

**Norton Sound and Kotzebue Sound Management Area,
Salmon Catch and Escapement Statistics, 1990**

By

Alden "Chuck" Blaney

and

Tracy Lingnau

Regional Information Report¹ No. 3A95-03

Alaska Department of Fish and Game
Commercial Fisheries Management and Development Division, AYK Region
333 Raspberry Road
Anchorage, Alaska 99518-1599

February 1995

¹ The Regional Information Report Series was established in 1987 to provide an information access system for all unpublished divisional reports. These reports frequently serve diverse ad hoc informational purposes or archive basic uninterpreted data. To accommodate needs for up-to-date information, reports in this series may contain preliminary data; this information may be subsequently finalized and published in the formal literature. Consequently, these reports should not be cited without prior approval of the author or the Commercial Fisheries Management and Development Division.

TABLE OF CONTENTS

	<u>Page</u>
LIST OF TABLES	
LIST OF FIGURES	
LIST OF APPENDICES	
ABSTRACT	
INTRODUCTION	
METHODS	
Harvest and Escapement	
Age, Sex, and Length Data Collection	
Sample Size	
RESULTS	
Norton Sound	
Commercial and Subsistence Harvest	
Escapement Abundance	
Age, Sex, and Length Composition	
Kotzebue Sound	
Commercial and Subsistence Harvest	
Escapement Abundance	
Age, Sex, and Length Composition	
LITERATURE CITED	
TABLES	
FIGURES	
APPENDIX A - NORTON SOUND	
APPENDIX B - KOTZEBUE SOUND	

LIST OF TABLES

<u>Table</u>	<u>Page</u>
1. Norton Sound commercial salmon effort and catch (numbers) by subdistrict, 1990.	
2. Subsistence salmon effort and catch in Nome, Norton Sound Subdistrict 1, 1990.	
3. Salmon aerial survey escapement counts in Norton Sound in 1990 by species, with survey count goals for chum salmon.	
4. Age and sex composition of chinook salmon samples from Unalakleet, Norton Sound, Subdistrict 6, 1990.	
5. Age and sex composition of chinook salmon commercial catch samples from Shaktoolik, Norton Sound Subdistrict 5, 1990.	
6. Mean length (mm) by age and sex for chinook salmon samples from Norton Sound commercial and test fisheries, 1990.	
7. Chum salmon commercial catch by age and sex in Unalakleet, Norton Sound Subdistrict 6, 1990.	
8. Age and sex composition of chum salmon samples from Unalakleet, Norton Sound subdistrict 6, test fishery, 1990.	
9. Age and sex composition of chum salmon samples from Moses Pt., Norton Sound Subdistrict 3, commercial fishery, 1990.	
10. Mean length (mm) by age and sex for chum salmon samples from Norton Norton Sound commercial and test fisheries, 1990.	
11. Coho salmon commercial catch by age and sex in Unalakleet, Norton Sound Subdistrict 6, 1990.	
12. Coho salmon age and sex composition from Shaktoolik escapement samples, Norton Sound Subdistrict 5, 1990.	
13. Mean length (mm) by age and sex for coho salmon samples from Shaktoolik, Norton Sound Subdistrict 5, 1990.	
14. Kotzebue District commercial salmon set gill net effort and catch by fishing period, 1990	
15. Subsistence salmon effort and catch in Noatak and Noorvik, Kotzebue District, 1990	

LIST OF TABLES (continued)

<u>Table</u>		<u>Page</u>
16.	Chum salmon commercial catch by age and sex in Kotzebue District for the entire season based upon sample data stratified by fishing period, 1990.	
17.	Age and sex composition of chum salmon samples from Kotzebue District test fishery and escapement, 1990.	
18.	Mean length (mm) by age and sex for chum salmon samples from Kotzebue District commercial fishery and escapement, 1990.	

LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
1. Norton Sound commercial salmon fishing subdistricts.	
2. Kotzebue Sound commercial fishing district.	
3. Kotzebue Sound commercial fishing subdistricts and statistical areas.	

LIST OF APPENDICES

APPENDIX A: NORTON SOUND

Page

A.1 Commercial salmon set gill net effort and catch in Golovin, Norton Sound Subdistrict 2, 1990

A.2 Commercial salmon set gill net effort and catch in Moses Point, Norton Sound Subdistrict 3, 1990.

A.3 Commercial salmon set gill net effort and catch in Shaktoolik, Norton Sound Subdistrict 5, 1990.

A.4 Commercial salmon set gill net effort and catch in Unalakleet, Norton Sound Subdistrict 6, 1990.

APPENDIX B: KOTZEBUE SOUND

B.1 Chum salmon commercial catch by age and sex in Kotzebue District by fishing period, 1990.

B.2 Thousands of chum salmon in the Kotzebue District commercial catch by age group, 1962-1990.

B.3 Percent age and sex composition of chum salmon samples taken from the Kotzebue District commercial fishery, 1962-1990.

ABSTRACT

The 1990 commercial and subsistence harvest of the five species of Pacific salmon (*Oncorhynchus*) found in the Norton Sound and Kotzebue Sound Areas are presented by age, sex, and length. The 1990 Norton Sound District commercial harvest totaled 131,666 salmon and was comprised of 8,896 chinook, 65,123 chum, 501 pink, 434 sockeye, and 56,712 coho salmon. The commercial harvest was 5% above the recent 5-year (1985-89) average for chinook salmon, 39% below for chum salmon, and 73% above the five year average for coho salmon. Pink salmon harvests are typically high in even-numbered years, however, only 501 pink salmon were reported to be sold for a market test. Sockeye salmon are only present in small numbers in this area. In general, the aerial survey assessment conditions and escapement abundance were variable in 1990. The chinook salmon harvest in the Unalakleet Subdistrict of Norton Sound was predominantly ages 1.4 (57.9%) and 1.3 (29.3%). Chum salmon harvest in Unalakleet Subdistrict was equally divided between ages 0.3 and 0.4. The coho harvest in the Unalakleet Subdistrict was dominated with age 2.1 (92.3%), with small percents of other age groups observed in the sample. In the Kotzebue District the harvest totaled 163,263 chum salmon and 32 chinook salmon. Commercial harvests are compared to the historical average from 1979 to present. In 1979, commercial periods were standardized. The chum salmon harvest was below the recent 11-year average of 274,560 fish. Aerial surveys of both the Noatak and Kobuk drainage indicated that escapements were well below objectives. Catch information from a test fishery on the Noatak River indicated the escapement into that system during 1990 was down from the prior two years. The age composition of the chum salmon harvest in the Kotzebue District commercial fishery was estimated to be 2.3% age 0.2, 45.6% age 0.3, 50.7% age 0.4, and 1.4% age 0.5.

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 area 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 Subdistricts 1 and 2, consisting of ocean waters north of the Baldwin Peninsula (Figures 2 and 3). Subdistrict 2 normally remains closed unless a chum salmon return that is substantially above average warrants opening this area at the mouth of the Noatak River.

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

Knowledge of the magnitude, distribution, timing, and age-sex-size composition of both the harvest and escapement by stock is fundamental to managing salmon fisheries and achieving full production; i.e., salmon recruitment is directly related to the number of fish in each age, sex, and size category of the spawning population (escapement). Therefore, the age, sex, and size composition for selected harvests and escapements in the Norton Sound and Kotzebue Sound areas have been estimated annually since 1962 and are presented in this report for 1990.

Basic fishery statistics for the Norton Sound and Kotzebue Sound Areas are available from several additional sources. Commercial and subsistence harvest and spawning escapement data for the years 1961 to 1989 are available in annual management reports from ADF&G. In addition, the results from escapement assessment projects are analyzed and reported annually. For the 1990 season these included test fishery projects on the Unalakleet River (Lean, ADF&G, personal communication) and Noatak River (Blaney, ADF&G, personal communication) and a counting tower project on the Kwiniuk River (Lean, ADF&G, personal communication). Age, sex, and size data for Norton Sound and Kotzebue Sound from 1962 to 1982 are summarized in an unpublished report series entitled ADF&G Arctic-Yukon-Kuskokwim Region Age-Sex-Size Composition of Salmon. Beginning with the 1983 season, these data have been published in an annual report (Lean et. al. 1984; Bigler and Lean 1986; Hamner 1987, 1989a, 1989b).

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. This information was summarized by a microcomputer in

the Nome area office and the Kotzebue office during the commercial fishing season.

Subsistence catches have not been monitored as closely as commercial catches in the Norton Sound and Kotzebue Sound Areas. Due to budget constraints, no subsistence harvest surveys were conducted in the Norton Sound area in 1990. A subsistence permit is required to subsistence fish in the Nome Subdistrict and catch limits are set by permit for each river and species. In the Kotzebue area, household interviews were conducted in the villages of Noatak and Noorvik. Since these are only two of several communities in the area, and the largest community of Kotzebue was not surveyed, the results are not intended to be an estimate of subsistence harvest for the area. The members of each household were asked how many fish of each species were caught for subsistence use. During these surveys it was assumed that fishermen could accurately recall their harvests, which may have occurred over several weeks. The reported subsistence harvests are estimates of total catch for each village surveyed. A mean catch per fishing family was calculated for each village surveyed. This mean was applied to those families known to have fished but unavailable for interview.

Aerial surveys have been the primary method for monitoring salmon escapement in the Norton Sound and Kotzebue Sound drainages. Aerial surveys are an index and do not provide a total enumeration of salmon spawning abundance. Therefore, aerial survey escapement counts should be regarded as an index of relative abundance for the surveyed streams. Ideally, a series of these surveys are conducted on approximately the same dates under similar survey conditions so they can be compared across years. Test fishing catches provide an index of escapement and species composition for turbid or large drainages, and may provide more timely information than can be obtained from aerial surveys. Test fish catch and catch per unit of effort (CPUE) statistics are used as an index of relative abundance. Counting towers provide a more comprehensive estimate of escapement. Test fisheries and counting towers both provide data on migratory timing. In 1990 a counting tower on the Kwiniuk River in the Moses Point Subdistrict and test fishing projects on the Unalakleet River in the Unalakleet Subdistrict and the Noatak River in the Kotzebue District were used to monitor escapements.

