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AGE, SEX, AND SIZE OF NORTON SOUND AND KOTZEBUE SOUND SALMON CATCH AND ESCAPEMENT, 1984

By:

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June 1986

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Commissioner

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ABSTRACT

The 1984 commercial, subsistence, and sport harvest of the five species of Pacific salmon *(Oncorhynchus* sp.*)* found in the Norton Sound - Kotzebue Sound area are presented by age, sex, length, or fishing district along with appendices of historical performance. Peak aerial survey salmon escapement counts, side-scan sonar, and tower counts are presented for all systems enumerated. Age, sex, and length data from escapement sampling are also presented.

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 from Point Hope north of Kotzebue to Canal Point Light south of Stebbins. The Port Clarence District located within this region has been closed to commercial salmon fishing since 1966. The Norton Sound District includes all waters from Canal Point Light north to Cape Douglas (Figure 1). This district includes 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 from Point Hope to Cape Prince of Wales, but commercial salmon fishing is restricted to ocean waters north of the Baldwin Peninsula (Figure 2).

Five species of Pacific salmon *(Oncorhynchus* sp.*)* are found in the Norton Sound and Kotzebue Sound areas. In order of economic importance are chum *(O. keta)*, chinook *(O. tshawytscha)*, coho *(O. kisutch)*, pink *(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 required knowledge of certain fundamental parameters of each contributing stock. Initially, the determination of brood stock requirements needed to maintain the population is of particular importance with the result that the harvest be adequately controlled. To carry out this objective, it is necessary to accurately assess: (1) the magnitude of the removal (harvest) and its characteristics (distribution, age, sex, and size composition); and (2) the magnitude of the breeding population (spawning escapement) and its characteristics. The objective of this report is to present estimates of the age, sex, and size composition for the inshore return of salmon to the Norton Sound and Kotzebue Sound areas. Summary information is presented for each harvest and escapement population sampled. Detailed information for each fishery as to 1984 period catch, historical performance, weekly age, sex, and size information is presented in the Appendices. Results of special studies involving small populations and samples are also presented in the Appendices.

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 1984 Norton Sound-Port Clarence-Kotzebue Sound Annual Management Report (in prep). Historical escapement data are 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 and Peterson 1985), the Kwiniuk River (Lean 1985a), North River (Lean 1985b), the Squirrel River (Dinnocenzo 1984), and the Noatak River (Mesiar 1984; Bigler 1985a). A summary of 1983 salmon catch and escapement information collected in the Norton Sound-Kotzebue Sound areas is provided by Lean, et al. (1984). Age, sex, and size data prior to 1983 were presented in the report series, ADF&G Arctic-Yukon-Kuskokwim Region Age, Sex, and Size Composition of Salmon and by Bigler (1985b).

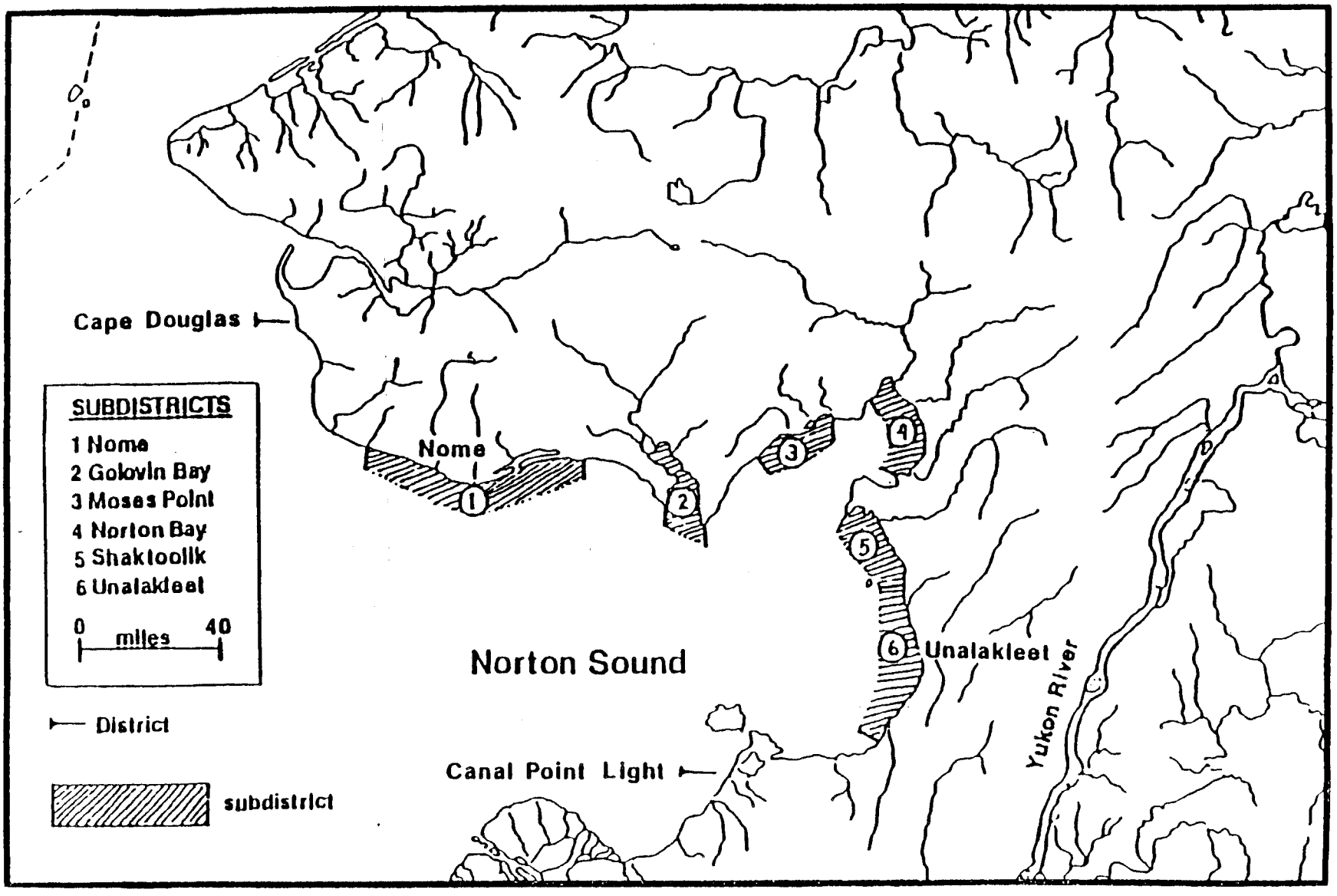

Figure 1. Norton Sound commercial salmon fishing subdistricts.

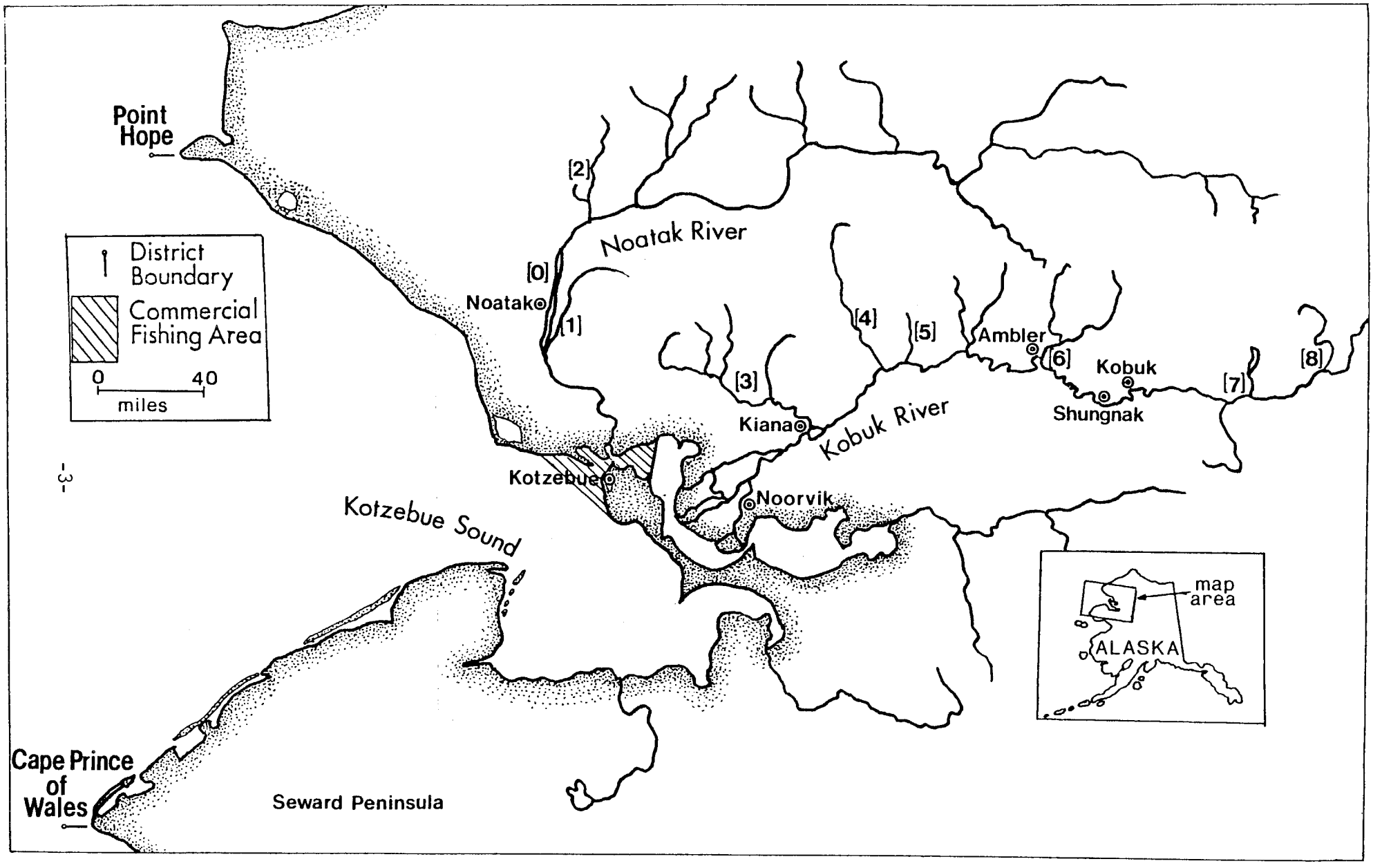

Figure 2. Kotzebue Sound commercial salmon fishing district and major chum salmon spawning index areas on the Noatak and Kobuk Rivers: (0) - Noatak River, (1) - Eli River, (2) - Kelly Lake and Creek, (3) - Squirrel River, (4) - Salmon River, (5) - Tutuksuk River, and combined to represent the upper Kobuk River, (6) - Ambler River, (7) - Selby Slough and, (8) - Beaver Creek.

METHODS

Abundance Data

The commercial catch data presented in this report were compiled from harvest receipts (fish tickets) which document each sale by a licensed fisherman. These data are entered into a microcomputer during the commercial fishing season in the Nome and Kotzebue area offices and are preliminary. Keying errors or late arriving tickets may change the figures slightly in later reports.

Subsistence catches are not monitored as closely as commercial catches in the Norton Sound-Kotzebue Sound area. Three methods of data collection are generally employed: (1) personal and 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, and (3) a permit is required in the Nome subdistrict with catch limits for each permit. Irrespective of which data collection method is used, each has inherent and unavoidable sources of error. When personal interviews are used, it is assumed that fishermen can accurately recall the harvest, which may have occurred over several weeks. Usually less than 5% of all subsistence catch calendars are returned. All methods only document the subsistence harvest of known or available fishermen and should be considered a minimum estimate only.

Sport fishing for salmon is monitored by the ADF&G, Division of Sport Fish. The sport salmon catch was estimated from postal surveys which consist of repeated mailing of questionnaires to random samples of Alaska sport fishing license holders by the Division of Sport Fish.

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 have the potential for use in annual or interdrainage comparison of escapement. Two sonar, and two counting tower escapement enumeration projects also operated in the area in 1984. Sonar counts provide an alternative index of escapement for turbid or large drainages that are difficult to count visually. Counting towers provide the most exact count of escapement. Both sonar and counting towers provide data concerning migratory timing.

Age, Sex, and Size Data Collection

Sampling goals for age, sex, and size composition of salmon returning to the Norton Sound-Kotzebue Sound area in 1984 involved techniques similar to those used in 1983 (Lean et al. 1984). Chum salmon which comprise the bulk of the commercial catch, were sampled in the Kotzebue District and in two subdistricts of Norton Sound and coho salmon in one. Salmon escapements were sampled in conjunction with enumeration projects (i.e., sonar projects, counting towers, and test fisheries) or on the spawning grounds. Subsistence and sport chinook salmon catches on the Unalakleet River were also sampled in 1984.

