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Kanektok River Salmon Monitoring and Assessment, 2004

Annual Report for Project FIS 04-305
USFWS Office of Subsistence Management
Fisheries Information Services Division

by

John C. Linderman Jr.

June 2005

Alaska Department of Fish and Game **Divisions of Sport Fish and Commercial Fisheries**

Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used without definition in the following reports by the Divisions of Sport Fish and of Commercial Fisheries: Fishery Manuscripts, Fishery Data Series Reports, Fishery Management Reports, and Special Publications. All others, including deviations from definitions listed below, are noted in the text at first mention, as well as in the titles or footnotes of tables, and in figure or figure captions.

Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
nautical mile	nmi
ounce	oz
pound	lb
quart	qt
yard	yd

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity (negative log of)	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

Alaska Administrative Code	AAC
all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.
all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Measures (fisheries)

fork length	FL
mideye-to-fork	MEF
mideye-to-tail-fork	METF
standard length	SL
total length	TL

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	*e*
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	*E*
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	log_2, etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

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By
John C. Linderman Jr.
Division of Commercial Fisheries, Anchorage

Alaska Department of Fish and Game
Division of Sport Fish, Research and Technical Services
333 Raspberry Road, Anchorage, Alaska, 99518-1599

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The Division of Sport Fish Fishery Data Series was established in 1987 for the publication of technically oriented results for a single project or group of closely related projects. Since 2004, the Division of Commercial Fisheries has also used the Fishery Data Series. Fishery Data Series reports are intended for fishery and other technical professionals. Fishery Data Series reports are available through the Alaska State Library and on the Internet: http://www.sf.adfg.state.ak.us/statewide/divreports/html/intersearch.cfm This publication has undergone editorial and peer review.

John C. Linderman Jr.,
Alaska Department of Fish and Game, Division of Commercial Fisheries,
333 Raspberry Road, Anchorage, Alaska, 99518-1599, USA

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ABSTRACT

A resistance-board weir was used on Kanektok River to estimate escapement and provide a platform to collect samples used in estimating age, sex, and length for Chinook *Oncorhynchus tshawytscha*, sockeye *O. nerka*, chum *O. keta*, and coho salmon *O. kisutch*. The weir was initially installed in late April and was operational from 29 June until 20 September. Escapement at the weir was estimated to be 19,528 Chinook, 102,867 sockeye, 46,444 chum, and 87,828 coho salmon. Aerial counts are used with weir escapement counts to derive escapement estimates for the Kanektok River drainage. The 2004 season was the third year Chinook, sockeye, and chum salmon escapement and age, sex, length composition data were collected and the fourth year coho salmon data were collected. Salmon of the Kanektok River are harvested in subsistence, commercial, and sport fisheries conducted both in river and in adjacent marine waters of Kuskokwim Bay (District W-4). The Alaska Department of Fish and Game has quantified subsistence harvests in the Quinhagak area of Kuskokwim Bay since 1968. From 1994 through 2003, annual subsistence harvests have averaged 3,286 Chinook, 1,336 sockeye, 1,155 chum, and 1,751 coho salmon. Subsistence harvest estimates for 2004 were not available at the time of publication. The 2004 District W-4 commercial salmon harvest was 25,465 Chinook, 34,627 sockeye, 82,398 coho, and 25,820 chum salmon, for a total of 168,310 fish. Samples were also collected from the District W-4 commercial catch for use in estimating age, sex, and length of the 2004 commercial harvest.

Key words: Kanektok River, Kuskokwim Area, District W-4, resistance board weir, Chinook *Oncorhynchus tshawytscha*, sockeye *O. nerka*, chum *O. keta*, coho *O. kisutch*, salmon, Dolly Varden *Salvelinus malma*, rainbow trout *O. mykiss*, whitefish *Coregonus spp.*

INTRODUCTION

STUDY AREA

Kanektok River is located in Togiak National Wildlife Refuge in southwestern Alaska (Figure 1). The river originates at Kegati/Pegati Lake, flows westerly for 91 mi (146 km), and empties into Kuskokwim Bay near the village of Quinhagak. The upper portion of the river is primarily a single channel flowing through mountainous terrain. The lower portion of the river flows through a broad fluvial plain and is highly braided with many side channels. Kanektok River and its many tributaries drain approximately 500 mi^2 (1,295 km^2) of surface area dominated by largely undisturbed tundra. The surrounding riparian vegetation is composed primarily of cottonwood, willow, and alder. Kanektok River weir is located at river mile 42 (67.60 km), GPS coordinates N 59 46.057, W 161 03.616.

SALMON FISHERIES

Subsistence fishing for salmon occurs throughout the Kanektok River drainage, in nearby streams of the Quinhagak area, and in the open waters of Kuskokwim Bay. Subsistence caught salmon make an important contribution to the annual subsistence harvests of residents from Quinhagak, Goodnews Bay, Eek, and Platinum (Ward et al. 2003). The Alaska Department of Fish and Game (ADF&G) has quantified subsistence harvests in the Quinhagak area since 1968. Chinook salmon are the most utilized subsistence salmon species in the Quinhagak area followed by coho, sockeye, and chum salmon (Appendix A1). Over the last 10 years, annual subsistence harvests have averaged 3,286 Chinook salmon *Oncorhynchus tshawytscha*, 1,751 coho salmon *O. kisutch*, 1,336 sockeye salmon *O. nerka*, and 1,155 chum salmon *O. keta*. In 2003, 143 households fished for subsistence use in the village of Quinhagak, exceeding the 114 permit holders participating in the local commercial fishery (Whitmore et al. *in prep*).

Commercial salmon fishing has occurred in the Quinhagak area since before statehood. In 1960, commercial fishing District W-4 was established by ADF&G offshore of Quinhagak in

Kuskokwim Bay (Figure 2). In 2004, the Alaska Board of Fisheries moved the northern boundary 3 miles up the coast from the Southern edge of Oyak Creek to the Southern edge of Weelung Creek. The northern boundary was expanded to address overcrowding of fishermen in the district during commercial openings. Since inception of District W-4, its northern boundary has been shifted between Weelung Creek and Oyak Creek in response to overcrowding issues and concern over interception of Kuskokwim River bound fish.

The commercial fishery is directed towards Chinook, sockeye, and coho salmon. Chum salmon are harvested incidentally. Pink salmon *O. gorbuscha*, are the least valuable species commercially and are not targeted. Historical average commercial salmon harvests in District W-4 are 15,717 Chinook, 24,343 sockeye, 34,441 coho, and 33,263 chum salmon and the average harvests for these species from 1994 through 2003 are 19,834 Chinook, 50,454 sockeye, 51,365 coho, and 45,228 chum salmon (Appendix A1). The historical average of total harvest is 117,267 salmon and the average total harvest from 1994 through 2003 is 170,720 salmon (Whitmore et al. *in prep*). District W-4 commercial fishery participation has declined since 1999. The decline is likely attributable to the poor market value of salmon since 1995, increasing fuel prices, and other economic opportunity in the area. The fishery rebounded slightly in 2004, participation was still very low, but harvests for all targeted species were above the recent 10-year average.

Kanektok River supports a popular sport fishery. Each year, sport anglers from around the world fish the drainage from mid-June to the beginning of September targeting salmon, rainbow trout *O. mykiss*, and Dolly Varden *Salvelinus malma*. There are currently 3 seasonal sport fish guiding operations located on Kanektok River and numerous guided and non-guided anglers float Kanektok River from its headwaters to the village of Quinhagak. From 1994 through 2003, average sport fishing harvests included 902 Chinook, 379 sockeye, 202 chum, and 1,169 coho salmon (Appendix A1).