Age, Sex, and Length Data Collection

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). Sex was determined by examining external morphology (snout, vent, body symmetry) extruded eggs, ovipositor or milt of live fish. The sex of dead fish was determined by examining the gonads, if necessary. Fish length from mid-eye to fork-of-tail was measured to the nearest 5 millimeters.

In some cases sex and length data were obtained without ageable scales, while in other cases ageable scales were collected without the corresponding sex or length data. Therefore, numbers of fish in a length-by-age summary table may differ from numbers of fish in a sex-by-age summary table for a given fishery or escapement sample. Additionally, the total number of fish in an age category for a sample may be greater than the sum of females and males for that category.

Sample Size

Minimum sample size goals within temporal strata for 1990 were derived in a different manner from prior years that resulted in substantially reduced sample size requirements. These reduced requirements were due to a change in recommended levels of accuracy and precision, as well as a different way of assigning variance to age classes. The objective was to obtain an estimated proportion by age class that was within 10 percentage points of the true proportion 95% of the time. This resulted in a per strata sample size goal of 128 fish scale samples regardless of the number of age classes expected. 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 was pooled and a standard error of the mean was calculated.

RESULTS

Commercial fishery samples were collected in sufficient numbers to estimate age and sex composition of the harvest for: 1) chinook, chum and coho salmon in the Unalakleet and Shaktoolik Subdistricts of Norton Sound; and 2) chum salmon in the Kotzebue District. Additional samples were collected in small numbers from commercial chinook catches in the Shaktoolik Subdistrict and from commercial chum catches in the Moses Point Subdistrict. Chinook, chum, and coho salmon were sampled from the Unalakleet River set gill net test fishing catch, while chum salmon were sampled from the Noatak River drift gill net test fishing catch. Due to the selectivity of the 149 mm (5-7/8 in) stretched-mesh gill nets used on these two projects, the sample compositions are not an unbiased estimator of spawning escapement age, sex, and size composition. Kotzebue Sound chum salmon escapement samples were collected from the Noatak River spawning grounds by beach seine, and by carcass collection from the Squirrel River spawning grounds in the Kobuk River drainage. Comparisons of age, sex, and size composition were not substantiated by statistical testing.

Norton Sound

Commercial and Subsistence Harvest

The 1990 Norton Sound commercial harvest totaled 131,666 salmon and was comprised of 8,896 chinook, 65,123 chum, 501 pink, 434 sockeye and 56,712 coho salmon (Table 1; Appendix A). Commercial effort and harvest were reduced due to a lack of salmon markets during most of the season in the four northern subdistricts. The Unalakleet Subdistrict accounted for 62.3% of the total salmon harvest in 1990, followed by the Shaktoolik (22.1%), Golovin (12.2%), and Moses Point (3.4%) Subdistricts.

The chinook salmon harvest was 5% above the 1985-89 average and comprised 6.8% of the district's total salmon harvest. Most fishermen in the Unalakleet and Shaktoolik Subdistricts target on chinook salmon from the opening of the season in early June using set gill nets with 210 mm (8-1/4 in) stretched mesh. During this portion of the season, fishing periods in these two subdistricts are reduced to 24 hours from the normal 48 hours to provide for adequate chinook escapements. North of the Shaktoolik

Subdistrict, fishermen typically use 149 mm (5-7/8 in) mesh gill nets throughout the fishing season and target on chum salmon, with chinook salmon harvested incidentally.

Chum salmon, the most economically important (ex-vessel value) species in Norton Sound, comprised 49.5% of the district's total harvest in 1990. This harvest was 39% below the 1985-89 average. Pink salmon returns in Norton Sound follow an even-year cycle of high abundance, but the negligible harvest in 1990 was attributable to the lack of a market. Sockeye salmon are harvested in small numbers incidental to chum salmon. The coho salmon harvest was the largest on record, 73% above the 1985-89 average, and accounted for 43% of the district's total salmon catch.

Although many of the 13,000 residents of the Norton Sound area are dependent to varying degrees on the fish and game resources of the area, subsistence catches have not been monitored since 1983, except in the Nome Subdistrict. Prior to 1983 the department conducted annual household surveys in many of the villages in the area. For the last 5 years in which complete surveys were conducted (1978-82), the average subsistence catch in the Norton Sound area was 73,000 salmon of all species combined; since not all fishermen were contacted, this should be considered a minimum estimate. In the Nome Subdistrict, subsistence permits require that fishermen document their harvest by species. One hundred and sixty nine subsistence permits were issued in 1990. One hundred and forty one of these were fished and resulted in a harvest of 6,882 salmon: 58 chinook, 4,153 chum, 409 pink, 1,937 sockeye, and 325 coho salmon (Table 2).

Escapement Abundance

In general, aerial survey assessment conditions and escapement abundance were variable in 1990 (Table 3). The Unalakleet and Shaktoolik subdistricts support the major chinook salmon returns in Norton Sound with Norton Bay, Moses Point and Golovin Subdistricts demonstrating increased returns in recent years. Chinook escapement surveys observed below average numbers in most streams except the Kwiniuk River which obtained an above average number past the counting tower. The count of 744 chinook was above the 1979-89 average of 356 fish. The Unalakleet River test fishery indicated an average return into that system.

Chum salmon escapement to the Kwiniuk River was only 55% of the objective level based on a counting tower estimate. Aerial survey counts of chum and pink salmon for the Eldorado, Sinuk, and Solomon Rivers in the Nome Subdistrict were obtained in August while surveying for coho salmon. Since timing of the surveys was past peak spawning activity and during a strong pink salmon return the resulting counts for chum salmon are very minimal estimates and not comparable to objective levels.

Coho salmon are found in nearly all of the chum salmon producing streams in Norton Sound, although the Unalakleet and Shaktoolik River systems support the largest populations. Due to poor weather conditions, surveys of the major coho salmon stocks could not be conducted. Counts of 377 coho salmon for the Nome River, 44 for the Eldorado River and 161 for the Sinuk River indicated poor coho escapements in the northern portion of Norton Sound.

Age, Sex, and Length Composition

Chinook salmon commercial harvest in the Unalakleet Subdistrict was 57.9% age-1.4 and 29.3% age-1.3, with ages 1.2 and 2.3 contributing smaller percentages (Table 4). Females were estimated to contribute 44.3% to the harvest. A small sample from the Shaktoolik commercial harvest was also dominated by

ages 1.4 and 1.3 (Table 5). A sample of 39 chinook from the Unalakleet River test fishery using 149 mm (5-7/8 in) mesh gill nets was 38.5% age-1.3 and 28.3% age-1.2, with 43.6% of the sample being female (Table 4). Mean lengths by age group for all samples collected ranged from 567 mm for age 1.2 males from the Unalakleet River commercial fishery sample to 980 mm for age 1.5 females from the Shaktoolik commercial fishery sample (Table 6).

The chum salmon commercial harvest in the Unalakleet Subdistrict were evenly split between ages 0.3 and 0.4 (Table 7). Females were estimated to contribute 57.4% to the harvest in this subdistrict. A small sample from the Moses Point commercial fishery harvest was dominated by age 0.3 (Table 9). A sample of 321 chum salmon from the Unalakleet River test fishery using 149 mm (5-7/8 in) mesh gill nets was 41.4% age-0.3 and 53.6% age-0.4. Females were dominant contributing 56.7% of the catch (Table 8). Mean lengths by age group for all samples collected ranged from 529 mm for an age-0.2 female from the Unalakleet commercial fishery sample to 664 mm for age-0.5 males, also from the Unalakleet commercial fishery sample (Table 10).

A sample of 238 coho from the Unalakleet River test fishery using 149 mm (5-7/8 in) mesh gill nets was 90% age-2.1, 8.5% age-3.1, with 48% of the sample being female (Table 11). Mean lengths by age group from the Unalakleet River test fishery and commercial catch sample ranged from 580 mm for an age-1.1 female to 610 mm for an age-2.3 male, from the Unalakleet River test fishery and commercial catch sample (Table 11).

A small commercial catch sample of 52 coho salmon from Shaktoolik Subdistrict was 84.6% age-2.1, 13.5% age-3.1, with 85% of the sample being male (Table 12). Mean lengths by age group from the ranged from 585.0 mm for age-3.1 females to 586.9 mm for age-2.1 males (Table 13).

Kotzebue Sound

Commercial and Subsistence Harvest

The 1990 commercial harvest of salmon in the Kotzebue District totaled 163,263 chum salmon and 32 chinook salmon (Table 14). The harvest was 47.2% below the 1979-89 average of 345,800 fish (Appendix B.2). 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, which may be up to 274 m (150 fm) in aggregate length per fisherman. After the first 3 fishing periods of below average catches in 1990, catch rates rose to near average. Therefore, fishing periods were extended to 36 hours in duration until 6 August. By the end of the ninth period, escapement indices on the Noatak River indicated low chum salmon returns and fishing time was reduced to 24 hours for the next period. The resulting catch in the next period was 36.8% below the 11 year average. Based on an aerial survey of the Noatak River on August 8th and the below average commercial catch of the preceding fishing period, an emergency closure of the Kotzebue commercial salmon season was initiated on August 10th.

Door-to-door subsistence fishermen interviews were conducted in the villages of Noorvik on the Kobuk River in October, and in the village of Noatak on the Noatak River in November (Table 15). Estimated chum salmon subsistence harvests totalled 4,353 in Noorvik and 3,915 in Noatak. These were not total subsistence harvest estimates for the Kotzebue Sound area in that the town of Kotzebue and several villages which harvest chum salmon for subsistence were not surveyed.

