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RECENT VARIATION IN THE CATCHES OF CHIGNIK SOCKEYE SALMON

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ACKNOWLEDGMENTS

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KEY WORDS

Chignik lake system, escapement, sockeye salmon, variation

INTRODUCTION

The Chignik lake system on the Alaska Peninsula has historically been the most productive sockeye salmon (*Oncorhynchus nerka*) system (on a surface area basis) in southwestern Alaska (Burgner et al. 1969). From the beginning of commercial fishing in the late 1800s until 1950, the annual catches in the Chignik fishery usually ranged between 0.5 and 1.5 million fish. The 1950s and 60s were periods of low production with annual catches averaging under 500,000; however, catches increased during the 1970s, and the 1980s brought some all-time record catches. The most recent (1991–95) annual catches have dropped off somewhat, averaging ~1.5 million. This would seem to be a success story for Chignik fishermen if it were not for the fact that salmon catches in all major fisheries in southwestern Alaska have increased since the 1970s and most of these increases appear much greater than the increase in the Chignik fishery (Figs. 1-3).

The purpose of this report is to document the recent variation in catches of Chignik sockeye salmon relative to catches in other sockeye salmon fisheries and examine possible causes for recent changes. We examine whether changes in the catches of Chignik sockeye salmon in other fisheries (interceptions) and/or the productivity (return per spawner) of the two Chignik stocks has affected the recent catches in the Chignik fishery.

METHODS

Historical Chignik catch and escapements were taken from Dahlberg (1979), whereas more recent Chignik statistics and those for other sockeye salmon systems were obtained from various Alaska Department of Fish and Game (ADFG) reports (e.g., Quimby and Owen [1994], McCullough et al. [1994, 1995]), and from brood tables provided by the Anchorage and Kodiak offices of ADFG.

Estimates of the annual interceptions of Chignik sockeye salmon in the Cape Igvak and Stepovak (Southeast Mainland) salmon fisheries were provided in ADFG reports; however, estimates of interceptions in the False Pass fishery (South Unimak and Shumagin islands June fisheries) and the post-June fishery in the Shumagin Islands had to be made. The percentages of Chignik-bound sockeye salmon caught in the June fisheries were obtained from an analysis of a 1987 ADFG tagging study (Rogers 1990). An estimate of the Chignik contribution to the post-June Shumagin fishery was based on the relative abundance of July runs of sockeye salmon in the upper Gulf of Alaska and the results of several years of tag returns from the Gulf of Alaska (FRI tag-return computer files). Although Chignik-bound sockeye salmon are also likely to be caught in Kodiak fisheries, there was no basis for making an estimate of these interceptions.

Comparisons of catches and runs among different systems were made by first grouping years into periods; 1964 marked the start of one period because estimates of Chignik interceptions were not available for earlier years. The *Exxon Valdez* oil spill interrupted much of the fishing in 1989, so that year was omitted, and 1988 marked the end of the penultimate period. We were especially interested in the most recent changes; thus 1990–95 was the final period.

RESULTS

Since the period of low production in 1952–63, the catches in the Chignik fishery have increased, but this increase has been the smallest of all major sockeye salmon fisheries in southwest Alaska (Table 1). During 1964–76, the average catch in the Chignik fishery ranked fourth behind the Naknek/Kvichak, Egegik, and Cook Inlet. Over the past 6 years the Chignik catches have averaged 1.7 million; although good relative to past years, Chignik now ranks near the bottom.

A part of this relative decline in the Chignik fishery can be attributed to catches in other fisheries (Table 2). While Chignik catches have increased by 10% from 1977–88 to 1990–95, the estimated interception of Chignik sockeye salmon has increased by 40%. During 1964–76, about 18% of the Chignik catch was made in other fisheries and in the recent 6 years almost 30% of the Chignik catch has been made in other fisheries (~21% of the run). In contrast, 27% of the Bristol Bay catch and 13% of the run were taken in other fisheries during 1964–76. Recently, those numbers have been reduced to 5% of the catch and 3% of the run (Fig. 4).

