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Alaska Peninsula Salmon, 1998

D. ROGERS

Annual Report

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Mike Kinnison, Jennifer Bahrke, and Allison Cardwell collected scales and took length measurements at King Cove and Brenda Rogers aged the scales and examined for scale holes. Thanks also to Arnie Shaul, Chris Hicks, and Dan Gray of the Alaska Department of Fish & Game for providing preliminary 1998 catch and escapement statistics.

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KEY WORDS

sockeye salmon, chum salmon, False Pass, Bristol Bay, Bear Lake

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INTRODUCTION

The salmon fisheries on the Alaska Peninsula have a long history dating back to the early 1900s. The June fisheries in the Shumagin Islands and south of Unimak Island, which are collectively called the False Pass fishery or South Peninsula June fishery, target on non-local sockeye salmon (*Oncorhynchus nerka*) primarily bound for Bristol Bay (Eggers et al. 1991, Rogers 1990). Non-local chum salmon (*O. keta*) are also caught by the purse seine and gillnet fleets. In recent years, the June fisheries have been restricted by quotas on both species. After June, most of the gillnet fleet moves to the north side of the peninsula to target on local stocks of sockeye while the seine fleet targets primarily on pink salmon (*O. gorbuscha*) in August.

The salmon fisheries on the Alaska Peninsula have frequently been subject to proposed restrictions at annual meetings of the Alaska Board of Fisheries by fishermen from other areas of Alaska. Claims are often made that catches of non-targeted salmon (chum salmon in the June fishery, sockeye and coho [*O. kisutch*] salmon in the post-June fishery, and Bristol Bay sockeye in the north side fishery) have significantly impacted other coastal fisheries.

Since 1992, we have (1) sampled the chum salmon catches in the False Pass fisheries to measure biological attributes (age, length, weight, condition), (2) estimated the annual runs of sockeye and chum salmon in the North Pacific, and (3) estimated the relative impact of the False Pass catches on coastal stocks. Since 1995, we have (1) examined the spatial and temporal distribution of Bristol Bay sockeye off the coast of the north side of the Alaska Peninsula, (2) compared the biological characteristics between local North Peninsula stocks and Bristol Bay stocks, (3) compared the age compositions in the two fisheries, and (4) investigated the salmon productivity of the North Peninsula with studies of the Bear Lake and Ilnik system sockeye salmon stocks.

This report summarizes the results of investigations in 1998. For the most part, this means adding one more line to existing data sets (Rogers and Ramstad 1997); however, our recent studies of the North Peninsula stocks were completed in 1998 as Master of Science theses (Ramstad 1998 and Witteveen 1998) and distributed to sponsors under separate cover.

METHODS

False Pass

The accuracy of estimates of the annual runs (catch and escapement) of sockeye and chum salmon to major North Pacific regions varies considerably. Annual catch statistics for sockeye and chum salmon since the 1950s are fairly accurate (probably within 10%) for most North American regions and Japan, but less so for Russia. There are accurate annual escapement estimates for sockeye salmon for most runs since the mid-1950s, but estimates for chum salmon escapements are either lacking, inaccurate, or only available for recent years. For most regions of Alaska, except the Arctic-Yukon-Kuskokwim (A-Y-K), chum salmon runs coincide with more valuable sockeye or more numerous pink salmon runs and therefore receive less monitoring for escapement. However, chum salmon runs can be estimated in these situations from the chum salmon catch and the rate of exploitation on the targeted species (Rogers 1987). The most important statistics for management are usually the most recent statistics, and these are only available in preliminary form or in-house reports. This report relies heavily on 1998 catch and escapement statistics provided by Alaska Department of Fish & Game (ADFG) area management biologists.

Annual runs of chum salmon to North Pacific regions from 1970 to 1996 were estimated primarily from catch and escapement statistics that were presented in Rogers (1995). Sockeye salmon exploitation rates were utilized in Bristol Bay even though some aerial and sonar estimates of chum salmon escapement were available (Nushagak and Togiak). Sonar estimates of chum salmon escapement were available for a few recent years in the Yukon River, and regressions of sonar count on spawning survey count were used to estimate escapements in years when only spawning survey counts were available (Rogers 1994). Expanded aerial survey and weir counts from selected spawning areas were used to estimate escapements

in the Kotzebue, Norton Sound, and Kuskokwim regions. Aerial survey estimates were used for most estimates of chum salmon escapements to central Alaska; otherwise, assumed exploitation rates and chum salmon catches were used to estimate chum salmon runs.

Chum salmon from the 1998 False Pass catches (June 13–30) were sampled at the Peter Pan processing plant in King Cove. Fish were selected randomly from the processing line and measured for length (mid-eye to tail fork). Weights were not taken in 1998 because the crew also had to collect scales from sockeye salmon as ADFG was unable to do so. Sex was determined from external appearance, and two scales were collected from the preferred region. Some chum without scales in the preferred region were also included in the samples to determine whether they were significantly smaller fish. The first samples were collected from the June 15 catches and the last samples collected from the June 24 catches. Data from the field forms (date, location, scale card number, fish number, sex, and length) were entered on to a computer file.

Scales were aged and examined for focal scale resorbtion (holes) by an experienced scale reader. The scale reader was tutored by Mr. Brian Bigler (Wards Cove Packing Co., Seattle, Washington) on the identification of focal scale resorbtion (Bigler 1988 and 1989). Ages and occurrences of scale holes were then added to the computer database. Data were stratified by location (South Unimak and Shumagin Is.), date, sex, and age. Mean weights for 1998 were estimated from mean lengths and regressions of mean weights on mean lengths for past years (1994–97).

Catch statistics for the False Pass fisheries of past years were obtained from Campbell et al. (1998). Mr. A.R. Shaul (ADFG, Kodiak) provided preliminary catches by gear, area, and date for 1998. These preliminary catches were used to weight stratified means (length, weight, age compositions) to obtain the annual means for 1998.

North Peninsula

Bristol Bay run timing past Port Moller was estimated annually (1987–98) by combining inshore run statistics collected by ADFG (e.g., Stratton and Crawford 1994) with Port Moller test boat catches collected by FRI (Rogers 1995). The test boat catches were also used to examine annual variation in the onshore–offshore distribution of the Bristol Bay run along the North Peninsula, the age composition of sockeye, and the sockeye/chum species composition. The onshore–offshore distribution was measured by the percentage that the index catch at station 2 (the inner most station) contributed to the total daily index (the sum of the catches at stations 2, 4, 6, and 8).

The annual age compositions of sockeye salmon caught in the North Peninsula fisheries were provided by weekly periods for two subdistricts: Bear River (Harbor Point to Cape Seniavin) and Ilnik/Three Hills (Cape Seniavin to Strogonof Point). Age compositions from the subdistricts were averaged through July 11 by weighting the subdistrict compositions by the catch (Murphy et al. 1998). Age compositions for North Peninsula escapements were estimated by weighting the individual river age compositions by the number in the escapement, and age compositions in the Bristol Bay catches were calculated from annual run statistics provided by D. Gray (ADFG, Anchorage).

RESULTS

False Pass

Abundance: The False Pass sockeye salmon catch is regulated by a quota set at 8.3% of the forecasted Bristol Bay catch. Since the inception of a chum salmon cap in 1986, the quota had been caught only 50% of the time and the catch did not reach 8.3% of the actual Bristol Bay catch until 1997 (Table 1). Three factors contribute to the inability of the fishery to achieve an allotment of 8.3% of the Bristol Bay catch: (1) the preseason forecasts that have tended to be too low, (2) a high abundance of chum salmon with a low chum salmon cap (quota), and (3) the availability of migratory Bristol Bay sockeye. During 1994–96, the low availability of Bristol Bay sockeye was likely the main factor. Despite fishing nearly every day, the 1994–96 catches were about 2 million fish short of the quotas. In 1997 and 1998, Bristol Bay sockeye appeared to be more available than usual as the catches exceeded 8.3% of the Bristol Bay catches although they were still below the preseason quotas. The False Pass fishery depends only on those Bristol Bay sockeye that are returning from ocean rearing in the Gulf of Alaska (Rogers 1987). Most Bristol Bay sockeye begin their homeward migration west of the fishery (south of the Aleutian Islands). A shift in the oceanic distribution from east to west or a shift from a nearshore to an offshore migratory route would result in variable availability to the Shumagin and South Unimak fisheries from year to year.

Omitting the 1990 and 1994–96 observations as outliers, the CPUE of sockeye salmon at South Unimak explained 61% of the annual variation in the Western Alaska runs (Fig. 1). This correlation was very good and provided a method of forecasting the Bristol Bay run about 2 weeks

in advance of their arrival in the bay (Eggers and Shaul 1987). Recent changes in the South Unimak fleet (effort by gear) may also have contributed to the recent poor correlation between CPUE and the size of the Bristol Bay run (Table 2). Purse seine effort was greatly reduced relative to drift gillnet effort in 1996–98 largely because purse seines did not fish in the early part of the season. Although the sockeye CPUE no longer appears reliable as a forecast tool, the age composition of the sockeye salmon catch at False Pass has been useful in forecasting the Bristol Bay runs (Table 3).