ESCAPEMENT MONITORING

Kanektok River is the primary spawning stream in the Quinhagak area. Establishing a viable method for assessing salmon escapement in Kanektok River has been problematic. The first attempt was a counting tower established in 1960 on the lower river near the village of Quinhagak (ADF&G 1960). The project was plagued by logistical problems, poor visibility into the water column, and difficulties with species apportionment. In 1961, the tower was relocated to the outlet of Kegati/Pegati Lake and operated through 1962 (ADF&G 1961, 1962). Although successful in providing sockeye salmon escapement information, it was abandoned after 1962. The next attempt was hydroacoustic sonar (1982 through 1987) but was deemed unfeasible because of budget constraints, technical obstacles, and site limitations (Huttunen 1984, 1985, 1986, 1988; Schultz and Williams 1984). In 1996, a cooperative effort between the Native Village of Quinhagak (NVK), United States Fish and Wildlife Service (USFWS), and ADF&G, reinitiated a counting tower located 15 mi upriver from the confluence. The counting tower again met with limited success (Fox 1997) despite improvements to the project in 1998 (Menard and Caole 1999). In 1999, resources were redirected towards developing a resistance board weir (Burkey et al. 2001). The weir was briefly operational in 2000, but technical limitations, personnel problems, and high water levels precluded the project from meeting its objectives (Linderman 2000). During operation in 2000, the site was determined incapable of facilitating a weir because of extensive bank erosion.

In 2001, the weir was relocated approximately 20 mi upriver from the original site. The weir was successfully installed and operated in 2001; however, installation was delayed until 10 August because of high water. In 2002, an attempt was made to install the weir just after ice-out in early May, but high water still delayed complete installation until late June. In 2003, crews arrived on-site even earlier and successfully installed the weir during the last week in April before snowmelt and spring precipitation raised water levels to an unworkable condition. Installation and successful operation of the weir is contingent upon "early installation" in late April or just after ice-out each year. This procedure should continue for the duration of the project. The project continues as a cooperative venture between the ADF&G, USFWS Togiak National Wildlife Refuge, USFWS OSM, Bering Sea Fisherman's Association (BSFA), and NVK.

Monitoring escapement for salmon stocks in Kanektok River is in the beginning stages (Appendix B1). The 2004 season represents the fourth year of operation for the Kanektok weir. Four years of coho salmon counts and 3 years of Chinook, sockeye, and chum salmon counts have been collected. Previous escapement information includes partial counts from a counting tower in 1996 and 1997.

The current location of the weir project is 42 river miles from the confluence with Kuskokwim Bay. Significant spawning of Chinook, sockeye, chum, pink, and coho salmon occurs downstream of the weir. The escapement counts derived from the weir are evaluated as an index of escapement for these species.

Kanektok River drainage salmon escapements have also been monitored by aerial surveys since 1962 (Appendix C1). Aerial survey escapement assessment can be subject to variability depending on viewing conditions and survey observers; however, when observers, timing, and methods are standardized to the extent feasible and survey conditions meet acceptable criteria, the resulting counts are used as an index of escapement. Procedures established in recent years have increased the annual consistency of Kanektok River aerial surveys through the creation of an aerial survey location database, intensive pre flight planning, and establishment of a dedicated aerial survey project staff. Additionally, variability between observers and methods has been addressed through standardized training and consistency of the observers, pilots, and aircraft used.

Aerial surveys are most reliable for indexing spawning populations of sockeye and Chinook salmon because these species are typically more visible than chum and coho salmon. Chum salmon have protracted run timing requiring multiple surveys throughout their runs to ensure accuracy of the index. Chum salmon aerial surveys have been discontinued as an escapement index until survey methods can be improved or funding can be secured to allow for multiple aerial surveys of chum salmon populations throughout the duration of their runs. Additionally, Kanektok River coho salmon have been difficult to survey because of poor fall weather conditions. Coho salmon aerial surveys have been conducted when funding and weather conditions allow.

Kanektok River aerial survey escapement goals were initially established in 1992 and set at 5,800 for Chinook, 15,000 for sockeye, 30,500 for chum, and 25,000 for coho salmon (Buklis 1993). Recent evaluation of AYK Region escapement goals has resulted in establishment of revised Sustainable Escapement Goals (SEG) for Kanektok River aerial surveys (ADF&G 2004). The revised SEG's represent ranges or thresholds and were set at 3,500–8,000 for Chinook salmon, >5,200 for chum salmon, 14,000–34,000 for sockeye salmon, and 7,700–36,000 for coho salmon.

AGE, SEX, AND LENGTH COMPOSITION ESTIMATES

Annual escapement age, sex, and length (ASL) composition estimates are used to develop stock-recruitment models, in turn providing information used for projecting future run sizes. Available escapement ASL information for Chinook, sockeye, chum, and coho salmon is limited. Historical summaries of existing ASL information for salmon returning to Kanektok River can be found in DuBois and Molyneaux (*unpublished*) and Folletti (*unpublished*). The summary for Chinook, sockeye, chum, and coho salmon are based on information from the 1997 Kanektok River counting tower project and Kanektok River weir from 2001 to present. Historical escapement ASL samples prior to 1997 are not included in these summaries (e.g. Huttunen 1984, 1985, 1986, 1988).

Chinook salmon age and sex information has been collected from the District W-4 commercial harvest since 1990, and length information has been collected since 1995 (Folletti *unpublished*). Since 1990, 62% of Chinook salmon commercially harvested have been male, and been comprised mostly (43%) of age-1.4 fish. Since 1995, the average seasonal mean lengths of age-1.4 Chinook salmon have been 836 and 853 mm, males and females, respectively.

Sockeye salmon age and sex information has been collected from the District W-4 commercial fishery since 1990, and length information since 1995 (Folletti *unpublished*). Since 1990, 51% of the sockeye salmon commercially harvested have been male, and been comprised mostly (61%) of age-1.3 fish. Since 1995, the average seasonal mean lengths of age-1.3 sockeye salmon have been 584 mm for males and 551 mm for females.

Chum salmon ASL information has been collected from the District W-4 commercial harvest since 1984 (Folletti *unpublished*). Over this period of time, chum salmon commercially harvested have been 55% female, and comprised mostly (58%) of age-0.3 fish. The average mean seasonal lengths of age-0.3 chum salmon have been 585 mm and 563 mm, males and females, respectively.

Coho salmon age and sex information has been collected from the District W-4 commercial harvest since 1990, and length information has been collected since 1996 (Folletti *unpublished*). Since 1990, coho salmon commercially harvested have been 52% male, and comprised mostly (87%) of age-2.1 fish. Since 1996, the average mean seasonal lengths of age-2.1 coho salmon have been 592 mm for males and 595 mm for females.

OBJECTIVES

The annual project objectives for Kanektok River weir are to:

1. Enumerate the daily passage of Chinook, chum, sockeye and coho salmon through the weir from mid-June through September.
2. Describe the run-timing or proportional daily passage of Chinook, sockeye, chum, and coho salmon through the weir.
3. Estimate the weekly sex and age composition of Chinook, sockeye, chum, and coho salmon such that simultaneous 90% confidence intervals have a maximum width of 0.20.

