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STATE OF ALASKA
Steve Cowper, Governor

ABUNDANCE, AGE, SEX, AND SIZE OF NORTON SOUND AND KOTZEBUE SOUND SALMON CATCH AND ESCAPEMENT, 1985

By:
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January 1987

ALASKA DEPARTMENT OF FISH AND GAME
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Don W. Collinsworth
Commissioner

ADF&G TECHNICAL DATA REPORTS

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Data presented in these reports is intended to be final, however, some revisions may occasionally be necessary. Minor revision will be made via errata sheets. Major revisions will be made in the form of revised reports.

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ABSTRACT

The 1985 commercial and subsistence harvest of the five species of Pacific salmon (*Oncorhynchus* sp.) found in the Norton Sound-Kotzebue Sound Area are presented by age, sex, and length along with appendices of historical performance. Samples are stratified by time-period where possible and temporal trends in age and sex composition are discussed. Salmon escapement estimates from peak aerial survey and tower counts are presented for all systems enumerated. Age, sex, and length composition is included for sampled escapements.

KEY WORDS; Norton Sound, Kotzebue Sound, harvest, escapement, *Oncorhynchus tshawytscha*, *O. nerka*, *O. keta*, *O. kisutch*, *O. gorbuscha*, age-size-sex composition, fishery synopsis.

INTRODUCTION

The Norton Sound, Port Clarence, and Kotzebue Sound commercial salmon management districts include all waters of Alaska from Canal Point Light, south of Stebbins, to Point Hope, north of Kotzebue. The Port Clarence District located within this region has been closed to commercial salmon fishing since 1966. The Norton Sound District is comprised of all waters of Alaska from Canal Point Light north to Cape Douglas (Figure 1). This district consists of six subdistricts: Nome (Subdistrict 1), Golovin (Subdistrict 2), Moses Point (Subdistrict 3), Norton Bay (Subdistrict 4), Shaktoolik (Subdistrict 5), and Unalakleet (Subdistrict 6). The Kotzebue Sound District includes all waters of Alaska from Point Hope to Cape Prince of Wales, but commercial salmon fishing is restricted to ocean waters north of the Baldwin Peninsula (Figures 2 and 3).

Five species of Pacific salmon (*Oncorhynchus* sp.) are found in the Norton Sound and Kotzebue Sound areas. In descending order of economic importance are chum salmon *(O. keta)*, chinook salmon *(O. tshawytscha)*, coho salmon *(O. kisutch)*, pink salmon *(O. gorbuscha)*, and sockeye salmon *(O. nerka)*. Numerically, the even-year returns of pink salmon are the largest of the five species followed by chum, coho, chinook, and sockeye salmon.

Adequate management of the salmon resource in the study area requires knowledge of the magnitude, distribution, timing, and age-sex-size composition of both the harvest and escapement by stock. The potential production of a salmon system is directly related to the number of fish in each age, sex, and size category of the breeding population (escapement). This report presents estimates of the age, sex, and size composition for each harvest and escapement population sampled from the inshore return of salmon to the Norton and Kotzebue Sound areas.

Basic fishery statistics for the Norton Sound-Kotzebue Sound Area are available from several additional sources. Commercial and subsistence harvest data are presented in the 1985 Norton Sound-Port Clarence-Kotzebue Sound Annual Management Report (ADF&G 1986). Historical escapement data is maintained and available in a computerized data base (ADF&G 1983). In addition, the results from escapement enumeration projects are analyzed and reported yearly for the Unalakleet River (Lean 1986), the Kwiniuk River (Lean 1986), and North River (Lean 1986). Results from two escapement projects which were eliminated in 1984, the Squirrel River, (Dinnocenzo 1984) and Noatak River (Mesiar 1984; Bigler 1985a; Berning et al. In Prep.) are also available. A historical summary of age, sex, and size composition of salmon from Kotzebue Sound prior to 1984 is provided by Bigler (1985b). Age, sex, and size composition of salmon is summarized in the annually prepared Catch and Escapement Report Series (Lean et al. 1984, Bigler and Lean 1986). Age, sex, and size data prior to 1983 are summarized in the report series: ADF&G Arctic-Yukon-Kuskokwim Region, Age-Sex-Size Composition of Salmon.

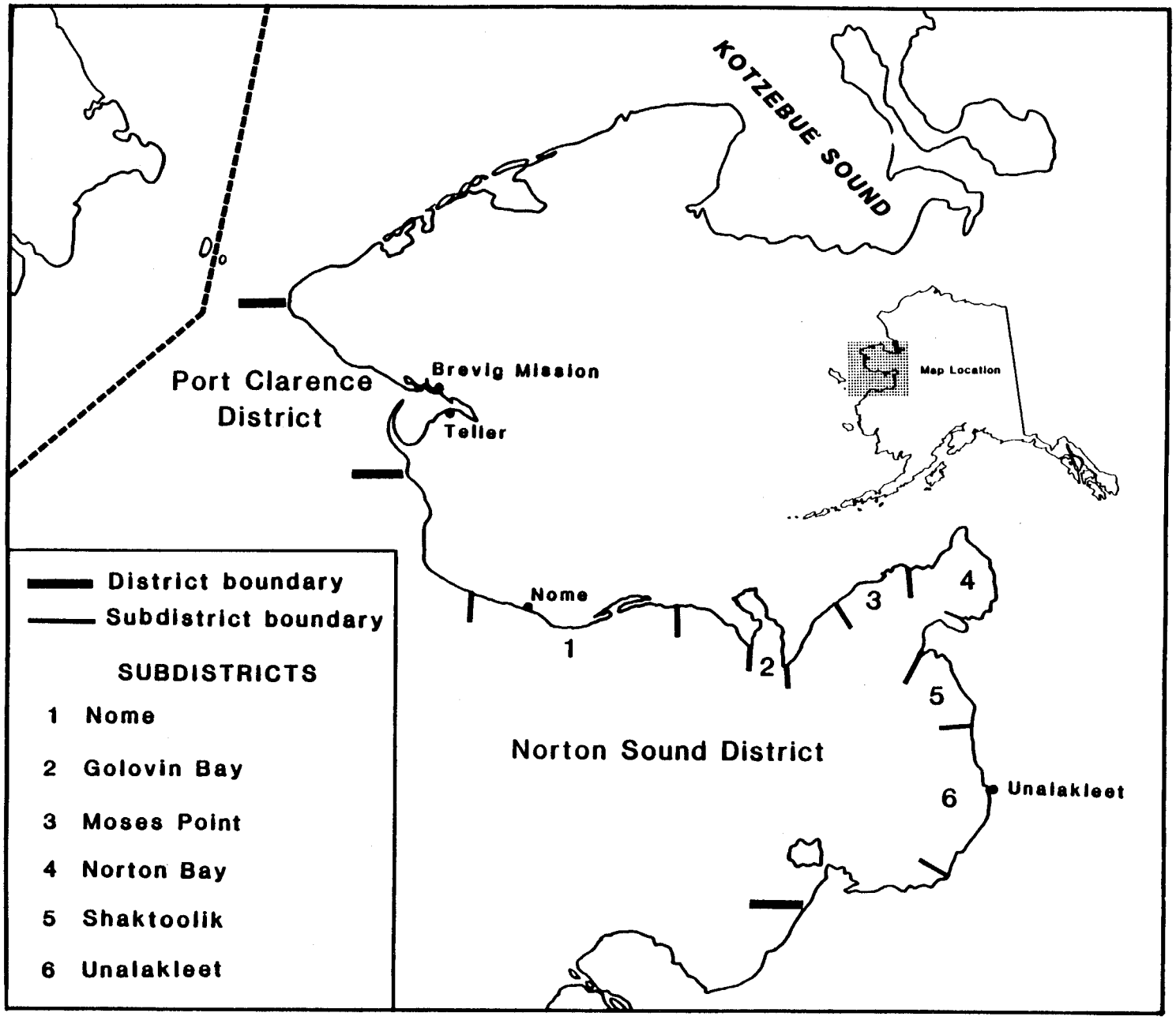

Figure 1. Norton Sound commercial salmon fishing subdistricts.

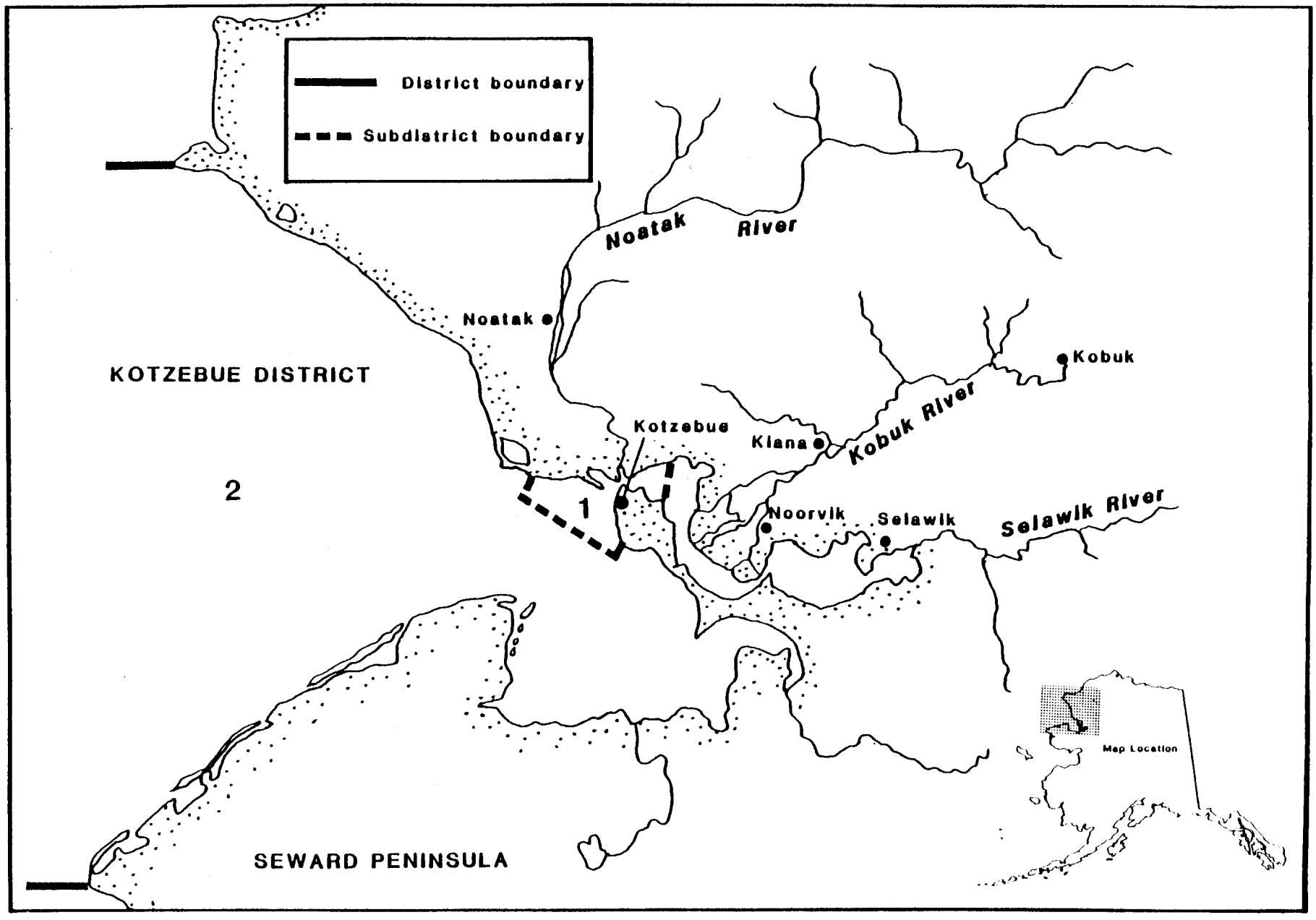

Figure 2. Kotzebue Sound commercial salmon fishing districts.