The chum salmon percentages in the False Pass catches of 1997 and 1998 were well below average whereas the chum salmon percentages in Western Alaska were a little above average (Table 4). Both runs were exceptionally small in both years. The sockeye runs were the smallest since 1978 (Tables 5 and 6) and the Bristol Bay chum runs were the smallest in 30 years. The percentage of chums was much higher than average in the Port Moller test boat catches in contrast to lower than average percentages in the Bristol Bay runs of 1997 and 1998. The Arctic/Yukon runs of chum salmon were again very small in 1998 (Table 7); however, a preliminary estimate of the Japanese chum salmon return in 1998 indicates that the run was only a little below average. No estimate was yet available for the 1998 Russian chum salmon run (Table 8).

Age, Weight, and Length: About 97% of the chum salmon caught in the 1998 South Unimak and Shumagin fisheries were ages 0.3 and 0.4; however, age 0.3 chum salmon were especially prominent (Table 9). The age 0.3 chum salmon in 1998 were also longer than in past years. The False Pass chum in 1998 were again much larger at each age than the average chum salmon in the Nushagak (Bristol Bay) catch (Table 10).

In the Nushagak catch, annual mean lengths of 3-ocean chum salmon and 3-ocean sockeye salmon have been significantly correlated (1967–1996, r = 0.80). Nushagak and other Bristol Bay sockeye have been smaller than average since the consecutive large runs that began in 1989 (Fig. 2). The annual sizes of Bristol Bay sockeye are density dependent (large numbers/small size) and temperature dependent (cold spring/small size), and for recent years the small size has also caused some delay in maturation as fish have been spending a longer time at sea (Rogers and Ruggerone 1993). In the Nushagak catch, 3-ocean chum salmon tend to be shorter and lighter than 3-ocean sockeye salmon; however, this was not the case in 1998 as Nushagak chum were the largest since 1985. Annual mean lengths of Nushagak chum have been more closely correlated with the numbers of sockeye in the western Alaska runs (r = .77) than were the mean lengths of Nushagak sockeye (r =.75). There was no significant correlation between chum salmon mean lengths and Nushagak chum or sockeye runs (Table 10). Chum and sockeye salmon returning to Bristol Bay over the past 10 years would likely have been even smaller if the spring weather since 1989 had not been warmer than normal (Fig. 3). Early Bristol Bay runs have been associated with warm spring weather and late runs with cold spring weather; however, the late run in 1994 was associated with average spring temperatures and, in 1998, the runs to the Naknek/Kvichak and Nushagak districts were much later than average.

Focal Scale Resorbtion: Murphy (1993) presented a summary of the incidence of focal scale resorbtion for chum salmon in the False Pass fisheries, including our preliminary results for 1992. Scales had only been examined from South Unimak in 1990 (600) and from the Shumagins in 1989 (302) and 1990 (298). The final results for 1998 are given in Table 11. For the combined samples, the percentage of chum salmon that had scale holes for 1992–97 is as follows (Rogers and Ramstad 1997):

Year	Percentage
1992	1.15
1993	1.53
1994	2.25
1995	1.78
1996	1.52
1997	1.75

Thus, the 1998 samples with a combined percentage of 0.64% was the lowest observed and indicated a lower than usual contribution of Asian chum salmon to the False Pass fishery in 1998.

Assuming that the incidence of focal scale resorbtion is zero in Alaskan stocks and ~11.8% in Asian stocks (Murphy 1993), the Asian stock contribution has been close to the estimated 20% from the 1987 tagging. To obtain more precise estimates of Asian stock contribution, we need a measure of the year-to-year variation in the incidence in Asian stocks. From the tagging results in 1987, we would expect the incidence of holes to be much greater in the Shumagin samples than in the South Unimak samples. Unfortunately we had only one small scale sample from the Shumagins in 1998.

North Peninsula

During 1998, our study of Bear Lake sockeye salmon was completed with a thesis by Kristina Ramstad. She

demonstrated significant biological differences in the early and late runs based on morphological, life history (age and growth), and genetic measurements (Ramstad 1998). Mark Witteveen completed a joint study with ADFG on the sockeye salmon runs to the Ilnik system. His thesis demonstrated the run timing of the four major stocks and contrasted the age composition of Ilnik stocks with the other North Peninsula runs. He showed that the early Ilnik runs were largely unfished as a result of past management plans (Witteveen 1998). A new management plan was subsequently implemented by ADFG that will provide some harvest of the early runs when weir counts are sufficient to meet escapement goals.

Abundance and Distribution

Rogers (1996) described the sockeye salmon fisheries along the north side of the Alaska Peninsula and the offshore migration of Bristol Bay salmon into the bay and the inshore migration out of the bay for Ugashik and North Peninsula stocks. The 1998 sockeye runs were the lowest since 1987 (Fig. 4) and harvest rates were reduced to obtain escapement goals. Harvest rates on the North Peninsula stocks were especially low during August and catches were below average in late-July to mid-August as a result of a rather weak and delayed Bear River late run (Fig. 5). The Ugashik run was also very late in 1998.

The vulnerability of Bristol Bay sockeye salmon to the North Peninsula fisheries from Port Moller to Ilnik may be dependent on the offshore distribution and timing of the Bristol Bay run. The Port Moller test fishery offers some measure of offshore distribution. Throughout the 1998 migration past Port Moller, the sockeye were concentrated well offshore as the catches were consistently highest at stations 4 and 6 and lowest at station 2 (the innermost station). The 1998 Bristol Bay run was about 2 days later than average as it moved past Port Moller, yet about 85% of the run had passed Port Moller by July 4, which suggests a very low vulnerability of Bristol Bay sockeye to the North Peninsula fisheries (Tables 12 and 13).

To examine whether sockeye salmon catches along the North Peninsula were influenced by the onshore–offshore distribution of Bristol Bay sockeye, we compared the catches in the Ilnik/Three Hills section (closest to Bristol Bay) through July 11 with a measure of the onshore distribution (percent of index catch made at station 2 during July 1–5). A plot of these observations for 1987–98 indicated no correlation was evident (Fig. 6). The year with the greatest offshore distribution was also the year with the largest Ilnik/Three Hills catch (1992), and catches in the two years when the distribution tended to be closer to shore were average to below average (1990 and 1991).

Age Composition

A comparison of the age compositions of sockeye salmon in the North Peninsula fisheries with the compositions in the offshore Port Moller test boat catches, the Bristol Bay inshore catches, and the North Peninsula escapements provides another measure of the possible contribution of Bristol Bay sockeye to the local fishery. The age compositions in the local escapements differ significantly among rivers. Bear and Nelson stocks have a preponderance of age 2.2 and 2.3 sockeye, while Sandy River sockeye are mostly ages 1.2 and 1.3 and Ilnik sockeye contribute a high percentage of age 0.3 fish (Table 14). These differences in age compositions were reflected in the 1998 catches in the Harbor Point to Strogonof Point districts as the freshwater age shifted from younger to older during the course of the season (Table 15). This shift in age generally corresponds with the timing of the contributing stocks. The August catch contained mostly ages 2.2 and 2.3 as did the late Bear River escapement . The age composition of the sockeye caught in the offshore test fishery at Port Moller in 1998 again closely compared with the age composition in the inshore Bristol Bay catch; however, both differed from the age composition in the North Peninsula catch (Table 16). It was difficult to construct a weighted escapement age composition for the North Peninsula to match the catch because the fishery extends over a long coastline where stocks with differing ages contribute at different rates depending on the run timing. The estimated escapement age composition in 1998 was quite different from the composition in the June to early-July catch.

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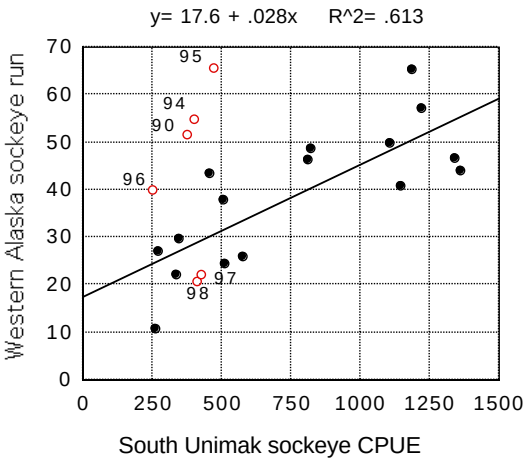

FIGURE 1. Western Alaska sockeye salmon run regressed on South Unimak CPUE.

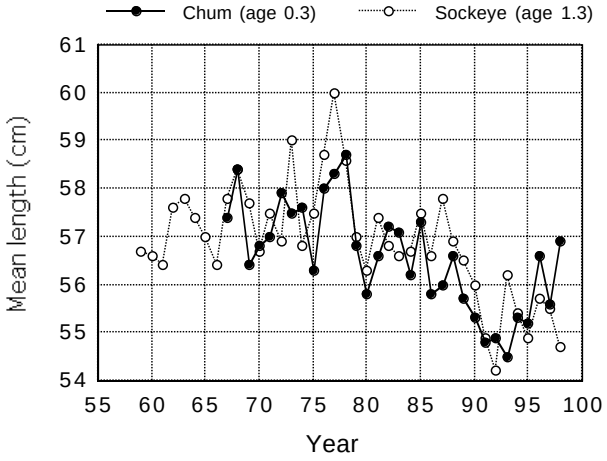

FIGURE 2. Mean lengths of sockeye and chum salmon in the Nushagak catches.

