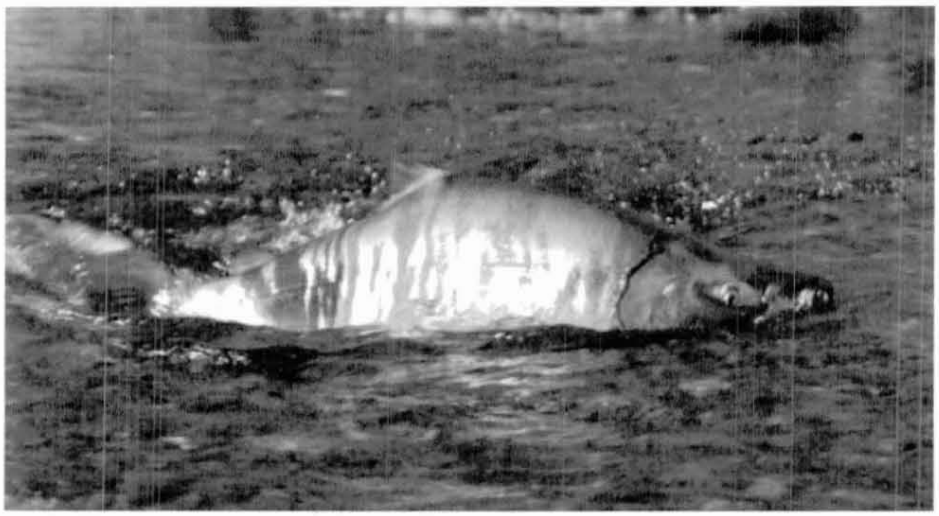
NORTON SOUND AND KOTZEBUE SOUND MANAGEMENT AREA

SALMON CATCH AND ESCAPEMENT REPORT, 1998



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ABSTRACT

The 1998 commercial and subsistence harvest and escapement information for the five species of Pacific salmon *Oncorhynchus* found in the Norton Sound and Port Clarence Management Area and the one species of *Oncorhynchus* found in the Kotzebue Sound Management Area in significant abundance are presented by age, sex, and length. The 1998 Norton Sound District commercial harvest totaled 641,396 salmon and was composed of 7,429 chinook (*O. tschawytscha*), 16,324 chum (*O. keta*), 7 sockeye (*O. nerka*), 588,013 pink (*O. gorbuscha*) and 29,623 coho (*O. kisutch*) salmon. The commercial harvest was 9% below the 1993-97 average for chinook salmon, 49% below for chum salmon, 50% below for coho salmon and 33% above for pink salmon. Sockeye salmon are only present in small numbers in this area. Seven counting tower projects and one weir project were operational in Norton Sound in 1998 to provide more complete information on salmon spawning escapements, and those data are reported here. In the Kotzebue District, the commercial harvest totaled 55,907 chum salmon. An incidental catch of 210 chinook salmon and 349 Dolly Varden was also reported. Subsistence catches of these species plus whitefish, sheefish, northern pike and burbot also occur in the Kotzebue District. The chum salmon commercial harvest in 1998 was a fraction of the 1979-97 average of 265,000 fish.

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

INTRODUCTION

The Norton Sound, Port Clarence, and Kotzebue Sound commercial salmon management districts include all waters of Alaska from Point Romanof, south of Stebbins, to Point Hope, north of Kotzebue. The Port Clarence District has been closed to commercial salmon fishing since 1966. The Norton Sound District includes all waters of Alaska from Point Romanof to Cape Douglas (Figure 1) and consists of six subdistricts: 1 (Nome), 2 (Golovin), 3 (Moses Point), 4 (Norton Bay), 5 (Shaktoolik), and 6 (Unalakleet). These subdistricts are intended to concentrate commercial harvests on stocks which spawn in the watersheds flowing into the respective subdistricts. 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, 3). Subdistrict 2, Noatak River mouth, normally remains closed unless the chum salmon return is substantially above average.

Five species of Pacific salmon are found in the Norton Sound and Kotzebue Sound areas. In descending order of economic importance in 1998, they are pink salmon (*O. gorbuscha*), chinook salmon (*O. tshawytscha*), coho salmon (*Oncorhynchus kisutch*), chum salmon (*O. keta*) and sockeye salmon (*O. nerka*). In Norton Sound the returns of pink salmon during 1998 were the largest of the five species, followed by coho, chum, chinook, and sockeye salmon. In the Kotzebue Sound District, chum salmon are the predominant species.

Knowledge of the magnitude, distribution, timing, and age-sex-length composition of both the harvest and escapement by stock is fundamental to managing salmon fisheries and achieving full production. Age, sex, and length composition of samples from selected salmon harvests and escapements in the Norton Sound and Kotzebue Sound areas have been reported since 1962 and are presented in this report for 1998.

Fishery statistics for the Norton Sound and Kotzebue Sound areas are available from several additional sources. Commercial and subsistence harvest and spawning escapement data from 1961 to 1978 have been summarized in the Norton Sound - Port Clarence - Kotzebue Sound Annual Management Report (Brennan et al. *In Press*). In addition, the results from escapement assessment projects are analyzed and reported annually. For the 1998 season these included test fishery projects on the Unalakleet River (Rob, 1999c) and the Kobuk River (Kohler, 1999b), counting tower projects on the Kwiniuk River (Rob, 1999a), Shaktoolik River (Rob, 1999b), Niukluk River (Rob, 1999d), North River (Rob, 1999e), Eldorado River (Rob, 1999f) and Snake River (1999g), and a weir on the Nome River (Rob, 1999c).

Age, sex, and length data for Norton Sound and Kotzebue Sound salmon 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; Buklis 1991a, 1991b; Lingnau 1992, 1994a, 1994b; Blaney and Lingnau 1995; Lingnau 1995, 1996, 1997, 1998).

This report presents catch, escapement and age-sex-length data for the Norton Sound and Kotzebue

Sound management areas for 1998.

METHODS

Harvest and Escapement

Commercial catch data presented in this report were compiled from harvest receipts, i.e., *fish tickets*, which document each sale by a licensed fisherman. These data were summarized by microcomputer in the Nome and Kotzebue offices during the fishing season.

Funds were dedicated in 1994 to conduct in-depth subsistence harvest surveys for most villages in the Kotzebue, Port Clarence the Norton Sound Districts. These surveys were continued in 1998. Villages surveyed in the Norton Sound and Port Clarence Areas were Brevig Mission, Elim, Golovin, Koyuk, Shaktoolik, St. Michael, Stebbins, Teller, Unalakleet, White Mountain, Gambell and Savoonga.. In the Kotzebue Area, the villages of Ambler, Kiana, Kobuk, Noatak, Noorvik and Shungnak were surveyed. In Kotzebue, postcards to be filled out and returned were sent to households to assess harvests of salmon. A subsistence permit is required to subsistence fish in the Nome Subdistrict, and catch limits are set by permit for each river and species. During community surveys the members of each household were asked how many salmon were caught for subsistence use. It was assumed that fishermen could accurately recall their harvests, which may have occurred over a period of several months.

The Division of Subsistence has conducted other in-depth subsistence harvest interviews in the region. These studies include the city of Kotzebue in 1986 (Georgette and Loon 1993), the village of Unalakleet in 1989-90 (Magdanz and Seitz 1993), Elim in 1992 and 1993 (Jim Magdanz, ADF&G, Nome, personal communication), the Nome Subdistrict in 1975-1991 (Magdanz 1992), and Brevig Mission, Golovin and Shishmaref in 1989 (Conger and Magdanz 1990).

Aerial surveys historically have been the primary method for monitoring salmon escapements to the Norton Sound and Kotzebue Sound drainages although a number of escapement projects are now operating in Norton Sound. Aerial surveys do not provide a total estimate of salmon spawning abundance. Aerial survey escapement counts are, at best, an index of relative abundance for the surveyed streams. To compare aerial surveys across years, surveys are attempted in approximately the same time frame each year for the same index areas. Weather conditions, pilots and surveyors are also variables in aerial survey counts. Comparing commercial catch statistics to previous years provides an index of run strength and timing. Test fishing provides an index of escapement and species composition for turbid or large drainages that are difficult to monitor visually, but does not provide an estimate of total abundance. Test fishery catch and catch per unit effort (CPUE) statistics are used as an index of relative abundance. A test fishing project on the Unalakleet River in the Unalakleet Subdistrict was used to index escapement into that drainage. In the Kotzebue Sound area a test fishing project was conducted on the Kobuk River near the village of Kiana to index salmon escapements into the Kobuk River system. Due to a lack of technical resources, the sonar escapement project on the Noatak River did not operate in 1998. Test drift net fishing on the Noatak River was conducted to collect age, sex, and length information. Counting towers, and weirs provide a better estimate of escapement. The following projects conducted during the 1998

season provided data on salmon escapement abundance and timing in Norton Sound: Nome River weir and Snake and Eldorado River towers in Subdistrict 1, Niukluk River tower in Subdistrict 2, Kwiniuk River tower in Subdistrict 3, Shaktoolik River tower in Subdistrict 5, and North River tower in Subdistrict 6 (Appendix B).

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 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 characteristics, such as: 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 to the nearest millimeter was measured from mid-eye to fork-of-tail. In some cases sex and length data but no ageable scales were obtained from fish, and in other cases ageable scales were collected without 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.

Sample Size

Minimum sample size goals were established for temporal strata based upon simultaneous interval estimation of age class composition. Two methods of determining sample size goals, based on different methods of constructing simultaneous confidence intervals, have been employed. For most purposes, sample size goals were developed using the method of Thompson (1987). Sample size goals were established such that 95% simultaneous confidence intervals would be of width 0.2. This objective is satisfied with a sample size of 128 scales per strata, although the goal was increased to account for the expected number of unreadable scales in any particular instance. In the Kotzebue commercial fishery, where age composition is an important index of run strength, a sample size goal was developed using more stringent standards based on the method of Bromaghin (1993). The ages of chum salmon were categorized into three age classes; age 4, age 5, and age 3 or age 6. The sample size goal was chosen such that such that the width of 95% simultaneous confidence intervals (Goodman 1965) would not exceed 0.15. A sample of 249 fish per stratum satisfied this objective. The sample size goal was increased to 280 fish per stratum to account for the expected number of unreadable scales.

RESULTS

Commercial fishery samples were collected from chinook, chum and coho salmon in Norton Sound Subdistrict 6. Sufficient commercial fishery samples were collected to estimate age and sex composition of the harvest for chum salmon in the Kotzebue District. Chinook, chum, and coho salmon were sampled from the Unalakleet River set gillnet test fishing catch. Because of the selectivity of the 5-7/8 in (149 mm) stretched-mesh gillnets used on the test net project, the samples are not an unbiased estimate of spawning escapement age, sex, and size composition. Chum salmon escapement samples were collected from projects on the Niukluk and Kwiniuk Rivers using beach seines. In the Kotzebue District, chum salmon from drift test fishing catches were sampled on both the Kobuk and Noatak Rivers. Age-sex-length data were collected from chum salmon carcasses from Selby Slough vicinity in the Kobuk River drainage. Comparisons of age, sex, and size composition between samples in this report are non-statistical comparisons. Temporal distribution of some samples may be of concern. Some sample sizes are marginally adequate and may not have been collected proportionally to the catch or abundance.

Norton Sound

Commercial and Subsistence Harvest

The 1998 Norton Sound commercial harvest totaled 641,396 salmon and was composed of 588,013 pink, 29,623 coho, 16,324 chum, 7,429 chinook, and 7 sockeye salmon (Table 1). Subdistrict 5 accounted for 39% of the total commercial salmon harvest (in numbers of fish) in 1998, followed by Subdistrict 3 (23%), Subdistrict 6 (21%) and Subdistrict 2 (17%).

Pink salmon accounted for 52% of the total fishery value followed by chinook salmon (26%), coho salmon (19%), and chum salmon (3%). One buyer purchased fish during the chinook and coho seasons while the second buyer, a floating processor, was mostly interested in pink salmon. Salmon were delivered to Unalakleet via tender and aircraft for processing. The salmon were headed and gutted, then shipped air freight to markets. A few fishermen sold their catch locally and to wholesale distributors, as permitted under catcher/seller regulations. The average price paid was $.74 per pound for chinook, $0.29/lb for coho, $0.14/lb for pink, and $0.09/lb for chum salmon. The total ex-vessel value of the raw fish was $358,982, 20% below the previous 5 year (1993-1997) average.

Although many of the residents of Norton Sound are dependent to some extent on the fish and game resources of the area, subsistence salmon catches generally were not monitored from 1983 through 1993, except in the Nome Subdistrict. Prior to 1983 the Department conducted annual household surveys in many of the villages. For the last 5 years in which these surveys were conducted, 1978-1982, the average annual subsistence catch in the Norton Sound area was 73,000 salmon for all species combined. Because not all households were contacted, this should be considered a minimum estimate. In the Nome Subdistrict (Figure 2), subsistence permits require that fishermen document their harvest by species. There were 183 subsistence permits issued in 1998. A total of 115 permits were returned of which 68 reported having fished. The reported permit harvest of 6,973 salmon was composed of 16 chinook, 44 sockeye, 1,148 coho, 965 chum, and 4,800 pink salmon (Table 2). Funds were dedicated to do comprehensive subsistence surveys in Norton Sound and Kotzebue Sound from 1994 through1998. The villages surveyed in 1998 were listed in the

methods section.

Results of the survey for 1998 indicate an estimated 114,657 salmon were harvested for subsistence purposes in Norton Sound and Port Clarence (Table 3). This estimate includes the permit fishery in Northern Norton Sound. The largest contribution to the harvest was pink salmon, followed by chum, coho, chinook, and sockeye salmon. The largest quantity of salmon was taken by the village of Unalakleet (27,191). Port Clarence villages harvested an estimated 14,179 salmon. Pink salmon were the most abundant followed by chum, coho, sockeye, and chinook salmon.

