7	3.3	7.9		9.2		
% of usable	0.3	3.3		7.5	18.4	0.6	31.8	31.2	1.1	0.8	5.0							359	
FAJ No.		9		39	82	2	107	114	4	3	14		3	7	23		43	450	5
%		2.0		8.7	18.2	0.4	23.8	25.3	0.9	0.7	3.1		0.7	1.6	5.1		9.6		

Table 4. Comparison of age determinations by the Fisheries Research Institute (FRI) and the Fisheries Agency of Japan (FAJ) for coho salmon (*Oncorhynchus kisutch*) in port samples of the 1990 Japanese traditional landbased driftnet salmon fishery. No. = number of fish in each age group. Total = total number of fish in the sample. Error = species identification error. Usable = number fish for which both a freshwater and ocean age could be determined.

(a) Combined ports

Age Group	1.1	2.1	3.1	x.1	x.x	Total	Error
FRI							
No.	76	355	35	260	62	788	
%	9.6	45.1	4.4	33.0	7.9		
FAJ							
No.	123	265	25	295	64	772	16
%	15.9	34.3	3.2	38.2	8.3		

(b) Hanasaki port

Age Group	1.1	2.1	3.1	x.1	x.x	Total	Error
FRI							
No.	43	214	31	126	34	448	
%	9.6	47.8	6.9	28.1	7.6		
% of usable	14.9	74.3	10.8			288	
FAJ							
No.	68	158	22	154	40	442	6
%	15.4	35.7	5.0	34.8	9.0		

(c) Kushiro port

Age Group	1.1	2.1	3.1	x.1	x.x	Total	Error
FRI							
No	33	141	4	134	28	340	
%	9.7	41.5	1.2	39.4	8.2		
% of usable	18.5	79.2	2.2			178	
FAJ							
No.	55	107	3	141	24	330	10
%	16.7	32.4	0.9	42.7	7.3		

Table 5. Comparison of age determinations by the Fisheries Research Institute (FRI) and the Fisheries Agency of Japan (FAJ) for chinook salmon (*Oncorhynchus tshawytscha*) in combined port samples of the 1990 Japanese traditional landbased driftnet salmon fishery. No. = number of fish in each age group. Total = total number of fish in the sample. Error = species identification error. Usable = number fish for which both a freshwater and ocean age could be determined.

(a) Combined ports

Age Group	1.1	1.2	1.3	1.4	2.1	2.2	2.3	x.1	x.2	x.3	x.4	x.x	Total	Error
FRI														
No.	22	402	149	40	1	6	1	9	170	69	10	175	1,054	
%	2.1	38.1	14.1	3.8	0.1	0.6	0.1	0.9	16.1	6.6	1.0	16.6		
FAJ														
No.	22	389	160	34	2	5	1	8	166	64	8	177	1,036	18
%	2.1	37.5	15.4	3.3	0.2	0.5	0.1	0.8	16.0	6.2	0.8	17.1		

(b) Hanasaki port

Age Group	1.1	1.2	1.3	1.4	2.1	2.2	2.3	x.1	x.2	x.3	x.4	x.x	Total	Error
FRI														
No.	8	231	132	38	1	2	1	3	68	60	10	110	664	
%	1.2	34.8	19.9	5.7	0.2	0.3	0.2	0.5	10.2	9.0	1.5	16.6		
% of usable	1.9	55.9	32.0	9.2	0.2	0.5	0.2						413	
FAJ														
No.	9	228	142	33	1	1	1	2	69	55	8	114	663	1
%	1.4	34.4	21.4	5.0	0.2	0.2	0.2	0.3	10.4	8.3	1.2	17.2		

(c) Kushiro port

Age Group	1.1	1.2	1.3	1.4	2.1	2.2	2.3	x.1	x.2	x.3	x.4	x.x	Total	Error
FRI														
No.	14	171	17	2		4		6	102	9		65	390	
%	3.6	43.8	4.4	0.5		1.0		1.5	26.2	2.3		16.7		
% of usable	6.7	82.2	8.2	1.0		1.9							208	
FAJ														
No.	13	161	18	1	1	4		6	97	9		63	373	17
%	3.5	43.2	4.8	0.3	0.3	1.1		1.6	26.0	2.4		16.9		

Table 6. Comparison of age determinations by the Fisheries Research Institute (FRI) and the Fisheries Agency of Japan (FAJ) for steelhead (*Oncorhynchus mykiss*) in combined port samples of the 1990 Japanese traditional landbased driftnet salmon fishery. No. = number of fish in each age group. Total = total number of fish in the sample. Error = species identification error. Usable = number fish for which both a freshwater and ocean age could be determined. Missing = scales missing from acetate impressions provided to FRI by FAJ.

(a) Combined ports

Age Group	1.1	1.2	1.3	2.1	2.2	2.3	2.4	3.1	3.2	3.3	4.2	x.1	x.2	x.3	x.4	x.x	Total	Error	Missing
FRI																			
No.	3	83	3	2	44	5		1	20	1	5	7	371	33	2	68	648		5
%	0.5	12.8	0.5	0.3	6.8	0.8		0.2	3.1	0.2	0.8	1.1	57.3	5.1	0.3	10.5			
FAJ																			
No.	1	25	2	3	124	8	1	1	43	3	1	3	258	18		159	650	3	
%	0.2	3.8	0.3	0.5	19.1	1.2	0.2	0.2	6.6	0.5	0.2	0.5	39.7	2.8		24.5			

(b) Hanasaki Port

Age Group	1.1	1.2	1.3	2.1	2.2	2.3	2.4	3.1	3.2	3.3	4.2	x.1	x.2	x.3	x.4	x.x	Total	Error	Missing
FRI																			
No.	1	56	2		37	4			14		4	2	208	22	2	50	402		5
%	0.2	13.9	0.5		9.2	1.0			3.5		1.0	0.5	51.7	5.5	0.5	12.4			
% of usable	0.8	47.5	1.7		31.4	3.4			11.9		3.4						118		
FAJ																			
No.		16	1		84	6	1	1	33	3	1	1	138	14		107	406	1	
%		3.9	0.2		20.7	1.5	0.2	0.2	8.1	0.7	0.2	0.2	34.0	3.4		26.4			

(c) Kushiro port

Age Group	1.1	1.2	1.3	2.1	2.2	2.3	2.4	3.1	3.2	3.3	4.2	x.1	x.2	x.3	x.4	x.x	Total	Error	Missing
FRI																			
No.	2	27	1	2	7	1		1	6	1	1	5	163	11		18	246		
%	0.8	11.0	0.4	0.8	2.8	0.4		0.4	2.4	0.4	0.4	2.0	66.3	4.5		7.3			
% of usable	4.1	55.1	2.0	4.1	14.3	2.0		2.0	12.2	2.0	2.0						49		
FAJ																			
No.	1	9	1	3	40	2			10			2	120	4		52	244	2	
%	0.4	3.7	0.4	1.2	16.4	0.8			4.1			0.8	49.2	1.6		21.3			

Table 7. The number of steelhead with spawning checks on their scales by age group in 1990 port samples of the Japanese traditional landbased driftnet salmon fishery collected at Hanasaki and Kushiro, Japan. No. = number of fish with spawning checks in each age group. Total = total number of fish with spawning checks.

Age Group	2.2	2.3	3.3	x.2	x.3	x.4	Total
Hanasaki							
No.	2	2		5	8	2	19
Kushiro							
No.			1	1			2
Total							
No.	2	2	1	6	8	2	21
% of total	9.5	9.5	4.8	28.6	38.1	9.5	