Escapement Abundance

Aerial escapement surveys were conducted on all index tributaries in 1990. Peak surveys indicated escapements were near the objective on the Kobuk River but below objectives on the Noatak River. Data from a test fishery on the Noatak River indicated that escapement to that system was substantially down from the prior two years.

Age, Sex, and Length Composition

Sufficient commercial fishery catch samples were collected to stratify the season by fishing period (Appendix B.1). A shift in age composition through the season was once again noted for 1990, with age-0.4 decreasing and age-0.3 increasing as the season progressed. For the first fishing period, 60.8% of the catch was age 0.4 and 36.0% was age 0.3, while for the tenth period 46.0% of the catch was age 0.4 and 47.8% was age 0.3. Ages 0.2 and 0.5 contributed only small percentages, but followed the timing pattern of older fish earlier in the run and younger fish later. The chum salmon commercial harvest for the entire season was comprised of 45.6% age-0.3, 50.7% age-0.4, 1.4% age-0.5 and 2.3% age-0.2 (Table 16). Females were estimated to contribute 50.2% to the harvest. During the prior 10 year period (1980-89), age 0.3 averaged 59.8% and age 0.4 averaged 31.6% of the commercial harvest in the Kotzebue District (Appendix B.3).

Additional samples were collected from the test fishery located in the lower Noatak River using 149 mm (5-7/8 in) mesh gill nets (age data only), and from the Noatak and Squirrel River spawning grounds. Age 0.3 accounted for 45.8% to 47.9%, and females accounted for 49.2% to 60.7% of these escapement samples (Table 17).

Mean lengths by age group for all samples collected ranged from 502 mm for age-0.2 females from the Squirrel River escapement carcass sample to 651 mm for age-0.4 males from the Noatak River escapement beach seine sample (Table 18).

LITERATURE CITED

- Bigler, B. S., and C. F. Lean. 1986. Age, sex, and size of Norton Sound and Kotzebue Sound salmon catch and escapement, 1984. Alaska Department of Fish and Game, Division of Commercial Fisheries, Technical Data Report 172, Juneau.
- Hamner, H. H. 1987. Abundance, age, sex, and size of Norton Sound and Kotzebue Sound salmon catch and escapement, 1985. Alaska Department of Fish and Game, Division of Commercial Fisheries, Technical Data Report 193, Juneau.
- Hamner, H. H. 1989a. Abundance, age, sex, and size of Norton Sound and Kotzebue Sound salmon catch and escapement, 1986. Alaska Department of Fish and Game, Division of Commercial Fisheries, Technical Fisheries Report 89-08, Juneau.
- Hamner, H. H. 1989b. Abundance, age, sex, and size of Norton Sound and Kotzebue Sound salmon catch and escapement, 1987. Alaska Department of Fish and Game, Division of Commercial Fisheries, Technical Fisheries Report 89-09, Juneau.
- Lean C. F., B. B. Bigler, and L. K. Brannian. 1984. Age, sex, and size of Norton Sound and Kotzebue Sound salmon catch and escapement, 1983. Alaska Department of Fish and Game, Division of Commercial Fisheries, Technical Data Report 130, Juneau.

Table 1. Norton Sound commercial salmon effort and catch (numbers) by subdistrict, 1990.

Subdistrict	Fisher- men	Catch					Total
		Chinook	Chum	Pink	Sockeye	Coho	
Nome ^a	0	-	-	-	-	-	-
Golovin	15	52	15,993	0	21	0	16,066
Moses Point	23	202	3,723	501	0	0	4,426
Norton Bay ^a	0	-	-	-	-	-	-
Shaktoolik	28	2,644	21,748	0	49	4,695	29,136
Unalakleet	73	5,998	23,659	0	364	52,017	82,037
District Totals	110 ^b	8,896	65,123	501	434	56,712	131,666

^a No buyers present during the fishery.

^b Total fishermen is total number of fishing permits used during the 1990 season in Norton Sound.

Table 2. Subsistence salmon effort and catch in Nome, Norton Sound Subdistrict 1, 1990.

Location	Permits Issued	Permits Returned	Catch ^a					Total
			Chi-nook	Chum	Pink	Sock-eye	Coho	
Nome R.	19	16	1	49	333	3	101	487
Marine Waters	86	71	49	2,157	775	83	118	3,182
Sinuk R.	5	3	4	83	43	66	0	191
Eldorado R.	24	20	2	1,599	208	92	47	1,948
Flambeau R.	5	3	1	116	0	0	0	117
Snake R.	14	12	1	22	233	2	69	327
Penny R.	0	0	0	0	0	0	0	0
Solomon R.	5	5	0	6	292	0	0	298
Bonanza R.	10	9	0	120	46	79	62	307
Cripple R.	1	1	0	1	7	0	12	20
Totals	169	141	58	4,153	409	1,937	325	6,882

^a Harvested by beach seine or set gill net.

Table 3. Salmon aerial survey escapement counts in Norton Sound in 1990 by species, with survey count goals for chum salmon.

Subdistrict	Stream	Chinook	Chum		Pink	Coho
			Goal ^a	Count		
Nome (1)	Nome	0 ^c	2,000	541 ^{b,c}	13,085 ^{b,c}	377
	Eldorado	17 ^c	5,300	884 ^c	2,050 ^c	44 ^c
	Sinuk	95 ^c	29,040 ^c	161 ^c		
	Solomon ^f					
Golovin (2)	Niukluk		8,000	6,200		170 ^d
Moses Pt. (3)	Kwiniuk ^e	744	25,000	13,735	404,452	746

^a Aerial survey count goals have only been developed for chum salmon and are based on the average of historical peak aerial survey counts with "good" or "fair" ratings. Goals are shown only for those streams with chum salmon survey counts in 1990.

^b Boat survey.

^c Poor survey conditions or non-peak timing resulting in minimal count.

^d Includes 70 coho salmon counted in Ophir Creek.

^e Preliminary expanded tower counts. Chum salmon escapement goal for Kwiniuk River is based on historical tower count data.

^f not surveyed

Table 4. Age and sex composition of chinook salmon samples from Unalakleet, Norton Sound Subdistrict 6, 1990.

		Brood Year and (Age Group)							
		1986	1985		1984		1983		Total
		(1.2)	(1.3)	(2.2)	(1.4)	(2.3)	(1.5)	(2.4)	
Unalakleet River Test GN ^a									
Sampling Dates: 6/15-7/07									
Female	Sample Size	4	6	0	5	0	1	1	17
	Percent of Sample	10.3	15.4	0.0	12.8	0.0	2.6	2.6	43.6
Male	Sample Size	7	9	2	2	0	1	1	22
	Percent of Sample	17.9	23.1	5.1	5.1	0.0	2.6	2.6	56.4
Total	Sample Size	11	15	2	7	0	2	2	39
	Percent of Sample	28.2	38.5	5.1	17.9	0.0	5.1	5.1	100.0
	Standard Error	7.3	7.9	3.6	6.2	0.0	3.6	3.6	
Unalakleet Commercial GN									
Stratum Dates: 6/14-9/08									
Sampling Dates: 6/15-6/19									
Female	Sample Size	5	12	1	42	1	1	0	62
	Percent of Sample	3.6	8.6	0.7	30.0	0.7	0.7	0.0	44.3
Male	Sample Size	8	29	0	39	2	0	0	78
	Percent of Sample	5.7	20.7	0.0	27.9	1.4	0.0	0.0	55.7
Total	Sample Size	13	41	1	81	3	1	0	140
	Percent of Sample	9.3	29.3	0.7	57.9	2.1	0.7	0.0	100.0
	Standard Error	2.5	3.9	0.7	4.2	1.2	0.7	0.0	

^a Gill net mesh size was 149 mm (5-7/8 in.) stretch measure.

Table 5. Age and sex composition of chinook commercial catch samples from Shaktoolik, Norton Sound Subdistrict 5, 1990.

		Brood Year and (Age Group)						
		1986 (1.2)	1985 (1.3)	1985 (2.2)	1984 (1.4)	1983 (1.5)	1983 (2.4)	Total
Stratum Dates:		6/14-8/18						
Sampling Dates:		6/22-6/23						
Female	Sample Size	1	10	0	72	1	2	86
	Percent of Sample	0.7	7.1	0.0	51.4	0.7	1.4	61.4
Male	Sample Size	10	16	1	27	0	0	54
	Percent of Sample	7.1	11.4	0.7	19.3	0.0	0.0	38.6
Total	Sample Size	11	26	1	99	1	2	140
	Percent of Sample	7.9	18.6	0.7	70.7	0.7	1.4	100.0
	Standard Error	2.3	3.3	0.7	3.9	0.7	1.0	

^a Gill net mesh size was 149 mm (5-7/8 in.) stretch measure.

Table 6. Mean length (mm) by age and sex for chinook salmon samples from Norton Sound commercial and test fisheries, 1990.