Escapement Abundance

Aerial survey escapement information is only an indication of run strength. Because of the many factors under which aerial surveys are conducted, this methodology of enumerating salmon does not provide estimates of total escapement abundance. Aerial survey escapement results from Norton Sound are found in Table 4. Overall the chinook salmon escapement was about average with the Shaktoolik River being below average and the Unalakleet River above average. Chum salmon escapements were variable with streams in the northwest portion of the area below average. The exception was the Snake River, which doubled its aerial escapement goal. Spawning escapement indices for the Golovin Bay, Moses Point, and Norton Bay Subdistricts were above average. Spawning escapement indices for the Shaktoolik and Unalakleet Subdistricts were below escapement goals. Coho salmon escapements were average in the Nome and Norton Bay Subdistricts and below average in the rest of the district.

There have been several new cooperative escapement projects implemented in recent years. These projects are listed under METHODS, *Harvests and Escapements*. The only project with an escapement goal is the Kwiniuk River Tower. That passage escapement goal is 19,500 for chum salmon only, as it is the species with the longest historical escapement information. Escapement counts for other species and projects are found in Appendix B. The Kwiniuk River had tower counts of 655,933 pink salmon, 24,248 chum salmon, and 302 chinook salmon. The Nome River weir enumerated 359,469 pink salmon, 1,930 chum salmon, 96 coho salmon, 70 chinook salmon, and 137 Dolly Varden. Counts past the Niukluk River tower were 1,624,436 pink salmon, 45,587 chum salmon, 839 coho salmon, 258 chinook salmon, and 2,419 Dolly Varden. Snake River tower counts were 219,679 pink salmon, 11,067 chum salmon, and 178 coho salmon. The Eldorado River tower project counted 137,283 pink salmon, 13,808 chum salmon, 446 chinook salmon and 21 coho salmon. The North River tower, a tributary of the Unalakleet River, counted 74,045 pink salmon, 1,526 chum salmon, 2,100 chinook salmon and 3,361 coho salmon. The Shaktoolik River tower counted 159,567 pink salmon, 5,789 chum salmon, 1,755 chinook salmon, and 2,355 Dolly Varden. Projects were not funded to enumerate entire runs of some salmon species, therefore some species counts should be considered conservative estimates.

Age, Sex, and Length Composition

The chinook salmon commercial harvest sample in Subdistrict 5 was composed of 34% age- 1.3, 48% age- 1.4, 2% age- 2.3, 9% age- 1.5, and 7% age- 2.4. The sample was 62% male and 38%

female (Table 5). The chinook salmon commercial harvest sample in Subdistrict 6 was composed of 28% age-1.3, 50% age-1.4, 7.6% age-2.3, 7.6% age-2.4 and 6.8% age-1.5 fish. The sample was 63% male and 37% female (Table 6). A sample of 75 chinook salmon from the Unalakleet River test fishery was 68.6% age 1.4, 22.2% age 1.3, 2.7% age 2.3, 2.6% age 2.4, and 8.3% age 1.5, with 66.7% of the total being female (Table 7). Mean lengths by age group from these samples ranged from 643 mm for age-2.3 females from the Unalakleet River test fishing sample to 889 mm for age-1.5 females from the Subdistrict 6 commercial catch.

The Subdistrict 6 chum salmon sample age composition was mostly age 0.3 (67%), followed by age 0.4 (31%). Females accounted for 52% of the sample (Table 8). A sample of 181 chum salmon from the Unalakleet River test fishery was 60% age-0.3, 32% age-0.4, and 6% age-0.5. The sex composition consisted of 72% males and 28% females (Table 9). The combined escapement sample from the Kwiniuk River above and below the tower was 79% age 0.3 and 19% age 0.4. The Niukluk River escapement sample was 60% age-0.3, followed by age-0.4 (35%). There were also smaller numbers of age-0.2 and age-0.5 fish. Males comprised 57% of the Niukluk River sample and (52%) in the Kwiniuk River sample. Mean lengths by age group for all samples collected ranged from 520 mm for age-0.3 females from the Kwiniuk River escapement to 630 mm for age-0.5 males from the Kwiniuk River escapement (Tables 10).

Age-2.1 dominated in the subdistrict 6 coho commercial catch accounting for 93%, with 53% being males (Table 11). There were 111 coho salmon sampled from the Unalakleet River test fishery with 98% age-2.1 (Table12). Females made up 61% of the sample. Mean lengths by age group for all samples collected ranged from 575 mm for age-3.1 for Unalakleet River females to 602 mm for age-3.1 for Subdistrict 6 males.

Kotzebue Sound

Commercial Harvest

The commercial harvest in the Kotzebue District during 1998 consisted of 55,907 chum salmon, 210 chinook salmon and 349 Dolly Varden (Table 13). The commercial chum harvest was below the projected harvest of 250,000-350,000 salmon due to poor market conditions and a lower than expected return. It was also well below the 19-year (1979-1997) average of 265,000. Only 45 permits were fished this year making it the lowest participation level since 1967. The low fishing effort was attributed to low prices. It is thought that fishermen found employment that provided a higher and more consistent income.

The buyer purchased a total of 447,256 pounds of chum salmon (average weight 8.0 pounds) at $0.15 per pound, 2,971 pounds of chinook salmon (average weight 14.1 pounds) at an average price of $1.00 per pound, and 2,640 pounds of Dolly Varden (average weight 7.6 pounds) at an average price of $0.20 per pound. The buyer used an average weight of 8.0 pounds for chum salmon. This was done to reduce labor costs that would cut into the already marginal profits as allowed by Alaska Statute 16.10.270 (a). The total ex-vessel value was $70,587 to Kotzebue area fishermen with an average of $1,569 for each participating permit holder. The lone buyer packed the fish in ice and

flew them in the round to Anchorage or Unalakleet for processing.

Limited commercial harvest of miscellaneous finfish has been allowed since statehood, normally under the auspices of a permit, which delineates harvest levels, open areas, legal gear, etc. There was no reported commercial harvest of whitefish, pike, or burbot during the 1998 commercial season. Sheefish are caught and sold primarily between mid-November and late March. Although some permit holders annually renew their permits, only one registered with the Kotzebue Fish and Game Office and reported sales of 2,400 pounds (average weight 9.5 pounds) of sheefish at an average price of $0.43 per pound.

Sikusuilaq Springs Hatchery

The total predicted return of hatchery chum salmon was 76,500. No commercial sampling for adipose clipped chum salmon was conducted in 1998 and high turbid water made observation of returns to the hatchery site impractical. No conclusions can be made of the hatchery contribution to the 1998 commercial catch or escapement.

Subsistence Harvest

Results from the Division of Subsistence survey indicate an estimated subsistence harvest of 52,329 salmon in the Kotzebue Sound area in 1998, with 94% of the harvest being chum salmon (Table 14). Smaller quantities of the other four species of salmon were reportedly harvested. The city of Kotzebue had the largest estimated harvest of 27,821 salmon, with the village of Kobuk taking the smallest quantity (1,031) salmon. These are also the locations with the largest and smallest human populations of the communities surveyed in the district. There was an estimated subsistence harvest of 3,872 Dolly Varden from the village of Noatak. The subsistence harvest of sheefish from the Kobuk River villages was 5,350. The village of Shungnak reported a harvest of 1,834 sheefish followed by Noorvik with 1,605.

Escapement Abundance

Poor aerial survey conditions were predominant during 1998. Only two portions of historically surveyed index areas, the Upper Kobuk River and the Noatak River, were surveyed in 1998. These were surveyed under poor conditions making comparisons to goal levels infeasible. The observed escapement was under the aerial survey goal (Table 15). The Kobuk River test fish index for 1998 was roughly equal to the 1993 level, the level felt necessary to achieve escapement goals in the Kobuk River.

Age, Sex, and Length Composition

Age groups 0.3 and 0.4 typically dominate the commercial chum salmon catch, with smaller percentages of age-0.2 and age-0.5 fish. The chum salmon commercial harvest for the season was

composed of an estimated 6.2% age 0.2, 50.4% age 0.3, 29.3% age 0.4, 13.3% age 0.5, and 0.7% age 0.6. Mean lengths from the commercial catch ranged from 669mm for age-0.6 males to 579 mm for age-0.2 females (Table 16). Sufficient samples were collected to stratify the season by fishing period (Appendix C).

Age composition from the Noatak and Kobuk River chum salmon drift gillnet test fishing samples were rather disparate, with age 0.3 at 70% and 51%, and age 0.4 at 22% and 31%, for these two locations respectively. Both samples had smaller numbers of age-0.2, age-0.5 and age-0.6 fish. Fifty-six percent of the samples from the Kobuk River were female, whereas 47% of the samples from the Noatak River test fishery were female. Mean lengths from the drift test fish samples ranged from 639 mm for age-0.5 females to 547 mm for age-0.2 males, both from the Noatak River (Table 17). Sufficient test fishing catch samples from the Kobuk River were collected to stratify the season by three periods (Appendix C).

Spawning ground samples were collected for chum salmon from the vicinity of Selby Slough in the Kobuk River drainage. Age composition was 62% age-0.3 and 20% age-0.4. Mean lengths by age group for escapement samples ranged from 510 mm for age-0.2 females to 643 mm for age-0.5 males (Table 18).

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Table 1. Norton Sound commercial salmon effort, catch and weight (pounds) by subdistrict, 1998.

Subdistrict	Number of Fishermen	Chinook		Sockeye		Coho		Pink		Chum		Total	
		No. Fish	Weight	No. Fish	Weight	No. Fish	Weight	No. Fish	Weight	No. Fish	Weight	No. Fish	Weight
1	-	-		-		-	-	-	-	-	-	-	-
2	16	1	3	-		3	20	106,761	246,444	723	4,937	107,488	251,404
3	23	105	1,847	-		1,462	12,154	145,669	324,068	2,311	13,651	149,547	351,720
4	-	-		-		-		-		-		-	-
5	28	910	15,894	-	-	3,624	29,258	236,171	539,608	7,080	46,197	247,785	630,957
6	52	6,413	110,087	7	43	24,534	191,273	99,412	220,504	6,210	41,902	136,576	563,809
Total	82	7,429	127,831	7	43	29,623	232,705	588,013	1,330,624	16,324	106,687	641,396	1,797,890

Table 2. Subsistence permit harvests of salmon in Norton Sound, 1998.

Location	Permits Issued [a]	Permits Returned [a]	Permits Fished	Chinook	Sockeye	Coho	Pink	Chum	Total Salmon
Marine Waters	83	45	27	12	12	418	1,906	747	3,095
Nome River	29	22	15	0	1	107	1,393	113	1,614
Snake River	9	4	1	0	0	3	23	4	30
Eldorado River	15	12	8	0	1	300	738	94	1,133
Flambeau River	9	5	3	3	0	165	0	2	170
Bonanza River	11	9	5	0	0	61	340	4	405
Safety Sound	3	1	0	0	0	0	0	0	0
Solomon River	8	6	5	0	0	3	397	0	400
Penny River	0	0	0	0	0	0	0	0	0
Kuzitrin River	3	2	1	0	0	0	0	0	0
Pilgrim River	9	5	1	1	30	0	3	1	35
Niukluk River	4	3	2	0	0	91	0	0	91
Unknown River	2	1	0	0	0	0	0	0	0
Total [b]	183	115	68	16	44	1,148	4,800	965	6,973

[a] Permits issued by the Alaska Department of Fish and Game, Division of Commercial Fisheries,in Nome.
[b] Preliminary information.

Table 3. Estimates of subsistence harvests of salmon in the Norton Sound and Port Clarence Area, 1998.

Village	Chinook	Chum	Pink	Sockeye	Coho	Total Salmon
Nome	16	965	4,800	44	1,148	6,973
Golovin	86	1,023	5,446	17	611	7,183
White Mountain	98	870	7,894	20	603	9,485
Elim	414	1,376	6,891	49	1,831	10,561
Koyuk	684	6,192	2,009	-	388	9,273
Savoonga	28	179	452	118	335	1,112
Shaktoolik	982	1,034	6,270	92	1,872	10,250
Unalakleet	3,963	2,551	13,173	201	7,303	27,191
Stebbins	1,410	3,909	3,125	295	3,116	11,855
St. Michael	542	1,502	961	143	1,406	4,554
Gambel	72	432	914	265	393	2,076
Brevig Mission	109	588	4,981	590	606	6,874
Teller	178	2,033	2,831	1,075	1,153	7,270
Total	8,582	22,654	59,747	2,909	20,765	114,657

Table 4. Salmon survey counts of Norton Sound streams and associated chum salmon escapement goals, 1998.

Stream Name	Chinook	Coho	Sockeye	Pink	Chum	Chum Goal
Salmon L.			5,210			
Grand Central R.			1,977			
Pilgrim R.	97	415	64	70,935	2,845	
Glacial L.			975			
Sinuk R.		322	3	372,850	630	4,500
Cripple R.			2	46,030	212	
Penny R.				11,300	43	
Snake R.		344		21,470	2,057	1,000
Nome R.	3	515		179,680	335	2,000
Flambeau R.	1			7,180	2,828	3,250
Eldorado R.	8	71		123,950	3,000	5,250
Bonanza R.		448	10	167,130	295	1,500
Solomon R.		358		45,175	90	550
Fish R.	96			663,050	28,010	17,500
Boston Cr.	255			175,330	418	2,500
Niukluk R.	51	593		205,110	2,556	8,000
Ophir Cr.		116				
Kwiniuk R.	302 [a]	610		655,933 [a]	24,248 [a]	19,500
Tubutulik R.	894			112,480	10,180	12,000
Inglutalik R.	2,015	100		29,630	9,235	8,500
Ungalik R.	402	1,070		259,550	2,965	2,500
Shaktoolik R.	197	1,404		89,010	1,557	11,000
Unalakeet R.	739	772		23,730	1,050	
North R.	591	233		153,150	50	2,000
Old Woman R.	312	210		14,410	180	100

Note: A multitude of factors affect escapement survey counts. The escapement survey counts here are instantaneous counts which do not represent total escapement. Chum goals pertain to aerial surveys in all cases except for Kwiniuk River which has a counting tower goal. Refer to text for an evaluation of the return.

a Preliminay expanded tower counts.
b Chum goal for tower count.

Table 5. Norton Sound Subdistrict 5 chinook salmon commercial catch sample age and sex composition, and mean length, 1998.