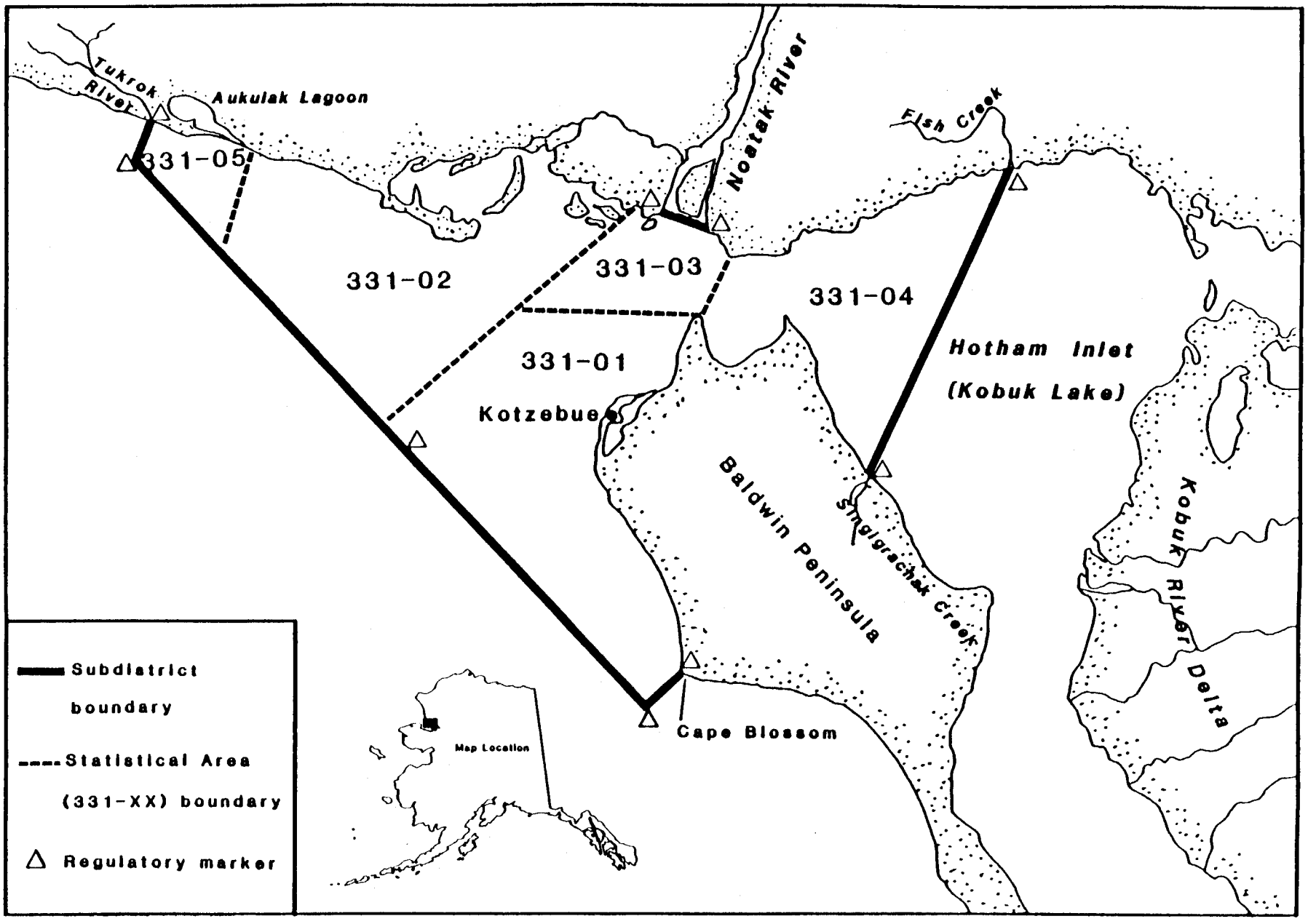

Figure 3. Kotzebue Sound commercial salmon fishing subdistricts.

METHODS

Harvest and Escapement

Commercial catch data presented in this report were compiled from harvest receipts (fish tickets) which document each sale by a licensed fisherman. These data were summarized by microcomputer in the Nome Area office during the commercial fishing season.

Subsistence catches are not monitored as closely as commercial catches in the Norton Sound-Kotzebue Sound Area. Two methods of data collection are generally employed: (1) household interviews conducted late in the season or (2) the return of catch calendars which are mailed to all known subsistence fishermen for reporting daily catches. A subsistence permit required in the Nome Subdistrict sets catch limits for each permit and requires catch reporting. Each data collection method has inherent and unavoidable sources of error. When personal interviews are used, it is assumed that fishermen can accurately recall their harvests, which may have occurred over several weeks. Usually, less than 5% of all subsistence catch calendars are returned, except in the Nome Subdistrict where the permit system requirement produces an average reporting rate of approximately 80%.

Reported subsistence catches from Norton Sound area villages are probably low since no expansion factors were used to compensate for unreported harvests. In the Kotzebue Area, however, the reported subsistence harvests are estimates of total catch. A mean catch per fishing family was calculated for each village surveyed. This mean was applied to those families known to have fished but were not available for interview.

Aerial escapement surveys are the primary method for monitoring salmon escapement into the Norton Sound and Kotzebue Sound drainages. Aerial surveys of escapement result in peak counts or a series of counts and are not a total enumeration of salmon spawning abundance. However, aerial survey escapement counts can be regarded as an index of relative abundance for the surveyed stream and can be used in interannual or interdrainage comparisons of escapement. Counting tower projects, operated in Norton Sound in 1985, provide the most exact estimate of total escapement. Test fishing counts provide an index of escapement and species composition for turbid or large drainages that are difficult to count visually. Both test fisheries and counting towers provide data on migratory timing.

Age, Sex, and Length Data Collection

Sampling the age, sex, and size composition of salmon returning to the Norton Sound-Kotzebue Sound Area in 1985 involved techniques similar to those used in 1983 and 1984 (Lean et al. 1984).

Chum salmon, which comprise the bulk of the commercial catch, were sampled in the Kotzebue District and in four subdistricts of Norton Sound. Salmon were also sampled at counting towers, in test fisheries, and on the spawning grounds.

All salmon were sampled for age, sex, and length. Sex was determined by examining external morphology, including the snout, vent, body symmetry, and appearance of eggs or milt of live fish. The sex of dead fish was determined by examining the gonads. Fish length was measured from mid-eye to fork-of-tail and recorded to the nearest millimeter.

Age was determined from scales removed from the left side of the fish in an area above the lateral line and crossed by a diagonal from the posterior insertion of the dorsal fin to the anterior insertion of the anal fin. Scales were mounted on gum cards and impressions made in cellulose acetate. Ages were reported in European notation: the first digit refers to the freshwater age and does not include the year spent in the gravel; the second digit refers to the ocean age. In past reports ages have been reported in Gilbert-Rich notation, in which the first digit refers to the total age (including the winter spent in the gravel) and the second digit refers to the freshwater age (again including the winter spent in the gravel)[1].

Sample Size

Minimum sample size goals within temporal strata were derived for each species of interest (Brannian 1985). The objective was to estimate proportions of age class for which there was a 10% chance that the estimate did not exceed plus or minus 5% of the true value. This resulted in a per strata sample size goal for readable scales of 502 for species with three major age classes (chinook salmon), 450 for species with two major age classes (chum salmon), and 247 for species with one major age class (coho salmon). Minor age classes comprising less than 10% were pooled and treated as a single age class in this analysis. Actual collection goals required that sample sizes be increased to include an expected proportion of unreadable scales. In cases where the total number of readable samples collected was less than the goal, data from several strata were pooled and a standard error of the mean presented.

RESULTS

Data, summarily presented below, are more fully detailed in Appendix A for Norton Sound and Appendix B for Kotzebue Sound.

Norton Sound

The commercial and subsistence harvests, escapement estimates, and biological sampling (age, sex, and size) for Norton Sound follows.

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1 European to (=) Gilbert-Rich conversions: $0.2=3_1/0.3=4_1/0.4=5_1/0.5=6_1/1.1=3_2/2.1=4_3/3.1=5_4/1.2=4_2/1.3=5_2/1.4=6_2/1.5=7_2$.

Commercial and Subsistence Harvest:

Commercial harvest in the Norton Sound District totaled 19,491 chinook salmon, 166 sockeye salmon, 134,928 chum salmon, 21,968 coho salmon, and 3,647 pink salmon (Tables 1 through 5, respectively). The 1985 chinook salmon harvest was the largest recorded in the history of the fishery and was 2.5 times larger than the recent 5-year average (Appendix A, Table 1). Chinook salmon landed in the Unalakleet and Shaktoolik Subdistricts comprised 92% of the district's total landings and the major portion of this catch occurred between 1 July and 10 July (Table 1). Most fishermen in these subdistricts weere targeting on chinook salmon using set gill nets with 210 mm (8-1/4 in) stretched mesh. North of Shaktoolik Subdistrict, chinook salmon harvests are incidental to taking chum salmon. Fishermen in these subdistricts used gill nets with 149 mm (5-7/8 in) mesh throughout the fishing season.

Coho and chum salmon harvests were approximately 33% and 60% below their respective 5-year averages. Approximately 41% of the district total chum salmon harvest was taken in the Golovin Subdistrict and 19% in the Unalakleet Subdistrict (Table 2). Catches in Golovin peaked early in the season (1 July to 6 July) whereas catches in the Unalakleet Subdistrict were relatively consistent throughout the fishing season. As the season progressed fishermen in Unalakleet gradually changed over to smaller mesh (146 mm or 5-3/4 in) gear which was more efficient in capturing chum salmon.

The Unalakleet Subdistrict comprised the majority (69%) of the coho salmon harvest. Coho salmon distribution in Norton Sound was similar to chinook salmon with Unalakleet and Shaktoolik Subdistricts comprising more than 90% of the total district catch (Table 4).

Pink salmon returns in the Norton Sound area follow an even-year cycle of high abundance. The pink salmon return was the lowest since 1972 and was less than 5% of the 5-year average. Fishermen in the Golovin Subdistrict landed 83% of the district total pink salmon harvest. Fishing effort has been fairly stable in Norton Sound and averages about 164 fishermen annually; 155 permits were fished in 1985.

Subsistence harvests from 10 villages totaled 31,118 salmon (Table 6) in 1985. White Mountain and Nome subsistence fishermen harvested more salmon than other villages, 9,217 and 7,912 salmon, respectively. Chum salmon comprised more than half (57%) of the district subsistence salmon harvest with coho and pink salmon representing 21% and 16% of the catch, respectively. These figures represent only the harvest of individuals who were interviewed, returned catch calendars, or obtained Nome Subdistrict permits, and should be considered only as a minimal estimate or index. In general, the subsistence harvest is taken in rivers using set gill nets. Seines are used more commonly in Kwiniuk, Tubutulik, Nome, and Unalakleet Rivers for coho and pink salmon.

Escapement Abundance:

Chinook salmon were most abundant in tributaries draining into the Norton Bay, Shaktoolik and Unalakleet Subdistricts with the Shaktoolik River producing the highest peak aerial survey count of 3,131 chinook salmon (Table 7). Counts of chinook salmon were above the historical average in most

Table 1. Commercial harvest in numbers of chinook salmon in Norton Sound stratified by time and subdistrict, 1985.

Inclusive Dates	Subdistrict 1	2	3	4	5	6	District Totals
6/27 - 6/29						133	133
7/01 - 7/03		35	218	24	1,700	5,726	7,703
7/04 - 7/06	4	56	278	225	1,377	4,071	6,011
7/08 - 7/10	*	24	223	91	1,233	1,520	3,091
7/11 - 7/13	7	25	80	131	573	803	1,619
7/15 - 7/17	5	26	11	31	264	167	584
7/18 - 7/20	2	8		8	84	72	174
7/21 - 7/24	*	11	4	7	47	25	94
7/25 - 7/27	2	5		7	13	34	61
7/29 - 7/31	*			4	11	14	29
8/01 - 8/03	1	1			6	14	22
8/05 - 8/07		2				17	19
8/08 - 8/10						5	5
8/12 - 8/14	*				2	5	7
8/15 - 8/17						4	4
8/19 - 8/21						2	2
8/22 - 8/24			2			5	9
8/26 - 8/27						1	1
8/29 - 8/31						3	3
Totals	21	193	816	528	5,312	12,621	19,491

* Fishing occurred but no harvest was reported.

Table 2. Commercial harvests in numbers of sockeye salmon in Norton Sound stratified by time and subdistrict, 1985.

Inclusive Dates	Subdistrict 1	2	3	4	5	6	District Totals
6/27-6/29			3				3
7/01-7/03		1	14				15
7/04-7/06		22	9				31
7/08-7/10		9	6				15
7/11-7/13		41					41
7/15-7/17		12					12
7/18-7/20		11					11
7/21-7/24		11					11
7/25-7/27		6					6
7/29-7/31							0
8/01-8/03							0
8/05-8/07						21	21
Totals	0	113	32	0	0	21	166

Table 3. Commercial harvest in numbers of chum salmon in Norton Sound stratified by time and subdistrict, 1985.

Inclusive Dates	Subdistrict 1	2	3	4	5	6	District Totals
6/27-6/29		3,508	625			1,209	5,342
7/01-7/03		11,308	11,764	189	781	1,688	25,730
7/04-7/06	562	14,051	5,486	1,802	691	2,023	24,615
7/08-7/10	*	7,110	4,059	797	623	1,526	14,115
7/11-7/13	1,831	7,062	1,608	1,922	952	1,916	15,291
7/15-7/17	1,940	4,401	534	1,042	2,153	1,664	11,735
7/18-7/20	858	3,074	201	686	2,387	1,390	8,596
7/21-7/24	250	3,638	115	949	1,543	2,035	8,530
7/25-7/27	350	1,016		1,975	863	3,766	7,970
7/29-7/31	165			586	1,647	1,488	3,886
8/01-8/03	231	407			619	1,006	2,263
8/05-8/07		206			279	1,108	1,593
8/08-8/10						1,626	1,626
8/12-8/14	25				341	646	1,012
8/15-8/17	7				161	1,043	1,211
8/19-8/21					91	521	612
8/22-8/24			71		272	261	604
8/26-8/27						150	150
8/29-8/31			3			43	46
9/05-9/06						2	2
Totals	6,219	55,781	24,466	9,948	13,403	25,111	134,928

* Fishing occurred but no harvest was reported.

Table 4. Commercial harvest in numbers of coho salmon in Norton Sound stratified by time and subdistrict, 1985.