All salmon were sampled for age, sex, and length (mideye to fork of tail, in millimeters). Several chum salmon were further sampled for weight, in grams, on the Unalakleet River. Sex was determined by either internal examination of gonads for dead fish, or external morphology on live fish. External characteristics include snout, vent, body symmetry, and occasional appearance of milt or eggs. Scales were taken from the left side approximately two scale rows above the lateral line and on the diagonal from the posterior insertion of the dorsal fin to the leading edge of the anal fin. Scales were mounted on gum cards and impressions made in cellulose acetate. Ages were reported in Gilbert-Rich notation: the first digit refers to the total age, the second digit, normally subscripted, refers to the freshwater age, leaving the difference between the two digits as the marine age. In many computer-derived tables the second digit is not subscripted.

Sample Size

Mininum sample size goals for temporal stratification were derived for each species of interest (Brannian and Arvey 1984). The objective was to obtain an estimated proportion by age class at a 10% level of significance (for a 90% confidence interval) with a 0.05 level of accuracy. This resulted in a stratum sample size goal for readable scales of 502 chinook salmon with three major age classes, 450 for chum salmon with two major age classes, and 247 for coho salmon with one major age class. 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. Therefore, conclusions, valid in the above mentioned levels, can be drawn, for example, concerning coho salmon from any time frame where a minimum of 247 samples were taken. In cases where the total number of samples collected was less than the goal, data were pooled into fewer strata and a standard error presented.

This report is a synopsis of the 1984 inshore return of salmon to the Norton Sound-Kotzebue Sound area. It presents the commercial salmon catch by subdistrict and fishing period or week. Length, age, and sex of commercial catch samples were extrapolated to the commercial catch by age and sex. Escapement indices are tabulated and escapement samples used to estimate the sex and age composition of specified drainages. Data are presented in summarized form in the body of this report, with more detailed tables given in Appendix A - Norton Sound, and Appendix B - Kotzebue Sound.

RESULTS

Norton Sound

The commercial, sport, and subsistence harvests; escapement abundance; and biological sampling; i.e., age, sex, and size for Norton Sound follows.

Commercial, Sport, and Subsistence Harvest:

Commercial harvest in the Norton Sound District totaled 8,453 chinook; 146,442 chum; 119,381 pink; 67,875 coho; (Tables 1 through 4, respectively) and 6 sockeye salmon. The chinook salmon harvest was taken predominately in the Unalakleet

Table 1. Commercial harvest of chinook salmon in Norton Sound by subdistrict, 1984.

	Subdistrict						
Inclusive Dates	1	2	3	4	5	6	Total
6/21-6/22		4					4
6/25-6/27		17			169	843	1029
6/28-6/30		9			515	2531	3055
7/02-7/04	2				574	2627	3203
7/05-7/07						222	222
7/09-7/11	2				250	314	566
7/12-7/14					85	100	185
7/16-7/18					5	66	71
7/19-7/21						24	24
7/23-7/25					7	13	20
7/26-7/28					2	12	14
7/30-8/01						4	4
8/02-8/05					1	7	8
8/06-8/08					3	5	8
8/09-8/11	1	1			1	7	10
8/13-8/15						5	5
8/16-8/19						4	4
8/20-8/22						3	3
8/23-8/25						3	3
8/27-8/29					1	3	4
8/30-9/01						5	5
9/03/9/05						3	3
9/06-9/08						3	3
Total	5	31	0	0	1613	6804	8453

Table 2. Commercial harvest of chum salmon in Norton Sound by subdistrict, 1984.

	Subdistrict						
Inclusive Dates	1	2	3	4	5	6	Total
6/21-6/22		1559					1559
6/25-6/27		15998			431	3167	19596
6/28-6/30		10185			4087	4255	18527
7/02-7/04	1593				7308	6266	15167
7/05-7/07						325	325
7/09-7/11	326	2893	5272		4966	4425	17882
7/12-7/14	1119	10174	2115	277	5051	3491	22227
7/16-7/18		9301	1096	413	430	5800	17040
7/19-7/21	74	1953	366		511	3966	6870
7/23-7/25	609	1999	499	975	2591	1745	8418
7/26-7/28		57		715	2027	2331	5130
7/30-8/01				1062	154	1884	3100
8/02-8/05					1792	2056	3848
8/06-8/08			15		758	568	1341
8/09-8/11	23	31	50		1421	1240	2765
8/13-8/15		3	4		264	386	657
8/16-8/19			49		234	594	877
8/20-8/22			11		133	203	347
8/23-8/25					127	171	298
8/27-8/29					24	147	171
8/30-9/01						139	139
9/03/9/05						100	100
9/06-9/08						58	58
Total	3744	54153	9477	3442	32309	43317	146442

Table 3. Commercial harvest of coho salmon in Norton Sound by subdistrict, 1984.

	Subdistrict						
Inclusive Dates	1	2	3	4	5	6	Total
7/09-7/11						3	3
7/12-7/14					8	15	23
7/16-7/18					1	158	159
7/19-7/21					46	441	487
7/23-7/25	144				731	704	1579
7/26-7/28					327	2483	2810
7/30-8/01					179	3167	3346
8/02-8/05					1959	9464	11423
8/06-8/08	107		609		2072	5702	8490
8/09-8/11	436	1174	1780		2013	4846	10249
8/13-8/15		1058	956		475	2869	5358
8/16-8/19		230	1338		753	5636	7957
8/20-8/22			1276		957	1638	3871
8/23-8/25	39				942	2922	3903
8/27-8/29	94				267	2821	3182
8/30-9/01						2497	2497
9/03/9/05						1823	1823
9/06-9/08						715	715
Total	820	2462	5959	0	10730	47904	67875

Table 4. Commercial harvest of pink salmon in Norton Sound by subdistrict, 1984.

	Subdistrict						
Inclusive Dates	1	2	3	4	5	6	Total
7/09-7/11		11999	6784		1596		20379
7/12-7/14		30242	11626				41868
7/16-7/18		19392	5700				25092
7/19-7/21		8100	1636				9736
7/23-7/25		11809	2289	294			14392
7/26-7/28		268		769			1037
7/30-8/01				99			99
Total	0	81810	28035	1162	1596	0	112603

(6) and Shaktoolik (5) subdistricts from 25 June to 4 July (Table 1). Most participants in these fisheries target chinook salmon using 210 mm (8-1/4 in) stretched mesh set gill nets. In all other subdistricts the landing of chinook salmon is incidental to the taking of chum salmon using 149 mm (5-7/8 in) stretched mesh set gill nets. The 1984 chum salmon harvest was 26% below the recent 5-year average of 198,812 and 21% below the recent 10-year average of 185,450 (Appendix Table A-1). The harvest of chum salmon was high at the onset of fishing in the last week of June (Table 2) and was maintained through July. In the Shaktoolik and Unalakleet subdistricts, there is a gradual (not mandatory) change over to smaller mesh (149 mm or 5-7/8 in) gill nets which is more efficient in the capture of chum salmon. The harvest of coho salmon was taken predominately in the Shaktoolik and Unalakleet subdistricts (Table 3) peaking in the month of August. The 1984 district-wide harvest (Appendix Table A-1) was 45% greater than the recent 5-year average of 46,853 and 262% greater than the recent 10-year average of 25,891 (Appendix Table A-1). The 1984 season was an even-year cycle of pink salmon returns and the commercial harvest of 112,603 (Table 4) was only exceeded by that of chum salmon.

Subsistence harvest information was collected from two subdistricts (Nome and Unalakleet) and totaled 1,733 chinook, 8,225 chum, 34,600 pink, 8,470 coho, and 17 sockeye salmon (Table 5). 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 documented minimum. In general the subsistence harvest is taken in rivers using set gill nets and occasionally seines to catch chum and pink salmon. The sport harvest (Table 6) totaled 247 chinook, 1,481 chum, 8,322 pink, and 7,582 coho salmon (Mills 1985).

Escapement Abundance:

Escapement goals for Norton Sound index streams are based on average historic peak aerial surveys rated "Fair" or "Good" (Appendix Table A-2). Due to the even-year pink salmon cycle, large numbers of pink salmon in Norton Sound streams masked chinook and chum salmon populations from aerial surveyors. In many streams the chum salmon index is low and in others, such as the Fish River, no chum salmon estimates were possible due to overwhelming numbers of pink salmon. The Unalakleet drainage was not surveyed due to poor weather and turbid water. A counting tower on the Kwiniuk River, in the Moses Point subdistrict, provided escapement estimates of 736 chinook, 54,043 chum, and 736,544 pink salmon (Table 7). A counting tower on the North River, in the Unalakleet subdistrict, estimated 2,844 chinook, 2,915 chum, and 458,387 pink salmon escapement (Table 7).

Age, Sex, and Length Composition:

In 1984 commercial catch samples were collected in two subdistricts. Chinook salmon from the Unalakleet subdistrict were sampled from the commercial fishery, test fishing project, sport harvest, and spawning grounds. Samples from the commercial fishery were predominantly 6_2 age but the test fish samples favored 5_2 age fish (Table 8). Chum salmon from the Unalakleet subdistrict were predominantly age 4_1 fish with 64% and 74% age 4_1 fish in test net and the commercial catches, respectively (Table 9). Age information is missing from 59 samples collected in Moses Point subdistrict (3) (Table 9). Coho

Table 5. Norton Sound subsistence salmon catches, 1984.

Subdistrict	Village	Number of Fishermen Interviewed	Chinook	Sockeye	Coho	Pink	Chum
1 (1)	Nome	138	83	16	1,795	17,182	4,883
2	White Mountain	(2)					
3	Council	(2)					
4	Koyuk	(2)					
5	Shaktoolik	(2)					
6	Unalakleet						
	River	71	1,089	1	6,640	17,330	3,171
	Ocean	14	561	0	35	88	171
	Total	73	1,650	1	6,675	17,418	3,342
	St. Michaels	(2)					
	Totals	211	1,733	17	8,470	34,600	8,225

(1) Data collected from returned permits.
(2) Not surveyed.

Table 6. Norton Sound area sport harvest of salmon, 1984.

Area/River	Chinook	Coho	Pink	Chum
Norton Sound Marine	65	1,480	1,518	792
Unalakleet River	39	779	117	117
Nome River	13	2,648	4,128	325
Other Streams	130	2,675	2,559	247
Total	247	7,582	8,322	1,481

Table 7. Peak aerial survey counts of Norton Sound index streams, 1984.

Subdistrict	Stream	Date 1/	Survey Rating 2/	Chum	Pink	Chinook	Coho
Nome (1)	Bonanza	6/28	Good	—	2,410 3/	—	—
	Cripple	7/12	Good	—	29,100 3/	—	—
	Eldorado	7/11	Good	4,361 5/	1,924,935 5/ 7/	14 7/	261
	Flambeau	7/26	Good	3,150 5/	20,200 5/	1 5/	—
	Nome	7/10	Fair	2,084 6/	178,870 3/	8 6/	839
	Penny	7/12	Good	—	56,100 3/	—	—
	Sinuk	7/27	Fair	493 6/	284,400 6/	7 6/	192
	Snake	7/12	Good	—	32,160 3/	1	921
Golovin (2)	Boston	7/11	Good	—	47,850 3/	35	—
	Casadepaga	9/07	Good	—	—	—	736
	Fish	7/11	Good	—	293,245 3/	42	—
	Niukluk	7/11	Good	—	57,208 3/	6	998
	Ophir	9/07	Good	—	—	—	1,338
Moses Point (3)	Kwinuik 4/	6/18-7/25	Good	54,043	736,544	736	983
	Tubutulik	7/11	Good	56,210	93,600	139	—
Norton Bay (4)	Ungalik	7/13	Good	220	85,040 3/	2	—
Shaktoolik (5)	Shaktoolik	7/13	Fair-Poor	425	28,735	131	—
Unalakleet (6)	Unalakleet System:						
	Main River	9/07	Fair	300	—	—	1,272
	North 4/	6/25-7/24	Good	2,915	458,387	2,844	152 8/
	Old Woman	9/07	Fair	—	—	—	512
	System Total			3,215	458,387	2,844	1,936
South of Norton Sound:							
	Kogok	7/11	Poor	—	300 3/	12	406
	Pikmiktalik	7/11	Good	7,360	6,590	24	3,515

1/ Date of the peak chum salmon survey.
2/ Overall effectiveness of survey: timing, weather, and water conditions.
3/ Large number of pink salmon made species identification difficult; probably includes chum.
4/ Tower count.
5/ Helicopter count.
6/ Boat survey.
7/ Foot survey.
8/ Aerial survey count; not tower count.

