

TECHNICAL FISHERY REPORT 89-08



Alaska Department of Fish and Game
Division of Commercial Fisheries
PO Box 3-2000
Juneau, Alaska 99802

May 1989

Abundance, Age, Sex, and Size of Norton Sound and Kotzebue Sound Salmon Catch and Escapement, 1986

by
Helen H. Hamner

State of Alaska

Steve Cowper, Governor

The Technical Fishery Report Series was established in 1987, replacing the Technical Data Report Series. The scope of this new series has been broadened to include reports that may contain data analysis, although data oriented reports lacking substantial analysis will continue to be included. The new series maintains an emphasis on timely reporting of recently gathered information, and this may sometimes require use of data subject to minor future adjustments. Reports published in this series are generally interim, annual, or iterative rather than final reports summarizing a completed study or project. They are technically oriented and intended for use primarily by fishery professionals and technically oriented fishing industry representatives. Publications in this series have received several editorial reviews and at least one *blind* peer review refereed by the division's editor and have been determined to be consistent with the division's publication policies and standards.

Abundance, Age, Sex, and Size of Norton Sound and Kotzebue Sound

Salmon Catch and Escapement, 1986

By

Helen H. Hamner

Technical Fisheries Report No. 89-08

Alaska Department of Fish and Game
Division of Commercial Fisheries
Juneau, Alaska

May 1989

AUTHOR

Helen Hamner is a Region III fisheries research and management biologist for the Alaska Department of Fish and Game, Division of Commercial Fisheries, 333 Raspberry Rd, Anchorage, Ak 99518.

ACKNOWLEDGMENTS

The author would like to thank Larry Buklis, Sue Merkouris and Charlie Lean for providing critical review. In addition, thanks to the Norton Sound-Kotzebue Sound management staff who collected the data for this report.

TABLE OF CONTENTS

	<u>Page</u>
LIST OF TABLES	iv
LIST OF FIGURES	vi
LIST OF APPENDICES	vii
ABSTRACT	ix
INTRODUCTION	1
METHODS	2
Harvest and Escapement	2
Age, Sex, and Length Data Collection	2
Sample Size	3
RESULTS	3
Norton Sound	3
Commercial and Subsistence Harvest	3
Escapement Abundance	4
Age, Sex, and Length Composition	5
Kotzebue Sound	5
Commercial and Subsistence Harvest	5
Escapement Abundance	6
Age, Sex, and Length Composition	6
LITERATURE CITED	7
APPENDIX A - NORTON SOUND	32
APPENDIX B - KOTZEBUE SOUND	46

LIST OF TABLES

<u>Table</u>	<u>Page</u>
1. Norton Sound commercial salmon effort and catch by subdistrict, 1986	8
2. Commercial salmon set gill net catch and effort in Nome, Norton Sound Subdistrict 1, 1986	9
3. Commercial salmon set gill net catch and effort in Golovin, Norton Sound Subdistrict 2, 1986	10
4. Commercial salmon set gill net catch and effort in Moses Point, Norton Sound Subdistrict 3, 1986	11
5. Commercial salmon set gill net catch and effort in Norton Bay, Norton Sound Subdistrict 4, 1986	12
6. Commercial salmon set gill net catch and effort in Shaktoolik, Norton Sound Subdistrict 5, 1986	13
7. Commercial salmon set gill net catch and effort in Unalakleet, Norton Sound Subdistrict 6, 1986	14
8. Subsistence salmon catch and effort in Nome, Norton Sound Subdistrict 1, 1986	15
9. Salmon aerial survey counts and chum salmon aerial survey goals for Norton Sound streams, 1986	16
10. Age and sex composition percentages of chinook salmon from the Unalakleet Subdistrict, 1986	17
11. Mean lengths by age and sex of chinook salmon samples taken by set gill net from the Norton Sound District, 1986	18
12. Age and sex composition percentages of chum salmon samples from the Norton Sound District, 1986	19
13. Mean length (mm) of chum salmon from the Norton Sound District, 1986	20
14. Age and sex composition percentages of coho salmon samples taken by set gill net from the Unalakleet Subdistrict, 1986	21
15. Mean lengths by age and sex of coho salmon samples taken by set gill net from the Norton Sound District, 1986	22

LIST OF TABLES (Continued)

<u>Table</u>	<u>Page</u>
16. Commercial effort and catch of chinook and chum salmon in the Kotzebue District by fishing period, 1986	23
17. Estimated subsistence effort and catch of chum salmon by village, Kotzebue District, 1986	24
18. Chum salmon aerial survey counts and goals for Kotzebue Sound streams, 1986	25
19. Percent age and sex composition of chum salmon from Kotzebue District catch and escapement samples, 1986	26
20. Mean lengths of chum salmon from Kotzebue District catch and escapement samples, 1986	27

LIST OF FIGURES

<u>Figure</u>		<u>Page</u>
1.	Norton Sound commercial salmon fishing subdistricts	28
2.	Kotzebue Sound Subdistrict 1	29
3.	Kotzebue Sound commercial salmon fishing statistical areas	30

LIST OF APPENDICES

	<u>Page</u>
APPENDIX A: NORTON SOUND	
A.1. Age, sex and length (mm) of chinook salmon sample taken by set gill net from the Moses Point commercial harvest, 1986	32
A.2. Age, sex and length (mm) of chinook salmon sample taken by set gill net from the Unalakleet commercial harvest, 1986	33
A.3. Age, sex and length (mm) of chinook salmon subsistence catch taken with beach seine from Kwiniuk River, 1986	34
A.4. Age, sex and length (mm) of chinook salmon sample taken with 149 mm (5-7/8 in) mesh gill net from the Unalakleet test fishery, 1986	35
A.5. Catch, age, sex and length (mm) of chum salmon taken by set gill net from the Golovin commercial fishery, 1986	36
A.6. Catch, age, sex and length (mm) of chum salmon taken by set gill net from the Moses Point commercial fishery, 1986	37
A.7. Catch, age, sex and length (mm) of chum salmon taken by set gill net from the Shaktoolik commercial fishery, 1986	38
A.8. Catch, age, and sex of chum salmon, by sample stratum, from the Unalakleet commercial fishery, 1986	39
A.9. Length (mm) by age and sex of chum salmon sample taken by set gill net from the Unalakleet commercial fishery, 1986	40
A.10. Age, sex and length (mm) of chum salmon subsistence catch sample taken with beach seine from Kwiniuk River, 1986	41
A.11. Age and sex of chum salmon, by sample stratum, taken with 149 mm (5-7/8 in) mesh gill net from the Unalakleet test fishery, 1986	42
A.12. Length (mm) of chum salmon taken by 149 mm (5-7/8 in) mesh gill net from the Unalakleet test fishery, 1986	43
A.13. Catch, age, sex and length (mm) of coho salmon sample taken with set gill net from the Unalakleet commercial fishery, 1986	44
A.14. Age, sex and length (mm) of coho salmon sample taken by 149 mm (5-7/8 in) mesh gill net from the Unalakleet test fishery, 1986	45

LIST OF APPENDICES (Continued)

Page

APPENDIX B: KOTZEBUE SOUND

B.1.	Thousands of chum salmon in the Kotzebue commercial fishery by age group, 1962-1986	46
B.2.	Percent age and sex composition of chum salmon samples taken from the Kotzebue commercial fishery, 1962-1986	47
B.3.	Catch, age and sex, by sample stratum, of chum salmon from the Kotzebue commercial fishery, 1986	48
B.4.	Length (mm) by age and sex of chum salmon taken with set gill net from the Kotzebue commercial fishery, 1986	50
B.5.	Age, sex and length (mm) of chum salmon escapement sample from Squirrel River, 1986	51
B.6.	Age, sex and length (mm) of chum salmon carcass sample from Salmon River, 1986	52
B.7.	Age, sex, and length (mm) of chum salmon escapement sample taken by beach seine from Noatak River, 1986	53

ABSTRACT

The 1986 commercial and subsistence harvest of the five species of Pacific salmon (*Oncorhynchus*) found in the Norton Sound-Kotzebue Sound Area are presented by age, sex, and length. Commercial salmon catches were below 1981-85 averages for the entire area. Poor weather hindered aerial surveys of many spawning streams in both districts. Test nets catches indicated an average escapement of chinook salmon in the Unalakleet River. However, escapements of pink salmon in Norton Sound were below average. There was no consistency in chum salmon escapements in Norton Sound; escapements were above goals in some streams but were well below the goals in other streams. Escapements of chum salmon was considered adequate in the Kotzebue area when compared to surveys conducted on approximately the same dates in past years. Age, sex, and length composition are presented for all sampled escapements. Age-1.6 chinook salmon comprised an unusually large percentage (28.8%) of the Unalakleet chinook catch. Both the Norton Sound and Kotzebue District catches of age-0.4 chum salmon were larger than is typical for these fisheries which have historically been dominated by age-0.3 chum salmon. The percent return of age-0.4 chum to the Kotzebue fishery was three times the 1975-86 average. Both the number and percent of age-0.2 chum salmon was the lowest in the history of the Kotzebue fishery. Norton Sound coho salmon catches were dominated by age-3.1 fish.

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

INTRODUCTION

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

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

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 breeding population (escapement). Therefore, the age, sex, and size composition for selected harvests and escapements in the Norton and Kotzebue Sound areas have been estimated annually since 1962 and are presented in this report for 1986.

Basic fishery statistics for the Norton Sound-Kotzebue Sound Area are available from several additional sources. Commercial and subsistence harvest data for the years 1961-1986 are available from ADF&G (1986). Historical escapement data (1958-1987) are available in a computerized data base (Lean and Wyatt 1987). In addition, the results from Norton Sound escapement enumeration projects are analyzed and reported yearly for the Unalakleet River (Lean 1987) and the Kwiniuk River (Lean and Merkouris 1987). The North River counting tower project, which was operated in 1972, 1973, 1974, 1984, and 1985, was most recently summarized by Lean (1987). Two Kotzebue area escapement projects were discontinued in 1984: the Squirrel River counting tower, which was operated from 1982 to 1984, was most recently summarized by Dinnocenzo (1984) and Noatak River sonar, which operated from 1982 to 1984, has been reviewed by several authors (D. Mesiar, Alaska Department of Fish and Game, Anchorage, personal communication; Bigler 1985a; Berning et al. 1987). A historical summary of age, sex and size composition of salmon from Kotzebue Sound from 1962 to 1983 is provided by Bigler (1985b). Age, sex, and size composition of salmon is summarized for 1984, 1985, and 1987 (Lean et al. 1984; Bigler and Lean 1986; Hamner 1987). Age, sex and size data from 1962-1983 are summarized in the report series entitled ADF&G Arctic-Yukon-Kuskokwim Region, Age-Sex-Size Composition of Salmon.