Inclusive Dates	Subdistrict 1	2	3	4	5	6	District Totals
7/15-7/17		3			1	5	9
7/18-7/20		3			5	15	23
7/21-7/24		21		6	10	45	82
7/25-7/27	36	33		25	6	278	378
7/29-7/31	27			177	196	568	968
8/01-8/03	198	454			171	1,029	1,852
8/05-8/07		505			104	1,702	2,311
8/08-8/10		177	312	176		1,460	2,125
8/12-8/14	54				557	1,469	2,080
8/15-8/17	41				538	2,688	3,267
8/19-8/21					421	1,828	2,249
8/22-8/24			1,085		799	1,671	3,555
8/26-8/27						1,325	1,325
8/29-8/31			406			799	1,205
8/02-9/03						365	365
9/05-9/06						174	174
Totals	356	1,196	1,803	384	2,808	15,421	21,968

Table 5. Commercial harvest in numbers of pink salmon in Norton Sound stratified by time and subdistrict, 1985.

Inclusive Dates	Subdistrict 1	2	3	4	5	6	District Totals
6/27-6/29		50	9				59
7/01-7/03		284	303			1	588
7/04-7/06		540	86	48			674
7/08-7/10		353	113	14			480
7/11-7/13		542	4	6			552
7/15-7/17		580	28				608
7/18-7/20		337	7				344
7/21-7/24		302	9				311
7/25-7/27		31					31
Totals	0	3,019	559	68	0	1	3,647

Table 6. Norton Sound subsistence salmon catches, 1985.

Subdistrict	Village	Number of Fishermen Interviewed	Chinook	Sockeye	Chum	Coho	Pink	Total
1 1/	Nome	102	53	64	4,971	971	1,853	7,912
2 3/	White Mountain	16	7	2	8,180	312	716	9,217
2 3/	Council	2	0	0	1,150	10	0	1,160
2 3/	Golovin	10	5	0	247	108	1188	1,548
3 3/	Elim	25	67	0	947	1389	1212	3,615
4 2/	Koyuk	-	-	-	-	-	-	-
5 3/	Shaktoolik	21	298	0	298	1,379	24	1,999
6 3/	Unalakleet							
	River	50	1,195	3	1,869	2,244	55	5,366
	Ocean	10	202	0	99	0	0	301
	Total	54	1,397	3	1,968	2,244	55	5,667
	Stebbins 2/	-	-	-	-	-	-	-
	St. Michael 2/	-	-	-	-	-	-	-
	Totals	230	1,827	69	17,761	6,413	5,048	31,118

1/ Data collected from returned permits; the number of fishermen interviewed is the number of permits actually fished.

2/ No data available; no surveys conducted. Not in a subdistrict.

3/ Data collected from household interviews.

4/ Six fishermen fished both river and ocean.

Table 7. Peak aerial survey salmon counts of Norton Sound index streams, 1985.

Subdistrict	Stream	Date 1/	Survey Rating 2/	Salmon Counts Chinook	Chum	Coho 5/	Pink
Nome, #1	Bonanza	7/23	Good	2	775	-	695
	Cripple	7/06	Good	-	420	-	730
	Eldorado	7/19	Good	8	6,090	67	150
	Flambeau	7/19	Good	1	3,215	-	260
	Nome	8/05	Good	7	1,967	242	2,250
	Penny	7/13	Good	-	90	-	-
	Sinuk	7/19	Fair	4	1,910	33	8,860
	Snake	7/23	Good	4	1,100	253	175
	Solomon	7/23	Good	2	530	-	1,250
Golovin, #2	Boston	7/16	Good	243	3,450	-	-
	Fish	7/16	Good	303	21,080	-	7,365
	Niukluk	7/16	Good	25	11,140	109	-
	Ophir 6/	9/20	Fair	-	-	223	-
Moses Point, #3	Kwiniuk 3/	6/25-7/28	Good	712	9,912	673 4/	22,548
	Tubutulik	7/06	Good	472	13,645	-	8,940
Norton Bay, #4	Ungalik Inglutalik	7/23	Good	2,339	18,870	-	8,790
Shaktoolik, #5	Shaktoolik	7/22	Fair	3,131	13,090	-	2,350
Unalakleet, #6	Unalakleet System:						
	Main River 7/	7/22	Poor	400	1,640	-	-
	North R. 3/	6/18-9/02	Good	1,227	4,251	1,468	4,227
	Old Woman	7/22	Fair	202	510	-	-
	Unalakleet System Totals			1,829	6,401	1,468	4,227
South of Norton Sound:							
	Kogok	8/05	Good	4	235	-	-
	Pikmiktalik	7/23	Fair	88	970	60	-

1/ Date of the peak chum salmon survey.
2/ Overall effectiveness of survey: timing, weather, and water conditions.
3/ Tower count.
4/ Aerial survey count; not tower count.
5/ Inclement weather conditions prevented most coho salmon surveys.
6/ Coho salmon survey only.
7/ Partial survey.

streams surveyed (Appendix A, Table 2).

Escapement goals for chum salmon in Norton Sound index streams are averages derived from historic peak aerial surveys flown during favorable survey conditions (Appendix A, Table 3). Chum salmon escapement goals were met or exceeded on nearly all index streams with the exception of Kwiniuk River where only 9,912 chum salmon were counted (Table 7). Chum salmon catches in the Unalakleet and Shaktoolik Subdistricts were slightly below average, however escapement was above average since most fishermen used large mesh gear to target chinook salmon. Chum salmon escapements based on peak aerial survey counts, were slightly below the historical average in the Nome Subdistrict; average in Norton Bay and Unalakleet Subdistricts; and above average in Shaktoolik and Golovin Subdistricts (Appendix A, Table 4 and ADF&G 1986).

Aerial surveys for coho salmon were incomplete in 1985. Inclement weather precluded flying most surveys until after the peak of spawning. By this time, a prolonged period of high water had removed many carcasses from spawning grounds. However, counts from the North River tower indicate an average escapement of coho salmon to this system.

Pink salmon escapements were extremely low in all subdistricts (Table 8 and Appendix A, Table 5). Pink salmon escapement to the Kwiniuk River was approximately 4% of the recent 5-year average. This low return may be the result of deeper than normal frost levels which occurred during the winter of 1983-1984 which may have adversely effected instream survival of salmon from this brood year.

Age, Sex, and Length Composition:

In 1985 commercial catch samples were collected in four subdistricts: Unalakleet, Shaktoolik, Moses Point, and Golovin. Chinook salmon from the Unalakleet Subdistrict were sampled from both commercial and test fisheries (Table 8). Samples were predominantly age 1.4 (6-year-olds from the 1979 brood year). Chinook salmon landed in the Unalakleet and Shaktoolik Subdistricts were similar in age composition; however more females were harvested than males in the Shaktoolik Subdistrict. Unalakleet River test fish samples consisted of a greater proportion of fish in the younger (age 1.2 and 1.3) and older (age 1.5) age classes than commercial catch samples. Test nets captured more males than females, 67% and 33%, respectively, and the Shaktoolik chinook harvest was comprised of 63% females and 37% males. Since only 33 samples were collected at Moses Point, statistically valid conclusions about the age-sex-size of the catch in that district could not be developed. However, relatively few chinook salmon are harvested at Moses Point as compared to Shaktoolik and Unalakleet. (See Appendix A, Tables 6-9 for the age composition, sample size, mean length, and respective standard errors of chinook salmon commercial samples).

Chum salmon in the Norton Sound Area are predominantly 4-year-olds (age 0.3) and 5-year-olds (age 0.4) (Table 9). More 4-year-olds were caught in the Golovin and Moses Point commercial fisheries than in Unalakleet and a larger proportion of 5-year-olds was taken in the test fishery than in the commercial fisheries. Kwiniuk River escapement was predominantly 4-year-olds (82%). Sex ratios were approximately equal in the commercial catches; however

Table 8. Age and sex composition percentages for chinook salmon spawning stocks in the Norton Sound District, 1985.

	Commercial Fisheries			Test Fishery
Sex/Age	Shaktoolik	Moses Point	Unalakleet	Unalakleet River
Males	37.2	44.7	51.1	66.9
1.2	2.0	0.0	1.6	14.9
1.3	6.9	15.2	5.9	21.4
1.4	26.7	27.3	41.6	26.0
1.5	1.6	3.0	2.0	4.5
Females	62.8	55.3	49.0	33.1
1.2	0.0	6.1	0.0	1.3
1.3	3.2	15.2	1.4	3.2
1.4	56.8	33.3	41.9	22.1
1.5	2.8	0.0	5.7	6.5
Sexes Combined	100.0	100.0	100.0	100.0
1.2	2.0	6.1	1.6	16.2
1.3	10.0	30.3	7.2	24.7
1.4	83.5	60.6	83.5	48.1
1.5	4.4	3.0	7.7	11.0
Sample Size	249	33	441	154

Table 9. Age and sex composition percentages for chum salmon spawning stocks in the Norton Sound District, 1985.

	Commercial Fisheries			Test Fishery	Escapement
Sex/Age	Golovin	Moses Point	Unalakleet	Unalakleet River	Kwiniuk River
Males	44.0	47.9	52.1	60.6	37.2
0.2	0.5	0.2	0.0	0.3	0.0
0.3	31.9	32.9	22.3	21.4	29.9
0.4	11.2	13.8	28.9	38.0	6.6
0.5	0.5	0.5	0.9	1.0	0.7
Females	56.0	52.1	47.9	39.4	62.7
0.2	1.1	0.2	0.0	0.1	0.0
0.3	33.0	34.6	21.3	12.9	51.8
0.4	20.2	17.2	25.7	25.5	10.9
0.5	1.6	0.5	0.8	0.9	0.0
Sexes Combined	100.0	100.0	100.0	100.0	100.0
0.2	1.6	0.5	0.0	0.4	0.0
0.3	64.9	67.6	43.6	34.3	81.8
0.4	31.4	31.0	54.6	63.5	17.5
0.5	2.1	1.0	1.7	1.9	0.7
Sample Size	186	407	1,299	800	146

more males than females were caught in the Unalakleet test fishery (61% and 39%, respectively) and more females than males were sampled from Kwiniuk River. Chum salmon from the Unalakleet commercial catch were sampled over 3 time strata; Unalakleet test net catches were sampled in 2 time strata (Table 10). The proportion of 4-year-olds (age 0.3) increased slightly throughout the fishing season, whereas 5-year-olds (age 0.4) decreased proportionately. (See Appendix A, Tables 10-16 for the age composition, sample size, mean length, and respective standard errors of chum salmon commercial samples).

Coho salmon from the Unalakleet Subdistrict were sampled from both commercial and test net catches. Test net samples were 77% and commercial catch 80% age 1.2 (Table 11). More males were caught in the commercial harvest than females (62% and 38%, respectively) whereas the test fishery took almost equal numbers of each sex. (See Appendix A, Tables 17 and 18 for the age composition, sample size, mean length, and respective standard errors of coho salmon commercial samples).

Kotzebue Sound

The commercial and subsistence harvests, escapement estimates, and biological sampling (age, sex, and size) for Kotzebue Sound follows.

Commercial and Subsistence Harvest:

The 1985 commercial harvest of salmon in the Kotzebue District totaled 63 chinook and 521,406 chum salmon (Table 12 and Appendix B, Table 1). This was the fourth largest commercial chum salmon harvest in the history of the fishery and is 33% greater than the previous 5-year average (1980-1984) of 391,656 chum salmon. The commercial fishing season was from 11 July to 31 August with 96% of the catch taken between 18 July and 24 August. Peak catches occurred on 29-31 July (74,420), 1-3 August (69,275), and again on 12-14 (85,788). Similar to past years, 50% of the total season harvest was taken by the end of the eighth fishing period (5 August). Commercial fishing gear in the Kotzebue area consists of set gill nets of 140 mm (5-1/2 in) to 152 mm (6 in) stretched mesh and up to 274 m (150 fm) in length.

Household surveys were conducted during August and September to determine the number of chum salmon taken for subsistence utilization within the Kotzebue Sound watershed. The estimated subsistence harvest for villages along the Kobuk River is 17,984. Harvests from the lower Kobuk River communities of Noorvik and Kiana were approximately 7,015 and 3,494, respectively (Table 13). Harvests from the upper river communities of Ambler, Shungnak, and Kobuk were approximately 3,487, 3,115, and 300, respectively. The Kotzebue and nearby fish camps harvest was estimated to be 13,510 chum salmon. The community of Deering was surveyed during mid-September when residents were still fishing; the estimatged partial harvest was 573 chum salmon. Noatak village, which has a recent 5-year average of subsistence harvest of 4,633 chum salmon, was not surveyed in 1985.

Escapement Abundance:

Aerial surveys of established index areas were conducted on the Noatak and Kobuk Rivers and associated tributaries. Water levels were exceptionally low early in the season allowing for fair to excellent surveys during late July

Table 10. Age and sex composition percentages for chum salmon from the Unalakleet commercial and test fisheries by sampling period, 1985.