		Brood Year and (Age Group)							
		1986 (1.2)	1985 (1.3)	1985 (2.2)	1984 (1.4)	1984 (2.3)	1983 (1.5)	1983 (2.4)	
Shaktoolik (Subdistrict 5) Commercial GN									
Sampling Dates: 6/22-6/23									
Females	Mean Length	615	755	-	867.8	-	980	892.5	
	Std. Error	0	16.77	-	6.16	-	0	37.5	
	Range	615- 615	690- 845	-	750-1010	-	980- 980	855- 930	
	Sample Size	1	10	0	72	0	1	2	
Males	Mean Length	590	683.8	645	805	-	-	-	
	Std. Error	9.04	22.67	0	15.74	-	-	-	
	Range	530- 620	560- 825	645- 645	665- 945	-	-	-	
	Sample Size	10	16	1	27	0	0	0	
All Fish	Mean Length	592.3	711	645	851	-	980	893	
	Std. Error	8.48	17	0	7	-	0	38	
	Range	530- 620	560- 845	645- 645	665-1010	-	980- 980	855- 930	
	Sample Size	11	26	1	99	0	1	2	
Unalakleet (subdistrict 6) Commercial GN									
Sampling Dates: 6/15-7/07									
Females	Mean Length	607	736.3	605	850.7	792	805	-	
	Std. Error	10.2	15.82	0	8.75	0	0	-	
	Range	575- 635	625- 850	605- 605	690- 965	792- 792	805- 805	-	
	Sample Size	5	12	1	42	1	1	0	
Males	Mean Length	566.6	732.6	-	824.2	724	-	-	
	Std. Error	12.08	39.38	-	14.78	16	-	-	
	Range	500- 610	496-1760	-	565-1000	708- 740	-	-	
	Sample Size	8	29	0	39	2	0	0	
All Fish	Mean Length	582.2	734	605	838	747	805	-	
	Std. Error	9.89	28	0	9	24	0	-	
	Range	500- 635	496-1760	605- 605	565-1000	708- 792	805- 805	-	
	Sample Size	13	41	1	81	3	1	0	
Unalakleet River Test GN ^a									
Sample Dates: 6/15-7/07									
Females	Mean Length	596.3	632.5	-	796	790	815	-	
	Std. Error	17	23.34	-	57.17	0	0	-	
	Range	550- 630	545- 700	-	585- 910	790- 790	815- 815	-	
	Sample Size	4	6	0	5	1	1	0	
Males	Mean Length	587.9	678.3	615	720	765	960	-	
	Std. Error	13.67	17.22	25	130	0	0	-	
	Range	555- 645	600- 750	590- 640	590- 850	765- 765	960- 960	-	
	Sample Size	7	9	2	2	1	1	0	
All Fish	Mean Length	590.9	660	615	774	778	888	-	
	Std. Error	10.22	15	25	51	13	73	-	
	Range	550- 645	545- 750	590- 640	585- 910	765- 790	815- 960	-	
	Sample Size	11	15	2	7	2	2	0	

^a Gill net mesh size was 149 mm (5-7/8 in.) stretch measure.

Table 7. Chum salmon commercial catch by age and sex in Unalakleet, Norton Sound Subdistrict 6, 1990.

		Brood Year and (Age Group)					Total
		1988 (0.1)	1987 (0.2)	1986 (0.3)	1985 (0.4)	1984 (0.5)	
Stratum Dates:		6/14-7/07					
Sampling Dates:		6/27-7/06					
Sample Size:		191					
Female	Percent of Sample	0.0	0.5	19.4	33.0	1.0	53.9
	Number in Catch	0	54	2,001	3,407	108	5,570
	Mean Length	0.0	540.0	574.5	592.1	615.0	
Male	Percent of Sample	0.0	0.0	22.5	21.5	2.1	46.1
	Number in Catch	0	0	2,325	2,217	216	4,759
	Mean Length	0.0	0.0	586.3	614.0	663.8	
Total	Percent of Sample	0.0	0.5	41.9	54.5	3.1	100.0
	Number in Catch	0	54	4,326	5,624	324	10,329
	Mean Length	0.0	540.0	580.8	600.7	647.5	
	Standard Error	0	54	370	373	131	
Stratum Dates:		7/09-7/21					
Sampling Dates:		7/10-7/20					
Sample Size:		195					
Female	Percent of Sample	0.0	1.0	30.8	27.2	2.1	61.0
	Number in Catch	0	83	2,498	2,206	167	4,954
	Mean Length	0.0	520.0	570.3	590.8	585.0	
Male	Percent of Sample	0.5	1.0	23.6	13.8	0.0	39.0
	Number in Catch	42	83	1,915	1,124	0	3,164
	Mean Length	540.0	557.5	575.7	607.4	0.0	
Total	Percent of Sample	0.5	2.1	54.4	41.0	2.1	100.0
	Number in Catch	42	167	4,413	3,330	167	8,118
	Mean Length	540.0	538.8	572.6	596.4	585.0	
	Standard Error	42	83	290	287	83	
Stratum Dates:		7/23-9/08					
Sampling Dates:		7/24-7/27					
Sample Size:		69					
Female	Percent of Sample	0.0	1.4	21.7	33.3	0.0	56.5
	Number in Catch	0	76	1,133	1,737	0	2,946
	Mean Length	0.0	535.5	543.3	592.4	0.0	
Male	Percent of Sample	1.4	1.4	24.6	15.9	0.0	43.5
	Number in Catch	76	76	1,284	831	0	2,266
	Mean Length	590.0	575.0	568.5	611.4	0.0	
Total	Percent of Sample	1.4	2.9	46.4	49.3	0.0	100.0
	Number in Catch	76	151	2,417	2,568	0	5,212
	Mean Length	590.0	555.0	556.7	598.5	0.0	
	Standard Error	76	106	315	316	0	

(continued)

Table 7. (page 2 of 2).

		Brood Year and (Age Group)					
		1988 (0.1)	1987 (0.2)	1986 (0.3)	1985 (0.4)	1984 (0.5)	Total
Stratum Dates:	6/14-7/27						Season Summary
Sample Size:	455						
Female	Percent of Sample	0.0	0.9	24.6	30.5	1.3	57.4
	Number in Catch	0	208	5,824	7,228	312	13,571
Male	Percent of Sample	0.4	0.7	23.3	17.4	0.9	42.6
	Number in Catch	104	156	5,512	4,108	208	10,088
Total	Percent of Sample	0.4	1.5	47.9	47.9	2.2	100.0
	Number in Catch	104	364	11,336	11,336	520	23,659
	Standard Error	73	137	555	555	163	

Table 8. Age and sex composition of chum salmon samples from Unalakleet, Norton Sound Subdistrict 6, test fishery, 1990.^a

		Brood Year and (Age Group)				
		1987 (0.2)	1986 (0.3)	1985 (0.4)	1984 (0.5)	Total
Sample Dates:		6/14-9/12				
Female	Sample Size	5	64	107	6	182
	Percent of Sample	1.6	19.9	33.3	1.9	56.7
Male	Sample Size	3	69	65	2	139
	Percent of Sample	0.9	21.5	20.2	0.6	43.3
Total	Sample Size	8	133	172	8	321
	Percent of Sample	2.5	41.4	53.6	2.5	100.0
	Standard Error	0.9	2.8	2.8	0.9	

^a Gill net size was 149 mm (5-7/8 in.) stretch measure.

Table 9. Age and sex composition of chum salmon samples from Moses Pt., Norton Sound Subdistrict 3, commercial fishery, 1990.

		Brood Year and (Age Group)				
		1987 (0.2)	1986 (0.3)	1985 (0.4)	1984 (0.5)	Total
Sampling Dates: 6/26-6/29						
Female	Sample Size	1	34	16	1	52
	Percent of Sample	0.8	26.0	12.2	0.8	39.7
Male	Sample Size	0	51	24	4	79
	Percent of Sample	0.0	38.9	18.3	3.1	60.3
Total	Sample Size	1	86	42	5	134
	Percent of Sample	0.8	64.9	30.5	3.8	100.0
	Standard Error	0.7	4.2	4.0	1.6	

Table 10. Mean length (mm) by age and sex for chum salmon samples from Norton Sound commercial and test fisheries, 1990.

		Brood Year and (Age Group)			
		1987 (0.2)	1986 (0.3)	1985 (0.4)	1984 (0.5)
Moses Point (Subdistrict 3) Commercial GN					
Females	Mean Length	593	563.6	587.2	636
	Std. Error	0	3.29	5.72	0
	Range	593- 593	525- 605	551- 634	636- 636
	Sample Size	1	34	16	1
Males	Mean Length	-	583.3	617.8	618.3
	Std. Error	-	4.43	7.06	10.28
	Range	-	523- 676	542- 680	606- 649
	Sample Size	0	51	24	4
All Fish	Mean Length	593	576	606	622
	Std. Error	0	3	5	9
	Range	593- 593	523- 676	542- 680	606- 649
	Sample Size	1	86	42	5
Unalakleet (Subdistrict 6) Commercial GN					
Sample Dates: 6/27-7/27					
Females	Mean Length	528.8	568	591.6	595
	Std. Error	8	2.61	2.49	13.54
	Range	5- 540	490- 655	520- 665	570- 655
	Sample Size	4	112	139	6
Males	Mean Length	563.3	578.8	611.4	663.8
	Std. Error	9.28	2.57	3.09	21.35
	Range	545- 575	515- 635	540- 695	605- 700
	Sample Size	3	106	79	4
All Fish	Mean Length	544	573	599	623
	Std. Error	9	2	2	16
	Range	505- 575	490- 655	520- 695	570- 700
	Sample Size	7	218	218	10
Unalakleet River Test GN ^a					
Sample Dates: 6/14-9/12					
Females	Mean Length	559	573.8	592.8	606.7
	Std. Error	18.8	3.16	2.46	9.28
	Range	515- 615	525- 640	510- 650	580- 640
	Sample Size	5	64	107	6
Males	Mean Length	548.3	577.7	619.5	627.5
	Std. Error	18.78	3.27	4.03	2.5
	Range	515- 580	525- 645	540- 690	625- 630
	Sample Size	3	69	65	2
All Fish	Mean Length	555	576	603	612
	Std. Error	12.96	2	2	8
	Range	515- 615	525- 645	510- 690	580- 640
	Sample Size	8	133	172	8

^a Gill net mesh size was 149 mm (5 7/8 in) stretch measure.

Table 11. Coho salmon commercial catch by age and sex in Unalakleet, Norton Sound Subdistrict 6, 1990.

