

TECHNICAL FISHERY REPORT 95-10



Alaska Department of Fish and Game
Commercial Fisheries Management
and Development Division
P.O. Box 25526
Juneau, Alaska 99802-5526

December 1995

Kodiak Management Area Salmon Catch, Escapement, and Run Statistics, 1989

by

Charles O. Swanton

Patricia A. Nelson

The Alaska Department of Fish and Game conducts all programs and activities free from discrimination on the basis of sex, color, race, religion, national origin, age, marital status, pregnancy, parenthood, or disability. For information on alternative formats available for this and other department publications, please contact the department ADA Coordinator at (voice) 907-465-4120, (TDD) 1-800-478-3648, or (fax) 907-586-6595. Any person who believes he or she has been discriminated against by this agency should write to: ADF&G, P.O. Box 25526, Juneau, AK 99802-5526; or O.E.O., U.S. Department of the Interior, Washington, DC 20240.

KODIAK MANAGEMENT AREA SALMON CATCH,
ESCAPEMENT, AND RUN STATISTICS, 1989

By

Charles O. Swanton

and

Patricia A. Nelson

Technical Fishery Report Number 95-10

Alaska Department of Fish and Game
Commercial Fisheries Management
and Development Division
P.O. Box 25526
Juneau, Alaska 99802-5526

December 1995

AUTHORS

Charles O. Swanton is the Region IV Kodiak Area Salmon Research Biologist for the Alaska Department of Fish and Game, Commercial Fisheries Management and Development Division, 211 Mission Road, Kodiak, AK 99615-6399.

Patricia A. Nelson is a Region IV Salmon Research Biologist for the Alaska Department of Fish and Game, Commercial Fisheries Management and Development Division, 211 Mission Road, Kodiak, AK 99615-6399.

ACKNOWLEDGMENTS

Alaska Department of Fish and Game, Commercial Fisheries Management and Development Division Kodiak Area salmon management and research staff, both full time and seasonal, assisted in collecting the data presented in this report. Jim Blackburn provided assistance with database summaries; Bruce Barrett provided supervision and editorial advice; and Lucinda Neel contributed publication expertise.

TABLE OF CONTENTS

	<u>Page</u>
LIST OF TABLES	iv
LIST OF FIGURES	v
ABSTRACT	vii
INTRODUCTION	1
METHODS.....	2
Catch Estimation	2
Escapement Enumeration and Estimation.....	2
Age, Length, and Sex Sampling.....	3
RESULTS.....	3
Chinook Salmon.....	4
Sockeye Salmon	4
Coho Salmon.....	5
Pink Salmon.....	5
Chum Salmon.....	6
LITERATURE CITED	6
TABLES.....	9
FIGURES	22
APPENDIX	27

LIST OF TABLES

<u>Table</u>	<u>Page</u>
1. Statistical weeks and associated calendar dates, 1989.....	9
2. Estimates, by species, of the foregone salmon harvest due to the <i>M/V Exxon Valdez</i> oil spill within the Kodiak Management Area, 1989.....	9
3. Total salmon commercial catch numbers, weight and average weight, by district and gear type, Kodiak Management Area, 1989.....	10
4. Salmon escapements counted through weirs, by district and stream, Kodiak Management Area, 1989.....	11
5. Salmon escapement, catch, and total run numbers, by district and species, Kodiak Management Area, 1989.....	12
6. Sockeye salmon commercial catch, by age and district, Kodiak Management Area, 1989.....	14
7. Estimated age composition of selected sockeye salmon escapements, by district, Kodiak Management Area, 1989.....	15
8. Length composition of selected sockeye escapements sampled by district, system, and age, Kodiak Management Area, 1989.....	17
9. Estimated sex composition of selected sockeye escapements, by district and system, Kodiak Management Area, 1989.....	20
10. Age composition of selected coho escapements sampled by district, Kodiak Management Area, 1989.....	20
11. Estimated age composition of Kitoi Bay chum salmon brood stock samples, statistical weeks 26 through 29, 1989.....	21
12. Length composition of Kitoi Bay chum salmon brood stock samples, by age and sex, statistical weeks 26 through 29, 1989.....	21
13. Estimated sex composition of Kitoi Bay chum salmon brood stock samples, statistical weeks 26 through 29, 1989.....	21

LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
1. Map depicting Kodiak and adjacent salmon management areas	22
2. Map of the Kodiak Management Area fishing districts.....	23
3. Total salmon catch, by species, in number of fish, Kodiak Management Area, 1989.....	24
4. Cumulative sockeye salmon escapements counted by day through the Karluk, Ayakulik, Frazer, and Upper Station weirs, 1989	25
5. Estimated total escapement, by species, Kodiak Management Area, 1989.....	26

ABSTRACT

The 1989 Kodiak Management Area (KMA) commercial salmon fishery was severely restricted due to the M/V *Exxon Valdez* oil spill; most areas were closed throughout the entire (1 June–31 October) fishing season. The KMA commercial salmon catch was 8,136,292 fish, which was composed of 106 chinook *Oncorhynchus tshawytscha*, 1,289,527 sockeye *O. nerka*, 2,599 coho *O. kisutch*, 6,824,122 pink *O. gorbuscha*, and 19,938 chum *O. keta* salmon. A majority (>95%) of the sockeye catch occurred within the Alitak Bay District (1,280,000) and most of the pink catch occurred within the Afognak District (6,640,000). Estimated total escapements were 26,078 chinook, 3,169,480 sockeye, 257,465 coho, 21,084,539 pink, and 1,526,511 chum salmon. A majority of the pink escapement was into Mainland, Alitak Bay, and Northwest Kodiak District streams. The KMA sockeye run was about 4,400,000 fish; the predominate age classes in both the catch and escapement were age-2.2 (1984 brood year) and age-2.3 (1983 brood year) fish.

KEY WORDS: Kodiak, Pacific salmon, *Oncorhynchus*, catch, escapement, run, age

INTRODUCTION

The Kodiak Management Area (KMA) encompasses the entire Kodiak Archipelago and that portion of the Alaska Peninsula draining into Shelikof Strait from Cape Douglas to Kilokak Rocks bordering Imuya Bay. The archipelago and Alaska Peninsula portions of the management area are each about 241 km in length, while Shelikof Strait, which separates the two, averages 48 km in width (Figure 1).

The KMA is composed of 7 districts and 52 sections that include 440 known salmon streams (Figure 2). Management program emphasis is to achieve biological escapement goals while ensuring local stock surplus production is fully harvested in an orderly fashion. Five species of salmon are harvested within the KMA, all of which have established biological escapement goals. These goals are 11,000–19,000 chinook *Oncorhynchus tshawytscha*, 1,480,000–2,380,000 sockeye *O. nerka*, 2,300,000–7,000,000 pink *O. gorbuscha* (odd year), 90,000–290,000 coho *O. kisutch*, and 500,000–1,500,000 chum *O. keta* salmon (Brennan et al. 1992). Directed commercial fisheries occur on sockeye, pink, chum, and coho salmon; chinook salmon are not targeted. To open and close the fishery inseason, fishery managers employ qualitative analysis of run timing, catch per unit effort (CPUE), species composition of catch, regulatory management plans, and aerial survey and weir escapement counts.

Three gear types are permitted within the KMA: purse seine, beach seine, and set gillnet. The Mainland, Afognak, Eastside Kodiak, Northeast Kodiak, and Southwest Kodiak Districts are exclusively purse and beach seining areas (Figure 2). Within the Central Section of the Northwest Kodiak District all three gear types are legally permitted. The Alitak Bay District uses exclusively purse and beach seine gear in the Cape Alitak and Humpy-Deadman Sections and set gillnet gear in the Moser-Olga Section. By regulation, purse seine and beach seine gear are allowed within the Moser-Olga Section of the Alitak Bay District after 5 September.

The Alaska Board of Fisheries has approved salmon management plans for the Cape Igvak Section of the Mainland District, North Shelikof Strait, and the Alitak Bay District (ADF&G 1988). The Cape Igvak plan allows the harvest of Chignik-bound sockeye within the Cape Igvak Section and assumes about 80% of the sockeye harvested within this area originate from Chignik Management Area systems (ADF&G 1988). The North Shelikof Strait plan allows traditional fisheries to occur in the area and restricts directed harvests of Upper Cook Inlet-bound sockeye salmon. The Alitak Bay District plan was adopted to promote local stock management and maintain traditional allocations between gear groups.

Management of the Kodiak salmon resource requires knowledge of the biological characteristics (age, size, and sex composition) of the various runs subjected to commercial exploitation, and preseason run forecasts and escapement goal evaluations are founded upon accurate assignment of the catch and run (run reconstruction) to stock of origin. This report summarizes KMA catch, escapement, and run statistics by species and stock, where applicable. Previous reports have published similar data for the KMA (Holmes and Monkiewicz 1988; Holmes 1990, 1991; Swanton and Nelson 1994).

On 24 March 1989 the grounding of the M/V *Exxon Valdez* and subsequent oil spill caused unprecedented disruption to the KMA commercial salmon fishery. Petroleum contaminants in various forms polluted sea surface waters and beaches in and around the Kodiak Archipelago and Alaska

Peninsula areas (Barrett and Monkiewitz 1989). Owing to this catastrophic event, the commercial catch and escapement data presented herein are very limited and are therefore not necessarily comparable with other years. Estimates by species of what the catch may have been had a normal fishery occurred are reported in Barrett et al. (1990) and English et al. (1991).

METHODS

Catch Estimation

Kodiak area salmon catch numbers by species, date and statistical week, district, and section for the 1989 season were obtained from summary reports of individual harvest receipts (fish tickets) compiled by the Department of Fish and Game (ADF&G), Commercial Fisheries Management and Development Division. The fish ticket database was edited by Kodiak area salmon management biologists prior to generating summary reports. Sport fishing catch numbers were obtained from Mills (1990) and subsistence catch numbers from Brennan et al. (1992). Harvest data presented are by catch date; age, length, and sex ratio data are provided by a statistical week sample unit (0001 hours Sunday to 2400 hours the following Saturday; Table 1). Estimates by species of the foregone harvest caused by the oil spill were generated by Barrett et al. (1990) and English et al. (1991) and are reported in Table 2.

Escapement Enumeration and Estimation

Salmon escapements within the KMA during 1989 were counted through weirs on 17 systems. Operational dates for the four major systems (Karluk, Ayakulik, Frazer Lake-Dog Salmon, and Upper Station) occurred from late May through mid-September, except for the Ayakulik weir, which ceased operation in late August. Estimating sockeye escapements for non-weired systems was accomplished by multiplying peak aerial survey counts by 2.0 (Barrett et al. 1985).

No attempts were made to quantify coho escapements after weirs were removed other than by visual estimates of fish in terminal brackish water areas; therefore, coho escapements are referred to as minimal. For systems without weirs, peak aerial or foot survey counts were expanded by a factor of 2.4, derived using data presented in Minard (1986).

A large proportion of pink and chum escapements were enumerated via aerial and foot surveys for 316 streams. Pink and chum streams for which there was greater than one aerial or foot survey, coupled with stream life estimates of 15 d (Swanton et al. 1993; Barrett et al. 1990), were incorporated into an area-under-the spawner abundance curve (AUC) model (Johnson and Barrett 1988). This model allowed us to estimate pink and chum total escapements. For systems with only a single survey count, expansion factors of 1.90 for pink salmon and 1.27 for chum salmon (Barrett et al. 1990) were employed to estimate total escapement; estimates of pink escapements into streams not surveyed during 1989 were obtained from Barrett et al. 1990.