	Commercial Fishery			Test Fishery	
Sex/Age	6/28-7/20	7/23-7/27	7/30-7/31	6/23-7/9	7/10-9/7
Males	55.9	48.7	52.1	66.7	53.9
0.2	0.0	0.0	0.0	0.0	0.5
0.3	21.4	21.9	22.3	22.5	20.2
0.4	33.4	25.6	28.9	43.3	32.1
0.5	0.5	1.0	0.9	0.9	1.1
Females	44.7	51.3	47.9	33.3	46.2
0.2	0.0	0.0	0.0	0.0	0.3
0.3	15.7	22.8	21.3	9.0	17.2
0.4	28.3	28.1	25.7	23.4	27.9
0.5	0.7	0.5	0.8	0.9	0.8
Sexes Combined	100.0	100.0	100.0	100.0	100.0
0.2	0.0	0.0	0.0	0.0	0.8
0.3	37.1	44.7	43.6	31.4	37.4
0.4	61.7	53.7	54.6	66.7	59.9
0.5	1.2	1.6	1.7	1.9	1.9
Sample Size	429	606	319	423	377

Table 11. Age and sex composition percentages for coho salmon from the Norton Sound District, 1985.

Sex/Age	Unalakleet Commercial Fishery	Unalakleet River Test Fishery
Males	62.0	51.9
1.1	10.7	9.5
2.1	48.6	39.6
3.1	3.3	1.8
Females	38.0	48.1
1.1	6.6	7.1
2.1	28.8	40.2
3.1	2.0	1.8
Sexes Combined	100.0	100.0
1.1	17.3	16.6
2.1	77.4	79.9
3.1	5.3	3.6
Sample Size	243	169

Table 12. Commercial effort and harvest of chum salmon in the Kotzebue District by period, 1985.

Inclusive Dates	Period	No.Hours Fished	No. of Boats	Catch (nos. fish) Chinook	Chum
July 11-12	1	24	48	0	5,563
15-16	2	24	87	5	4,778
18-19	3	24	129	2	12,698
22-23	4	24	144	6	37,795
25-26	5	24	155	0	37,514
29-31	6	36	163	5	72,420
Aug 1-3	7	48	169	5	69,225
5-7	8	48	177	7	46,462
8-10	9	48	158	4	57,509
12-14	10	48	173	6	85,788
15-18	11	72	154	7	46,314
19-21	12	48	136	5	20,875
22-24	13	48	124	4	15,432
26-28	14	48	79	6	6,613
29-31	15	48	37	1	2,420
Total		612	189	63	521,406

Table 13. Estimated subsistence effort and catches of chum salmon by village, Kotzebue District, 1985.

Village	Number of Fishermen	Harvest (Nos. Fish)
Kobuk River Area		
Kiana	38	3,494
Noorvik	34	7,015
Shungnak	16	3,115
Kobuk	6	300
Deering	8	573
Ambler	23	3,487
Subtotal	117	17,984
Kotzebue Area	126	13,510
District Total	243	31,494

to mid-August. By late August, water levels had risen to such an extent that survey conditions were unsatisfactory. River waters remained high and turbid until freeze-up. Peak aerial survey counts of chum salmon on the Squirrel, Salmon, and Tutuksuk Rivers (lower Kobuk River drainage) were approximately 6,145, 2,884, and 5,098, respectively (Table 14). Although Noatak and upper Kobuk River surveys were conducted well before the peak of the migration, which occurs in September, counts were above average. Escapement goals are 11,500 chum salmon for the Squirrel River; 7,000 for the Salmon River; and 2,000 for the Tutuksuk River. Average (1962-1985) aerial survey counts from surveys rated fair or good and conducted during peak spawning for the Squirrel, Salmon, and Tutuksuk Rivers are 11,158, 5,723, and 2,107 chum salmon, respectively (Appendix B, Table 2). Since escapement surveys in 1985 were conducted prior to peak spawning, escapement was probably in excess of that documented.

Age, Sex, and Length Composition:

Chum salmon were sampled from the commercial catch and several spawning areas on the Noatak and Kobuk Rivers (Tables 15 and 16). The 1985 commercial catch was dominated by 4-year-olds (84%); 5-year-olds comprised 16% of the catch (Table 16). An exceptionally poor return of 3-year-olds (less than 1%) was observed in both commercial catch and escapement samples. This is the smallest percent return of 3-year-olds in the history of the fishery (Appendix B, Table 3). Generally, the proportion of younger fish increases dramatically over the period of migration. However, 3-year-olds comprised only 1% of the catch at the end of the 1985 season. This compares with 1984, a more typical year, in which the proportion of 3-year-olds increased from 2% to 32% during the fishing season. In 1985, the proportion of 4-year-olds (age 0.3) in period catches fluctuated erratically from 79% to 90% and the proportion of 5-year-olds (age 0.4) varied from 9% to 19%. Slightly more females were caught in the commercial catch than males (52% and 48%, respectively). The proportion of females in commercial catches increased during the season from 32% to 58%. (See Appendix B, Tables 4 and 5 for the age composition, sample size, mean length, and respective standard errors of chum salmon commercial samples).

The age composition of escapements was similar to the commercia catch with age 0.3 fish (4-year-olds) dominating the samples. Four-year-olds comprised 82%, 83%, and 79% of chum salmon sampled in the Noatak, Kelly, and Salmon Rivers, respectively. More (32%) 5-year-olds and fewer (68%) 4-year-olds were found in the Kugururok River and samples from the Squirrel and Kobuk Rivers consisted of 87.5% and 88% 4-year-olds, respectively. Sex composition of escapements varied with more females than males sampled in the Salmon and Squirrel Rivers; more males than females were caught in Kelly River and mainstem Kobuk River escapement samples. These differences may be the result of small samples and sampling techniques rather than actual differences. (See Appendix B, Tables 6-12 for the age composition, sample size, mean length, and respective standard errors of chum salmon escapement samples).

In general, female chum salmon are smaller than males for a given age and both show an increase in mean length with age (Table 17).

Table 14. Peak aerial survey escapement estimates of chum salmon in the Kotzebue District, 1985 1/.

River/Subsection	Date	Survey Rating	Numbers of Chum Salmon
Noatak River System			
Noatak River (below Kelly River)	8/16	Fair	43,529
Eli River	8/14	Fair	1,852
Kelly River and Lake	8/16	Fair	1,200
Noatak River System Total			46,581
Kobuk River System			
Main Kobuk River:			
Mouth to Kobuk Village			ND
Kobuk to Pah River	8/18	Good	2,048
Pah River to Selby River	8/18	Good	241
Selby River	8/18	Good	711
Selby River to Beaver River	8/18	Good	3,278
Beaver River	8/18	Good	ND
Main Kobuk Total			6,278
Squirrel River	8/17	Good	6,145
Salmon River	8/17	Good	2,884
Tutuksuk River	8/17	Good	5,098
Kobuk River System Total			20,405

1/ Aerial surveys conducted before peak of chum salmon migration.

ND - No data

Table 15. Age and sex composition, by sample period, of chum salmon taken in Kotzebue Sound by set gill net, 1985.

Sex/ Age	Period 1 7/11-7/16 %	Period 1 Nos.	Period 2 7/18-7/23 %	Period 2 Nos.	Period 3 7/25-7/31 %	Period 3 Nos.	Period 4 8/01-8/07 %	Period 4 Nos.	Period 5 8/08-8/14 %	Period 5 Nos.	Period 6 8/15-8/21 %	Period 6 Nos.	Period 7 8/22-8/28 %	Period 7 Nos.	Period 8 8/29-8/31 %	Period 8 Nos.
Males	67.5	6,983	60.2	30,386	47.0	51,719	50.8	58,762	44.6	63,838	40.2	27,025	44.0	9,711	42.1	1,018
0.2	0.5	49	0.2	113	0.0	0	0.0	0	0.2	340	0.7	448	0.4	97	0.0	0
0.3	56.5	5,839	47.2	23,834	38.4	42,224	42.6	49,318	37.0	52,971	36.0	24,188	36.1	7,963	31.8	769
0.4	10.4	1,071	12.1	6,100	8.2	8,995	7.7	8,919	7.1	10,187	3.6	2,389	7.0	1,554	10.3	249
0.5	0.2	24	0.7	339	0.4	500	0.4	525	0.2	340	0.0	0	0.4	97	0.0	0
Sample Size	287		269		207		224		188		181		200		90	
Female	32.5	3,358	39.8	20,107	53.0	58,215	49.2	56,925	55.4	79,459	59.8	40,164	56.0	12,334	57.9	1,402
0.2	0.0	0	0.0	0	0.4	500	0.0	0	0.2	340	0.4	299	0.2	49	1.0	23
0.3	26.4	2,726	30.9	15,589	44.3	48,720	40.8	47,219	46.9	67,234	54.0	36,282	47.8	10,537	48.1	1,164
0.4	5.9	608	9.0	4,518	8.2	8,995	8.4	9,706	8.3	11,885	5.3	3,583	7.5	1,651	8.4	204
0.5	0.2	24	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.4	97	0.4	11
Sample Size	138		178		233		217		234		269		254		124	
Both Sexes	100.0	10,341	100.0	50,493	100.0	109,934	100.0	115,687	100.0	143,297	100.0	67,189	100.0	22,045	100.0	2,420
0.2	0.5	49	0.2	113	0.4	500	0.0	0	0.5	680	1.1	747	0.7	146	1.0	23
0.3	82.8	8,565	78.1	39,423	82.7	90,944	83.4	96,537	83.9	120,205	90.0	60,470	83.9	18,500	79.9	1,933
0.4	16.2	1,679	21.0	10,618	16.4	17,990	16.1	18,625	15.4	22,072	8.9	5,972	14.5	3,205	18.7	453
0.5	0.5	48	0.7	339	0.4	500	0.4	525	0.2	340	0.0	0	0.9	194	0.4	11
Sample Size	425		447		440		441		422		450		454		214	

Table 16. Age and sex composition of chum salmon from Kotzebue District catch and escapement samples, 1985 (N = sample size).

Sex/ Age	Comm. Catch[1/]		Noatak R[2/3/]		Kelly R[2/]		Kugururok R[2/]		Salmon R[2/]		Squirrel R[2/]		Kobuk R[2/]	
	%	Nos.	%	Nos.	%	Nos.	%	Nos.	%	Nos.	%	Nos.	%	Nos.
Males	47.8	1,646	53.3	303	59.5	88	47.0	47	37.0	131	40.0	40	65.0	35
0.2	0.2	9	0.2	1	0.0	0	0.0	0	0.0	0	1.1	1	0.0	0
0.3	39.7	1,358	41.7	229	50.7	74	25.6	20	25.3	75	30.7	27	56.5	26
0.4	7.6	268	11.3	62	9.6	14	21.8	17	9.7	29	6.8	6	10.9	5
0.5	0.4	11	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Females	52.2	1,647	46.7	265	40.5	60	53.0	53	63.0	223	60.0	60	35.0	19
0.2	0.2	8	0.2	1	0.0	0	0.0	0	0.3	1	1.1	1	0.0	0
0.3	44.0	1,386	40.3	221	32.2	47	42.3	33	53.3	160	56.8	50	30.4	13
0.4	7.9	249	6.4	35	7.5	11	10.3	8	11.3	34	3.4	3	2.2	1
0.5	0.0	4	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Sexes Combined	100.0	3,293	100.0	568	100.0	148	100.0	100	100.0	354	100.0	100	100.0	54
0.2	0.4	17	0.4	2	0.0	0	0.0	0	0.3	1	2.3	2	0.0	0
0.3	83.7	2,744	81.9	450	82.9	121	67.9	53	78.7	235	87.5	77	87.0	39
0.4	15.5	517	17.7	97	17.1	25	32.1	25	21.0	63	10.2	9	13.0	6
0.5	0.4	15	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0

1/ Commercial catch samples taken with 49 mm (5-7/8 in) to 152 mm (6 in) mesh gill nets.
2/ Escapement samples collected by modified beach seine on spawning grounds.
3/ Mainstem Noatak River samples collected September 17-23.

Table 17. Mean length (ln) of chum salmon (in cm) from Kotzebue District catch and escapement samples 1985, (N = sample size).

Sex/ Age	Comm. Fishery 1/		Noatak R. 2/		Kelly R. 2/		Kugururok R. 2/		Salmon R. 2/		Squirrel R. 2/		Kobuk R. 2/	
	Ln	Nos.	Ln	Nos.	Ln	Nos.	Ln	Nos.	Ln	Nos.	LN	Nos.	Ln	Nos.
Males	618.6	1,646	641.4	303	621.0	88	616.5	47	605.8	131	606.7	40	613.3	35
0.2	553.0	9	635.0	1		0		0		0	625.0	1		0
0.3	615.9	1,358	637.8	229	618.8	74	611.3	20	598.7	75	604.3	27	606.9	26
0.4	633.4	268	658.0	62	632.9	14	627.4	17	625.9	29	635.0	6	625.0	5
0.5	644.8	11		0		0		0		0		0		0
Females	594.8	1,647	587.1	265	583.8	60	574.9	53	556.7	223	572.1	60	567.2	19
0.2	584.0	8	570.0	1		0		0	525.0	1	530.0	1		0
0.3	592.8	1,386	584.2	221	581.3	47	571.8	33	554.7	160	570.5	50	569.3	13
0.4	605.8	249	601.7	35	599.1	11	590.0	8	564.0	34	580.0	3	490.0	1
0.5	617.4	4		0		0		0		0		0		0
Sexes Combined	606.2	3,293	616.1	568	606.0	148	594.4	100	574.8	354	585.9	100	597.4	54
0.2	569.7	17	602.5	2		0		0	525.0	1	577.5	2		0
0.3	603.8	2,744	611.5	450	604.2	121	586.7	53	568.7	235	582.3	77	594.4	39
0.4	619.3	517	637.7	97	618.0	25	615.4	25	592.5	63	616.7	9	602.5	6
0.5	642.9	15		0		0		0		0		0		0

1/ Commercial catch samples taken with 49 mm (5-7/8 in) to 152 mm (6 in) mesh gill nets.
2/ Escapement samples collected by modified beach seine on spawning grounds.