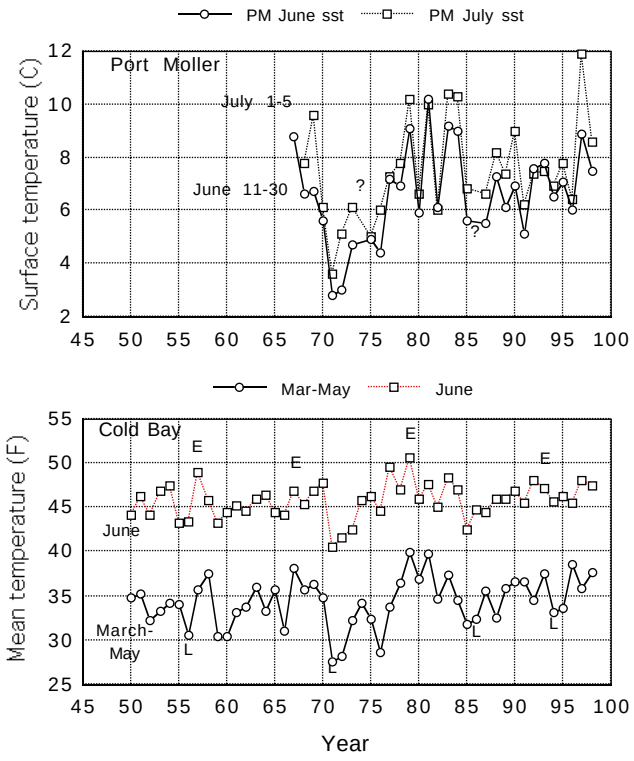

FIGURE 3. Annual air temperatures at Cold Bay and water temperatures off Port Moller.

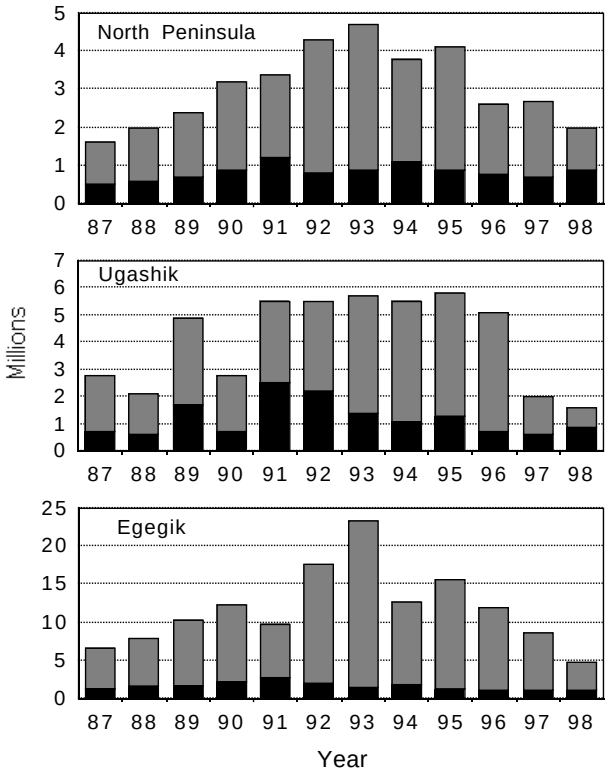

FIGURE 4. Annual sockeye salmon runs to Egegik, Ugashik, and North Peninsula. Solid = escapement; pattern fill = catch.

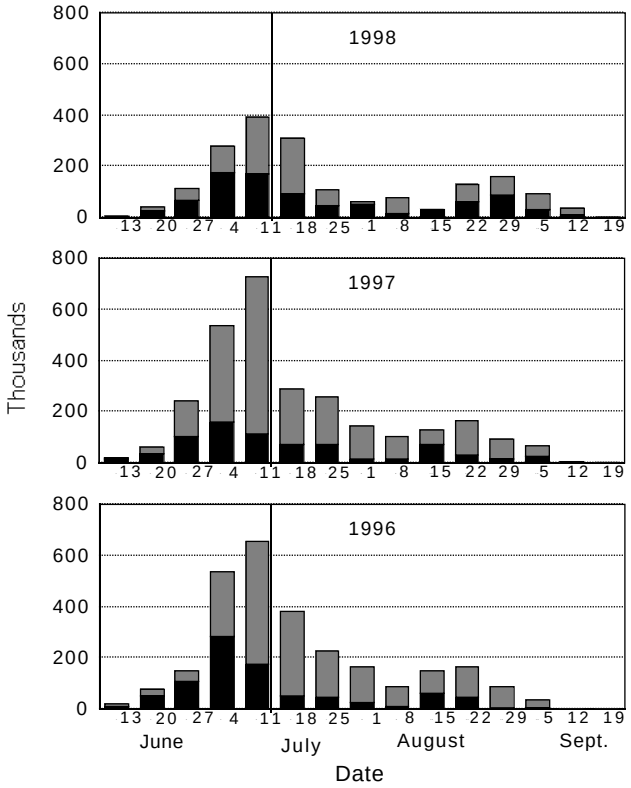

FIGURE 5. Northern District sockeye salmon catches and escapements, 1996–98. Solid = escapement; pattern fill = catch.

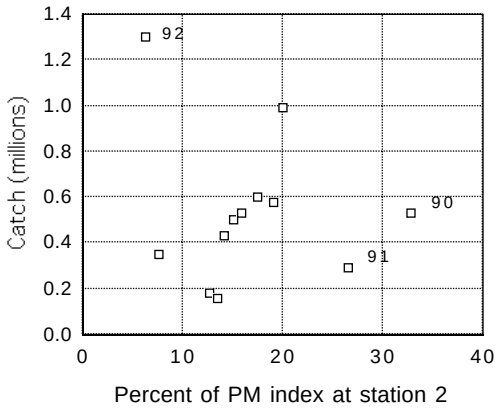

FIGURE 6. Ilnik/Three Hills catch plotted on percent of Port Moller index at station 2.

TABLE 1. False Pass fishery catches, the preseason quotas, and the actual Bristol Bay catches.

	Sockeye salmon (millions)							Chum salmon (1,000s)		
	Bristol Bay		False Pass							
Year	Run	Catch	Catch	Quota	8.3%	C-Q	C-8.3%	Catch	Cap	Catch-cap
77	9.72	4.88	.24	.24	.42	.00	-.19	116		
78	19.92	9.93	.49	.52	.86	-.04	-.38	122		
79	39.90	21.43	.85	1.10	1.85	-.25	-1.00	104		
80	62.49	23.76	3.21	3.07	2.24	.14	.97	509		
81	34.47	25.60	1.82	1.76	2.28	.06	-.46	564		
82	22.21	15.10	2.12	2.26	1.43	-.14	.69	1095		
83	45.91	37.37	1.96	1.79	3.26	.17	-1.30	786		
84	41.11	24.71	1.39	1.36	2.17	.03	-.78	337		
85	36.86	23.70	1.79	1.69	2.12	.11	-.33	434		
86	23.74	15.78	.47	1.11	1.35	-.64	-.88	352	400	-48
87	27.52	16.07	.79	.78	1.40	.02	-.61	443	0	
88	23.42	13.99	.76	1.54	1.22	-.79	-.47	527	500	27
89	44.05	28.74	1.74	1.46	2.53	.28	-.79	455	500	-45
90	48.12	33.52	1.35	1.33	2.89	.02	-1.55	519	600	-81
91	41.91	25.82	1.55	1.92	2.27	-.37	-.72	773	600	173
92	45.22	31.88	2.46	2.39	2.85	.07	-.39	426	700	-274
93	52.22	40.46	2.97	2.90	3.60	.07	-.63	532	700	-168
94	50.58	35.22	1.46	3.59	3.04	-2.13	-1.58	582	700	-118
95	60.89	44.43	2.11	3.65	3.86	-1.54	-1.76	537	700	-163
96	37.00	29.65	1.03	3.13	2.55	-2.10	-1.52	360	700	-340
97	18.89	12.26	1.63	2.25	1.15	-.62	.48	322	700	-378
98	18.35	9.98	1.29	1.87	.94	-.58	.35	246	375	-129
99				1.30						
87-96 average	43.09	29.98	1.62	2.27	2.62	-0.65	-1.00	523	633	-110

TABLE 2. Sockeye salmon CPUE by gear in the South Unimak fishery.