Age, Length, and Sex Sampling

A single scale per fish was collected from sockeye catch and escapements and from chum salmon brood stock at Kitoi Bay Hatchery. Two scales per fish were obtained from selected coho escapements. Focus of the catch and escapement scale-sampling program was primarily on sockeye salmon. Age-designation rules used were those reported by Narver (1963) and Swanton (1992). Reporting of age information employed European notation: number of freshwater annuli, decimal point, number of marine annuli. Total age was reported as freshwater and marine components plus one (for the period from egg deposition to scale formation; Koo 1962).

Scale sampling and preparation procedures were adaptations of those described by INPFC (1963) and Clutter and Whitesel (1956). Fish lengths (mid-eye to fork-of-tail), when measured, were recorded to the nearest millimeter. Sockeye mean length was estimated by age class, along with standard error of each estimate. Determination of sex was via examination of external morphological characteristics.

Catch samples were collected within districts where a fishery had occurred; escapement age, length, and sex (ALS) samples were obtained weekly at weir sites. At several systems (e.g., Uganik, Little River, Horse Marine) escapement sampling was performed with a targeted sample size of 600 scheduled at or near the peak of the escapement; a beach seine in terminal brackish water or lake spawning areas was used. Catch sample sizes were 600 fish per district per statistical week; escapement sample sizes were 240 fish per system per statistical week. Attempts were made to collect escapement samples to meet the required sample size within a two consecutive-day period. The catch sample size provided for simultaneously estimating at $\alpha=0.05$ that all age classes were within $\pm 4.0\%$ of the true proportions; escapement sample size allowed for simultaneously estimating at $\alpha=0.10$ that all age classes were within $\pm 6.5\%$ of the true proportions (Thompson 1987).

Escapement counts and catch numbers for selected areas and systems were stratified by age, sex, and day using linear interpolation between weekly sampling events. Length compositions were reported by age, sex, week, and escapement system sampled.

RESULTS

During 1989 the total salmon catch was 8,205,010 fish, of which 8,136,292 were caught by commercial, 37,230 by sport, and 31,488 by subsistence fishermen. Of this amount, pink salmon composed 83.8%, sockeye 15.8%, and other species $<1.0\%$. There were 121 limited entry permits fished (33 purse seine, 1 beach seine, and 87 set gillnet; Brennan et al. 1992) making a total of 3,356 landings (Table 3). Most of this catch occurred within the Afognak and Alitak Bay Districts.

An estimate of the foregone commercial salmon harvest caused by the MV *Exxon Valdez* oil spill totaled 14,900,000–20,000,000 fish (Barrett et al 1990; English et al. 1991), most of which ($>80.0\%$) were pink salmon.

Estimated total escapements by species were 26,078 chinook, 3,169,480 sockeye, 257,465 coho, 21,084,539 pink, and 1,526,511 chum salmon.

Chinook Salmon

A total of 316 chinook salmon were harvested in 1989, of which 106 were caught by commercial, 168 by sport, and 42 by subsistence fishermen. All commercial catches occurred within the Alitak Bay District; average fish weight was 19.2 lb (Table 3).

A total of 26,078 chinook salmon were counted as escapement through weirs (Table 4). Approximately 99% of the escapement occurred in the Ayakulik and Karluk Rivers.

The estimated total chinook run was 26,393 fish, of which 316 were harvested (Table 5).

Sockeye Salmon

During 1989, 1.3 million sockeye salmon were harvested 1,289,527 commercially, 25,305 by subsistence, and 5,438 fish by sport fishermen. Most of the commercial sockeye catch (about 99%) was from the Alitak Bay District (Table 5). All of the sockeye harvested within the Alitak Bay District were caught with set gillnet gear (Brennan et al. 1992). This limited catch was dominated by age-2.2 (28.4%; 1984 brood year) and age-2.3 fish (61.6%; 1983 brood year; Table 6). Average sockeye catch weight was 5.5 lbs (Table 3).

A total of 3.2 million sockeye salmon were counted as escapement through weirs (88%) and estimated via aerial and foot survey counts. Biological escapement goals for these systems were 1,600,000–1,900,000; desired escapement goals were attained for all weired systems (Brennan et al. 1992). More than 85% of the sockeye escapements occurred within the Southwest Kodiak, Alitak Bay, and Mainland Districts. The Ayakulik and Akalura systems, with escapement goals of 200,000–300,000 and 40,000–60,000 fish each, had escapements well above target levels (Barrett et al. 1993). Weir escapements presented as cumulative percent by day for selected systems are shown in Figure 4. Overall, scale and length samples were collected from 12,172 fish (Table 7). Most of the sockeye escapements were age-2.2 (34.9%; 1984 brood year), age-2.3 (31.3%; 1983 brood year), and age-1.2 (15.8%; 1985 brood year). Estimated age, length, and sex compositions of selected escapements are reported in Tables 8 and 9).

The 1989 KMA estimated sockeye run was 4,400,000 fish; most of which (>80%) occurred within the Alitak Bay and Southwest Kodiak Districts (Table 5). Sockeye run numbers by commercial fishing district were 2,000,000 Alitak, 1,800,000 Southwest Kodiak, 200,000 Mainland, 100,000 Afognak, 100,000 Northwest Kodiak, 85,124 Eastside Kodiak, and 23,529 Northeast Kodiak. Total run numbers stratified by early and late (i.e., through and post 15 July) are reported in Brennan et al. (1992).

Coho Salmon

The total actual coho harvest was 23,815, of which 2,599 (11%) were caught commercially, 16,996 (71%) by sport fishermen, and 4,220 (18%) by subsistence users (Table 5). Of the actual commercial harvest, 986 fish were caught in the Southwest Kodiak District and 1,613 in the Alitak Bay District. A majority of the sport and subsistence catches occurred within the Afognak, Southwest Kodiak, Eastside Kodiak, and Northeast Kodiak Districts.

The estimated minimum total coho escapement was 257,465, of which 106,047 were counted through weirs and 151,418 from aerial and foot survey counts (Table 5). Most of the escapement was into Northwest Kodiak (67,634), Southwest Kodiak (50,876), and Eastside Kodiak (46,890) District streams. Escapement counts derived via weir and aerial and foot surveys were not complete counts owing to weirs being dismantled and aerial and foot surveys discontinued prior to completion of the coho run. Age composition of coho escapement samples collected were 63.3% age 2.1, 24.2% age 1.1, and 11.8% age 3.1 (Table 10).

The estimated KMA total coho run for 1989 was 280,000 fish composed of a 23,815-fish harvest and a minimum 256,942-fish escapement (Table 5). Coho runs to the Northwest Kodiak, Southwest Kodiak, Eastside Kodiak, and Afognak Districts collectively accounted for about 78% of the total.

Pink Salmon

The commercial pink salmon catch was 6,824,119, all of which occurred within the Afognak and Alitak Bay Districts (Table 3). There were 6,641,889 pink salmon harvested at Kitoi Bay by hatchery operators. This cost recovery fishery took virtually all of the hatchery return, less brood stock needs due to an extremely limited commercial common property fishery resulting from the oil spill. The only commercial common property harvest (182,230 fish) was in the Moser-Olga Bay Section. Average weight of commercially caught pink salmon was 2.9 lb (Table 3). Sport and subsistence harvests represented <1.0% of the overall catch: 14,231 and 1,535 fish, respectively (Table 5).

Estimated total pink salmon escapement was 21,084,539, of which 1,200,000 were counted through weirs and 19,700,000 were estimated from aerial and foot survey counts (Appendix A.1). An estimated 1,131,784 escaped into systems not surveyed during 1989. Pink biological escapement goals overall were exceeded in many systems throughout the KMA (Swanton et al. 1993). The 1989 estimated escapement was 3.6 times greater than the next largest odd-year escapement, which occurred in 1981 (Brennan et al. 1992).

The 1989 pink run was 27,924,380 fish, including an estimated 6,600,000 hatchery fish produced at Kitoi Bay. The total run excludes 129,986 fish, which were estimated to have been used for Kitoi Bay Hatchery brood stock (Brennan et al. 1992). A majority (>70%) of the total run was to the Northwest Kodiak, Afognak, and Mainland Districts (Table 5).

Chum Salmon

The chum catch during 1989 was 20,721; sport fishermen caught 397 and subsistence users caught 386. All but 19 fish caught commercially were harvested within the Alitak Bay District. Average weight for commercially caught chum salmon was 8.9 lb (Table 3).

Predominate age classes of chum salmon captured for Kitoi Bay Hatchery brood stock were age 0.2 (33.7%) and 0.3 (47.8%; Table 11). Length and sex compositions of this catch are presented in Tables 12 and 13.

Estimated total area-wide chum escapement was 1,526,511, of which 5,602 were counted through weirs and 1,520,909 were estimated from aerial and foot surveys. Of the total number of chum salmon counted via weirs, 4,964 (84%) were enumerated through the Dog Salmon weir within the Alitak Bay District. Most of the estimated chum salmon escapement was in the Mainland (36%), Northwest Kodiak (33%), and Eastside Kodiak (23%) District streams (Table 5). Escapements into small streams were not estimated during 1989.

The 1988 total chum salmon run was 1,547,213, of which 1,526,511 were estimated as escapement.

LITERATURE CITED

- ADF&G (Alaska Department of Fish and Game). 1988. 1988–1989 Bristol Bay and Westward Alaska commercial fishing regulations, salmon and miscellaneous finfish. Alaska Department of Fish and Game, Division of Commercial Fisheries, Juneau.
- Barrett, B. M., F. M. Thompson, and S. N. Wick. 1985. Adult anadromous fish investigations: May–October 1984. Alaska Department of Fish and Game, Susitna Hydro Aquatic Studies, Report 6. Prepared for the Alaska Power Authority, Anchorage.
- Barrett, B. M., and B. E. Monkiewicz. 1989. A survey of the Kodiak Management Area salmon grounds for oil spill contaminants, 16 April to 17 September 1989. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 4K89-25, Kodiak.
- Barrett, B. M., C. O. Swanton, and P. A. Roche. 1990. An estimate of the 1989 Kodiak Management Area salmon catch, escapement and run numbers had there been a normal fishery without the *Exxon Valdez* oil spill. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 4K90-35, Kodiak.
- Barrett, B. M., P. A. Roche, and C. O. Swanton. 1993. Sockeye salmon *Oncorhynchus nerka* smolt investigations at Red, Akalura, and Upper Station Lakes conducted in response to the 1989 M/V

LITERATURE CITED (Continued)

- Exxon Valdez* oil spill, 1990–1992. Alaska Department of Fish and Game Division of Commercial Fisheries, Regional Information Report 4K93-01, Kodiak.
- Brennan, K., L. Malloy, D. Prokopowich, and D. Gretsche. 1992. Kodiak Management Area annual finfish management report, 1989. Alaska Department of Fish and Game, Commercial Fisheries Management and Development Division, Regional Information Report 4K92-30, Kodiak.
- Clutter, R., and L. Whitesel. 1956. Collection and interpretation of sockeye salmon scales. International Pacific Salmon Fisheries Commission Bulletin 9, Vancouver, British Columbia.
- English, K. K., W. J. Gazey, and D. W. Chapman. 1991. Assessment of the 1989 Kodiak Management Area salmon catch had there been a normal fishery without the *Exxon Valdez* oil spill. Technical report prepared for the Trans-Alaska Pipeline Liability Fund.
- Holmes, P. B., and B. E. Monkiewicz. 1988. Catch and escapement statistics for Kodiak Management Area sockeye and coho salmon, 1985. Alaska Department of Fish and Game, Division of Commercial Fisheries, Technical Fishery Report 88-09, Juneau.
- Holmes, P. B. 1990. Kodiak Management Area salmon catch and escapement statistics, 1986. Alaska Department of Fish and Game, Division of Commercial Fisheries, Technical Fishery Report 90-04, Juneau.
- Holmes, P. B. 1991. Kodiak Management Area salmon catch and escapement statistics, 1987. Alaska Department of Fish and Game, Division of Commercial Fisheries, Technical Fishery Report 91-14, Juneau.
- INPFC (International North Pacific Fisheries Commission). 1963. Annual Report 1961. Vancouver, British Columbia.
- Johnson, B. A., and B. M. Barrett. 1988. Estimation of salmon escapement based on stream survey data: a geometric approach. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 4K88-35, Kodiak.
- Koo, T. S. Y. 1962. Age designation in salmon. Pages 37–48 in T. S. Y. Koo, editor. Studies of Alaska red salmon. University of Washington Publications in Fisheries, New Series, Volume I, Seattle.
- Mills, M. J. 1990. Alaska statewide sport fisheries harvest report, 1989. Alaska Department of Fish and Game, Division of Sport Fisheries, Fishery Data Series 90-44, Juneau.