4. Estimate the mean length of Chinook, chum, sockeye, and coho salmon and Dolly Varden by sex and age.
5. Enumerate the number of Chinook, sockeye, chum, and coho salmon carcasses that wash down onto the weir.
6. Monitor environmental variables at the weir site, such as relative water level, discharge rate, water chemistry, and water temperature.

Though this report represents an annual report for project FIS 04-305 funded by the USFWS OSM, additional information necessary for sustainable management of fisheries harvesting Kanektok River salmon have been included. These types of data include harvests from subsistence, commercial, and sport fisheries, ASL sampling of the commercial fishery, and resulting exploitation rates for Chinook and sockeye salmon. Eventually run reconstruction and brood-year-return tables, which are built upon Kanektok River weir and area fishery information, will be included.

METHODS

RESISTANCE BOARD WEIR

Methods for the design, construction, and installation of the resistance board weir follow those described in Stewart (2002, 2003) and Tobin (1994). The approximately 250 ft (76.20 m) weir used at the Kanektok River site is comprised of 3 major parts: the substrate rail, the resistance board panel section, and the fixed picket section. During weir operations, picket spacing of the weir panels allows for a complete census of all but the smallest returning Chinook, sockeye, chum, and coho salmon. The picket spacing allows smaller fish such as pink salmon and other non-salmon species to pass upstream and downstream through the weir between pickets. Further details of the resistance board weir components used on Kanektok River weir are described in Estensen and Diesinger (2004).

Two fish passage chutes were installed on the weir, one approximately 100 ft (30.48 m) from the left bank (as looking downstream), the other approximately 25 feet (7.62 m) from the right bank. A 10 ft (3 m) by 15 ft (4.6 m) live trap box used to collect fish for ASL sampling was installed directly upstream of the right bank passage chute. Gates were attached on both chutes to control fish passage.

Boats passed at a designated boat gate located in the center of the weir and boat operators were able to pass with little or no involvement by the weir crew. The boat gate consisted of boat passage panels described in Estensen and Diesinger (2004). Weight of a passing boat temporarily submerged the boat passage panels, allowing boats to pass over the weir. Boats with jet-drive engines were most common and could pass upstream and downstream over the boat gate at reduced speed. Rafts could pass downstream by submerging the boat passage panels and drifting over the weir. Boats with propeller-drive engines were uncommon and required a towrope when passing upstream.

AERIAL SURVEYS

Aerial surveys are flown during peak spawning periods for each species in order to maximize the number of observable fish on the spawning grounds. Peak spawning periods were developed from run timing estimates and vary by species. Aerial surveys are numerically ranked on a scale of 1 = good, 2 = fair, and 3 = poor. Ranking criteria are based on survey method, weather and water conditions, time of survey, and spawning stage. Only surveys with rankings of fair and good (1 and 2) and conducted within the peak spawning period are included as part of the Kanektok River aerial survey database.

Chinook and coho aerial surveys are focused on the main river channel and larger tributaries while sockeye aerial surveys are focused on the main river channel, larger tributaries and lakes, and larger lake tributaries. Kanektok River aerial survey counts are tallied to derive a total count of observable fish throughout the drainage upon which attainment of the SEG is judged. Aerial survey counts are also tallied by the total count of fish observed upstream and downstream of the weir. These counts are used with weir escapement counts to derive escapement estimates for the Kanektok River drainage.

ESCAPEMENT MONITORING AND ESTIMATES

To determine salmon escapement past the weir, fish passage counts were made daily during the operational period of the project. Passage counts occurred regularly throughout the day, typically for 1–2 hour periods, beginning in the morning and continuing as late as light permitted. During counting periods, the passage chute gate was opened to pass fish through the weir. Crew members identified and enumerated all fish by species as they exited the passage chute. Any fish observed traveling downstream through the fish passage cutes were subtracted from the count tally. Spawned out salmon and carcasses of dead salmon (both hereafter referred to as carcasses) that washed up on the weir, were counted by species and passed downstream.

For various reasons, fish sometimes migrated downstream and required an avenue for safe passage over the weir. This behavior was especially common among non salmon species such as rainbow trout, Dolly Varden, and whitefish species *Coregonus spp.* The resistance board weir provided a means of accommodating downstream fish passage through incorporation of downstream passage chutes. Each chute consisted of a single panel set to allow some water to flow over the distal end of the panel. Further details of downstream passage chutes are described in Linderman et al. (2002). Fish do not typically pass upstream over these chutes, and they are only set during periods of active downstream fish migration. Downstream passage chutes were not used during periods of strong upstream salmon passage. Downstream fish passage over these chutes was not enumerated.

Weir escapement was estimated for periods when a breach occurred in the weir. Estimates were assumed to be zero if passage was considered negligible based on historical data and run timing indicators. Estimates were calculated as the average observed passage 2 days before and after the day a breach occurred multiplied by the hourly proportion of the breach duration in a 24 hour day using the following formulas:

$$\hat{n}_d = n_d \cdot \frac{t_b}{T_d}, \qquad (1)$$

and

$$n_d = \left(\frac{(\bar{n}_{d-1 \to d-2}) + (\bar{n}_{d+1 \to d+2})}{2} \right) \qquad (2)$$

where:

$\hat{n}_d$ = passage estimate for the day a weir breach occurred,

$n_d =$ average passage from the 2 days before and after the day a weir breach occurred,

$t_b =$ time period (in hours) the weir was breached,

$T_d =$ number of hours in a day (24),

$\bar{n}_{d-1 \to d-2} =$ average passage from 2 days before the day a weir breach occurred, and

$\bar{n}_{d+1 \to d+2} =$ average passage from 2 days after the day a weir breach occurred.

Daily estimated passage then became the sum of any observed passage from the day the weir breach occurred and that estimated from the above equation.

Drainage escapement for Chinook and sockeye salmon was estimated by summing the weir escapement count with the estimated number of fish that spawn below the weir. The number of fish estimated to spawn downstream of the weir was calculated by applying the proportion of fish observed upstream and downstream of the weir during the aerial survey to the weir escapement. The drainage escapement estimates account for the number of fish counted past the weir after the aerial survey date and was calculated using the following formula:

$$N_d = \left(\frac{\left(n_{a_d} \times n_{w_2} \right)}{n_{a_u}} \right) + n_{w_2} , \qquad (3)$$

where:

$N_d =$ total drainage escapement estimate,

$n_{a_d} =$ aerial survey count downstream of the weir,

$n_{a_u} =$ aerial survey count upstream of the weir, and

$n_{w_2} =$ final weir escapement count including any estimates.

AGE, SEX, AND LENGTH ESCAPEMENT SAMPLING

Escapement sampling for Chinook, sockeye, and chum salmon ASL composition estimates was conducted following the pulse sampling design of DuBois and Molyneaux (2000). Intensive sampling was conducted for 1 to 3 days followed by a few days without sampling. Sample objectives were 4 to 5 pulses of 210 Chinook salmon and 6 pulses of 210 sockeye and 200 chum salmon, distributed equally over their respective runs. These sample sizes were selected for simultaneous 95% confidence interval estimates of age composition ± 0.1 and are adjusted from sample sizes recommended by Bromaghin (1993) to account for regenerated and otherwise unreadable scales.

The coho salmon sample design was modified from previous years and from the original investigation plan for FIS 04-305 to account for stability in ASL compositions over the duration of the coho salmon run. Pulse sample goals were replaced with a total run sample goal of 170 fish in 2003. The total run sample goal was divided between 3 pulse samples, each representing a third of the run.