Table 8. Age composition (in percent) of chinook salmon from the Unalakleet subdistrict, 1984.

	Unalakleet River Test Fishing Project			Escapement		Ocean Harvest	
Sex/Age(1)	133mm Drift Gill Net	149mm Set Gill Net	210mm Set Gill Net	Carcass	Sport Fishery	Subsistence Fishery	Commercial Fishery
Males	50.0	75.0	47.5	50.0	80.0	51.7	51.2
32							0.7
42		7.5	1.6			1.7	4.9
52	25.0	50.0	32.8	30.8	40.0	22.4	22.9
62	25.0	15.0	11.5	15.4	40.0	27.6	20.7
63		2.5		3.8			0.7
72							0.4
73			1.6				0.9
Females	50.0	25.0	52.5	50.0	20.0	48.3	48.8
32							
42							0.9
52	25.0	7.5	19.7	11.5		6.9	8.5
62	25.0	17.5	27.9	34.7	20.0	41.4	36.1
63							0.2
72			1.6	3.8			2.7
73			3.3				0.4
Both Sexes							
32							0.7
42		7.5	1.6			1.7	5.8
52	50.0	57.5	52.5	42.3	40.0	29.3	31.4
62	50.0	32.5	39.4	50.1	60.0	69.0	56.8
63		2.5		3.8			0.9
72			1.6	3.8			3.1
73			4.9				1.3
Sample Size	4	40	61	26	14	5	445

(1) Gilbert-Rich formula: the first digit refers to the total age, the second digit, normally subscripted, refers to the freshwater age, leaving the difference between the two digits as the marine age. In some computer-derived tables the second digit is not subscripted.

Table 9. Age composition (in percent) of chum salmon from the Norton Sound District, 1984.

	Unalakleet Subdistrict					Moses Point Subdistrict (2)
	Commercial Catch by Statistical Period			Test Fishing Project		
Sex/Age(1)	1 7/7-7/13	2 7/16-7/20	3 7/24-7/28	149mm Set Net	210mm Set Net	Commercial Fishery
Males	47.8	52.6	50.7	53.7	75.3	57.6
31	0.4		2.7	0.7		
41	33.6	42.7	35.3	34.3	26.0	
51	11.8	9.5	11.3	16.7	42.8	
61	2.0	0.4	1.4	2.0	6.5	
Females	52.3	47.4	49.3	46.3	24.7	42.4
31	0.6		0.7	0.2		
41	34.7	33.7	38.6	29.6	11.7	
51	16.0	13.0	8.0	15.7	13.0	
61	1.0	0.7	1.4	0.8		
Both Sexes						
31	1.0		3.4	0.9		
41	68.3	76.4	73.9	63.9	37.7	
51	27.8	22.5	19.9	32.4	55.8	
61	3.0	1.1	2.8	2.8	6.5	
Sample Size	800	285	292	592	69	59

(1) Gilbert-Rich formula: the first digit refers to the total age, the second digit, normally subscripted, refers to the freshwater age, leaving the difference between the two digits as the marine age. In some computer-derived tables the second digit is not subscripted.
(2) Age data missing.

salmon from the Unalakleet subdistrict were sampled from both the commercial and the test net catch. Test net samples were 59% and the commercial catch 55% age 4_3 salmon (Table 10). Detailed presentation of age, sex, and length data from Norton Sound chinook salmon sampled in 1984 is contained in Appendix Tables A-3 through A-9; chum salmon statistics in Appendix Tables A-10 through A-13, and coho salmon statistics in Appendix Table A-14.

Kotzebue Sound

The commercial, sport, and subsistence harvests; escapement abundance; and biological sampling of salmon; i.e., age, sex, and length for Kotzebue Sound follows.

Commercial, Sport, and Subsistence Harvest:

The 1984 commercial harvest of salmon in the Kotzebue District totaled 320,206 chum and 107 chinook salmon (Table 11). The harvest was taken using set gill nets of 140 mm (5-1/2 in) to 152 mm (6 in) stretched mesh, and up to 274 mm (150 fm) in length. The 1984 commercial chum salmon harvest was 45% above the recent 22-year average and second lowest since 1979 (Appendix Table B-1). Chum salmon catches peaked at 66,477 during the first 48-hour commercial fishing period (2-4 August) with a relatively rapid decline thereafter (Table 11). Low harvest and CPUE necessitated the premature closure of the 1984 season by emergency order on 22 August. The relatively rapid decline in both catch and CPUE following the first week in August also occurred in the 1983 season (Lean et al. 1984).

Of five villages on the Kobuk River household surveys were conducted in Shungnak and Ambler for estimates of subsistence harvest (2,990 Ambler and 4,241 Shungnak, Table 12). An estimated 6,049 chum salmon were harvested by Noatak Village subsistence fishermen but is not included in the estimated region-wide chum salmon return because subsistence fishing in that village occurs after Department personnel have conducted aerial escapement surveys. The inclusion of Noatak Village subsistence harvest in an estimate of total annual return would constitute double counting (Appendix Table B-1). An adjusted region-wide estimate of 15,508 subsistence harvest is based on extremely limited data and is considered an incomplete estimate. The estimated sport fish harvest was 312 chum salmon (Mills 1985).

Escapement Abundance:

The Kobuk and Noatak River systems provide the majority of spawning habitat for Kotzebue Sound salmon. A revised sonar program was initiated on the Noatak River in 1984 which indexed a total of 45,564 chum salmon in 1984 (Mesiar 1984). A counting tower was operated on the Squirrel River to provide inseason assessment of escapement. Due to unusually high water conditions which prevailed through the season counting was not possible and the project terminated prematurely (Dinnocenzo 1984). Unlike the Kobuk River, few chum salmon spawn in tributaries of the Noatak River and most spawning occurs in the main river downstream (and inclusive) of the Kelly River (Figure 2). Aerial surveys are conducted for estimates of chum salmon spawning escapement in both the Noatak and Kobuk River systems (Appendix Table B-2). Surveys of Noatak River spawn-

Table 10. Age composition of coho salmon from the Unalakleet subdistrict, 1984.

	Test Fishing Project	
Sex/Age(1)	149mm Set Gill Nets	Commercial Catch
Males	50.7	61.4
32	13.7	13.7
43	31.3	36.6
54	5.7	11.1
Females	49.3	38.6
32	15.0	12.4
43	28.1	18.3
54	6.2	7.8
Both Sexes		
32	28.7	26.1
43	59.4	54.9
54	11.9	19.0
Sample Size	227	153

(1) Gilbert-Rich formula: the first digit refers to the total age, the second digit, normally subscripted, refers to the freshwater age, leaving the difference normally subscripted, refers to the freshwater age, leaving the difference between the two digits as the marine age. In some computer-derived tables the second digit is not subscripted.

Table 11. Commercial harvest of salmon in the Kotzebue District, 1984.

Inclusive Dates	Hours Fished	Number of Boats	Catch	
			Chum	Chinook
7/9-7/10	24	12	482	
7/12-7/13	24	30	2,334	
7/16-7/17	24	93	10,255	1
7/19-7/20	24	120	22,145	2
7/23-7/24	24	137	22,573	9
7/26-7/27	24	151	39,951	6
7/30-8/1	36	107	14,001	7
8/2-8/4	48	160	66,477	24
8/6-8/8	48	161	52,943	19
8/9-8/11	48	167	42,362	20
8/13-8/15	48	156	28,149	8
8/16-8/18	48	135	14,287	4
8/20-8/22	48	85	4,247	7
Total	468	181	320,206	107

Table 12. Subsistence harvest of chum salmon in the Kotzebue District, 1984.

Village	Chum Harvest(1)
Noorvik	(2)
Kiana	(2)
Ambler	2,990
Shungnak	4,241
Kobuk	(2)
Total Kobuk River	7,231
Total Noatak Village/River	6,049
Kotzebue	88
Deering	1,940
Kivalina	200
District Total	15,508

(1) During 1984 household surveys were conducted in Noatak, Kivalina, Deering, Ambler, and Shungnak only. Other harvest information is from the limited return of mail-in calendars. Harvest data should be considered a minimum only.
(2) Not surveyed.

ing areas were conducted under favorable conditions and the estimated escapement of 76,399 (Table 13) is 17% below the observed average of 89,755 fish (Appendix Table B-3). Chum salmon spawn throughout the Kobuk River system. Peak aerial survey counts of primary index spawning areas of the Kobuk River were 10,621 main stem (upper river) spawners, 5,473 Squirrel River, 1,471 Salmon River, and 1,132 Tutuksuk River chum salmon. Counts from all Kobuk River spawning grounds (Table 13) were below observed averages (Appendix Table B-3). Aerial surveys were also conducted on the Wulik (2,922) and Inmachuk (13,297) Rivers (Table 13) in association with commercial fishery feasibility studies (Kneupfer 1984a and 1984b).

Age, Sex, and Length Composition:

In 1984 chum salmon were sampled from the commercial catch and numerous spawning areas. Temporal changes in age composition and average body size were present in the commercial samples. Age 5 chum salmon comprised more than 33% of sample period one and dropped to only 8% by period four. Conversely, age 3 fish increased from just over 2% to over 32% between sample periods one and four (Table 14). The average length of all samples combined declined 23.5 mm from a 606.6 mm in sample period one to 583.1 mm in period four (Appendix Table B-4). Changes in age and length was also evident when comparing samples by commercial fishing period (Appendix Table B-5). Overall, age 4 comprised 65% of the commercial sample and was the major age class in all escapement samples (Table 15). The Noatak River sample was 64% age 4 and the lower and upper Kobuk River 62% and 46%, respectively (Table 15). Noatak River age, sex, and length values (Appendix Table B-6) for 1984 are based on combined samples collected from 149 mm (5-7/8 in) mesh monofilament gill nets operated at the test fishing project (Appendix Table B-7) and beach seining from spawning grounds by Sikusuilaq Springs Hatchery personnel (Appendix Table B-8). Samples were also collected from 149 mm (5-7/8 in) mesh multifilament gill nets (Appendix Table B-9) and 102 mm (4 in) mesh monofilament gill nets (Appendix Table B-10) operated at the test fishing project, and a 149 mm mesh multifilament net operated for subsistence purposes (Appendix Table B-11). Samples taken from the spawning grounds were collected using the least size selective gear and are the best representation of age, sex, and size of escapement; these data were combined with that of 149 mm monofilament gear as chi square analysis indicates a strong similarity in age composition ($0.50 \geq P \geq 0.25$) (Bigler 1985a). The 1984 season total age composition of chum salmon was estimated to be 15% age 3, 64% age 4, 20% age 5, and 1% age 6 (Table 15, Appendix Table B-12). One age 7 fish was sampled at the Noatak River test fishing project (Appendix Table B-10) and one was sampled on the Squirrel River (Appendix Table B-13) representing the second occurrence in the 23-year history of the fishery of this rare age class (Bigler 1985b). In general, females are smaller than males for a given age and both show an increase in mean length with age (Table 16). See Appendix B-14 and B-15 for specific sample size, length, and age compositions of Salmon River and Beaver Creek escapement samples.

Table 13. Peak aerial survey escapement estimates of chum and pink salmon in the Kotzebue District, 1984.

River	Chum Salmon	Pink Salmon
Noatak River System		
Noatak River (below Kelly River)	67,873	0
Eli River	5,027	0
Kelly River and Lake	3,499	0
Total	76,399	0
Kobuk River System		
Main Kobuk River		
Mouth to Kobuk Village	—	—
Kobuk to Pah River	402	448
Pah River to Selby River	257	411
Selby River	—	—
Selby River to Beaver River	5,910	1,745
Beaver River	—	—
Main Kobuk Total	10,621	2,604
Squirrel River	5,473	478
Salmon River	1,471	0
Tutuksuk River	1,132	0
Kobuk River System Total	18,697	3,082
Fish Creek(1)	0	910
Inmachuk River(2)	13,297	941
Wulik River(3)	2,922	102

(1) Drains into Hotham Inlet
(2) Northern Seward Penninsula near Deering.
(3) Empties into the Bering Sea near Kivalina.