METHODS

Harvest and Escapement

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

Subsistence catches have not been monitored as closely as commercial catches in the Norton Sound-Kotzebue Sound Area. Due to budget constraints, no subsistence harvest surveys were conducted in the Norton Sound area in 1986. 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 several villages during September. The members of each household were asked how many of each species was 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. A mean catch per fishing family was calculated for each village surveyed. This mean was applied to those families known to have fished but who were not available for interview.

Aerial surveys are the primary method for monitoring salmon escapement in the Norton Sound and Kotzebue Sound drainages. Aerial surveys of escapements are not a total enumeration of salmon spawning abundance. Ideally, a series of surveys is flown and counts on approximately the same dates can be compared across years. Therefore, aerial survey escapement counts can be regarded as an index of relative abundance for the surveyed stream and can be used for interannual or interdrainage comparisons of escapement. Counting towers provide a better estimate of total escapement. Test fishing catches provide an index of escapement and species composition for turbid or large drainages that are difficult to count visually. Either test catches or catch per unit of effort (CPUE) is used as an index of relative abundance for comparisons of escapements across years. Both test fisheries and counting towers provide data on migratory timing. In 1986, counting towers in the Norton Sound District were used to monitor escapement on the Kwiniuk River in the Moses Point Subdistrict and on the North River in the Unalakleet Subdistrict. In addition, a test fishing project was operated on the Unalakleet River in the Unalakleet Subdistrict.

Age, Sex, and Length Data Collection

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

All salmon were sampled for age, sex, and length. Sex was determined by examining external morphology, including the snout, vent, body symmetry and extruded eggs, ovipositor or milt of live fish. The sex of dead fish was deter-

mined by examining the gonads. Fish length from mid-eye to fork-of-tail was measured to the nearest millimeter.

Age was determined from scales removed from the left side of the fish in an area above the lateral line and crossed by a diagonal from the posterior insertion of the dorsal fin to the anterior insertion of the anal fin. Scales were mounted on gum cards and impressions made in cellulose acetate. Ages were reported in European notation (the first digit refers to the freshwater age and does not include the year spent in the gravel; the second digit refers to the ocean age).

Sample Size

Minimum sample size goals within temporal strata were derived for each species of interest (L. K. Brannian, Alaska Department of Fish and Game, Anchorage, personal communication). The objective was to obtain an estimated proportion by age class that was within 5 percentage points of the true proportion 90% of the time. This resulted in a per strata sample size goal for readable scales of 502 fish for species with three major age classes (chinook salmon), 450 fish for species with two major age classes (chum salmon), and 247 fish for species with one major age class (coho salmon). Minor age classes comprising less than 10% of the run were pooled and treated as a single age class in this analysis. Actual collection goals required that sample sizes be increased to include an expected proportion of unreadable scales. In cases where the total number of readable samples collected was less than the goal, data from several strata were pooled and a standard error of the mean was calculated.

RESULTS

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

Norton Sound

Commercial and Subsistence Harvest

The 1986 Norton Sound commercial salmon harvest totaled 230,400 fish and was comprised of 6,395 chinook, 146,912 chum, 41,260 pink, 233 sockeye, and 35,600 coho salmon (Table 1). Harvests of all five salmon species were below their 5-year (1981-85) averages. Although the Norton Sound area consists of six subdistricts, during 1986 salmon were primarily harvested in the Golovin (42%), Unalakleet (24%), Moses Point (19%) and Shaktoolik (10%) Subdistricts (Tables 2-7).

The chinook harvest was 39% below the 1981-85 average and comprised 3% of the district total salmon harvest. Chinook salmon are harvested primarily in the Unalakleet Subdistrict (70%) and to a lesser extent in the Shaktoolik Subdistrict (17%). Early in the 1986 season most fishermen in these two subdistricts targeted on chinook salmon using set gill nets of 210 mm (8-1/4 in)

stretched mesh. North of the Shaktoolik Subdistrict, most fishermen used 149 mm (5-7/8 in) mesh gill nets and targeted on chum salmon with chinook salmon harvested incidently.

Chum salmon, the most economically important species in Norton Sound, comprised 64% of the salmon harvest, which was 23% below the 1981-85 average. Golovin fishermen harvested the majority (47%) of the catch, followed by Unalakleet fishermen (21%). Moses Point and Shaktoolik fishermen landed 14% and 10%, respectively, of the district chum catch.

Pink salmon returns in the Norton Sound Area follow an even-year cycle of high abundance. Pink salmon comprised 18% of the district salmon harvest and were landed primarily in the Golovin (62%) and Moses Point (38%) Subdistricts. The pink harvest was less than expected and was 61% below the 1981-85 average. Both a poor return of pink salmon and a lack of local markets contributed to the below average catch.

The coho harvest was 32% below the 1981-85 average and comprised 15% of the district total salmon catch. The majority (58%) of coho salmon were landed in the Unalakleet Subdistrict, with 16% and 19% harvested in the Moses Point and Shaktoolik Subdistricts, respectively.

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; since not all fishermen were contacted, this harvest should be considered a minimum estimate. In the Nome Subdistrict, a the subsistence permit requires that fishermen document their harvest by species. Two-hundred and sixty-five subsistence permits were issued in 1986. Eighty-six percent of these fishermen reported catches which totaled 17,793 salmon: 150 chinook, 108 sockeye, 689 coho, 8,749 pink and 8,097 chum salmon (Table 8).

Escapement Abundance

Inclement weather hindered aerial surveys of most spawning streams in the Norton Sound area in 1986 (Table 9). No surveys were flown in the Shaktoolik Subdistrict streams and only a partial survey of the Unalakleet River system was achieved. However, test net catches on the Unalakleet River and tower counts on the North River in the Unalakleet system indicated average chinook escapement.

Escapement goals for chum salmon in Norton Sound index streams are averages (1962-1985) derived from historic peak aerial surveys flown during favorable survey conditions. There was no consistency in chum escapements in Norton Sound in 1986. Escapements were above goals in some streams in the Golovin and Moses Point Subdistricts but were well below the goals in other streams. These two subdistricts accounted for 60% of the district chum harvest in 1986. Escapements were below the goal in the Nome Subdistrict but were considered average in the Unalakleet Subdistrict.

Pink escapements were below the recent even-year averages for 1980, 1982 and 1984.

Adverse weather conditions hindered coho aerial surveys. However, test net and tower counts indicate that an average number of coho salmon returned to the Unalakleet system. No coho salmon aerial surveys were flown in the Shaktoolik Subdistrict.

Age, Sex, and Length Composition

Comparisons of sex and lengths were not substantiated by statistical testing. Commercial catch samples were collected in four subdistricts in 1986: Golovin, Moses Point, Shaktoolik, and Unalakleet. Chinook salmon from the Unalakleet Subdistrict were sampled from both commercial and test fisheries.

Chinook salmon harvested in the Unalakleet commercial fishery were predominantly age 1.4 (50%) with age-1.3 fish comprising nearly 19% (Table 10). Age-1.5 chinook salmon comprised an unusually large percent (29%) of the catch.

Approximately equal numbers of males and females were caught and mean length increased with age (Table 11). Too few chinook salmon were sampled from the Unalakleet test fishery, the Moses Point commercial catch and the Kwiniuk River subsistence catch (Moses Point Subdistrict) to accurately assess the age, sex and length composition of those fisheries. (See Appendix A.1-A.4 for the age and sex composition, sample size, mean length, and respective standard errors of all chinook samples collected).

Chum salmon were sampled from the Golovin, Moses Point, Shaktoolik, and Unalakleet Subdistricts, as well as from the Unalakleet test fishery (Table 12). A few samples (43) were collected from the Kwiniuk River subsistence fishery. Age-0.3 and -0.4 chum salmon, combined, comprised over 95% of all populations sampled and were present in nearly equal percentages in all commercial fisheries. Age-0.4 chum salmon comprised an unusually large percent in all commercial catches. No consistent temporal changes in age compositions were observed. More males than females were caught in all subdistricts, especially in the Shaktoolik (64% males) and Golovin (62% males) fisheries. Males were larger than females in all fisheries and larger chum salmon were caught in the Unalakleet test fishery than in the commercial fishery (Table 13). (See Appendix A.5-A.12 for the age and sex composition, sample size, mean length, and respective standard errors of all chum samples collected).

Age-2.1 coho salmon comprised 93% of both commercial and test fishery catches in Unalakleet (Table 14). More males were caught in the commercial fishery (59.6%) than in the test fishery (54.7%). Mean length increased with age (Table 15). See Appendix A.13 and A.14 for the age and sex composition, sample size, mean length, and respective standard errors of all coho samples collected).

Kotzebue Sound

Commercial and Subsistence Harvest

The 1986 commercial harvest of salmon in the Kotzebue District totaled 261,436 chum salmon and 101 chinook salmon (Table 16). The harvest was 62% of the 1981-

85 average of 422,480 chum salmon. The commercial fishing season consisted of 15 fishing periods scheduled twice weekly from July 10 through August 29. Half of the catch was taken prior to the end of the seventh fishing period (8/02), one fishing period earlier than normal. The peak catch of 47,551 chum salmon occurred during the seventh fishing period (7/31-8/02).

Subsistence surveys were conducted in two Kobuk River villages, Shungnak and Noorvik, and one Noatak River village, Noatak, during the fourth week of September (Table 17). Kobuk River villages reported catches of 4,483 and 8,418 chum salmon in Shungnak and Noorvik, respectively. The average catch per fishing family in Shungnak was 195 chum salmon, which is below the 1981-85 average of 249. The average catch per fishing family in Noorvik was 272 chum salmon which compares with the 5-year (1980, 1981, 1982, 1984 and 1985) average of 275 chum salmon. Noatak villagers traditionally fish in September and were more affected by flood level conditions which occurred during September of 1986. Nearly all of the Noatak subsistence fishermen were still fishing at the time of the survey.

Escapement Abundance

Aerial surveys were hindered by poor weather, but completed surveys of established index spawning streams indicated adequate escapement of chum salmon on both the Noatak and Kobuk River systems when compared to aerial surveys on approximately the same dates in previous years. The numbers of chum salmon counted on the Noatak and Kobuk Rivers were 42,374 and 17,225, respectively (Table 18). Aerial surveys on the lower Kobuk River were flown during peak spawning while all other surveys were flown prior to peak spawning.

Age, Sex, and Length Composition

Comparisons of sex and lengths were not substantiated by statistical testing. Chum salmon were sampled from the commercial catch and several spawning areas on the Noatak and Kobuk Rivers. Age composition of the catch was 0.3% age-0.2, 18.6% age-0.3, 78.9% age-0.4, and 2.2% age-0.5 (Table 19). For the first time in the history of the fishery, the number of age-0.4 chum salmon in the catch surpassed the number of age-0.3 (Appendix B.1). Age-0.3 have dominated the catch every year prior to 1986 and have historically comprised 63.5% (1976-1985) of the catch (Appendix B.2). Conversely, the return of age-0.4 chum salmon was three times the 1976-85 average percentage of 25.1%. Both the number and percentage of age-0.2 chum salmon were the lowest in the history of the fishery. This was the second consecutive year that the fishery experienced a record low return of age-0.2 chum salmon. The percentage of age-0.4 decreased from 90.2% at the beginning of the 1986 fishing season to 57.9% at the end of the season, whereas age-0.3 fish increased from 8.9% to 36.2% (Appendix B.3).