Salmon were sampled from the fish trap installed in the weir. The general practice was to open the entrance gate and leave the exit gate closed allowing fish to accumulate inside the holding pen. The holding pen was typically allowed to fill with fish and sampling was done during scheduled counting periods. To avoid potential bias caused by the selection or capture of individual fish, all fish within the trap were included in the sample, even if the sample size objective was exceeded.

Scales were removed from the preferred area of the fish (INPFC 1963). A minimum of 3 scales were taken from each fish and mounted on numbered and labeled gum cards. Sex was determined by visually examining external morphology, keying on the development of the kype, roundness of the belly and the presence or absence of an ovipositor. Length was measured to the nearest millimeter from mid eye to tail fork. After each fish was sampled, it was released into a recovery area upstream of the weir. After sampling was completed, relevant information such as sex, length, date, and location was copied from hardcopy forms to computer mark-sense forms. The completed gum cards and data forms were sent to the Bethel and Anchorage ADF&G offices for processing. Further details of sampling procedures can be found in DuBois and Molyneaux (2000) and Estensen and Diesinger (2004).

Weir crews conducted active sampling on sockeye salmon to increase sockeye salmon sample sizes. Active sampling consisted of capturing and sampling sockeye salmon while actively passing and enumerating fish. Further details of active sampling procedures are described in Linderman et al. (2002).

AGE, SEX AND LENGTH COMMERCIAL HARVEST SAMPLING

Commercial catch sampling for Chinook, sockeye, chum, and coho salmon ASL composition estimates was conducted based on the pulse sampling design of DuBois and Molyneaux (2000). The primary goal was to characterize the ASL composition of the entire commercial harvest for each species. Pulse samples were collected from a minimum of 3 commercial openings, each representing a third of the total harvest. The goal for each pulse was to collect samples from 70 Chinook, 70 sockeye, 70 chum, and 70 coho salmon.

Salmon were sampled from the Quinhagak dock area where fishers unloaded their catch to the on-site processor. An area was set aside for the sampling crew and processor workers supplied the crew with totes of iced fish for sampling. Fish were sampled as efficiently and carefully as possible to reduce processing delays and prevent bruising. Sampled fish were returned to iced totes in an ongoing effort to preserve catch quality.

Scales were removed from the preferred area of the fish (INPFC 1963). A minimum of 3 scales were taken from each fish and mounted on numbered and labeled gum cards. All sampled fish were sex determined by visual inspection of internal gonads. Length was measured to the nearest millimeter from mid eye to tail fork. After sampling was completed, completed gum cards and data forms were returned to the Bethel ADF&G offices for data transfer to computer mark-sense forms and sample processing. Further details of sampling procedures can be found in DuBois and Molyneaux (2000).

AGE, SEX AND LENGTH COMPOSITION ESTIMATES

ADF&G staff in Bethel and Anchorage aged scales, processed the ASL data, and generated data summaries (DuBois and Molyneaux 2000). These procedures generated 2 types of summary tables for each species; one described the age and sex composition and the other described length statistics. These summaries account for ASL composition changes over the season by first partitioning the season into temporal strata based on pulse sample dates, applying age and sex composition of individual pulse samples to the corresponding temporal strata, and finally summing the strata to generate the estimated age and sex composition for the season. This procedure ensured ASL composition estimates were weighted by fish abundance in the escapement or harvest rather than fish abundance in the samples. Likewise, estimated mean length composition was calculated by weighting sample mean lengths from each stratum by the escapement or harvest of salmon during that stratum. Similar procedures were used for coho salmon; however, sample design modifications implemented in 2004 reduced the ability to estimate changes in ASL composition for the season, in favor of estimating ASL composition for the entire run or harvest.

Ages were reported in tables using European notation. European notation is composed of 2 numerals separated by a decimal, where the first numeral indicates the number of winters spent by the juvenile fish in fresh water and the second numeral indicates the number of winters spent in the ocean (Groot and Margolis 1991). Total age is equal to the sum of these 2 numerals plus 1 year added to account for the single winter of egg incubation in the gravel. For example, a Chinook salmon described as an age-1.4 fish under European notation has a total age of 6 years.

The original ASL gum cards, acetates, and mark-sense forms were archived at the ADF&G office in Anchorage. The computer files were archived by ADF&G in the Anchorage and Bethel offices.

ATMOSPHERIC AND HYDROLOGICAL MONITORING

Atmospheric and hydrologic conditions were recorded around noon each day. Cloud cover was judged from clear to overcast; wind speed was recorded in miles per hour and direction was noted; precipitation was measured in inches per 24 hours, daily air and water temperature were recorded in degrees Celsius. The river gauge height was recorded daily and was pegged to a benchmark established in 2001. The benchmark was initially set in 2001 and consists of a ¾ inch diameter steel length of rebar driven into the bank adjacent to the field camp. The top of the benchmark represents a river stage of 90 cm. The river gauge is a steel rule installed near shore in the river and the 90 cm mark is pegged level with the top of a benchmark to achieve relative water level between project years.

RESULTS

SALMON FISHERIES

Subsistence, commercial, and sport fishing activities occurred in District W-4 or Kanektok River in 2004. At the time of this writing, 2004 subsistence harvest estimates for Quinhagak were not final though discussions with participants inseason indicated subsistence needs were met and catches were average to above average. A total of 116 permit holders fished commercially in District W-4 for total harvests of 25,465 Chinook, 34,627 sockeye, 25,820 chum, and 82,398 coho salmon (Table 1). No pink salmon were commercially harvested in 2004. Exvessel value by species was $107,752 for Chinook, $77,956 for sockeye, $18,156 for chum, and $222,272 for coho salmon for a total exvessel value of $426,135. Sport fish harvest estimates for Kanektok River in 2004 have not yet been determined.

PROJECT OPERATIONS

Kanektok River weir was operational from 29 June to 20 September 2004 (Table 2, Appendix B1). Counts of salmon were made each day during that period. Breaches in the weir caused by broken weir panel pickets occurred for 2 hours on 15 July and 2 hours on 19 July. Counts were concurrent with these breach events and fish were observed passing through the breaches before they were repaired. Fish observed passing through the breaches were not enumerated.

AERIAL SURVEYS

An aerial survey of the Kanektok River drainage was conducted on 1 August 2004. The survey was flown with a Piper PA-18 aircraft and was rated as good (1) with excellent survey conditions throughout the drainage. A total of 28,375 Chinook and 78,380 sockeye salmon were counted in the Kanektok River drainage (Table 5, Appendix C1). Chinook and sockeye salmon aerial survey results exceeded the upper end of their respective SEG ranges. Of the 28,375 Chinook salmon observed, 15,461 (54.5%) were observed downstream of the weir and 12,914 (45.5%) were observed upstream of the weir. Of the 78,380 sockeye salmon observed, 17,240 (22.0%) were observed downstream of the weir and 61,140 (78.0%) were observed upstream of the weir. No chum or coho salmon aerial surveys were conducted in 2004.

WEIR ESCAPEMENT

Chinook salmon escapement past Kanektok River weir in 2004 was estimated to be 19,528 fish (Table 2). A total of 19,406 Chinook salmon were observed passing upstream through the weir and 122 fish (0.6%) were estimated to have passed upstream uncounted during the breach events. The first Chinook salmon was observed on 29 June, the first day of operation, and the last Chinook salmon was observed on 20 September. Based on the operational period and inclusive of estimated passage, the median passage date was 19 July and the central 50% of the run occurred between 12 July and 25 July (Appendix D1).