Table 14. Age and sex summary of Kotzebue Sound commercial set gill net catch of chum salmon, by statistical sampling period, 1984. All percents rounded to the nearest tenth, numbers are calculated using more digits than shown. Sum of age numbers may not equal indicated totals due to rounding.

Sex/	1 7/9-7/20		2 7/23-8/4		3 8/6-8/11		4 8/13-8/20		Total	
Age	Percent	Numbers	Percent	Numbers	Percent	Numbers	Percent	Numbers	Percent	Numbers
Males	52.7	15,559	52.1	74,504	48.0	45,746	40.8	19,046	49.4	154,855
31	1.4	493	4.0	5,720	12.2	11,627	14.5	6,769	7.7	24,609
41	36.9	12,995	36.6	52,338	26.3	25,065	21.9	10,224	31.4	100,622
51	13.0	4,578	10.9	15,587	9.0	8,577	3.7	1,727	9.5	30,469
61	1.4	493	0.6	858	0.5	477	0.7	327	0.7	2,155
Sample Size	260		249		208		188		905	
Females	47.3	16,657	47.9	68,498	52.0	49,559	59.2	27,636	50.7	162,350
31	0.8	282	2.9	4,147	7.9	7,529	17.8	8,310	6.3	20,268
41	24.1	8,487	32.2	46,047	37.6	35,835	36.9	17,226	33.6	107,595
51	20.1	7,078	12.1	17,303	6.0	5,718	4.3	2,007	10.1	32,106
61	2.2	775	0.6	858	0.5	477	0.2	93	0.7	2,203
Sample Size	233		229		225		273		960	
Both Sexes	100.0	35,216	100.0	143,002	100.0	95,305	100.0	46,683	100.0	320,206
31	2.2	775	6.9	9,867	20.1	19,156	32.3	15,079	14.0	44,877
41	61.1	21,517	68.8	98,385	64.0	60,995	58.8	27,450	65.1	208,345
51	33.1	11,656	23.0	32,890	15.0	14,296	8.0	3,735	19.6	62,577
61	3.7	1,303	1.3	1,859	0.9	858	0.9	420	1.4	4,440
Sample Size	493		478		433		461		1,865	

Table 15. Summary of total chum salmon return to the Kotzebue District by age, sex, and collection site, 1984.

Sex/ Age	Commercial Catch(1) Percent	Commercial Catch(1) Numbers	Noatak River Escapement(2) Percent	Noatak River Escapement(2) Numbers	Lower Kobuk Escapement(3) Percent	Lower Kobuk Escapement(3) Numbers	Upper Kobuk Escapement(4) Percent	Upper Kobuk Escapement(4) Numbers	Total Return Percent	Total Return Numbers
Males	49.4	157,855	53.4	40,797	50.1	4,046	56.1	5,958	50.2	208.656
31	7.7	24,609	7.9	6,035	5.4	436	14.6	1,551	7.9	32.631
41	31.4	100,622	33.2	25,364	30.1	2,431	24.4	2,591	31.6	131,003
51	9.5	30,469	11.1	8,480	12.4	1,001	17.1	1,816	10.1	41,766
61	0.7	2,155	0.5	382					0.6	2,537
Sample Size	905		327		223		23		1,478	
Females	50.7	162,350	46.6	35,601	49.9	4,030	43.9	4,663	49.8	206,644
31	6.3	20,268	6.5	4,966	8.8	711	12.2	1,296	6.6	27,241
41	33.6	107,595	30.7	23,454	31.5	2,544	24.4	2,592	32.8	136,185
51	10.1	32,106	8.9	6,800	9.4	759	7.3	775	19.7	40,440
61	0.7	2,203	0.7	535					0.7	2,738
Sample Size	960		289		222		19		1,490	
Both Sexes (5)		320,206		76,399		8,076		10,621		415,302
31	14.0	44,877	14.5	11,001	14.2	1,147	35.2	3,739	14.6	60,764
41	65.1	208,345	64.2	48,818	61.6	4,975	46.1	4,896	64.3	267,034
51	19.6	62,577	20.2	15,280	21.8	1,761	18.7	1,986	19.7	81,604
61	1.4	4,440	1.1	917	2.3	186			1.3	5,543
Sample Size	1,865		616		445		193		3,119	

(1) Commercial catch taken by 149mm (5 7/8") to 152mm (6") mesh set gill nets.
(2) Noatak River escapement based on pooled results from 149mm (5 7/8") mesh monofilament gill nets operated at the Noatak River sonar project and beach seine operated on Noatak River spawning grounds (Appendix B Table 6).
(3) Squirrel, Salmon and Tutuksuk Rivers; ages based on sagital otolith and scale samples from Squirrel (n=354) and Salmon (n=91) Rivers.
(4) Combined escapement index areas of the upper Kobuk River. Sex samples from scales collected at Beaver Creek (n=42). Age structure for both sexes (sex/size data not collected) is based on scales collected from Selby Slough (n=99) and Beaver Creek (n=94).
(5) Total of sexes combined does not equal sum of individual sexes due to rounding.

Table 16. Mean length of chum salmon in selected Kotzebue catch and escapement samples, 1984.

	Commercial Catch(1)	Noatak River(2)	Salmon River(3)	Squirrel River(3)	Beaver Creek(3)
Males	608.1	595.9	612.3	631.7	610.2
31	574.8	569.2	562.5	589.6	585.0
41	607.7	603.2	597.1	631.9	611.0
51	635.2	626.1	625.0	647.9	630.7
61	636.9	628.0	655.0	689.6	
71				630.0	
Females	586.5	581.6	558.9	585.0	558.3
31	561.2	559.4	523.8	555.3	546.0
41	584.9	577.2	556.3	590.2	557.0
51	605.2	610.2	573.3	601.3	583.3
61	620.5	622.8		605.0	
71					
Both Sexes	597.0	593.2	583.5	608.9	587.4
31	568.3	564.4	536.7	568.6	567.3
41	595.9	591.0	572.1	611.5	584.0
51	619.0	619.1	600.8	628.6	616.5
61	628.2	625.0	655.0	675.5	
71				630.0	

(1) Gill net catches from 149mm (5 7/8") to 152mm (6") gear.
(2) Pooled samples from 149mm (5 7/8") monofilament gear operated at test fishing project and beach seine operated by Sikusuilaq Springs Hatchery personnel.
(3) Collected by beach seine on spawning grounds.

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APPENDICES

Appendix Table A-1. Commercial and subsistence salmon catches by species, for the Norton Sound District, 1961-1984.

	Commercial					Subsistence				Combined				
Year	Chinook	Sockeye	Coho	Pink	Chum	Chinook	Coho	Pink	Chum	Chinook	Sockeye	Coho	Pink	Chum
1961	5300	35	13807	34327	48332	--	--	--	--	5300	35	13807	34327	48332
1962	7286	18	9156	33187	182784	--	--	--	--	7286	18	9156	33187	182784
1963	6613	71	16765	55625	154789	5	118	16607	17635	6618	71	16883	72232	172424
1964	2018	126	98	13567	148862	565	2567	9225	12486	2583	126	2665	22792	161348
1965	1449	30	2030	220	36795	574	4812	19131	30772	2023	30	6842	19351	67567
1966	1553	14	5755	12778	80245	269	2210	14335	21873	1822	14	7965	27113	102118
1967	1804	--	2379	28879	41756	817	1222	17516	22724	2621	--	3601	46395	64480
1968	104	--	6885	71179	45300	237	2391	36912	11661	1282	--	9276	108091	57051
1969	2392	--	6836	86949	82795	436	2191	18562	15615	2828	--	9027	105511	98410
1970	1853	--	4423	64908	107034	561	4675	26127	22763	2414	--	9098	91035	129797
1971	2593	--	3127	4895	161362	1026	4097	10863	21815(1)	3619	--	7224	15758	153177
1972	2938	--	454	45182	100920	804	2319	14158	13966(2)	3742	--	2773	59340	114886
1973	1918	--	9282	46499	119098	392	520	14770	7185	2310	--	9802	61269	126283
1974	2951	--	2092	148519	162267	420	1064	16426	3958	3371	--	3156	164945	166225
1975	2393	2	4593	32388	212485	186	192	15803	8124(3)	2579	2	4785	48191	220609
1976	2243	11	6934	87919	95956	203	1004	18048	7718	2446	11	7938	105964	103674
1977	4500	5	3690	48675	200455	846	2530	14296	26607	5346	5	6220	62971	227062
1978	9819	12	7335	325503	189279	1211	2981	35281	12257	11030	12	10316	360784	201536
1979	10706	57	31438	167411	140789	747	8487	25247	11975	11453	57	39925	192658	152764
1980	6311	40	29842	227352	180792	1397	8625	63778	19622	7708	40	38467	291130	200414
1981	7929	56	31562	232479	169708	2021	13416	28741	32866	9950	94	44978	261220	202574
1982	5892	10	91690	230281	183335	1328	17874	56295	23185	220	18	109564	286576	206520
1983	10308	27	49735	76913	319437	(6)								
1984	8455	6	67875	119381	146442	(6)								
5-Yr Avg. (4)	8229	38	46853	186887	198812									
10-Yr Avg. (5)	6305	22	25891	157744	185450									

(1) Includes 197 recorded sockeye salmon in all subdistricts.
(2) Includes 93 recorded sockeye salmon in all subdistricts.
(3) Includes 11 recorded sockeye salmon in all subdistricts.
(4) 1979-1983.
(5) 1974-1983.
(6) Subsistence surveys not conducted in all subdistricts.

Appendix Table A-2. 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	4500
	Nome	2000
	Flambeau	3250
	Eldorado	5250
	Bonanza	1500
Golovin Subdistrict (2)		
	Fish	17500
	Niukluk	8000
	Boston	2500
Moses Point Subdistrict (3)		
	Kwiniuk	2500 (Tower)
	Tubutulik	12000
Norton Bay Subdistrict (4)		
	Ungalik	Insufficient Data
	Inglutalik	Insufficient Data
Shaktoolik Subdistrict (5)		
	Shaktoolik	11000
Unalakleet Subdistrict (6)		
	Unalakleet	Poor Conditions
	North River	4500 (Tower)
	North Fork	Insufficient Data
	Old Woman	Insufficient Data

Appendix Table A-3. Chinook salmon age, sex, and length composition, 133 mm (5-1/4 in) mesh drift gill net, Unalakleet River test fishing project, 1984.

	Age Class							
	32	42	52	62	63	72	73	Total
Males								
Percent			25.0	25.0				50.0
Avg Length			612.0	862.0				737.0
Std. Error(1)			—	—				—
Sample Size			1	1				2
Females								
Percent			25.0	25.0				50.0
Avg Length			780.0	965.0				872.5
Std. Error(1)			—	—				—
Sample Size			1	1				2
Both Sexes								
Percent			50.0	50.0				
Avg Length			696.0	913.5				804.8
Std. Error(1)			—	—				—
Sample Size			2	2				4

(1) Standard Error of the average length.

Appendix Table A-4. Chinook salmon age, sex, and length composition, Unalakleet River sport fishery, 1984.

	Age Class							
	32	42	52	62	63	72	73	Total
Males								
Percent			40.0	40.0				80.0
Avg Length			741.0	905.5				823.3
Std. Error(1)			27.0	128.5				65.7
Sample Size			2	2				4
Females								
Percent				20.0				20.0
Avg Length				697.0				697.0
Std. Error(1)				—				—
Sample Size				1				1
Both Sexes								
Percent			40.0	60.0				
Avg Length			741.0	836.0				798.0
Std. Error(1)			27.0	85.7				52.5
Sample Size			2	3				5

(1) Standard Error of the average length.

Appendix Table A-5. Chinook salmon age, sex, length, and weight composition, 149 mm (5-7/8 in) mesh gill net, Unalakleet River test fishing project, 1984.

	Age Class							
	32	42	52	62	63	72	73	Total
Males								
Percent		7.5	50.0	15.0	2.5			75.0
Avg Length		652.0	690.6	845.5	757.0			719.9
Std. Error(1)		48.8	14.6	46.7	--			14.4
Avg Weight (kg)		5.0	5.4	10.2	7.5			6.4
Std. Error(2)		1.5	0.5	2.0	--			0.5
Sample Size		3	20	6	1			30
Females								
Percent			7.5	17.5				25.0
Avg Length			786.0	859.0				837.1
Std. Error(1)			60.1	17.0				21.6
Avg Weight (kg)			7.7	9.4				8.9
Std. Error(2)			1.4	0.3				0.5
Sample Size			3	7				10
Both Sexes								
Percent		7.5	57.5	32.5	2.5			
Avg Length		652.0	703.0	852.8	757.0			749.2
Std. Error(1)		48.8	14.9	23.4	--			12.0
Avg Weight (kg)		5.0	5.7	9.8	7.5			7.0
Std. Error(2)		1.5	0.4	0.9	--			0.4
Sample Size		3	23	13	1			40

(1) Standard Error of the average length.
(2) Standard Error of the average weight.

