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SCALE PATTERN ESTIMATES OF ORIGIN OF SOCKEYE SALMON IN 1990 PORT SAMPLES OF THE JAPANESE TRADITIONAL LANDBASED DRIFTNET SALMON FISHERY

by

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ABSTRACT

Maximum likelihood analysis of scale pattern data was used to estimate the proportions of U.S.S.R. (Kamchatka R. and Ozernaya R.) and Bristol Bay sockeye salmon in samples from Japanese traditional landbased driftnet (LBDN) salmon fishery catches collected at Hanasaki and Kushiro ports in Japan in 1990. These were the first samples of sockeye salmon scales to be collected directly from the LBDN fishery. The results were used to estimate interceptions of U.S.S.R. (East and West Kamchatka) and Bristol Bay sockeye salmon by the 1990 LBDN fishery. Three age groups of sockeye salmon predominated in the 1990 LBDN port samples: ages 1.3 (20.2%), 2.2 (14.7%), and 2.3 (49.2%). Sockeye salmon from the Kamchatka Peninsula (U.S.S.R.) predominated all three age groups (90.8% of age 2.2 fish, 87.4% of age 1.3 fish, and 64.3% of age 2.3 fish). Eighty-four percent (54,690 fish) of the total reported catch in 1990 (65,030 fish) was allocated to the three age groups, and Western Alaska (Bristol Bay) sockeye salmon accounted for 26% (13,956 fish) of the total allocated catch. The estimated proportion (26%) of Bristol Bay sockeye salmon in 1990 catches was higher than previous estimates for Alaskan sockeye salmon, which averaged 8%-11% of the sockeye salmon in 1972-1984 LBDN catches. The relatively high estimate for Bristol Bay sockeye salmon in 1990 LBDN catches was due to an estimated proportion of 35.7% Bristol Bay sockeye salmon in the scale pattern analysis of age 2.3 fish and to the fact that age 2.3 sockeye salmon were the predominant age group in the 1990 port samples. Ages 1.2 and 2.2 fish predominated in previously reported analyses. These results may indicate a shift in age or stock groups of sockeye salmon taken by the fishery in recent years or that data used in previous analyses were not representative of the fishery. Although precise age/maturity and stock composition data for historical LBDN catches are lacking, total catches by the fishery since 1972 have declined, and runs of sockeye salmon to Bristol Bay have increased to record numbers. A rough estimate of the total catch of Bristol Bay sockeye by the LBDN fishery in 1990 is 16,908 fish. Compared to the commercial catch of sockeye salmon in Bristol Bay in 1990 (33 million fish) and the total run (catch + escapement) of sockeye salmon to Bristol Bay in 1990 (47.8 million fish), reported catches of sockeye salmon by the 1990 LBDN fishery (65,030 fish) and estimated interceptions of Bristol Bay sockeye salmon are negligible.

INTRODUCTION

The primary quantitative information on origins of sockeye salmon in the Japanese traditional landbased driftnet (LBDN) salmon fishery has come from scale pattern analyses (Cook et al. 1981, Knudsen and Harris 1982). Harris (1986, 1987, 1989) used the results of the analysis by Cook et al. (1981) of scales from 1972-1976 Japanese research vessel samples to estimate interceptions of Alaskan sockeye salmon by the 1972-1984 LBDN fishery. A major assumption pertaining to Harris's interception estimates was that stock composition in areas of high seas intermingling was roughly the same after 1977 as before. However, after 1977 run sizes of Bristol Bay sockeye salmon, which are the major component of sockeye salmon returns to Alaska, increased to record levels (Rogers 1984). Harris (1986, 1987, 1989) suggested that scale patterns in recent samples could be analyzed to determine whether stock proportions of sockeye salmon in Japanese high seas salmon catches have changed substantially with the increase in relative abundance of

Alaskan sockeye salmon since 1977. However, he doubted that new scale pattern analyses would change his overall conclusions that high seas catches of Alaskan sockeye were lower in 1978-1984 than in 1972-1976, and that the proportion of Alaskan fish in the high seas catches of sockeye changed relatively little between these periods.