LITERATURE CITED (Continued)

- Minard, R. E. 1986. Calibration of aerial surveys and determination of stream life for coho salmon (*O. kisutch*) spawning in the Gechiak River. Presented at the Bristol Bay Coho Salmon Workshop, February, 4, 1986. Alaska Department of Fish and Game, Division of Commercial Fisheries, Dillingham.
- Narver, D. W. 1963. Identification of adult red salmon groups by lacustrine scale measurement, time of entry, and spawning characteristics. Master's thesis, University of Washington, Seattle.
- Swanton, C. O. 1992. Stock interrelationships of sockeye salmon runs, Alitak Bay District, Kodiak Island, Alaska. Masters thesis, University of Washington, Seattle.
- Swanton, C. O., T. J. Dalton, B. M. Barrett, D. Pengilly, K. R. Brennan, and P. A. Nelson. 1993. Effects of pink salmon (*Oncorhynchus gorbuscha*) escapement level on egg retention, preemergent fry, and adult returns to the Kodiak and Chignik Management Areas caused by the *Exxon Valdez* oil spill. State/Federal Natural Resource Damage Assessment: Final Report Fish/Shellfish Studies 7b and 8b, Alaska Department of Fish and Game, Juneau.
- Swanton, C. O., and P. A. Nelson. 1993. Kodiak Management Area salmon catch, escapement, and run statistics, 1988. Alaska Department of Fish and Game, Commercial Fisheries Management and Development Division, Technical Fishery Report 94-22, Juneau.
- Thompson, S. K. 1987. Sample size for estimating multinomial proportions. *The American Statistician* 41(1):42-46.

Table 1. Statistical weeks and associated calendar dates, 1989.

Statistical Week	Calendar Date	Statistical Week	Calendar Date
1	01 January to 07 January	28	09 July to 15 July
2	08 January to 14 January	29	16 July to 22 July
3	15 January to 21 January	30	23 July to 29 July
4	22 January to 28 January	31	30 July to 05 August
5	29 January to 04 February	32	06 August to 12 August
6	05 February to 11 February	33	13 August to 19 August
7	12 February to 18 February	34	20 August to 26 August
8	19 February to 25 February	35	27 August to 02 September
9	26 February to 04 March	36	03 September to 09 September
10	05 March to 11 March	37	10 September to 16 September
11	12 March to 18 March	38	17 September to 23 September
12	19 March to 25 March	39	24 September to 30 September
13	26 March to 01 April	40	01 October to 07 October
14	02 April to 08 April	41	08 October to 14 October
15	09 April to 15 April	42	15 October to 21 October
16	16 April to 22 April	43	22 October to 28 October
17	23 April to 29 April	44	29 October to 04 November
18	30 April to 06 May	45	05 November to 11 November
19	07 May to 13 May	46	12 November to 18 November
20	14 May to 20 May	47	19 November to 25 November
21	21 May to 27 May	48	26 November to 02 December
22	28 May to 03 June	49	03 December to 09 December
23	04 June to 10 June	50	10 December to 16 December
24	11 June to 17 June	51	17 December to 23 December
25	18 June to 24 June	52	24 December to 30 December
26	25 June to 01 July	53	31 December
27	02 June to 08 July		

Table 2. Estimates, by species, of the foregone salmon harvest due to the M/V *Exxon Valdez* oil spill within the Kodiak Management Area, 1989.

Source ^a	Estimated Catch by Species					
	Chinook	Sockeye	Coho	Pink	Chum	Total
Barrett et al. (1990)	4,850	2,529,018	141,433	16,597,269	765,680	20,038,250
English et al. (1991)	4,394	1,460,044	205,501	12,259,665	1,007,928	14,937,532

^a Estimates of the foregone sockeye harvest by Barrett et al. (1990) do not include fish bound for Upper Cook Inlet.

Table 3. Total salmon commercial catch numbers, weight and average weight, by district and gear type, Kodiak Management Area, 1989.

District (gear) Section	Permits	Landings	Commercial Catch Numbers														
			Chinook			Sockeye			Coho			Pink ^a			Chum		
			No.	Lbs.	Avg. Wt.	No.	Lbs.	Avg. Wt.	No.	Lbs.	Avg. Wt.	No.	Lbs.	Avg. Wt.	No.	Lbs.	Avg. Wt.
<i>Afognak (Purse Seine)</i>																	
Kitoi Bay	1	275	0	0	0.0	0	0	0.0	0	0	0.0	6,641,889 ^a	19,710,000	2.9	0	0	0.0
Subtotal	1	275	0	0	0.0	0	0	0.0	0	0	0.0	6,641,889	19,710,000	2.9	0	0	0.0
District Total	1	275	0	0	0.0	0	0	0.0	0	0	0.0	6,641,889	19,710,000	2.9	0	0	0.0
<i>Southwest Kodiak (Purse Seine)</i>																	
Subtotal	4	7	0	0	0.0	3,480	17,359	5.0	986	10,288	10.4	3	10	3.3	19	143	7.5
<i>Southwest Kodiak (Beach Seine)</i>																	
Subtotal	0	0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0
District Total	4	7	0	0	0.0	3,480	17,359	5.0	986	10,288	10.4	3	10	3.3			
<i>Alitak Bay (Purse Seine)</i>																	
Cape Alitak	1	1	0	0	0.0	107	590	5.5	0	0	0.0	0	0	0.0	3	31	10.3
Subtotal	1	1	0	0	0.0	107	590	5.5	0	0	0.0	0	0	0.0	3	31	10.3
<i>Alitak Bay (Beach Seine)</i>																	
Subtotal	0	0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	3	31	10.3
<i>Alitak Bay (Set Gillnet)</i>																	
Moser-Olga	113	1,544	103	2,002	19.4	814,754	4,447,000	5.4	436	3,521	8.1	157,231	553,406	3.5	19,053	166,955	8.8
Inner/Outer Upper Station	79	1,528	3	35	11.7	471,186	2,661,672	5.6	1,177	10,618	9.0	24,999	97,707	3.9	863	7,255	8.4
Subtotal		3,072	106	2,037	19.2	1,285,940	7,108,672	5.5	1,613	14,139	8.8	182,230	651,113	3.6	19,916	174,210	8.7
District Total	193	3,073	106	2,037	19.2	1,286,047	7,109,262	5.5	1,613	14,139	8.8	182,230 ^a	651,113	3.6	19,919	174,241	8.7
Kodiak Management Area Total		3,356	106	2,037	19.2	1,289,527	7,126,621	5.5	2,399	24,427	9.4	6,824,119	20,361,123	2.9	19,935	174,384	8.7

^a The catch at Kitoi Bay was hatchery cost recovery; the commercial common property harvest was 182,230 fish.

Table 4. Salmon escapements counted through weirs, by district and stream, Kodiak Management Area, 1989.

District Stream	Species					Total
	Chinook	Sockeye	Coho	Pink	Chum	
<i>Afognak</i>						
Afognak	0	88,825	16,347	49,088 ^b	9	154,269
Pauls Bay	0	12,605	7,984	4,254	0	24,843
Perenosa	0	9	5,928	95,700	4	101,641
Thorsheim	0	8,206	0	15	32	8,253
Carry-Bear	0	7	441	37	0	485
Big Bay	0	0	1,799	62	0	1,861
East Arm Creek	0	48	433	20,056	522	21,059
Whitey's Hole	0	1	42	11	0	54
Little Waterfall	0	0	0	106,347	0	106,347
Corts Creek	0	42	28	6,469	19	6,558
Subtotal	0	109,743	33,002	282,039	586	425,370
<i>Southwest Kodiak</i>						
Karluk (Total) ^a	10,484	1,108,646	25,370	109,880	129	1,254,509
Early Run		349,753				
Late Run		758,893				
Ayakulik	15,432	768,101	12,822	45,655	100	842,110
Subtotal	25,916	1,876,747	38,192	155,535	229	2,096,619
<i>Alitak Bay</i>						
Dog Salmon	156	362,007	6,750	315,559	4,690	689,162
Frazer Lake	85	360,373	0	516	0	360,974
Upper Station (Total) ^a	4	286,288	7,229	754	1	294,276
Early Run		62,770				
Late Run		223,518				
Akalura	0	116,029	4,182	49,608	3	169,822
Subtotal ^b	160	764,324	18,161	365,921	4,694	1,153,260
<i>Eastside Kodiak</i>						
Saltery	1	30,237	6,738	214,541	14	251,531
<i>Northeast Kodiak</i>						
Buskin ^c	1	17,853	9,954	272,785	79	300,672
Area Total	26,078	2,798,904	106,047	1,290,821	5,602	4,227,452

^a Karluk and Upper Station sockeye runs are managed for obtaining escapement goals for early and late runs. The Karluk early run is designated through 7/21 at the weir and for Upper Station through 7/15.

^b Two weirs exist on the Frazer system (Dog Salmon and Frazer fish pass). The sockeye subtotal excludes the Frazer fish pass counts.

^c Pink salmon total weir count was expanded owing to historical spawner distribution below the existing weir site (Barrett et al. 1990).

Table 5. Salmon escapement, catch, and total run numbers, by district and species, Kodiak Management Area, 1989.