Interceptions do not completely explain the comparatively small increase in Chignik catches in recent years. A comparison of runs (catch + escapement) to southwestern Alaska reveals that even including estimates of interceptions, the Chignik runs have lagged behind other sockeye salmon systems in recent years (Table 3). The increase in runs to the Chignik lake system is the smallest.

An examination of the relative production (return/escapement) of Black and Chignik lake stocks suggests that the recent lag in productivity in the Chignik system may be caused more by relatively low and variable production from the early Black Lake runs than from the Chignik lake runs (Table 4). This points out the need for continued research into the causes of this phenomenon, which are poorly understood.

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FIGURES

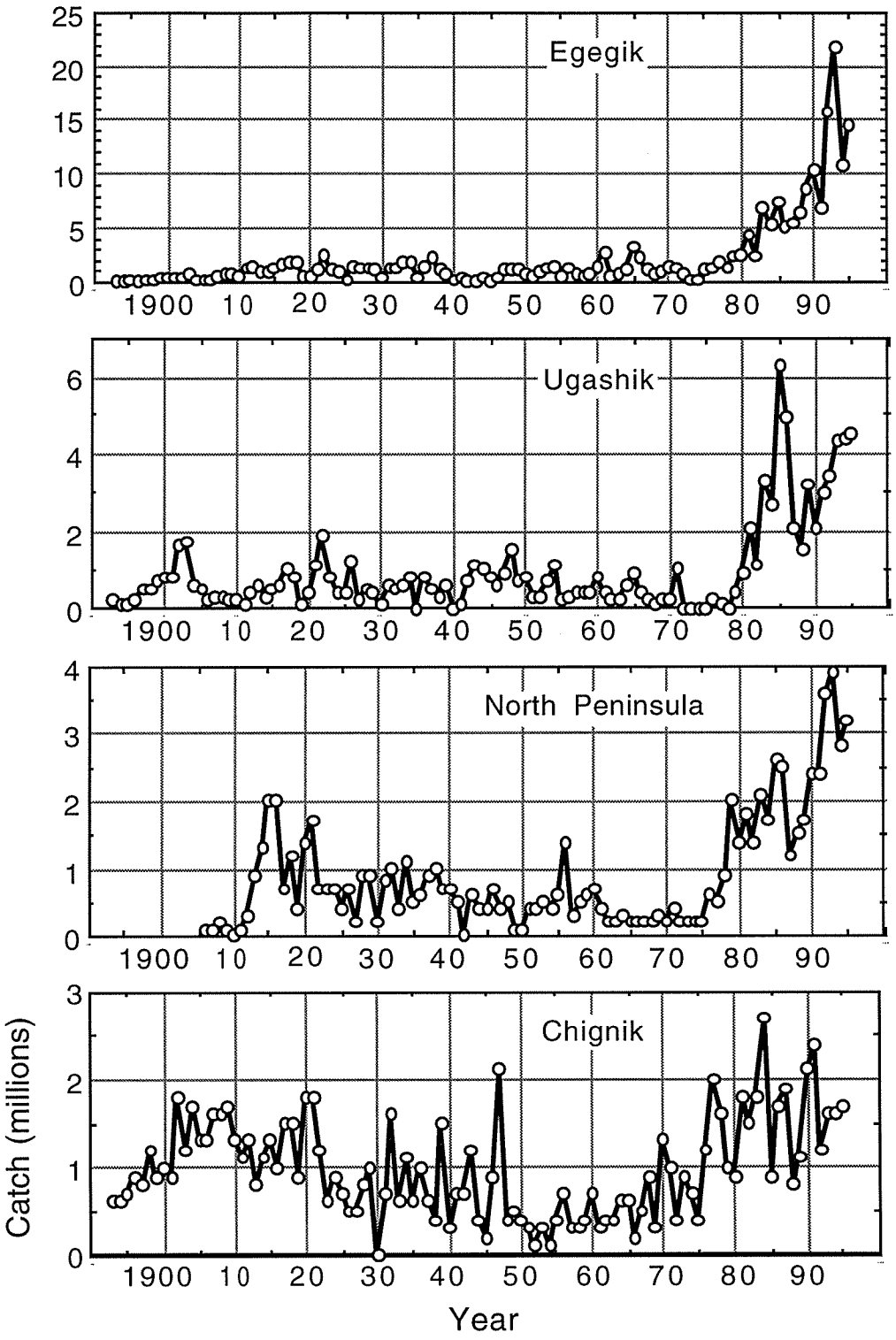

Figure 1. Annual catches of sockeye salmon in Alaska Peninsula fisheries.