The first samples of sockeye salmon scales to be collected directly from the LBDN fishery were taken in 1990 from catches landed at Hanasaki and Kushiro ports in Japan (Fisheries Agency of Japan 1990a). In this paper, I use scale pattern analysis to estimate the proportions of U.S.S.R. and Bristol Bay sockeye salmon in the 1990 port samples. The results are used to estimate interceptions of U.S.S.R. (East and West Kamchatka) and Bristol Bay sockeye salmon by the 1990 LBDN fishery. The results are compared to those of Harris (1986, 1987, 1989).

METHODS

Scale Samples

The fishery samples were collected by the Fisheries Agency of Japan (FAJ) during port sampling (June 4 to 21, 1990) for coded wire tagged fish (Fisheries Agency of Japan 1990a). 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 (1990a) reported that scales were collected from 1,104 sockeye salmon. Acetate impressions of scale samples and biological data, consisting of species and age determinations by FAJ scale readers, were provided to the University of Washington, Fisheries Research Institute (FRI) by FAJ.

I used the results of high seas tagging studies and previous scale pattern analyses to determine which Asian and North American stocks of sockeye salmon to include as standards in my analysis. The high seas tagging database is archived at FRI. From 1956-1989, 2,323 tagged sockeye salmon were released in the area of the LBDN fishery (southwest of 46°N, 175°W). Five coastal recoveries have resulted from these releases; three were from May and June releases of maturing fish that returned to the U.S.S.R. (two from the west coast of Kamchatka [Ozernaya R.], one from an unknown coastal area in the U.S.S.R.) and two were from May releases of immature fish that were recovered in the U.S.S.R. (Kamchatka R. estuary) and Alaska (Bristol Bay). Although information from tagging is very limited, the Ozernaya and Kamchatka rivers are known to be the major producers of sockeye salmon in Asia, and the most important production area in North America is Bristol Bay. In previous analyses of sockeye salmon scales from the area of the LBDN fishery, researchers used North American standards from western Alaska (Bristol Bay), central Alaska, and southeast Alaska/British Columbia. Cook et al. (1981) suspected that stock proportion estimates for central Alaska sockeye salmon in the far western area of the fishery were spurious. Because of this problem, Harris (1986, 1987, 1989) did not use the estimates for central Alaska sockeye salmon by Cook et al. (1981) to calculate estimates of interception of North American sockeye in fishery area west of 175°W. Stock proportion estimates for southeast Alaska sockeye salmon in the LBDN area were not statistically significant (Knudsen and Harris 1982). After reviewing these results, I decided not to include standards for central Alaska or southeast Alaska in my analysis. The only scale samples from 1990 runs of Asian sockeye salmon that were available for my analysis were from the Ozernaya and Kamchatka rivers. Therefore, I used samples from

U.S.S.R. (Kamchatka R. and Ozernaya R.) and Bristol Bay sockeye salmon as standards in the scale pattern analysis.

Maturity of fish in the LBDN samples was not known. Therefore, the best procedure was to analyze the fishery samples using standards composed of fish of the same brood year and age group. Acetate impressions of scales sampled from adult sockeye salmon that returned to the Kamchatka and Ozernaya rivers in 1990 were loaned to FRI by the Fisheries Agency of Japan (FAJ). Later, the Kamchatka Branch of the Pacific Research Institute of Fisheries and Oceanography (KoTINRO) provided FRI with a duplicate set of acetate impressions of the same samples. For the Bristol Bay standard, I used acetate impressions of scale samples collected by FRI biologists from adult sockeye salmon during the 1990 Port Moller test fishery (June 11- July 5, 1990). The fish in the Port Moller samples were composed of a mixture of stocks returning to Bristol Bay in 1990.

Age determinations and sample sizes

All of the scales in the standards and unknowns were aged by FRI biologists using standard visual criteria (Davis et al. 1990). Age was designated by the European formula (Koo 1962): the number preceding the decimal point is the number of freshwater annuli, and the number following the decimal point is the number of ocean annuli. Usable scales were defined those that (1) were not regenerated, i.e., both a freshwater and ocean age could be determined, and (2) appeared to have been collected from the INPFC preferred area of the body of the fish. In some cases, scales that met these 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.

INPFC has adopted 100 scales as a target sample size for any established stratum in a scale pattern analysis (Davis et al. 1990). Age groups in the LBDN samples that included 100 or more useable scales included ages 2.2, 1.3, and 2.3 fish (Table 1), and all useable scales in these three age groups were measured. A stratified (over time) random sample of 100 fish of each age group was selected from the Bristol Bay (Port Moller) samples. Because the sizes of the U.S.S.R. samples were small (Table 1), all useable scales in the three age groups were measured in the Ozernaya R. and Kamchatka R. samples.