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APPENDIX A: NORTON SOUND

Appendix A - Table 1. Commercial and subsistence salmon catches by species, all subdistricts, Norton Sound District, 1961-1985.

	Commercial Harvest						Subsistence Harvest					Combined Harvest					
Year	Chinook	Sockeye	Chum	Coho	Pink	Total	Chinook	Chum	Coho	Pink	Total	Chinook	Sockeye	Chum	Coho	Pink	Total
1961	5,300	35	48,332	13,807	34,327	101,801	-	-	-	-	-	5,300	35	48,332	13,807	34,327	101,801
1962	7,286	18	182,784	9,156	33,187	232,431	-	-	-	-	-	7,286	18	182,784	9,156	33,187	232,431
1963	6,613	71	154,789	16,765	55,625	233,863	5	17,635	118	16,607	34,365	6,618	71	172,424	16,883	72,232	268,228
1964	2,018	126	148,862	98	13,567	164,671	565	12,486	2,567	9,225	24,843	2,583	126	161,348	2,665	22,792	189,514
1965	1,449	30	36,795	2,030	220	40,524	574	30,772	4,812	19,131	55,289	2,023	30	67,567	6,842	19,351	95,813
1966	1,553	14	80,245	5,755	12,778	100,345	269	21,873	2,210	14,335	38,687	1,822	14	102,118	7,965	27,113	139,032
1967	1,804	-	41,756	2,379	28,879	74,818	817	22,724	1,222	17,516	42,279	2,621	-	64,480	3,601	46,395	117,097
1968	1,045	-	45,300	6,885	71,179	124,409	237	11,661	2,391	36,912	51,201	1,282	-	56,961	9,276	108,091	175,610
1969	2,392	-	82,795	6,836	86,949	178,972	436	15,615	2,191	18,562	36,804	2,828	-	98,410	9,027	105,511	215,776
1970	1,853	-	107,034	4,423	64,908	178,218	561	22,763	4,675	26,127	54,126	2,414	-	129,797	9,098	91,035	232,344
1971	2,593	-	131,362	3,127	4,895	141,977	1,026	21,815	1/ 4,097	10,863	37,801	3,619	-	153,177	7,224	15,758	179,778
1972	2,938	-	100,920	454	45,182	149,494	804	13,966	2/ 2,319	14,158	31,247	3,742	-	114,886	2,773	59,340	180,741
1973	1,918	-	119,098	9,282	46,499	176,797	392	7,185	520	14,770	22,867	2,310	-	126,283	9,802	61,269	199,664
1974	2,951	-	162,267	2,092	148,519	315,829	420	3,958	1,064	16,426	21,868	3,371	-	166,225	3,156	164,945	337,697
1975	2,393	2	212,485	4,593	32,388	251,861	186	8,124	3/ 192	15,803	24,305	2,579	2	220,609	4,785	48,191	276,166
1976	2,243	11	95,956	6,934	87,919	193,063	203	7,718	1,004	18,048	26,973	2,446	11	103,674	7,938	105,967	220,036
1977	4,500	5	200,455	3,690	48,675	257,325	846	26,607	2,530	14,296	44,279	5,346	5	227,062	6,220	62,971	301,604
1978	9,819	12	189,279	7,335	325,503	531,948	1,211	12,257	2,981	35,281	51,730	11,030	12	201,536	10,316	360,784	583,678
1979	10,706	57	140,789	31,438	167,411	350,401	747	11,975	8,487	25,247	46,456	11,453	57	152,764	39,925	192,658	396,857
1980	6,311	40	180,792	29,842	227,352	444,337	1,397	19,622	8,625	63,778	93,422	7,708	40	200,414	38,467	291,130	537,759
1981	7,929	56	169,708	31,562	232,479	441,734	2,021	32,866	13,416	28,741	77,082 6/7/	9,950	94	202,574	44,978	261,220	518,816
1982	5,892	10	183,335	91,690	230,281	511,208	1,328	23,185	17,874	56,295	98,690 6/8/	7,220	18	206,520	109,564	286,576	609,898
1983	10,308	27	319,437	49,735	76,913	456,420	-	-	-	-	- 9/	-	-	-	-	-	-
1984	8,455	6	146,442	67,875	119,381	342,159	-	-	-	-	- 9/	-	-	-	-	-	-
1985	19,491	166	134,928	21,968	3,647	180,200	-	-	-	-	- 9/	-	-	-	-	-	-
5-Yr Avg. 4/	7,779	28	199,943	54,141	177,281	439,172											
10-Yr Avg. 5/	6,856	23	183,868	32,469	154,830	378,046											

1/ Includes 197 sockeye.
2/ Includes 93 sockeye.
3/ Includes 11 sockeye.
4/ 1980-1984 average.
5/ 1975-1984 average.
6/ Includes data from Stebbins and St. Michael.
7/ Includes 38 sockeye.
8/ Includes 8 sockeye.
9/ Subsistence surveys not conducted in all districts.

Appendix A - Table 2. Chinook salmon escapement estimates for selected streams in the Norton Sound Area, 1961-1985[1/].

Year	Eldorado River	Flambeau River	Nome River	Sinuk River	Boston Creek	Fish River	Kachauik Creek	Niukluk River	North River
1961	-	-	-	-	-	1	-	-	-
1962	-	-	-	-	-	48	-	11	162
1963	-	-	-	-	67	21	-	1	287 2/
1964	-	-	-	-	10	-	-	-	23
1965	-	-	-	-	-	-	-	-	153
1966	-	-	-	-	153 /2	7	-	-	-
1967	-	-	-	-	-	20	-	-	-
1968	-	-	-	-	7	10	-	-	-
1969	-	-	-	-	100	-	-	-	-
1970	-	-	-	-	246	33	-	-	1 2/
1971	-	-	-	-	42	1	-	-	256 2/
1972	-	-	-	-	57	-	-	-	561 3/
1973	-	-	6	-	153	31	-	-	298 3/
1974	13	-	-	-	231	7	-	1	220 3/
1975	-	-	1	-	147	26	-	-	60 2/
1976	-	-	-	-	-	1	-	-	66 2/
1977	-	-	5	-	76	9	-	19	1,275
1978	-	-	2	-	136	29	-	2	321
1979	-	-	-	-	58	11	-	8 3/	735
1980	6	-	5	3	16	-	-	-	61
1981	-	1	15	-	-	90	-	-	68
1982	2	1	-	-	10	-	-	20	8
1983	11	2	2	48	154	87	-	54	347
1984	14 5/	-	-	7 4/	35	42	-	6 6/	2,844 3/
1985	8	1	7	4	243	303	-	25	1,227 3/

1/ Represents peak count for season.
2/ Poor survey conditions or partial survey, poor counting tower conditions.
3/ Total counts from counting tower.
4/ Boat survey.
5/ Foot survey.
6/ Includes counts from Casadepaga and Ophir Creeks.

Appendix A - Table 3. Escapement goals for chum salmon in key Norton Sound aerial survey index streams. Goals are based on the average historic aerial surveys of "Good" or "Fair" rating.

Subdistrict and River		Escapement Goal
Nome Subdistrict (1)		
	Sinuk	3,500
	Nome	2,000
	Flambeau	3,250
	Eldorado	5,250
	Bonanza	1,500
Golovin Subdistrict (2)		
	Fish	17,500
	Niukluk	8,000
	Boston	2,500
Moses Point Subdistrict (3)		
	Kwiniuk	25,000 (Tower)
	Tubutulik	12,000
Norton Bay Subdistrict (4)		
	Ungalik	2,500
	Inglutalik	8,500
Shaktoolik Subdistrict (5)		
	Shaktoolik	11,000
Unalakleet Subdistrict (6)		
	Unalakleet	Poor Conditions
	North River	4500 (Tower)
	North Fork	Insufficient Data
	Old Woman	Insufficient Data

Appendix A - Table 4. Chum salmon escapement estimates for selected streams in the Norton Sound Area, 1961-1985[1/].

Year	Eldorado River	Flambeau River	Nome River	Sinuk River	Boston Creek	Fish River	Kachauik Creek	Niukluk River	North River
1961	-	-	-	-	-	-	-	-	-
1962	-	-	-	-	-	-	-	-	-
1963	-	-	-	-	1,669	-	16,000	13,687	-
1964	-	-	-	-	3,315	18,670	5,284	8,395	-
1965	-	-	-	-	-	-	-	-	-
1966	-	-	-	-	761 3/	-	758	21,300	-
1967	-	-	-	-	-	-	-	20,546	-
1968	-	-	-	-	2,500	-	-	-	-
1969	-	-	-	-	7,000	2,080	600	10,240	-
1970	-	-	-	-	8,200	76,550	500	7,300	20,655 3/
1971	-	-	75	-	7,045	13,185	1,000	22,605	-
1972	-	-	710	-	4,252	3,616 2/	3,100	10,500	2,332 4/
1973	-	-	1,760	-	3,014	6,887	10,325	14,365	4,332 4/
1974	2,143	-	854	-	2,426	10,945	1,645	8,720	861 4/
1975	-	-	2,161	4,662	1,885	20,114	1,735	10,089	5,237 3/
1976	-	375	-	-	-	8,390	-	4,130	196 3/
1977	1,835	1,275	3,046	5,207	1,325	9,664	9,564 4/	10,456	8,139
1978	10,125	7,110	5,242	8,756	2,655	26,797	3,481 4/	14,365	9,349
1979	-	283	-	-	882	6,893	2,650	10,127	1,130
1980	9,900	-	0	2,022	2,450	19,100	-	8,915	2,300
1981	15,605	12,031	1,195	5,579	-	24,095	-	7,249	405
1982	1,095	5,097	700	638	1,730	-	1,111	2,557	599
1983	994	1,195	198	2,150	704	20,037	-	8,886	4,135
1984	4,361 5/7/	3,150 5/	2,084 6/	493 6/	-	42	-	-	2,903 4/
1985	6,090	3,215	1,967	1,910	3,450	21,080	-	11,140 8/	4,251 4/

1/ Represents peak count for season.
2/ Surveyor unable to distinguish between pink and chum salmon.
3/ Poor survey conditions or partial survey, poor counting tower conditions.
4/ Total counts from counting tower.
5/ Helicopter survey.
6/ Boat survey.
7/ Foot survey.
8/ Includes counts from Ophir Creek.

Appendix A - Table 5. Pink salmon escapement estimates for selected streams in the Norton Sound Area, 1961-1985[1/].

Year	Eldorado River	Flambeau River	Nome River	Sinuk River	Boston Creek	Fish River	Kachauik Creek	Niukluk River	North River
1961	-	-	-	-	-	-	-	-	-
1962	-	-	-	-	-	-	-	-	-
1963	-	-	-	-	-	-	16,000	4,103	-
1964	-	-	-	-	-	10,935	3,675	10,495	-
1965	-	-	-	-	-	-	-	-	-
1966	-	-	-	-	-	-	1,788	8,600	-
1967	-	-	-	-	-	-	-	-	-
1968	-	-	-	-	2,500	-	-	-	-
1969	-	-	-	-	16,000	124,000	4,525	92,650	-
1970	-	-	-	-	12,900	198,000	-	60,350	12,400 3/
1971	-	-	7,765	-	80	1,670	5,323	8,370	-
1972	-	-	14,960	-	3,950	13,050 2/	16,950	22,600	54,934 4/
1973	-	-	14,940	-	3,213	15,564	22,275	14,790	26,542 4/
1974	6,185	-	17,832	-	749	15,690	2,723	8,915	154,285 4/
1975	-	-	3,405	5,390	2,556	15,840	23,360	16,258	17,885 3/
1976	-	1,994	-	-	-	15,850	-	7,190	10,606 3/
1977	125	10	1,726	1,302	385	2,430	30,432 4/	4,150	4,565
1978	12,800	-	34,900	22,435	74,221	140,640	26,533 4/	208,300	21,813
1979	-	291	-	-	271	9,132	23,850	30,147	9,500
1980	55,520	-	-	199,000	1,510	33,500	-	75,770	127,900
1981	495	2,710	12,565	350	-	450	-	-	575
1982	163,300	25,001	327,570	148,800	22,020	-	72,235	227,540	173,352
1983	270	200	9,170	10,770	-	300	-	50	4,980
1984	1,924,935 5/7/	20,200 5/	178,870	284,400 6/	-	-	-	-	316,073 4/
1985	150	260	2,250	8,860	-	7,365	-	-	4,227 4/

1/ Represents peak count for season.
2/ Surveyor unable to distinguish between pink and chum salmon.
3/ Poor survey conditions or partial survey, poor counting tower conditi
4/ Total counts from counting tower.
5/ Helicopter survey.
6/ Boat survey.
7/ Foot survey.
8/ Includes counts from Ophir Creek

Appendix A - Table 6. Age, sex, and length (mm) of chinook salmon from the Unalakleet commercial harvest, 1985.