		1993 (1.3)	1992 (1.4)	1992 (2.3)	1991 (1.5)	(2.4)	Total
Stratum Dates:	06/27						
Sampling Dates:	06/27						
Sample Size:	100						
Male	Percent of Sample	26.0	25.0	2.0	4.0	5.0	62.0
	Number	26	25	2	4	5	62
	Mean length (mm)	740	767	750	827	803	
Female	Percent of Sample	8.0	23.0	0.0	5.0	2.0	38.0
	Number	8	23	0	5	2	38
	Mean length (mm)	802	796		867	865	
Total	Percent of Sample	34.0	48.0	2.0	9.0	7.0	100.0
	Number	34	48	2	9	7	100

Table 6. Norton Sound Subdistrict 6 chinook salmon commercial catch sample age and sex composition, and mean length, 1998.

		1993 (1.3)	1992 (1.4)	1992 (2.3)	1991 (1.5)	(2.4)	Total
Stratum Dates:	06/16-06/26						
Sampling Dates:	06/16-06/26						
Sample Size:	132						
Male	Percent of Sample	18.2	31.1	5.3	2.3	6.1	63.0
	Number	24	41	7	3	8	83
	Mean length (mm)	740	767	724	827	792	
Female	Percent of Sample	9.8	18.9	2.3	4.5	1.5	37.0
	Number	13	25	3	6	2	49
	Mean length (mm)	802	796	793	889	785	
Total	Percent of Sample	28.0	50.0	7.6	6.8	7.6	100.0
	Number	37	66	10	9	10	132

Table 7. Unalakleet River chinook salmon test fishing sample age and sex composition, and mean length, 1998. [a]

		1993 (1.3)	1992 (1.4)	(2.3)	1991 (2.4)	(1.5)	Total
Stratum Dates:	6/10-7/27						
Sampling Dates:	6/10-7/27						
Sample Size:	75						
Male	Percent of Sample	8.3	21.4	0.0	1.3	2.8	33.3
	Number	6	16	0	1	2	25
	Mean length (mm) [b]	688	732		720	770	
Female	Percent of Sample	13.9	47.2	2.7	1.3	5.5	66.7
	Number	10	35	2	1	4	50
	Mean length (mm) [b]	718	828	643	720	835	
Total	Percent of Sample	22.2	68.6	2.7	2.6	8.3	100.0
	Number	17	51	2	2	6	75

[a] Fish sampled from 5-7/8 inch mesh size set gillnet test fishery in the Unalakleet River.

[b] Length was from mid-eye to fork of tail.

Table 8. Norton Sound Subdistrict 6 chum salmon commercial catch sample age and sex composition, and mean length, 1998.

		Brood Year and (Age Group)				
		1995 (0.2)	1994 (0.3)	1993 (0.4)	1992 (0.5)	Total
Stratum Dates:	7/28-8/05					
Sampling Date	7/28-8/05					
Sample Size:	186					
Male	cent of Sample	0.0	32.3	15.1	0.5	47.9
	Number	0	60	28	1	89
	Mean length (mm) [a]		588	592	592	
Female	cent of Sample	1.1	34.9	16.1	0.0	52.1
	Number	2	65	30	0	97
	Mean length (mm) [a]	578	571	569		
Total	cent of Sample	1.1	67.2	31.2	0.5	100.0
	Number	2	125	58	1	186

[a] Length was from mid-eye to fork of tail.

Table 9. Unalakleet River chum salmon test fishing catch sample age and sex composition, and mean length, 1998.

		Brood Year and (Age Group)					
		1995 (0.2)	1994 (0.3)	1993 (0.4)	1992 (0.5)	1991 (0.6)	Total
Stratum Dates:	6/10-8/04						
Sampling Dates:	6/10-8/04						
Sample Size:	181						
Male	Percent of Sample	0.0	44.7	23.2	4.4	0.0	72.3
	Mean length (mm) a		597	613	626		
Female	Percent of Sample	1.7	15.5	8.8	1.7	0.0	27.7
	Mean length (mm) a	578	586	598	615		
Total	Percent of Sample	1.7	60.2	32.0	6.1	0.0	100.0

a Length was from mid-eye to fork of tail.

Table 10. Norton Sound District chum salmon escapement sample age and sex composition, and mean length, 1998.

			Brood Year and (Age Group)				
			1995 (0.2)	1994 (0.3)	1993 (0.4)	1992 (0.5)	Total
Kwiniuk River							
Above Tower	Stratum Dates:	7/10-7/21					
	Sampling Dates:	7/10-7/21					
	Sample Size:	217					
	Male	Percent of Sample	0.0	33.2	11.1	0.5	44.7
		Number	0	72	24	1	97
		Mean length (mm) [a]	0.0	577	586	615	
	Female	Percent of Sample	0.5	44.7	10.1	0.0	55.3
		Number in Escapem	1	97	22	0	120
		Mean length (mm) [a]	520	542	558	0	
	Total	Percent of Sample	0.5	77.8	21.2	0.5	100.0
		Number	1	169	46	1	217
Kwiniuk River							
Below Tower	Stratum Dates:	06/26-07/22					
	Sampling Dates:	06/26-07/22					
	Sample Size:	277					
	Male	Percent of Sample	0.4	45.1	11.9	0.7	58.1
		Number	1	125	33	2	161
		Mean length (mm) [a]	525	587	609	630	
	Female	Percent of Sample	0.3	35.4	6.2	0.0	41.9
		Number	1	98	17	0	116
		Mean length (mm) [a]	580	559	584	0	
	Total	Percent of Sample	0.7	80.5	18.1	0.7	100.0
		Number	2	223	50	2	277
Niukluk River							
	Stratum Dates:	07/04-07/20/98					
	Sampling Dates:	07/04-07/20/98					
	Sample Size:	138					
	Male	Percent of Sample	0.0	29.7	25.4	1.4	56.5
		Number	0	41	35	2	78
		Mean length (mm) [a]		611	613	630	
	Female	Percent of Sample	1.4	30.4	9.4	2.2	43.5
		Number	2	42	13	3	60
		Mean length (mm) [a]	580	559	584	0	
	Total	Percent of Sample	1.4	60.1	34.8	3.6	99.9
		Number	2	83	48	5	138

[a] Length was from mid-eye to fork of tail.

Table 11. Norton Sound Subdistrict 6 coho salmon catch sample age and sex composition, and mean length, 1998.

			1994 (2.1)	1993 (3.1)	Total
Stratum Dates:		8/04-8/05			
Sampling Dates:		8/04-8/05			
Sample Size:		135			
Male	Percent of Sample		48.9	3.7	52.6
	Number		66	5	71
	Mean length (mm) [a]		584	602	
Female	Percent of Sample		44.4	3.0	47.4
	Number		60	4	64
	Mean length (mm) [a]		589	596	
Total	Percent of Sample		93.3	6.7	100.0
	Number		126	9	135

[a] Length was from mid-eye to fork of tail.

Table 12. Unalakleet River coho salmon test fishing catch sample age and sex composition, and mean length, 1998.

		1994 (2.1)	1993 (3.1)	Total
Stratum Dates:	7/29-9/4			
Sampling Dates:	7/29-9/4			
Sample Size:	111			
Male	Percent of Sample	38.7	0.0	38.7
	Number	43	0	43
	Mean length (mm) [a]	590		
Female	Percent of Sample	59.5	1.8	61.3
	Number	66	2	68
	Mean length (mm) [a]	587	575	
Total	Percent of Sample	98.2	1.8	100.0
	Number	109	2	111

[a] Length was from mid-eye to fork of tail.

able 13. Kotzebue District commercial catch, weight, and average weight of chum salmon, chinook salmon and Dolly Varden by period, 1998.

Period	Date	Hours Fished	Number of Fishermen	Catch Rate [a] (chum)	Chum [b]			Chinook			Dolly Varden		
					Number	Pounds	Avg. Wt.	Number	Pounds	Avg. Wt.	Number	Pounds	Avg. Wt.
1	9-Jul-98	12	7	3.6	304	2,432	8.0	4	56	14.0	0		
2	10-Jul-98	12	6	8.0	574	4,592	8.0	6	114	19.0	0		
3	13-Jul-98	12	10	15.6	1,874	14,992	8.0	10	145	14.5	4	33	8.3
4	14-Jul-98	12	9	12.4	1,340	10,720	8.0	4	64	16.0			
5	16-Jul-98	12	12	13.4	1,923	15,384	8.0	28	397	14.2	8	68	8.5
6	17-Jul-98	12	5	10.4	622	4,976	8.0	1	22	22.0	3	22	7.3
7	20-Jul-98	12	13	11.5	1,787	14,296	8.0	21	288	13.7	3	34	11.3
8	21-Jul-98	12	12	24.0	3,458	27,664	8.0	25	357	14.3	16	125	7.8
9	23-Jul-98	12	22	15.6	4,109	32,872	8.0	16	221	13.8	16	131	8.2
10	24-Jul-98	12	19	12.4	2,833	22,664	8.0	11	165	15.0	7	45	6.4
11	27-Jul-98	12	26	11.6	3,605	28,840	8.0	14	168	12.0	23	165	7.2
12	28-Jul-98	12	25	11.6	3,491	27,928	8.0	10	132	13.2	15	104	6.9
13	29-Jul-98	12	26	13.7	4,279	34,232	8.0	5	75	15.0	6	46	7.7
14	30-Jul-98	12	26	11.6	3,622	28,976	8.0	18	257	14.3	19	149	7.8
15	31-Jul-98	12	22	9.3	2,467	19,736	8.0	1	23	23.0	8	54	6.8
16	3-Aug-98	12	20	8.5	2,035	16,280	8.0	10	143	14.3	20	149	7.5
17	4-Aug-98	12	20	13.6	3,257	26,056	8.0	4	58	14.5	15	109	7.3
18	5-Aug-98	12	25	13.3	3,992	31,936	8.0	7	83	11.9	37	297	8.0
19	6-Aug-98	12	2	35.0	841	6,728	8.0	1	7	7.0	3	21	7.0
20	7-Aug-98	12	19	10.2	2,330	18,640	8.0	2	16	8.0	11	82	7.5
21	10-Aug-98	12	17	14.7	2,998	23,984	8.0	9	139	15.4	11	72	6.5
22	11-Aug-98	12	14	12.0	2,018	16,144	8.0	3	41	13.7	10	71	7.1
23	13-Aug-98	12	5	13.5	809	6,472	8.0	0	0	0.0	0	0	
24	14-Aug-98	12	2	12.3	294	2,352	8.0	0	0	0.0	0	0	
25	17-Aug-98	12	2	5.9	142	1,136	8.0	0	0	0.0	18	164	9.1
26	18-Aug-98	12	7	10.8	903	7,224	8.0	0	0	0.0	96	699	7.3
Totals		312			55,907	447,256	8.0	210	2,971	14.1	349	2,640	7.6

[a] Catch rate= Chum catch per permit fished per hour fished.

[b] Chum Salmon were not weighed and assumed to be 8 pounds

Table 14. Estimates of subsistence harvests of salmon, sheefish and Dolly Varden in the Kotzebue Sound Area, 1998.

Village	Chinook	Chum	Pink	Sockeye	Coho	Total Salmon	Sheefish	Dolly Varden
Kotzebue	327	24,968	1,877	387	262	27,821	[a]	[a]
Noorvik	21	9,845	224	-	140	10,230	1,605	[a]
Kiana	29	3,414	6	-	17	3,466	572	[a]
Ambler	-	2,432	2	2	-	2,436	942	[a]
Shungnak	-	4,676	-	-	42	4,718	1,834	[a]
Kobuk	-	1,031	-	-	-	1,031	397	[a]
Noatak	5	2,614	6	2	-	2,627	[a]	3,872
Total	382	48,980	2,115	391	461	52,329	5,350	3,872

[a] Not surveyed for this species.

Table 15. Kotzebue District chum salmon aerial survey escapement indices and goal for primary index streams, 1962-1998. Indices listed in this table are the peak survey observed for each tributary during the given year. [a]

Year	Noatak River (80,000)	Eli River (5,000)	Squirrel River (11,500)	Salmon River (7,000)	Tutuksuk River (2,000)	Upper Kobuk Mainstem (10,000)
1962	168,000	9,080	5,384	12,936	10,841	9,224
1963	1,970 [b]	35 [b]	2,200	1,535	670	4,535
1964	89,798		8,009	9,353	2,685	7,985
1965	6,152 [b]		7,230	1,500 [b]		2,750
1966	101,640	120	1,350	3,957	1,383	1,474
1967	29,120 [b]		3,332	2,116	169	2,495
1968	39,394	5,502	6,746	3,367	823	2,370
1969	33,945	68	6,714	2,561	159	7,500 [c]
1970	138,145		4,418	3,000 [b]	2,000 [b]	13,908
1971	41,056		6,628	5,453	1,384	17,202
1972	64,315 [b]	3,286 [b]	32,126	2,073 [b]		18,155
1973	32,144		12,345	6,891		2,470 [b]
1974	129,640	22,249	32,523	29,190	8,312	28,120
1975	96,509	1,302	32,256	9,721	1,344 [b]	10,702
1976	44,574	1,205	7,229	1,161	758	2,522 [b]
1977	11,221 [b]	742 [b]	1,964 [b]			
1978	37,817	5,525	1,863	814 [b]	368 [b]	1,981 [b]
1979	15,721 [b]	1,794 [b]	1,500 [b]	674 [b]	382 [b]	2,008
1980	164,474	10,277	13,563	8,456	1,165	11,472
1981	116,352		9,854	4,709	1,114	8,648
1982	20,682 [b]	189 [b]	7,690	1,821 [c]	1,322	14,674
1983	79,773	3,044	5,115	1,677	2,637	33,746
1984	67,873	5,027	5,473	1,471	1,132	10,621
1985	45,525 [b]	855 [b]	6,160	2,884	5,089	6,278
1986	37,227 [b]	4,308 [b]	4,982	1,971	4,257	6,015
1987	5,515 [b]	2,780 [b]	2,708 [c]	3,333	206	8,210
1988	45,930 [b]	8,639 [b]	4,848 [b]	6,208	3,122	11,895 [b]
1989						
1990	23,345 [b]	3,000	5,500	6,335	2,275	15,355
1991	82,750	2,940	4,606	5,845	744	24,525
1992	34,335 [b]	701 [b]	2,765	1,345	1,162	11,803
1993	25,415 [b]	4,795	4,463	13,880	1,196	12,158
1994						
1995	159,260	7,860	10,605	13,988	3,901	35,725
1996	306,900	30,040	21,795	21,740	8,200	74,770
1997	[d]	[d]	4,779 [b]	1,181 [b]	164 [b]	8,513 [b]
1998	3,121 [b]	[d]	[d]	[d]	[d]	816 [b]

[a] Typically, three aerial surveys are attempted yearly at different intervals for each tributary to assess escapements prior to the peak, at the peak and after the peak of the run. Indices listed in this table are the largest survey observed for each tributary during the given year.