	Effort (boat days)		Catch (1,000s)		CPUE (catch/boat days)		
Year	Purse seine	Drift gillnet	Purse seine	Drift gillnet	Purse seine	Drift gillnet	PS/GN
77	59	501	30	159	508	317	1.60
78	70	1000	77	333	1100	333	3.30
89	157	926	473	182	3013	197	15.33
80	408	946	2074	630	5083	666	7.63
81	481	1027	682	627	1418	611	2.32
82	581	1273	918	699	1580	549	2.88
83	280	533	798	392	2850	735	3.88
84	85	151	385	199	4529	1318	3.44
85	199	360	761	401	3824	1114	3.43
86	193	410	145	135	751	329	2.28
87	270	734	235	321	870	437	1.99
88	107	431	141	307	1318	712	1.85
89	159	351	735	434	4623	1236	3.74
90	482	1292	619	452	1284	350	3.67
91	280	549	650	539	2321	982	2.36
92	340	657	1192	766	3506	1166	3.01
93	392	657	1397	903	3564	1374	2.59
94	458	862	573	371	1251	430	2.91
95	498	1367	611	793	1227	580	2.11
96	289	1237	127	422	439	341	1.29
97	297	1544	175	897	589	581	1.01
98	137	1816	70	856	511	471	1.08

TABLE 3. Comparison of the age compositions of sockeye salmon in Bristol Bay runs with age compositions from the False Pass fishery, inseason Port Moller test fishery, and the ADFG preseason forecast, 1987–98.

		Age composition (%)						Bristol Bay
Year		1.2	2.2	1.3	2.3	all .2	all .3	run (millions)
1987	ADF&G pre-f'cast	26	24	33	17	50	50	16.1
	Moller in-f'cast	49	19	19	12	68	31	26.0
	False Pass catch	35	13	33	14	49	51	
	Bristol Bay run	49	12	24	13	61	39	27.3
1988	ADF&G pre-f'cast	30	27	34	9	57	43	26.5
	Moller in-f'cast	17	20	48	12	37	60	22.0
	False Pass catch	23	42	23	9	66	33	
	Bristol Bay run	20	22	41	13	43	55	23.0
1989	ADF&G pre-f'cast	22	45	24	9	67	33	28.9
	Moller in-f'cast	13	45	22	17	58	39	37.0
	False Pass catch	8	62	13	15	70	28	
	Bristol Bay run	11	62	16	9	73	26	43.8
1990	ADF&G pre-f'cast	19	42	26	13	61	39	25.4
	Moller in-f'cast	10	37	24	26	48	52	56.0
	False Pass catch	16	37	20	25	53	45	
	Bristol Bay run	14	41	21	20	56	43	47.8
1991	ADF&G pre-f'cast	28	25	31	16	53	47	30.0
	Moller in-f'cast	12	14	55	13	28	71	37.0
	False Pass catch	21	33	36	6	54	46	
	Bristol Bay run	19	20	46	11	39	60	42.1
1992	ADF&G pre-f'cast	19	39	27	13	58	42	37.1
	Moller in-f'cast	8	35	31	22	43	53	45.0
	False Pass catch	6	35	25	30	42	58	
	Bristol Bay run	13	34	27	22	47	50	44.9
1993	ADF&G pre-f'cast	23	41	21	14	64	35	41.8
	Moller in-f'cast	7	27	19	44	34	65	42.0
	False Pass catch	14	46	14	23	61	38	
	Bristol Bay run	13	33	18	33	46	53	51.9
1994	ADF&G pre-f'cast	14	43	19	22	57	43	52.5
	Moller in-f'cast	7	42	20	28	50	50	46.0
	False Pass catch	8	34	33	22	42	57	
	Bristol Bay run	8	56	14	18	65	34	50.1
1995	ADF&G pre-f'cast	16	53	17	13	69	31	55.1
	Moller in-f'cast	14	51	15	19	65	34	49.2
	False Pass catch	19	57	12	11	76	24	
	Bristol Bay run	16	56	12	15	72	27	60.7
1996	ADF&G pre-f'cast	18	36	26	19	54	48	43.4
	Moller in-season	8	13	51	24	21	79	41.0
	False Pass catch	15	24	38	20	39	61	
	Bristol Bay run	10	13	51	24	23	76	36.9
1997	ADF&G pre-f'cast	22	31	25	20	53	47	33.6
	Moller in-season	9	26	33	27	36	62	35.0
	False Pass catch	19	44	23	11	64	36	
	Bristol Bay run	20	34	26	18	54	44	18.9
1998	ADF&G pre-f'cast	25	32	24	18	57	43	30.2
	Moller in-season	19	9	38	33	28	72	30.7
	False Pass catch	14	9	39	37	24	76	
	Bristol Bay run	34	13	29	22	47	52	18.2
Means	ADF&G pre-f'cast	22	37	26	15	58	42	35.1
	Moller in-season	14	28	31	23	43	56	38.9
	False Pass catch	17	36	26	19	53	46	
	Bristol Bay run	19	33	27	18	52	47	38.8

Age composition for Port Moller is for June 11-30 only, whereas the forecast is the one issued about July 2-3.
Forecasts and runs do not include jacks (1-ocean fish).

TABLE 4. Percent chums in chum and sockeye salmon catches and runs (in millions), 1997–98.

	Bristol Bay Run			Western Alaska run			South Peninsula June catch			Port Moller test boat CPUE		
Year	Sockeye	Chum	%C	Sockeye	Chum	%C	Sockeye	Chum	%C	Sockeye	Chum	%C
77	9.6	4.0	29.4	10.8	9.0	45.5	0.24	0.12	32.4	6.9	2.3	25.0
78	19.8	2.3	10.4	22.1	7.2	24.6	0.49	0.12	19.7	3.2	0.8	20.0
79	39.8	1.7	4.0	43.6	7.4	14.5	0.85	0.10	10.5	9.6	0.2	2.0
80	62.4	3.3	5.1	65.4	12.0	15.5	3.21	0.51	13.7	4.6	1.6	25.8
81	34.3	2.1	5.8	37.9	11.6	23.4	1.82	0.56	23.5	7.6	2.0	20.8
82	22.1	1.3	5.7	24.6	7.4	23.1	2.12	1.09	34.0	5.1	1.1	17.7
83	45.7	2.2	4.5	48.8	8.0	14.1	1.96	0.78	28.5	4.4	0.4	8.3
84	40.7	3.5	7.8	43.9	11.4	20.6	1.39	0.34	19.7	27.1	5.0	15.6
85	36.6	2.0	5.3	40.7	8.8	17.8	1.79	0.43	19.4	15.9	0.9	5.4
86	23.6	2.2	8.6	27.1	8.9	24.7	0.47	0.35	42.7			
87	27.3	2.9	9.5	29.7	8.0	21.2	0.79	0.44	35.8	11.1	0.8	6.7
88	23.2	2.5	9.8	26.0	10.8	29.3	0.76	0.53	41.1	7.0	1.1	13.6
89	43.9	2.2	4.9	46.8	9.0	16.1	1.75	0.46	20.8	18.9	1.0	5.0
90	47.8	1.8	3.6	51.6	6.2	10.7	1.35	0.52	27.8	23.4	1.3	5.3
91	42.2	2.1	4.7	46.3	7.6	14.1	1.55	0.77	33.2	17.5	1.6	8.4
92	45.0	1.5	3.2	49.9	6.2	11.1	2.46	0.43	14.7	24.4	1.7	6.4
93	52.1	1.1	2.1	57.2	3.9	6.4	2.97	0.53	15.1	30.3	1.4	4.5
94	50.3	1.5	2.9	54.7	7.5	12.1	1.46	0.58	28.4	23.3	1.6	6.2
95	60.7	1.4	2.3	65.5	10.6	13.9	2.11	0.54	20.4	30.0	0.8	2.6
96	37.0	1.2	3.1	40.1	8.6	17.7	1.03	0.36	25.9	22.5	1.6	6.4
97	18.9	0.6	2.9	22.1	4.9	18.1	1.63	0.32	16.2	20.8	3.2	13.3
98	18.4	0.9	4.7	20.6	4.7	18.6	1.29	0.25	16.2	13.8	1.7	11.0
Means 83-98	38.3	1.8	5.0	41.9	7.8	16.7	1.55	0.48	25.4	19.4	1.6	7.9

TABLE 5. Annual sockeye salmon runs (millions) to the eastern Bering Sea (Western Alaska), 1970–98.