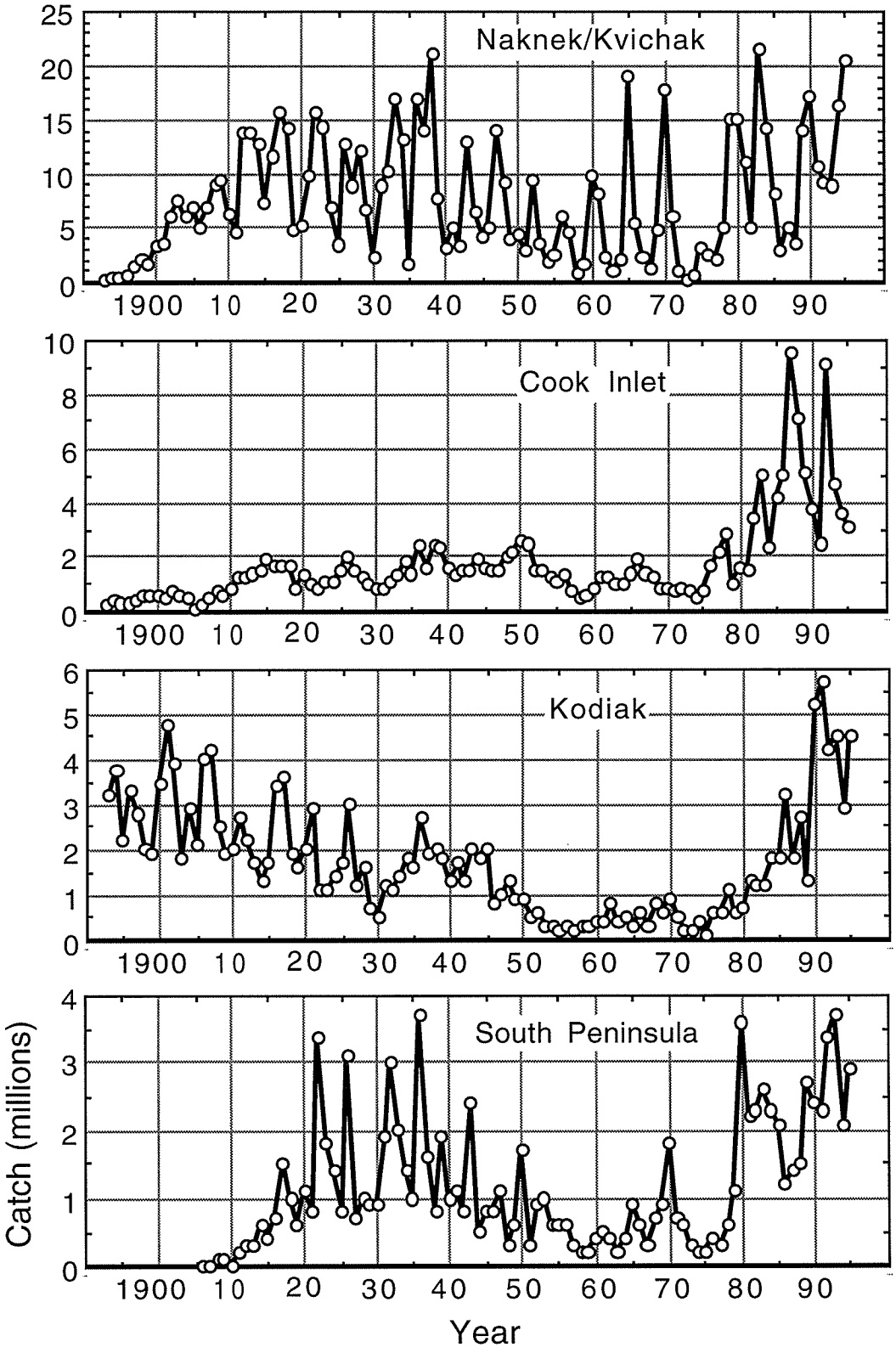

Figure 2. Annual catches of sockeye salmon in the South Peninsula, Kodiak, Cook Inlet, and Naknet/Kvichak fisheries.