	Age Class				
	1.2	1.3	1.4	1.5	Totals[1]
Males	202	745	5,251	252	6,450
Percent	1.6	5.9	41.6	2.0	51.1
Mean Length	552.7	727.4	832.4	892.2	818.2
Std. Error [2]	11.0	23.1	5.3	20.8	96.5
Sample Size	7	26	184	9	253
Females	0	177	5,289	719	6,185
Percent	0.0	1.4	41.9	5.7	49.0
Mean Length	0.0	832.2	866.1	923.4	868.8
Std. Error [2]	0.0	21.9	4.0	11.8	58.3
Sample Size	0	6	184	25	257
Sexes Combined	202	909	10,539	972	12,622
Percent	1.6	7.2	83.5	7.7	100.0
Std. Error[3]	0.6	1.2	1.8	1.3	
Mean Length	552.7	747.1	849.3	915.2	843.7
Std. Error [2]	11.0	20.5	3.4	10.4	83.4
Sample Size	7	32	368	34	510

[1] Totals include fish not aged.
[2] Standard Error of average length.
[3] Standard Error of age class percent.

Appendix A - Table 7. Age, sex, and length (mm) of chinook salmon from the Moses Point commercial harvest, 1985.

	Age Class				
	1.2	1.3	1.4	1.5	Totals[1]
Males	0	124	223	24	365
Percent	0.0	15.2	27.3	3.0	44.7
Mean Length	0.0	723.8	846.9	820.0	789.6
Std. Error [2]	0.0	53.5	35.5	0.0	119.6
Sample Size	0	5	9	1	17
Females	50	124	272	0	451
Percent	6.1	15.2	33.3	0.0	55.3
Mean Length	582.0	747.0	789.0	0.0	745.8
Std. Error [2]	22.0	49.6	34.3	0.0	123.6
Sample Size	2	5	11	0	21
Sexes Combined	50	247	495	24	816
Percent	6.1	30.3	60.6	3.0	100.0
Std. Error[3]	4.2	8.1	8.6	3.0	
Mean Length	582.0	735.4	815.0	820.0	765.4
Std. Error [2]	22.0	34.6	25.0	.0	122.2
Sample Size	2	10	20	1	38

[1] Totals include fish not aged.
[2] Standard Error of average length.
[3] Standard Error of age class percent.

Appendix A - Table 8. Age, sex, and length (mm) of chinook salmon from the Shaktoolik commercial harvest, 1985.

	Age Class				
	1.2	1.3	1.4	1.5	Totals[1]
Males	106	366	1,417	85	1,974
Percent	2.0	6.9	26.7	1.6	37.2
Mean Length	569.6	724.2	865.1	919.8	826.7
Std. Error [2]	10.0	34.1	8.2	59.2	113.5
Sample Size	5	17	66	4	103
Females	0	170	3,013	149	3,332
Percent	0.0	3.2	56.8	2.8	62.8
Mean Length	0.0	825.9	877.4	886.3	873.4
Std. Error [2]	0.0	16.8	5.0	15.0	62.2
Sample Size	0	8	140	7	174
Sexes Combined	106	531	4,431	233	5,306
Percent	2.0	10.0	83.5	4.4	100.0
Std. Error[3]	0.9	1.9	2.4	1.3	
Mean Length	569.6	756.8	873.2	898.5	856.0
Std. Error [2]	10.0	25.4	4.3	22.2	87.7
Sample Size	5	25	208	11	277

[1] Totals include fish not aged.
[2] Standard Error of average length.
[3] Standard Error of age class percent.

Appendix A - Table 9. Age, sex, and length (mm) of chinook salmon taken with 149 mm (5-7/8 in) mesh gill net in the Unalakleet test fishery, 1985.

	Age Class				
	1.2	1.3	1.4	1.5	Total[1]
Males					
Percent	14.9	21.4	26.0	4.5	66.9
Mean Length	578.7	665.8	793.1	809.3	702.5
Std. Error [2]	7.6	17.5	14.3	49.2	127.2
Sample Size	23	33	40	7	111
Females					
Percent	1.3	3.2	22.1	6.5	33.1
Mean Length	637.5	727.0	829.4	861.0	817.9
Std. Error [2]	7.5	31.9	9.9	32.0	85.6
Sample Size	2	5	34	10	57
Sexes Combined					
Percent	16.2	24.7	48.1	11.0	100.0
Std. Error[3]	3.0	3.5	4.0	2.5	
Mean Length	583.4	673.8	809.8	839.7	741.6
Std. Error [2]	7.7	16.0	9.2	27.4	127.0
Sample Size	25	38	74	17	168

[1] Totals include fish not aged.
[2] Standard Error of average length.
[3] Standard Error of age class percent.

Appendix A - Table 10. Age, sex, and length (mm) of chum salmon from the Unalakleet commercial harvest, by sample period, 1985.

Sample period 1: June 28 to July 20

	Age Class 0.2	0.3	0.4	0.5	Totals[1]
Males	0	2,443	3,813	57	6,382
Percent	0.0	21.4	33.4	0.5	55.9
Mean Length		587.0	605.0	615.0	598.0
Std. Error [2]		2.8	2.4	30.0	28.5
Sample Size	0	87	136	2	240
Females	0	1,792	3,231	80	5,034
Percent	0.0	15.7	28.3	0.7	44.7
Mean Length		568.5	591.9	596.0	583.5
Std. Error [2]		3.4	2.5	8.3	28.7
Sample Size	0	64	115	3	189
Sexes Combined	0	4,235	7,044	137	11,416
Percent	0.0	37.1	61.7	1.2	100.0
Std. Error[3]		2.4	2.4	0.5	
Mean Length		579.1	599.0	603.6	591.6
Std. Error [2]		2.3	1.8	11.5	29.4
Sample Size	0	151	251	5	429

Sample period 2: July 23 to July 27

	Age Class 0.2	0.3	0.4	0.5	Totals[1]
Males	0	1,270	1,485	58	2,825
Percent	0.0	21.9	25.6	1.0	48.7
Mean Length		593.6	608.1	620.8	601.7
Std. Error [2]		2.3	2.6	13.4	29.5
Sample Size	0	127	149	6	295
Females	0	1,323	1,630	29	2,976
Percent	0.0	22.8	28.1	0.5	51.3
Mean Length		572.0	581.9	588.3	577.2
Std. Error [2]		1.7	1.9	17.4	23.3
Sample Size	0	132	163	3	311
Sexes Combined	0	2,593	3,115	93	5,801
Percent	0.0	44.7	53.7	1.6	100.0
Std. Error[3]		2.1	2.1	0.5	
Mean Length		582.6	594.4	610.0	589.1
Std. Error [2]		1.6	1.7	11.4	29.2
Sample Size	0	259	312	9	606

-Continued-

Appendix A - Table 10. Age, sex, and length (mm) of chum salmon from the Unalakleet commercial harvest, by sample period, 1985 (continued).

Sample period 3: July 30 to July 31, 1985

	Age Class					
	0.2	0.3	0.4	0.5	0.6	Totals[1]
Males	0	1,879	1,958	103	24	3,964
Percent	0.0	23.8	24.8	1.3	0.3	50.2
Mean Length		587.8	594.7	577.5	580.0	590.0
Std. Error[2]		3.2	3.7	8.3	0.0	29.8
Sample Size	0	74	77	4	1	160
Females	0	2,234	1,602	103	0	3,939
Percent	0.0	28.3	20.3	1.3	0.0	49.9
Mean Length		567.6	583.5	581.3	0.0	574.8
Std. Error[2]		2.5	3.2	2.4	0.0	25.2
Sample Size	0	88	63	4	0	159
Sexes Combined	0	4,121	3,544	205	24	7,894
Percent	0.0	52.2	44.9	2.6	0.3	100.0
Std. Error[3]		2.8	2.8	0.9	0.3	
Mean Length		576.9	589.6	579.4	580.0	582.6
Std. Error[2]		2.1	2.5	4.1	0.0	28.6
Sample Size	0	163	140	8	1	319

[1] Totals include fish not aged.
[2] Standard Error of average length.
[3] Standard Error of age class percent.

Appendix A - Table 11. Age, sex, and length (mm) of chum salmon taken in the Unalakleet commercial fishery, all periods combined, 1985.

	Age Class					
	0.2	0.3	0.4	0.5	0.6	Total[1]
Males	0	5,592	7,256	218	24	13,090
Percent	0.0	22.3	28.9	0.9	0.1	52.1
Mean Length[4]		590.1	604.1	605.4	580.0	597.8
Std. Error [2]		1.6	1.6	9.8	0.0	29.5
Sample Size	0	288	362	12	1	695
Females	0	5,349	6,463	212	0	12,024
Percent	0.0	21.3	25.7	0.8	0.0	47.9
Mean Length[4]		569.8	585.6	587.8	0.0	578.4
Std. Error [2]		1.4	1.4	5.4	0.0	25.6
Sample Size	0	284	341	10	0	659
Sexes Combined	0	10,949	13,703	435	24	25,111
Percent	0.0	43.6	54.6	1.7	0.1	100.0
Std. Error[3]		1.4	1.4	0.4	0.1	
Mean Length[4]		580.1	595.1	597.4	580.0	588.4
Std. Error [2]		1.1	1.1	6.1	0.0	29.3
Sample Size	0	573	703	22	1	1,354

[1] Totals include fish not aged.
[2] Standard Error of average length.
[3] Standard Error of age class percent.
[4] Mean length is average of samples collected, i.e. not weighted by sample period or age compostion.

Appendix A - Table 12. Age, sex, and length (mm) of chum salmon from the Golovin commercial harvest, 1985.

	Age Class				
	0.2	0.3	0.4	0.5	Total[1]
Males	279	17,794	6,247	279	24,544
Percent	0.5	31.9	11.2	0.5	44.0
Mean Length	560.0	580.3	585.7	615.0	581.4
Std. Error [2]	0.0	3.5	6.4	0.0	27.2
Sample Size	1	58	21	1	84
Females	614	18,408	11,268	892	31,237
Percent	1.1	33.0	20.2	1.6	56.0
Mean Length	570.0	562.8	573.6	563.3	566.6
Std. Error [2]	5.0	2.0	4.2	13.3	20.7
Sample Size	2	62	38	3	107
Sexes Combined	893	36,202	17,515	1,171	55,781
Percent	1.6	64.9	31.4	2.1	100.0
Std. Error[3]	0.9	3.5	3.4	1.0	
Mean Length	566.7	571.3	577.9	576.3	573.1
Std. Error [2]	4.4	2.2	3.6	16.0	24.8
Sample Size	3	120	59	4	191

[1] Totals include fish not aged.
[2] Standard Error of average length.
[3] Standard Error of age class percent.

Appendix A - Table 13. Age, sex, and length (mm) of chum salmon from the Moses Point commercial harvest, 1985.

	Age Class				
	0.2	0.3	0.4	0.5	Total [1]
Males	60	8,055	3,366	120	11,719
Percent	0.2	32.9	13.8	0.5	47.9
Mean Length	510.0	573.7	594.0	601.5	581.2
Std. Error [2]	0.0	2.4	3.9	8.5	30.0
Sample Size	1	134	56	2	216
Females	60	8,476	4,208	120	12,747
Percent	0.2	34.6	17.2	0.5	52.1
Mean Length	498.0	561.5	569.3	572.0	563.5
Std. Error [2]	0.0	1.8	3.3	4.0	23.6
Sample Size	1	141	70	2	235
Sexes Combined	120	16,531	7,574	240	24,466
Percent	0.5	67.6	31.0	1.0	100.0
Std. Error [3]	0.4	2.3	2.3	0.5	
Mean Length	504.0	567.5	580.4	586.8	572.0
Std. Error [2]	6.0	1.5	2.8	9.3	28.2
Sample Size	2	275	126	4	451

[1] Totals include fish not aged.
[2] Standard Error of average length.
[3] Standard Error of age class percent.

Appendix A - Table 14. Age, sex, and length (mm) of chum salmon caught with 149 mm (5-7/8 in) mesh gill net in the Unalakleet test fishery, by sample period, 1985.