Scale measurement and variables

Scales were measured using the BioSonics Model OPR-513 Optical Pattern Recognition System (OPRS, BioSonics, Inc., Seattle, WA). Measurements were made in the anterior (sculptured) field of the scale along a single radius that was 90° to a reference line that marked the boundary of the sculptured and unsculptured fields of the scale. In some cases, scales were too dirty or deformed along this radius to make accurate measurements, and these scales were not measured (see Table 1 for the total number of scales measured).

The scale data consisted of distances measured along a radius from the center of the scale focus to the end of the first freshwater annulus, to the end of freshwater plus-growth (for age 1. scales) or to the end of the second freshwater annulus (for age 2. scales), and to the outer edge of each circulus in the first ocean zone through the tenth circulus in the second ocean zone. Fifteen variables were calculated from these measurements (Table 2). The scales of most age 1. sockeye in the samples had freshwater plus-growth, and the scales of most age 2. sockeye did not have freshwater plus-growth. In the few cases where age 1. scales did not have freshwater plus-growth, a marker consisting of two very closely placed measurements (1 OPRS sampling unit apart) was placed at the end of the freshwater annulus. In the few cases where age 2. scales had freshwater plus growth,

these circuli were included in the triplet measurements for the first year of ocean growth. All variables were used in the analyses except for TRIP5 in the analysis of age 1.3 scales and TRIP6 in the analyses of ages 1.3 and 2.3 scales (Table 2). In these cases, the values of TRIP5 and TRIP6 were zero for some scales. Means and standard deviations of the variables used in the analyses are presented in Appendix Tables 1-3.

Stock proportion and interception estimates

The proportions of U.S.S.R. (Ozernaya R. and Kamchatka R.) and Bristol Bay sockeye in the LBDN samples were estimated by a maximum likelihood method using a FORTRAN program written by R. Millar (Millar 1987, 1988, 1990) . Confidence intervals (95%) were derived from ranked results of bootstrap runs (500 iterations) of the same program. Estimates of interceptions of western Alaskan sockeye salmon were calculated using the same general approach as Meyer and Harris (1983) and Harris (1986, 1987, 1989), who applied age/maturity data and stock proportion estimates to landbased sockeye catch statistics.

RESULTS AND DISCUSSION

Sockeye salmon from the Kamchatka Peninsula (U.S.S.R.) predominated in all three age groups that were analyzed (90.8% of age 2.2 fish, 87.4% of age 1.3 fish, and 64.3% of age 2.3 fish, Table 3). Eighty-four percent (54,690 fish) of the salmon caught by the 1990 LBDN fishery could be allocated to the three age groups that were analyzed, and Western Alaska (Bristol Bay) sockeye salmon accounted for 26% of the total allocated catch (Table 4). This percentage is higher than estimates for Alaskan sockeye salmon presented by Harris (1986, 1987, 1989), which averaged 8% of the maturing fish (ages 1.2, 2.2, 1.3, 2.3) and 11% of the immature fish (ages 1.2 and 2.2) in 1972-1976 LBDN catches and 10% of maturing fish and 9% of immature fish in 1978-1984 LBDN catches. The relatively high estimate for Bristol Bay sockeye salmon in 1990 LBDN catches was due to an estimated proportion of 35.7% Bristol Bay sockeye salmon in the analysis of age 2.3 scales (Table 3) and to the fact that age 2.3 sockeye salmon were the predominant age group in the 1990 port samples (49.2% of usable scales, Table 1). In Harris's (1986, 1987, 1989) analyses ocean age .2 fish predominated.

These results may indicate a shift in the age or stock groups taken by the fishery in recent years or that data used in Harris's analyses were not representative of the fishery. Harris (1986, 1987, 1989) noted that the age/maturity composition estimates used in his analyses were "probably very rough" owing to "major gaps in research vessel sampling in the LBDN fishery area." Because of these gaps in research vessel sampling much of the age/maturity data used by Harris came from Japanese mothership fishery samples collected between 46°N an 48°N, and he thought that these data likely showed "higher proportions of maturing and older fish than actually occurred in landbased fishery catches." Harris observed a shift toward a higher proportion of age .3 fish in the maturing component of the 1978-1984 data compared to the previous (1972-1977) period, but thought that this shift "likely resulted from the use of age/maturity data for the southern mothership area to prorate a large fraction of the landbased catches."