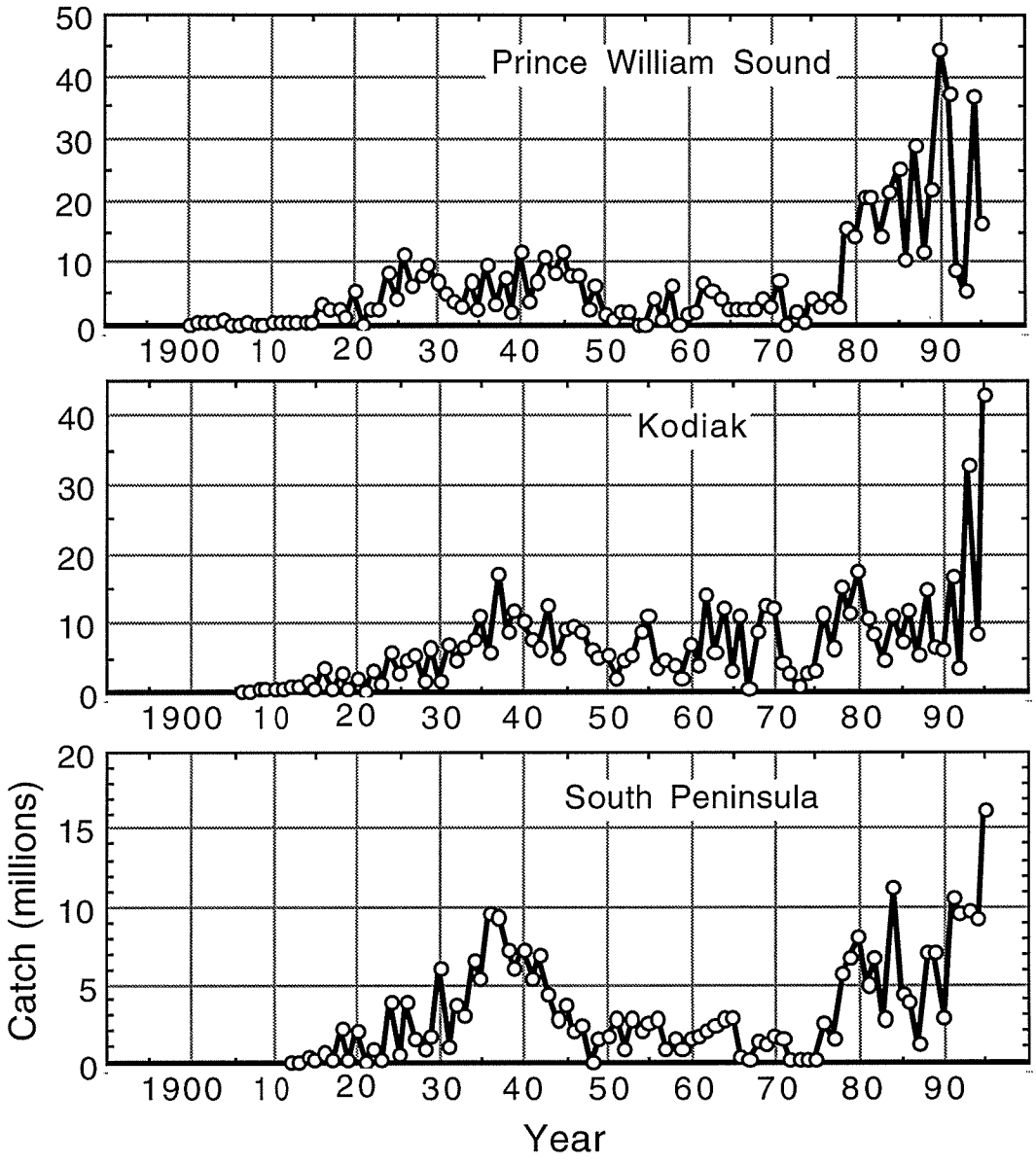

Figure 3. Annual catches of pink salmon in Gulf of Alaska fisheries.