Age composition of chum salmon seined on the lower Noatak River spawning ground was similar to the commercial catch (Table 19). Chum salmon from the Salmon River on the lower Kobuk River consisted of 91% age-0.4 chum salmon compared to the Squirrel River which consisted of 79.0% age 0.4. Approximately one-fourth of the samples from the Squirrel River were collected by beach seine. Only 69% of the beach seine samples were age-0.4 compared with 83% of the carcasses sampled. Since older fish dominate the early portion of the chum salmon migration in Kotzebue Sound and younger fish arrive later, the difference in age composition between beach seine and carcass samples may be attributed to this

LITERATURE CITED

- ADF&G (Alaska Department of Fish and Game). 1986. Norton Sound-Port Clarence-Kotzebue Sound Annual Management Report, 1986. Division of Commercial Fisheries, Unpublished Region 3 report, Anchorage.
- Berning R., D. Mesiar, and D. Gaudet. 1987. Sonar enumeration of migrating fish in the Noatak River, 1984. Alaska Department of Fish and Game, Division of Commercial Fisheries, Informational Leaflet 262, Juneau.
- Bigler, B. 1985a. Noatak River test fish project, 1984. Alaska Department of Fish and Game, Division of Commercial Fisheries, AYK Region Report, Norton Sound/Kotzebue Test Fish Report 3, Anchorage.
- Bigler, B. 1985b. Kotzebue Sound chum salmon catch and escapement data, 1962-1984. Alaska Department of Fish and Game, Division of Commercial Fisheries, Technical Data Report 149, Juneau.
- Bigler, B. S., and C. F. Lean. 1986. 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.
- Dinnocenzo, J. D. 1984. Squirrel River counting tower project, 1984. Alaska Department of Fish and Game, Division of Commercial Fisheries, AYK Region Report, Norton Sound/Kotzebue Sound Salmon Report 32, Anchorage.
- 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.
- Lean, C. F. 1987. 1986 North River salmon counting tower. Alaska Department of Fish and Game, Division of Commercial Fisheries, AYK Region Report, Norton Sound/Kotzebue Sound Salmon Escapement Report 47, Anchorage.
- Lean, C.F. 1987. 1986 Unalakleet River test fishing project. Alaska Department of Fish and Game, Division of Commercial Fisheries, AYK Region Report: Norton Sound/Kotzebue Sound Salmon Escapement Report 46, Anchorage.
- Lean, C., B. Bigler, and L. 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.
- Lean, C. F., and S. Merkouris. 1987. 1986 Kwiniuk River salmon counting tower. Alaska Department of Fish and Game, Division of Commercial Fisheries, AYK Region Report, Norton Sound/Kotzebue Sound Salmon Escapement Report 45, Anchorage.
- Lean, C. F., and M. Wyatt. 1987. Norton Sound and Kotzebue stream survey, 1959-1987. Alaska Department of Fish and Game, Division of Commercial Fisheries, Unpublished Region 3 report, Nome.

Table 1. Norton Sound commercial salmon effort and catch by subdistrict, 1986.

Subdistrict	Fisher- men	Catch (nos.)					Total
		Chinook	Chum	Pink	Sockeye	Coho	
Nome	13	6	8,160	^a	0	50	8,216
Golovin	24	81	69,725	25,425	8	958	96,197
Moses Point	34	600	20,668	15,795	41	5,874	42,978
Norton Bay	9	139	1,994	40	2	1,512	3,687
Shaktoolik	30	1,075	16,126	^a	29	6,626	23,856
Unalakleet	73	4,494	30,239	^a	153	20,580	55,466
District Totals	163 ^b	6,395	146,912 ^b	41,260	233	35,600	230,400

^a No market for pink salmon in these subdistricts.

^b Total fishermen is total number of fishing permits fished during the 1986 fishing season in Norton Sound.

Table 2. Commercial salmon set gill net catch and effort in Nome, Norton Sound Subdistrict 1, 1986.

Period	Period Dates	Hours Fished	No. of Fishermen	Catch (nos.)		
				Chinook	Chum	Coho
1	7/01-7/02	24	5	2	2,554	0
2	7/03-7/04	24	7	0	1,118	0
3	7/07-7/08	24	8	3	1,668	0
4	7/10-7/11	24	5	1	2,374	0
5	7/14-7/15	24	4	0	436	0
6 ^a	7/17-7/18	24	0			
7 ^b	7/21-7/22	24	0			
8 ^b	7/24-7/25	24	0			
9 ^b	7/28-7/29	24	0			
10 ^b	7/31-8/01	24	0			
11 ^a	8/04-8/05	24	0			
12 ^a	8/07-8/08	24	0			
13 ^a	8/11-8/12	24	0			
14 ^a	8/14-8/15	24	0			
15	8/18-8/20	48	1	0	10	50
16 ^a	8/21-8/22	24	0			
17 ^a	8/25-8/26	24	0			
18 ^a	8/28-8/29 ^c	24	0			
Season Total			13 ^d	6	8,160	50

^a No fishing effort due to severe storm.

^b No buyers present.

^c Season closed 8/31 by regulation.

^d Total number of fishermen is number of permits fished during the 1986 fishing season.

Table 3. Commercial salmon set gill net catch and effort in Golovin, Norton Sound Subdistrict 2, 1986.

Period	Period Dates	Hours Fished	No. of Fishermen	Catch (nos.)				
				Chinook	Chum	Pink	Sockeye	Coho
1	6/23-6/24	24	13	17	3,121	104	0	0
2	6/26-6/28	48	14	31	15,173	1,390	0	0
3	6/30-7/02	48	20	16	13,068	3,684	0	0
4 ^a	7/02-7/03	12	2	0	294	595	0	0
5	7/03-7/05	48	19	4	10,838	3,045	0	0
6 ^a	7/06-7/07	24	11	1	1,162	2,814	0	0
7	7/07-7/09	48	17	3	8,671	4,088	0	0
8	7/10-7/12	54	15	5	5,934	2,496	0	0
9	7/13-7/13	24	8	1	2,095	777	0	0
10	7/14-7/14	24	13	0	1,868	1,519	0	0
11	7/15-7/15	24	15	0	2,811	1,253	3	0
12	7/16-7/16	24	13	1	1,765	1,214	1	0
13	7/17-7/17	24	13	1	1,520	1,112	1	0
14	7/18-7/18	24	8	0	429	499	2	0
15	7/19-7/19	24	3	0	75	102	0	0
16 ^b	7/20-7/20	24	0					
17 ^b	7/21-7/21	24	0					
18	7/22-7/22	24	4	0	502	411	1	5
19	7/23-7/23	24	3	1	399	322	0	0
20 ^c	7/24-7/24	24	0					
21 ^c	7/25-7/25	24	0					
22 ^c	7/26-7/26	24	0					
23 ^c	7/27-7/27	24	0					
24 ^c	7/28-7/28	24	0					
25 ^c	7/29-7/29	24	0					
26 ^c	7/30-7/30	24	0					
27 ^c	7/31-7/31	24	0					
28 ^c	8/01-8/01	24	0					
29 ^c	8/02-8/02	18	0					
30 ^c	8/04-8/06	48	0					
31 ^c	8/07-8/09	48	0					
32	8/11-8/13	48	1	0	0	0	0	54
33	8/14-8/16	48	3	0	0	0	0	212
34	8/18-8/20	48	5	0	0	0	0	353
35	8/21-8/24	72	5	0	0	0	0	334
36 ^c	8/25-8/27	48	0					
37 ^c	8/28-8/31 ^d	72						
Season Total			24 ^e	81	69,725	25,425	8	958

^a Special "pink gear" opening (4 1/2" mesh or less).

^b No fishing effort due to severe storm.

^c No buyers present.

^d Season closed 8/31 by regulation.

^e Total number of fishermen is number of permits fishing during the 1986 fishing season.

Table 4. Commercial salmon set gill net catch and effort in Moses Point, Norton Sound Subdistrict 3, 1986.

Period	Period Dates	Hours Fished	No. of Fishermen	Catch (nos.)				
				Chinook	Chum	Pink	Sockeye	Coho
1	6/23-6/24	24	16	128	1,673	112	1	0
2	6/26-6/27	24	20	186	3,228	907	3	0
3	6/30-7/02	48	30	140	6,509	5,465	9	0
4 ^a	7/02-7/03	12	10	3	416	1,451	1	0
5	7/03-7/05	48	28	63	4,307	2,256	11	0
6 ^a	7/06-7/07	24	11	7	739	1,089	0	0
7	7/07-7/09	48	25	47	2,405	2,747	10	0
8 ^b	7/10-7/12	48	21	18	1,391	1,768	6	0
9 ^c	7/28-7/30	48	0					
10 ^c	7/31-8/02	48	0					
11 ^c	8/04-8/06	48	0					
12	8/07-8/09	48	9	0	0	0	0	476
13	8/11-8/13	48	4	0	0	0	0	197
14	8/14-8/16	48	11	1	0	0	0	817
15	8/18-8/20	48	18	0	0	0	0	1,021
16	8/21-8/24	72	19	3	0	0	0	1,765
17	8/25-8/27	48	20	4	0	0	0	1,319
18	8/28-8/31 ^d	72	11	0	0	0	0	279
Season Total			34 ^e	600	20,668	15,795	41	5,874

^a Special "pink gear" opening (4 1/2" mesh or less).

^b Commercial fishery closed by emergency order from 7/14-7/28 due to below average chum salmon escapements.

^c No buyers present.

^d Season closed 8/31 by regulation.

^e Total fishermen is total number of fishing permits fished during the 1986 fishing season.

Table 5. Commercial salmon set gill net catch and effort in Norton Bay, Norton Sound Subdistrict 4, 1986.

Period	Period Dates	Hours Fished	No. of Fishermen	Catch (nos.)				
				Chinook	Chum	Pink	Sockeye	Coho
1	6/23-6/24	24	0					
2	6/26-6/28	48	1	9	93	0	1	0
3	6/30-7/02	48	4	67	299	3	0	0
4	7/03-7/05	48	4	37	375	5	1	0
5	7/07-7/09	48	4	21	549	32	0	0
6 ^a	7/10-7/12	48	0					
7	7/14-7/16	48	6	5	244	0	0	0
8 ^b	7/17-7/19	48	0					
9 ^b	7/21-7/23	48	0					
10 ^b	7/24-7/26	48	0					
11 ^b	7/28-7/30	48	0					
12 ^b	7/31-8/02	48	0					
13	8/04-8/06	48	5	0	166	0	0	230
14	8/07-8/09	48	4	0	96	0	0	278
15	8/11-8/13	48	5	0	68	0	0	147
16	8/14-8/16	48	5	0	98	0	0	482
17	8/18-8/20	48	4	0	5	0	0	146
18	8/21-8/24	72	4	0	1	0	0	105
19	8/25-8/27	48	2	0	0	0	0	119
20	8/28-8/31	72	1	0	0	0	0	5
21 ^b	9/01-9/03	48	0					
22 ^b	9/04-9/07 ^c	72	0					
Season Total			9 ^d	139	1,994	40	2	1,512

^a No fishing effort due to severe storm.