Appendix Table A-6. Chinook salmon age, sex, length, and weight composition, 210 mm (8-1/4 in) mesh gill net, Unalakleet River test fishing project, 1984.

	Age Class							
	32	42	52	62	63	72	73	Total
Males								
Percent		1.6	32.8	11.5			1.6	47.5
Avg Length		650.0	751.5	878.0			866.0	782.5
Std. Error(1)		--	20.2	26.5			--	15.3
Avg Weight (kg)		4.8	7.7	11.1			9.3	8.4
Std. Error(2)		--	0.6	1.0			--	0.5
Sample Size		1	20	7			1	29
Females								
Percent			19.7	27.9		1.6	3.3	52.5
Avg Length			820.3	897.7		887.0	866.0	866.3
Std. Error(1)			18.0	12.5		--	19.0	9.5
Avg Weight (kg)			9.4	12.1		12.3	10.6	11.0
Std. Error(2)			0.7	0.5		--	1.4	0.4
Sample Size			12	17		1	2	32
Both Sexes								
Percent		1.6	52.5	39.4		1.6	4.9	
Avg Length		650.0	777.3	891.9		887.0	866.0	826.5
Std. Error(1)		--	14.3	11.8		--	12.7	8.8
Avg Weight (kg)		4.8	8.3	11.8		12.3	10.2	9.8
Std. Error(2)		1.5	0.4	0.9		--	0.9	0.3
Sample Size		1	32	24		1	3	61

(1) Standard Error of the average length.
(2) Standard Error of the average weight.

Appendix Table A-7. Chinook salmon age, sex, and length composition, Unalakleet Subdistrict commercial fishery, 1984.

	Age Class							
	32	42	52	62	63	72	73	Total
Males								
Percent	0.7	4.9	22.9	20.7	0.7	0.4	0.9	51.2
Avg Length	537.0	692.1	754.2	871.0	796.0	935.0	797.0	795.3
Std. Error(1)	5.8	15.9	7.5	9.4	28.0	115.0	32.3	5.4
Sample Size	3	22	102	92	3	2	4	228
Females								
Percent		0.9	8.5	36.1	0.2	2.7	0.4	48.8
Avg Length		685.8	844.0	885.7	881.0	938.9	901.5	877.8
Std. Error(1)		42.9	9.9	4.3	--	16.9	23.5	3.8
Sample Size		4	38	160	1	12	2	217
Both Sexes								
Percent	0.7	5.8	31.4	56.8	0.9	3.1	1.3	
Avg Length	537.0	691.2	778.5	880.3	814.9	938.4	829.2	835.5
Std. Error(1)	5.8	15.0	6.1	4.4	21.0	21.9	22.9	3.3
Sample Size	3	26	140	252	4	14	6	445

(1) Standard Error of the average length.

Appendix Table A-8. Chinook salmon age, sex, and length composition, Unalakleet River carcass survey, 1984.

	Age Class							
	32	42	52	62	63	72	73	Total
Males								
Percent			30.8	15.4	3.8			50.0
Avg Length			713.0	887.5	720.0			767.3
Std. Error(1)			13.5	75.5	--			24.7
Sample Size			8	4	1			13
Females								
Percent			11.5	34.7		3.8		50.0
Avg Length			806.7	899.6		995.0		885.5
Std. Error(1)			90.5	22.1		--		25.9
Sample Size			3	9		1		13
Both Sexes								
Percent			42.3	50.1	3.8	3.8		
Avg Length			738.5	895.9	720.0	995.0		826.4
Std. Error(1)			26.6	27.8	--	--		17.9
Sample Size			11	13	1	1		26

(1) Standard Error of the average length.

Appendix Table A-9. Chinook salmon age, sex, length, and weight composition, Unalakleet Village subsistence harvest, 1984.

	Age Class							
	32	42	52	62	63	72	73	Total
Males								
Percent		1.7	22.4	27.6				51.7
Avg Length		570.0	769.8	861.9				812.4
Std. Error(1)		--	12.6	21.3				12.6
Sample Size		1	13	16				30
Avg Weight (kg)			10.5	9.9				10.2
Std. Error(2)			--	1.6				1.4
Sample Size			1	6				7
Females								
Percent			6.9	41.4				48.3
Avg Length			874.5	891.7				889.3
Std. Error(1)			10.9	8.1				7.1
Sample Size			4	24				28
Avg Weight (kg)			11.3	12.8				12.6
Std. Error(2)			--	0.9				0.7
Sample Size			1	6				7
Both Sexes								
Percent		1.7	29.3	69.0				
Avg Length		570.0	794.4	879.8				849.5
Std. Error(1)		--	10.0	9.8				7.4
Avg Weight (kg)			10.7	11.6				11.4
Std. Error(2)			--	0.9				0.8
Sample Size			2	12				14

(1) Standard Error of the average length.
(2) Standard Error of the average weight.

Appendix Table A-10. Chum salmon age, sex, length, and weight composition, Unalakleet River test fishing project, 149 mm (5-7/8 in) mesh gill net, 1984.

	Age Class				
	31	41	51	61	Total
Males					
Percent	0.7	34.3	16.7	2.0	53.7
Avg Length	555.0	591.9	619.4	623.7	601.2
Std. Error(1)	11.7	1.9	2.8	5.7	1.5
Avg Weight (kg)	3.0	3.7	4.3	4.4	3.9
Std. Error(2)	0.2	0.1	0.1	0.2	0.1
Sample Size	4	203	99	12	318
Females					
Percent	0.2	29.6	15.7	0.8	46.3
Avg Length	537.0	578.8	595.1	620.0	584.9
Std. Error(1)	—	2.1	2.8	10.1	1.7
Avg Weight (kg)	2.5	3.2	3.5	4.5	3.3
Std. Error(2)	—	0.1	0.1	0.6	0.1
Sample Size	1	175	93	5	274
Both Sexes					
Percent	0.9	63.9	32.4	2.8	
Avg Length	551.0	585.8	607.6	622.6	593.6
Std. Error(1)	9.4	1.4	2.0	5.0	1.1
Avg Weight (kg)	2.9	3.4	3.9	4.4	3.6
Std. Error(2)	0.1	0.1	0.1	0.2	0.1
Sample Size	5	378	192	17	592

(1) Standard Error of the average length.
(2) Standard Error of the average weight.

Appendix Table A-11. Chum salmon age, sex, and length composition, Unalakleet Subdistrict commercial harvest, by sample period, 1984.

Period 1: July 7 - July 13, 1984

	Age Class				
	31	41	51	61	Total
Males					
Percent	0.4	33.6	11.8	2.0	47.8
Avg Length	553.3	584.7	613.4	600.1	592.1
Std. Error(1)	15.2	1.7	3.7	7.9	1.5
Sample Size	3	269	94	16	382
Females					
Percent	0.6	34.7	16.0	1.0	52.3
Avg Length	562.0	564.8	583.8	585.8	571.0
Std. Error(1)	9.4	1.5	2.4	10.8	1.3
Sample Size	5	277	128	8	418
Both Sexes					
Percent	1.0	68.3	27.8	3.0	
Avg Length	558.8	574.6	596.3	595.3	581.1
Std. Error(1)	8.4	1.1	2.1	6.4	1.0
Sample Size	8	546	222	24	800

(1) Standard Error of the average length.

-Continued-

Appendix Table A-11. Chum salmon age, sex, and length composition, Unalakleet Subdistrict commercial harvest, by sample period, 1984 (continued).

Period 2: July 16 - July 20, 1984

	Age Class				
	31	41	51	61	Total
Males					
Percent		42.7	9.5	0.4	52.6
Avg Length		590.9	615.4	650.0	595.7
Std. Error(1)		2.6	7.0	—	2.5
Sample Size		122	27	1	150
Females					
Percent		33.7	13.0	0.7	47.4
Avg Length		568.7	590.9	605.5	575.3
Std. Error(1)		2.5	3.6	0.5	2.0
Sample Size		96	37	2	135
Both Sexes					
Percent		76.4	22.5	1.1	
Avg Length		581.1	601.2	620.3	586.0
Std. Error(1)		1.8	3.6	0.5	1.6
Sample Size		218	64	3	285

(1) Standard Error of the average length.

-Continued-

Appendix Table A-11. Chum salmon age, sex, and length composition, Unalakleet Subdistrict commercial harvest, by sample period, 1984 (continued).

Period 3: July 24 - July 28, 1984

	Age Class				
	31	41	51	61	Total
Males					
Percent	2.7	35.3	11.3	1.4	50.7
Avg Length	565.3	591.3	610.9	593.5	594.3
Std. Error(1)	8.8	2.5	4.7	23.2	2.2
Sample Size	8	103	33	4	148
Females					
Percent	0.7	38.6	8.0	1.4	49.3
Avg Length	530.5	571.8	583.4	592.3	573.8
Std. Error(1)	0.5	2.7	6.1	16.4	2.4
Sample Size	2	113	25	4	144
Both Sexes					
Percent	3.4	73.9	19.9	2.8	
Avg Length	558.3	581.1	599.0	592.9	584.2
Std. Error(1)	7.0	1.8	3.7	14.2	1.6
Sample Size	10	216	58	8	292

(1) Standard Error of the average length.

Appendix Table A-12. Chum salmon age, sex, length, and weight composition, Unalakleet River test fishing project, 210 mm (8-1/4 in) mesh gill net, 1984.

	Age Class				
	31	41	51	61	Total
Males					
Percent		26.0	42.8	6.5	75.3
Avg Length		612.6	645.6	663.0	635.7
Std. Error(1)		11.5	6.2	16.8	5.5
Sample Size		20	33	5	58
Avg Weight (kg)		4.1	5.0	5.7	4.8
Std. Error(2)		0.3	0.2	0.5	0.2
Sample Size		19	32	5	56
Females					
Percent		11.7	13.0		24.7
Avg Length		564.3	590.3		578.0
Std. Error(1)		6.1	7.6		4.9
Sample Size		9	10		19
Avg Weight (kg)		2.9	3.6		3.2
Std. Error(2)		0.3	0.3		0.2
Sample Size		5	8		13
Both Sexes					
Percent		37.7	55.8	6.5	
Avg Length		597.6	632.8	663.0	621.5
Std. Error(1)		8.2	5.1	16.8	4.3
Sample Size		29	43	5	77
Avg Weight (kg)		3.7	4.7	5.7	4.4
Std. Error(2)		0.2	0.2	0.5	0.1
Sample Size		24	40	5	69

(1) Standard Error of the average length.

Appendix Table A-13. Coho salmon age, sex, weight, and length composition, Unalakleet River test fishing project, 149 mm (5-7/8 in) mesh gill nets, 1984.

	Age Class			
	32	43	54	Total
Males				
Percent	13.7	31.3	5.7	50.7
Avg Length	617.8	603.1	599.2	606.6
Std. Error(1)	5.9	5.1	12.7	3.8
Sample Size	31	71	13	115
Avg Weight (kg)	4.5	4.0	4.0	4.2
Std. Error(2)	0.2	0.1	0.3	0.1
Sample Size	31	71	13	115
Females				
Percent	15.0	28.1	6.2	49.3
Avg Length	599.1	597.6	598.7	598.2
Std. Error(1)	5.4	4.1	8.4	3.0
Sample Size	34	64	14	112
Avg Weight (kg)	3.9	3.9	3.7	3.8
Std. Error(2)	0.1	0.1	0.2	0.1
Sample Size	34	64	14	112
Both Sexes				
Percent	28.7	59.4	11.9	
Avg Length	608.0	600.5	598.9	602.5
Std. Error(1)	4.0	3.3	7.5	2.4
Sample Size	65	135	27	227
Avg Weight (kg)	4.2	4.0	3.8	4.0
Std. Error(2)	0.1	0.1	0.2	0.1
Sample Size	65	135	27	227

(1) Standard Error of the average length.
(2) Standard Error of the average weight.

Appendix Table A-14. Chum salmon sex and length composition, Moses Point Subdistrict commercial harvest, 1984.

Males	
Percent	57.6
Avg Length	574.4
Std. Error(1)	5.0
Sample Size	34
Females	
Percent	42.4
Avg Length	566.3
Std. Error(1)	4.6
Sample Size	25
Both Sexes	
Percent	
Avg Length	571.0
Std. Error(1)	3.5
Sample Size	59

(1) Standard Error of the average length.