Sockeye salmon escapement past Kanektok River weir in 2004 was estimated to be 102,867 fish (Table 2). A total of 102,443 sockeye salmon were observed passing upstream through the weir and 424 fish (0.2%) were estimated to have passed upstream uncounted during the breach events. The first sockeye salmon was observed on 29 June, the first day of operation, and the last sockeye salmon was observed on 20 September. Based on the operational period and inclusive of estimated passage, the median passage date was 12 July and the central 50% of the run occurred between 8 July and 20 July (Appendix D1).

Chum salmon escapement past Kanektok River weir in 2004 was estimated to be 46,444 fish (Table 2). A total of 46,194 chum salmon were observed passing upstream through the weir and 250 fish (0.5%) were estimated to have passed upstream uncounted during the breach events. The first chum salmon was observed on 29 June, the first day of operation, and the last chum salmon was observed on 19 September. Based on the operational period and inclusive of estimated passage, the median passage date was 18 July and the central 50% of the run occurred between 11 July and 26 July (Appendix D1).

Coho salmon escapement past Kanektok River weir in 2004 was estimated to be 87,828 fish (Table 2). Estimates were made for coho salmon in 2004 resulting in an increase of one fish over the observed weir count. The first coho salmon was observed on 9 July and the last coho salmon was observed on 20 September. Coho salmon continued migrating upstream after the weir was dismantled on 21 September. Based on the operational period, the median passage date was 1 September and the central 50% of the run occurred between 20 August and 9 September (Appendix D1).

The total count of pink salmon upstream of Kanektok River weir in 2004 was 98,060 fish (Table 3). No escapement estimate was made for pink salmon in 2004 because picket spacing of the weir panels allows them to freely pass through the weir unobserved and they are not a species targeted for escapement estimation. The first pink salmon was observed on 29 June and the last pink salmon was observed on 18 September.

Dolly Varden, whitefish, and rainbow trout were also counted through the weir in 2004. A total of 9,861 Dolly Varden, 285 whitefish, and 142 rainbow trout were observed passing upstream through the weir during project operations (Table 3). No passage estimates were made for these species because picket spacing of the weir panels allow them to freely pass through the weir unobserved and they are not targeted for escapement determination.

Carcass Counts

Fish carcasses were cleaned off of the weir each day during the operational period (Table 4). A total of 1,496 Chinook, 1,224 sockeye, 6,908 chum, 2,551 pink, and 298 coho salmon carcasses was counted during project operations. Additionally, 25 Dolly Varden, 5 rainbow trout, one Arctic Grayling *Thymallus arcticus*, and one whitefish carcasses were counted.

Drainage Escapement

Kanektok River drainage escapement was estimated for Chinook and sockeye salmon in 2004. Chinook salmon total drainage escapement was estimated to be 42,908 fish, of which 23,380 (54.5%) were estimated to have spawned downstream of the weir (Table 5). Sockeye salmon total drainage escapement was estimated to be 131,873 fish, of which 29,006 (22.0%) were estimated to have spawned downstream of the weir.

Age, Sex and Length Composition Estimates

Kanektok River Weir Escapement

Scale samples, sex, and length were collected from 472 Chinook salmon at the weir in 2004. The samples did not achieve the minimum sample objectives and were not adequate for estimating ASL composition of weir escapement. Age was determined for 428 of the 472 fish sampled (90.6%). Weir escapement was partitioned into 3 temporal strata based on sample dates. Applied to weir escapement, age-1.2 Chinook salmon was the most abundant age class (58.3%), followed by age 1.3 (25.2%), age 1.4 (15.5%), age 1.5 (0.7%), and age 1.1 (0.2%) (Table 6). Sex composition of weir escapement was estimated to include 16,867 males (86.4%) and 2,661 females (13.6%). Mean male length by age class was 413 mm for age-1.1 fish, 583 mm for age-1.2 fish, 692 mm for age-1.3 fish, and 815 mm for age-1.4 fish (Table 7). There was one age-1.5 fish in the sample with a length of 928 mm. Mean female length by age class was 651 mm for age-1.2 fish, 753 mm for age-1.3 fish, 862 mm for age-1.4 fish, and 838 mm for age-1.5 fish. Overall, male lengths ranged from 413 to 983 mm and female lengths ranged from 645 to 965 mm.

Scale samples, sex, and length were collected from 615 sockeye salmon at the weir in 2004. The samples did not achieve the minimum sample objectives and were not adequate for estimating ASL composition of weir escapement. Age was determined for 470 of the 615 fish sampled (78.9%). Weir escapement was partitioned into 3 temporal strata based on sample dates.

Applied to weir escapement, age-1.2 sockeye salmon was the most abundant age class (48.4%), followed by age 1.3 (46.5%), age 2.2 (3.3%), age 1.4 (1.0%), age 2.3 (0.5%), along with age 0.2 and age 0.3 (both at 0.2%) (Table 8). Sex composition of weir escapement was estimated to include 58,054 males (56.5%) and 44,622 females (43.5%). Mean male length by age class was 523 mm for age-1.2 fish, 578 mm for age-1.3 fish, 527 mm for age-2.2 fish, 558 mm for age-1.4 fish, and 559 mm for age-2.3 fish (Table 9). There was one male age-0.2 fish in the sample with a length of 589 mm and one male age-0.3 fish in the sample with a length of 574 mm. Mean female length by age class was 491 mm for age-1.2 fish, 534 mm for age-1.3 fish, and 499 mm for age-2.2 fish. There was one female age-1.4 fish in the sample at a length of 549 mm and there were no female age-0.2, -0.3, and -2.3 fish in the sample. Overall, male lengths ranged from 450 to 631 mm and female lengths ranged from 430 to 595 mm.

Scale samples, sex, and length were collected from 841 chum salmon at the weir in 2004. The samples did not achieve the minimum sample objectives and were not adequate for estimating ASL composition of weir escapement. Age was determined for 736 of the 841 fish sampled (87.5%). Weir escapement was partitioned into 5 temporal strata based on sample dates. Applied to weir escapement, age-0.3 chum salmon was the most abundant age class (49.9%), followed by age 0.4 (44.2 %), age 0.2 (5.7%) and age 0.5 (0.3%) (Table 10). Sex composition of weir escapement was estimated to include 24,056 males (51.8%) and 22,388 females (48.2 %). Mean male length by age class was 540 mm for age-0.2 fish, 579 mm for age-0.3 fish, and 602 mm for age-0.4 fish (Table 11). There were no male age-0.5 fish in the sample. Mean female length by age class was 526 mm for age-0.2 fish, 548 mm for age-0.3 fish, and 564 mm for age-0.4 fish. There was one female age-0.5 fish in the sample at a length of 545 mm. Overall, male lengths ranged from 483 to 673 mm and female lengths ranged from 477 to 634 mm.