^b No buyers present.

^c Season closed 9/07 by regulation.

^d Total fishermen is total number of fishing permits fished during the 1986 fishing season.

Table 6. Commercial salmon set gill net catch and effort in Shaktoolik, Norton Sound Subdistrict 5, 1986.

Period	Period Dates	Hours Fished	No. of Fishermen	Catch (nos.)			
				Chinook	Chum	Sockeye	Coho
1	6/23-6/24	24	17	167	311	0	0
2	6/26-6/28	48	22	512	1,782	0	0
3	6/30-7/02	48	19	254	3,334	0	0
4	7/03-7/05	48	4	41	1,493	0	0
5	7/07-7/09	48	17	43	1,811	3	0
6	7/10-7/12	48	22	28	2,100	6	0
7	7/14-7/16	48	18	13	2,157	4	3
8 ^a	7/17-7/19	48	0				
9	7/21-7/23	48	18	7	1,390	16	56
10 ^a	7/24-7/26	48	0				
11	7/28-7/30	48	15	1	380	0	188
12	7/31-8/02	48	11	2	229	0	450
13	8/04-8/06	48	15	0	261	0	701
14	8/07-8/09	48	19	1	325	0	2,421
15	8/11-8/13	48	11	1	149	0	504
16	8/14-8/16	48	20	1	149	0	904
17	8/18-8/20	48	20	2	196	0	857
18	8/21-8/24	72	18	1	49	0	443
19	8/25-8/27	48	4	1	10	0	99
20 ^b	8/28-8/31	72	0				
21 ^b	9/01-9/03	48	0				
22 ^b	9/04-9/07 ^c	72	0				
Season Total			30 ^d	1,075	29	6,626	16,126

^a No fishing effort due to severe storm.

^b No buyers present.

^c Season closed 9/07 by regulation.

^d Total fishermen is total number of fishing permits fished during the 1986 fishing season.

Table 7. Commercial salmon set gill net catch and effort in Unalakleet, Norton Sound Subdistrict 6, 1986.

Period	Period Dates	Hours Fished	No. of Fishermen	Catch (nos.)			
				Chinook	Chum	Sockeye	Coho
1	6/23-6/24	24	59	1,055	141	0	0
2	6/26-6/28	48	66	1,604	1,927	0	0
3	6/30-7/02	48	57	994	2,173	0	0
4	7/03-7/05	48	48	496	4,533	0	0
5	7/07-7/09	48	40	173	3,137	3	0
6	7/10-7/12	48	28	54	3,443	9	0
7	7/14-7/16	48	35	39	6,879	31	10
8	7/17-7/19	48	29	14	2,298	6	19
9	7/21-7/23	48	26	9	1,569	22	168
10	7/24-7/26	48	26	6	1,403	6	342
11	7/28-7/30	48	27	4	381	6	603
12	7/31-8/02	48	29	1	482	3	1,114
13	8/04-8/06	48	32	2	389	4	2,123
14	8/07-8/09	48	39	5	381	8	3,240
15	8/11-8/13	48	29	9	364	14	3,267
16	8/14-8/16	48	44	10	252	8	2,848
17	8/18-8/20	48	42	7	236	14	2,515
18	8/21-8/24	72	38	4	147	11	1,670
19	8/25-8/27	48	27	6	49	3	1,054
20	8/28-8/31	72	27	1	37	5	926
21	9/01-9/03	48	13	1	12	0	220
22	9/04-9/07 ^a	72	9	0	6	0	461
Season Total			73 ^b	4,494	30,239	153	20,580

^a Season closed 9/07 by regulation.

^b Total fishermen is total number of fishing permits fished during the 1986 fishing season.

Table 8. Subsistence salmon catch and effort in Nome, Norton Sound Subdistrict 1, 1986.^a

Location	Permits Issued	Permits Returned	Permits Fished	Catch (nos.)					Total
				Chi-nook	Chum	Pink	Sock-eye	Coho	
Nome R.	92	77	55	6	847	4,611	0	210	5,674
Marine Waters	100	92	61	140	5,528	2,115	104	276	8,163
Sinuk R.	6	3	2	0	180	91	1	3	275
Eldorado R.	23	19	14	1	919	799	1	124	1,844
Flambeau R.	12	11	6	0	513	571	1	5	1,090
Snake R.	13	11	8	3	82	257	1	38	381
Penny R.	2	2	1	0	3	97	0	0	100
Solomon R.	9	8	3	0	3	1	0	19	23
Feather R.	0	0	0						
Bonanza R.	7	5	3	0	22	207	0	14	243
Cripple R.	1	0	0	0	0	0	0	0	0
Safety Sound	0	0	0						
Totals	265	228	153	150	8,097	8,749	108	689	17,793

^a Harvested with beach seine or set gill net.

Table 9. Salmon aerial survey counts and chum salmon aerial survey goals for Norton Sound streams, 1986.^a

Subdistrict	Stream name	Chinook	Chum		Pink	Coho ^c
			Count	Goal ^b		
Nome (1)	Nome	2	1,150	2,000	13,580	
	Flambeau ^d	2	3,075	3,250	300	
	Eldorado	9	3,490	5,250	18,200	
	Bonanza			1,500	18,480 ^e	
	Snake	0	415		1,690	
	Sinuk ^d	4	1,960	3,500	28,690 ^e	
	Solomon ^d		165		3,440	
Golovin (2)	Fish	200	25,190	17,500	140	
	Niukluk	2	2,442	8,000	0	
	Boston	2	220	2,500	0	
Moses Point (3)	Tubutulik ^d	453	5,975	12,000	35,680	
	Kwiniuk ^f (Tower count)	653	24,704	25,000	241,446	421 ^g
Norton Bay (4)	Ungalik	0	0	2,500	0	
	Inglutalik ^h			8,500		
Shaktoolik (5)	Shaktoolik	10	20	11,000	0	
Unalakleet (6)	North River ^f	1,613	3,738	4,500	236,487	
	(Tower count) Unalakleet System ⁱ		382	1,296	15	

^a Due to stormy weather conditions prevalent in July, August, and September, most surveys were flown prior to or after run peaks.

^b Aerial survey counts with a "good" or "fair" rating.

^c Surveys not flown due to stormy conditions.

^d Peak chum salmon survey count.

^f Tower counts are expanded totals.

^g Early (prior to July 27) coho tower counts.

^h Not surveyed.

ⁱ Partial survey, includes counts from Chirosky to Old Woman.

Table 10. Age and sex composition percentages of chinook salmon samples from the Unalakleet Subdistrict, 1986.

Sex/Age	Commercial Fishery ^{ab}	Test Fishery ^c
Females		
1.2	0.0	0.0
1.3	3.4	6.4
1.4	27.9	23.4
1.5	18.8	21.3
Total	50.5	51.1
Males		
1.2	2.1	2.1
1.3	15.2	31.9
1.4	22.0	8.5
1.5	10.0	6.4
Total	49.5	48.9
Sexes Combined		
1.2	2.1	2.1
1.3	18.6	38.3
1.4	49.9	31.9
1.5	28.8	27.7
Total	100.0	100.0
Sample Size	468	47

^a Does not include two age-2.3 and one age-2.4 chinook salmon.

^b Most commercial fishermen target on chinook salmon with 215.9 mm (8-1/2 in) mesh gill nets during chinook salmon migration.

^c Test net is 149 mm (5-7/8 in) mesh gill net.

Table 11. Mean lengths by age and sex of chinook salmon samples taken by set gill net from the Norton Sound District, 1986.

Sex/Age	Mean Length (mm)	
	Commercial Fishery ^{ab}	Test Fishery ^c
Females		
1.2		
1.3	801	845
1.4	867	852
1.5	903	890
Males		
1.2	570	560
1.3	766	692
1.4	852	846
1.5	924	960
Sexes Combined		
1.2	570	560
1.3	772	718
1.4	860	850
1.5	910	906
Sample Size	468	47

^a Does not include two age-2.3 and one age-2.4 chinook salmon.

^b Most commercial fishermen target on chinook salmon with 215.9 mm (8-1/2 in) mesh gill nets during chinook salmon migration.

^c Test net is 149 mm (5-7/8 in) mesh gill net.

Table 12. Age and sex composition percentages of chum salmon from the Norton Sound District, 1986.^a

Sex/Age	Commercial Fisheries				Test Fishery	Escapement
	Golovin (2) (7/10-7/11)	Moses Point (3) (6/24-7/11)	Shaktoolik (4) (7/4)	Unalakleet (5) (7/5-8/1)	Unalakleet River (6/17-8/20)	Kwiniuk River (7/6-7/10)
Females						
0.2	0.0	0.0	0.7	0.0	0.3	0.0
0.3	16.0	22.4	15.2	17.8	15.3	41.9
0.4	20.8	24.7	17.4	24.4	20.8	4.7
0.5	1.1	0.4	2.2	1.0	0.8	0.0
Total	37.9	47.5	35.5	43.2	37.1	46.6
Males						
0.2	0.0	0.4	0.0	0.2	0.3	0.0
0.3	28.8	30.6	31.9	29.0	31.3	44.1
0.4	32.0	21.1	31.9	25.9	29.9	9.3
0.5	1.3	0.4	0.7	1.6	1.4	0.0
Total	62.1	52.5	64.5	56.8	62.9	53.4
Sexes Combined						
0.2	0.0	0.4	0.7	0.3	0.5	0.0
0.3	44.8	53.0	47.1	46.8	46.6	86.0
0.4	52.8	45.8	49.3	50.4	50.7	14.0
0.5	2.4	0.8	2.9	2.6	2.2	0.0
Total	100.0	100.0	100.0	100.0	100.0	100.0
Sample Size	462	223	138	1,352	760	43

^a All samples collected with set gill net except Kwiniuk River samples collected with beach seine.

Table 13. Mean lengths (mm) of chum salmon from the Norton Sound District, 1986.^a

Sex/Age	Commercial Fisheries				Test Fishery	Escapement
	Golovin (2) (7/10-7/11)	Moses Point (3) (6/24-7/11)	Shaktoolik (4) (7/4)	Unalakleet (5) (7/5-8/1)	Unalakleet River (6/17-8/20)	Kwiniuk River (7/6-7/10)
Females						
0.2			570.0	520.0	575.0	
0.3	567.5	560.3	581.2	571.8	572.4	
0.4	577.8	568.4	601.5	587.2	593.7	545.0
0.5	562.8	550.0	586.7	592.0	590.0	500.0
Males						
0.2		545.0		538.3	525.0	
0.3	580.5	580.2	586.3	585.9	589.9	
0.4	598.5	602.9	608.5	610.4	611.9	562.1
0.5	584.3	605.0	560.0	615.0	617.7	607.5
Sexes Combined						
0.2		545.0	570.0	533.8	550.0	
0.3	575.9	571.7	584.6	579.9	584.1	
0.4	590.4	584.3	606.0	598.3	604.4	553.8
0.5	574.5	577.5	580.0	605.1	607.9	571.7
Sample Size	462	223	138	1,352	760	43

^a All samples collected with set gill net except Kwiniuk River samples collected with beach seine.