Fishing District	Salmon Species	Escapement			Catch			Total Run
		Surveyed ^a	Weir	Total	Commercial	Sport ^b	Subsistence ^c	
Afognak								
	Chinook		0	0	0	12	17	29
	Sockeye	4,217	109,743	118,117	0	871	4,441	123,429
	Coho	4,675	33,002	44,222	0	2,562	683	47,467
	Pink	738,650	282,039	1,631,480	6,641,889	1,405	102	8,274,876
	Chum	524	586	1,108	0	28	29	1,165
	Subtotal	748,066	425,361	1,794,927	6,641,889	4,878	5,272	8,446,966
Northwest Kodiak								
	Chinook				0	0	9	9
	Sockeye	52,700		105,400	0	0	2,139	107,539
	Coho	28,181		67,634	0	0	508	68,142
	Pink	2,420,630		3,803,478	0	0	515	3,803,993
	Chum	414,100		498,355	0	0	173	498,528
	Subtotal	2,915,611		4,474,867	0	0	3,344	4,478,211
Southwest Kodiak								
	Chinook		25,916	25,916	0	102	6	26,024
	Sockeye		1,876,747	1,876,747	3,480	799	13,713 ^d	1,894,739
	Coho	4,585	38,192	50,876	986	906	733	53,501
	Pink	5,750	155,535	165,879	3	35	47	165,964
	Chum	7,150	229	9,802	19	9	20	9,850
	Subtotal	17,485	2,096,619	2,129,220	4,488	1,851	14,519	2,150,078
Alitak Bay								
	Chinook		160	160	106	0	0	266
	Sockeye	7,035	764,324	778,394	1,286,047	0	874	2,065,315
	Coho	3,600	18,161	26,801	1,613	0	106	28,520
	Pink	1,618,450	365,921	4,063,500	182,230	0	46	4,245,776
	Chum	36,905	4,694	72,126	19,919	0	0	92,045
	Subtotal	1,665,990	1,153,260	4,940,981	1,489,915	0	1,026	6,431,922
Eastside Kodiak								
	Chinook		1	1	0	18	0	19
	Sockeye	26,360	30,237	82,957	0	1,634	533	85,124
	Coho	16,730	6,738	46,890	0	3,078	223	50,191
	Pink	1,369,077	214,541	3,076,233	0	901	273	3,077,407
	Chum	239,570	14	347,253	0	0	18	347,271
	Subtotal	1,651,737	251,531	3,553,334	0	5,631	1,047	3,560,012
Northeast Kodiak								
	Chinook		1	1	0	36	6	43
	Sockeye	6	17,853	17,865	0	2,134	3,530	23,529
	Coho	4,510	9,954	20,778	0	10,450	1,962	33,190
	Pink	774,000	272,785	1,955,901	0	11,890	492	1,968,283
	Chum	17,600	79	40,430	0	360	146	40,936
	Subtotal	796,116	300,672	2,034,975	0	24,870	6,136	2,065,981

- continued -

Table 5. (Page 2 of 2).

Fishing District	Salmon Species	Escapement			Catch			Total Run
		Surveyed ^a	Weir	Total	Commercial	Sport ^b	Subsistence ^c	
Mainland								
	Chinook				0	0	4	4
	Sockeye	95,000		190,000	0	0	75	190,075
	Coho	110		264	0	0	5	269
	Pink	3,335,870		5,256,284	0	0	60	5,256,344
	Chum	380,300		557,437	0	0	0	557,437
	Subtotal	3,811,280		6,003,985	0	0	144	6,004,129
Total								
	Chinook	0	26,078	26,078	106	168	42	26,393
	Sockeye	185,318	2,798,904	3,169,480	1,289,527	5,438	25,305	4,476,421
	Coho	62,391	106,047	257,465	2,599	16,996	4,220	280,757
	Pink	10,262,427	1,290,821	19,952,755	6,824,122 ^c	14,231	1,535	26,792,596
	Chum	1,096,149	5,602	1,526,511	19,938	397	386	1,547,213
	All Species Combined	11,606,285	4,227,452	24,932,289	8,136,292	37,230	31,488	33,137,300

^a Survey-derived estimates are aerial and foot survey counts, AUC model, and 15-day stream life value, or expansion factors cited within text.

^b Sport fisheries catch data from Mills (1990).

^c Subsistence catch data from Brennan et al. (1992).

^d A special subsistence fishery was permitted in Karluk Lagoon on 7 and 8 September 1989; numbers of fish caught by species are reported in Brennan et al. (1992).

^e Of the 6,824,122 pink salmon commercially harvested, 6,641,889 were taken for hatchery cost recovery and the balance in the commercial common property fisheries.

Table 6. Sockeye salmon commercial catch, by age and district, Kodiak Management Area, 1989.

District Section	Sample Size	Ages ^a											Total
		0.2	0.3	1.2	2.1	1.3	2.2	1.4	2.3	3.2	3.3	Other ^b	
Alitak Bay													
Moser-Olga ^c	1,114	Numbers											
		Percent		1.5	1.6		6.6	28.4	0.2	61.6	0.1	0.1	100.0
Dog Salmon Flats ^c	214	Numbers											
		Percent		3.0	0.4		4.2	23.8		68.7			100.0
Area Total	1,328	Numbers											
		Percent		1.7	1.4		6.2	27.7	0.1	62.7	0.1	0.1	100.0

^a Age-composition data presented are only for district sections where scale samples were collected during 1989.

^b Other denotes age-1.1, -2.4, and -3.1 fish.

^c Catch numbers were not stratified by age class for these areas owing to the few scale samples collected relative to the commercial harvest.

Table 7. Estimated age composition of selected sockeye salmon escapements, by district, Kodiak Management Area, 1989.

District Stream	Sample Size	Ages ^a														Total	
		0.1	0.2	1.1	0.3	1.2	2.1	1.3	2.2	3.1	1.4	2.3	3.2	2.4	3.3		
Afognak																	
Afognak	1,069	Percent			16.4		11.0	3.2	42.5	22.8		4.0			0.0	100.0	
		Numbers			14,595		9,765	2,859	37,746	20,290		3,528			44	88,825	
District Total	1,069	Percent			16.4		11.0	3.2	42.5	22.8		4.0			0.0	100.0	
		Numbers			14,595		9,765	2,859	37,746	20,290		3,528			44	88,825	
Northwest Kodiak																	
Little River ^c	304	Percent			0.3		0.7	0.3	0.3	53.6		40.8	2.0		2.0	100.0	
		Numbers			97		193	97	97	15,764		11,992	580		580	29,400	
Uganik Lake ^c	309	Percent			0.6	0.6	24.3		41.7	5.2		26.5	0.6		0.3	100.0	
		Numbers			492	492	18,447		31,728	3,935		20,168	492		246	76,000	
District Total	418	Percent			0.5	0.4	17.7	0.1	30.2	18.8		30.5	1.0		0.8	100.0	
		Numbers			589	492	18,640	97	31,825	19,699		32,160	1,072		826	105,400	
Southwest Kodiak																	
Karluk																	
Early	1,394	Percent			0.0		0.0	1.2	0.8	1.7	27.9	0.2		52.6	9.7	5.9	100.0
		Numbers			24		24	4,258	2,842	5,830	97,537	738		183,829	33,945	20,728	349,753
Late	1,209	Percent	0.0	0.1		0.2	4.2	0.0	3.9	56.1		0.0	28.5	4.9		2.0	100.0
		Numbers	30	1,090		1,279	31,696	170	29,763	425,904		31	216,522	37,412		14,993	758,893
Ayakulik	2,176	Percent			0.0	0.6	0.5	47.6	2.5	9.4	25.7		0.1	13.6			100.0
		Numbers			91	4,409	3,912	365,699	18,946	72,310	197,087		1,064	104,582			768,101
District Total	4,838	Percent	0.0	0.1	0.2	0.3	21.4	1.2	5.7	38.4	0.1	0.1	26.9	3.8		1.9	100.0
		Numbers	30	1,205	4,409	5,215	401,653	21,958	107,903	720,528	738	1,095	504,933	71,357		35,721	1,876,745
Alitak Bay																	
Frazer	1,335	Percent			0.1	2.6		1.6	0.2	1.0	25.4			69.3			100.0
		Numbers			247	9,359		5,611	601	3,478	91,432			249,645			360,373
Upper Station																	
Early	1,509	Percent	0.0	3.7	2.0	2.1	17.1	1.7	37.4				35.9				100.0
		Numbers	10	2,388	1,296	1,350	11,057	1,106	24,194				23,214				64,712
Late	1,493	Percent		11.4	0.3	42.7	4.8	1.7	2.9	32.3			4.0				100.0
		Numbers		25,288	730	94,594	10,530	3,683	6,446	71,543			8,763				221,576

- continued -

Table 7. (Page 2 of 2).

District Stream	Sample Size	Ages ^a											Total			
		0.1	0.2	1.1	0.3	1.2	2.1	1.3	2.2	3.1	1.4	2.3		3.2	2.4	3.3
Alitak Bay (continued)																
Akalura	441	Percent Numbers				0.2 263	1.4 1,579	0.5 526	4.8 5,525	44.4 51,568		47.8 55,515	0.9 1,052			100.0 116,029
Horse Marine ^c	39	Percent Numbers							17.9		2.6	79.5				100.0
District Total	4,817	Percent Numbers		3.4 25,545	1.6 12,477	12.6 96,153	2.5 19,070	2.1 15,867	2.2 16,555	31.3 238,737		44.2 337,137	0.1 1,052			100.0 762,593
Eastside Kodiak																
Saltery	479	Percent Numbers			0.2 63		10.9 3,283		26.5 8,017	11.5 3,472		50.3 15,213	0.6 189			100.0 30,237
District Total	479	Percent Numbers			0.2 63		10.9 3,283		26.5 8,017	11.5 3,472		50.3 15,213	0.6 189			100.0 30,237
Northeast Kodiak																
Buskin	415	Percent Numbers				0.3 61	12.9 2,300	0.3 61	10.5 1,876	19.0 3,389		55.6 9,925	0.3 61		1.0 182	100.0 17,583
District Total	415	Percent Numbers				0.3 61	12.9 2,300	0.3 61	10.5 1,876	19.0 3,389		55.6 9,925	0.3 61		1.0 182	100.0 17,583
Grand Total	12,172	Percent Numbers	0.1 30	0.9 26,750	1.1 32,070	3.5 101,860	15.8 454,711	1.4 40,842	7.0 203,982	34.9 1,006,115	0.1 738	0.1 1,095	31.3 902,896	2.5 73,731	1.3 36,773	100.0 2,881,383

^a Age composition was derived from a terminal area commercial catch sample and assumed to represent the escapement.

^b Early and late runs were stratified as through and post 15 July.

^c Uganik Lake escapement numbers were estimated using aerial survey counts.

Table 8. Length composition of selected sockeye escapements sampled by district, system, and age, Kodiak Management Area, 1989.

District Section	Ages												Total ^a
	0.2	1.1	0.3	1.2	2.1	1.3	2.2	3.1	2.3	3.2	3.3	2.4	
<i>Afognak</i>													
<i>Afognak Lake</i>													
Mean		324		474	342	541	481		536		510		467
SE		2		5	3	2	2		4				3
Range		300-385		307-586	297-391	350-618	358-581		467-600		510-510		300-618
N		227		111	38	401	227		54		1		1,059
<i>Northwest Kodiak</i>													
<i>Uganik</i>													
Mean		305	580	458		582	478		583	490	550		544
SE		0	45	3		3	8		3	25			4
Range		305-305	535-625	365-530		520-655	395-520		525-665	465-515	550-550		305-665
N		2	2	75		129	16		82	2	1		309
<i>Little River</i>													
Mean		345		468	340	515	476		533	467	528		499
SE				8			2		2	8	6		2
Range		345-345		460-475	340-340	515-515	385-510		510-580	440-485	510-58	0	340-580
N		1		2	1	1	162		123	6	6		302
<i>Southwest Kodiak</i>													
<i>Karluk (early run)</i>													
Mean	543		607	479	356	533	510		561	508	561		531
SE				9	6	5	1		1	3	4		1
Range	543-543		607-607	427-536	307-421	493-570	400-598		448-645	425-595	448-618		307-645
N	1		1	16	23	18	543		612	112	60		1,394
<i>Karluk (late run)</i>													
Mean	556		579	548	402	578	534		581	538	578		554
SE	6		7	5	32	7	1		1	4	5		1
Range	521-573		550-599	456-589	370-434	525-635	388-614		477-658	375-603	494-647		370-658
N	8		7	25	2	18	661		498	82	41		1,334
<i>Ayakulik (Red River)</i>													
Mean		363	588	520	410	560	541		568				533
SE		11	12	1	4	2	1		2				1
Range		327-432	526-628	427-608	336-464	472-644	422-625		489-637				327-644
N		10	8	955	48	167	707		270				2,168

- continued -

Table 8. (Page 2 of 3).