Although precise age/maturity and stock composition data for historical LBDN catches are lacking, total catches by the fishery since 1972 have declined, and runs of sockeye salmon to Bristol Bay have increased to record numbers (Fig. 1). If the estimated percentage of Bristol Bay sockeye salmon in the allocated portion of the catch (26%) is applied to the total catch (65,030 fish), then a rough estimate of the total catch of Bristol

Bay sockeye by the LBDN fishery in 1990 is 16,908 fish. The maturity of fish in the 1990 LBDN catches is not known, but the majority of the fish in the 1990 LBDN scale samples were ocean age .3 fish (Table 1), and most sockeye salmon of this ocean age group in high seas samples are maturing fish (French et al. 1976). Compared to the commercial catch of sockeye salmon in Bristol Bay in 1990 (33 million fish) and the total run (catch + escapement) of sockeye salmon to Bristol Bay in 1990 (47.8 million fish), reported catches of sockeye salmon by the 1990 LBDN fishery (65,030 fish) and estimated interceptions of Bristol Bay sockeye salmon are negligible.

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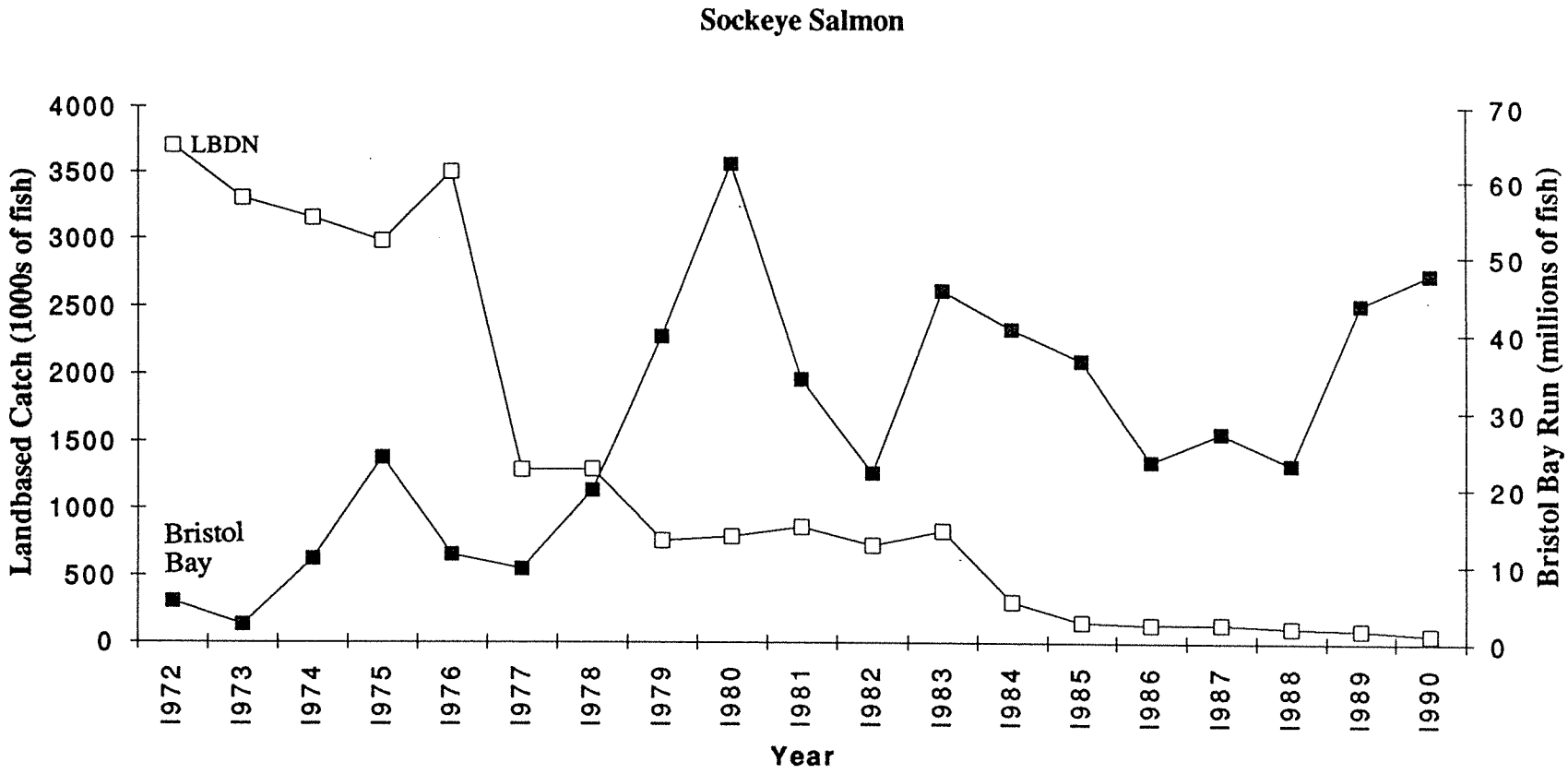