Table 14. Age and sex composition percentages of coho salmon samples taken by set gill net from the Unalakleet Subdistrict, 1986.

Sex/Age	Commercial Fishery	Test Fishery ^a
Females		
1.1	0.4	0.0
2.1	36.8	40.6
2.2	0.0	2.3
3.1	3.1	2.3
Total	40.3	45.2
Males		
1.1	0.0	0.0
2.1	56.5	52.3
2.2	0.0	1.6
3.1	3.1	0.8
Total	59.6	54.7
Sexes Combined		
1.1	0.4	0.0
2.1	93.3	93.0
2.2	0.0	3.9
3.1	6.3	3.1
Total	100.0	100.0
Sample Size	223	128

^a Test net is 149 mm (5-7/8 in) mesh gill net.

Table 15. Lengths by age and sex of coho salmon samples taken by set gill net from Unalakleet Subdistrict, 1986.

Sex/Age	Mean Length (mm)	
	Commercial Fishery	Test Fishery ^a
Females		
1.1	545	
2.1	560	576
2.2		553
3.1	558	573
Males		
1.1		
2.1	557	572
2.2		602
3.1	569	575
Sexes Combined		
1.1	545	
2.1	558	574
2.2		573
3.1	563	574
Sample Size	223	128

^a Test net is 149 mm (5-7/8 in) mesh gill net.

Table 16. Commercial effort and catch of chinook and chum salmon in the Kotzebue District by fishing period, 1986.

Period	Period Dates	Hours Fished	No. of		
			Fishermen	Chinook	Chum
1	7/10-7/11	24	82	13	6,960
2	7/14-7/15	24	116	11	7,058
3	7/17-7/18	24	138	8	16,883
4	7/21-7/22	24	152	10	25,555
5	7/24-7/25	24	154	11	26,462
6	7/28-7/29	24	166	11	31,678
7	7/31-8/02	36	163	15	47,551
8	8/04-8/06	36	171	4	32,610
9	8/07-8/09	36	166	3	27,979
10	8/11-8/12	24	124	2	11,818
11	8/14-8/15	24	149	4	14,324
12	8/18-8/19	24	112	5	7,061
13	8/21-8/22	24	66	3	3,823
14	8/25-8/26	24	40	1	1,674
15 ^a	8/28-8/29	24	0		
Season Totals		372	189 ^b	101	261,436

^a No buyers present.

^b Total fishermen is total number of fishing permits fished during the 1986 fishing season.

Table 17. Estimated subsistence effort and catch of chum salmon by village, Kotzebue District, 1986.

Village	Number of Fishermen	Chum Salmon Harvest	Average Catch per Fisherman
Noatak ^a	18	1,246	69
Noorvik	31	8,418	272
Shungnak	23	4,483	195
Kotzebue ^b	765	36,311	47
District total	837	50,458	60

^a Most fishermen still fishing at time of survey.

^b Subsistence Division survey using a stratified sample design conducted during winter of 1986-1987.

Table 18. Chum salmon aerial survey counts and goals for Kotzebue Sound streams, 1986.

River	Aerial Survey Goal ^a	Aerial Survey Count
Noatak	80,000	42,374 ^b
Squirrel	11,500	4,982
Salmon	7,000	1,971
Tutuksuk	2,000	4,257
Upper Kobuk R. (between Kobuk and the lower canyon)	10,000	6,015 ^b

^a Aerial survey goal is historical average (1962-1985) of peak aerial surveys with a "good" or "fair" rating.

^b Surveyed prior to peak spawning.

Table 19. Percent age and sex composition of chum salmon from Kotzebue District catch and escapement samples, 1986.

Sex/ Age	Commercial Catch ^a (7/11-8/26)	Noatak River ^b (9/17-9/19)	Salmon River ^c (9/1-9/3)	Squirrel River ^d (8/30-8/31)
Males				
0.2	0.2	0.2	0.0	0.5
0.3	8.9	10.8	1.4	9.3
0.4	35.7	40.0	39.8	32.1
0.5	1.2	0.9	1.9	1.0
Total	46.0	48.1	43.1	42.9
Females				
0.2	0.1	0.2	0.0	0.0
0.3	9.7	10.8	4.7	9.8
0.4	43.2	36.2	51.2	47.2
0.5	1.0	0.9	0.9	0.0
Total	54.0	51.9	56.8	57.0
Sexes Combined				
0.2	0.3	0.4	0.0	0.5
0.3	18.6	21.8	6.4	19.5
0.4	78.9	76.0	90.9	79.0
0.5	2.2	1.8	2.7	1.0
Total	100.0	100.0	100.0	100.0
Sample Size	3,095	433	220	193

^a Commercial catch samples taken with 149 mm (5-7/8 in) to 152 mm (6 in) mesh gill nets.

^b Escapement sample collected by beach seine on spawning grounds.

^c Carcass sample collected on spawning grounds.

^d Sample taken by beach seine and carcass recovery.

Table 20. Mean lengths of chum salmon from Kotzebue District catch and escapement samples, 1986.

Sex/ Age	Mean Length (mm)			
	Commercial Catch ^a (7/11-8/26)	Noatak River ^b (9/17-9/19)	Salmon River ^c (9/1-9/3)	Squirrel River ^c (8/30-8/31)
Males				
0.2	566	529		625
0.3	600	627	605	604
0.4	631	648	617	635
0.5	625	636	612	
Females				
0.2	542	518		530
0.3	577	574	559	570
0.4	599	600	571	580
0.5	600	611	560	
Sexes Combined				
0.2	554	524		578
0.3	587	602	564	582
0.4	613	623	589	617
0.5	613	624	591	
Sample Size	3,095	433	96	125

^a Commercial catch samples taken with 149 mm (5-7/8 in) to 152 mm (6 in) mesh gill nets.

^b Escapement sample collected by beach seine on spawning grounds.

^c Carcass sample collected on spawning grounds.

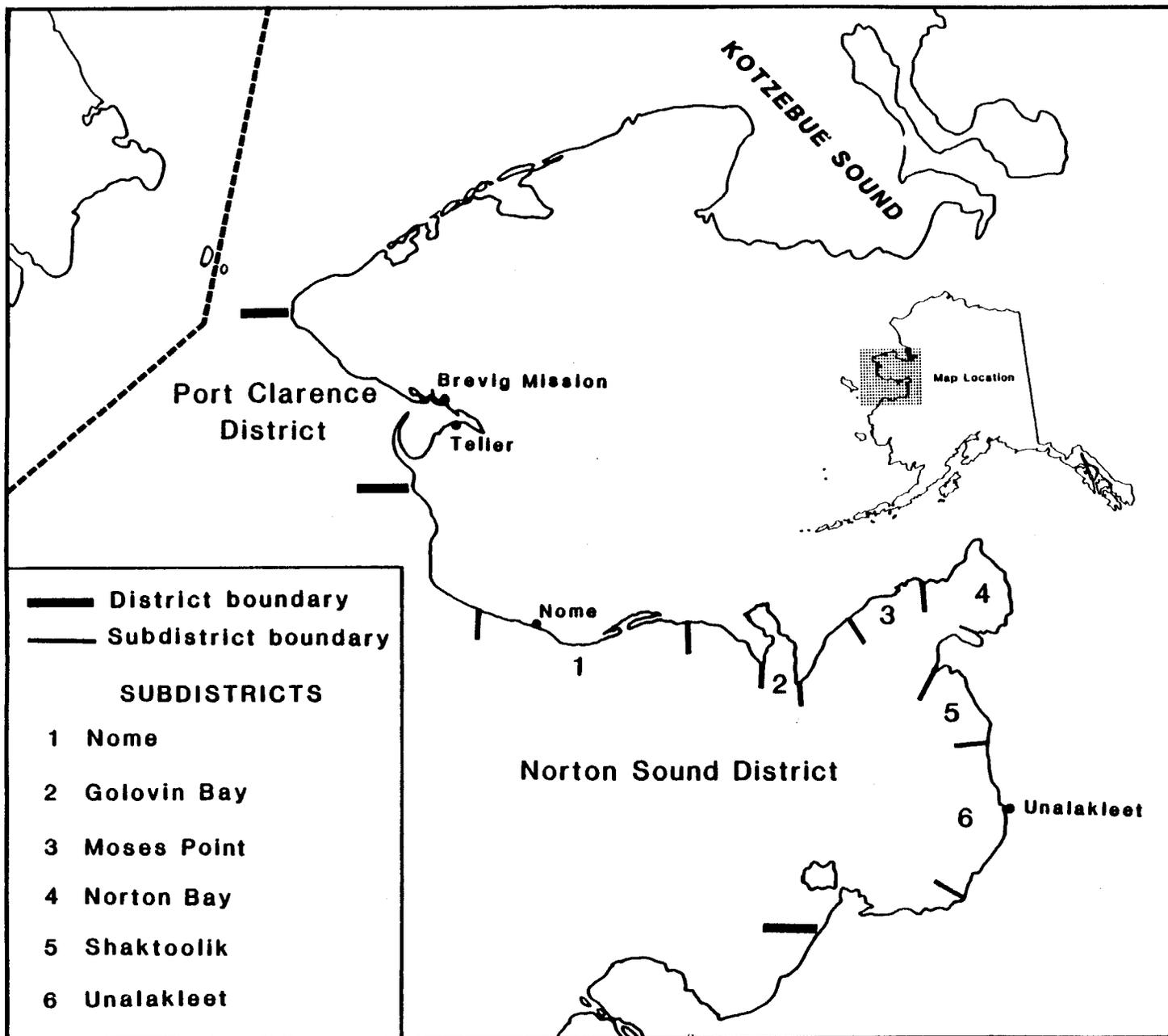


Figure 1. Norton Sound commercial salmon fishing subdistricts.