		Brood Year and (Age Group)							
		1987	1986		1985		1984		Total
		(1.1)	(1.2)	(2.1)	(2.2)	(3.1)	(2.3)	(3.2)	
Unalakleet (Subdistrict 6) Commercial GN									
Sampling Dates 7/27-8/21									
Female	Percent of Sample	0.7	0.0	41.1	0.0	2.7	0.0	0.0	44.5
	Number in Catch	348	0	21,398	0	1,392	0	0	23,138
	Mean Length	570.0	0.0	573.9	0.0	580.6	0.0	0.0	
Male	Percent of Sample	1.3	0.3	51.2	0.3	2.3	0.0	0.0	55.5
	Number in Catch	696	174	26,617	174	1,218	0	0	28,879
	Mean Length	540.0	620.0	576.4	595.0	570.7	0.0	0.0	
Total	Percent of Sample	2.0	0.3	92.3	0.3	5.0	0.0	0.0	100.0
	Number in Catch	1,044	174	48,016	174	2,610	0	0	52,017
	Mean Length	550.0	620.0	575.3	595.0	576.0	0.0	0.0	
	Standard Error	423	174	803	174	658	0	0	
Unalakleet River Test GN ^a									
Sampling Dates: 7/30-9/12									
Female	Sample Size	0	0	101	1	13	0	0	115
	Percent of Sample	0	0	42.4	0.4	5.5	0.0	0.0	48.3
	Mean Length	0.0	0.0	579.5	620.0	570.4			
Male	Sample Size	0	0	113	1	7	1	1	123
	Percent of Sample	0	0	47.5	0.4	3.0	0.4	0.4	51.7
	Mean Length	0.0	0.0	583.9	615.0	563.6	610.0	570.0	
Total	Sample Size	0	0	214	2	20	1	1	238
	Percent of Sample	0	0	89.9	0.8	8.5	0.4	0.4	100.0
	Mean Length	0.0	0.0	581.8	618.0	568.0	610.0	570.0	
	Standard Error	0	0	2.0	0.6	1.8	0.4	0.4	

^a Gill net mesh size was 149 mm (5-7/8 in) stretch measure.

Table 12. Coho salmon age and sex composition from Shaktoolik escapement samples, Norton Sound Subdistrict 5, 1990.

		Brood Year and (Age Group)			
		1986	1985		Total
		(2.1)	(2.2)	(3.1)	
Stratum Dates:	6/14-9/08				
Sampling Dates:	8/7-9/2				
Female	Sample Size	6	0	2	8
	Percent of Sample	11.5	0.0	3.9	15.4
Male	Sample Size	38	1	5	44
	Percent of Sample	73.1	1.9	9.6	84.6
Total	Sample Size	44	1	7	52
	Percent of Sample	84.6	1.9	13.5	100.0
	Standard Error	5.1	1.9	4.8	

Table 13. Mean length (mm) by age and sex for coho salmon samples from Shaktoolik, Norton Sound Subdistrict 5, 1990.

		Brood Year and (Age Group)		
		1986 (1.1)	1985 (2.1)	1984 (3.1)
Females	Mean Length	583.8	-	585
	Std. Error	7.83	-	6
	Range	564- 604	-	579- 591
	Sample Size	6	0	2
Males	Mean Length	586.9	558	597.8
	Std. Error	6.5	0	6.47
	Range	450- 645	558- 558	580- 619
	Sample Size	38	1	5
All Fish	Mean Length	586.5	558	594
	Std. Error	5.69	0	5
	Range	450- 645	558- 558	579- 619
	Sample Size	44	1	7

Table 14. Kotzebue District commercial salmon set gill net effort and catch by fishing period, 1990.

Period	Period Dates	Period Hours	No. of Fishermen	Catch	
				Chinook	Chum
1	7/09-7/10	24	43	1	3,059
2	7/12-7/13	24	44	0	3,293
3	7/16-7/17	24	73	4	7,273
4	7/19-7/20	24	76	1	11,640
5	7/23-7/24	24	103	1	11,810
6	7/26-7/27	24	114	6	20,670
7	7/30-7/31	36	126	3	37,047
8	8/02-8/03	36	129	7	23,206
9	8/06-8/07	36	117	4	26,272
10	8/09-8/10	24	121	5	18,993
Season Total		276	153 ^a	32	163,263

^a Total fishermen is total number of fishing permits used during the 1990 season in Kotzebue District.

Table 15. Subsistence salmon effort and catch in Noatak and Noorvik, Kotzebue District, 1990.

Village	Number of Fishermen	Chum Salmon Harvest	Average Catch per Fisherman
Noatak	29	3,915	135
Noorvik	22	4,353	198
Survey Total ^a	51	8,268	162

^a Subsistence catch estimated for two selected villages by direct interview of available fishermen. Resulting estimates were expanded for subsistence fishermen not contacted in these two villages. Salmon were harvested for subsistence in several other villages in the area. These were not surveyed due to budget and staff limitations.

Table 16. Chum salmon commercial catch by age and sex in Kotzebue District for the entire season based upon sample data stratified by fishing period, 1990.

		Brood Year and (Age Group)				
		1987 (0.2)	1986 (0.3)	1985 (0.4)	1984 (0.5)	Total
Stratum Dates:	7/09-8/10					
Sampling Dates	7/10-8/10 ^a					
Sample Size:	2,284					
Female	Percent of Sample	0.8	23.5	25.0	0.8	50.2
	Number in Catch	1,299	38,381	40,834	1,371	81,884
Male	Percent of Sample	1.5	22.1	25.7	0.6	49.8
	Number in Catch	2,453	36,000	41,988	938	81,379
Total	Percent of Sample	2.3	45.6	50.7	1.4	100.0
	Number in Catch	3,752	74,381	82,822	2,309	163,263
	Standard Error	512	1,702	1,708	403	

^a Sufficient samples were collected to estimate age and sex composition by fishing period, which were summed to provide season totals.

Table 17. Age and sex composition of chum salmon samples from Kotzebue District test fishery and escapement, 1990.

		Brood Year and (Age Group)				
		1987 (0.2)	1986 (0.3)	1985 (0.4)	1984 (0.5)	Total
Noatak River Test GN ^a						
Sampling Dates: 7/17-8/17						
Female	Sample Size	3	103	113	4	223
	Percent of Sample	0.8	27.5	30.2	1.1	59.6
Male	Sample Size	2	76	68	5	151
	Percent of Sample	0.5	20.3	18.2	1.3	40.4
Total	Sample Size	5	179	181	9	374
	Percent of Sample	1.3	47.9	48.4	2.4	100.0
	Standard Error	0.6	2.6	2.6	0.8	
Noatak River Esc. Beach Seine						
Sampling Dates: 9/18-9/19						
Female	Sample Size	15	104	85	3	207
	Percent of Sample	3.6	24.7	20.2	0.7	49.2
Male	Sample Size	9	89	115	1	214
	Percent of Sample	2.1	21.1	27.3	0.2	50.8
Total	Sample Size	24	193	200	4	421
	Percent of Sample	5.7	45.8	47.5	1.0	100.0
	Standard Error	1.1	2.4	2.4	0.5	
Squirrel River Esc. Carcass Survey						
Sampling Dates: 9/11						
Female	Sample Size	3	7	7	0	17
	Percent of Sample	10.7	25.0	25.0	0.0	60.7
Male	Sample Size	1	6	4	0	11
	Percent of Sample	3.6	21.4	14.3	0.0	39.3
Total	Sample Size	4	13	11	0	28
	Percent of Sample	14.3	46.4	39.3	0.0	100.0
	Standard Error	6.7	9.6	9.4	0.0	

^a Gill net mesh size was 149 mm (5-7/8 in.) stretch measure.

Table 18. Mean length (mm) by age and sex for chum salmon samples from Kotzebue District commercial fishery and escapement, 1990.

		Brood Year and (Age Group)			
		1986 (0.2)	1985 (0.3)	1984 (0.4)	1983 (0.5)
Kotzebue Commercial GN					
Sample Dates: 7/10-8/10					
Females	Mean Length	567.8	589.7	614.4	633.9
	Std. Error	5.52	1.15	1.28	7.7
	Range	522- 630	515- 706	373- 688	585- 687
	Sample Size	18	532	566	19
Males	Mean Length	569.2	611.2	643.7	643.2
	Std. Error	3.95	1.35	1.42	13.73
	Range	528- 615	513- 700	525- 750	535- 720
	Sample Size	34	499	582	13
All Fish	Mean Length	568.9	600	629	638
	Std. Error	3.07	1	1	7
	Range	522- 630	513- 706	373- 750	535- 720
	Sample Size	54	1043	1155	32
Noatak River Esc. Beach Seine					
Sample Dates: 9/18-9/19					
Females	Mean Length	554	588.8	597.4	593.3
	Std. Error	7.19	3.13	3.47	20.48
	Range	490- 600	500- 685	530- 675	555- 625
	Sample Size	15	104	85	3
Males	Mean Length	562.2	617.8	650.9	615
	Std. Error	11.7	3.38	3.67	0
	Range	525- 630	525- 705	550- 790	615- 615
	Sample Size	9	89	115	1
All Fish	Mean Length	557.1	602	628	599
	Std. Error	6.18	3	3	15
	Range	490- 630	500- 705	530- 790	555- 625
	Sample Size	24	193	200	4
Squirrel River Esc. Carcass Survey					
Sample Dates: 9/11					
Females	Mean Length	501.7	515	557.1	-
	Std. Error	7.26	5.88	12.53	-
	Range	490- 515	495- 540	520- 605	-
	Sample Size	3	7	7	0
Males	Mean Length	545	593.3	622.5	-
	Std. Error	0	7.92	7.77	-
	Range	545- 545	565- 620	610- 645	-
	Sample Size	1	6	4	0
All Fish	Mean Length	512.5	551	581	-
	Std. Error	11.99	12	13	-
	Range	490- 545	495- 620	520- 645	-
	Sample Size	4	13	11	0