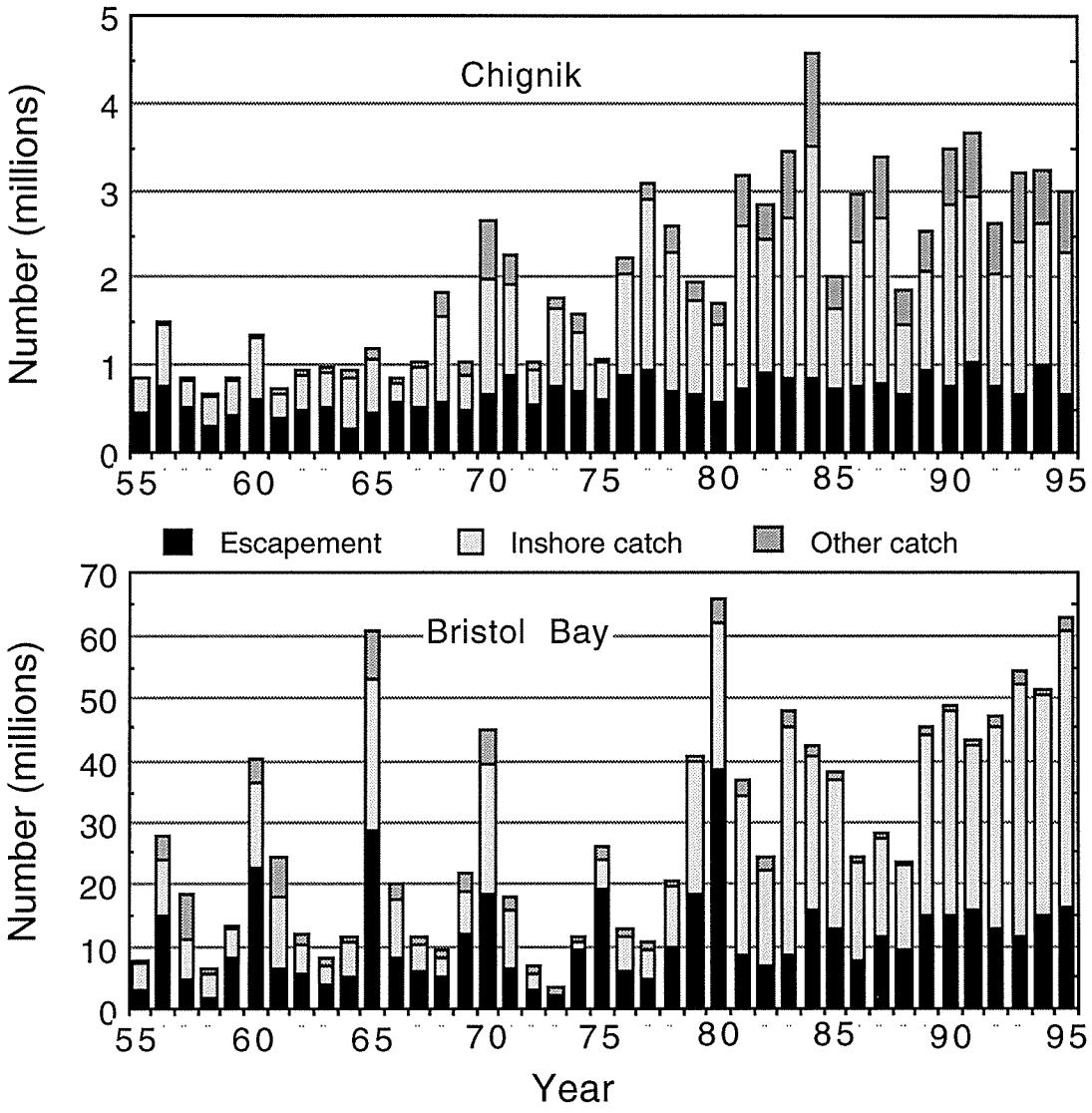

Figure 4. Annual sockeye salmon runs to Bristol Bay and Chignik, 1955–1995.