Figure 1. Reported catches of sockeye salmon (*Oncorhynchus nerka*) by the Japanese traditional landbased driftnet salmon (LBDN) fishery and estimated runs (catch + escapement) of sockeye salmon to Bristol Bay Alaska, 1972-1990 (Int. North Pac. Fish. Comm. 1975, 1977-1979, 1981-1983, 1985-1990; Fisheries Agency of Japan 1989-1991; D. Rogers, pers. comm.).

Table 1. Age composition estimates and number of scales measured for scale pattern analysis of sockeye salmon in samples collected in 1990 from (1) the Japanese traditional landbased driftnet salmon fishery (LBDN), (2) the Ozernaya River, West Kamchatka, U.S.S.R. (WKAM), (3) the Kamchatka River, East Kamchatka, U.S.S.R. (EKAM), and (4) Port Moller (Bristol Bay), Alaska (BBAY). No. = number of fish; % = age composition estimate (as a percentage of total number of fish with usable scales). Meas. = the number scales measured for scale pattern analysis (one scale per fish).

	Age Group																
Sample	0.2	0.3	0.4	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4	3.2	3.3	3.4	Total Usable	Unusable	Total
LBDN																	
No.	1	19	6	28	171	17	0	0	124	416	12	10	41	1	846	241	1087
%	0.1	2.2	0.7	3.3	20.2	2.0			14.7	49.2	1.4	1.2	4.9	0.1			
Meas.					169				121	403							
WKAM																	
No.	0	0	0	1	1	0	0	11	84	93	1	1	8	1	201	0	201
%				0.5	0.5			5.5	41.8	46.3	0.5	0.5	4.0	0.5			
Meas.					0				83	92							
EKAM																	
No.	0	13	12	0	93	17	2	0	11	48	17	0	8	1	222	8	230
%		5.9	5.4		41.9	7.7	0.9		5.0	21.6	7.6		3.6	0.4			
Meas.					92				10	46							
BBAY																	
No.	0	50	1	264	556	7	0	0	917	695	1	16	2	0	2509	212	2721
%		2.0	<0.1	10.5	22.2	0.3			36.5	27.7	<0.1	0.6	0.1				
Meas.					100				100	100							

Table 2. Scale characters used in 1990 sockeye analyses. Measurements were made in the anterior (sculptured) field of the scale along a single radius that was 90° to a reference line that marked the boundary of the sculptured and unsculptured fields of the scale.

Name of Scale Character	Description	Used in analyses: 1.3	2.2	2.3
FWSZ	For age 1. scales, distance in the freshwater zone from the center of the focus to the edge of the last freshwater circulus, may include freshwater plus-growth. For age 2. scales, distance in the freshwater zone from the center or the focus to the edge of the last circulus in the second freshwater annulus	X	X	X
OC1SZ	Distance in the first year of ocean growth from the edge of the last freshwater annulus to the edge of the last circulus in the first ocean annulus; for age 2. scales may include freshwater plus-growth after the last freshwater annulus	X	X	X
OC1CIRC	Number of circuli in the first year of ocean growth; for age 2. scales, may include circuli of freshwater plus-growth	X	X	X
TRIP1	For age 1. scales, distance from the edge of the last freshwater circulus to the edge of the third circulus in the first year of ocean growth; for age 2. scales, distance from the edge of the last circulus in the second freshwater annulus to the edge of the third circulus in the first year of ocean growth, may include circuli of freshwater plus-growth	X	X	X
TRIP2	Distance from the third to the sixth circulus in the first year of ocean growth	X	X	X
TRIP3	Distance from the sixth to the ninth circulus in the first year of ocean growth	X	X	X
TRIP4	Distance from the ninth to the twelfth circulus in the first year of ocean growth	X	X	X
TRIP5	Distance from the twelfth to the fifteenth circulus in the first year of ocean growth		X	X
TRIP6	Distance from the fifteenth to the eighteenth circulus in the first year of ocean growth		X	
FW1	Distance in the freshwater zone from the center of the focus to the edge of the last circulus in the first freshwater annulus	X	X	X

Table 2. cont'd.