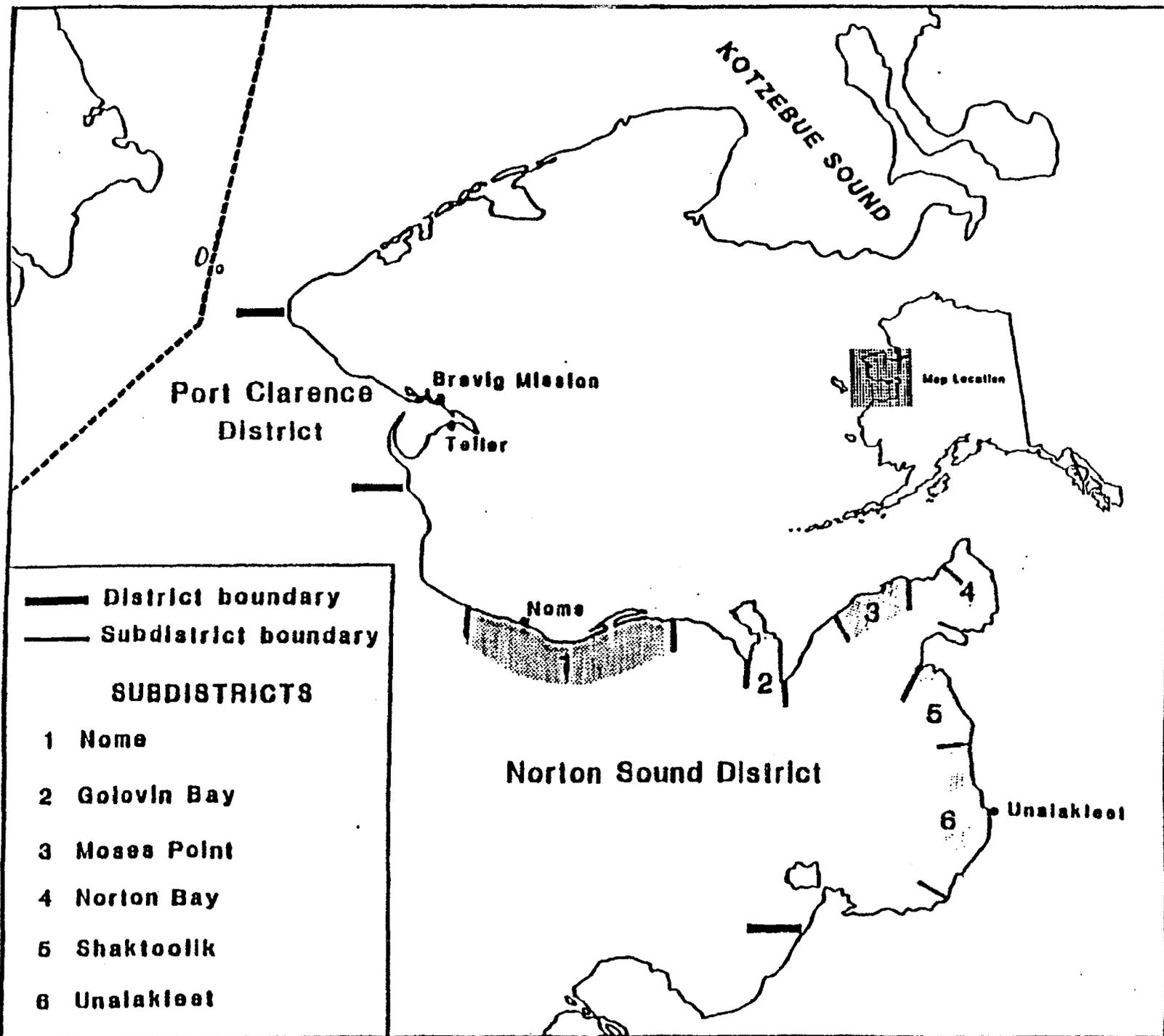


Figure 1. Norton Sound commercial salmon fishing subdistricts.

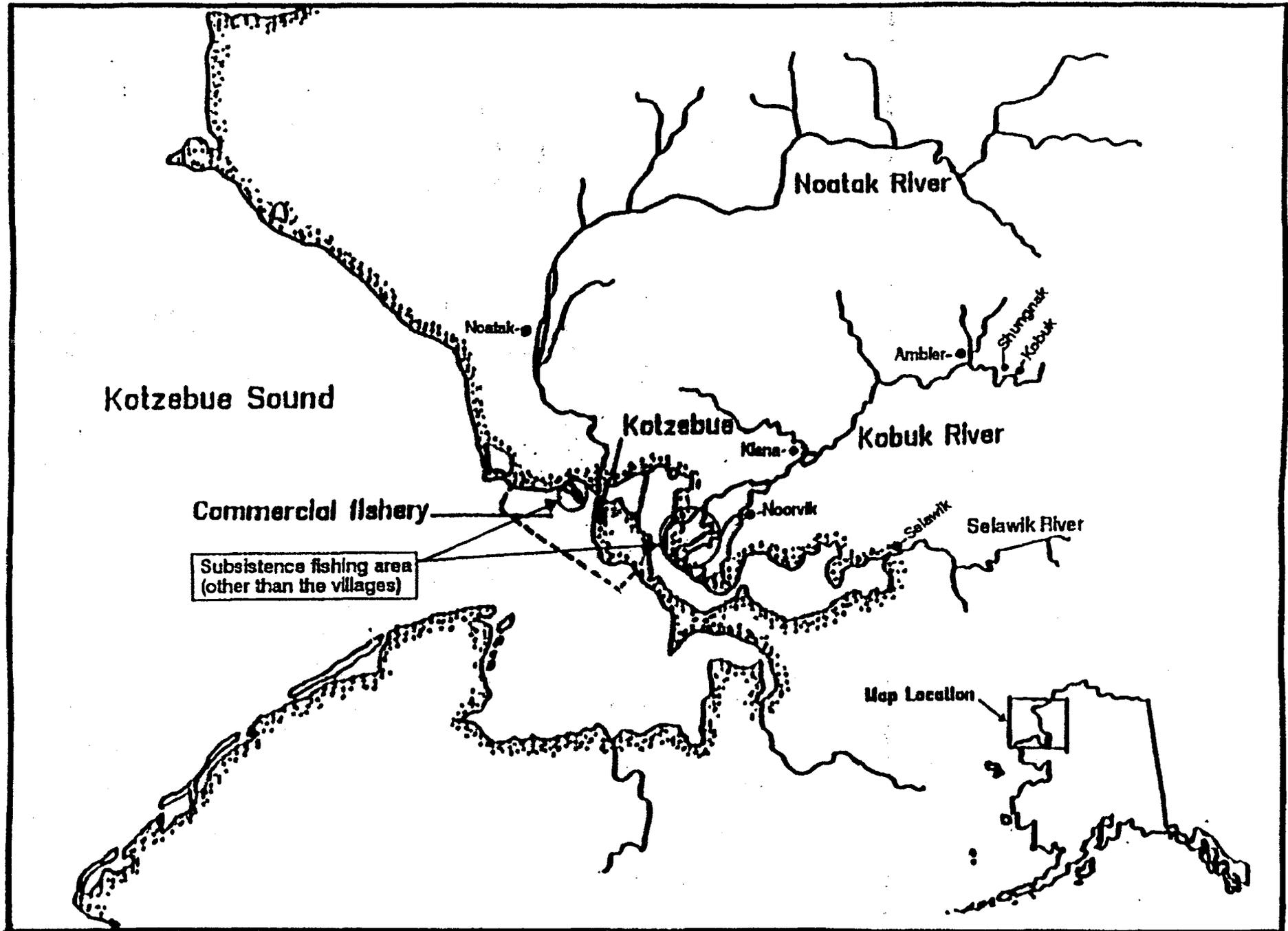


Figure 2. Kotzebue Sound commercial fishing district.