TABLES

Table 1. Relative changes in sockeye salmon catches (millions) in western and central Alaska.

	Period				Percent change		
	1	2	3	4	From 2	From 3	From 2
Location	52-63	64-76	77-88	90-95	to 3	to 4	to 4
Alaska Peninsula							
Chignik inshore	.37	.69	1.55	1.70	125	10	146
South Peninsula	.50	.62	1.78	2.81	187	58	353
North Peninsula	.52	.28	1.64	3.03	486	85	982
Ugashik	.44	.30	2.12	3.59	607	69	1097
Egegik	1.08	1.17	4.22	13.28	261	215	1035
Naknek	.84	.94	2.19	3.95	133	80	320
Mainland							
Kvichak	3.20	3.99	7.01	9.41	76	34	136
Wood River	.62	.48	1.62	1.93	238	19	302
Igushik	.21	.18	.69	1.10	283	59	511
Togiak	.11	.16	.40	.43	150	7	169
Bristol Bay combined							
Inshore	6.90	7.50	19.30	35.20	157	82	369
interceptions	2.30	2.30	1.50	1.70	-35	13	-26
Kodiak	.38	.46	1.50	4.50	226	200	878
Cook Inlet	.98	1.05	3.80	4.47	262	18	326

Table 2. Chignik sockeye salmon runs and estimated interceptions (1,000s of fish), 1964–95.

			Estimated catches of Chignik sockeye in other fisheries									
Year	Escape-ment	Chignik catch	Igvak x .80	Stepo-vak x .80	Unimak x .02	Shuma-gin x .15	Shuma-gin July x .50	Total	Total Chignik catch	Percent inter-ception	Total Chignik run	Percent inter-ception
61	396	323			4	3						
62	492	365			5	8						
63	533	409			2	8						
64	304	557	15	43	3	5	11	77	634	12	938	8
65	470	600	11	56	11	31	11	120	720	17	1190	10
66	567	220	18	12	11	8	2	50	270	19	837	6
67	517	462	23	20	4	10	2	59	521	11	1038	6
68	587	977	136	71	7	35	6	254	1231	21	1818	14
69	499	394	98	7	16	11	7	139	533	26	1032	13
70	656	1326	542	68	30	23	8	671	1997	34	2653	25
71	904	1016	253	51	8	7	20	339	1355	25	2259	15
72	558	378	42	18	9	11	9	88	466	19	1024	9
73	780	870	57	38	4	3	7	109	979	11	1759	6
74	716	663	122	66	0	0	13	201	864	23	1580	13
75	623	400	24	2	4	7	0	37	437	9	1060	4
76	893	1164	118	45	5	11	0	178	1342	13	2235	8
77	945	1972	129	35	4	7	0	175	2147	8	3092	6
78	721	1576	227	24	8	10	26	295	1871	16	2592	11
79	704	1049	20	82	13	27	71	213	1262	17	1966	11
80	591	860	1	88	55	71	69	284	1144	25	1735	16
81	740	1839	284	166	29	53	59	591	2430	24	3170	19
82	921	1522	168	87	33	68	34	390	1912	20	2833	14
83	868	1824	323	297	31	62	54	767	2591	30	3459	22
84	866	2661	450	488	23	39	48	1047	3708	28	4574	23
85	747	922	125	93	29	50	54	352	1274	28	2021	17
86	773	1646	188	147	6	23	171	536	2182	25	2955	18
87	804	1899	344	189	13	21	125	692	2591	27	3395	20
88	676	796	29	79	9	42	209	368	1164	32	1840	20
89	941	1159	0	139	27	60	209	435	1594	27	2535	17
90	770	2094	134	217	22	38	212	623	2717	23	3487	18
91	1040	1896	342	229	24	51	108	753	2649	28	3689	20
92	767	1277	156	178	41	63	127	564	1841	31	2608	22
93	697	1698	330	223	47	92	99	791	2489	32	3186	25
94	1000	1620	250	193	20	70	61	595	2215	27	3215	19
95	686	1606	170	264	29	98	118	679	2285	30	2971	23
Means												
64-76	621	694	112	38	9	13	7	179	873	18	1494	11
77-88	780	1547	191	148	21	39	77	476	2023	23	2803	16
90-95	827	1699	230	217	31	69	121	667	2366	28	3193	21

Sources: McCullough et al (1994), Quimby and Owen (1994), and C.O. Swanton (ADF&G) for preliminary 1994-95 data.