Name of Scale Character	Description	Used in analyses: 1.3	2.2	2.3
FW2	For age 1. scales: distance from the edge of the first freshwater annulus to the edge of the last circulus of freshwater plus-growth. For age 2. scales: distance from the edge of the first freshwater annulus to the edge of the second freshwater annulus	X	X	X
OC2SZ	Distance in the second year of ocean growth from the edge of the first ocean annulus to the edge of the tenth circulus in the second year of ocean growth	X	X	X
TRIP16	Distance from the first to the fourth circulus in the second year of ocean growth	X	X	X
TRIP17	Distance from the fourth to the seventh circulus in the second year of ocean growth	X	X	X
TRIP18	Distance from the seventh to the tenth circulus in the second year of ocean growth	X	X	X

Table 3. Maximum likelihood stock proportion estimates for ages 1.3, 2.2, and 2.3 sockeye salmon in the 1990 Japanese traditional landbased driftnet salmon (LBDN) fishery based on analysis of scale pattern data. Estimates utilize Millar's (1988) method with confidence intervals derived from bootstrapping (500 runs). WKAM = Ozernaya River, West Kamchatka, U.S.S.R.; EKAM = Kamchatka River, East Kamchatka, U.S.S.R.; BBAY = Bristol Bay (Port Moller), Alaska. N = number of scales measured in 1990 LBDN samples.

		WKAM		EKAM		BBAY	
Age group	N	Est.	95% CI	Est.	95% CI	Est.	95% CI
1.3	169			.874	(.714-.939)	.126	(.060-.285)
2.2	121	.908	(.631-.997)			.092	(.002-.365)
2.3	403	.464	(.355-.626)	.179	(.099-.297)	.357	(.200-.459)

Table 4. Estimated catch of ages 1.3, 2.2, and 2.3 sockeye salmon of U.S.S.R. (WKAM = West Kamchatka, Ozernaya R. and EKAM = East Kamchatka, Kamchatka R.) and western Alaska (BBAY = Bristol Bay) origin in the 1990 Japanese traditional landbased driftnet salmon fishery (LBDN fishery).

Total[1] Catch	Catch by Age[2]			WKAM[3]			EKAM[3]			BBAY[3]		
	Group	Prop.	Catch	Prop.	Catch	95% CI	Prop.	Catch	95% CI	Prop.	Catch	95% CI
65,030	1.3	.202	13,136				.874	11,481	(9,379-12,335)	.126	1,655	(788- 3,744)
	2.2	.147	9,559	.908	8,680	(6,032- 9,530)				.092	879	(19- 3,489)
	2.3	.492	31,995	.464	14,846	(11,358-20,029)	.179	5,727	(3,168- 9,502)	.357	11,422	(6,399-14,686)
Total no. of fish			54,690		23,526			17,208			13,956	
% of Total					43%			31%			26%	

[1]Total catch of sockeye salmon by the LBDN fishery in 1990 was reported by the Fisheries Agency of Japan (1991).

[2]Prop. is the estimated proportion of each age group in samples of scales collected by the Fisheries Agency of Japan from catches by the LBDN fishery at Hanasaki and Kushiro ports in 1990 (see Table 1).

[3]Prop. is the maximum likelihood stock proportion estimate based on analysis of scale pattern data (see Table 3). The 95% confidence intervals (95% CI) were calculated directly from 95% confidence intervals on maximum likelihood stock proportion estimates derived from bootstrapping (500 runs, see Table 3).

Appendix Table 1. Means and standard deviations (values in parentheses) of scale pattern variables used to calculate maximum likelihood estimates of stock proportions of age 1.3 sockeye salmon in the 1990 Japanese traditional landbased driftnet salmon fishery. Measurement units are in microns. The number of scales measured and descriptions of scale pattern variables are in Tables 1-2. EKAM = Kamchatka River, East Kamchatka, U.S.S.R. BBAY = Bristol Bay (Port Moller), Alaska.