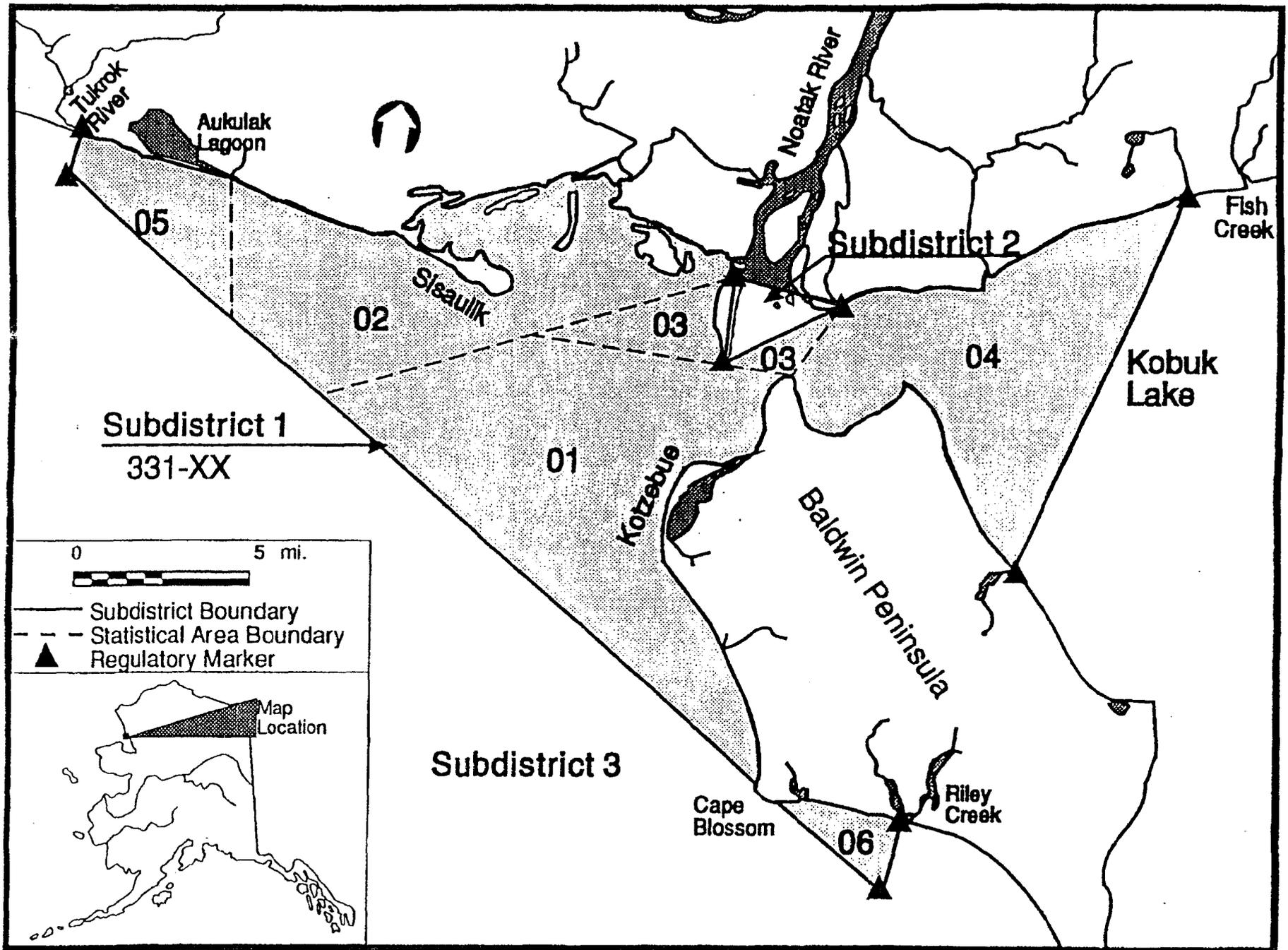


Figure 3. Kotzebue Sound commercial fishing subdistricts and statistical areas.

Appendix A.1. Commercial salmon set gill net effort and catch in Golovin, Norton Sound Subdistrict 2, 1990.

Period	Period Dates	Period Hours	No. of Fishermen	Catch		
				Chinook	Chum	Sockeye
1 ^a	6/22-6/23	24	0	-	-	-
2	6/25-6/27	48	10	19	4,857	0
3	6/28-6/30	48	14	21	6,410	8
4	7/02-7/04	48	15	12	4,726	13
5 ^a	7/05-7/07	48	0	-	-	-
6 ^a	7/09-7/11	48	0	-	-	-
7 ^a	7/12-7/14	48	0	-	-	-
8 ^a	7/16-7/18	48	0	-	-	-
9 ^a	7/19-7/21	48	0	-	-	-
10 ^a	7/23-7/25	48	0	-	-	-
11 ^a	7/26-7/28	48	0	-	-	-
12 ^a	7/30-8/01	48	0	-	-	-
13 ^a	8/02-8/04	48	0	-	-	-
14 ^a	8/06-8/08	48	0	-	-	-
15 ^a	8/09-8/11	48	0	-	-	-
16 ^a	8/13-8/15	48	0	-	-	-
17 ^a	8/16-8/18	48	0	-	-	-
18 ^a	8/20-8/22	48	0	-	-	-
19 ^a	8/23-8/25	48	0	-	-	-
20 ^a	8/27-8/29	48	0	-	-	-
21 ^a	8/30-8/31	48	0	-	-	-
Season Total	100 ^b	15	52	15,993	21	

^a No buyers present.

^b Total hours actually fished.

Appendix A.2. Commercial salmon set gill net effort and catch in Moses Point, Norton Sound Subdistrict 3, 1990.

Period	Period Dates	Period Hours	No. of Fishermen	Catch	
				Chinook	Chum
1	6/25-6/26	24	16	110	1,339
2	6/28-6/29	24	19	83	1,641
3 ^a	7/02-7/03	24	0	-	-
4 ^a	7/05-7/06	24	0	-	-
5	7/09-7/10	24	16	9	733
6 ^a	7/12-7/13	24	0	-	-
7 ^c	7/16-7/17	24	2	0	10
8 ^a	7/19-7/20	24	0	-	-
9 ^a	7/23-7/24	24	0	-	-
10 ^a	7/26-7/27	24	0	-	-
11 ^a	7/30-7/31	24	0	-	-
12 ^a	8/02-8/03	24	0	-	-
13 ^a	8/06-8/07	24	0	-	-
14 ^a	8/09-8/10	24	0	-	-
15 ^a	8/13-8/14	24	0	-	-
16 ^a	8/16-8/17	24	0	-	-
17 ^a	8/20-8/21	24	0	-	-
18 ^a	8/23-8/24	24	0	-	-
19 ^a	8/27-8/28	24	0	-	-
20 ^a	8/30-8/31	24	0	-	-
Season Total		23 ^b	96	202	3,723

^a No buyers present.

^b Total hours actually fished.

^c 501 Pinks were purchased to test roe marketability on 7/10 and 7/17.

Appendix A.3. Commercial salmon set gill net effort and catch in
Shaktoolik, Norton Sound Subdistrict 5, 1990.

Period	Period Dates	Period Hours	No. of Fishermen	Catch			
				Chinook	Chum	Sockeye	Coho
1	6/14-6/15	24	15	225	39	0	0
2	6/18-6/29	24	17	419	169	0	0
3	6/21-6/23	48	21	863	861	0	0
4	6/25-6/27	48	20	554	1,795	0	0
5	6/28-6/30	48	19	360	4,844	1	0
6	7/02-7/04	48	23	118	3,644	3	0
7	7/05-7/07	48	19	47	2,958	10	0
8	7/09-7/11	48	18	34	3,971	3	2
9	7/12-7/14	48	7	3	440	0	0
10 ^a	7/16-7/18	48	0	-	-	-	-
11	7/19-7/21	48	9	2	594	3	73
12	7/23-7/25	48	12	2	863	3	181
13	7/26-7/28	48	11	4	645	2	269
14	7/30-8/01	48	12	3	207	0	180
15	8/02-8/04	48	10	1	200	3	401
16	8/06-8/08	48	16	2	163	7	1,019
17	8/09-8/11	48	13	3	134	4	640
18	8/13-8/15	48	14	4	179	10	1,401
19	8/16-8/18	48	10	0	42	0	529
20 ^a	8/20-8/22	48	0	-	-	-	-
21 ^a	8/23-8/25	48	0	-	-	-	-
22 ^a	8/27-8/29	48	0	-	-	-	-
23 ^a	8/30-8/31	48	0	-	-	-	-
24 ^a	9/03-9/05	48	0	-	-	-	-
25 ^a	8/30-8/31	48	0	-	-	-	-
26 ^a	9/06-9/08	48	0	-	-	-	-
Season Total		816 ^b	28	2,644	21,748	49	4,695

^a No buyers present.

^b Total hours actually fished.

Appendix A.4. Commercial salmon set gill net effort and catch in Unalakleet, Norton Sound Subdistrict 6, 1990.

Period	Period Dates	Period Hours	No. of Fishermen	Catch			
				Chinook	Chum	Sockeye	Coho
1	6/14-6/15	24	31	515	28	0	0
2	6/18-6/19	24	33	743	93	0	0
3	6/21-6/23	48	43	2,037	1,174	0	0
4	6/25-6/27	48	55	1,437	1,844	2	0
5	6/28-6/30	48	55	808	1,807	5	0
6	7/02-7/04	48	33	189	2,622	56	0
7	7/05-7/07	48	31	76	2,761	34	2
8	7/09-7/11	48	31	52	3,088	11	2
9	7/12-7/14	48	22	25	1,475	2	2
10	7/16-7/18	48	26	17	2,094	12	62
11	7/19-7/21	48	23	14	1,461	7	152
12	7/23-7/25	48	26	10	917	5	596
13	7/26-7/28	48	24	9	597	10	690
14	7/30-8/01	48	29	6	493	10	1,360
15	8/02-8/04	48	39	12	773	46	4,980
16	8/06-8/08	48	44	14	707	51	8,254
17	8/09-8/11	48	51	5	429	17	6,023
18	8/13-8/15	48	42	9	544	17	9,716
19	8/16-8/18	48	34	4	257	15	6,860
20	8/20-8/22	48	45	2	234	18	6,579
21	8/23-8/25	48	34	13	177	25	3,956
22	8/27-8/29	48	13	1	70	16	1,987
23	8/30-9/01	48	18	0	10	1	549
24	9/03-9/05	48	11	0	4	4	247
25 ^b	9/06-9/08	48	0	-	-	-	-
Season Total		1,152 ^a	73	5,998	23,659	364	52,017

^a Total hours actually fished.

^b No buyer present during period.

Appendix B.1. Chum salmon commercial catch by age and sex in Kotzebue District by fishing period, 1990.