	Kuskokwim		Bristol Bay runs					Bristol Bay	North Penin.	Total	South Peninsula June catch	
Year	Catch	Run	Togiak	Nushagak	Nak/Kvi	Egegik	Ugashik	Total	Run	Run	No.	%
70	.013	.03	.37	3.15	32.65	2.32	.91	39.40	.64	40.1	1.65	3.4
71	.006	.02	.42	2.61	9.37	1.94	1.48	15.82	.79	16.6	.46	2.3
72	.004	.01	.16	.91	2.85	1.39	.10	5.41	.37	5.8	.50	6.8
73	.005	.01	.21	.85	.79	.55	.04	2.44	.35	2.8	.25	7.0
74	.028	.07	.25	2.78	6.43	1.45	.06	10.97	.58	11.6	.00	0.0
75	.018	.05	.38	2.92	18.35	2.14	.44	24.23	.75	25.0	.24	0.8
76	.014	.04	.50	2.75	5.92	1.84	.53	11.54	1.17	12.7	.31	2.0
77	.019	.05	.42	1.84	4.69	2.47	.29	9.71	1.01	10.8	.24	1.9
78	.014	.04	.79	6.62	10.32	2.10	.09	19.92	2.11	22.1	.49	1.9
79	.039	.10	.69	6.40	27.43	3.29	2.10	39.91	3.55	43.6	.85	1.6
80	.043	.11	1.21	12.81	40.57	3.68	4.22	62.49	2.78	65.4	3.21	4.0
81	.106	.27	1.01	10.34	14.63	5.06	3.44	34.48	3.19	37.9	1.82	3.9
82	.096	.24	.94	7.93	7.54	3.48	2.32	22.21	2.15	24.6	2.12	6.8
83	.089	.22	.83	7.07	26.11	7.55	4.35	45.91	2.67	48.8	1.96	3.3
84	.081	.20	.52	3.81	26.50	6.36	3.93	41.12	2.56	43.9	1.39	2.6
85	.121	.30	.40	2.99	17.36	8.63	7.48	36.86	3.50	40.7	1.79	3.6
86	.142	.36	.58	4.85	6.28	6.01	6.02	23.74	3.04	27.1	.47	1.5
87	.171	.43	.66	5.15	12.27	6.63	2.82	27.53	1.77	29.7	.79	2.2
88	.150	.38	1.16	3.23	8.85	8.01	2.19	23.44	2.14	26.0	.76	2.4
89	.080	.20	.21	5.05	23.56	10.31	4.90	44.03	2.53	46.8	1.74	3.1
90	.204	.41	.52	5.71	26.36	12.28	2.89	47.76	3.45	51.6	1.35	2.2
91	.202	.40	.80	7.69	18.64	9.59	5.50	42.22	3.71	46.3	1.55	2.8
92	.194	.39	.80	5.19	15.89	17.62	5.53	45.03	4.44	49.9	2.46	4.0
93	.167	.33	.70	7.62	14.78	23.34	5.67	52.11	4.87	57.3	2.97	4.2
94	.191	.38	.50	5.86	25.83	12.70	5.45	50.34	3.96	54.7	1.46	2.2
95	.198	.40	.73	6.69	31.78	15.73	5.81	60.74	4.35	65.5	2.11	2.7
96	.120	.24	.67	8.30	11.02	11.92	5.10	37.01	2.88	40.1	1.03	2.1
97	.123	.25	.24	4.64	3.36	8.67	1.99	18.90	2.97	22.1	1.63	5.9
98	.129	.26	.36	5.40	6.30	4.67	1.62	18.35	1.98	20.59	1.29	5.1
Means												
70-79		.04	.42	3.08	11.88	1.95	.60	17.94	1.13	19.1	.50	2.8
80-89		.27	.75	6.32	18.37	6.57	4.17	36.18	2.63	39.1	1.61	3.3
90-98		.34	.59	6.34	17.11	12.95	4.40	41.38	3.62	45.3	1.76	3.5

Kuskokwim run estimated by catch/ 0.4 (1970-89) and catch/0.5 (1990-98).
South Peninsula percent= (SP catch*.85)/ (SP catch*.85+ WA total)*100.

TABLE 6. North Pacific runs (catch plus escapement; millions of fish) of sockeye salmon, 1970–98.

Year	Bristol Bay run	Alaska runs		Japan high seas Catch	Russian run	North Pacific total run	SE Alaska BC and Wash.	Total Pacific run	Percent Western Alaska
		Western	Central						
70	39	42	7	10	3	62	9	71	59
71	16	17	6	7	2	32	12	44	39
72	5	6	5	7	1	19	8	27	22
73	2	3	4	6	1	14	15	29	10
74	11	12	4	5	1	22	14	36	33
75	24	25	3	5	2	35	7	42	60
76	12	13	7	6	1	27	10	37	35
77	10	11	10	3	3	27	13	40	28
78	20	22	9	3	4	38	14	52	42
79	40	44	7	3	3	57	12	69	64
80	62	68	8	3	4	83	7	90	76
81	34	40	10	3	4	57	15	72	56
82	22	26	14	3	3	46	20	66	39
83	46	51	15	2	5	73	10	83	61
84	41	45	14	2	7	68	11	79	57
85	37	42	15	1	8	66	23	89	47
86	24	27	17	1	6	51	18	69	39
87	27	30	22	1	8	61	11	72	42
88	23	27	17	<1	5	49	10	59	46
89	44	48	17	<1	6	71	24	95	51
90	48	53	18	<1	12	83	24	107	50
91	42	48	19	<1	8	75	20	95	51
92	45	52	23	0	10	85	18	103	50
93	52	60	19	0	10	89	29	118	51
94	50	56	16	0	8	80	20	100	56
95	61	67	17	0	10	94	12	106	63
96	37	41	20	0	13	74	15	89	46
97	19	24	18	0	9	51	22	73	33
98	18	22	14	0	9	45	7	52	42
Means									
70-79	18	20	6	6	2	33	11	45	39
80-89	36	40	15	2	6	63	15	77	51
90-98	41	47	18	0	10	75	19	94	49

Western Alaska includes Bristol Bay, North Peninsula and 85% of South Peninsula catch.
Japan high seas catches since1992 are included in Russian run.

TABLE 7. Estimated runs of chum salmon (catch plus escapement; millions of fish) to the eastern Bering Sea, 1970–98.

Year	Kotz-ebue	Norton Sound	Yukon River		Arctic/ Yukon Region	Kusko-kwim	Bristol Bay						North Alaska Penins.	S.P. June catch	Total run
			Summer	Fall			Togiak	Nush-agak	Naknek/ Kvichak	Egegik	Ugashik	Total			
70	.60	.75	.92	.82	3.09	.60	.22	1.14	.22	.07	.09	1.74	.22	.44	6.0
71	.37	.44	.82	.80	2.43	.42	.24	.75	.24	.04	.02	1.29	.17	.51	4.7
72	.50	.30	.74	.59	2.13	.43	.38	.74	.30	.07	.06	1.55	.21	.52	4.7
73	.55	.35	1.36	.90	3.16	.69	.44	1.06	.59	.06	.07	2.22	.28	.20	6.5
74	1.27	.37	1.45	.99	4.08	.92	.14	.89	.51	.03	.07	1.64	.14	.00	6.8
75	.97	.44	2.87	1.78	6.06	.78	.18	.68	.47	.01	.07	1.41	.12	.10	8.4
76	.34	.19	1.82	.74	3.09	.90	.25	1.74	.74	.07	.03	2.83	.37	.41	7.5
77	.30	.44	1.49	.97	3.20	.97	.52	2.65	.74	.12	.01	4.04	.81	.12	9.1
78	.27	.47	2.04	.87	3.65	.79	.47	1.38	.37	.08	.01	2.31	.47	.12	7.3
79	.23	.27	1.71	1.63	3.84	1.57	.33	.85	.36	.06	.06	1.66	.37	.10	7.5
80	.92	.44	2.44	.98	4.78	2.45	.57	1.94	.55	.11	.17	3.34	1.47	.51	12.4
81	1.10	.48	3.79	1.28	6.65	1.62	.36	1.11	.47	.10	.06	2.10	1.24	.56	12.0
82	.61	.40	2.13	.76	3.90	1.38	.23	.57	.30	.12	.11	1.33	.79	1.10	8.2
83	.53	.62	2.14	1.05	4.34	.79	.45	1.01	.42	.14	.14	2.16	.74	.79	8.6
84	.57	.54	2.88	.86	4.85	1.31	.55	1.63	.81	.22	.31	3.52	1.67	.34	11.6
85	.70	.35	2.85	1.15	5.05	.74	.38	.91	.45	.15	.15	2.04	1.01	.43	9.2
86	.68	.34	3.41	.90	5.33	.89	.51	.88	.57	.12	.13	2.21	.51	.35	9.2
87	**.18**	**.25**	**1.72**	**1.00**	**3.15**	**1.02**	**.81**	**.67**	**1.09**	**.18**	**.13**	**2.88**	**.88**	**.44**	8.3
88	.57	.20	3.59	.75	5.11	2.24	.66	.70	.74	.30	.14	2.54	.89	.53	11.2
89	.46	.21	3.23	1.14	5.04	1.34	.49	.93	.53	.16	.13	2.24	.37	.46	9.3
90	.31	.20	1.56	.90	2.97	1.00	.22	.71	.65	.16	.04	1.78	.35	.52	6.5
91	.56	.28	2.00	1.02	3.86	1.17	.38	.75	.77	.10	.10	2.10	.49	.77	8.2
92	.44	.19	1.92	.63	3.18	.79	.23	.62	.38	.13	.09	1.45	.69	.43	6.4
93	.25	.26	1.19	.38	2.08	.26	.22	.63	.07	.05	.09	1.06	.54	.53	4.3
94	.33	.28	2.68	1.01	4.30	1.23	.35	.67	.32	.07	.06	1.47	.56	.58	8.0
95	.88	.38	3.66	1.54	6.46	1.82	.31	.58	.37	.07	.08	1.41	.86	.54	11.0
96	1.27	.29	2.79	1.23	5.58	.96	.30	.55	.17	.09	.12	1.23	.89	.36	8.9
97	.40	.28	1.68	.89	3.25	.55	.11	.32	.05	.06	.02	.56	.49	.32	5.1
98	.32	.35	1.10	.42	2.19	.79	.18	.54	.12	.03	.02	.89	.80	.25	4.9
Means															
70-79	.54	.40	1.52	1.01	3.47	.81	.32	1.19	.45	.06	.05	2.07	.32	.25	6.9
80-89	.63	.38	2.82	.99	4.82	1.38	.50	1.04	.59	.16	.15	2.44	.96	.55	10.0
90-98	.53	.28	2.06	.89	3.76	.95	.26	.60	.32	.08	.07	1.33	.63	.48	7.0

Total run includes 75% of South Peninsula June catch.