Scale samples, sex, and length were collected from 323 coho salmon at the weir in 2004. The samples achieved the minimum sample objectives and were adequate for estimating ASL composition of weir escapement. Age was determined for 257 of the 323 fish sampled (79.5%). Weir escapement was partitioned into 4 temporal strata based on sample dates. Applied to weir escapement, age-2.1 coho salmon was the most abundant age class (95.5%), followed by age 3.1 (3.7%), and age 1.1 (0.8%) (Table 12). Sex composition was estimated at 41,619 males (47.4%) and 46,209 females (52.6 %). Mean male length by age class was 536 mm for age-1.1 fish, 548 mm for age-2.1 fish, and 570 mm for age-3.1 fish (Table 13). Mean female length by age class was 560 mm for age-2.1 fish and 527 mm for age-3.1 fish. There were no female age-1.1 fish in the sample. Overall, male lengths ranged from 410 to 638 mm and female lengths ranged from 428 to 631 mm.

District W-4 Commercial Harvest

Scale samples, sex, and length were collected from 235 Chinook salmon harvested in the 2004 District W-4 commercial fishery. The samples achieved the minimum sample objectives and were adequate for estimating ASL composition of District W-4 commercial harvest. Age was determined for 208 of the 235 fish sampled (88.5%). The harvest was partitioned into 4 temporal strata based on sample dates. Applied to total harvest, age-1.2 Chinook salmon was the most abundant age class (46.6%), followed by age 1.3 (29.4%), age 1.4 (21.7%), age 1.5 (1.9%), and age 1.1 (0.5%) (Table 14). Sex composition was estimated to include 21,907 males (86.0%) and 3,558 females (14.0%). Mean male length by age class was 580 mm for age-1.2 fish, 691 mm for age-1.3 fish, 830 mm for age-1.4 fish, and 863 mm for age-1.5 fish (Table 15). There was one male age-1.1 fish in the sample at a length of 450 mm. Mean female length by age class was

778 mm for age-1.3 fish and 848 mm for age-1.4 fish. There was one female age-1.2 fish in the sample at a length of 635 mm and one female age-1.5 fish in the sample at a length of 830 mm. Overall, male lengths ranged from 450 to 985 mm and female lengths ranged from 635 to 975 mm.

Scale samples, sex, and length were collected from 240 sockeye salmon harvested in the 2004 District W-4 commercial fishery. The samples achieved the minimum sample objectives and were adequate for estimating ASL composition of District W-4 commercial harvest. Age was determined for 217 of the 240 fish sampled (90.4%). The harvest was partitioned into 3 temporal strata based on sample dates. Applied to total harvest, age-1.3 sockeye salmon was the most abundant age class (59.0%), followed by age 1.2 (30.9%), age 1.4 (5.6%), age 0.3 (2.2%), and age 2.3 (0.6%) (Table 16). Sex composition was estimated to include 18,320 males (52.9%) and 16,307 females (47.1%). Mean male length by age class was 587 mm for age-0.3 fish, 506 mm for age-1.2 fish, 580 mm for age-1.3 fish, and 577 mm for age-1.4 fish (Table 17). There were no male age-2.3 fish in the sample. Mean female length by age class was 494 mm for age-1.2 fish, 549 mm for age-1.3 fish, and 559 mm for age-1.4 fish. There was one female age-0.3 fish in the sample at a length of 565 mm and one female age-2.3 fish in the sample at a length of 565 mm. Overall, male lengths ranged from 415 to 635 mm and female lengths ranged from 409 to 665 mm.

Scale samples, sex, and length were collected from 240 chum salmon harvested in the 2004 District W-4 commercial fishery. The samples achieved the minimum sample objectives and were adequate for estimating ASL composition of District W-4 commercial harvest. Age was determined for 225 of the 240 fish sampled (93.7%). The harvest was partitioned into 3 temporal strata based on sample dates. Applied to total harvest, age-0.4 chum salmon was the most abundant age class (55.0%), followed by age 0.3 (40.2%), age 0.2 (4.2%), and age 0.5 (0.6%) (Table 18). Sex composition was estimated to include 14,379 males (55.7%) and 11,441 females (44.3%). Mean male length by age class was 533 mm for age-0.2 fish, 592 mm for age-0.3 fish, and 603 mm for age-0.4 fish (Table 19). There was one male age-0.5 fish in the sample at a length of 549 mm. Mean female length by age class was 563 mm for age-0.3 fish and 581 mm for age-0.4 fish. There was one female age-0.2 fish in the sample at a length of 570 mm and no female age-0.5 fish in the sample. Overall, male lengths ranged from 464 to 680 mm and female lengths ranged from 510 to 623 mm.

Scale samples, sex, and length were collected from 220 coho salmon harvested in the 2004 District W-4 commercial fishery. The samples achieved the minimum sample objectives and were adequate for estimating ASL composition of District W-4 commercial harvest. Age was determined for 186 of the 220 fish sampled (84.5%). The harvest was partitioned into 3 temporal strata based on sample dates. Applied to total harvest, age-2.1 coho salmon was the most abundant age class (94.3%), followed by age 1.1 (4.8%), and age 3.1 (0.9%) (Table 20). Sex composition was estimated at 44,281 males (53.7%) and 38,117 females (46.3%). Mean male length by age class was 534 mm for age-1.1 fish and 572 mm for age-2.1 fish (Table 21). There was one male age-3.1 fish in the sample at a length of 610 mm. Mean female length by age class was 565 mm for age-1.1 fish and 576 mm for age-2.1 fish. There was one female age-3.1 fish in the sample with a length of 560 mm. Overall, male lengths ranged from 478 to 639 mm and female lengths ranged from 480 to 647 mm.

ATMOSPHERIC AND HYDROLOGICAL MONITORING

Atmospheric and hydrological observations were recorded daily from 16 June through 21 September (Table 22). Air temperatures ranged from 4 to 32˚ C. Water temperature was more consistent ranging from 6 to 15˚ C. Several rain events resulted in accumulations of trace amounts up to 0.7 inches during a 24-hour period. Relative water level ranged from 20 to 65 cm. Water chemistry samples were not collected in 2004.

DISCUSSION

PROJECT OPERATIONS

Operation of the weir in 2004 was successful and nearly complete enumeration of Chinook, sockeye, and chum salmon escapement, and Dolly Varden migration past the weir occurred. Initial weir installation occurred during the last week in April to take advantage of winter base-flow just after ice-out. Towards the end of installation, rising water caused by snowmelt and spring precipitation prevented installation of approximately 50 ft of weir in the deepest part of the channel. The fish passage chutes and trap were not initially installed in order to prevent damage to these components from debris during high water. The weir remained inoperative throughout May and early June and NVK crews regularly monitored the weir during this time period. The weir crew arrived on site for the season on 15 June, but continued high water prevented installation of the remaining weir components until 29 June. This is comparable to the starting dates of 1 July 2002 and 24 June 2003.

Trapping sockeye salmon for ASL sampling proved to be difficult. Sockeye were reluctant to enter the trap when other fish were present or when the fyke doors on the trap were set. This problem was solved though active sampling of sockeye salmon. The Kuskokwim River experienced one of the lowest water levels in 50 years. Water levels throughout the Kuskokwim area, including Kanektok River, were well below average. Low water throughout the season contributed towards uninterrupted weir operations in 2004. The passage chute located towards the center of the weir became ineffective at passing fish because too little water was flowing through it. As a result, the majority of fish were counted through the weir at the fish trap located in the deepest section of the channel. Low water did not appear to hamper fish passage through the weir. Additionally, navigation of the river by jet boat proved difficult during low water conditions.