		Brood Year and (Age Group)				
		1987 (0.2)	1986 (0.3)	1985 (0.4)	1984 (0.5)	Total
Stratum Dates:		7/09-7/10				
Sampling Dates		7/10				
Sample Size:		222				
Female	Percent of Sample	0.0	11.7	23.4	1.4	36.5
	Number in Catch	0	358	717	41	1,116
Male	Percent of Sample	0.0	24.3	37.4	1.8	63.5
	Number in Catch	0	744	1,144	55	1,943
Total	Percent of Sample	0.0	36.0	60.8	3.2	100.0
	Number in Catch	0	1,102	1,860	96	3,059
	Standard Error	0	99	100	36	
Stratum Dates:		7/12-7/13				
Sampling Dates		7/13				
Sample Size:		221				
Female	Percent of Sample	0.9	20.1	28.8	0.0	49.8
	Number in Catch	30	662	947	0	1,639
Male	Percent of Sample	0.0	16.4	33.3	0.5	50.2
	Number in Catch	0	541	1,098	15	1,654
Total	Percent of Sample	0.9	36.5	62.1	0.5	100.0
	Number in Catch	30	1,203	2,045	15	3,293
	Standard Error	21	107	108	15	
Stratum Dates:		7/16-7/17				
Sampling Dates		7/17				
Sample Size:		222				
Female	Percent of Sample	0.0	21.2	29.3	0.0	50.5
	Number in Catch	0	1,540	2,129	0	3,669
Male	Percent of Sample	0.5	20.3	28.8	0.0	49.5
	Number in Catch	33	1,474	2,097	0	3,604
Total	Percent of Sample	0.5	41.4	58.1	0.0	100.0
	Number in Catch	33	3,014	4,226	0	7,273
	Standard Error	33	241	241	0	

(continued)

		Brood Year and (Age Group)				
		1987 (0.2)	1986 (0.3)	1985 (0.4)	1984 (0.5)	Total
Stratum Dates:		7/19-7/20				
Sampling Dates:		7/20				
Sample Size:		232				
Female	Percent of Sample	1.3	27.6	20.7	0.4	50.0
	Number in Catch	151	3,211	2,408	50	5,820
Male	Percent of Sample	1.3	29.3	19.0	0.4	50.0
	Number in Catch	151	3,412	2,208	50	5,820
Total	Percent of Sample	2.6	56.9	39.7	0.9	100.0
	Number in Catch	301	6,623	4,616	100	11,640
	Standard Error	122	379	375	71	
Stratum Dates:		7/23-7/24				
Sampling Dates:		7/24				
Sample Size:		233				
Female	Percent of Sample	1.3	21.0	29.2	0.4	51.9
	Number in Catch	152	2,484	3,447	51	6,133
Male	Percent of Sample	0.4	18.9	27.9	0.9	48.1
	Number in Catch	51	2,230	3,295	101	5,677
Total	Percent of Sample	1.7	39.9	57.1	1.3	100.0
	Number in Catch	203	4,714	6,741	152	11,810
	Standard Error	101	380	384	87	
Stratum Dates:		7/26-7/27				
Sampling Dates:		7/27				
Sample Size:		222				
Female	Percent of Sample	0.0	27.0	27.0	0.9	55.0
	Number in Catch	0	5,586	5,586	186	11,359
Male	Percent of Sample	0.5	15.3	28.8	0.5	45.0
	Number in Catch	93	3,166	5,959	93	9,311
Total	Percent of Sample	0.5	42.3	55.9	1.4	100.0
	Number in Catch	93	8,752	11,545	279	20,670
	Standard Error	93	687	690	161	

(continued)

		Brood Year and (Age Group)				
		1987 (0.2)	1986 (0.3)	1985 (0.4)	1984 (0.5)	Total
Stratum Dates:		7/30-7/31				
Sampling Dates:		7/31				
Sample Size:		234				
Female	Percent of Sample	0.4	26.5	23.9	2.1	53.0
	Number in Catch	158	9,816	8,866	792	19,632
Male	Percent of Sample	1.7	23.9	20.5	0.9	47.0
	Number in Catch	633	8,866	7,599	317	17,415
Total	Percent of Sample	2.1	50.4	44.4	3.0	100.0
	Number in Catch	792	18,682	16,465	1,108	37,047
	Standard Error	351	1,213	1,206	413	
Stratum Dates:		8/02-8/03				
Sampling Dates:		8/03				
Sample Size:		231				
Female	Percent of Sample	0.4	28.6	24.2	1.3	54.5
	Number in Catch	100	6,630	5,626	301	12,658
Male	Percent of Sample	4.8	19.5	20.8	0.4	45.5
	Number in Catch	1,105	4,521	4,822	100	10,548
Total	Percent of Sample	5.2	48.1	45.0	1.7	100.0
	Number in Catch	1,206	11,151	10,448	402	23,206
	Standard Error	340	764	761	200	
Stratum Dates:		8/06-8/07				
Sampling Dates:		8/07				
Sample Size:		232				
Female	Percent of Sample	1.8	28.8	21.6	0.5	52.7
	Number in Catch	473	7,574	5,680	118	13,846
Male	Percent of Sample	3.2	26.6	17.6	0.0	47.3
	Number in Catch	828	6,982	4,615	0	12,426
Total	Percent of Sample	5.0	55.4	39.2	0.5	100.0
	Number in Catch	1,302	14,556	10,296	118	26,272
	Standard Error	375	859	844	116	

(continued)

		Brood Year and (Age Group)				
		1987 (0.2)	1986 (0.3)	1985 (0.4)	1984 (0.5)	Total
Stratum Dates:	8/09-8/10					
Sampling Dates:	8/10					
Sample Size:	235					
Female	Percent of Sample	1.8	22.1	22.1	1.3	47.3
	Number in Catch	336	4,202	4,202	252	8,992
Male	Percent of Sample	2.7	25.7	23.9	0.4	52.7
	Number in Catch	504	4,874	4,538	84	10,001
Total	Percent of Sample	4.4	47.8	46.0	1.8	100.0
	Number in Catch	840	9,076	8,740	336	18,993
	Standard Error	255	620	619	164	

Appendix B.2. Thousands of chum salmon in the Kotzebue District commercial catch by age group, 1962-1990.

Year	Sample Size ^a	Age Class ^b				Total
		0.2	0.3	0.4	0.5	
1962	69	9.5	82.2	36.4	1.8	129.9
1963	255	16.4	27.7	10.1	0.2	54.4
1964	463	40.7	34.5	1.3	0.0	76.5
1965	480	0.9	36.4	2.7	0.0	40.0
1966	430	3.1	20.7	7.0	0.0	30.8
1967	1,865	2.6	21.3	5.4	0.1	29.4
1968	1,989	6.4	17.5	6.0	0.3	30.2
1969	1,125	21.8	34.6	2.9	0.0	59.3
1970	267	6.2	145.4	8.1	0.0	159.7
1971	1,105	11.0	103.2	40.8	0.0	155.0
1972	980	26.8	100.9	41.0	1.0	169.7
1973	598	62.7	260.9	51.8	0.0	375.4
1974	350	179.0	398.7	49.0	1.2	627.9
1975	340	14.1	488.9	60.3	0.0	563.3
1976	566	17.9	82.2	59.4	0.2	159.7
1977	446	13.1	143.1	36.4	3.3	195.9
1978	579	11.7	64.1	35.5	0.2	111.5
1979	658	43.3	75.3	21.5	1.4	141.5
1980	710	55.5	286.9	24.2	0.7	367.3
1981	1,167	16.3	453.7	207.2	0.0	677.2
1982	983	24.7	201.7	168.4	23.0	417.8
1983	1,979	10.2	101.6	60.1	3.9	175.8
1984	2,933	46.7	206.2	63.1	4.2	320.2
1985	3,293	2.3	436.4	80.6	2.1	521.4
1986	3,095	0.8	48.6	206.3	5.7	261.4
1987	1,987	14.8	45.4	36.6	12.7	109.5
1988	3,324	21.5	263.6	60.8	6.8	352.7
1989	3,336	1.8	198.2	51.9	2.6	254.6
1990	2,284	3.8	74.4	82.8	2.3	163.3
10 yr avg (1980-1989)		20.5	227.3	98.4	6.2	345.8

^a Sample size in numbers of fish.

^b Age 0.6, which contributes less than 1% of the commercial harvest in any given year, is not included here.

Appendix B.3. Percent age and sex composition of chum salmon samples taken from the Kotzebue District commercial fishery, 1962-1990.

Year	Sample Size ^a	Males	Females	Class ^b			
				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	1,865	37.3	62.7	8.8	72.3	18.5	0.5
1968	1,989	48.2	51.8	21.2	58.0	19.8	0.9
1969	1,125	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	1,105	54.6	45.4	7.1	66.6	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	53.6	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	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	1,167	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	1,979	43.4	56.6	5.8	57.8	34.2	2.3
1984	1,933	50.2	49.8	14.6	64.3	19.7	1.3
1985	3,293	47.8	52.2	0.4	83.7	15.5	0.4
1986	3,095	46.0	54.0	0.3	18.6	78.9	2.2
1987 ^c	1,987	50.6	49.4	13.5	41.5	33.4	11.6
1988	3,324	47.8	52.2	6.1	74.7	17.2	1.9
1989	3,336	49.3	50.7	0.7	77.9	20.4	1.0
1990 ^d	2,497	49.4	49.7	2.3	45.6	50.7	1.4
10 yr avg (1980-1989)		49.4	50.5	6.1	59.8	31.6	2.5

^a Sample size in numbers of fish.

^b Age 0.6, which contributes less than 1% of the commercial harvest in any given year, is not included here.

^c Adjusted percentages for 1987 include estimates of age composition for closed fishing periods.

^d Adjusted percentages for 1990 do not include estimates of age composition for closed fishing periods.

OEO/ADA STATEMENT

The Alaska Department of fish and Game administers all programs and activities free from discrimination on the basis of sex, color, race, religion, national origin, age, marital status, pregnancy, parenthood or disability. For information on alternative formats available for this and other department publications, please contact the department ADA Coordinator at (voice) 907-465-4120, or (TDD) 907-465-3646. Any person who believes s/he has been discriminated against should write to:

ADF&G
P.O. Box 25526
Juneau, AK 99802-5526

or

O.E.O.
U.S. Department of Interior
Washington, D.C. 20240