District Section	Ages												Total ^a
	0.2	1.1	0.3	1.2	2.1	1.3	2.2	3.1	2.3	3.2	3.3	2.4	
Alitak Bay													
<i>Akalura (late run)</i>													
Mean			570	525	362	575	542		576	560			559
SE				11	52	2	9		2	8			2
Range			570-570	390-505	295-465	430-659	477-550		512-645	540-575			295-659
N			1	6	2	20	193		210	4			436
<i>Upper Station (early run)</i>													
Mean		329	558	495	364	568	515		561	522			504
SE		2	6	11	2	4	2		1	13			2
Range		303-368	405-618	314-611	254-461	521-614	320-611		383-633	497-538			254-633
N		44	44	43	3	123	995		224	2			1,564
<i>Upper Station (late run)</i>													
Mean	466	324	562	475	384	544	551		572				534
SE	3	10	1	5	3	6	2		4				2
Range	303-548	266-383	328-650	311-577	313-440	471-621	346-626		446-653				266-653
N	191	12	694	89	55	39	442		68				1,590
<i>Frazer Lake</i>													
Mean	510	364		502	372	540	506		565				532
SE		3		7	9	13	1		1				2
Range	510-510	310-406		453-568	339-386	465-590	423-598		479-652				310-652
N	1	80		206	5	11	444		774				1,335
<i>Horse Marine Lake</i>													
Mean						595			592				594
SE						11			5				4
Range						560-635			540-640				540-640
N						8			31				39
Eastside Kodiak													
<i>Saltery</i>													
Mean		324		517		562	521		566	511			554
SE		1		6		4	6		2	31			2
Range		324-324		409-597		450-696	425-594		485-690	468-572			324-696
N		1		52		127	55		240	3			478

- continued -

Table 8. (Page 3 of 3).

District Section	Ages											Total ^a	
	0.2	1.1	0.3	1.2	2.1	1.3	2.2	3.1	2.3	3.2	3.3		2.4
<i>Northeast Kodiak</i>													
<i>Buskin</i>													
Mean			565	464	305	542	465		545	475	518		518
SE			0	4		5	4		2		5		3
Range			565-565	417-510	305-305	505-630	364-502		505-622	475-475	508-526		305-630
N			1	38	1	31	56		164	1	3		295

^a Age-1.4 sockeye lengths were excluded owing to low frequency of occurrence.

Table 9. Estimated sex composition of selected sockeye escapements, by district and system, Kodiak Management Area, 1989.

District System	N	Percent		Escapement		
		Females	Males	Females	Males	Total
Afognak						
Afognak (late run)	496	45.5	54.5	40,420	48,405	88,825
Northwest Kodiak						
Uganik	366	46.2	53.8	35,093	40,907	12,000
Little River	400	49.7	50.3	14,626	14,774	29,400
Southwest Kodiak						
Karluk (early run)	1,679	54.5	45.5	190,716	159,037	349,753
Karluk (late run)	1,669	46.2	53.8	350,669	408,224	758,893
Ayakulik (Red River)	2,564	40.8	59.2	313,002	455,099	768,101
Alitak Bay						
Akalura (late run)	481	45.5	54.5	52,828	63,201	116,029
Upper Station (early run)	1,690	33.8	66.2	21,844	42,868	64,712
Upper Station (late run)	1,680	49.6	50.4	109,931	111,645	221,576
Frazer	1,439	49.3	50.7	177,656	182,717	360,373
Eastside Kodiak						
Saltery	599	43.1	56.9	13,024	17,213	30,237
Northeast Kodiak						
Buskin	450	64.4	35.6	11,505	6,348	17,853
Total	14,681	42.4	57.6	655,582	891,210	1,546,792

Table 10. Age composition of selected coho escapements sampled by district, Kodiak Management Area, 1989.

District System	Statistical Week	Sample Size	Ages				Total	
			1.1	2.0	2.1	3.1		
Southwest Kodiak								
Ayakulik	35	113	Percent Numbers	46.0 52	0.0	46.0 52	8.0 9	100.0 113
Alitak Bay								
Upper Station	35-37	134	Percent Numbers	7.5 10	1.5 2	77.6 104	13.4 18	100.0 134
Eastside Kodiak								
Saltery	36-39	75	Percent Numbers	21.3 16	0.0	64.0 48	14.7 11	100.0 75
Total		322	Percent Numbers	24.2 78	0.7 2	63.3 204	11.8 38	100.0 322

Table 11. Estimated age composition of Kitoi Bay chum salmon brood stock samples, statistical weeks 26 through 29, 1989.

Statistical Weeks	N	Ages				Total	
		0.2	0.3	0.4	0.5		
26-29	395	Percent	33.7	47.8	18.2	0.2	100.0
		Numbers	1,354	1,924	733	10	4,022

Table 12. Length composition of Kitoi Bay chum salmon brood stock samples, by age and sex, statistical weeks 26 through 29, 1989.

	Ages				Total
	0.2	0.3	0.4	0.5	
Females					
Mean Length	514	574	602	642	572
SE	7	3	5		3
Range	428-595	502-638	521-685	642-642	428-685
Sample Size	23	94	36	1	154
Males					
Mean Length	514	571	631	0	554
SE	3	5	7		4
Range	432-590	441-693	541-710	0-0	432-710
Sample Size	110	95	36	0	241
All Fish					
Mean Length	514	573	617	642	561
SE	3	3	4		3
Range	428-595	441-693	521-710	642-642	428-710
Sample Size	133	189	72	1	395

Table 13. Estimated sex composition of Kitoi Bay chum salmon brood stock samples, statistical weeks 26 through 29, 1989.

Statistical Weeks	Numbers			Percent		
	Females	Males	Total	Females	Males	Total
26-29	1,536	2,486	4,022	38.2	61.8	100.0
Total	1,536	2,486	4,022	38.2	61.8	100.0

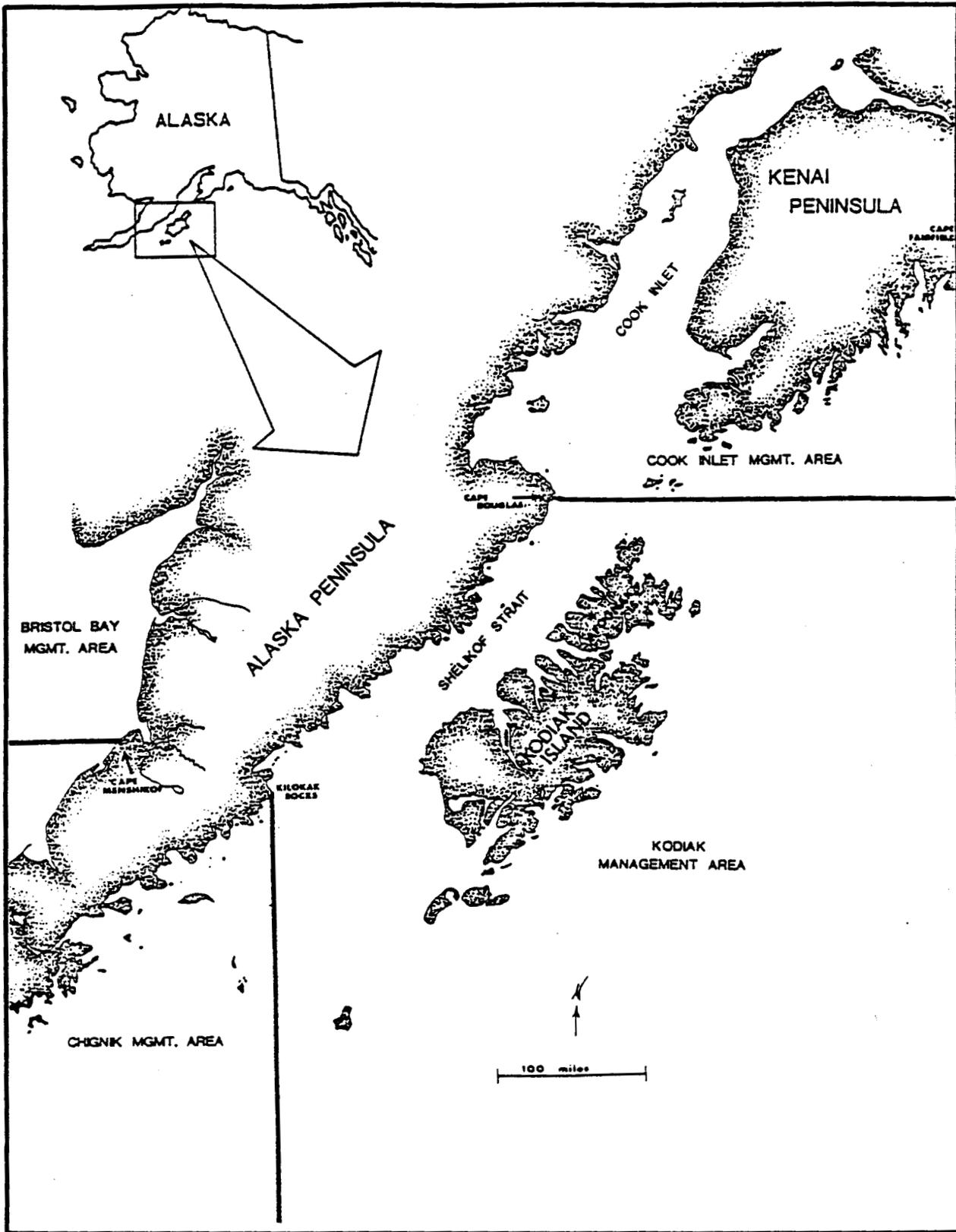


Figure 1. Map depicting Kodiak and adjacent salmon management areas.