VARIABLE	EKAM	BBAY
FWS2	404.55 (67.8)	528.61 (86.4)
OC1C1RC	23.478 (2.98)	22.120 (2.91)
OC1S2	926.84 (131.)	954.41 (121.)
TRIP1	122.23 (17.1)	144.01 (25.8)
TRIP2	132.49 (20.0)	155.36 (21.8)
TRIP3	138.96 (23.9)	150.56 (20.0)
TRIP4	131.20 (21.9)	142.93 (19.4)
FW1	315.21 (76.1)	400.49 (67.0)
FW2	89.380 (64.7)	128.12 (89.0)
OC2S2	397.87 (39.9)	449.42 (44.8)
TRIP16	120.72 (18.4)	136.62 (18.9)
TRIP17	118.83 (16.9)	138.27 (19.5)
TRIP18	119.75 (15.9)	132.10 (17.7)

Appendix Table 2. Means and standard deviations (values in parentheses) of scale pattern variables used to calculate maximum likelihood estimates of stock proportions of age 2.2 sockeye salmon in the 1990 Japanese traditional landbased driftnet salmon fishery. Measurement units are in microns. The number of scales measured and descriptions of scale pattern variables are in Tables 1-2. WKAM = Ozernaya River, West Kamchatka, U.S.S.R. BBAY = Bristol Bay (Port Moller), Alaska.

VARIABLE	WKAM	BBAY
FWS2	552.75 (60.5)	582.28 (94.5)
OC1C1RC	25.012 (2.13)	23.650 (2.04)
OC1S2	1087.5 (92.4)	1072.5 (89.3)
TRIP1	144.48 (16.3)	147.25 (24.8)
TRIP2	154.54 (18.6)	169.06 (19.0)
TRIP3	151.69 (16.7)	158.09 (19.7)
TRIP4	143.73 (16.9)	151.08 (18.4)
TRIP5	134.70 (16.7)	140.72 (18.9)
TRIP6	120.89 (13.4)	116.16 (16.4)
FW1	320.05 (54.0)	303.41 (72.1)
FW2	232.73 (53.9)	278.96 (53.4)
OC2S2	415.98 (44.4)	458.89 (48.1)
TRIP16	129.25 (17.8)	144.87 (20.4)
TRIP17	124.22 (18.0)	141.45 (18.9)
TRIP18	121.66 (15.8)	129.26 (18.6)

Appendix Table 3. Means and standard deviations (values in parentheses) of scale pattern variables used to calculate maximum likelihood estimates of stock proportions of age 2.3 sockeye salmon in the 1990 Japanese traditional landbased driftnet salmon fishery. Measurement units are in microns. The number of scales measured and descriptions of scale pattern variables are in Tables 1-2. WKAM = Ozernaya River, West Kamchatka, U.S.S.R. EKAM = Kamchatka River, East Kamchatka, U.S.S.R. BBAY = Bristol Bay (Port Moller), Alaska.

VARIABLE	WKAM	EKAM	BBAY
FWSZ	523.08 (59.1)	523.24 (160.)	594.77 (94.0)
OC1C1RC	23.283 (1.79)	23.304 (3.22)	21.890 (2.13)
OC1SZ	1051.4 (90.7)	908.72 (126.)	981.71 (108.)
TRIP1	143.15 (19.4)	118.87 (18.9)	161.13 (25.1)
TRIP2	167.27 (16.1)	133.09 (20.5)	166.08 (19.7)
TRIP3	160.50 (17.6)	134.22 (24.3)	159.64 (18.4)
TRIP4	154.24 (19.0)	129.67 (20.1)	145.64 (18.8)
TRIP5	136.95 (16.8)	119.26 (17.7)	125.93 (18.5)
FW1	227.93 (44.8)	278.43 (96.0)	295.33 (68.3)
FW2	295.20 (41.2)	244.67 (89.3)	299.52 (62.2)
OC2SZ	405.77 (37.1)	383.89 (40.6)	434.79 (44.7)
TRIP16	125.32 (16.0)	115.28 (14.7)	132.82 (17.1)
TRIP17	119.15 (15.9)	116.59 (15.4)	132.41 (19.1)
TRIP18	120.68 (16.6)	113.54 (17.5)	127.23 (17.9)