[b] Poor survey conditions or incomplete, early or late survey.

[c] Survey by foot or boat.

[d] Unacceptable conditions.

Table 16. Kotzebue District chum salmon commercial catch age and sex composition, and mean length 1988.

		Brood Year and (Age Group)					
		1995 (0.2)	1994 (0.3)	1993 (0.4)	1992 (0.5)	1991 (0.6)	Total
Stratum Dates:	7/10-8/30						
Sampling Dates:	7/10-8/30						
Sample Size:	3,128						
Male	Percent of Sample	4.7	28.7	15.9	7.4	0.4	57.2
	Number in Catch	2,628	16,045	8,889	4,137	224	31,923
	Mean length (mm) [a]	583	619	632	646	669	
Female	Percent of Sample	1.5	21.7	13.4	5.9	0.3	42.8
	Number in Catch	839	12,132	7,492	3,299	168	23,928
	Mean length (mm) [a]	579	600	614	627	621	
Total	Percent of Sample	6.2	50.4	29.3	13.3	0.7	100.0
	Number in Catch	3,466	28,177	16,381	7,436	391	55,907

[a] Length was from mid-eye to fork of tail.

Table 17. Kobuk and Noatak River chum salmon drift test fishing catch sample age and sex composition, and mean length, 1998.

		Brood Year and (Age Group)					
		1995 (0.2)	1994 (0.3)	1993 (0.4)	1992 (0.5)	1991 (0.6)	Total
Stratum Dates:	7/10-8/14			Kobuk River [a]			
Sampling Dates:	7/10-8/14						
Sample size:	536						
Male	Percent of Sample	1.3	20.5	16.1	5.6	0.0	43.5
	Number	7	110	86	30	0	233
	Mean length (mm) [b]	577	618	636	636		
Female	Percent of Sample	3.6	30.8	14.9	6.3	0.9	56.5
	Number	5	303	495	88	4	303
	Mean length (mm) [b]	562	592	607	623	616	
Total	Percent of Sample	4.9	51.3	31.0	11.9	0.9	100.0
	Number	26	275	166	64	5	536
	Standard Error	3	19	20	12	2	
Stratum Dates:	7/27-8/28			Noatak River [a]			
Sampling Dates:	7/27-8/28						
Sample size:	284						
Male	Percent of Sample	4.9	35.9	10.9	1.4	0.0	53.1
	Number	14	102	31	4	0	151
	Mean length (mm) [b]	547	593	604	616		
Female	Percent of Sample	0.7	34.2	10.6	1.1	0.4	47.0
	Number	2	97	30	3	1	133
	Mean length (mm) [b]	565	608	631	639	608	
Total	Percent of Sample	5.6	70.1	21.5	2.5	0.4	100.0
	Number	16	199	61	7	1	284
	Standard Error	0	3	3	1	0	

[a] Fish sampled from 6 inch mesh size drift gillnet.

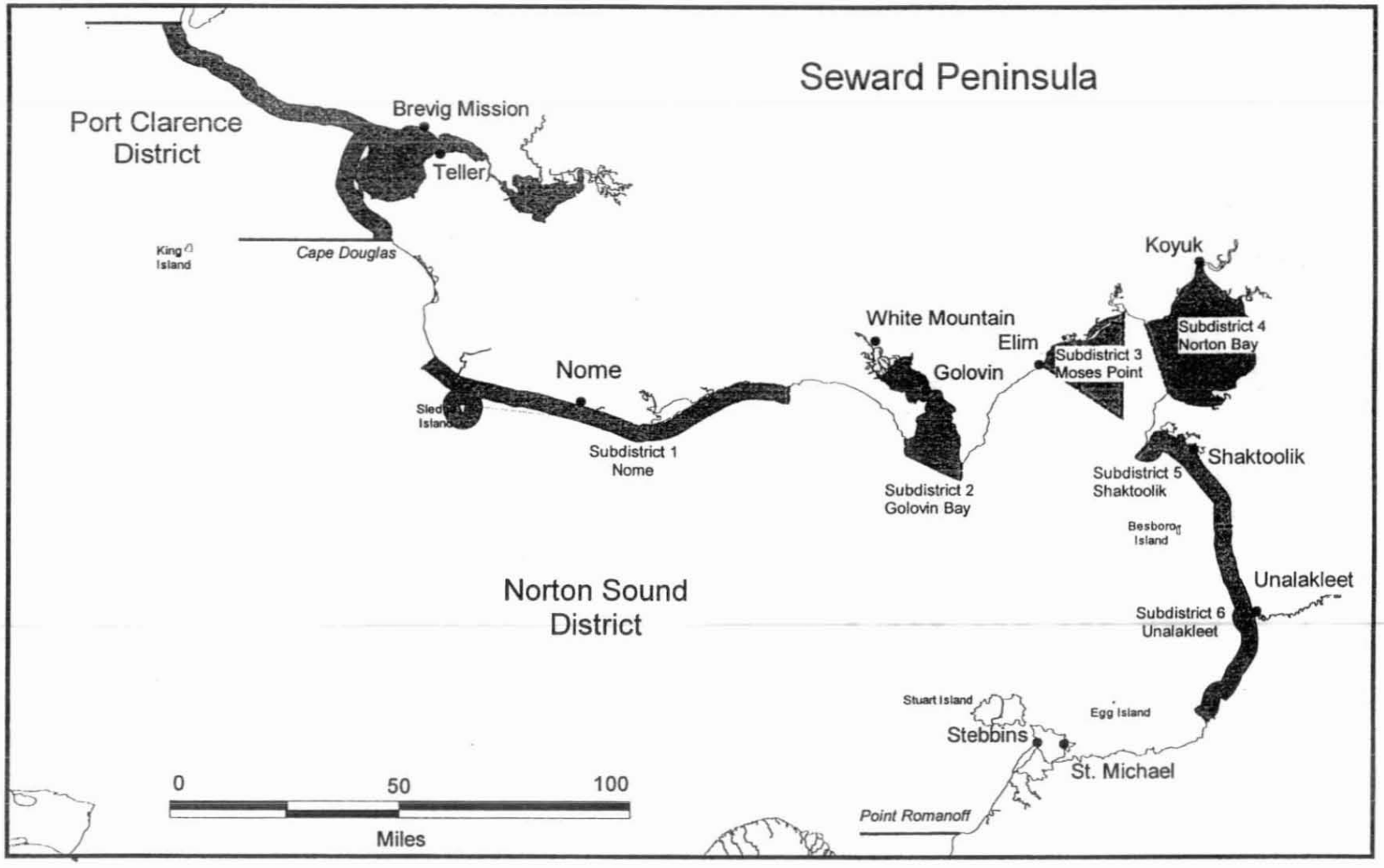
[b] Length was from mid-eye to fork of tail.

Table 18. Kotzebue District chum salmon tributary escapement sample age and sex composition, and mean length, 1998.

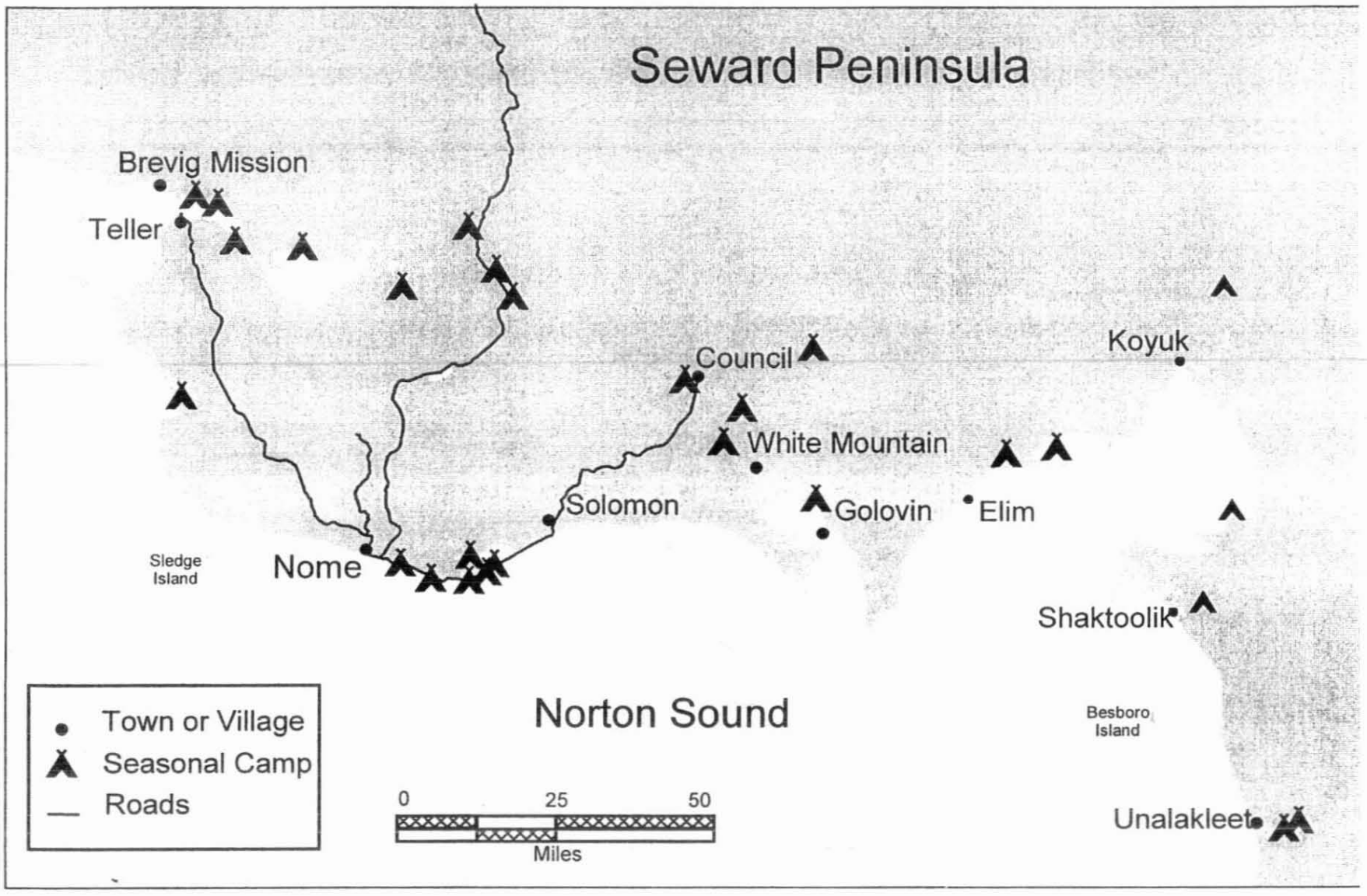
		Brood Year and(Age Group)				
		1991 (0.2)	1992 (0.3)	1991 (0.4)	1990 (0.5)	Total
Stratum Dates:	9/12			Selby Sough vicinity [a]		
Sampling Dates:	9/12					
Sample Size:	162					
Male	Percent of Sample	5.0	24.1	8.7	4.3	42.1
	Number in Sample	8	39	14	7	68
	Mean length (mm) [b]	555	616	607	643	
Female	Percent of Sample	4.9	38.2	11.7	3.1	57.9
	Number in Sample	8	62	19	5	94
	Mean length (mm) [b]	510	598	614	603	
Total	Percent of Sample	9.9	62.3	20.4	7.4	100.0
	Number in Sample	16	101	33	12	162
	Standard Error	3.8	6.2	5.1	3.3	

[a] Samples were collected from carcasses on the spawning grounds.
[b] Length is measured from mid-eye to fork-of-tail.

Figure 1. Norton Sound commercial salmon fishing districts and subdistricts.