Appendix Table A-15. Coho salmon age, sex, and length composition, Unalakleet Subdistrict commercial catch, 1984.

	Age Class			
	32	43	54	Total
Males				
Percent	13.7	36.6	11.1	61.4
Avg Length	593.3	585.5	600.3	589.9
Std. Error(1)	6.6	5.9	7.8	--
Sample Size	21	56	17	94
Females				
Percent	12.4	18.3	7.8	38.6
Avg Length	575.5	580.9	586.3	580.3
Std. Error(1)	8.2	6.3	8.3	--
Sample Size	19	28	12	59
Both Sexes				
Percent	26.1	54.9	19.0	
Avg Length	584.9	583.9	594.5	586.2
Std. Error(1)	5.3	4.51	5.8	--
Sample Size	40	84	29	153

(1) Standard Error of the average length.

Appendix Table B-1. Total annual chum salmon returns (in thousands) to the Kotzebue region, 1962-1984.

Year	Escapement Index	Commercial Catch	Subsistence Catch(1)	Total Return
1962	172.3(2)	129.9	21.4	323.6
1963	86.6(2)	54.4	14.3	155.3
1964	117.8	76.5	17.0	211.3
1965	106.3(2)	40.0	19.6	165.9
1966	110.5	30.8	9.6	150.9
1967	60.8	29.4	10.2	100.4
1968	58.6	30.2	12.3	101.1
1969	51.1	59.3	13.3	123.7
1970	161.5	159.7	22.7	343.9
1971	71.7	155.0	20.9	247.6
1972	89.0(2)	169.7	10.6	269.3
1973	177.9(2)	375.4	15.8	569.1
1974	234.6	627.9	19.7	882.2
1975	157.7	563.3	23.1	744.1
1976	57.7	159.8	9.4	226.9
1977	91.4(2)	195.9	4.1	291.4
1978	48.8(2)	111.5	11.4	171.7
1979	29.2	141.6	9.4	180.2
1980	216.7	367.3	8.5	592.5
1981	154.4	677.2	11.8	843.4
1982	142.5(2)	417.8	23.7	584.0
1983	139.1	175.8	12.9	327.8
1984	95.1	320.2	7.3	422.6
Mean	114.4	220.4	14.3	349.1
Std. Dev.	55.8	196.0	5.7	238.6

(1) Includes only Kotzebue and Kobuk River Villages. Noatak Village subsistence catch is considered part of the escapement index.
(2) Documented aerial escapement survey is of poor quality. Escapement estimated by Bigler (1985b).

Appendix Table B-2. Stream catalog entries for Kotzebue Sound chum salmon aerial escapement surveys conducted on index spawning areas only, 1984.

River	Survey Date(mo/dy)	Chum Salmon Counted	Survey Conditions(1) Wi(2)	We(3)	Wa(4)	Vi(5)	Bot(6)	Ti(7)	Sp(8)	Rt(9)	Comments(10)
Noatak	7/27	4,445	1	2	1	1	1	1	1	2	Area 101
	7/27	2,411	1	2	1	1	1	1	1	2	Area 102
	Total	6,856									
	Catalog Comment: Survey from Agi to Noatak Village.										
	9/4	4,485	1	1	1	1	1	1	2	1	Area 101
	9/4	20,303	1	1	1	1	1	1	2	1	Area 102
	9/4	43,085	1	1	1	1	1	1	2	1	Area 103
	Total	67,873									
	Catalog Comment: Area 103 is Noatak Village to Kelly River.										
Eli	9/15	5,027	1	2	2	2	2	1	3	2	
	Catalog Comment: Some chums may be pinks but timing makes it unlikely. Survey started at mouth.										
Kelly	9/4	905	1	1	1	1	1	1	2	1	Area 101
	9/4	2,594	1	1	1	1	1	1	2	1	Area 102
	Total	3,499									
	Catalog Comment: 101 is Kelly River, 102 is Kelly Lake.										
Kobuk	9/5	402	1	1	1	1	1	1	2	1	Area 101
	9/5	257	1	1	1	1	1	1	2	1	Area 102
	9/5	5,910	1	1	1	1	1	1	2	1	Area 103
	9/5	4,052	1	1	1	1	1	1	2	1	Area 104
	Total	10,621									
	Catalog Comment: 101=Kobuk to Pah River, 102=Pah River to Selby River, 103=Selby River to Beaver River, 104=Beaver River to lower canyon. 9 subsistence nets fishing.										
Squirrel	7/24	962	2	4	2	2	1	1	1	2	Area 101
	7/24	34	2	4	2	2	1	1	1	2	Area 102
	7/24	56	2	4	2	2	1	1	1	2	Area 103
	7/24	6	2	4	2	2	1	1	1	2	Area 104
	Total	1,058									
	Catalog Comment: 101=Mouth to tower, 102=tower to Omar River 103=Omar R mouth to North Fork, 104=above North Fork mouth.										

-Continued-

Appendix Table B-2. Stream catalog entries for Kotzebue Sound chum salmon aerial escapement surveys conducted on index spawning areas only, 1984 (continued).

River	Survey Date (mo/dy)	Chum Salmon Counted	Survey Conditions (1) Wi(2)	We(3)	Wa(4)	Vi(5)	Bot(6)	Ti(7)	Sp(8)	Rt(9)	Comments (10)
Squirrel (Continued)	8/13	249	3	4	2	2	1	1	1	2	Area 101
	8/13	816	3	4	2	2	1	1	1	2	Area 102
	8/13	685	3	4	2	2	1	1	1	2	Area 103
	8/13	3,723	3	4	2	2	1	1	1	2	Area 104
	Total	5,473									
	8/27	312	0	4	2	2	1	1	3	2	Area 101
	8/27	1,621	0	4	2	2	1	1	3	2	Area 102
	8/27	350	0	4	2	2	1	1	3	2	Area 103
	8/27	2,260	0	4	2	2	1	1	3	2	Area 104
	8/27	314	0	4	2	2	1	1	3	2	Area 105
	Total	4,857									
	Catalog Comment: 105=Omar River, other areas as in previous survyes. Survey conditions poor in lower 30 miles of river. Many carcasses not visible due to recent flooding.										
Salmon	7/25	305	2	4	2	2	2	1	1	2	
	Catalog Comment: 165 chums in Kobuk River at mouth										
	8/27	1,471	1	3	2	2	2	1	3	2	
	Catalog Comment: Many red(d)s without carcasses. Recent flooding probably washed carcasses away.										
Tutksuk	7/25	630	2	4	2	2	2	1	1	2	
	Catalog Comment: All fish were in lower 10 miles.										
	8/27	1,132	1	3	2	2	2	1	3	2	
	Catalog Comment: Many red(d)s without carcasses. Recent flooding probably washed carcasses away.										

(1) Descriptive codes; Method used in the survey, Distance of survey, Observers initials and Agency conducting the survey, are not listed.
(2) Wind=Wi:
1-No wind affect on counts
2-Slight riffle or turbulence, only slightly affecting counts
3-Moderate riffle or turbulence, affecting counts
4-Heavy riffle activity or turbulence, badly affecting counts

-Continued-

Appendix Table B-2. Stream catalog entries for Kotzebue Sound chum salmon aerial escapement surveys conducted on index spawning areas only, 1984 (continued).

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(3) Weather=We:
- 1-Clear
- 2-Partial overcast, 5-30%
- 3-Overcast, 31-70%
- 4-Overcast, 70-100%

(4) Water=Wa:
- 1-Clear
- 2-Slightly turbid, bottom visible in most areas, deep pools obscured
- 3-Turbid, bottom visible only along bars and in shallow areas
- 4-Extremely turbid, counts impossible

(5) Water Visibility=Vi:
- 1-Good, optimum conditions
- 2-Fair, counts partially obscured by glare, shadow, ice, etc
- 3-Poor, counts badly obscured by glare, shadows, ice, etc

(6) Bottom=Bot:
- 1-No adverse affect on survey
- 2-Slightly adverse affect of survey
- 3-Moderately adverse affect on survey
- 4-Extremely adverse affect on survey

(7) Time=Ti:
- 1-No adverse affect on survey
- 2-Slightly adverse affect of survey
- 3-Moderately adverse affect on survey
- 4-Extremely adverse affect on survey

(8) Spawning Stage=Sp:
- 1-Before peak
- 2-At peak
- 3-After peak

(9) Overall effectiveness (rating) of survey=Rt:
- 1-Good
- 2-Fair
- 3-Poor

(10) Any information useful for clarification beyond Catalog Comments.

Appendix Table B-3. Average aerial survey counts of chum salmon in selected streams in the Kotzebue District. Only complete surveys rated "Fair" to "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 Table B-4. Chum salmon age, sex, and length (mm) sampled from the Kotzebue Sound commercial set gill net fishery, by statistical sampling period, 1984.

Period 1: July 9 - July 20, 1984

	Age Class				
	31	41	51	61	Total(1)
Males					
Percent	1.4	36.9	13.0	1.4	52.7
Avg. Length	589.9	607.2	637.6	630.6	614.8
Std. Error(2)	12.5	2.2	4.0	13.1	—
Range	554-647	516-689	580-712	564-668	516-712
Sample Size	7	182	64	7	260
Females					
Percent	0.8	24.1	20.1	2.2	47.3
Avg. Length	563.0	589.1	605.7	622.6	597.3
Std. Error(2)	8.3	2.3	2.6	6.3	—
Range	544-584	532-680	514-659	589-651	514-680
Sample Size	4	119	99	11	233
Both Sexes					
Percent	2.2	61.1	33.1	3.7	
Avg. Length	580.1	600.1	618.2	625.7	606.6
Std. Error(2)	9.1	1.7	2.5	6.2	—
Range	544-647	516-689	514-712	564-668	514-712
Sample Size	11	301	163	18	493

Period 2: July 23 - August, 4 1984

	Age Class				
	31	41	51	61	Total(1)
Males					
Percent	4.0	36.6	10.9	0.6	52.1
Avg. Length	562.9	614.9	627.3	649.0	613.9
Std. Error(2)	4.8	2.4	4.9	11.4	—
Range	485-580	528-757	542-720	631-670	485-757
Sample Size	19	175	52	3	249
Females					
Percent	2.9	32.2	12.1	0.6	47.9
Avg. Length	576.2	589.7	609.0	618.0	594.1
Std. Error(2)	5.4	2.1	3.6	16.1	—
Range	534-612	520-646	550-695	599-650	520-695
Sample Size	14	154	58	3	229
Both Sexes					
Percent	6.9	68.8	23.0	1.3	
Avg. Length	568.5	603.1	617.7	633.5	604.5
Std. Error(2)	3.7	1.8	3.1	11.2	—
Range	485-612	520-757	542-720	599-670	485-757
Sample Size	33	329	110	6	478

-Continued-

Appendix Table B-4. Chum salmon age, sex, and length (mm) sampled from the Kotzebue Sound commercial set gill net fishery, by statistical sampling period, 1984 (continued).

Period 3: August 6 - August 11, 1984

	Age Class				
	31	41	51	61	Total(1)
Males					
Percent	12.2	26.3	9.0	0.5	48.0
Avg. Length	576.5	602.5	639.2	630.5	603.0
Std. Error(2)	3.8	3.2	5.5	29.5	—
Range	538-640	506-680	569-702	601-660	506-702
Sample Size	53	114	39	2	208
Females					
Percent	7.9	37.6	6.0	0.5	52.0
Avg. Length	558.5	584.9	599.7	618.0	582.9
Std. Error(2)	4.5	1.8	5.6	7.0	—
Range	499-624	518-652	542-652	611-625	499-652
Sample Size	34	163	26	2	225
Both Sexes					
Percent	20.1	64.0	15.0	0.9	
Avg. Length	569.5	592.1	623.4	624.3	592.6
Std. Error(2)	3.0	1.8	4.6	12.9	—
Range	499-640	506-680	542-702	601-660	499-702
Sample Size	87	277	65	4	433

Period 4: August 13 - August 20, 1984

	Age Class				
	31	41	51	61	Total(1)
Males					
Percent	14.5	21.9	3.7	0.7	40.8
Avg. Length	575.3	601.8	641.5	644.0	596.6
Std. Error(2)	4.1	3.0	8.9	21.6	—
Range	501-678	521-682	568-713	614-686	501-713
Sample Size	67	101	17	3	188
Females					
Percent	17.8	36.9	4.3	0.2	59.2
Avg. Length	559.7	577.5	598.8	610.0	573.8
Std. Error(2)	2.7	1.9	6.9	—	—
Range	511-668	495-643	535-657	610-610	495-668
Sample Size	82	170	20	1	273
Both Sexes					
Percent	32.3	58.8	8.0	0.9	
Avg. Length	566.7	586.5	618.4	635.5	583.1
Std. Error(2)	2.4	1.8	6.5	17.5	—
Range	501-678	495-682	535-713	610-686	495-713
Sample Size	149	271	37	4	461

(1) Weighted average.
(2) Standard Error of the average length.