Sample period 1: June 23 to July 9

	Age Class				
	0.2	0.3	0.4	0.5	Totals[1]
Males					
Percent	0.0	22.5	43.3	0.9	66.7
Mean Length		594.3	611.7	618.8	605.9
Std. Error [2]		2.5	1.8	12.1	26.0
Sample Size	0	95	183	4	287
Females					
Percent	0.0	9.0	23.4	0.9	33.3
Mean Length		581.9	590.9	591.3	587.9
Std. Error [2]		3.2	2.5	15.3	23.9
Sample Size	0	38	99	4	143
Sexes Combined					
Percent	0.0	31.4	66.7	1.9	100.0
Std. Error[3]		2.3	2.3	0.7	
Mean Length		590.7	604.4	605.0	599.9
Std. Error [2]		2.1	1.6	10.4	27.0
Sample Size	0	133	282	8	430

Sample period 2: July 10 to September 7, 1985

	Age Class				
	0.2	0.3	0.4	0.5	Totals[1]
Males					
Percent	0.5	20.2	32.1	1.1	53.9
Mean Length	592.5	593.3	610.5	602.5	603.7
Std. Error [2]	2.5	3.1	2.7	10.9	29.5
Sample Size	2	76	121	4	204
Females					
Percent	0.3	17.2	27.9	0.8	46.2
Mean Length	590.0	574.2	594.9	588.3	587.2
Std. Error [2]	0.0	2.4	2.0	1.7	22.2
Sample Size	1	65	105	3	177
Sexes Combined					
Percent	0.8	37.4	59.9	1.9	100.0
Std. Error[3]	0.5	2.5	2.5	0.7	
Mean Length	591.7	584.5	603.2	596.4	594.0
Std. Error [2]	1.7	2.1	1.8	6.5	27.6
Sample Size	3	141	226	7	381

[1] Totals include fish not aged.
[2] Standard Error of average length.
[3] Standard Error of age class percent.

Appendix A - Table 15. Age, sex, and length (mm) of chum salmon caught with 149 mm (5-7/8 in) gill net in the Unalakleet test fishery, 1985, all sample periods combined.

	Age Class				
	0.2	0.3	0.4	0.5	Total[1]
Males					
Percent	0.3	21.4	38.0	1.0	60.6
Mean Length[4]	592.5	593.8	611.1	610.6	605.0
Std. Error[2]	2.5	2.0	1.5	8.2	27.5
Sample Size	2	171	304	8	491
Females					
Percent	0.1	12.9	25.5	0.9	39.4
Mean Length[4]	590.0	577.1	592.9	590.0	587.5
Std. Error[2]	0.0	1.9	1.6	8.2	22.9
Sample Size	1	103	204	7	320
Sexes Combined					
Percent	0.4	34.3	63.5	1.9	100.0
Std. Error[3]	0.2	1.7	1.7	0.5	
Mean Length[4]	591.7	587.5	603.8	601.0	598.1
Std. Error[2]	1.7	1.5	1.2	6.2	27.2
Sample Size	3	274	508	15	811

[1] Totals include fish not aged.
[2] Standard Error of average length.
[3] Standard Error of age class percent.
[4] Mean length is average of samples collected, i.e. not weighted by sample period or age composition.

Appendix A - Table 16. Age, sex, and length (mm) of chum salmon escapement sample caught with beach seine from Kwiniuk River, 6 July-25 July 1985.

	Age Class				
	0.2	0.3	0.4	0.5	Total[1]
Males					
Percent	0.0	29.9	6.6	0.7	37.2
Mean Length		569.0	578.2	571.0	570.0
Std. Error [2]		5.2	13.8	0.0	33.5
Sample Size	0	41	9	1	55
Females					
Percent	0.0	51.8	10.9	0.0	62.7
Mean Length		534.6	535.1	0.0	534.0
Std. Error [2]		3.0	9.4	0.0	27.3
Sample Size	0	71	15	0	91
Sexes Combined					
Percent	0.0	81.8	17.5	0.7	100.0
Std. Error[3]		3.2	3.2	0.7	
Mean Length		547.2	551.3	571.0	547.5
Std. Error [2]		3.1	8.8	0.0	34.5
Sample Size	0	112	24	1	146

[1] Totals include fish not aged.
[2] Standard Error of average length.
[3] Standard Error of age class percent.

Appendix A - Table 17. Age, sex, and length (mm) of coho salmon from the Unalakleet commercial harvest, 1985.

	Age Class 1.1	2.1	3.1	Total[1]
Males	1,650	7,495	509	9,561
Percent	10.7	48.6	3.3	62.0
Mean Length	576.7	582.5	562.5	581.9
Std. Error [2]	7.4	3.4	12.8	37.0
Sample Size	26	118	8	207
Females	1,018	4,441	308	5,860
Percent	6.6	28.8	2.0	38.0
Mean Length	569.1	574.5	564.0	575.6
Std. Error [2]	6.7	3.7	13.2	29.2
Sample Size	16	70	5	127
Sexes Combined	2,668	11,936	817	15,421
Percent	17.3	77.4	5.3	100.0
Std. Error[3]	2.4	2.7	1.4	
Mean Length	573.8	579.5	563.1	579.5
Std. Error [2]	5.2	2.6	9.0	34.3
Sample Size	42	188	13	334

[1] Totals include fish not aged.
[2] Standard Error of average length.
[3] Standard Error of age class percent.

Appendix A - Table 18. Age, sex, and length (mm) of coho salmon taken by 149 mm (5-7/8 in) mesh gill net in the Unalakleet test fishery, 1985.

	Age Class			
	1.1	2.1	3.1	Total[1]
Males				
Percent	9.5	39.6	1.8	51.9
Mean Length	590.0	595.0	581.7	594.5
Std. Error [2]	13.0	4.9	11.7	40.7
Sample Size	16	67	3	95
Females				
Percent	7.1	40.2	1.8	48.1
Mean Length	587.5	590.6	575.0	588.3
Std. Error [2]	8.4	3.5	16.1	29.8
Sample Size	12	68	3	88
Sexes Combined				
Percent	16.6	79.9	3.6	100.0
Std. Error[3]	2.9	3.1	1.4	
Mean Length	588.9	592.8	578.3	591.5
Std. Error [2]	8.1	3.0	9.0	35.9
Sample Size	28	135	6	183

[1] Totals include fish not aged.
[2] Standard Error of average length.
[3] Standard Error of age class percent.

APPENDIX B: KOTZEBUE SOUND

Appendix B - Table 1. Total utilization of chum salmon (in thousands) in the Kotzebue region, 1962-1985.

Year	Commercial Catch	Subsistence Catch	Total Utilization
1962	129.9	70.3	200.2
1963	54.4	31.1	85.5
1964	76.5	29.8	106.3
1965	40.0	30.5	70.5
1966	30.8	35.6	66.4
1967	29.4	40.1	69.5
1968	30.2	20.8	51.0
1969	59.3	29.8	89.1
1970	159.7	28.5	188.2
1971	155.0	32.0	187.0
1972	169.7	11.1	180.8
1973	375.4	18.9	394.3
1974	627.9	26.7	654.6
1975	563.3	27.6	590.9
1976	159.8	15.8	175.6
1977	195.9	9.8	205.7
1978	111.5	12.9	124.4
1979	141.6	14.6	156.2
1980	367.3	10.6	377.9
1981	677.2	17.8	695.0
1982	417.8	30.1	447.9
1983	175.8	10.3	186.1
1984	320.2	15.5	335.7
1985	521.4	31.5	552.9
5 Yr. Ave. (1981-1985)	422.5	21.0	443.5
Std Dev. (5 Yr. Ave.)	191.1	9.3	195.6

Appendix B - Table 2. Average aerial survey counts of chum salmon in selected streams in the Kotzebue District, 1962-1985. Only complete surveys rated "Fair" or "Good" were considered.

River	Average Aerial Survey Count	Number of Years Used	Years Excluded
Noatak (including Kelly and Eli Rivers)	89,755	13	1962, 63, 65, 67, 72, 73, 77, 78, 82
Squirrel	11,158	20	1970, 77, 79
Salmon	5,723	20	1970, 72, 77
Tutuksuk	2,107	18	1965, 72, 73, 77
Upper Kobuk R. (between Kobuk and the lower canyon)	10,468	19	1973, 76, 77

Appendix B - Table 3. Comparative age and sex composition of Kotzebue District chum salmon, 1962-1985.

Year	Sample Size	Percent Males	Percent Females	Percent Age Class 0.2	0.3	0.4	0.5
1962	69	26.1	73.9	7.3	63.3	28.0	1.4
1963	255	35.0	65.0	30.1	50.9	18.6	0.4
1964	463	43.6	56.4	53.3	45.1	1.7	0.0
1965	480	42.1	57.9	2.3	91.0	6.7	0.0
1966	430	40.2	59.8	10.1	67.1	22.8	0.0
1967	1865	37.3	62.7	8.8	72.3	18.5	0.5
1968	1989	48.2	51.8	21.2	58.0	19.8	0.9
1969	1125	53.7	46.3	36.8	58.3	4.9	0.0
1970	267	45.3	54.7	3.9	91.0	5.1	0.0
1971	1105	54.6	45.4	7.1	67.3	26.3	0.0
1972	980	50.9	49.1	15.8	59.4	24.1	0.6
1973	598	46.0	54.0	16.7	69.5	13.8	0.0
1974	350	47.1	52.9	28.5	63.5	7.8	0.2
1975	340	46.4	63.6	2.5	86.9	10.7	0.0
1976	566	47.9	52.1	11.2	51.6	37.2	0.1
1977	446	49.3	50.7	6.7	73.0	18.6	1.7
1978	579	49.9	50.1	10.5	57.5	31.8	0.2
1979[1]	658	53.3	46.7	30.6	53.2	15.2	1.0
1980	710	56.4	43.6	15.1	78.1	6.6	0.2
1981	1167	52.4	47.6	2.4	67.1	30.6	0.0
1982	983	48.8	51.2	5.9	48.3	40.3	5.5
1983	1979	43.4	56.6	5.8	57.8	34.2	2.3
1984[1]	2933	50.2	49.8	14.6	64.3	19.7	1.3
1985	3293	47.8	52.2	0.4	83.7	15.5	0.4
Mean	985	46.5	53.9	14.5	65.8	19.1	0.7

[1] Does not show < 0.1% age 0.6 fish.

Appendix B - Table 4. Age, sex, and length (mm) of chum salmon from the Kotzebue Sound commercial catch, by sample period, 1985.

Sample Period 1: 7/11- 7/16

	Age Class 0.2	0.3	0.4	0.5	Total
Males	49	5,839	1,071	0 24	6,983
Percent	0.47	56.46	10.36	0.23	67.53
Mean Length	579.50	612.62	633.30	685.00	615.81
Std. Error [1]	14.50	1.90	5.01	0.00	1.77
Sample Size	2	240	44	1	287
Females	0	2,726	608	24	3,358
Percent	0.00	26.36	5.88	0.23	32.47
Mean Length	0.00	591.55	612.52	628.00	595.61
Std. Error [1]	0.00	2.59	5.70	0.00	2.36
Sample Size	0	112	25	1	138
Sexes Combined	49	8,565	1,679	48	10,341
Percent	0.47	82.83	16.24	0.46	100.00
Mean Length	579.50	605.92	625.77	656.50	609.25
Std. Error [1]	14.50	1.53	3.80	0.00	1.42
Sample Size	2	352	69	2	425

Sample Period 2: 7/18- 7/23

	Age Class 0.2	0.3	0.4	0.5	Total
Males	113	23,834	6,100	339	30,386
Percent	0.22	47.20	12.08	0.67	60.18
Mean Length	579.00	619.89	635.37	628.33	622.94
Std. Error [1]	0.00	1.95	3.74	17.52	1.72
Sample Size	1	211	54	3	269
Females	0	15,589	4,518	0	20,107
Percent	0.00	30.87	8.95	0.00	39.82
Mean Length	0.00	597.66	611.38	0.00	600.74
Std. Error [1]	0.00	2.10	4.80	0.00	1.95
Sample Size	0	138	40	0	178
Sexes Combined	113	39,423	10,618	339	50,493
Percent	0.22	78.08	21.03	0.67	100.00
Mean Length	579.00	611.10	625.16	628.33	614.10
Std. Error [1]	0.00	1.44	2.97	17.52	1.30
Sample Size	1	349	94	3	447

-Continued-

Appendix B - Table 4. Age, sex, and length (mm) of chum salmon from the Kotzebue Sound commercial catch, by sample period, 1985 (continued).

Sample Period 3: 7/25- 7/31

	Age Class 0.2	0.3	0.4	0.5	Total
Males	0	42,224	8,995	500	51,719
Percent	0.00	38.41	8.18	0.45	47.05
Mean Length	0.00	607.38	632.08	635.50	611.95
Std. Error [1]	0.00	1.98	4.67	19.50	1.82
Sample Size	0	169	36	2	207
Females	500	48,720	8,995	0	58,215
Percent	0.45	44.32	8.18	0.00	52.95
Mean Length	590.50	590.05	600.58	0.00	591.68
Std. Error [1]	26.50	1.65	4.66	0.00	1.57
Sample Size	2	195	36	0	233
Sexes Combined	500	90,944	17,990	500	109,934
Percent	0.45	82.73	16.36	0.45	100.00
Mean Length	590.50	598.10	616.33	635.50	601.22
Std. Error [1]	26.50	1.27	3.30	19.50	1.19
Sample Size	2	364	72	2	440

Sample Period 4: 8/ 1- 8/ 7

	Age Class 0.2	0.3	0.4	0.5	Total
Males	0	49,318	8,919	525	58,762
Percent	0.00	42.63	7.71	0.45	50.79
Mean Length	0.00	618.44	638.85	672.00	622.02
Std. Error [1]	0.00	2.14	6.44	34.00	2.07
Sample Size	0	188	34	2	224
Females	0	47,219	9,706	0	56,925
Percent	0.00	40.82	8.39	0.00	49.21
Mean Length	0.00	596.07	603.41	0.00	597.32
Std. Error [1]	0.00	1.63	3.72	0.00	1.49
Sample Size	0	180	37	0	217
Sexes Combined	0	96,537	18,625	525	115,687
Percent	0.00	83.45	16.10	0.45	100.00
Mean Length	0.00	607.50	620.38	672.00	609.86
Std. Error [1]	0.00	1.35	3.64	34.00	1.28
Sample Size	0	368	71	2	441

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Appendix B - Table 4. Age, sex, and length (mm) of chum salmon from the Kotzebue Sound commercial catch, by sample period, 1985 (continued).