2. Northern Norton Sound subsistence salmon fishing areas.



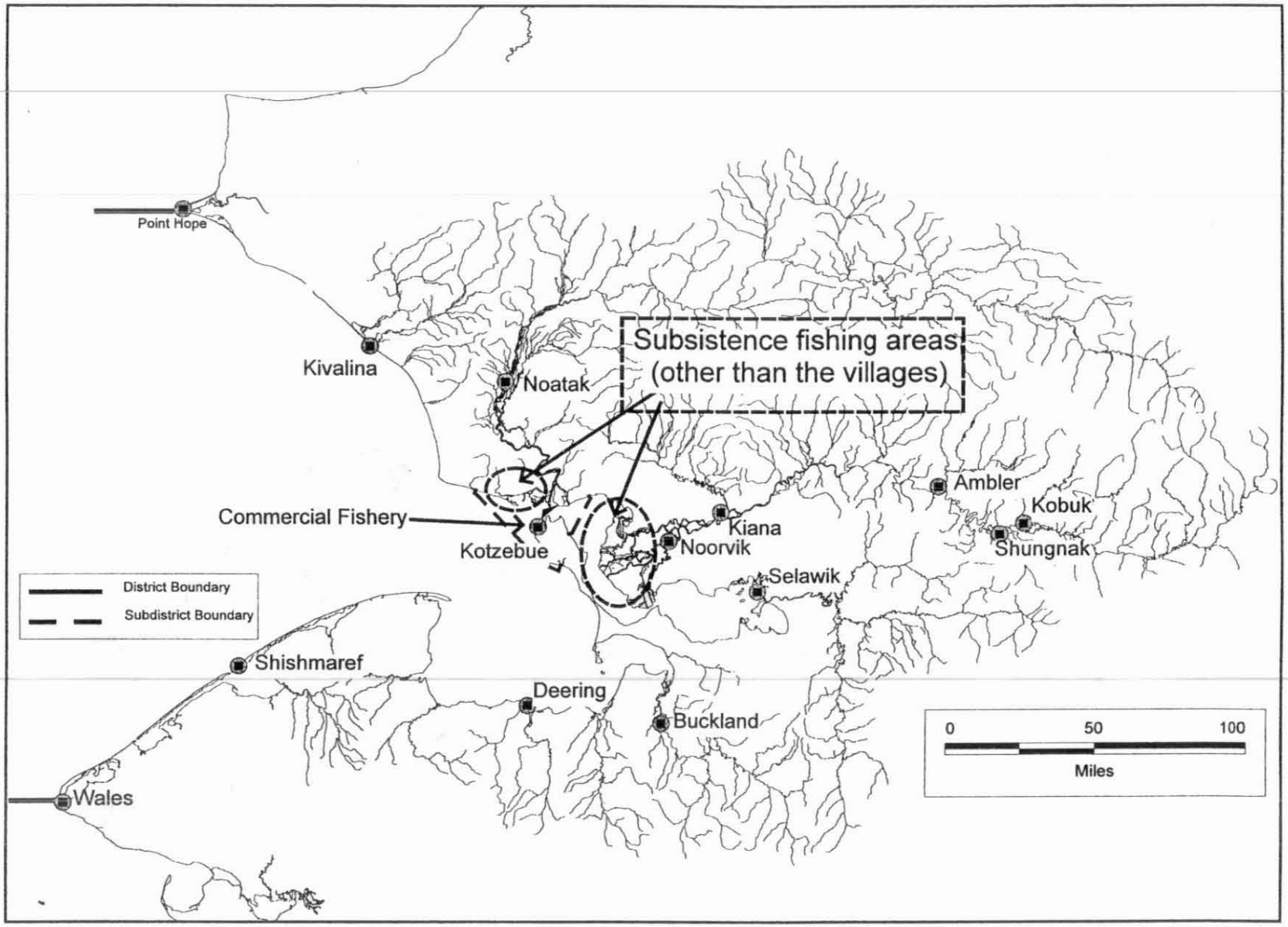
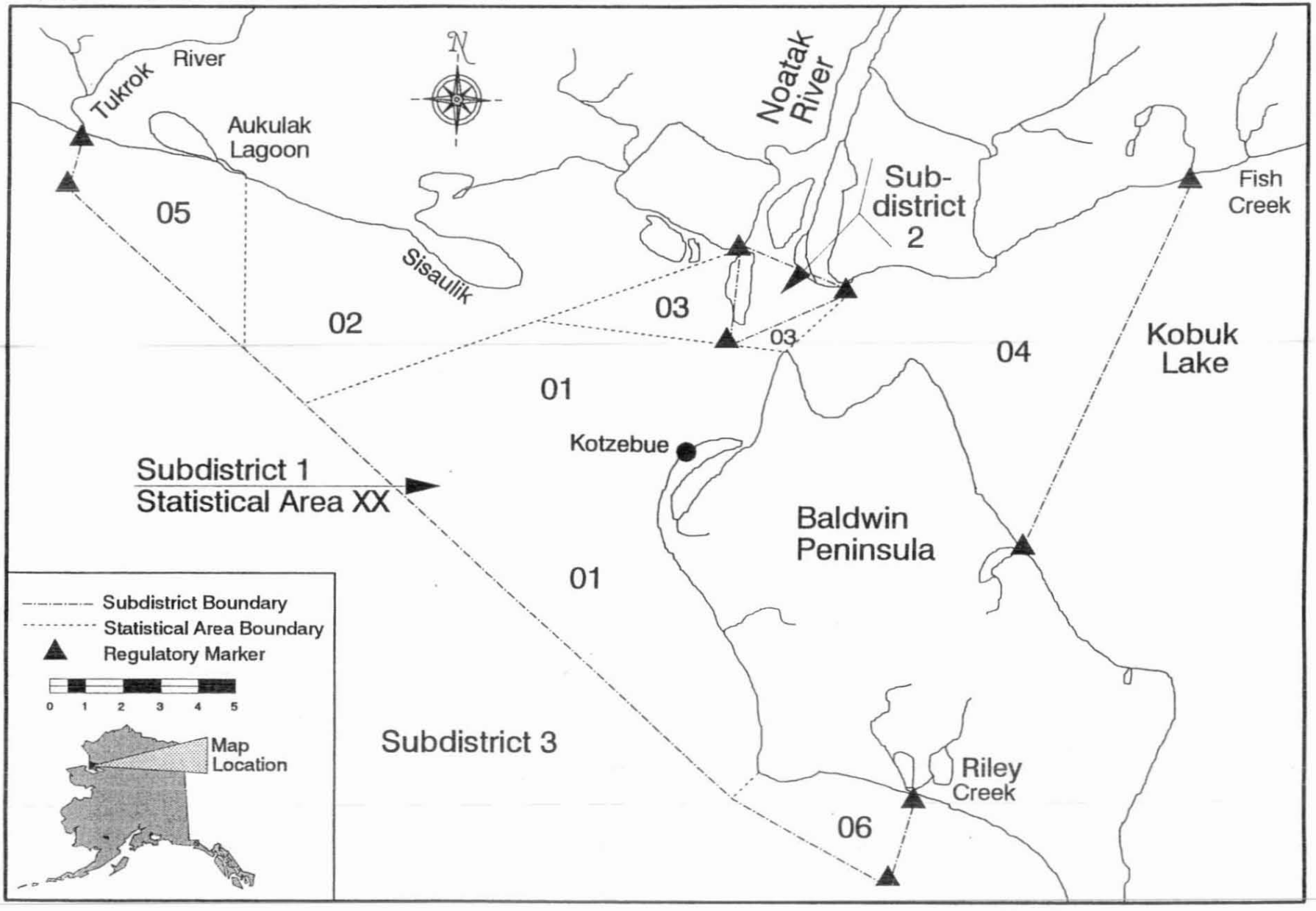


Figure 3. Kotzebue Sound commercial fishing districts, villages, and subsistence fishing areas.

ure 4 Kotzebue Sound commercial fishing subdistr. , and statistical areas.



Appendix Table A. 1. Commercial salmon set gillnet catches from Golovin, Subdistrict 2, Norton Sound,1998.

			Period Catch and Catch Per Unit Effort								Cumulative Catch and Catch Per Uinit Effort							
Period	Hrs. Fished	Date	Fishers	Kings	King CPUE	Chum	Chum CPUE	Pinks	Pink CPUE	Coho	Coho CPUE	Kings	King CPUE	Chum	Chum CPUE	Pinks	Pink CPUE	Coho	Coho CPUE
Pink 1	24	7/18	4	0	0.00	23	0.24	2,818	29.35	0		0		23	0.24	2,818	29.35	0	
Pink 2	24	7/19	14	1	0.00	188	0.56	32,220	95.89	0		1		211	0.49	35,038	81.11	0	
Pink 3	24	7/20	13	0	0.00	183	0.59	26,026	83.42	0		1		394	0.53	61,064	82.08	0	
Pink 4	24	7/21	12	0	0.00	127	0.44	20,529	71.28	1		1		521	0.50	81,593	79.06	1	
Pink 5	24	7/22	11	0	0.00	111	0.42	18,429	69.81	1		1		632	0.49	100,022	77.18	2	
Pink 6	24	7/23	6	0	0.00	91	0.63	6,739	46.80	1		1		723	0.50	106,761	74.14	3	
Pink 7	12	7/24	0	No Deliveries								1		723		106,761		3	
Coho 1	24	8/1-8/2	0	No fishermen...	Poor weather							1		723		106,761		3	
Coho 2	24	8/3-8/4	1	0	0.00	0	0.00	0		0		1		723		106,761		3	0.13

Total hours fished = 204
Total number of permits used = 16

Appendix Table A. 2. Commercial salmon set gillnet catches from Moses Point, Subdistrict 3, Norton Sound, 1998.

				Period Catch and Catch Per Unit Effort							Cumulative Catch and Catch Per Unit Effort							
Period	Hrs. Fished	Date	Fishers	Kings	King CPUE	Chum	Chum CPUE	Pinks	Pink CPUE	Coho	Coho CPUE	Kings	King CPUE	Chum	Chum CPUE	Pinks	Pink CPUE	Coho	Coho CPUE
King 1	24	6/18-6/19	8	82	0.43	0		0		0		82	0.43	0		0		0	
Pink 1	14	6/30/98	5	2		154	2.20	2,860	40.86	0		84		154	2.20	2,860	40.86	0	
Pink 2	24	7/1/98	6	5		186	1.29	4,978	34.57	0		89		340	1.59	7,838	36.63	0	
Pink 3	24	7/2/98	7	4		115	0.68	4,198	24.99	0		93		455	1.19	12,036	31.51	0	
Pink 4	24	7/3/98	5	1		300	2.50	6,671	55.59	0		94		755	1.50	18,707	37.26	0	
Pink 5	24	7/4/98	6	3		379	2.63	6,007	41.72	0		97		1,134	1.76	24,714	38.26	0	
Pink 6	24	7/5/98	5	2		91	0.76	1,855	15.46	0		99		1,225	1.60	26,569	34.69	0	
Pink 7	24	7/6/98	8	0		96	0.50	5,445	28.36	0		99		1,321	1.38	32,014	33.42	0	
Pink 8	24	7/7/98	8	1		139	0.72	6,605	34.40	0		100		1,460	1.27	38,619	33.58	0	
Pink 9	24	7/8/98	9	0		109	0.50	7,464	34.56	0		100		1,569	1.15	46,083	33.74	0	
Pink 10	24	7/9/98	7	0		40	0.24	6,464	38.48	0		100		1,609	1.05	52,547	34.25	0	
Pink 11	24	7/10/98	6	0		35	0.24	4,517	31.37	0		100		1,644	0.98	57,064	34.01	0	
Pink 12	24	7/11/98	5	0		72	0.60	6,024	50.20	0		100		1,716	0.95	63,088	35.09	0	
Pink 13	24	7/12/98	5	0		39	0.33	5,206	43.38	0		100		1,755	0.92	68,294	35.61	0	
Pink 14	24	7/13/98	9	1		106	0.49	8,841	40.93	0		101		1,861	0.87	77,135	36.15	0	
Pink 15	24	7/14/98	9	0		41	0.19	5,127	23.74	0		101		1,902	0.81	82,262	35.01	0	
Pink 16	24	7/15/98	15	2		168	0.47	25,084	69.68	0		103		2,070	0.76	107,346	39.61	0	
Pink 17	24	7/16/98	14	1		88	0.26	16,500	49.11	1		104		2,158	0.71	123,846	40.66	1	
Pink 18	24	7/17/98	10	0		111	0.46	14,081	58.67	5		104		2,269	0.69	137,927	41.97	6	
Pink 19	24	7/18/98	0									104		2,269	0.69	137,927	41.97	6	
Pink 20	24	7/19/98	4	0		20	0.21	3,877	40.39	1		104		2,289	0.68	141,804	41.93	7	
Pink 21	24	7/20/98	0									104		2,303	0.68	141,804	41.93	7	
Pink 22	24	7/21/98	4	0		14	0.15	3,358	34.98	0		104		2,303	0.66	145,162	41.74	7	
Pink 23	24	7/22/98	0									104		2,303	0.66	145,162	41.74	7	
Pink 24	24	7/23/98	1	0		0	0.00	507	21.23	0		104		2,303	0.66	145,669	41.60	7	
Pink 25	12	7/24/98	0									104		2,303	0.66	145,669	41.60	7	
Coho 2	24	8/3-8/4	0									104		2,306	0.66			7	
Coho 3	24	8/5-8/6	4	0		3	0.03			563	5.86	105		2,311	0.64			570	5.94
Coho 4	24	8/7-8/8	9	1		5	0.02			892	4.13	105		2,311	0.61			1,462	4.69
Coho 5	24	8/10-8/11	0	Poor weather								105		2,311	0.61			1,462	4.69
Coho 6	24	8/13-8/14	0	Poor weather								105		2,311	0.61			1,462	4.69

Total hours fished = 722

Total number of permits used = 23

Appendix Table A. 3. Commercial salmon set gillnet catches from Shaktoolik, Subdistrict 5, Norton Sound, 1998.