Appendix Table B-5. Chum salmon age, sex, and length (mm) sampled from the Kotzebue Sound commercial set gill net fishery, by commercial fishing period, 1984.

Period 1: July 9 - July 10, 1984

	Age Class				
	31	41	51	61	Total(1)
Males					
Percent	1.3	39.5	18.4		59.2
Avg. Length	593.0	601.7	624.5		608.6
Std. Error(2)	—	5.1	7.1		—
Range	593-593	535-665	5589-675		593-675
Sample Size	1	30	14		45
Females					
Percent		21.1	18.4	1.3	40.8
Avg. Length		583.8	588.1	619.0	586.9
Std. Error(2)		6.7	5.4	—	—
Range		533-632	556-624	619-619	533-632
Sample Size		16	14	1	21
Both Sexes					
Percent	1.3	60.5	36.8	1.3	
Avg. Length	593.0	595.5	606.3	619.0	599.8
Std. Error(2)	—	4.2	5.6	—	—
Range	593-593	533-665	556-675	619-619	533-675
Sample Size	1	46	28	1	76

Period 2: July 12 - July 13, 1984

	Age Class				
	31	41	51	61	Total(1)
Males					
Percent	4.0	19.7	10.5		34.2
Avg. Length	569.3	597.1	640.0		607.1
Std. Error(2)	13.4	5.6	14.4		—
Range	554-596	566-640	580-712		554-712
Sample Size	3	15	8		26
Females					
Percent	2.6	32.9	25.0	5.3	65.8
Avg. Length	551.5	589.6	596.4	613.0	592.5
Std. Error(2)	7.5	5.5	6.5	9.9	—
Range	544-559	544-680	514-629	589-633	514-680
Sample Size	2	25	19	4	50
Both Sexes					
Percent	6.6	52.6	35.5	5.3	
Avg. Length	562.2	592.4	609.3	613.0	597.5
Std. Error(2)	8.9	4.0	7.3	9.9	—
Range	544-596	544-680	514-712	589-633	514-712
Sample Size	5	40	27	4	76

-Continued-

Appendix Table B-5. Chum salmon age, sex, and length (mm) sampled from the Kotzebue Sound commercial set gill net fishery by commercial fishing period, 1984 (continued).

Period 3: July 16 - July 17, 1984

	Age Class				
	31	41	51	61	Total(1)
Males					
Percent	1.2	39.7	12.8	2.0	55.6
Avg. Length	609.3	605.0	643.25	629.6	614.8
Std. Error(2)	22.6	2.9	5.8	18.1	—
Range	569-647	516-687	594-7105	564-668	516-710
Sample Size	3	102	33	5	143
Females					
Percent	0.8	23.0	19.5	1.2	44.4
Avg. Length	574.5	588.3	612.1	640.0	599.9
Std. Error(2)	9.5	3.1	3.4	4.6	—
Range	565-584	532-660	549-659	632-648	532-660
Sample Size	2	59	50	3	114
Both Sexes					
Percent	2.0	62.7	32.3	3.1	
Avg. Length	595.4	598.9	624.5	633.5	608.2
Std. Error(2)	15.3	2.3	3.5	11.1	—
Range	565-647	516-687	549-710	564-668	516-710
Sample Size	5	161	83	8	257

Period 4: July 19 - July 20, 1984

	Age Class				
	31	41	51	61	Total(1)
Males					
Percent		41.7	10.7	2.4	54.8
Avg. Length		622.7	635.1	633.0	625.6
Std. Error(2)		4.6	9.3	18.0	—
Range		575-689	600-692	615-65	575-692
Sample Size		35	9	2	46
Females					
Percent		22.6	19.1	3.6	45.3
Avg. Length		595.2	612.1	619.3	604.2
Std. Error(2)		5.2	6.0	17.2	—
Range		553-637	557-658	592-651	553-658
Sample Size		19	16	3	38
Both Sexes					
Percent		64.3	29.8	6.0	
Avg. Length		613.0	620.4	624.8	615.9
Std. Error(2)		3.9	5.5	11.5	—
Range		553-689	557-692	592-651	553-692
Sample Size		54	25	5	84

-Continued-

Appendix Table B-5. Chum salmon age, sex, and length (mm) sampled from the Kotzebue Sound commercial set gill net fishery, by commercial fishing period, 1984 (continued).

Period 5: July 23 - July 24, 1984

	Age Class				
	31	41	51	61	Total(1)
Males					
Percent		29.4	20.0	1.2	50.6
Avg. Length		621.0	620.3	670.0	621.9
Std. Error(2)		5.0	8.5	—	—
Range		575-678	542-681	670-670	542-681
Sample Size		25	17	1	43
Females					
Percent		28.2	21.2		49.4
Avg. Length		585.8	599.5		591.7
Std. Error(2)		6.6	5.3		—
Range		520-634	550-631		520-634
Sample Size		24	18		42
Both Sexes					
Percent		57.7	41.2	1.2	
Avg. Length		603.7	609.6	670.0	606.9
Std. Error(2)		4.8	5.2	—	—
Range		520-678	542-681	670-670	520-681
Sample Size		49	35	1	85

Period 6: July 26 - July 27, 1984

	Age Class				
	31	41	51	61	Total(1)
Males					
Percent	2.4	46.4	7.1	2.4	58.3
Avg. Length	563.0	608.9	628.3	638.5	610.6
Std. Error(2)	5.0	4.4	16.1	7.5	—
Range	558-568	542-695	593-688	631-646	542-695
Sample Size	2	39	6	2	49
Females					
Percent	2.4	29.8	8.3	1.2	41.7
Avg. Length	539.5	594.6	626.3	650.0	599.4
Std. Error(2)	5.5	4.4	13.0	—	—
Range	534-545	561-643	594-695	650-650	534-695
Sample Size	2	25	7	1	35
Both Sexes					
Percent	4.8	76.2	15.5	3.6	
Avg. Length	551.3	603.3	627.2	642.3	605.9
Std. Error(2)	7.4	3.3	9.7	5.8	—
Range	534-568	542-695	593-695	631-650	534-695
Sample Size	4	64	13	3	84

-Continued-

Appendix Table B-5. Chum salmon age, sex, and length (mm) sampled from the Kotzebue Sound commercial set gill net fishery, by commercial fishing period, 1984 (continued).

Period 7: July 30 - August 1, 1984

	Age Class 31	41	51	61	Total(1)
Males					
Percent	5.8	40.2	10.3		56.3
Avg. Length	543.8	613.4	640.1		611.2
Std. Error(2)	15.0	4.8	10.8		—
Range	485-586	528-667	594-683		485-683
Sample Size	5	35	9		49
Females					
Percent	1.2	35.6	6.9		43.7
Avg. Length	600.0	591.5	610.0		594.6
Std. Error(2)	—	4.7	18.2		—
Range	600-600	546-646	556-663		546-663
Sample Size	1	31	6		38
Both Sexes					
Percent	6.9	75.9	17.2		
Avg. Length	553.2	603.1	628.1		604.0
Std. Error(2)	15.5	3.6	10.2		—
Range	485-600	528-667	556-683		485-683
Sample Size	6	66	15		87

Period 8: August 2 - August 4, 1984

	Age Class 31	41	51	61	Total(1)
Males					
Percent	5.4	34.2	9.0		48.7
Avg. Length	570.8	616.6	627.2		613.5
Std. Error(2)	2.2	4.2	8.3		—
Range	558-580	536-757	584-720		536-757
Sample Size	12	76	20		108
Females					
Percent	5.0	33.3	12.2	0.9	51.4
Avg. Length	580.7	588.5	610.7	602.0	593.2
Std. Error(2)	4.0	3.0	4.5	3.0	—
Range	565-612	535-646	575-657	599-605	535-657
Sample Size	11	74	27	2	114
Both Sexes					
Percent	10.4	67.6	21.2	0.9	
Avg. Length	575.6	602.8	617.7	602.0	603.1
Std. Error(2)	2.4	2.8	4.5	3.0	—
Range	558-612	535-757	575-720	599-605	535-757
Sample Size	23	150	47	2	222

-Continued-

Appendix Table B-5. Chum salmon age, sex, and length (mm) sampled from the Kotzebue Sound commercial set gill net fishery, by commercial fishing period, 1984 (continued).

Period 9: August 6 - August 8, 1984

	Age Class				
	31	41	51	61	Total(1)
Males					
Percent	8.5	28.3	9.0	0.9	46.7
Avg. Length	576.7	607.7	646.6	630.5	610.0
Std. Error(2)	6.2	4.6	9.5	29.5	—
Range	540-630	526-680	569-702	601-660	526-702
Sample Size	18	60	19	2	99
Females					
Percent	5.7	39.2	7.6	0.9	53.3
Avg. Length	556.4	586.9	597.3	618.0	585.7
Std. Error(2)	7.3	2.6	7.8	7.0	—
Range	523-599	518-634	542-650	611-625	518-650
Sample Size	12	83	16	2	113
Both Sexes					
Percent	15.2	67.5	16.5	1.9	
Avg. Length	568.6	595.6	624.1	624.3	597.0
Std. Error(2)	5.0	2.6	7.5	12.9	—
Range	523-630	518-680	542-702	601-660	518-702
Sample Size	30	143	35	4	212

Period 10: August 9 - August 11,1984

	Age Class				
	31	41	51	61	Total(1)
Males					
Percent	15.8	24.4	9.1		49.3
Avg. Length	576.4	596.8	632.2		596.7
Std. Error(2)	4.8	4.3	5.5		—
Range	538-640	506-656	588-668		506-668
Sample Size	35	54	20		109
Females					
Percent	10.0	36.2	4.5		50.7
Avg. Length	559.6	582.8	603.7		580.1
Std. Error(2)	5.8	2.5	7.7		—
Range	499-624	530-652	572-652		499-652
Sample Size	22	80	10		112
Both Sexes					
Percent	25.8	60.6	13.6		
Avg. Length	569.9	588.4	622.7		588.3
Std. Error(2)	3.8	2.4	5.1		—
Range	499-640	506-656	572-668		499-668
Sample Size	57	134	30		221

-Continued-

Appendix Table B-5. Chum salmon age, sex, and length (mm) sampled from the Kotzebue Sound commercial set gill net fishery, by commercial fishing period, 1984 (continued).

Period 11: August 13 - August 15, 1984

	Age Class				
	31	41	51	61	Total(1)
Males					
Percent	11.7	23.8	4.0	0.5	39.9
Avg. Length	584.7	603.7	649.4	686.0	603.7
Std. Error(2)	6.0	4.0	15.9	—	—
Range	520-678	535-682	568-713	686-686	520-713
Sample Size	26	53	9	1	89
Females					
Percent	17.0	37.7	4.9	0.5	60.1
Avg. Length	556.3	579.0	604.3	610.0	574.9
Std. Error(2)	3.8	2.8	10.7	—	—
Range	516-607	495-643	535-657	610-610	495-657
Sample Size	38	84	11	1	134
Both Sexes					
Percent	28.7	61.4	9.0	0.9	
Avg. Length	567.9	588.5	624.6	648.0	586.4
Std. Error(2)	3.7	2.5	10.4	38.0	—
Range	516-678	495-682	535-713	610-686	495-713
Sample Size	64	137	20	2	223

Period 12: August 16 - August 18, 1984

	Age Class				
	31	41	51	61	Total(1)
Males					
Percent	16.8	22.7	5.0	0.8	45.4
Avg. Length	566.8	596.8	635.3	632.0	590.6
Std. Error(2)	7.3	6.1	7.5	—	—
Range	501-652	521-654	609-661	632-632	501-661
Sample Size	20	27	6	1	54
Females					
Percent	17.6	33.6	3.4		54.6
Avg. Length	558.4	580.5	600.3		574.6
Std. Error(2)	5.1	4.1	7.4		—
Range	511-601	526-635	586-620		511-635
Sample Size	21	40	4		65
Both Sexes					
Percent	34.5	56.3	8.4	0.8	
Avg. Length	562.5	587.0	621.3	632.0	581.8
Std. Error(2)	4.4	3.6	7.7	—	—
Range	501-652	521-654	586-661	632-632	501-661
Sample Size	41	67	10	1	119

-Continued-

Appendix Table B-5. Chum salmon age, sex, and length (mm) sampled from the Kotzebue Sound commercial set gill net fishery, by commercial fishing perid, 1984 (continued).