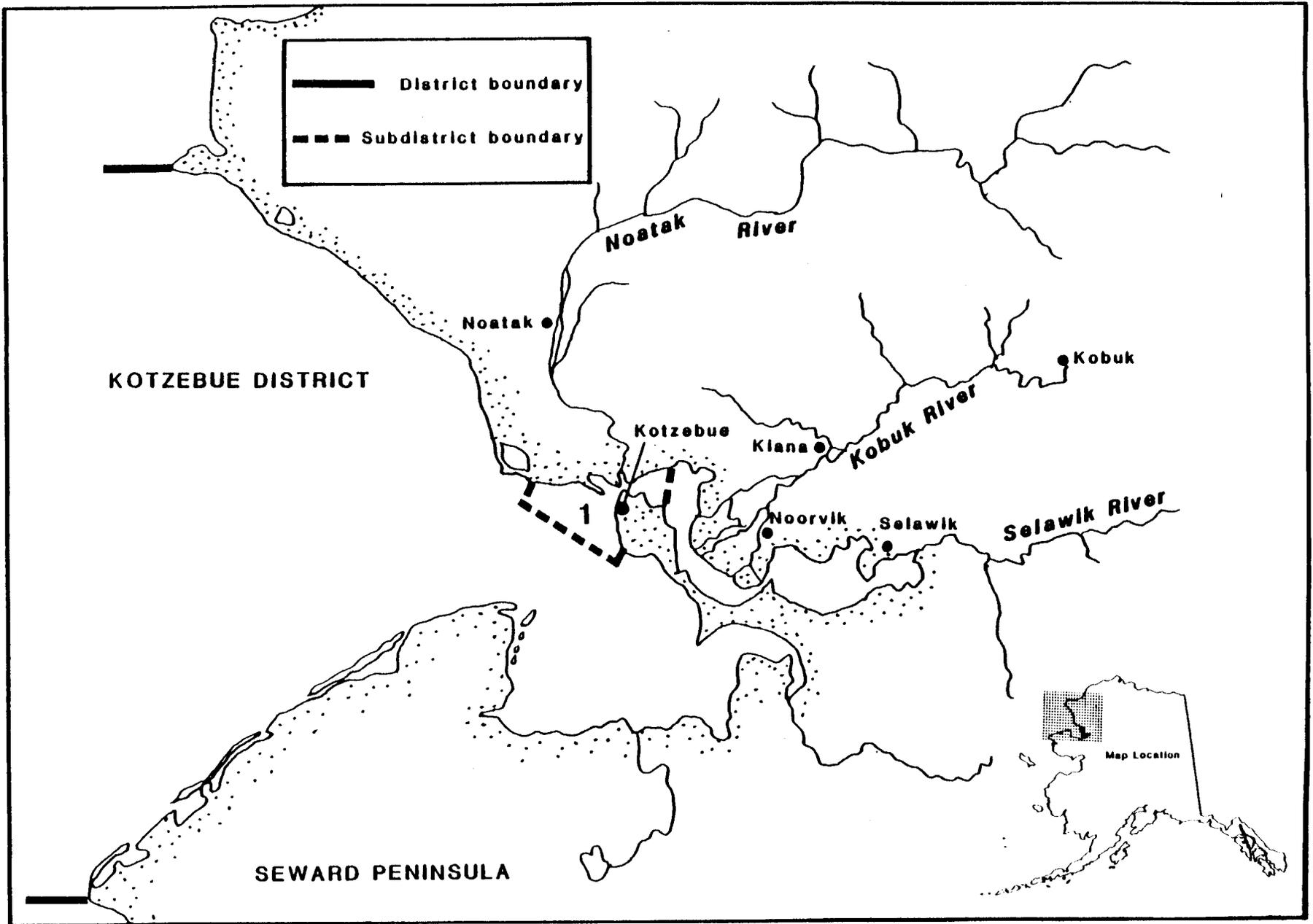


Figure 2. Kotzebue Sound Subdistrict 1.

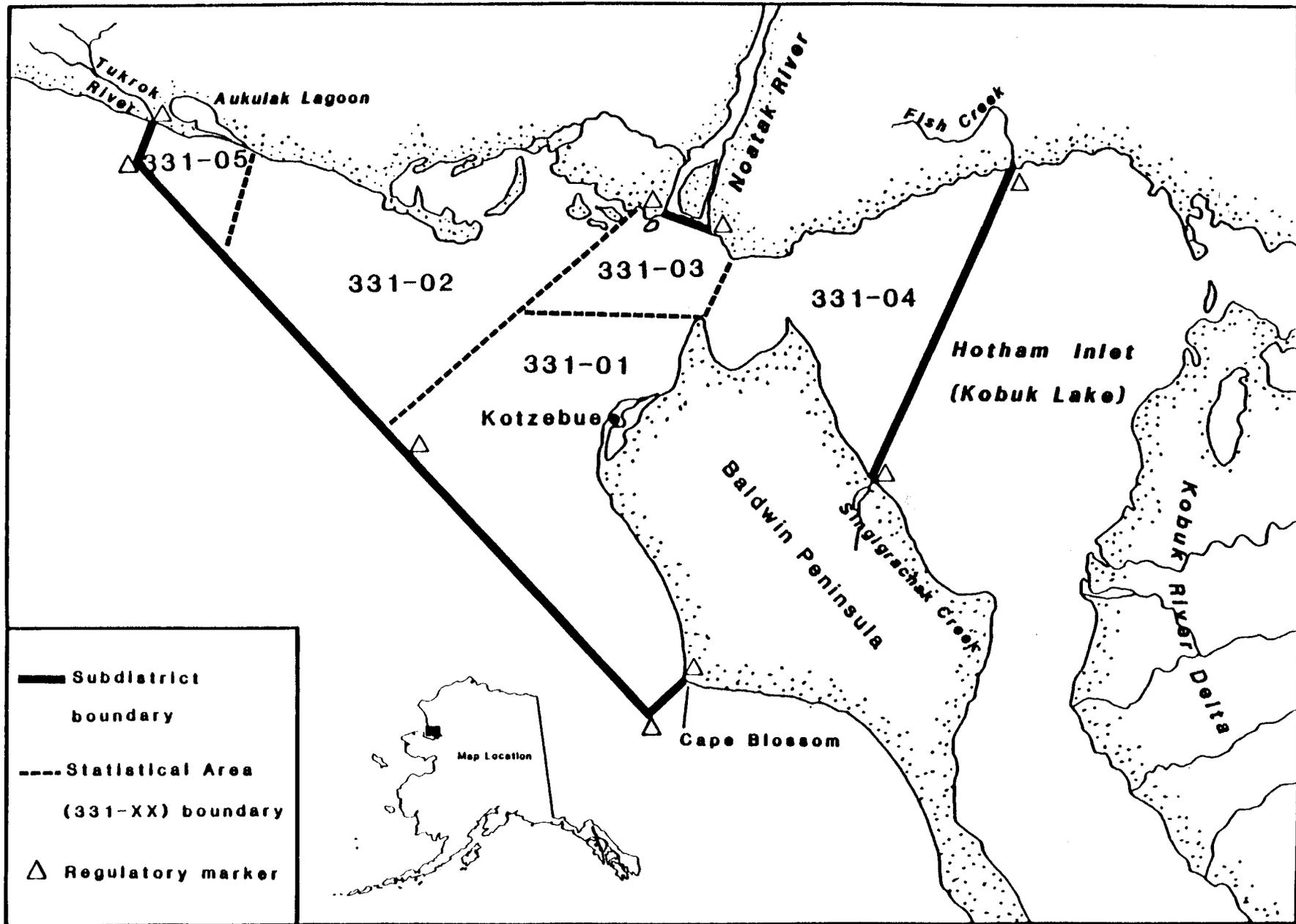


Figure 3. Kotzebue Sound commercial salmon fishing statistical areas.

APPENDICES

Appendix A.1. Age, sex and length (mm) of chinook salmon sample taken by set gill net from the Moses Point commercial harvest, 1986.

	Age Class			Total
	1.2	1.3	1.4	
Females				
Percent	0.0	21.4	42.9	64.3
Mean Length		662	793	
Std. Error ^a	6	32		
Sample Size	0	3	6	9
Males				
Percent	7.1	14.3	14.3	35.7
Mean Length	520	720	855	
Std. Error ^a	0	30	35	
Sample Size	1	2	2	5
Sexes Combined				
Percent	7.1	35.7	57.2	100.0
Std. Error ^b	7.1	13.3	13.7	
Mean Length	520	685	808	
Std. Error ^a	0	18	26	
Sample Size	1	5	8	14

^a Standard error of mean length.

^b Standard error of age class percent.

Appendix A.2. Catch, age, sex and length (mm) of chinook salmon taken by set gill net from the Unalakleet commercial fishery, 1986.

	Age Class						Total
	1.2	1.3	1.4	2.3	1.5	2.4	
Females							
Catch	0	153	1,254	9	845	9	2,270
Percent	0.0	3.4	27.9	0.2	18.8	0.2	50.5
Mean Length		801	867	790	903	860	
Std. Error ^a	13	4	0	4	0		
Sample Size	0	16	130	1	88	1	236
Males							
Catch	94	683	989	9	449	0	2,224
Percent	2.1	15.2	22.0	0.2	10.0	0.0	49.5
Mean Length	570	766	852	830	924		
Std. Error ^a	12	8	8	0	8		
Sample Size	10	71	103	1	47	0	232
Sexes Combined							
Catch	94	836	2,243	18	1,294	9	4,494
Percent	2.1	18.6	49.9	0.4	28.8	0.2	100.0
Std. Error ^b	0.7	1.8	2.3	0.3	2.1	0.2	
Mean Length	570	772	860	810	910	860	
Std. Error ^a	12	8	4	20	4	0	
Sample Size	10	87	233	2	135	1	468

^a Standard error of mean length.

^b Standard error of age class percent.

Appendix A.3. Age, sex and length (mm) of chinook salmon subsistence catch sample taken with beach seine from Kwiniuk River, 1986.

	Age Class			Total
	1.2	1.3	1.4	
Females				
Percent	13.3	20.0	20.0	53.3
Mean Length	552	723	857	
Std. Error ^a	8	96	24	
Sample Size	2	3	3	8
Males				
Percent	0.0	6.7	40.0	46.7
Mean Length		800	822	
Std. Error ^a		0	18	
Sample Size	0	1	6	7
Sexes Combined				
Percent	13.3	26.7	60.0	100.0
Std. Error ^b	9.1	11.8	13.1	
Mean Length	552	742	833	
Std. Error ^a	8	71	15	
Sample Size	2	4	9	15

^a Standard error of mean length.

^b Standard error of age class percent.

Appendix A.4. Age, sex and length (mm) of chinook salmon sample taken by 149 mm (5-7/8 in) mesh gill net from the Unalakleet test fishery, 1986.

	Age Class				Total
	1.2	1.3	1.4	1.5	
Females					
Percent	0.0	6.4	23.4	21.3	51.1
Mean Length		845	852	890	
Std. Error ^a		20	17	17	
Sample Size	0	3	11	10	24
Males					
Percent	2.1	31.9	8.5	6.4	48.9
Mean Length	560	692	846	960	
Std. Error ^a	0	24	43	12	
Sample Size	1	15	4	3	23
Sexes Combined					
Percent	2.1	38.3	31.9	27.7	100.0
Std. Error ^b	2.1	7.2	6.9	6.6	
Mean Length	560	718	850	906	
Std. Error ^a	0	25	16	16	
Sample Size	1	18	15	13	47

^a Standard error of mean length.