			Period Catch and Catch Per Unit Effort								Cumulative Catch and Catch Per Unit Effort							
Period	Hrs. Fished	Date	Fishers	Kings	King CPUE	Chum	Chum CPUE	Pinks	Pink CPUE	Coho	Coho CPUE	Kings	King CPUE	Chum	Chum CPUE	Pinks	Pink CPUE	Coho	Coho CPUE
King 1	24	6/15-6/16	14	222	0.66	3	0.01	-		0		222	0.66	3		0		0	
King 2	24	6/18-6/19	17	244	0.60	0	0.00	-		0		466	0.63	3		0		0	
King 3	24	6/25-6/26	18	319	0.74	8	0.02	-		0		785	0.67	11		0		0	
Pink 1	12	6/28	9	1		41	0.38	4,651	43.06	0		786		52		4,651	43.06	0	
Pink 2	6	6/29	11	9		100	1.52	5,115	77.50	0		795		152	2.30	9,766	56.13	0	
Pink 3	24	6/30	18	19		334	0.77	17,617	40.78	0		814		486	0.98	27,383	45.19	0	
Pink 4	24	7/1	17	5		755	1.85	17,523	42.95	0		819		1,241	1.37	44,906	44.29	0	
Pink 5	24	7/2	11	14		898	3.40	19,137	72.49	0		833		2,139	1.83	64,043	50.11	0	
Pink 6	24	7/3	14	2		120	0.36	7,523	22.39	0		835		2,259	1.50	71,566	44.34	0	
Pink 7	24	7/4	15	12		329	0.91	12,418	34.49	0		847		2,588	1.39	83,984	42.55	0	
Pink 8	24	7/5	14	9		633	1.88	16,102	47.92	0		856		3,221	1.46	100,086	43.33	0	
Pink 9	24	7/6	16	3		720	1.88	16,312	42.48	1		859		3,941	1.52	116,398	43.21	1	
Pink 10	24	7/7	18	6		272	0.63	11,321	26.21	0		865		4,213	1.40	127,719	40.86	1	
Pink 11	24	7/8	15	2		139	0.39	9,722	27.01	0		867		4,352	1.29	137,441	39.43	1	
Pink 12	24	7/9	17	3		285	0.70	22,868	56.05	0		870		4,637	1.22	160,309	41.17	1	
Pink 13	24	7/10	15	23		196	0.54	12,758	35.44	0		893		4,833	1.17	173,067	40.68	1	
Pink 14	24	7/11	15	5		323	0.90	16,984	47.18	0		898		5,156	1.14	190,051	41.19	1	
Pink 15	24	7/12	3	1		90	1.25	4,112	57.11	0		899		5,246	1.15	194,163	41.43	1	
Pink 16	24	7/13	14	2		140	0.42	8,286	24.66	1		901		5,386	1.10	202,449	40.31	2	
Pink 17	24	7/14	18	2		485	1.12	21,654	50.13	2		903		5,871	1.10	224,103	41.09	4	
Pink 18	24	7/15	3	1		147	2.04	5,038	69.97	0		904		6,018	1.11	229,141	41.47	4	
Pink 19	24	7/16	4	0		130	1.35	3,104	32.33	0		904		6,148	1.11	232,245	41.31	4	
Pink 20	24	7/17	5	0		230	1.92	3,123	26.03	1		904		6,378	1.13	235,368	40.99	5	
Pink 21	24	7/18	2	0		0	0.00	570	11.88	0		904		6,378	1.12	235,938	40.75	5	
Pink 22	24	7/19	2	0		42	0.88	233	4.85	0		904		6,420	1.12	236,171	40.45	5	
Pink 23	24	7/20	0									904		6,420	1.12			5	
Pink 24	24	7/21	0									904		6,420	1.12			5	
Pink 25	24	7/22	0									904		6,420	1.12			5	
Pink 26	24	7/23	0									904		6,420	1.12			5	
Pink 27	12	7/24	0									904		6,420	1.12			5	
Coho 4	24	7/27-7/28	7	1		139	0.83			355	2.11	905		6,559	1.11			360	2.14
Coho 5	48	7/30-8/1	3			49	0.34			136	0.94	905		6,608	1.09			496	1.59
Coho 6	48	8/3-8/5	0	Poor weather								905		6,608	1.09			496	1.59
Coho 7	48	8/6-8/8	13	4		425	0.68			2654	4.25	909		7,033	1.06			3,150	3.37
Coho 8	48	8/10-8/12	1	0		1	0.02			18	0.38	909		7,034	1.05			3,168	3.22
Coho 9	48	8/13-8/15	0	Poor weather								909		7,034	1.05			3,168	3.22
Coho 10	30	8/17-8/18	0	Poor weather								909		7,034	1.05			3,168	3.22
Coho 11	24	8/19	0	Poor weather								909		7,034	1.05			3,168	3.22
Coho 12	24	8/20	0	Poor weather								909		7,034	1.05			3,168	3.22
Coho 13	24	8/21	6	0		22	0.15			135	0.94	909		7,056	1.03			3,303	2.93
Coho 14	24	8/22	0	Poor weather								909		7,056	1.03			3,303	2.93
Coho 15	24	8/23	1	0		1	0.04			56	2.33	909		7,057	1.03			3,359	2.92
Coho 16	24	8/24	1	0		7	0.29			62	2.58	909		7,064	1.02			3,421	2.91
Coho 17	24	8/25	3	1		6	0.08			70	0.97	910		7,070	1.01			3,491	2.80
Coho 18	24	8/26	4	0		10	0.10			133	1.39	910		7,080	1.00			3,624	2.70
Coho 19	24	8/27	0	Poor weather															
Coho 20	24	8/28	0	Poor weather															
Coho 21	24	8/29	0	Poor weather															
Coho 22	24	8/30	0	Poor weather															
Coho 23	24	8/31	0	Poor weather															

Total hours fished = 1272

Total number of permits used = 28

Appendix Table A. 4. Commercial salmon set gillnet catches from Unalakleet, Subdistrict 6, Norton Sound, 1998.

				Period Catch and Catch Per Unit Effort							Cumulative Catch and Catch Per Unit Effort							
Period	Hrs. Fished	Date	Fishers	Kings	King CPUE	Chum	Chum CPUE	Pinks	Pink CPUE	Coho	Coho CPUE	Kings	King CPUE	Chum	Chum CPUE	Pinks	Pink CPUE	Coho	Coho CPUE
King 1	24	6/15-6/16	29	641	0.92	1	0.00	0		0		641	0.92	1	-	0		0	
King 2	24	6/18-6/19	32	754	0.98	8	0.01	0		0		1,395	0.95	9	-	0		0	
King 3	48	6/25-6/27	42	2,831	1.40	184	0.09	0		0		4,226	1.21	193	0.10	0		0	
Pink 1	12	6/28/98	5	39		68	1.13	4,756	79.27	0		4,265		261	0.13	4,756	79.27	0	
Pink 2	6	6/29/98	3	2		9	0.50	1,040	57.78	0		4,267		270	0.13	5,796	74.31	0	
Pink 3	24	6/30/98	6	0		0		2,728	18.94	0		4,267		270	0.12	8,524	38.40	0	
Pink 4	24	7/1/98	5	9		23	0.19	8,237	68.64	0		4,276		293	0.12	16,761	49.01	0	
King 4	48	6/29-7/1	38	1,375	0.75	287	0.16	0		0		5,651	1.07	580	0.14	16,761	49.01	0	
King 5	24	7/2-7/3	26	488	0.78	127	0.20	0		0		6,139	1.04	707	0.15	16,761	49.01	0	
Pink 5	24	7/2/98	6	8		26	0.18	3,211	22.30	0		6,147		733	0.15	19,972	41.09	0	
Pink 6	24	7/3/98	5	2		38	0.32	3,429	28.58	0		6,149		771	0.15	23,401	38.62	0	
Pink 7	24	7/4/98	3	33		41	0.57	2,064	28.67	0		6,182		812	0.16	25,465	37.56	0	
Pink 8	24	7/5/98	2	12		0		1,672	34.83	0		6,194		812	0.16	27,137	37.38	0	
Pink 9	24	7/6/98	2	6		56	1.17	731	15.23	0		6,200		868	0.17	27,868	36.01	0	
Pink 10	24	7/7/98	6	32		41	0.28	8,418	58.46	0		6,232		909	0.17	36,286	39.53	0	
Pink 11	24	7/8/98	0	No fishermen...		Poor weather						6,232		909	0.17	36,286	39.53	0	
Pink 12	24	7/9/98	9	8		37	0.17	4,425	20.49	0		6,240		946	0.17	40,711	35.90	0	
Pink 13	24	7/10/98	15	20		97	0.27	9,318	25.88	2		6,260		1,043	0.18	50,029	33.49	2	
Pink 14	24	7/11/98	5	9		29	0.24	2,740	22.83	0		6,269		1,072	0.18	52,769	32.69	2	
Pink 15	24	7/12/98	8	8		52	0.27	6,097	31.76	0		6,277		1,124	0.18	58,866	32.59	2	
Pink 16	24	7/13/98	14	16		29	0.09	10,164	30.25	6		6,293		1,153	0.17	69,030	32.23	8	
Pink 17	24	7/14/98	18	17		158	0.37	8,703	20.15	9		6,310		1,311	0.19	77,733	30.20	17	
Pink 18	24	7/15/98	13	21		261	0.84	6,594	21.13	23		6,331		1,572	0.21	84,327	29.22	40	
Pink 19	24	7/16/98	13	8		78	0.25	4,484	14.37	23		6,339		1,650	0.22	88,811	27.77	63	
Pink 20	24	7/17/98	7	5		94	0.56	3,750	22.32	11		6,344		1,744	0.22	92,561	27.50	74	
Pink 21	24	7/18/98	8	13		134	0.70	4,821	25.11	25		6,357		1,878	0.23	97,382	27.37	99	
Pink 22	24	7/19/98	2	4		70	1.46	916	19.08	2		6,361		1,948	0.24	98,298	27.26	101	
Pink 23	24	7/20/98	0	No fishermen...		Poor weather						6,361		1,948	0.24	98,298	27.26	101	
Pink 24	24	7/21/98	3	0		0		1,114	15.47	1		6,361		1,948	0.24	99,412	27.03	102	
Pink 25	24	7/22/98	0	No fishermen...		Poor weather						6,361		1,948	0.24	99,412	27.03	102	
Pink 26	24	7/23/98	0	No fishermen...		Poor weather						6,361		1,948	0.24	99,412	27.03	102	
Pink 27	12	7/24/98	0	No fishermen...		Poor weather						6,361		1,948	0.24	99,412	27.03	102	
Coho 6	24	7/27-7/28	26	12		998	1.60			1,193	1.91	6,373		2,946	0.34	99,412		1,295	2.08
Coho 7	48	7/30-8/1	28	15		956	0.71			3,867	2.88	6,388		3,902	0.39	99,412		5,162	2.62
Coho 8	48	8/3-8/5	20	7		601	0.63			2,378	2.48	6,395		4,503	0.41	99,412		7,540	2.58
Coho 9	48	8/6-8/8	19	6		565	0.62			4,588	5.03	6,401		5,068	0.42	99,412		12,128	3.16
Coho 10	48	8/10-8/12	21	1		366	0.36			3,741	3.71	6,402		5,434	0.42	99,412		15,869	3.27
Coho 11	48	8/13-8/15	11	1		115	0.22			950	1.80	6,403		5,549	0.41	99,412		16,819	3.13
Coho 12	48	8/17-8/19	5	1		66	0.28			583	2.43	6,404		5,615	0.41	99,412		17,402	3.10
Coho 13	48	8/20-8/22	7	0		83	0.25			643	1.91	6,404		5,698	0.40	99,412		18,045	3.03
Coho 14	48	8/24-8/26	17	0		112	0.14			1,778	2.18	6,404		5,810	0.39	99,412		19,823	2.93
Coho 15	48	8/27-8/29	17	3		184	0.23			2,553	3.13	6,407		5,994	0.38	99,412		22,376	2.95
Coho 16	48	8/31-9/2	13	6		124	0.20			1,664	2.67	6,413		6,118	0.37	99,412		24,040	2.93
Coho 17	48	9/3-9/5	3	0		92	0.64			494	3.43	6,413		6,210	0.38	99,412		24,534	2.94

Total hours fished = 738
Total number of permits used = 52
Additionally 7 sockeye commercially harvested.

Appendix Table B.1. Expanded daily and cumulative migration of all salmon species past the Kwiniuk River counting tower, Norton Sound, 1998.

Date	Daily chum salmon	Cumulative chum salmon	Daily pink salmon	Cumulative pink salmon	Daily king salmon	Cumulative king salmon
18-Jun	0	0	0	0	0	0
19-Jun	0	0	4	4	0	0
20-Jun	0	0	0	4	0	0
21-Jun	-13	-13	2	6	-2	-2
22-Jun	65	52	15	21	-1	-3
23-Jun	142	194	28	49	0	-3
24-Jun	67	261	2	51	0	-3
25-Jun	-25	236	-8	43	0	-3
26-Jun	56	292	20	63	0	-3
27-Jun	-2	290	65	128	2	-1
28-Jun	651	942	276	404	2	1
29-Jun	396	1,337	144	548	2	3
30-Jun	140	1,477	12	560	2	5
1-Jul	2,471	3,949	2,287	2,847	10	15
2-Jul	532	4,480	1,049	3,896	14	29
3-Jul	1,039	5,519	6,463	10,359	4	33
4-Jul	2,125	7,644	5,645	16,004	0	33
5-Jul	1,928	9,573	14,396	30,400	9	42
6-Jul	1,719	11,292	48,332	78,732	20	62
7-Jul	1,510	12,802	82,268	161,000	30	92
8-Jul	704	13,506	36,454	197,454	53	145
9-Jul	410	13,916	46,445	243,899	12	156
10-Jul	454	14,370	34,536	278,436	14	170
11-Jul	1,668	16,038	21,589	300,025	10	180
12-Jul	2,202	18,240	41,422	341,446	14	194
13-Jul	1,095	19,335	22,693	364,139	7	201
14-Jul	-12	19,323	3,964	368,103	4	205
15-Jul	540	19,863	17,121	385,224	0	205
16-Jul	1,914	21,777	41,951	427,175	14	219
17-Jul	1,170	22,947	38,769	465,944	30	249
18-Jul	186	23,133	21,332	487,276	6	255
19-Jul	284	23,417	31,999	519,275	4	259
20-Jul	266	23,683	35,595	554,870	9	268
21-Jul	248	23,931	39,192	594,062	14	282
22-Jul	186	24,117	45,485	639,547	6	288
23-Jul	47	24,164	3,137	642,684	12	300
24-Jul	28	24,192	2,402	645,086	2	302
25-Jul	12	24,204	1,626	646,712	0	302
26-Jul	12	24,216	3,616	650,327	0	302
27-Jul	32	24,248	5,606	655,933	0	302

Appendix Table B.2. Daily weir passage of all salmonid species at the Nome River weir, Norton Sound, 1998.