Period 13: August 20 - August 22, 1984	31	41	51	61	Total(1)
Males					
Percent	17.8	17.0	1.7	0.9	37.3
Avg. Length	571.7	603.1	624.0	614.0	589.3
Std. Error(2)	7.8	7.4	6.0	—	—
Range	527-675	542-664	618-630	614-614	527-675
Sample Size	21	20	2	1	44
Females					
Percent	19.5	39.0	4.2		62.7
Avg. Length	566.4	572.0	585.6		571.2
Std. Error(2)	5.8	3.5	13.1		—
Range	528-668	520-635	560-634		520-668
Sample Size	23	46	5		74
Both Sexes					
Percent	37.3	55.9	5.9	0.9	
Avg. Length	569.0	581.4	596.6	614.0	578.0
Std. Error(2)	4.7	3.7	11.5	—	—
Range	527-675	520-664	560-634	614-614	520-675
Sample Size	44	66	7	1	118

(1) Weighted average.
(2) Standard Error of the average length.

Appendix Table B-6. Noatak River chum salmon age, sex, and length data collected from 149 mm (5-7/8 in) stretched mesh monofilament gill nets operated at test fishing project and beach seine samples taken by Sikusuilaq Springs Hatchery personnel, 1984.

	Age Class				
	31	41	51	61	Total(1)
Males					
Percent	7.9	33.2	11.1	0.5	53.4
Avg Length	569.2	603.2	626.1	628.0	595.9
Std. Error	3.4	1.9	4.4	9.5	--
Size Range	525-610	534-705	535-707	610-642	525-707
Sample Size	49	206	69	3	327
Females					
Percent	6.5	30.7	8.9	0.7	46.6
Avg Length	559.4	577.2	610.2	622.8	581.6
Std. Error	5.0	2.1	4.1	6.8	--
Size Range	501-645	515-665	547-674	610-640	501-674
Sample Size	40	190	55	4	289
Both Sexes					
Percent	14.5	64.2	20.2	1.1	
Avg Length	564.4	591.0	619.1	625.0	593.2
Std. Error	3.0	1.6	3.1	5.2	--
Size Range	501-645	515-705	535-707	610-642	501-707
Sample Size	90	398	125	7	616

(1) Weighted average.

Appendix Table B-7. Noatak River chum salmon age, sex, and length data collected from 149 mm (5-7/8 in) stretched mesh monofilament gill nets operated at test fishing project, 1984.

	Age Class				
	31	41	51	61	Total(1)
Males					
Percent	8.6	35.6	10.9	0.5	55.6
Avg Length	565.3	600.1	618.9	621.0	598.6
Std. Error	3.9	2.1	5.6	11.0	—
Size Range	525-601	534-665	535-707	610-632	525-707
Sample Size	37	153	47	2	239
Females					
Percent	5.8	27.7	10.2	0.7	44.0
Avg Length	565.5	583.9	609.0	617.0	587.8
Std. Error	6.6	2.2	4.4	5.1	—
Size Range	501-645	530-665	550-670	610-627	501-670
Sample Size	25	119	44	3	191
Both Sexes					
Percent	14.4	63.3	21.2	1.2	
Avg Length	564.8	593.3	614.3	618.6	593.9
Std. Error	3.5	1.6	3.6	4.6	—
Size Range	501-645	530-688	535-707	610-632	501-707
Sample Size	62	272	91	5	430

(1) Weighted average.

Appendix Table B-8. Chum salmon age, sex, and length data collected from beach seines operated on Noatak River spawning grounds by Sikusuilaq Springs Hatchery personnel, 1984.

	Age Class				
	31	41	51	61	Total(1)
Males					
Percent	6.5	28.5	11.8	0.5	47.3
Avg Length	581.3	612.2	641.5	642.0	615.7
Std. Error	6.0	4.5	5.7	—	—
Size Range	537-610	553-705	601-694	642-642	537-705
Sample Size	12	53	22	1	88
Females					
Percent	8.1	38.2	5.9	0.5	52.7
Avg Length	549.2	566.1	614.7	640.0	569.7
Std. Error	7.2	3.7	10.7	—	—
Size Range	510-605	515-640	547-674	640-640	510-674
Sample Size	15	81	11	1	98
Both Sexes					
Percent	14.5	66.7	17.7	1.1	
Avg Length	563.5	585.8	632.6	641.0	591.5
Std. Error	5.7	3.5	5.6	1.0	—
Size Range	510-610	515-705	547-694	640-642	510-705
Sample Size	27	124	33	2	186

(1) Weighted average.

Appendix Table B-9. Noatak River chum salmon age, sex, and length data collected from 149 mm (5-7/8 in) stretched mesh multi-filament gill nets operated at test fishing project, 1984.

	Age Class				
	31	41	51	61	Total(1)
Males					
Percent	1.6	28.3	9.2	1.0	40.0
Avg Length	571.6	591.9	629.3	635.3	605.5
Std. Error	7.4	6.8	8.0	45.6	—
Size Range	555-595	539-655	505-710	545-691	505-710
Sample Size	5	89	29	3	126
Females					
Percent	5.1	37.8	16.5	0.6	60.0
Avg Length	555.0	579.7	603.3	602.5	575.2
Std. Error	5.9	2.2	4.3	2.5	—
Size Range	500-585	501-653	525-660	600-605	500-660
Sample Size	16	119	52	2	189
Both Sexes					
Percent	6.9	65.9	25.6	1.6	
Avg Length	560.8	584.8	612.6	622.2	590.8
Std. Error	5.1	3.2	4.2	26.2	—
Size Range	500-600	501-655	505-710	545-691	500-710
Sample Size(2)	22	209	81	5	317

(1) Weighted average.
(2) Sum of age sample size does not equal total sample size due to unsexed samples.

Appendix Table B-10. Noatak River chum salmon, age, sex, and length data collected from 102 mm (4 in) stretched mesh monofilament gill nets operated at test fishing project, 1984.

	Age Class					
	31	41	51	61	71	Total(1)
Males						
Percent	5.7	31.2	14.7	1.3	0.6	53.5
Avg Length	591.7	608.7	642.8	638.0	695.0	617.9
Std. Error	14.2	4.8	7.4	28.0	—	—
Size Range	535-655	545-710	570-713	610-666	695-695	535-713
Sample Size	9	49	23	2	1	84
Females						
Percent	8.9	24.2	12.1	1.3		46.5
Avg Length	535.1	563.5	589.8	622.5		
Std. Error	4.3	4.1	5.8	7.5		—
Size Range	500-560	520-630	530-640	615-630		500-640
Sample Size	14	38	19	2		73
Both Sexes						
Percent	14.7	55.4	26.8	2.6	0.6	
Avg Length	557.2	588.9	618.8	630.3	695.0	594.0
Std. Error	8.4	4.0	6.3	12.7	—	—
Size Range	500-655	520-710	530-713	610-666	695-695	500-713
Sample Size	23	87	42	4	1	157

(1) Weighted average.

Appendix Table B-11. Chum salmon age, sex, and length data collected from 149 mm (5-7/8 in) stretched mesh gill nets operated at Sikusuilaq Springs Hatchery, 1984.

	Age Class				
	31	41	51	61	Total(1)
Males					
Percent	6.4	26.7	5.8	1.2	40.1
Avg Length	581.8	610.2	646.1	665.0	612.5
Std. Error	11.0	4.8	13.2	—	—
Size Range	540-660	520-675	550-695	665-665	520-695
Sample Size	11	46	10	2	69
Females					
Percent	5.8	43.0	9.3	1.7	59.9
Avg Length	570.0	585.0	598.9	612.3	586.5
Std. Error	6.4	3.6	7.4	15.8	—
Size Range	545-620	485-678	547-660	582-635	485-678
Sample Size	10	74	16	3	103
Both Sexes					
Percent	12.2	69.8	15.1	2.9	
Avg Length	576.2	594.7	617.1	633.4	597.0
Std. Error	6.5	3.1	8.1	15.5	—
Size Range	540-660	485-678	547-695	582-665	485-695
Sample Size	21	120	26	5	172

(1) Weighted average.

Appendix Table B-12. Comparative age and sex composition of Kotzebue District chum salmon, 1962-1984.

Year	Sample Size	Percent Males	Percent Females	Percent Age Class 31	41	51	61
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	1.6	
1965	480	42.1	57.9	2.3	91.0	6.7	
1966	430	40.2	59.8	10.1	67.1	22.8	
1967	1865	37.3	62.7	8.8	72.3	18.5	0.5
1968	1989	48.2	51.8	21.2	58.1	19.8	0.9
1969	1125	53.7	46.3	36.8	58.3	4.9	
1970	267	45.3	54.7	3.9	91.0	5.1	
1971	1105	54.6	45.4	7.1	67.3	26.3	
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	
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	
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	
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
Mean	884	46.0	54.0	15.1	65.0	19.3	0.7

(1) Does not show < 0.1% age 7 fish.

Appendix Table B-13. Chum salmon age, sex, and length data collected from beach seines operated on Squirrel River spawning grounds, 1984. Samples taken at Squirrel River counting tower project (n=30) and spawning ground survey (n=324), 1984.

	Age Class					
	31	41	51	61	71	Total(1)
Males						
Percent	12.2	63.5	21.0	2.8	0.6	51.1
Avg Length	589.6	631.9	647.9	689.6	630.0	631.7
Std. Error	10.6	3.6	6.4	16.9	—	—
Size Range	512-742	536-770	520-760	655-745	630-630	512-770
Sample Size	22	115	38	5	1	181
Females						
Percent	20.2	63.6	15.6	0.6		48.9
Avg Length	555.3	590.2	601.3	605.0		585.0
Std. Error	8.7	3.5	5.6	—		—
Size Range	476-764	492-746	535-650	605-605		476-764
Sample Size	35	110	27	1		173
Both Sexes						
Percent	16.1	63.6	18.4	1.7	0.3	
Avg Length	568.6	611.5	628.6	675.5	630.0	608.9
Std. Error	7.0	2.9	5.2	19.7	—	—
Size Range	476-764	492-770	520-760	605-745	630-630	476-770
Sample Size	57	225	65	6	1	354

(1) Weighted average.

Appendix Table B-14. Chum salmon age, sex, and length data collected from beach seines operated on Salmon River spawning grounds, 1984.

	Age Class				
	31	41	51	61	Total(1)
Males					
Percent	4.8	45.2	40.5	9.5	46.2
Avg Length	562.5	597.1	625.0	655.0	612.3
Std. Error	2.5	6.4	9.0	14.9	—
Size Range	560-565	545-640	565-680	615-680	545-680
Sample Size	2	19	17	4	42
Females					
Percent	8.2	61.2	30.6		53.9
Avg Length	523.8	556.3	573.3		558.9
Std. Error	10.0	4.8	7.9		—
Size Range	500-540	505-615	530-620		500-620
Sample Size	4	30	15		49
Both Sexes					
Percent	6.6	53.9	35.2	4.4	
Avg Length	536.7	572.1	600.8	655.0	583.5
Std. Error	10.3	4.8	7.5	14.9	—
Size Range	500-565	505-640	530-680	615-680	500-680
Sample Size	6	49	32	4	91

(1) Weighted average.

Appendix Table B-15. Chum salmon age, sex, and length data collected from beach seine at the mouth of Beaver Creek, 1984.

	Age Class				
	31	41	51	61	Total(1)
Males					
Percent	14.7	24.4	17.1		56.1
Avg Length	585.0	611.0	630.7		610.2
Std. Error	12.9	9.4	12.4		—
Size Range	550-640	575-665	575-680		550-680
Sample Size	6	10	7		23
Females					
Percent	12.2	24.4	7.3		43.9
Avg Length	546.0	557.0	583.3		558.3
Std. Error	13.9	11.0	7.3		—
Size Range	495-575	515-615	570-595		495-615
Sample Size	5	10	3		18
Both Sexes					
Percent	26.8	48.8	24.4		
Avg Length	567.3	584.0	616.5		587.4
Std. Error	10.9	9.4	11.3		—
Size Range	495-640	515-665	570-680		495-640
Sample Size	11	20	10		41

(1) Weighted average.

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