TABLE 8. North Pacific runs (catch plus escapement; millions of fish) of chum salmon, 1970–98.

Year	Bristol Bay run	Alaska runs Western	Alaska runs Central	Japan catch High seas	Japan catch Coastal	Russian run (catch/.5)	North Pacific total run	SE Alaska B.C. and Wash.	Total Pacific run	Percent Asia
70	1.7	6.0	5.2	17	7	7	43	11	54	59
71	1.3	4.7	6.6	17	10	7	45	7	52	65
72	1.6	4.7	4.5	22	9	4	45	17	62	57
73	2.2	6.5	3.5	16	12	3	41	15	56	56
74	1.6	6.8	1.9	22	13	5	48	10	58	68
75	1.4	8.4	2.1	19	20	4	54	5	59	74
76	2.8	7.5	3.4	22	12	8	53	9	62	68
77	4.0	9.1	5.9	12	15	9	51	5	56	64
78	2.3	7.3	4.3	7	18	11	47	9	56	63
79	1.7	7.5	4.0	6	28	12	58	4	62	75
80	3.3	12.4	5.1	6	26	7	57	11	68	58
81	2.1	12.0	8.3	6	34	9	70	6	76	65
82	1.3	8.2	8.9	7	30	7	61	9	70	63
83	2.2	8.6	7.0	6	37	12	71	6	77	72
84	3.5	11.6	6.5	6	38	7	70	13	83	62
85	2.0	9.2	5.5	4	51	12	82	17	99	68
86	2.2	9.2	8.1	3	49	14	83	17	100	66
87	2.9	8.3	6.2	3	43	13	73	12	85	69
88	2.5	11.2	8.7	2	51	13	86	20	106	62
89	2.2	9.3	4.9	1	55	13	83	9	92	74
90	1.8	6.5	4.6	1	68	13	94	13	107	77
91	2.1	8.2	5.2	1	60	10	84	11	95	74
92	1.5	6.4	4.4	0	46	17	73	16	89	70
93	1.1	4.3	3.8	0	61	21	90	21	111	74
94	1.5	8.0	6.0	0	69	26	109	21	130	73
95	1.4	11.0	6.5	0	78	24	120	20	140	73
96	1.2	8.9	6.0	0	87	25	127	30	157	71
97	0.6	5.1	5.6	0	74	18	103	18	121	76
98	0.9	4.9	4.1	0	*60*	*15*	84	*20*	104	72
Means										
70-79	2.1	6.9	4.1 #	16	14	7	48	9	58	65
80-89	2.4	10.0	6.9	4	41	11	74	12	86	66
90-97	1.4	7.3	5.3 #	0	68	19	100	19	119	74

Western AWestern Alaska includes Bristol Bay, North Peninsula, Yukon-Kuskokwim regions and 75% of June catchJune catch south of the Alaska Peninsula.
Japan highJapan high seas catches since 1992 included in Russian runs.
Japan coa Japan coastal catch includes in-river catch (hatchery returns).

TABLE 9. Summary of age, length, and weight for chum salmon in the False Pass catches.

			Sex/age percent							Mean length (mm)							Mean weight (kg)						
Location	Sex	Age	92	93	94	95	96	97	98	92	93	94	95	96	97	98	92	93	94	95	96	97	98*
South Unimak	Male	0.2	0.4	1.0	0.4	1.6	0.1	0.5	0.6	491	488	498	538	548	484	523	1.75	1.41	1.88	2.61	2.68	1.74	2.30
		0.3	26.9	31.4	23.6	21.2	26.4	25.2	28.2	550	557	568	580	588	571	591	3.00	2.55	3.14	3.32	3.62	3.03	3.59
		0.4	21.8	17.0	26.7	18.5	15.0	15.9	9.0	579	591	589	602	619	604	611	3.62	3.14	3.50	3.76	4.19	3.59	3.94
		0.5	0.1	0.6	2.0	2.0	0.5	0.7	0.4	628	599	611	619	634	618	634	4.42	3.16	3.85	4.07	4.52	3.84	4.50
		0.6			0.1		0.1	0.2				652		651	686				4.90		5.49	5.72	
	Female	0.2	0.1	1.2	0.3	1.2	0.1	1.0	0.5	514	514	507	517	525	468	542	2.30	1.82	2.02	2.18	2.54	1.36	2.65
		0.3	29.7	35.4	26.8	30.6	40.0	34.1	48.8	543	545	546	556	567	558	564	2.83	2.35	2.59	2.77	3.02	2.65	2.99
		0.4	20.8	13.3	19.2	23.9	16.0	21.6	11.9	568	574	563	581	594	589	586	3.23	2.84	2.84	3.19	3.52	3.20	3.34
		0.5	0.2	0.1	0.9	1.0	1.7	0.8	0.6	573	582	587	615	610	627	602	3.58	2.90	3.13	3.93	3.93	3.56	3.60
		0.6					0.1							629	644						4.17	3.67	
	Comb.	0.2	0.5	2.2	0.7	2.8	0.2	1.5	1.5	496	502	502	529	536	473	531	1.86	1.63	1.94	2.43	2.61	1.49	2.46
		0.3	56.6	66.8	50.4	51.8	66.4	59.3	77.0	546	551	556	566	575	564	574	2.91	2.44	2.85	3.00	3.26	2.81	3.21
		0.4	42.6	30.3	45.9	42.4	31.0	37.5	20.9	574	584	578	590	606	595	597	3.43	3.01	3.22	3.44	3.84	3.37	3.60
		0.5	0.3	0.7	2.9	3.0	2.2	1.5	1.5	591	597	604	618	615	623	615	3.86	3.12	3.63	4.02	4.05	3.70	3.96
		0.6			0.1		0.2	0.2				652		644	665				4.90		5.05	4.70	
Shum-agin	Male	0.2	0.0	0.7	0.3	1.0	0.0	0.0	2.2		519	567	561			563		1.99	3.09	3.13			3.04
		0.3	23.7	27.6	27.1	22.6	24.7	16.9	37.1	547	554	575	588	600	575	594	2.74	2.49	3.29	3.54	3.90	3.15	3.65
		0.4	21.6	20.7	28.8	23.4	20.2	19.3	6.7	589	586	589	604	637	615	632	3.47	2.88	3.52	3.84	4.63	3.96	4.42
		0.5	0.2	1.0	1.2	2.0	1.6	1.6	1.1	651	632	618	610	635	645	712	5.44	3.47	4.12	4.07	4.56	4.46	6.72
		0.6					0.1							658							4.22		
	Female	0.2	0.0	0.1	0.1	0.6	0.0	0.5	0.0		534	532	527		530			2.31	2.59	2.36		2.63	
		0.3	32.0	33.2	21.2	28.4	31.9	34.0	41.6	543	547	550	563	577	573	571	2.62	2.31	2.71	2.92	3.20	2.96	3.13
		0.4	21.7	15.4	20.5	20.1	18.3	25.1	10.1	574	577	572	587	616	595	598	3.11	2.79	3.04	3.38	4.00	3.39	3.62
		0.5	0.8	1.3	0.8	1.7	3.0	2.6	1.1	609	662	595	604	630	618	678	3.39	4.25	3.33	3.68	4.35	3.96	5.75
		0.6				0.2	0.2						595	664						4.08	5.53		
	Comb.	0.2	0.0	0.8	0.4	1.6	0.0	0.5	2.2		521	558	548		530	563		2.03	2.97	2.84		2.63	3.04
		0.3	55.7	60.8	48.3	50.0	56.6	49.9	78.7	545	550	564	586	587	574	582	2.67	2.39	3.04	3.26	3.51	3.02	3.38
		0.4	43.3	36.1	49.3	43.5	38.5	44.4	16.8	581	582	582	596	627	604	612	3.29	2.84	3.32	3.63	4.33	3.64	3.94
		0.5	1.0	2.3	2.0	3.7	4.6	4.2	2.2	617	649	609	607	632	628	695	3.80	3.91	3.80	3.89	4.42	4.15	6.23
		0.6				0.2	0.3						595	662						4.08	5.09		

* Mean weights calculated from mean lenghts and weight on length regressions for 1994-97 data.