	Daily chum salmon	Cumulative chum salmon	Daily pink salmon	Cumulative pink salmon	Daily king salmon	Cumulative king salmon	Daily coho salmon	Cumulative coho salmon	Daily Dolly Varden	Cumulative Dolly Varden
1-Jul	0	0	0	0	0	0	0	0	0	0
2-Jul	0	0	38	38	0	0	0	0	3	3
3-Jul	4	4	36	74	0	0	0	0	4	7
4-Jul	1	5	29	103	0	0	0	0	0	7
5-Jul	3	8	9	112	0	0	0	0	0	7
6-Jul	24	32	42	154	1	1	0	0	0	7
7-Jul	3	35	33	187	0	1	0	0	0	7
8-Jul	18	53	108	295	0	1	0	0	2	9
9-Jul	12	65	126	421	0	1	0	0	0	9
10-Jul	36	101	94	515	2	3	2	2	2	11
11-Jul	570	671	27,106	27,621	27	30	0	2	45	56
12-Jul	67	738	53,835	81,456	21	51	0	2	20	76
13-Jul	32	770	3,524	84,980	0	51	0	2	2	78
14-Jul	42	812	17,843	102,823	0	51	0	2	0	78
15-Jul	4	816	967	103,790	0	51	0	2	0	78
16-Jul	108	924	9,769	113,559	1	52	0	2	5	83
17-Jul	51	975	26,155	139,714	2	54	0	2	5	88
18-Jul	27	1,002	5,967	145,681	2	56	0	2	2	90
19-Jul	192	1,194	49,783	195,464	2	58	0	2	1	91
20-Jul	73	1,267	28,840	224,304	0	58	0	2	0	91
21-Jul	126	1,393	58,742	283,046	0	58	0	2	14	105
22-Jul	102	1,495	38,452	321,498	4	62	2	4	6	111
23-Jul	63	1,558	9,702	331,200	0	62	0	4	1	112
24-Jul	12	1,570	159	331,359	1	63	0	4	0	112
25-Jul	12	1,582	119	331,478	1	64	1	5	0	112
26-Jul	33	1,615	1,565	333,043	2	66	0	5	0	112
27-Jul	37	1,652	1,437	334,480	0	66	1	6	3	115
28-Jul	34	1,686	3,310	337,790	1	67	1	7	3	118
29-Jul	15	1,701	4,030	341,820	1	68	1	8	0	118
30-Jul	32	1,733	3,795	345,615	0	68	0	8	2	120
31-Jul	84	1,817	3,200	348,815	1	69	2	10	1	121
1-Aug	40	1,857	5,680	354,495	0	69	3	13	0	121
2-Aug	7	1,864	584	355,079	1	70	2	15	0	121
3-Aug	6	1,870	1,030	356,109	0	70	1	16	0	121
4-Aug		1,870		356,109		70		16		121
5-Aug	1	1,871	227	356,336	0	70	0	16	0	121
6-Aug	10	1,881	626	356,962	0	70	1	17	0	121
7-Aug	6	1,887	403	357,365	0	70	5	22	7	128
8-Aug	8	1,895	411	357,776	0	70	2	24	0	128
9-Aug	7	1,902	785	358,561	0	70	4	28	8	136
10-Aug	8	1,910	512	359,073	0	70	12	40	1	137
11-Aug	20	1,930	396	359,469	0	70	56	96	0	137

Appendix Table B.3. Expanded daily and cumulative migration of all salmonid species past the Niukluk River counting [illegible], Norton Sound, 1998.

Date	Daily chum salmon	Cumulative chum salmon	Daily pink salmon	Cumulative pink salmon	Daily king salmon	Cumulative king salmon	Daily coho salmon	Cumulative coho salmon	Daily Dolly Varden	[illegible]
4-Jul	883	883	931	931	42	42	0	0	74	[illegible]
5-Jul	1,494	2,377	2,154	3,086	26	68	0	0	83	[illegible]
6-Jul	2,322	4,699	5,456	8,541	42	109	0	0	76	[illegible]
7-Jul	3,170	7,869	24,622	33,163	26	135	0	0	24	[illegible]
8-Jul	2,055	9,924	21,526	54,689	16	151	0	0	21	[illegible]
9-Jul	940	10,864	18,430	73,120	5	156	0	0	17	[illegible]
10-Jul	2,053	12,916	65,144	138,264	26	182	0	0	35	[illegible]
11-Jul	4,147	17,063	97,225	235,488	8	190	0	0	13	[illegible]
12-Jul	2,536	19,599	75,556	311,045	19	209	0	0	8	[illegible]
13-Jul	3,299	22,898	114,399	425,444	11	219	0	0	19	[illegible]
14-Jul	1,590	24,488	80,866	506,310	8	227	0	0	32	[illegible]
15-Jul	1,986	26,474	96,999	603,308	7	234	0	0	60	[illegible]
16-Jul	2,382	28,856	113,131	716,439	5	239	0	0	88	[illegible]
17-Jul	2,779	31,634	162,851	879,290	8	247	0	0	45	[illegible]
18-Jul	1,574	33,208	91,054	970,344	0	247	0	0	106	[illegible]
19-Jul	751	33,959	43,313	1,013,657	10	257	0	0	47	[illegible]
20-Jul	1,096	35,055	76,914	1,090,570	-2	255	4	4	37	[illegible]
21-Jul	2,872	37,927	201,956	1,292,526	2	257	8	12	32	[illegible]
22-Jul	1,686	39,613	129,753	1,422,279	1	258	12	24	62	[illegible]
23-Jul	500	40,114	57,550	1,479,829	0	258	16	40	91	[illegible]
24-Jul	591	40,705	-9,675	1,470,153	0	258	20	60	71	[illegible]
25-Jul	348	41,053	10,254	1,480,407	0	258	12	72	39	[illegible]
26-Jul	552	41,605	13,541	1,493,948	0	258	10	82	50	[illegible]
27-Jul	688	42,293	15,974	1,509,923	0	258	14	96	45	[illegible]
28-Jul	516	42,809	14,156	1,524,079	0	258	22	118	80	[illegible]
29-Jul	428	43,237	14,311	1,538,389	0	258	16	134	84	[illegible]
30-Jul	340	43,576	14,466	1,552,855	0	258	10	144	89	[illegible]
31-Jul	436	44,012	15,195	1,568,050	0	258	16	160	101	[illegible]
1-Aug	272	44,284	11,387	1,579,437	0	258	23	183	109	[illegible]
2-Aug	130	44,414	3,504	1,582,940	0	258	12	195	63	[illegible]
3-Aug	51	44,465	4,273	1,587,213	0	258	37	232	72	[illegible]
4-Aug	100	44,565	3,982	1,591,195	0	258	30	262	50	[illegible]
5-Aug	82	44,647	3,730	1,594,925	0	258	33	295	47	[illegible]
6-Aug	32	44,679	3,585	1,598,510	0	258	42	337	44	[illegible]
7-Aug	213	44,892	5,707	1,604,218	0	258	48	385	66	[illegible]
8-Aug	260	45,152	5,528	1,609,746	0	258	30	415	55	[illegible]
9-Aug	217	45,368	4,414	1,614,159	0	258	19	434	73	[illegible]
10-Aug	170	45,539	3,983	1,618,143	0	258	34	468	102	[illegible]
11-Aug	26	45,565	2,392	1,620,535	0	258	72	540	70	[illegible]
12-Aug	4	45,569	2,270	1,622,805	0	258	124	663	88	[illegible]
13-Aug	17	45,587	1,631	1,624,436	0	258	176	839	53	[illegible]

Appendix Table B.4. Expanded daily and cumulative salmon migration past the Snake River counting tower, Norton Sound, 1998.

Date	Daily Chum	Cumulative Chum	Daily Pink	Cumulative Pink	Daily Coho	Cumulative Coho
1-Jul	0	0	0	0	0	0
2-Jul	0	0	0	0	0	0
3-Jul	0	0	6	6	0	0
4-Jul	0	0	2	8	0	0
5-Jul	16	16	19	27	0	0
6-Jul	17	33	14	41	0	0
7-Jul	17	50	21	62	0	0
8-Jul	48	98	130	192	0	0
9-Jul	222	320	458	650	0	0
10-Jul	55	375	249	899	0	0
11-Jul	293	668	854	1,753	0	0
12-Jul	733	1,401	2,212	3,965	0	0
13-Jul	311	1,712	1,657	5,622	0	0
14-Jul	1,032	2,744	14,149	19,771	0	0
15-Jul	1,318	4,062	19,341	39,112	0	0
16-Jul	1,318	5,380	19,341	58,453	0	0
17-Jul	1,802	7,182	29,302	87,755	0	0
18-Jul	1,333	8,515	31,030	118,785	0	0
19-Jul	316	8,831	5,903	124,688	0	0
20-Jul	396	9,227	19,889	144,577	0	0
21-Jul	595	9,822	21,905	166,482	0	0
22-Jul	475	10,297	13,505	179,987	0	0
23-Jul	248	10,545	8,449	188,436	0	0
24-Jul	73	10,618	3,867	192,303	0	0
25-Jul	49	10,667	3,037	195,340	0	0
26-Jul	24	10,691	2,268	197,608	0	0
27-Jul	48	10,739	4,227	201,835	0	0
28-Jul	118	10,857	5,410	207,245	0	0
29-Jul	42	10,899	3,413	210,658	0	0
30-Jul	43	10,942	2,504	213,162	0	0
31-Jul	38	10,980	1,951	215,113	0	0
1-Aug	4	10,984	51	215,164	0	0
2-Aug	18	11,002	866	216,030	0	0
3-Aug	10	11,012	605	216,635	0	0
4-Aug	12	11,024	708	217,343	14	14
5-Aug	7	11,031	550	217,893	20	34
6-Aug	7	11,038	383	218,276	21	55
7-Aug	8	11,046	292	218,568	28	83
8-Aug	4	11,050	411	218,979	12	95
9-Aug	1	11,051	399	219,378	21	116
10-Aug	8	11,059	207	219,585	32	148
11-Aug	8	11,067	94	219,679	30	178

Appendix Table B.5. Expanded daily and cumulative migration of all salmon species past the Eldorodo River counting tower, Norton Sound, 1998.

Date	Daily Chum	Cumulative Chum	Daily Pink	Cumulative Pink	Daily King	Cumulative King	Daily Coho	Cumulative Coho
29-Jun	0	0	0	0	0	0	0	0
30-Jun	35	35	0	0	2	2	0	0
1-Jul	107	142	47	47	0	2	0	0
2-Jul	43	185	62	109	0	2	0	0
3-Jul	43	228	145	254	0	2	0	0
4-Jul	32	260	74	328	2	4	0	0
5-Jul	40	300	90	418	2	6	0	0
6-Jul	145	445	660	1,078	1	7	0	0
7-Jul	159	604	669	1,747	0	7	0	0
8-Jul	445	1,049	1,528	3,275	0	7	0	0
9-Jul	1,672	2,721	5,860	9,135	9	16	0	0
10-Jul	1,143	3,864	8,247	17,382	16	32	0	0
11-Jul	2,574	6,438	20,840	38,222	264	296	0	0
12-Jul	946	7,384	18,739	56,961	25	321	0	0
13-Jul	639	8,023	11,053	68,014	19	340	0	0
14-Jul	639	8,662	11,053	79,067	19	359	0	0
15-Jul	639	9,301	11,053	90,120	19	378	0	0
16-Jul	639	9,940	11,053	101,173	19	397	0	0
17-Jul	441	10,381	6,252	107,425	17	414	0	0
18-Jul	732	11,113	7,832	115,257	12	426	0	0
19-Jul	22	11,135	322	115,579	0	426	0	0
20-Jul	312	11,447	1,635	117,214	0	426	0	0
21-Jul	1,004	12,451	6,458	123,672	4	430	0	0
22-Jul	617	13,068	4,375	128,047	2	432	0	0
23-Jul	291	13,359	2,302	130,349	0	432	0	0
24-Jul	266	13,625	3,135	133,484	2	434	0	0
25-Jul	16	13,641	108	133,592	0	434	0	0
26-Jul	50	13,691	742	134,334	2	436	0	0
27-Jul	20	13,711	354	134,688	0	436	0	0
28-Jul	46	13,757	558	135,246	4	440	0	0
29-Jul	24	13,781	332	135,578	2	442	0	0
30-Jul	17	13,798	280	135,858	0	442	0	0
31-Jul	0	13,798	72	135,930	0	442	0	0
1-Aug	0	13,798	22	135,952	0	442	6	6
2-Aug	4	13,802	187	136,139	0	442	-2	4
3-Aug	6	13,808	209	136,348	0	442	0	4
4-Aug	0	13,808	130	136,478	0	442	0	4
5-Aug	0	13,808	127	136,605	0	442	1	5
6-Aug	0	13,808	118	136,723	0	442	2	7
7-Aug	0	13,808	123	136,846	0	442	0	7
8-Aug	0	13,808	70	136,916	2	444	0	7
9-Aug	0	13,808	96	137,012	2	446	4	11
10-Aug	0	13,808	59	137,071	0	446	0	11
11-Aug	0	13,808	212	137,283	0	446	10	21
12-Aug	0	13,808	0	137,283	0	446	0	21

Appendix Table B.6. Expanded daily and cumulative migration of all salmon species past the North River counting tower, Norton Sound, 1998.