Sample Period 5: 8/ 8- 8/14

	Age Class 0.2	0.3	0.4	0.5	Total
Males	340	52,971	10,187	340	63,838
Percent	0.24	36.97	7.11	0.24	44.55
Mean Length	572.00	617.26	622.20	615.00	617.80
Std. Error [1]	0.00	2.61	6.73	0.00	2.44
Sample Size	1	156	30	1	188
Females	340	67,234	11,885	0	79,459
Percent	0.24	46.92	8.29	0.00	55.45
Mean Length	580.00	593.50	611.26	0.00	596.10
Std. Error [1]	0.00	1.70	4.96	0.00	1.62
Sample Size	1	198	35	0	234
Sexes Combined	680	120,205	22,072	340	143,297
Percent	0.47	83.89	15.40	0.24	100.00
Mean Length	576.00	603.97	616.31	615.00	605.76
Std. Error [1]	0.00	1.49	4.10	0.00	1.41
Sample Size	2	354	65	1	422

Sample Period 6: 8/15- 8/21

	Age Class 0.2	0.3	0.4	0.5	Total
Males	448	24,188	2,389	0	27,025
Percent	0.67	36.00	3.56	0.00	40.22
Mean Length	530.33	618.49	653.25	0.00	620.10
Std. Error [1]	6.74	2.50	6.34	0.00	2.31
Sample Size	3	162	16	0	181
Females	299	36,282	3,583	0	40,164
Percent	0.45	54.00	5.33	0.00	59.78
Mean Length	585.00	592.69	601.96	0.00	593.46
Std. Error [1]	11.00	1.64	5.16	0.00	1.56
Sample Size	2	243	24	0	269
Sexes Combined	747	60,470	5,972	0	67,189
Percent	1.11	90.00	8.89	0.00	100.00
Mean Length	552.20	603.01	622.48	0.00	604.18
Std. Error [1]	5.98	1.40	4.00	0.00	1.31
Sample Size	5	405	40	0	450

-Continued-

Appendix B - Table 4. Age, sex, and length (mm) of chum salmon from the Kotzebue Sound commercial catch, by sample period, 1985 (continued).

Sample Period 7: 8/22- 8/28

	Age Class 0.2	0.3	0.4	0.5	Total
Males	97	7,963	1,554	97	9,711
Percent	0.44	36.12	7.05	0.44	44.05
Mean Length	547.50	617.14	643.97	697.50	621.54
Std. Error [1]	12.50	2.42	7.30	12.50	2.31
Sample Size	2	164	32	2	200
Females	49	10,537	1,651	97	12,334
Percent	0.22	47.80	7.49	0.44	55.95
Mean Length	540.00	581.59	599.18	618.50	584.07
Std. Error [1]	0.00	1.75	5.30	28.50	1.68
Sample Size	1	217	34	2	254
Sexes Combined	146	18,500	3,205	194	22,045
Percent	0.66	83.92	14.54	0.88	100.00
Mean Length	545.00	596.89	620.90	658.00	600.58
Std. Error [1]	12.50	1.44	4.47	15.56	1.39
Sample Size	3	381	66	4	454

Sample Period 8: 8/29- 8/31

	Age Class 0.2	0.3	0.4	0.5	Total
Males	0	769	249	0	1,018
Percent	0.00	31.78	10.29	0.00	42.07
Mean Length	0.00	624.10	634.05	0.00	626.53
Std. Error [1]	0.00	4.16	7.04	0.00	3.59
Sample Size	0	68	22	0	90
Females	23	1,164	204	11	1,402
Percent	0.95	48.10	8.43	0.45	57.93
Mean Length	584.50	583.94	601.33	584.00	586.47
Std. Error [1]	20.50	2.37	5.31	0.00	2.16
Sample Size	2	103	18	1	124
Sexes Combined	23	1,933	453	11	2,420
Percent	0.95	79.88	18.72	0.45	100.00
Mean Length	584.50	599.91	619.33	584.00	603.32
Std. Error [1]	20.50	2.19	4.55	0.00	1.96
Sample Size	2	171	40	1	214

[1] Standard Error of the average length.

Appendix B - Table 5. Age, sex, and length (mm) of chum salmon from Kotzebue Sound commercial catch, 1985, all periods combined.

	Age Class				
	0.2	0.3	0.4	0.5	Total
Males	1,047	207,106	39,214	1,825	249,442
Percent	0.20	39.72	7.57	0.35	47.84
Mean Length	553.01	615.86	633.36	644.80	618.58
Std. Error [1]	4.81	0.81	2.03	8.88	0.75
Sample Size	9	1,358	268	11	1,646
Females	1,211	229,471	41,150	132	271,964
Percent	0.23	44.01	7.89	0.03	52.16
Mean Length	584.04	592.83	605.76	617.35	594.76
Std. Error [1]	8.82	.66	1.76	14.25	0.62
Sample Size	8	1,386	249	4	1,647
Sexes Combined	2,258	436,577	80,614	1,957	521,406
Percent	0.43	83.73	15.46	0.38	100.00
Std. Error [2]	0.86	4.87	4.77	0.81	
Mean Length	569.65	603.76	619.27	642.94	606.16
Std. Error [1]	4.87	0.52	1.35	7.54	0.49
Sample Size	17	2,744	517	15	3,293

[1] Standard Error of mean length.
[2] Standard Error of age class percent.

Appendix B - Table 6. Age, sex, and length (mm) of chum salmon escapement sample taken by modified beach seine (4 in mesh) from upper Kobuk River.

	Age Class			
	0.2	0.3	0.4	Total[1]
Males				
Percent	0.0	56.5	10.9	65.0
Mean Length	0.0	606.9	625.0	613.3
Std. Error [2]	0.0	7.3	24.3	6.7
Sample Size	0	26	5	35
Females				
Percent	0.0	30.4	2.2	35.0
Mean Length	0.0	569.3	490.0	567.2
Std. Error [2]	0.0	13.1	0.0	10.0
Sample Size	0	13	1	19
Sexes Combined				
Percent	0.0	87.0	13.0	100.0
Std. Error[3]	0.0	5.1	5.1	
Mean Length	0.0	594.4	602.5	597.4
Std. Error [2]	0.0	7.0	30.0	6.3
Sample Size	0	39	6	54

[1] Totals include fish not aged.
[2] Standard Error of average length.
[3] Standard Error of age class percent.

Appendix B - Table 7. Age, sex, and length (mm) of chum salmon escapement sample taken by modified beach seine from mainstem Noatak River, 5-7 September 1985.

	Age Class				
	0.2	0.3	0.4	0.5	Total[1]
Males					
Percent	0.5	40.0	4.7	0.5	46.2
Mean Length	710.0	638.8	661.7	695.0	641.6
Std. Error [2]	0.0	4.9	16.2	0.0	4.6
Sample Size	1	76	9	1	91
Females					
Percent	0.5	47.4	6.3	0.0	53.8
Mean Length	605.0	584.6	608.3	0.0	587.7
Std. Error [2]	0.0	2.9	14.2	0.0	3.0
Sample Size	1	90	12	0	106
Both sexes					
Percent	1.0	87.0	11.5	0.5	100.0
Std. Error [3]	0.7	2.3	2.2	0.5	
Mean Length	657.5	609.3	632.3	695.0	612.6
Std. Error [2]	52.5	3.4	11.5	0.0	45.9
Sample Size	2	167	22	1	197

[1] Totals include fish not aged.
[2] Standard Error of average length.
[3] Standard Error of age class percent.

Appendix B - Table 8. Age, sex, and length (mm) of chum salmon escapement sample from mainstem Noatak River, 17-23 September 1985[1].

	Age Class			
	0.2	0.3	0.4	Total[2]
Males				
Percent	0.2	41.7	11.3	53.3
Mean Length	635.0	637.8	658.0	641.4
Std. Error[3]	0.0	2.2	4.6	2.0
Sample Size	1	229	62	303
Females				
Percent	0.2	40.3	6.4	46.7
Mean Length	570.0	584.2	601.7	587.1
Std. Error[3]	0.0	1.9	5.4	1.8
Sample Size	1	221	35	265
Sexes combined				
Percent	0.4	81.9	17.7	100.0
Std. Error[4]	0.3	1.6	1.6	
Mean Length	602.5	611.5	637.7	616.1
Std. Error[3]	32.5	1.9	4.5	1.8
Sample Size	2	450	97	568

[1] Majority of fish taken by modified beach seine (4" mesh), remainder by 4" mesh set gill net.
[2] Totals include fish not aged.
[3] Standard Error of average length.
[4] Standard Error of age class percent.

Appendix B - Table 9. Age, sex, and length (mm) of chum salmon escapement sample taken by modified beach seine (4 in mesh) from Kelly River, 1985.

	Age Class			
	0.2	0.3	0.4	Total[1]
Males				
Percent	0.0	50.7	9.6	59.5
Mean Length	0.0	618.8	632.9	621.0
Std. Error [2]	0.0	3.4	10.5	3.3
Sample Size	0	74	14	88
Females				
Percent	0.0	32.2	7.5	40.5
Mean Length	0.0	581.3	599.1	583.8
Std. Error [2]	0.0	2.9	10.2	3.1
Sample Size	0	47	11	60
Sexes Combined				
Percent	0.0	82.9	17.1	100.0
Std. Error[3]	0.0	3.1	3.1	
Mean Length	0.0	604.2	618.0	606.0
Std. Error [2]	0.0	2.9	8.0	2.8
Sample Size	0	121	25	148

[1] Totals include fish not aged.
[2] Standard Error of average length.
[3] Standard Error of age class percent.

Appendix B - Table 10. Age, sex, and length (mm) of chum salmon escapement sample taken by modified beach seine (4 in mesh) from Squirrel River, 1985.

	Age Class			
	0.2	0.3	0.4	Total[1]
Males				
Percent	1.1	30.7	6.8	40.0
Mean Length	625.0	604.3	635.0	606.7
Std. Error[2]	0.0	4.3	8.8	25.2
Sample Size	1	27	6	40
Females				
Percent	1.1	56.8	3.4	60.0
Mean Length	530.0	570.5	580.0	572.1
Std. Error[2]	0.0	3.8	5.0	25.7
Sample Size	1	50	3	60
Sexes Combined				
Percent	2.3	87.5	10.2	100.0
Std. Error[3]	1.6	3.5	3.2	
Mean Length	577.5	582.3	616.7	585.9
Std. Error[2]	47.5	3.4	10.9	30.6
Sample Size	2	77	9	100

[1] Totals include fish not aged.
[2] Standard Error of average length.
[3] Standard Error of age class percent.

Appendix B - Table 11. Age, sex, length (mm) of chum salmon escapement sample from Salmon River, 1985[1].

	Age Class			
	0.2	0.3	0.4	Total[2]
Males				
Percent	0.0	25.3	9.7	37.0
Mean Length	0.0	598.7	625.9	605.8
Std. Error[3]	0.0	4.1	7.3	3.3
Sample Size	0	75	29	131
Females				
Percent	0.3	53.3	11.3	63.0
Mean Length	525.0	554.7	564.0	556.7
Std. Error[3]	0.0	2.1	3.6	1.8
Sample Size	1	160	34	223
Both Sexes				
Percent	0.3	78.7	21.0	100.0
Std. Error[4]	0.3	2.4	2.4	
Mean Length	525.0	568.7	592.5	574.8
Std. Error[3]	0.0	2.4	5.5	2.1
Sample Size	1	235	63	354

[1] Majority of sample taken by modified beach seine (4" mesh); remainder by carcass recovery.
[2] Totals include fish not aged.
[3] Standard Error of average length.
[4] Standard Error of age class percent.

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Appendix B - Table 12. Age, sex, and size of chum salmon escapement sample taken by modified beach seine (4 in mesh) from Kugururok River, 1985.

	Age Class			
	0.2	0.3	0.4	Total[1]
Males				
Percent	0.0	25.6	21.8	47.0
Mean Length	0.0	611.3	627.4	616.5
Std. Error [2]	0.0	7.0	8.4	4.8
Sample Size	0	20	17	47
Females				
Percent	0.0	42.3	10.3	53.0
Mean Length	0.0	571.8	590.0	574.9
Std. Error [2]	0.0	3.7	11.1	3.4
Sample Size	0	33	8	53
Sexes Combined				
Percent	0.0	67.9	32.1	100.0
Std. Error[3]	0.0	5.3	5.3	594.4
Mean Length	0.0	586.7	615.4	3.5
Std. Error [2]	0.0	4.5	7.4	
Sample Size	0	53	25	100

[1] Totals include fish not aged.
[2] Standard Error of average length.
[3] Standard Error of age class percent.

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