TABLE 10. Age composition, mean length (mm), and weight (kg) of chum salmon from Nushagak catches.

	age 0.2			age 0.3			age 0.4			0.5	Number (millions)		
											Chum salmon		Sockeye
Year	%	Length	Weight	%	Length	Weight	%	Length	Weight	%	catch	run	run
66	10.5		1.81	75.5		3.88	14.0		4.07	0.0	.13	.31	2.80
67	3.6	534	2.39	89.2	574	2.97	7.2	590	3.29	0.0	.34	.79	1.53
68	6.9	552	2.83	65.9	584	3.17	27.1	597	3.32	0.1	.18	.43	1.68
69	21.3	529	2.31	73.9	564	2.82	4.8	594	3.38	0.0	.21	.54	1.99
70	1.1	531	3.33	96.5	568	2.95	2.4	610	3.60	0.0	.44	1.14	3.15
71	5.5	542	2.28	68.5	570	2.91	26.0	585	3.15	0.0	.36	.84	2.61
72	8.2	551	2.72	67.9	579	3.09	23.5	590	3.14	0.4	.31	.74	0.91
73	0.2			71.6	575	3.08	26.7	592	3.39	1.5	.34	1.10	0.85
74	16.3	533	2.36	42.4	576	3.11	39.6	594	3.25	1.7	.16	.89	2.78
75	24.3	530	2.37	73.9	563	2.93	1.7	585	2.88	0.1	.15	.68	2.92
76	9.3	542	2.45	84.1	580	3.02	6.6	601	3.30	0.0	.80	1.74	2.75
77	3.1	553	2.52	93.3	583	3.26	3.6	596	3.53	0.0	.90	2.65	1.84
78	2.3	541	2.55	40.6	587	3.23	57.1	617	3.95	0.0	.65	1.38	6.62
79	6.7	532	2.33	62.8	568	2.93	29.9	599	3.33	0.6	.44	.85	6.40
80	0.9	523	2.29	98.3	558	2.94	0.8	588	3.01	0.0	.68	1.94	12.81
81	0.3			61.0	566	2.95	38.7	596	3.58	0.0	.80	1.11	10.34
82	1.3			44.2	572		53.5	576		1.0	.44	.57	7.93
83	2.0	535		34.5	571	3.18	61.5	585	3.45	2.0	.72	1.00	7.07
84	1.6	528		87.2	562	3.07	10.0	584	4.06	1.2	.85	1.57	3.81
85	32.7	572	2.92	54.4	573	3.19	12.4	571	2.96	0.5	.40	.91	2.99
86	0.3			85.2	558	2.93	14.5	574	3.39	0.0	.49	.88	4.85
87	0.0			40.2	560	3.02	57.3	582	3.37	2.5	.42	.67	5.15
88	6.9	535	2.65	62.3	566	3.07	30.0	580	3.40	0.8	.37	.70	3.23
89	0.4			82.0	557	2.82	17.3	577	3.35	0.3	.52	.93	5.05
90	0.5			78.8	553	2.87	20.2	587	3.47	0.5	.38	.71	5.71
91	2.3	526	2.47	67.4	548	2.71	30.3	573	3.18	0.0	.46	.75	7.69
92	0.2	479		55.2	549	2.80	44.1	565	2.97	0.4	.31	.62	5.19
93	0.2	502		42.6	545	2.61	53.6	570	2.94	3.6	.41	.63	7.62
94*	0.4	512		51.2	553	2.81	47.0	562	2.83	1.5	.29	.67	5.86
95	7.1	533	2.44	52.7	552	2.75	36.6	568	3.06	3.6	.36	.58	6.70
96	0.2	545		77.2	566	3.17	21.8	592	3.63	0.8	.32	.55	8.30
97	0.7	510		69.5	556	2.83	29.3	574	3.05	0.5	.18	.24	4.63
98	1.2	541		86.0	569	2.90	12.1	590	3.40	0.6	.24	.54	5.40
Means													
70-95	5.2	532	2.55 #	65.3	565	2.97	28.7	585	3.30	0.9	.48	1.01	5.11

Sources: Yuen and Nelson (1984), annual ADF&G reports on Bristol Bay salmon; e.g. Stratton and Crawford (1994); and B. Cross (ADF&G) for 1993-9
*About 55% of catch made with king salmon gear. AWL statistics are for sockeye gear (7/1-21).

TABLE 11. Frequencies of focal scale resorption (holes) on chum salmon scales from the 1998 False Pass fisheries.

Location	Date	Number of normal scales (2)	Number with holes: one scale	Number with holes: both scales	Percent with holes (1 or 2)	Number with questionable holes (1 or 2)	Percent with holes including questionable	Number of normal scales (1)	Number with holes	Percent with holes	Number with question.	Percent including question.
Unimak	6/15	130	1	0	0.76	0	0.76	28	0	0.00	0	0.00
	6/16	215	1	0	0.46	1	0.92	40	1	2.43	0	2.43
	6/17	162	0	1	0.61	1	1.21	30	0	0.00	1	3.23
	6/18	123	1	0	0.81	1	1.60	13	0	0.00	0	0.00
	6/19	60	0	1	1.64	1	3.22	15	0	0.00	0	0.00
	6/20	225	2	0	0.88	1	1.32	8	0	0.00	0	0.00
	6/21	80	0	1	1.23	0	1.23	7	0	0.00	0	0.00
	6/22	53	0	0	0.00	1	1.85	3	0	0.00	0	0.00
	6/23	157	1	0	0.63	1	1.26	34	0	0.00	0	0.00
	6/24	115	0	0	0.00	0	0.00	30	0	0.00	0	0.00
	Totals	1320	6	3	0.68	7	1.20	208	1	0.48	1	0.95
Shumagin Is.	6/22	74	0	0	0.00	0	0.00	13	0	0.00	0	0.00
	Totals	74	0	0	0.00	0	0.00	13	0	0.00	0	0.00
False Pass	Combined	1394	6	3	0.64	7	1.13	221	1	0.45	1	0.90

TABLE 12. Timing of Bristol Bay sockeye salmon runs and between Bristol Bay and Port Moller.

	Mean date of run (July)				Mean date	Days P.M. to	P.M. mean temp. (C)
Year	Egegik	Nak/Kvi	Nush.	Wt'd mean	at P.M.*	B.B.	6/11 to 7/5
85	2.1	3.0	4.3	2.9	27.1	5.8	5.8
86	6.6	6.4	8.3	7.0			
87	3.4	5.5	4.3	4.7	25.5	9.2	5.7
88	1.5	2.0	5.1	2.3	26.8	5.5	7.5
89	3.4	1.4	3.0	2.1	27.0	5.1	6.3
90	6.0	5.0	6.4	5.5	28.0	7.5	7.3
91	4.1	3.6	5.4	4.1	25.8	8.3	5.3
92	5.4	5.0	6.0	5.3	26.7	8.6	7.6
93	0.3	0.6	1.4	0.6	25.3	5.3	7.7
94	6.4	7.0	8.0	7.0	28.0	9.0	6.6
95	4.4	5.0	4.0	4.7	26.3	8.4	7.3
96	1.4	3.6	3.6	2.8	25.9	6.9	6.1
97	2.6	4.4	5.4	3.7	27.1	6.6	9.5
98	4.4	7.8	6.0	6.2	28.2	8.0	7.7
Means 1987-96	3.6	3.9	4.7	3.9	26.5	7.4	6.7

* Date in June of 50% of index through July 5.

TABLE 13. Estimates of the daily passage of sockeye salmon off Port Moller, 1987–98.