^b Standard error of age class percent.

Appendix A.5. Catch, age, sex and length (mm) of chum salmon taken by set gill net from the Golovin commercial fishery, 1986.

	Age Class			Total
	0.3	0.4	0.5	
Females				
Catch	11,156	14,503	767	26,426
Percent	16.0	20.8	1.1	37.9
Mean Length	568	578	563	
Std. Error ^a	2	3	6	
Sample Size	74	96	5	175
Males				
Catch	20,081	22,312	906	43,299
Percent	28.8	32.0	1.3	62.1
Mean Length	580	598	584	
Std. Error ^a	2	2	9	
Sample Size	133	148	6	287
Sexes Combined				
Catch	31,237	36,815	1,673	69,725
Percent	44.8	52.8	2.4	100.0
Std. Error ^b	2.3	2.3	0.7	
Mean Length	576	590	574	
Std. Error ^a	2	2	7	
Sample Size	207	244	11	462

^a Standard error of mean length.

^b Standard error of age class percent.

Appendix A.6. Catch, age, sex and length (mm) of chum salmon taken by set gill net from the Moses Point commercial fishery, 1986.

	Age Class				Total
	0.2	0.3	0.4	0.5	
Females					
Catch	0	4,630	5,105	83	9,818
Percent	0.0	22.4	24.7	0.4	47.5
Mean Length		560	568	550	
Std. Error ^a		4	3	0	
Sample Size	0	50	55	1	106
Males					
Catch	83	6,324	4,361	83	10,851
Percent	0.4	30.6	21.1	0.4	52.5
Mean Length	545	580	603	605	
Std. Error ^a	0	3	4	0	
Sample Size	1	68	47	1	117
Sexes Combined					
Catch	83	10,954	9,466	165	20,668
Percent	0.4	53.0	45.8	0.8	100.0
Std. Error ^b	0.4	3.3	3.3	0.6	
Mean Length	545	572	584	578	
Std. Error ^a	0	3	3	28	
Sample Size	1	118	102	2	223

^a Standard error of mean length.

^b Standard error of age class percent.

Appendix A.7. Catch, age, sex and length (mm) of chum salmon taken by set gill net from the Shaktoolik commercial fishery, 1986.

	Age Class				Total
	0.2	0.3	0.4	0.5	
Females					
Catch	113	2,451	2,806	355	5,725
Percent	0.7	15.2	17.4	2.2	35.5
Mean Length	570	581	602	587	
Std. Error ^a	0	4	4	13	
Sample Size	1	21	24	3	49
Males					
Catch	0	5,144	5,144	113	10,401
Percent	0.0	31.9	31.9	0.7	64.5
Mean Length		586	608	560	
Std. Error ^a		3	4	0	
Sample Size	0	44	44	1	89
Sexes Combined					
Catch	113	7,595	7,950	468	16,126
Percent	0.7	47.1	49.3	2.9	100.0
Std. Error ^b	0.7	4.3	4.3	1.4	
Mean Length	570	585	606	580	
Std. Error ^a	0	3	4	11	
Sample Size	1	65	68	4	138

^a Standard error of mean length.

^b Standard error of age class percent.

Appendix A.8. Catch, age and sex of chum salmon, by sample stratum, from the Unalakleet commercial fishery, 1986.

		Age Class				
		0.2	0.3	0.4	0.5	Total
Stratum Dates: 6/23-7/13		Commercial Periods 1-6				
Sample Dates: 7/05-7/11						
Sample Size: 503						
Female	Catch	0	2,165	2,656	92	4,913
	Percent	0.0	14.1	17.3	0.6	32.0
Male	Catch	61	5,528	4,545	307	10,441
	Percent	0.4	36.0	29.6	2.0	68.0
Total	Catch	61	7,693	7,201	399	15,354
	Percent	0.4	50.1	46.9	2.6	100.0
	Std. Error	0.3	2.2	2.2	0.7	
Stratum Dates: 7/14-7/20		Commercial Periods 7-8				
Sample Dates: 7/15-7/18						
Sample Size: 392						
Female	Catch	0	1,542	2,927	119	4,588
	Percent	0.0	16.8	31.9	1.3	50.0
Male	Catch	0	2,248	2,221	119	4,588
	Percent	0.0	24.5	24.2	1.3	50.0
Total	Catch	0	3,790	5,148	239	9,177
	Percent	0.0	41.3	56.1	2.6	100.0
	Std. Error	0.0	2.5	2.5	0.8	
Stratum Dates: 7/21-9/07		Commercial Periods 9-22				
Sample Dates: 7/22-8/01						
Sample Size: 457						
Female	Catch	11	1,661	1,804	86	3,562
	Percent	0.2	29.1	31.6	1.5	62.4
Male	Catch	11	999	1,073	63	2,146
	Percent	0.2	17.5	18.8	1.1	37.6
Total	Catch	23	2,660	2,877	148	5,708
	Percent	0.4	46.6	50.4	2.6	100.0
	Std. Error	0.3	2.3	2.3	0.7	
Stratum Dates: 6/23-9/07		SEASON TOTAL				
Sample Dates: 7/05-8/01						
Sample Size: 1,352						
Female	Catch	11	5,368	7,387	297	13,063
	Percent	0.0	17.8	24.4	1.0	43.2
Male	Catch	72	8,774	7,839	489	17,174
	Percent	0.2	29.0	25.9	1.6	56.8
Total	Catch	84	14,142	15,226	786	30,238
	Percent	0.3	46.8	50.4	2.6	100.0
	Std. Error	0.1	1.4	1.4	0.4	

Appendix A.9. Length (mm) by age and sex of chum salmon sample taken by set gill net from the Unalakleet commercial fishery, 1986.

	Age Class			
	0.2	0.3	0.4	0.5
Females				
Mean Length	520	572	587	592
Std. Error	0	2	1	8
Sample Size	1	270	356	15
Males				
Mean Length	538	586	610	615
Std. Error	13	1	2	10
Sample Size	3	357	330	20
Sexes Combined				
Mean Length	534	580	598	605
Std. Error	11	1	1	7
Sample Size	4	627	686	35

Appendix A.10. Age, sex and length (mm) of chum salmon subsistence catch sample taken with beach seine from Kwiniuk River, 1986.

	Age Class		Total
	0.3	0.4	
Females			
Percent	41.9	4.7	46.6
Mean Length	545	500	
Std. Error ^a	6	40	
Sample Size	18	2	20
Males			
Percent	44.1	9.3	53.4
Mean Length	562	608	
Std. Error ^a	9	11	
Sample Size	19	4	23
Sexes Combined			
Percent	86.0	14.0	100.0
Std. Error ^b	5.4	5.4	
Mean Length	554	572	
Std. Error ^a	5	26	
Sample Size	37	6	43

^a Standard error of mean length.

^b Standard error of age class percent.

Appendix A.11. Age and sex of chum salmon sample, by sample stratum, taken with 149 mm (5-7/8 in) mesh gill net from the Unalakleet test fishery, 1986.

		Age Class				
		0.2	0.3	0.4	0.5	Total
Stratum Dates: 6/17-7/22						
Sample Size: 378						
Female	Percent	0.0	9.8	16.9	0.5	27.2
	Sample Size	0	37	64	2	103
Male	Percent	0.0	35.4	36.0	1.3	72.7
	Sample Size	0	134	136	5	275
Total	Percent	0.0	45.2	52.9	1.9	100.0
	Std. Error	0.0	2.6	2.6	0.7	
	Sample Size	0	171	200	7	378
Stratum Dates: 7/23-8/20						
Sample Size: 382						
Female	Percent	0.5	20.7	24.6	1.0	46.8
	Sample Size	2	79	94	4	179
Male	Percent	0.5	27.3	23.8	1.6	53.2
	Sample Size	2	104	91	6	203
Total	Percent	1.0	47.9	48.4	2.6	100.0
	Std. Error	0.5	2.6	2.6	0.8	
	Sample Size	4	183	185	10	382
Stratum Dates: 7/08-8/20		SEASON TOTAL				
Sample Size: 760						
Female	Percent	0.3	15.3	20.8	0.8	37.1
	Sample Size	2	116	158	6	282
Male	Percent	0.3	31.3	29.9	1.4	62.9
	Sample Size	2	238	227	11	478
Total	Percent	0.5	46.6	50.7	2.2	100.0
	Std. Error	0.3	1.8	1.8	0.5	
	Sample Size	4	354	385	17	760

Appendix A.12. Length (mm) of chum salmon sample taken by 149 mm (5-7/8 in) mesh gill net from the Unalakleet test fishery, 1986.

	Age Class			
	0.2	0.3	0.4	0.5
Females				
Mean Length	575	572	594	590
Std. Error	20	4	2	6
Sample Size	2	116	158	6
Males				
Mean Length	525	590	612	618
Std. Error	5	2	2	10
Sample Size	2	238	227	11
Sexes Combined				
Mean Length	550	584	604	608
Std. Error	17	2	1	7
Sample Size	4	354	385	17

Appendix A.13. Catch, age, sex and length (mm) of coho salmon sample taken with set gill net from the Unalakleet commercial fishery, 1986.

	Age Class			Total
	1.1	2.1	3.1	
Females				
Catch	82	7,573	638	8,293
Percent	0.4	36.8	3.1	40.3
Mean Length	545	560	558	
Std. Error ^a	0	3	11	
Sample Size	1	82	7	90
Males				
Catch	0	11,628	638	12,266
Percent	0.0	56.5	3.1	59.6
Mean Length		556	569	
Std. Error ^a		3	14	
Sample Size	0	126	7	133
Sexes Combined				
Catch	82	19,201	1,297	20,580
Percent	0.4	93.3	6.3	100.0
Std. Error ^b	0.4	1.7	0.6	
Mean Length	545	558	563	
Std. Error ^a	0	2	9	
Sample Size	1	208	14	223

^a Standard error of mean length.

^b Standard error of age class percent.

Appendix A.14. Catch, age, sex and length (mm) of coho salmon sample taken by 149 mm (5-7/8 in) mesh gill net from the Unalakleet test fishery, 1986.

	Age Class			Total
	2.1	2.2	3.1	
Females				
Percent	40.6	2.3	2.3	45.2
Mean Length	576	553	573	
Std. Error ^a	4	9	12	
Sample Size	52	3	3	58
Males				
Percent	52.3	1.6	0.8	54.7
Mean Length	572	602	575	
Std. Error ^a	4	18	0	
Sample Size	67	2	1	70
Sexes Combined				
Percent	93.0	3.9	3.1	100.0
Std. Error ^b	2.3	1.7	1.5	
Mean Length	574	573	574	
Std. Error ^a	3	14	8	
Sample Size	119	5	4	128

^a Standard error of mean length.

^b Standard error of age class percent.

Appendix B.1. Thousands of chum salmon in the Kotzebue commercial fishery by age group, 1962-1986.