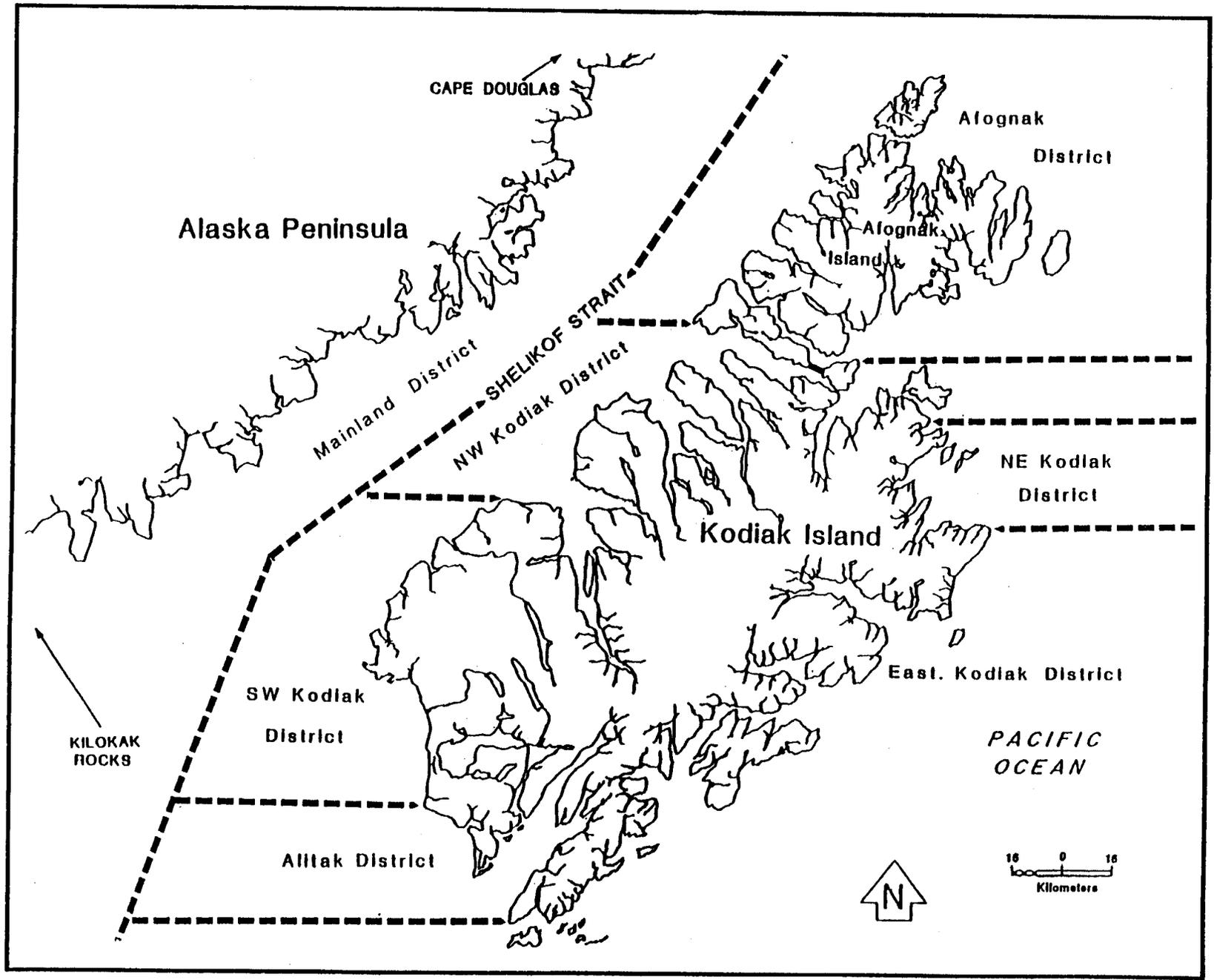


Figure 2. Map of the Kodiak Management Area fishing districts.

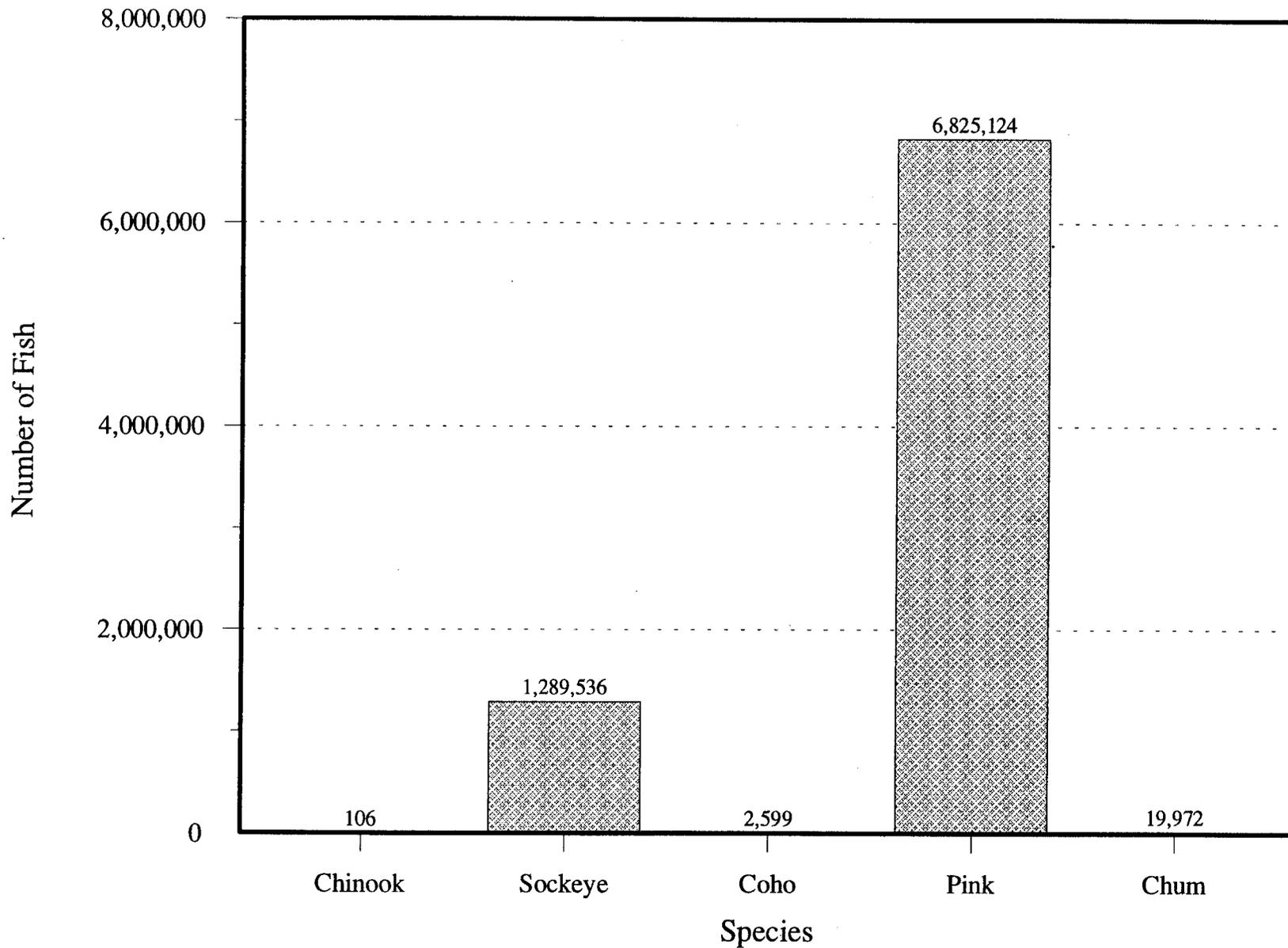


Figure 3. Total salmon catch, by species, in number of fish, Kodiak Management Area, 1989.

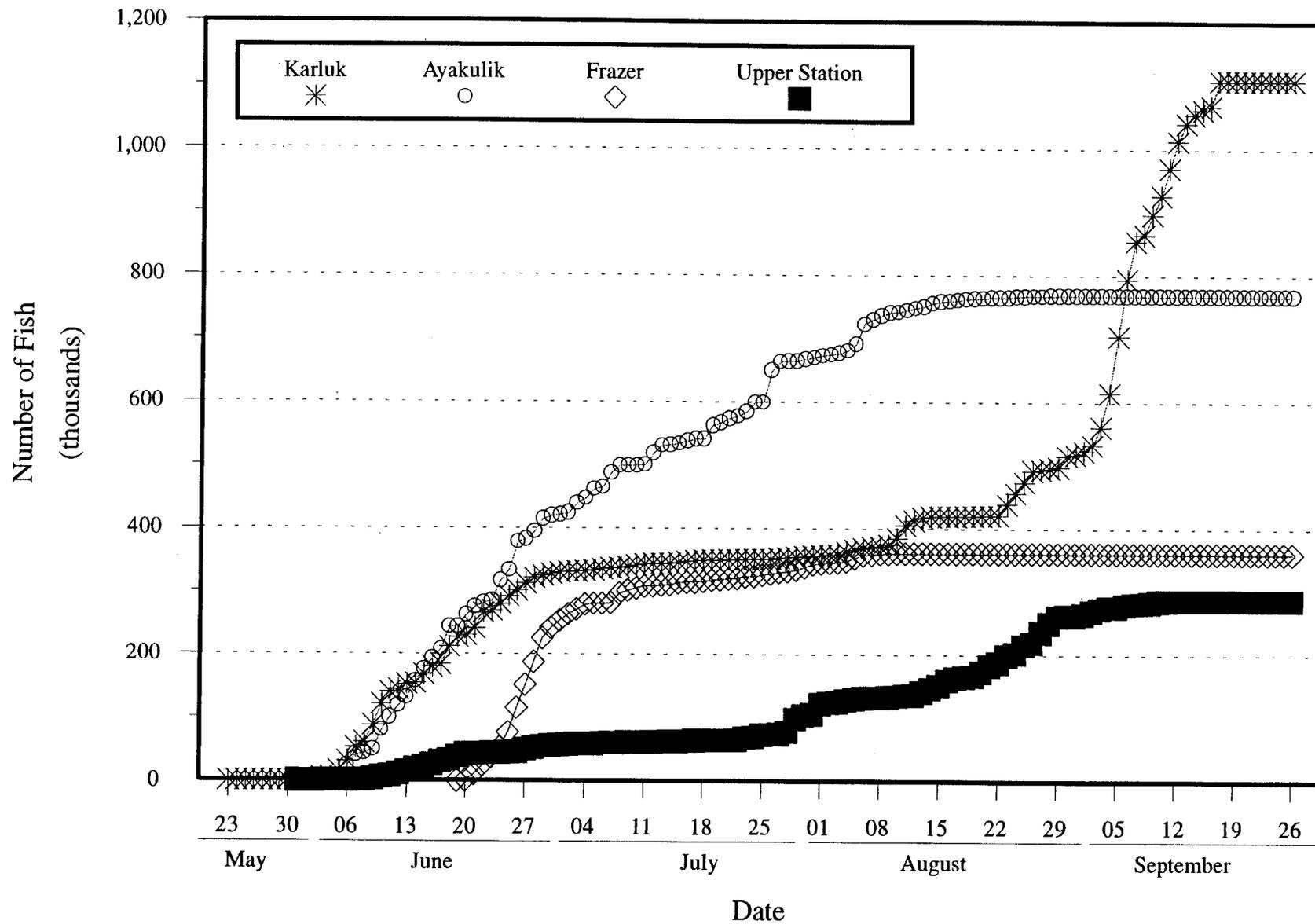


Figure 4. Cumulative sockeye salmon escapements counted by day through the Karluk, Ayakulik, Frazer, and Upper Station weirs, 1989.