		Daily passage 0-70mi off coast (millions)											
Date		87	88	89	90	91	92	93	94	95	96	97	98
June	11	.08	.07	.26	.07	.05	.26	.22	.04	.10	.15	.09	.05
	12	.07	.12	.33	.03	.04	.12	.19	.07	.12	.20	.11	.02
	13	.08	.19	.48	.05	.07	.21	.29	.09	.36	.20	.11	.04
	14	.11	.30	.59	.10	.12	.34	.58	.10	.61	.21	.13	.08
	15	.11	.45	.83	.10	.18	.64	1.09	.07	.91	.18	.19	.17
	16	.19	.56	.97	.12	.30	.68	1.50	.10	.87	.34	.34	.17
	17	.39	.69	.97	.17	.50	.92	1.31	.09	1.40	.65	.46	.24
	18	.72	.74	1.29	.36	.74	.69	1.33	.26	1.99	.90	.50	.17
	19	.89	.73	1.53	.72	1.01	.97	1.53	.74	2.49	1.18	.36	.28
	20	1.16	.82	1.98	1.00	1.28	.98	2.12	1.42	2.44	1.37	.49	.31
	21	1.08	.94	2.72	1.44	1.72	1.50	2.46	1.76	2.29	1.82	.58	.45
	22	.99	.93	2.87	1.99	2.08	1.72	2.69	2.15	2.75	2.22	.81	.75
	23	1.28	1.07	2.92	1.87	2.36	2.00	2.84	2.77	2.96	2.79	.79	1.08
	24	1.51	1.30	2.62	1.95	2.54	1.94	3.02	2.88	3.09	2.92	1.03	1.21
	25	1.97	1.72	2.79	2.61	2.64	2.25	3.57	2.89	3.14	2.69	1.07	1.13
	26	1.62	1.45	2.71	3.55	2.97	2.93	4.03	2.95	3.42	2.02	1.27	1.02
	27	1.63	1.19	2.19	4.06	2.82	3.34	4.08	3.48	3.68	1.92	1.35	1.27
	28	1.35	1.00	1.93	3.32	2.66	3.17	3.51	3.97	3.16	2.05	1.46	1.29
	29	1.19	.97	1.94	3.28	2.19	2.51	2.86	3.48	2.80	2.18	1.27	1.31
	30	1.06	.98	1.54	2.78	2.15	2.47	2.47	3.38	2.54	2.10	1.10	1.15
July	1	.91	.81	1.24	2.87	2.13	2.42	2.22	2.62	2.59	1.67	.92	.94
	2	1.00	.76	1.02	2.07	2.14	2.54	1.97	2.17	2.56	1.39	.89	.73
	3	1.15	.71	1.18	2.36	1.99	2.16	1.60	1.59	2.39	1.02	.63	.64
	4	1.29	.66	1.37	1.75	1.73	1.76	1.20	1.51	2.13	.89	.55	.72
	5	1.31	.70	1.37	1.84	1.39	1.35	.83	1.60	1.94	.81	.46	.73
	6	1.11	.59	1.14	1.28	.99	1.13	.59	1.57	1.84	.66	.46	.56
	7	.86	.68	.84	1.38	.73	1.08	.44	1.51	1.65	.54	.36	.50
	8	.65	.58	.52	1.16	.58	.94	.34	1.31	1.27	.42	.26	.40
	9	.42	.55	.48	.99	.56	.73	.25	1.03	.85	.35	.22	.32
	10	.38	.35	.38	.67	.48	.49	.18	.64	.75	.32	.17	.18
	11	.22	.27	.34	.58	.35	.24	.14	.45	.61	.25	.13	.13
	12	.17	.17	.25	.41	.21	.16	.11	.40	.45	.15	.09	.10
	13	.13	.11	.14	.28	.13	.10	.09	.35	.24	.07	.04	.07
	14	.12	.08	.07	.17	.10	.07	.08	.24	.07	.04	.04	.05
	15 +	.29	.18	.21	.34	.38	.16	.18	.39	.23	.21	.20	.08
Totals		27	23	44	48	42	45	52	50	61	37	19	18

TABLE 14. Age compositions of sockeye salmon from North Peninsula rivers in July, 1994–98.

		1-ocean			2-ocean				3-ocean			4-ocean			Escape.
Year	River	1.1	2.1	3.1	0.2	1.2	2.2	3.2	0.3	1.3	2.3	0.4	1.4	2.4	1,000s
94	Ilnik					.083			.350	.317	.033	.017	.117	.083	75
	Sandy	.017	.002		.001	.899	.019		.001	.060	.001		.001		115
	Bear (early)	.006	.060			.012	.477			.057	.366		.002	.020	262
	Nelson		.047			.020	.843	.005		.010	.069		.004	.001	325
	Combined	.005	.040		.000	.153	.516	.002	.034	.063	.156	.002	.014	.015	777
95	Ilnik				.022	.129	.010		.125	.650	.037	.015	.012		38
	Sandy	.033			.006	.320	.030			.603	.007				124
	Bear (early)	.000	.112			.027	.424			.006	.416		.006	.009	221
	Nelson	.001	.086		.001	.013	.826	.002		.014	.056			.002	338
	Combined	.006	.075		.003	.076	.523	.001	.007	.146	.157	.001	.002	.004	721
96	Ilnik				.006	.033	.006		.676	.259		.013	.007		62
	Sandy	.008	.001		.012	.521			.077	.372	.005		.003		64
	Bear (early)	.002	.142			.046	.576			.032	.197			.005	247
	Nelson	.002	.065		.001	.139	.651	.005	.001	.054	.082				250
	Combined	.002	.082		.002	.131	.490	.002	.076	.098	.112	.001	.001	.002	623
97	Ilnik	.043			.048	.034	.001		.217	.403	.006	.234	.014		82
	Sandy	.099	.001		.017	.572	.005		.042	.260	.002		.001	.001	38
	Bear (early)	.006	.170			.056	.484	.001		.034	.249				215
	Nelson	.005	.023			.115	.617		.001	.107	.128	.001	.001		183
	Combined	.018	.079		.009	.111	.419	.000	.038	.135	.150	.037	.003	.000	518
98	Ilnik	.002	.000		.042	.432	.000		.270	.242	.001	.009	.001		50
	Sandy	.064	.000		.034	.530	.003		.036	.333	.000				52
	Bear (early)	.006	.152			.064	.368		.000	.056	.354				225
	Nelson	.007	.158			.126	.370		.001	.123	.215				160
	Combined	.012	.122		.008	.172	.292		.032	.127	.234	.001	.000		487

Source: P. Nelson, C. Hicks,and R Murphy ADF&G Kodiak

TABLE 15. Age compositions in the Northern District by week, 1998.

Section	Week ending	2-ocean				3-ocean				4-ocean			Catch
		0.2	1.2	2.2	3.2	0.3	1.3	2.3	3.3	0.4	1.4	2.4	1,000s
Nelson Lagoon													
June	13		.063	.107		.001	.825	.093			.000		3
	20		.048	.007		.008	.845	.092			.001		12
	27		.060	.030		.008	.692	.204			.005		41
July	4		.096	.054		.001	.543	.304			.002		28
	11	.001	.207	.123		.010	.358	.302			.000		33
	18	.006	.366	.109		.021	.332	.166			.000		15
	25	.011	.528	.079		.024	.304	.056			.000		9
Aug.	1	.017	.619	.044		.018	.266	.036			.000		8
	8	.008	.677	.027		.010	.253	.024			.000		6
	15	.000	.637	.019		.002	.327	.012			.000		4
	22	.000	.637	.019		.002	.327	.012			.000		2
	29	.000	.637	.019		.002	.327	.012			.000		1
Total number		0	36	10	0	2	81	32	0	0	0	0	161
Proportion		.003	.222	.063	.000 #	.010	.505	.197	.000 #	.000	.002	.000	
Harbor Point to Stoganof Point													
June	27	.002	.044	.137	.001	.024	.245	.545	.001	.000	.001		4
July	4	.002	.045	.156	.001	.023	.248	.524	.001	.000	.001		79
	11	.003	.068	.259	.001	.014	.272	.380	.001	.000	.000		192
	18	.012	.132	.257	.001	.015	.269	.311	.001	.000	.000		203
	25	.017	.218	.330	.001	.014	.206	.210	.001	.001	.001		56
Aug.	1	.003	.196	.523	.000	.006	.095	.175	.000	.000	.000		2
	8	.000	.185	.565	.000	.004	.075	.169	.000	.000	.000		56
	15												0
	22	.000	.040	.815	.000	.001	.014	.130	.000	.000	.000		68
	29	.000	.023	.858	.001	.000	.005	.111	.000	.000	.000		73
Sept.	8	.000	.022	.861	.001	.000	.004	.110	.000	.000	.000		87
Total number		4	73	359	1	9	145	228	1 0	0	0	0	819
Proportion		.005	.089	.438	.001	.011	.177	.278	.001	.000	.000	.000	

Source: C. Hicks, ADF&G Kodiak

TABLE 16. Comparison of age compositions, 1994–98.

		Age composition				
Year	Location	1.2	2.2	1.3	2.3	Other
94	BB catch	.054	.534	.155	.225	.032
	Ugashik c	.046	.392	.077	.459	.026
	Ugashik e	.127	.660	.031	.161	.021
	PM catch	.059	.433	.206	.272	.030
	NP catch	.040	.154	.208	.546	.052
	NP escape.	.322	.141	.124	.280	.133
95	BB catch	.153	.548	.123	.163	.013
	Ugashik c	.291	.404	.112	.186	.007
	Ugashik e	.479	.314	.126	.075	.006
	PM catch	.142	.496	.151	.202	.009
	NP catch	.109	.250	.241	.375	.025
	NP escape.	.172	.203	.347	.245	.033
96	BB catch	.088	.127	.514	.248	.023
	Ugashik c	.028	.118	.586	.257	.011
	Ugashik e	.084	.073	.747	.074	.022
	PM catch	.075	.117	.522	.255	.031
	NP catch	.034	.204	.391	.317	.054
	NP escape.	.142	.403	.149	.148	.158
97	BB catch	.135	.372	.247	.212	.034
	Ugashik c	.084	.437	.291	.176	.012
	Ugashik e	.194	.452	.227	.097	.030
	PM catch	.122	.265	.321	.248	.044
	NP catch	.050	.301	.197	.386	.066
	NP escape.	.135	.385	.185	.200	.095
98	BB catch	.272	.119	.297	.299	.013
	Ugashik c	.076	.104	.182	.634	.004
	Ugashik e	.298	.171	.210	.313	.008
	PM catch	.175	.095	.367	.347	.016
	NP catch	.061	.228	.265	.424	.022
	NP escape	.221	.288	.146	.277	.068

BB= Bristol Bay, PM=Port Moller, NP= North Peninsula
NP catch for Bear River and Ilnik/Three Hills sections through July 11.
NP escapement for Ilnik, Sandy, and Bear River (early run).
Escapement age composition excludes jacks (1-ocean fish)