Year	Sample Size ^a	Age Class			Total ^b
		0.2	0.3	0.4	
1962	69	9.5	82.2	36.4	128.1
1963	255	16.4	27.7	10.1	54.2
1964	463	40.8	34.5	1.3	76.6
1965	480	0.9	36.4	2.7	40.0
1966	430	3.1	20.7	7.0	30.8
1967	1,865	2.6	21.3	5.4	29.3
1968	1,989	6.4	17.5	6.0	29.9
1969	1,125	21.8	34.6	2.9	59.3
1970	267	6.2	145.3	8.1	159.6
1971	1,105	11.0	104.3	40.8	156.1
1972	980	26.8	100.8	40.9	168.5
1973	598	62.7	260.9	51.8	375.4
1974	350	179.0	398.7	49.0	626.7
1975	340	14.1	489.5	60.3	563.9
1976	566	17.9	82.5	59.4	159.8
1977	446	13.1	143.0	36.4	192.5
1978	579	11.7	64.1	35.5	111.3
1979	658	43.3	75.3	21.5	140.1
1980	710	55.5	286.9	24.2	366.6
1981	1,167	16.3	454.4	207.2	677.9
1982	983	24.7	201.8	168.4	394.9
1983	1,979	10.2	101.6	60.1	171.9
1984	2,933	46.7	205.9	63.1	315.7
1985	3,293	2.3	436.6	80.6	521.4
1986	3,095	0.8	48.6	206.3	261.4
10-Year Average (1976-1985)		24.2	205.2	75.6	305.2

^a Sample size in numbers of fish.

^b Totals do not include age 0.5 fish which generally contribute less than 1% towards the commercial fishery.

Appendix B.2. Percent age and sex composition of chum salmon samples taken from the Kotzebue commercial fishery, 1962-1986.

Year	Sample Size ^a	Males	Females	Age Class			
				0.2	0.3	0.4	0.5
1962	69	26.1	73.9	7.3	63.3	28.0	1.4
1963	255	35.0	65.0	30.1	50.9	18.6	0.4
1964	463	43.6	56.4	53.3	45.1	1.7	0.0
1965	480	42.1	57.9	2.3	91.0	6.7	0.0
1966	430	40.2	59.8	10.1	67.1	22.8	0.0
1967	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	67.3	26.3	0.0
1972	980	50.9	49.1	15.8	59.4	24.1	0.6
1973	598	46.0	54.0	16.7	69.5	13.8	0.0
1974	350	47.1	52.9	28.5	63.5	7.8	0.2
1975	340	46.4	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
10-Year Average (1976-1985)		49.9	50.1	10.3	63.5	25.1	1.2

^a Sample size in numbers of fish.

Appendix B.3. Catch, age and sex, by sample stratum, of chum salmon from the Kotzebue commercial fishery, 1986.

		Age Class				
		0.2	0.3	0.4	0.5	Total
Stratum Dates: 7/10-7/15		Commercial Periods 1 and 2				
Sample Size: 449						
Female	Catch	0	378	5,313	28	5,719
	Percent	0.0	2.7	37.9	0.2	40.8
Male	Catch	0	869	7,331	98	8,298
	Percent	0.0	6.2	52.3	0.7	59.2
Total	Catch	0	1,248	12,644	126	14,018
	Percent	0.0	8.9	90.2	0.9	100.0
	Std. Error	0.0	1.3	1.4	0.4	
Stratum Dates: 7/17-7/22		Commercial Periods 3 and 4				
Sample Size: 444						
Female	Catch	0	976	20,921	849	22,746
	Percent	0.0	2.3	49.3	2.0	53.6
Male	Catch	0	2,292	16,721	679	19,692
	Percent	0.0	5.4	39.4	1.6	46.4
Total	Catch	0	3,268	37,642	1,528	42,438
	Percent	0.0	7.7	88.7	3.6	100.0
	Std. Error	0.0	1.3	1.5	0.9	
Stratum Dates: 7/24-7/29		Commercial Periods 5 and 6				
Sample Size: 444						
Female	Catch	0	3,663	25,930	523	30,116
	Percent	0.0	6.3	44.6	0.9	51.8
Male	Catch	0	3,140	23,837	1,047	28,024
	Percent	0.0	5.4	41.0	1.8	48.2
Total	Catch	0	6,802	49,768	1,570	58,140
	Percent	0.0	11.7	85.6	2.7	100.0
	Std. Error	0.0	1.5	1.7	0.8	
Stratum Dates: 7/31-8/06		Commercial Periods 7 and 8				
Sample Size: 440						
Female	Catch	0	7,615	34,229	160	42,004
	Percent	0.0	9.5	42.7	0.2	52.4
Male	Catch	401	9,860	27,335	561	38,157
	Percent	0.5	12.3	34.1	0.7	47.6
Total	Catch	401	17,475	61,564	721	80,161
	Percent	0.5	21.8	76.8	0.9	100.0
	Std. Error	0.3	2.0	2.0	0.5	

		Age Class				
		0.2	0.3	0.4	0.5	Total
Stratum Dates: 8/07-8/12		Commercial Periods 9 and 10				
Sample Size: 435						
Female	Catch	199	7,760	15,282	637	23,878
	Percent	0.5	19.5	38.4	1.6	60.0
Male	Catch	80	3,582	11,899	358	15,919
	Percent	0.2	9.0	29.9	0.9	40.0
Total	Catch	279	11,342	27,181	995	39,797
	Percent	0.7	28.5	68.3	2.5	100.0
	Std. Error	0.4	2.2	2.2	0.7	
Stratum Dates: 8/14-8/19		Commercial Periods 11 and 12				
Sample Size: 449						
Female	Catch	43	3,785	8,918	342	13,088
	Percent	0.2	17.7	41.7	1.6	61.2
Male	Catch	0	2,716	5,389	192	8,297
	Percent	0.0	12.7	25.2	0.9	38.8
Total	Catch	43	6,522	14,307	513	21,385
	Percent	0.2	30.5	66.9	2.4	100.0
	Std. Error	0.2	2.2	2.2	0.7	
Stratum Dates: 8/21-8/26		Commercial Periods 13 and 14				
Sample Size: 434						
Female	Catch	49	1,253	2,232	88	3,622
	Percent	0.9	22.8	40.6	1.6	65.9
Male	Catch	49	737	951	137	1,874
	Percent	0.9	13.4	17.3	2.5	34.1
Total	Catch	99	1,990	3,183	225	5,497
	Percent	1.8	36.2	57.9	4.1	100.0
	Std. Error	0.6	2.3	2.3	0.9	
Stratum Dates: 7/10-8/26		SEASON TOTAL				
Sample Size: 3,095						
Female	Catch	291	25,430	112,826	2,627	141,174
	Percent	0.1	9.7	43.2	1.0	54.0
Male	Catch	530	23,196	93,463	3,072	120,261
	Percent	0.2	8.9	35.7	1.2	46.0
Total	Catch	822	48,647	206,289	5,678	261,436
	Percent	0.3	18.6	78.9	2.2	100.0
	Std. Error	0.1	0.7	0.7	0.3	

Appendix B.4. Length (mm) by age and sex of chum salmon taken with set gill net from the Kotzebue commercial fishery, 1986.

	Age Class			
	0.2	0.3	0.4	0.5
Females				
Mean Length	542	577	599	600
Std. Error	8	1	1	4
Sample Size	7	354	1301	36
Males				
Mean Length	566	600	631	625
Std. Error	8	2	1	6
Sample Size	7	283	1058	40
Sexes Combined				
Mean Length	554	587	613	613
Std. Error	6	1	1	4
Sample Size	14	637	2359	76

Appendix B.5. Age, sex and length (mm) of chum salmon escapement sample from Squirrel River, 1986.^a

	Age Class				Total
	0.2	0.3	0.4	0.5	
Females					
Percent	0.0	9.8	47.2	0.0	57.0
Sample Size ^b	0	19	91	0	110
Mean Length		566	578		
Std. Error ^c		8	3		
Sample Size ^d	0	11	55	0	66
Males					
Percent	0.5	9.3	32.1	1.0	42.9
Sample Size ^b	1	18	62	2	83
Mean Length	520	591	618	630	
Std. Error ^c	0	6	5	0	
Sample Size	1	15	42	1	59
Sexes Combined					
Percent	0.5	19.5	79.0	1.0	100.0
Std. Error ^e	0.5	0.6	0.3	0.7	
Sample Size ^b	1	38	154	2	193
Mean Length	520	580	595	630	
Std. Error ^c	0	5	3	0	
Sample Size ^d	1	26	97	1	125

^a Sample taken by beach seine and carcass recovery.

^b Number of fish aged.

^c Standard error of mean length.

^d Number of fish measured for length.

^e Standard error of age class percent.

Appendix B.6. Age, sex and length (mm) of chum salmon carcass sample from Salmon River, 1986.

	Age Class			Total
	0.3	0.4	0.5	
Females				
Percent	4.7	51.2	0.9	56.8
Sample Size ^a	10	108	2	120
Mean Length	559	571	560	
Std. Error ^b	11	4	10	
Sample Size ^c	8	50	2	60
Males				
Percent	1.4	39.8	1.9	43.1
Sample Size ^a	3	84	4	91
Mean Length	605	617	612	
Std. Error ^b	0	6	6	
Sample Size ^c	1	32	3	36
Sexes Combined				
Percent	6.4	90.9	2.7	100.0
Std. Error ^d	1.6	1.9	1.1	
Sample Size ^a	14	200	6	220
Mean Length	564	589	591	
Std. Error ^b	11	4	13	
Sample Size ^c	9	82	5	96

^a Number of fish aged.

^b Standard error of mean length.

^c Number of fish measured for length.

^d Standard error of age class percent.

Appendix B.7. Age, sex and length (mm) of chum salmon escapement sample taken by beach seine from Noatak River, 1986.^a

	Age Class				Totals
	0.2	0.3	0.4	0.5	
Females					
Percent	0.2	10.8	40.0	0.9	51.9
Mean Length	518	574	600	611	
Std. Error ^b	0	4	2	21	
Sample Size	1	46	173	4	224
Males					
Percent	0.2	10.8	36.2	0.9	48.1
Mean Length	529	627	648	636	
Std. Error ^b	0	4	2	9	
Sample Size	1	47	157	4	209
Sexes Combined					
Percent	0.4	21.8	76.0	1.8	100.0
Std. Error ^c	0.3	2.0	2.0	0.6	
Mean Length	524	602	623	624	
Std. Error ^b	6	4	2	12	
Sample Size	2	93	330	8	433

^a Sample from hatchery egg-take. Therefore, fish were not sampled randomly.

^b Standard error of mean length.

^c Standard error of age percent.

Because the Alaska Department of Fish and Game receives federal funding, all of its public programs and activities are operated free from discrimination on the basis of race, religion, color, national origin, age, sex, or handicap. Any person who believes he or she has been discriminated against should write to:

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