ESCAPEMENT MONITORING AND ESTIMATES

Chinook salmon weir escapement in 2004 of 19,528 fish was the highest escapement of 3 years with complete data (Figure 3). Weir escapement in 2004 was 57.9% higher than the next highest escapement of 8,221 Chinook salmon in 2003. The Chinook salmon aerial survey count of 28,375 was the highest aerial survey count on record and exceeded the upper end of the SEG range by 71.8% (Appendix C1). It should be noted that aerial survey conditions were ideal and fish visibility was optimal because of high water clarity, extreme low water, and near perfect weather conditions on the day of the survey. It is possible that these conditions inflated the survey count compared to historical surveys flown under less optimal conditions. The drainage escapement estimate of 42,908 fish is 54.5% higher than the weir escapement indicating approximately 50% of Chinook salmon returning to Kanektok River in 2004 spawned downstream of the weir (Table 5). Total exploitation of Kanektok River Chinook salmon in

2004 was estimated to be 40.9%. This estimate is based on the drainage escapement estimate, District W-4 commercial harvest, and estimates of subsistence and sport fishing harvest. Subsistence and sport fish harvest estimates were not available at the time of publication so the most recent 10-year average (1994 through 2003) of Quinhagak Subsistence and Kanektok River sport fish harvest was used in determining total run and exploitation.

Sockeye salmon weir escapement in 2004 of 102,867 fish was the second highest escapement of 3 years with complete data (Figure 3). Weir escapement in 2004 was 19.3% lower than the high escapement of 127,471 sockeye salmon in 2003. The sockeye salmon aerial survey count of 78,380 fish was also the highest aerial survey count on record and exceeded the upper end of the SEG range by 56.6% (Appendix C1). It is notable that a higher escapement in 2003 resulted in a relatively average aerial survey count of 21,335 fish. Similar to Chinook aerial surveys, conditions were ideal and it is possible that these conditions inflated the survey count compared to historical surveys flown under less optimal conditions. Additionally, 22% of the aerial survey count was observed downstream of the weir. In less optimal survey conditions, these fish may not have been observed or identified to species correctly. It is also unclear whether tributaries of Kegati/Pegati Lake are surveyed on a consistent basis. The majority of sockeye salmon counted in the lake index area in 2004 were observed in 3 major feeder tributaries of the lake and not in the lake itself. These factors combined may have inflated the aerial survey count compared to historical aerial survey results. The drainage escapement estimate of 131,873 is 22% higher than the weir escapement which indicates that approximately 20% of sockeye salmon returning to Kanektok River in 2004 spawned downstream of the weir (Table 5). Total exploitation of Kanektok River sockeye salmon in 2004 was estimated to be 21.6%. This estimate is based on the drainage escapement estimate, District W-4 commercial harvest, and estimates of subsistence and sport fishing harvest. Subsistence and sport fish harvest estimates were not available at the time of publication so the most recent 10-year average (1994 through 2003) of Quinhagak Subsistence and Kanektok River sport fish harvest was used in determining total run and exploitation.

The methodology used to estimate drainage escapement for Chinook and sockeye salmon in 2004 is not optimal and is subject to the inaccuracies inherent to aerial surveys; however, the aerial survey data are only used to determine the proportion of fish upstream and downstream of the weir while the abundance of fish in the estimate is weighted by weir escapement counts. Therefore, the drainage escapement estimate represents a more accurate index compared to an aerial survey because it is weighted by weir escapement counts. Regardless, a more rigorous methodology should be employed on Kanektok River to more accurately determine the proportion of fish downstream of the weir and for use in verifying aerial survey results.

Data are not available to estimate the productivity of salmon stocks in the Kanektok River and place 2004 estimates of exploitation in perspective. ADF&G staff generally use a Ricker-type spawner-recruit model to estimate the number of spawners that provide maximum sustained yield (MSY), total return at MSY, and the resulting exploitation fraction. Exploitation at MSY for 9 sockeye stocks in Bristol Bay averaged 65% (Fair et al. 2004) and ranged from 49% for the least productive Kvichak River off-peak runs to 77% for Ugashik sockeye salmon. Similarly derived estimates of exploitation at MSY for 26 Chinook salmon stocks in Oregon, Washington, and Alaska averaged 67% (C. Parkin, Department of Fisheries and Oceans Canada; personal communication). Exploitation at MSY for Bering Sea Chinook salmon from Salcha, Chena (Evenson 2002), and Nushagak Rivers (Fair et al. 2004) averaged 75%. In comparison to these stocks the exploitation of Kanektok River sockeye salmon is well below the level providing MSY and Chinook salmon well below other northern Alaskan stocks.

It is difficult to access the quality or any directional bias of the estimates of total abundance and exploitation. Three main issues affect these estimates for 2004; 1) lack of 2004 estimates of subsistence and sport fish harvests, 2) lack of escapement monitoring of other tributaries and salmon stocks that are harvested in District W-4, and 3) the comparability of aerial surveys of the Kanektok River above and below the weir. The 10-year average subsistence and sport fish harvest was added to the 2004 commercial harvest for an estimate of total harvest. The contribution of other stocks of salmon to the District W-4 harvest is unknown. An important assumption underlying the estimate of total drainage escapement is that the same proportion of salmon is seen in aerial surveys flown above and below the weir.

The use of the 10-year average sport and subsistence harvest should not have a large affect on the 2004 estimates of total abundance and exploitation. For sockeye salmon, subsistence and sport harvest represent 5% of the total and misrepresenting the 2004 value by a historic mean will make little difference. In contrast, on average 23% of the Chinook harvest is taken by subsistence and sport fishers and the coefficient of variation for these Chinook harvests are 17% and 42% respectively. If the actual 2004 harvest is greater than the 10-year mean then total return and exploitation will be higher and the estimate published here biased low. If the 2004 actual harvest is lower than the mean then the opposite will occur. Yet even when substituting the highest Chinook subsistence and sport harvests since 1994 the estimated exploitation rate increases to only 43% and if these harvests are ignored the exploitation rate drops to 37%, both values well below other Chinook stocks exploitation at MSY.

The direction of the bias in total abundance and exploitation rates due to the omission of other stocks of Chinook and sockeye salmon in the escapement is known. The estimates of total abundance will be biased low and the exploitation will be biased high. The Arolik River is the only other significant salmon producing river that drains into District W-4, and is thought to have lower abundance relative to the Kanektok River. Kuskokwim River salmon potentially pass through District W-4 on their return migration. Few Chinook salmon and no sockeye salmon tagged in District W-4 in 1969 and 1970 were recovered in the Kuskokwim River (Baxter *unpublished*). The bias is thought to be small and in a direction that leads managers to take a precautionary approach to fishery management.

An assumption necessary for an unbiased estimate of total escapement, abundance, and exploitation is that the percent of salmon observed during aerial surveys upriver and downriver from the weir on the Kanektok River are equal. Differences could arise with differences in environmental conditions or salmon run timing. If a higher proportion of salmon present are observed above the weir, and the same relationship is assumed for the area below the weir, total escapement and abundance will be underestimated and exploitation will be biased high. The reverse will occur if a lower percent of the salmon present are counted during the aerial survey above the weir than occurred during the survey below the weir.

Aerial surveys of the Kanektok River above and below the weir are typically conducted on the same day so conditions and methods used during each survey are also similar. Additionally, it is likely that surveys would be conducted by the same observer in a given year. This reduces the possibility of bias caused by differences in methods or different observers employed between the two areas; however, experienced staff have described hydrologic differences between river sections above and below the weir that may affect Kanektok River aerial surveys. Although overall depth, water color, riparian vegetation, and substrate type is nearly identical between river sections, the river is more braided and spread out over a wider channel below the weir. This braiding makes it difficult to observe every channel for spawning fish during a given survey. This may result in a higher percentage of fish being observed upstream of the weir if fewer salmon are observable in the braided sections downstream. Determining whether this actually occurs or not is difficult to do, but the result would bias escapement estimates low and exploitation high.