(Prior to 8 July passage estimates are unreliable because of problems with the weir and flash panel)

Date	Daily Chum	Cumulative Chum	Daily Pink	Cumulative Pink	Daily King	Cumulative King	Daily Coho	Cumulative Coho
15-Jun	0	0	0	0	0	0	0	0
16-Jun	0	0	0	0	0	0	0	0
17-Jun	0	0	0	0	2	2	0	0
18-Jun	0	0	0	0	2	4	0	0
19-Jun	0	0	0	0	3	7	0	0
20-Jun	0	0	0	0	4	11	0	0
21-Jun	0	0	0	0	4	15	0	0
22-Jun	0	0	0	0	7	22	0	0
23-Jun	0	0	0	0	22	44	0	0
24-Jun	0	0	0	0	20	64	0	0
25-Jun	0	0	0	0	26	90	0	0
26-Jun	0	0	16	16	26	116	0	0
27-Jun	0	0	18	34	11	127	0	0
28-Jun	0	0	19	53	5	132	0	0
29-Jun	0	0	90	143	8	140	0	0
30-Jun	0	0	80	223	0	140	0	0
1-Jul	6	6	202	425	20	160	0	0
2-Jul	16	22	848	1,273	12	172	0	0
3-Jul	1	23	354	1,627	5	177	0	0
4-Jul	23	46	2,896	4,523	13	190	0	0
5-Jul	24	70	2,935	7,458	13	203	0	0
6-Jul	46	116	5,598	13,056	12	215	0	0
7-Jul	88	204	12,116	25,172	88	303	0	0
8-Jul	31	235	3,866	29,038	56	359	0	0
9-Jul	34	269	1,428	30,466	71	430	0	0
10-Jul	86	355	7,522	37,988	80	510	0	0
11-Jul	119	474	4,844	42,832	259	769	0	0
12-Jul	107	581	4,901	47,733	242	1,011	0	0
13-Jul	14	595	2,782	50,515	50	1,061	0	0
14-Jul	8	603	1,456	51,971	72	1,133	0	0
15-Jul	50	653	3,254	55,225	60	1,193	0	0
16-Jul	64	717	3,684	58,909	92	1,285	0	0
17-Jul	32	749	1,736	60,645	114	1,399	0	0
18-Jul	52	801	2,446	63,091	56	1,455	0	0
19-Jul	25	826	1,501	64,592	39	1,494	0	0
20-Jul	20	846	1,014	65,606	82	1,576	0	0
21-Jul	14	860	912	66,518	92	1,668	20	20
22-Jul	12	872	652	67,170	90	1,758	36	56
23-Jul	24	896	282	67,452	106	1,864	54	110
24-Jul	17	913	404	67,856	43	1,907	42	152
25-Jul	11	924	442	68,298	39	1,946	28	180
26-Jul	29	953	555	68,853	43	1,989	52	232
27-Jul	40	993	574	69,427	20	2,009	70	302
28-Jul	40	1,033	384	69,811	2	2,011	98	400
29-Jul	32	1,065	674	70,485	14	2,025	100	500
30-Jul	38	1,103	520	71,005	12	2,037	100	600
31-Jul	69	1,172	525	71,530	14	2,051	126	726
1-Aug	41	1,213	611	72,141	10	2,061	126	852
2-Aug	32	1,245	463	72,604	7	2,068	297	1,149
3-Aug	16	1,261	188	72,792	6	2,074	232	1,381
4-Aug	16	1,277	182	72,974	5	2,079	232	1,613
5-Aug	16	1,293	182	73,156	5	2,084	232	1,845
6-Aug	16	1,309	182	73,338	5	2,089	232	2,077
7-Aug	16	1,325	182	73,520	5	2,094	232	2,309
8-Aug	21	1,346	193	73,713	2	2,096	246	2,555
9-Aug	36	1,382	134	73,847	-2	2,094	262	2,817
10-Aug	118	1,500	126	73,973	2	2,096	346	3,163
11-Aug	26	1,526	72	74,045	4	2,100	198	3,361
12-Aug	0	1,526	0	74,045	0	2,100	0	3,361

Appendix Table B.7. Expanded daily and cumulative migration of all salmonid species past the Shaktoolik River Counting tower, Norton Sound, 1998.

Date	Daily chum salmon	Cumulative chum salmon	Daily pink salmon	Cumulative pink salmon	Daily king salmon	Cumulative king salmon	Daily Dolly Varden	Cumulative Dolly Varden
16-Jun	0	0	0	0	-3	-3	0	0
17-Jun	0	0	0	0	-6	-9	81	81
18-Jun	0	0	0	0	-14	-23	0	81
19-Jun	0	0	2	2	-2	-25	99	180
20-Jun	0	0	3	5	-11	-36	72	252
21-Jun	0	0	8	13	-8	-44	51	303
22-Jun	0	0	12	25	-3	-47	9	312
23-Jun	0	0	48	73	-5	-52	135	447
24-Jun	0	0	27	100	-8	-60	144	591
25-Jun	2	2	90	190	-13	-73	117	708
26-Jun	4	6	240	430	52	-21	34	742
27-Jun	83	89	617	1,047	118	97	26	768
28-Jun	61	150	602	1,649	82	179	48	816
29-Jun	30	180	573	2,222	33	212	60	876
30-Jun	165	345	1,562	3,784	222	434	56	932
1-Jul	420	765	5,554	9,338	132	566	34	966
2-Jul	260	1,025	2,979	12,317	94	660	26	992
3-Jul	209	1,234	1,536	13,853	128	788	12	1,004
4-Jul	60	1,294	261	14,114	56	844	13	1,017
5-Jul	108	1,402	1,087	15,201	56	900	41	1,058
6-Jul	132	1,534	1,917	17,118	24	924	66	1,124
7-Jul	918	2,452	16,109	33,227	88	1,012	6	1,130
8-Jul	158	2,610	6,368	39,595	8	1,020	28	1,158
9-Jul	189	2,799	5,820	45,415	37	1,057	53	1,211
10-Jul	230	3,029	5,487	50,902	23	1,080	99	1,310
11-Jul	361	3,390	11,705	62,607	53	1,133	77	1,387
12-Jul	305	3,695	12,806	75,413	54	1,187	74	1,461
13-Jul	237	3,932	13,896	89,309	45	1,232	63	1,524
14-Jul	38	3,970	1,652	90,961	23	1,255	81	1,605
15-Jul	323	4,293	5,327	96,288	56	1,311	99	1,704
16-Jul	270	4,563	6,835	103,123	65	1,376	95	1,799
17-Jul	206	4,769	8,338	111,461	65	1,441	81	1,880
18-Jul	247	5,016	10,078	121,539	79	1,520	59	1,939
19-Jul	215	5,231	9,740	131,279	68	1,588	102	2,041
20-Jul	193	5,424	9,446	140,725	59	1,647	87	2,128
21-Jul	193	5,617	9,446	150,171	59	1,706	87	2,215
22-Jul	172	5,789	9,396	159,567	49	1,755	140	2,355

Appendix Table C. 1. Kotzebue District chum salmon commercial catch age composition by fishing period, and season summary, 1998.

			Brood Year and (Age Group)											
			1995		1994		1993		1992		1991		Total	
			0.2		0.3		0.4		0.5		0.6			
			N	%	N	%	N	%	N	%	N	%	N	%
Sampling Dates:	07/09 07/10						Period 1							
Stratum Dates:	07/09 07/10													
Sample Size:	272	Male	0	0	178	20.2	158	18	97	11	0	0	433	49.3
		Female	3	0.4	184	21.0	165	18.8	90	10.3	3	0.4	445	50.7
		Subtotal	3	0.4	362	41.2	323	36.8	187	21.3	3	0.4	878	100
Sampling Dates:	07/13 07/14						Period 2							
Stratum Dates:	07/13 07/14													
Sample Size:	280	Male	12	0.4	528	16.4	769	23.9	390	12.2	34	1.1	1,733	53.9
		Female	11	0.3	413	12.9	631	19.7	425	13.2	0	0	1,481	46.1
		Subtotal	23	0.7	941	29.3	1400	43.6	815	25.4	34	1.1	3,214	100
Sampling Dates:	07/16 07/17						Period 3							
Stratum Dates:	07/16 07/17													
Sample Size:	280	Male	9	0.4	745	29.3	618	24.3	236	9.3	18	0.7	1,627	63.9
		Female	0	0	318	12.5	373	14.6	200	7.8	27	1.1	918	36.1
		Subtotal	9	0.4	1063	41.8	991	38.9	436	17.1	45	1.8	2,545	100
Sampling Dates:	07/20 07/21						Period 4							
Stratum Dates:	07/20 07/21													
Sample Size:	280	Male	19	0.4	1798	34.3	1068	20.4	637	12.1	38	0.7	3,559	67.9
		Female	0	0	862	16.4	599	11.4	187	3.6	37	0.7	1,686	32.1
		Subtotal	19	0.4	2660	50.7	1667	31.8	824	15.7	75	1.4	5,245	100
Sampling Dates:	07/23 07/24						Period 5							
Stratum Dates:	07/23 07/24													
Sample Size:	280	Male	174	2.5	2231	32.1	1240	17.9	669	9.6	25	0.4	4,339	62.5
		Female	0	0	1339	19.3	967	13.9	248	3.6	49	0.7	2,603	37.5
		Subtotal	174	2.5	3570	51.4	2207	31.8	917	13.2	74	1.1	6,942	100
Sampling Dates:	07/27 07/28						Period 6							
Stratum Dates:	07/27 07/28													
Sample Size:	270	Male	253	2.2	3497	30.7	1980	17.4	1011	8.9	0	0	6,741	59.3
		Female	42	0.4	2064	18.2	1770	15.6	758	6.7	0	0	4,634	40.7
		Subtotal	295	2.6	5561	48.9	3750	33	1769	15.6	0	0	11,375	100
Sampling Dates:	07/30 07/31						Period 7							
Stratum Dates:	07/30 07/31													
Sample Size:	280	Male	196	3.2	1674	27.5	783	12.9	217	3.6	43	0.7	2,914	47.9
		Female	65	1.1	1544	25.4	1196	19.6	370	6	0	0	3,175	52.1
		Subtotal	261	4.3	3218	52.9	1979	32.5	587	9.6	43	0.7	6,089	100
Sampling Dates:	08/03 08/04						Period 8							
Stratum Dates:	08/03 08/04													
Sample Size:		Male	464	5	2785	30	1459	15.7	530	5.7	66	0.7	5,305	57.1
		Female	199	2.1	2487	26.8	895	9.7	365	3.9	33	0.4	3,979	42.9
		Subtotal	663	7.1	5272	56.8	2354	25.4	895	9.6	99	1.1	9,284	100

(Continued)

Appendix Table C.1. (page 2 of 2)

			Brood Year and Age Group											
			1995 0.2		1994 0.3		1993 0.4		1992 0.5		1991 0.6		Total	
			N	%	N	%	N	%	N	%	N	%	N	%
Sampling Dates:	08/06 08/07						Period 9							
Stratum Dates:	08/06 08/07													
Sample Size:	280	Male	204	6.5	1155	36.4	306	9.6	147	4.6	0	0	1,812	57.1
		Female	45	1.4	883	27.9	294	9.3	136	4.3	0	0	1,359	42.9
		Subtotal	249	7.9	2038	64.3	600	18.9	283	8.9	0	0	3,171	100
Sampling Dates:	08/10 08/11						Period 10							
Stratum Dates:	08/10 08/11													
Sample Size:	280	Male	555	11.1	1666	33.2	466	9.3	143	2.9	18	0.4	2,848	56.8
		Female	179	3.5	1487	29.7	268	5.3	233	4.6	0	0	2,168	43.2
		Subtotal	734	14.6	3153	62.9	734	14.6	376	7.5	18	0.4	5,016	100
Sampling Dates:	08/13 08/14						Period 11							
Stratum Dates:	08/13 08/14													
Sample Size:	80	Male	303	27.5	372	33.8	55	5	28	2.5	0	0	758	68.8
		Female	55	5	221	20	69	6.3	0	0	0	0	345	31.2
		Subtotal	358	32.5	593	53.8	124	11.3	28	2.5	0	0	1,103	100
Sampling Dates:	08/17 08/18						Period 12							
Stratum Dates:	08/17 08/18													
Sample Size:	160	Male	176	16.9	268	25.6	111	10.7	33	3.2	0	0	588	56.3
		Female	59	5.6	255	24.4	111	10.6	32	3.1	0	0	457	43.7
		Subtotal	235	22.5	523	50	222	21.3	65	6.3	0	0	1,045	100
Sampling Dates:	08/26 08/30						Period 15							
Stratum Dates:	08/26 08/30													
Sample Size:	106	Male	11	10.4	23	21.7	7	6.6	2	1.9	0	0	43	40.6
		Female	8	7.5	40	37.7	13	12.3	2	1.9	0	0	63	59.4
		Subtotal	19	17.9	63	59.4	20	18.9	4	3.8	0	0	106	100
Sampling Dates:	07/09-08/30						Season Total							
Stratum Dates:	07/09-08/30													
Sample Size:	3128	Male	2376	4.2	16921	30.2	9019	16.1	4142	7.4	242	0.4	32,700	58.4
		Female	667	1.2	12097	21.6	7352	13.1	3046	5.4	151	0.3	23,313	41.6
		Total	3043	5.4	29018	51.8	16371	29.2	7188	12.8	393	0.7	56,013	100.0

Appendix Table C.2. Kobuk River drift gillnet test fishing chum salmon catch age and sex composition by time period and season total, 1998.

		Brood Year and (Age Group)					
		1995 (0.2)	1994 (0.3)	1993 (0.4)	1992 (0.5)	1991 (0.6)	Total
Stratum Dates:	7/10-7/21						
Sampling Dates:	7/10-7/21						
Sample Size:	101						
Male	Percent of Catch	0.0	6.9	23.8	4.9	0.0	35.6
	Number in Catch	0	7	24	5	0	36
Female	Percent of Catch	0.0	15.9	24.7	20.8	3.0	64.4
	Number in Catch	0	16	25	21	3	65
Total	Percent of Catch	0.0	22.8	48.5	25.7	3.0	100.0
	Number in Catch	0	23	49	26	3	101
Stratum Dates:	7/23-8/1						
Sampling Dates:	7/22-8/1						
Sample Size:	260						
Male	Percent of Catch	0.7	19.6	16.1	8.1	0.0	44.6
	Number in Catch	2	51	42	21	0	116
Female	Percent of Catch	3.1	34.6	13.1	4.2	0.4	55.4
	Number in Catch	8	90	34	11	1	144
Total	Percent of Catch	3.8	54.2	29.2	12.3	0.4	100.0
	Number in Catch	10	141	76	32	1	260
Stratum Dates:	8/2-8/15						
Sampling Dates:	8/2-8/15						
Sample Size:	175						
Male	Percent of Catch	2.8	29.7	11.4	2.3	0.0	46.3
	Number in Catch	5	52	20	4	0	81
Female	Percent of Catch	6.3	33.7	12.0	1.1	0.6	53.7
	Number in Catch	11	59	21	2	1	94
Total	Percent of Catch	9.1	63.4	23.4	3.4	0.6	100.0
	Number in Catch	16	111	41	6	1	175
Stratum Dates:	7/10-8/15						
Sampling Dates:	7/10-8/15		Season Total				
Sample Size:	536						
Male	Percent of Catch	1.3	20.5	16.1	5.6	0.0	43.5
	Number in Catch	7	110	86	30	0	233
Female	Percent of Catch	3.6	30.8	14.9	6.3	0.9	56.5
	Number in Catch	19	165	80	34	5	303
Total	Percent of Catch	4.9	51.3	31.0	11.9	0.9	100.0
	Number in Catch	26	275	166	64	5	536