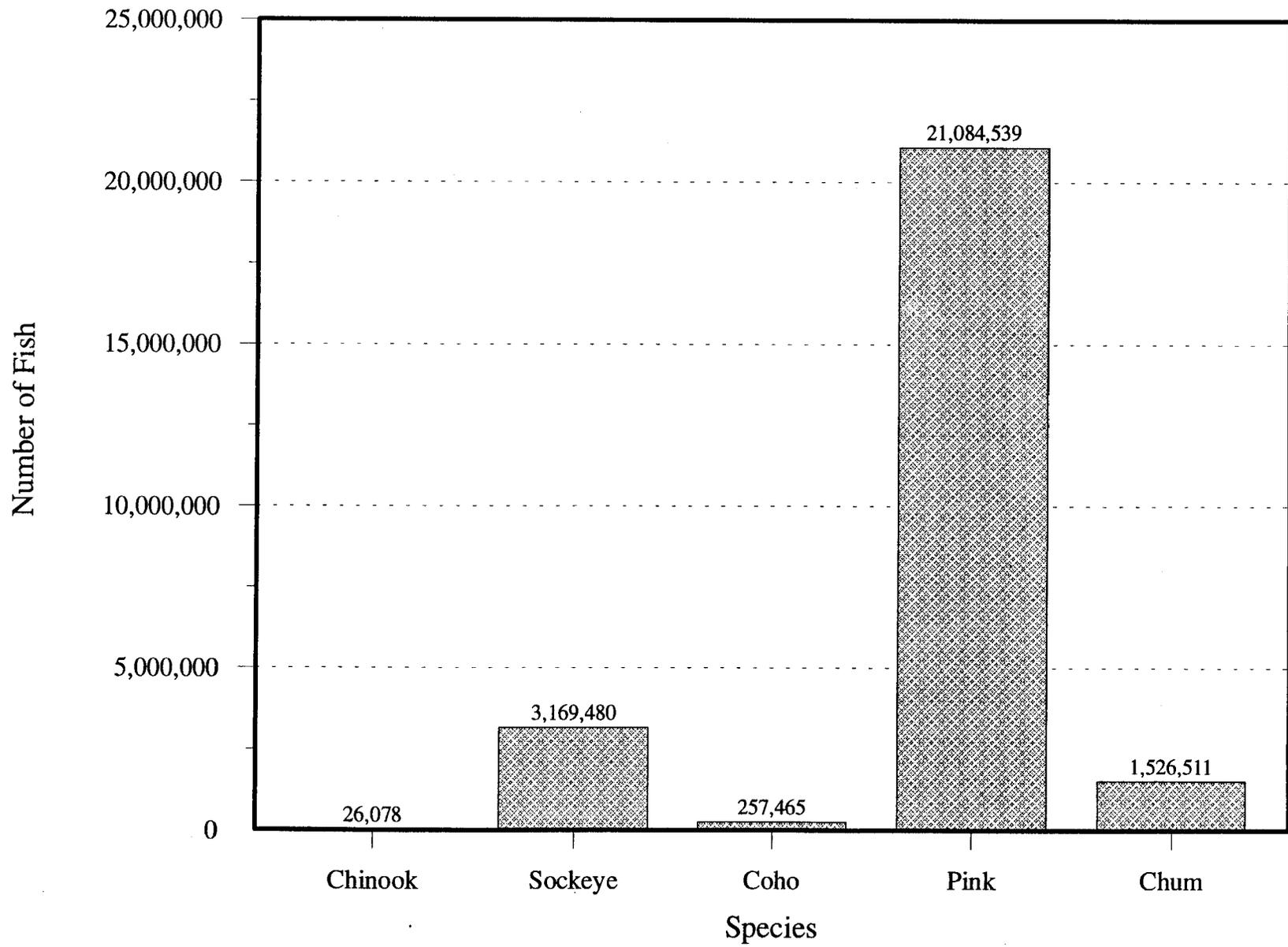


Figure 5. Estimated total escapement, by species, Kodiak Management Area, 1989.

APPENDIX

Appendix A.1. Peak aerial survey, weir, and estimated total escapements, by species and district, Kodiak Management Area, 1989.

Stream Number	Salmon Species											
	Sockeye			Coho			Pink			Chum		
	Peak Count	Weir Count	Estimated Total Escapement	Peak Count	Weir Count	Estimated Total Escapement	Peak Count	Weir Count	Estimated Total Escapement	Peak Count	Weir Count	Estimated Total Escapement
<i>Afognak District</i>												
251-101	2,600		5,200	4,500		10,800	0		0	0		0
251-102							409		778	0		0
251-103	1		2	18		43	4,000		7,604	24		31
251-104							300		570	0		0
251-105	1,600		3,200				1,200		4,022	0		0
251-109							500		951	0		0
251-201							774		1,471	0		0
251-202							651		1,238	0		0
251-206							9		17	0		0
251-207							200		380	0		0
251-301							0		0	0		0
251-302		8,206	8,206	0		0	368	15	383		32	32
251-402												
251-403							200		1,351	0		0
251-404		48	48	433		433		20,056	20,056		522	522
251-405							75		143	0		0
251-406							27,500		27,500	0		0
251-407							8,425		8,425	0		0
251-502							225		225	0		0
251-503							0		0	0		0
251-504							615		615	0		0
251-505							325		325	0		0
251-505A							424		424	0		0
251-506							274		274	0		0
251-507							287		287	0		0
251-510							2,000		2,000	0		0
251-601		0	0	1,799		1,799		62	62		0	0
251-705		7	7	441		441		37	37		0	0
251-706		1	1	42		42		11	11		0	0
251-811							41		41	0		0
251-812							2		2	0		0
251-813							2,150		2,150	0		0
251-821							0		0	0		0
251-822	14	0	28	16		38		106,347	106,347		0	0
251-825												
251-826							0		0	0		0

- continued -

Stream Number	Salmon Species											
	Sockeye			Coho			Pink			Chum		
	Peak Count	Weir Count	Estimated Total Escapement	Peak Count	Weir Count	Estimated Total Escapement	Peak Count	Weir Count	Estimated Total Escapement	Peak Count	Weir Count	Estimated Total Escapement
<i>Afognak District</i> (continued)												
251-829							0		0	0		0
251-830		9	9		5,928	5,928		95,700	95,700		4	4
251-831		12,605	12,605		7,984	7,984		4,254	4,254		0	0
251-832							75		143	0		0
251-901				12		29	1,500		6,000	0		0
252-101												
252-102												
252-103							1,150		2,186	0		0
252-104							325		618	0		0
252-301							1,500		1,500	0		0
252-302							50,000		95,052	0		0
252-303							0		0	0		0
252-305							3,000		3,000	0		0
252-306							150,000		285,157	0		0
252-307							60,000		114,063	0		0
252-308							3		6	0		0
252-309							60,000		114,063	0		0
252-317							1		8	0		0
252-318							150,000		285,157	0		0
252-319							0		0	0		0
252-323							150,000		285,157	0		0
252-331				54		130	2,356		2,356	0		0
252-331A							1,429		2,717	0		0
252-331B				50		120	1,156		2,198	0		0
252-332							30,000		39,207	500		500
252-333	2		4				15,000		28,516	0		0
252-335							189		359	0		0
252-337							3		6	0		0
252-338							2		4	0		0
252-339							7		13	0		0
252-342		88,825	88,825		16,347	16,347		49,088	49,088			
252-343				25		60	10,000		20,794	0		0
252-345		42	42		28	28		6,469	6,469		19	19
Subtotal	4,217	109,743	118,177	4,675	33,002	44,222	738,650	282,039	1,631,480	524	577	1,108

- continued -

Stream Number	Salmon Species											
	Sockeye			Coho			Pink			Chum		
	Peak Count	Weir Count	Estimated Total Escapement	Peak Count	Weir Count	Estimated Total Escapement	Peak Count	Weir Count	Estimated Total Escapement	Peak Count	Weir Count	Estimated Total Escapement
<i>Northwest Kodiak District</i>												
253-114				150		360	2,500		3,707	0		0
253-115	14,700		29,400	5,000		12,000	84,000		193,167	0		0
253-121							8,000		13,600	7,000		7,000
253-122	38,000		76,000	2,681		6,434	520,000		795,899	53,000		67,827
253-141							1,800		3,422	0		0
253-142							900		4,400	0		0
253-311							1,500		2,852	0		0
253-313				350		840	12,000		12,000	0		0
253-321				50		120	6,000		11,406	0		0
253-331				500		1,200	367,000		410,913	23,000		34,039
253-332							325,000		353,333	0		0
253-333							800		2,740	0		0
254-103							2,000		3,802	0		0
254-105							1,400		1,400	0		0
254-201							60,000		60,000	1,000		1,300
254-202				700		1,680	300,000		645,157	57,600		57,600
254-203							165,000		251,953	50,000		50,000
254-204				250		600	34,000		63,820	1,000		1,467
254-205							500		1,500	0		0
254-206							1,000		1,000	0		0
254-207							1,000		2,200	0		0
254-208							1,000		2,000	0		0
254-209							1,500		1,500	0		0
254-210							1,500		1,500	0		0
254-211							5,000		5,000	0		0
254-212							2,500		2,500	1,500		1,500
254-301				6,000		14,400	95,000		103,983	80,000		116,792
254-302							3,000		3,000	1,500		1,500
254-401				12,500		30,000	48,000		91,250	32,000		32,000
254-402							2,500		4,753	0		0
254-403							100		190	0		0
254-404							1,500		4,833	0		0
254-405							400		1,920	0		0
259-363							0		0	0		0
259-365							236,000		432,100	55,500		55,500
259-366							8,700		16,539	0		0

- continued -

Stream Number	Salmon Species											
	Sockeye			Coho			Pink			Chum		
	Peak Count	Weir Count	Estimated Total Escapement	Peak Count	Weir Count	Estimated Total Escapement	Peak Count	Weir Count	Estimated Total Escapement	Peak Count	Weir Count	Estimated Total Escapement
<i>Northwest Kodiak District (continued)</i>												
259-368							7,000		13,307	0		0
259-371							39,000		119,943	45,000		57,830
259-372							4,500		14,700	0		0
259-373							1,800		1,800	0		0
259-381							0		0	0		0
259-382							54,000		126,000	6,000		14,000
259-383							0		0	0		0
259-391							5,400		5,477	0		0
259-392							4,000		7,604	0		0
259-394							3,200		3,200	0		0
259-395							286		544	0		0
259-397							300		1,500	0		0
259-398A							36		68	0		0
259-398B							5		10	0		0
259-399							3		6	0		0
Subtotal	52,700		105,400	28,181		67,634	2,420,630		3,803,478	414,100		498,355
<i>Southwest Kodiak District</i>												
255-101		1,108,646	1,108,646		25,370	25,370	0	109,880	109,880	100	129	129
256-102										0		0
256-201		768,101	768,101		12,822	12,822	0	45,655	45,655	0	100	100
256-202							0		0	0		0
256-301				600		1,440	1,500		2,852	0		0
256-302				100		240	0		0	0		0
256-303							0		0	0		0
256-303A							0		0	0		0
256-401				3,970		9,528	1,250		1,692	5,000		6,506
256-402				615		1,476	3,000		5,800	2,050		3,067
Subtotal		1,876,747	1,876,747	4,585	38,192	50,876	5,750	155,535	165,879	7,150	229	9,802

- continued -

Stream Number	Salmon Species											
	Sockeye			Coho			Pink			Chum		
	Peak Count	Weir Count	Estimated Total Escapement	Peak Count	Weir Count	Estimated Total Escapement	Peak Count	Weir Count	Estimated Total Escapement	Peak Count	Weir Count	Estimated Total Escapement
Alitak Bay District												
257-101				1,200		2,880	0		0	430		516
257-102							1,000		1,000	500		1,167
257-301							0		0	0		0
257-302		116,029	116,029		4,182	4,182		49,608	28,010		3	3
257-303	3,035		6,070	1,000		2,400	600		1,400	0		0
257-304		286,288	286,288		7,229	7,229		754	754		1	1
257-401							550		2,097	25		32
257-402	4,000		8,000	700		1,680	300		570	0		0
257-403		362,007	362,007		6,750	6,750		315,559	315,559		4,690	4,690
257-404												
257-405							6,000		6,000	0		0
257-502				700		1,680	410,000		1,093,543	22,000		41,697
257-503							87,000		139,417	650		650
257-504							32,000		67,133	0		0
257-601							12,000		24,800	800		1,040
257-602							35,000		72,333	4,000		9,467
257-603							55,000		62,962	5,500		6,930
257-604							123,000		212,733	3,000		5,933
257-605							7,000		14,260	0		0
257-701							690,000		1,783,196	0		0
257-702							94,000		103,400	0		0
257-702A							65,000		134,333	0		0
257-703							0		0	0		0
Subtotal	7,035	764,324	778,394	3,600	18,161	26,801	1,618,450	365,921	4,063,500	36,905	4,694	72,126
Eastside Kodiak District												
258-101							2,600		12,880	0		0
258-201				300		720	4,700		28,420	5,300		13,780
258-202							200		271	3,600		4,536
258-203							150		150	0		0
258-204							200		227	16,700		24,870
258-205							300		340	1,725		1,725
258-206							4,100		7,653	1,800		2,760
258-207				650		1,560	60,500		69,762	34,000		49,639