Table 3. Relative changes in sockeye salmon runs (millions) in western and central Alaska.

	Period				Percent change		
	1	2	3	4	From 2	From 3	From 2
Location	52-63	64-76	77-88	90-95	to 3	to 4	to 4
Alaska Peninsula							
Chignik inshore	.84	1.32	2.33	2.53	77	9	92
with interceptions	?	1.49	2.80	3.19	88	14	114
North Peninsula	?	.64	2.54	4.12	297	62	544
Ugashik	1.00	.66	3.23	5.12	389	59	676
Egegik	1.86	1.97	5.26	15.22	167	189	673
Naknek	1.61	1.96	3.56	5.77	82	62	194
Mainland							
Kvichak	6.67	10.17	12.82	15.80	26	23	55
Wood River	1.45	1.35	2.96	3.20	119	8	137
Igushik	.46	.41	1.17	1.56	185	33	280
Togiak	.24	.28	.66	.64	136	-3	129
Bristol Bay combined							
Inshore	14.00	17.50	22.20	49.60	27	123	183
with interceptions	16.30	19.90	33.70	51.40	69	53	158
Kodiak							
Red River	.15	.19	.52	.99	174	90	421
Upper Station (late)	?	.14	.57	.56	307	-2	300
Frazer	.00	.07	.29	.81	314	179	1057
Cook Inlet							
Kenai	?	.76	2.80	3.96	268	41	421
Kasilof	?	.23	.83	.71	261	-14	209

Table 4. Escapements (millions) and relative production (return/escapement) of sockeye on the Alaska Peninsula.

Brood year	Black Lake		Chignik Lake		Ugashik		Egegik		Bear River (late)	
	Esc.	R/E	Esc.	R/E	Esc.	R/E	Esc.	R/E	Esc.	R/E
70	.54	0.8	.12	0.8	.74	0.4	.92	1.3		
71	.67	2.0	.23	2.0	.53	1.5	.63	4.3		
72	.33	3.2	.23	4.4	.08	3.1	.55	5.4		
73	.53	2.3	.25	4.6	.04	2.3	.33	5.1		
74	.35	1.7	.36	2.9	.06	12.0	1.28	2.4		
75	.31	1.9	.31	3.9	.43	9.5	1.17	3.2		
76	.55	1.6	.34	4.2	.34	15.5	.51	10.4		
77	.42	5.0	.46	3.2	.20	13.4	.69	6.1		
78	.46	2.0	.26	3.4	.07	29.4	.90	10.2		
79	.39	9.3	.32	2.2	1.70	3.5	1.03	5.8		
80	.31	5.1	.28	3.4	3.32	2.3	1.06	8.1	.24	2.4
81	.44	4.4	.30	2.5	1.33	5.6	.70	9.0	.22	1.5
82	.62	3.8	.31	3.0	1.16	2.2	1.04	6.1	.10	2.7
83	.43	1.3	.44	3.2	1.00	2.0	.79	13.5	.17	1.9
84	.60	1.1	.27	8.0	1.24	4.4	1.16	11.5	.11	4.7
85	.39	2.0	.37	2.3	1.01	2.7	1.10	6.9	.17	5.5
86	.57	4.4	.21	5.9	1.00	6.8	1.15	12.5	.10	8.8
87	.59	2.4	.21	8.6	.67	10.1	1.27	20.3	.08	13.1
88	.42		.26		.64	5.9	1.61	14.9	.14	4.8
89	.38		.56		1.68	2.7	1.61	7.1	.21	5.0
Means										
70-81	.44	3.3	.29	3.1	.74	8.2	.81	5.9		
82-87	.53	2.5	.30	5.2	1.01	4.7	1.09	11.8	.12	6.1