- continued -

Stream Number	Salmon Species											
	Sockeye			Coho			Pink			Chum		
	Peak Count	Weir Count	Estimated Total Escapement	Peak Count	Weir Count	Estimated Total Escapement	Peak Count	Weir Count	Estimated Total Escapement	Peak Count	Weir Count	Estimated Total Escapement
258-208							900		1,647	3,200		3,446
258-209							1,600		1,600	0		0
258-210							0		0	0		0
258-211							400		647	1,300		3,380
258-212							4,000		10,800	6,500		16,900
258-213							28,500		43,700	1,800		2,760
258-301							2,800		2,800	6,000		7,712
258-302							3,500		3,500	6,000		7,800
258-303							2		6	0		0
258-304							3,000		10,247	0		0
258-305							575		1,648	0		0
258-306							150		430	0		0
258-307							1,100		3,520	0		0
258-401	11,000		22,000	800		1,920	0		0	0		0
258-511				400		960	0		0	32,000		43,810
258-512							11,000		11,000	28,000		28,240
258-513							0		0	8,600		9,635
258-514							10,800		35,800	1,200		1,542
258-521				2,500		6,000	15,000		42,437	2,300		3,233
258-522				1,600		3,840	53,300		147,423	10,000		10,000
258-531							0		0	0		0
258-532							0		0	0		0
258-533							0		0	0		0
258-541	100		200	300		720	30,500		57,133	0		0
258-541A							0		0	0		0
258-542							78,000		118,323	10,000		10,000
258-544				60		144	17,000		19,257	0		0
258-551	10		20				2,600		10,450	0		0
258-554							1,000		1,533	0		0
258-555							300		620	0		0
258-601							4,000		8,267	0		0
258-602							50,400		81,256	15		18
258-603							42,000		81,200	20		31
258-701							450,000		1,192,683	0		0
258-702							68,000		146,467	0		0
258-703							47,000		65,033	0		0

- continued -

Stream Number	Salmon Species											
	Sockeye			Coho			Pink			Chum		
	Peak Count	Weir Count	Estimated Total Escapement	Peak Count	Weir Count	Estimated Total Escapement	Peak Count	Weir Count	Estimated Total Escapement	Peak Count	Weir Count	Estimated Total Escapement
<i>Eastside Kodiak District</i> (continued)												
258-704							0		0	0		0
258-705							19,000		25,367	0		0
258-706							0		0	0		0
258-707							100		190	200		257
258-801							0		0	1,200		1,542
258-803							0		0	0		0
258-804							0		0	0		0
258-805							0		0	0		0
258-807							0		0	900		1,157
258-808				20		48	100		200	400		514
258-809							0		0	0		0
258-810							0		0	300		386
258-851				400		960	0		0	2,100		2,699
258-852							100		100	0		0
258-901							1,800		3,720	0		0
258-902							17,000		35,133	0		0
258-903							3,000		3,000	0		0
258-904							2,000		2,000	0		0
259-401							3,600		6,844	0		0
259-403							100		190	0		0
259-411	14,300		28,600	1,800		4,320	2,000		3,802	0		0
259-412	950		1,900	1,400		3,360	61,000		196,087	0		0
259-414							96,000		142,535	1,000		1,000
259-415 ^a		30,237	30,237		6,738	6,738	81,000	214,541	251,741	15,000	14	15,014
259-416							6,500		12,357	4,000		5,142
259-417							500		1,300	1,200		3,120
259-417A							0		0	40		51
259-418							0		0	470		604
259-418A							900		1,711	3,800		4,885
259-418B							0		0	0		0
259-419							0		0	0		0
259-420							0		0	0		0
259-421							0		0	0		0
259-422							20,200		47,160	0		0
259-423							700		1,820	1,900		6,920

- continued -

Stream Number	Salmon Species											
	Sockeye			Coho			Pink			Chum		
	Peak Count	Weir Count	Estimated Total Escapement	Peak Count	Weir Count	Estimated Total Escapement	Peak Count	Weir Count	Estimated Total Escapement	Peak Count	Weir Count	Estimated Total Escapement
<i>Eastside Kodiak District (continued)</i>												
259-424				6,500		15,600	46,000		103,478	15,000		33,078
259-425							6,300		16,647	0		0
259-426							800		1,521	0		0
259-427							200		200	0		0
259-428							0		0	12,000		25,067
Subtotal	26,360	30,237	82,957	16,730	6,738	46,890	1,369,077	214,541	3,076,233	239,570	14	347,253
<i>Northeast Kodiak District</i>												
259-101				150		360	8,000		11,519	0		0
259-102				25		60	42,100		42,950	0		0
259-105							4,000		7,298	0		0
259-211		17,853	17,853		9,954	9,954		272,785	272,785		79	79
259-221							22,000		41,823	0		0
259-222							36,500		108,498	1,800		2,314
259-223				200		480	113,000		329,627	0		0
259-231				2,500		6,000	152,000		365,383	11,000		29,813
259-233							500		951	1,800		2,314
259-235							3,700		5,427	0		0
259-242	6		12	800		1,920	46,000		139,668	1,400		3,897
259-243							47,700		90,680	1,400		1,800
259-244							12,600		12,600	0		0
259-245							10,200		19,391	0		0
259-246							300		300	0		0
259-251				235		564	39,400		74,901	200		213
259-365				600		1,440	236,000		432,100			
Subtotal	6	17,853	17,865	4,510	9,954	20,778	774,000	272,785	1,955,901	17,600	79	40,430
<i>Mainland District</i>												
262-101							100		190	0		0
262-102							12,000		21,693	0		0
262-103							600		1,141	0		0
262-104							0		0	0		0

- continued -

Stream Number	Salmon Species											
	Sockeye			Coho			Pink			Chum		
	Peak Count	Weir Count	Estimated Total Escapement	Peak Count	Weir Count	Estimated Total Escapement	Peak Count	Weir Count	Estimated Total Escapement	Peak Count	Weir Count	Estimated Total Escapement
<i>Mainland District</i> (continued)												
262-105							0		0	0		0
262-106							0		0	0		0
262-107							0		0	0		0
262-108							3,600		6,480	4,200		7,560
262-109							0		0	1,400		2,520
262-110							0		0	0		0
262-111							0		0	0		0
262-113							3,800		7,224	0		0
262-151	39,000		78,000							0		0
262-152							15,000		28,516	45,000		57,844
262-153							48,000		91,250	8,000		10,283
262-154							0		0	11,000		14,140
262-155							800		1,521	0		0
262-201							3,000		12,000	8,000		32,000
262-202							0		0	1,100		1,414
262-203							0		0	8,000		10,283
262-204							0		0	0		0
262-205							42,000		79,844	12,000		15,425
262-206							6,000		11,406	2,000		2,571
262-207							0		0	3,400		4,370
262-254							100		190	0		0
262-271							2,000		3,802	56,000		71,983
262-272							0		0	0		0
262-273							0		0	0		0
262-301	56,000		112,000				0		0	0		0
262-351							9,000		17,109	0		0
262-352							3,800		7,224	0		0
262-401							3,800		7,224	0		0
262-402							19,000		36,120	0		0
262-451							37,000		54,327	3,000		3,450
262-501							200,000		380,209	0		0
262-502							0		0	0		0
262-503							1,000		1,901	0		0
262-504							10,000		10,000	0		0
262-505							10,000		10,000	0		0
262-551							38,000		65,910	5,000		7,368

-- continued --

Stream Number	Salmon Species											
	Sockeye			Coho			Pink			Chum		
	Peak Count	Weir Count	Estimated Total Escapement	Peak Count	Weir Count	Estimated Total Escapement	Peak Count	Weir Count	Estimated Total Escapement	Peak Count	Weir Count	Estimated Total Escapement
<i>Mainland District</i> (continued)												
262-552							0		0	0		0
262-601							0		0	0		0
262-602							0		0	0		0
262-603							0		0	0		0
262-604							80,000		282,600	12,000		19,600
262-605							10,000		22,667	0		0
262-606							20		38	0		0
262-651							445,000		541,827	15,000		15,333
262-652							162,000		201,400	0		0
262-653							230,000		230,000	0		0
262-654							0		0	11,400		25,840
262-655							300		620	0		0
262-656							13,600		33,320	0		0
262-701							44,000		92,000	0		0
262-702							67,000		138,880	0		0
262-703							42,000		42,000	15,000		20,440
262-704							20,000		27,253	20,000		21,467
262-705							12,000		19,867	0		0
262-706				60		144	0		0	0		0
262-751							73,000		115,612	0		0
262-752							10,000		11,560	56,000		95,240
262-753							3,500		6,654	0		0
262-801							22,000		23,303	0		0
262-802							76,000		158,350	7,600		7,853
262-803							500		500	0		0
262-804							200		200	0		0
262-850							5,000		5,000	0		0
262-851				50		120	1,320,000		2,078,433	60,000		94,200
262-852							91,000		110,580	0		0
262-853							66,000		124,200	0		0
262-854							10,000		12,000	0		0
262-856							100		190	0		0
262-858							1,900		2,489	15,200		16,253
262-859							0		0	0		0
262-860							0		0	0		0
262-861							9,000		18,600	0		0

- continued -

Stream Number	Salmon Species											
	Sockeye			Coho			Pink			Chum		
	Peak Count	Weir Count	Estimated Total Escapement	Peak Count	Weir Count	Estimated Total Escapement	Peak Count	Weir Count	Estimated Total Escapement	Peak Count	Weir Count	Estimated Total Escapement
<i>Mainland District</i> (continued)												
262-862							200		200	0		0
262-863							0		0	0		0
262-864							0		0	0		0
262-865							50		95	0		0
262-866							800		1,521	0		0
262-868							100		190	0		0
262-951							24,000		45,625	0		0
262-952							28,000		53,229	0		0
Subtotal	95,000		190,000	110		264	3,335,870		5,256,284	380,300		557,437
Totals	95,700	1,565,832	1,739,232	15,935	80,205	117,049	10,262,427	1,615,871	19,952,755	527,430	31,101	780,097

^a Saltery Creek pink salmon survey counts and estimated total escapement includes escapement below the weir.

The Alaska Department of Fish and Game conducts all programs and activities free from discrimination on the basis of sex, color, race, religion, national origin, age, marital status, pregnancy, parenthood, or disability. For information on alternative formats available for this and other department publications, please contact the department ADA Coordinator at (voice) 907-465-4120, (TDD) 1-800-478-3648, or (fax) 907-586-6595. Any person who believes he or she has been discriminated against by this agency should write to: ADF&G, P.O. Box 25526, Juneau, AK 99802-5526; or O.E.O., U.S. Department of the Interior, Washington, DC 20240.