A different percent observed during aerial surveys above and below the weir may also arise if spawning time is not the same or the area surveyed differs. For Chinook and coho salmon, these factors are not as pronounced because they are primarily main channel spawners, their peak spawning period is consistent between areas, and similar areas are surveyed. In contrast the majority of sockeye salmon are lake and lake tributary spawners. The time when sockeye salmon enter the lakes and later move into lake tributaries to spawn is a critical factor for sockeye salmon aerial surveys. If few sockeye salmon are observed in the lakes and the lake tributaries are not surveyed, it will be unknown whether abundance was actually low (small percent observed) or the majority of sockeye salmon had already moved into the lake tributaries to spawn. In order to reduce this potential for bias, sockeye salmon aerial surveys should be conducted around the perimeter of the lakes but also on the lake spawning tributaries on a consistent annual basis. Historically, it is unclear whether sockeye aerial surveys of the Kanektok River drainage have consistently included lake tributaries. This uncertainty has been addressed in recent years through improvements and standardization of the Kuskokwim Area aerial survey program and the inclusion of lake spawning tributaries in all sockeye salmon aerial surveys.

Lastly, the timing of aerial surveys must be such that few salmon counted below the weir will pass through the weir after the survey has been conducted. Historically, 90% of Chinook and sockeye salmon have passed the weir by late July and early August when surveys are conducted.

Though it is not known for certain, estimates of exploitation rates for Chinook and chum salmon in 2004 seem reasonable. No large source of bias is apparent and any overall bias would likely skew actual exploitation high. The exploitation percents for Kanektok River Chinook and sockeye salmon seem low given the productivity seen in other and adjacent salmon stocks.

Chum salmon weir escapement in 2004 of 46,444 fish was the highest escapement of 3 years with complete data (Figure 3). Weir escapement in 2004 was 9.5% higher than the next highest escapement of 42,014 chum salmon in 2002. It is notable that chum salmon escapements in all 3 years with available data were similar and within 13% of each other indicating chum salmon escapement to Kanektok River weir is relatively stable. However, it is known that large numbers of chum salmon, perhaps in excess of weir escapements, spawn downstream of the weir. Aerial surveys are not an effective method for determining chum salmon escapement indices because of chum salmon run timing and spawning behavior is protracted. By extension, aerial surveys would not be an accurate method for determining chum salmon drainage escapement on Kanektok River unless multiple surveys could be conducted throughout the chum salmon run. Currently, funding and personnel shortages preclude this from occurring. Continued accumulation of chum salmon weir escapement data will increase the ability to evaluate Kanektok River chum salmon escapements in the future.

Coho salmon weir escapement in 2004 of 87,828 fish was the highest escapement of 4 years with complete data (Figure 3). Weir escapement in 2004 was 17.5% higher than the next highest escapement of 72,448 coho salmon in 2003. Coho salmon aerial surveys were not conducted in 2004 because of poor weather conditions in late September. There is anecdotal evidence that coho salmon migration within Kanektok River may have been delayed because of prolonged low water conditions throughout August and September. Coho salmon migration timing has been shown to coincide with rising water levels (Linderman et al. 2003a). During their inriver spawning migration, coho salmon typically move in pulses that are triggered by even small increases in water level. Water level was dropping throughout much of August and September, which may have reduced or delayed the migration pulses that coho salmon typically exhibit. Additionally, approximately 2,000 coho salmon per day were still being counted through the weir just prior to the end of project operations on 20 September. While the crew was dismantling the weir after 20 September, coho salmon were observed migrating past the weir site in large numbers for several days. The weir escapement reported here should be viewed as an index of coho salmon escapement past the weir in 2004 as the actual total escapement past the weir would have been higher if counts had continued.

Chinook salmon run timing in 2004 was intermediate to 2002 and 2003 (Figure 4, Appendix D1). Overall, Chinook salmon run timing has been similar between years. Sockeye salmon run timing in 2004 was similar to 2003 and earlier overall to 2002. Chum salmon run timing was similar to 2002, but earlier overall to 2003. Coho salmon run timing in 2004 was slightly later compared to all previous years. The inter-annual run timing pattern between these species has varied. For example, in 2004 Chinook salmon run timing was intermediate, sockeye and chum salmon were early, and coho salmon were late.

The use of carcass counts for estimating “stream life” of Chinook and chum salmon has been abandoned because this analysis is believed unreliable (Linderman et al. 2003a, b). Stream life estimates from carcass counts are unreliable because of the small percentage of carcasses recovered relative to total escapement, annual variability of carcass to escapement percentages, and potential biases in sex ratios between carcasses and escapement. The small percentage of carcasses at the weir has positive ramifications for aerial stream surveys because most observable spawning salmon and their carcasses remain in the river when surveys are typically flown. Another benefit is protracted retention of carcasses on the spawning grounds enhances absorption of marine derived nutrients within Kanektok River (Cederholm et al. 1999; 2000).

AGE, SEX AND LENGTH COMPOSITION ESTIMATES

Chinook, sockeye, and chum salmon minimum sample objectives for Kanektok River weir have not been met in any year of project operation. Chinook salmon abundance is typically too low to successfully achieve 4 or more pulses of 210 fish each. Chinook salmon escapement in 2004 was more than double any previous escapement and the minimum sample objective was still not met. The majority of weir projects in the Kuskokwim area, including Kanektok River weir, experience difficulties in achieving Chinook salmon ASL sample objectives (Gilk and Molyneaux 2004; Linderman et al. 2003b; 2004; Shelden et al. 2004; Stewart 2004). Lower relative abundance compared to other species and difficulties in acquiring adequate numbers of Chinook salmon in the fish trap have made Chinook salmon ASL sample objectives difficult to achieve if not unrealistic. Sockeye and chum salmon sample objectives for Kanektok River weir are also difficult to achieve. In order to successfully achieve the objectives, 200 to 210 fish must be sampled each week for a minimum of 6 weeks. Chum and sockeye runs last 5 to 6 weeks at a maximum. It is unrealistic to expect 200 to 210 pulse samples at the onset and end of their respective runs when weekly counts may be slightly more or less than the sample size objective. Additionally, Kanektok River weir ASL sample objectives are dissimilar to ASL sample objectives at other Kuskokwim Area escapement and ASL assessment projects. In general, most Kuskokwim Area ASL objectives for all species require a minimum of 3 pulse samples, each one representing a third of the overall salmon run. It should be noted that these alternate objectives are the minimum required and if exceeded, ASL results can be processed and analyzed accordingly to represent ASL composition in more detail (i.e. temporal changes in ASL composition throughout the run). Kanektok River sample objectives should be modified to account for differential abundance throughout the run and the minimum number of pulse samples should be reduced to come in line with ASL objectives used at the majority of other Kuskokwim Area ASL assessment projects.

The following discussion focuses on describing ASL trends seen within Kanektok River weir escapement and District W-4 commercial harvest in 2004. Some comparisons are made indicating similarities and differences between weir escapement and commercial harvest ASL estimates. The limited historical data set for Kanektok River weir precludes any long term comparisons in weir escapement ASL trends. Probably the greatest value in collecting ASL information is for future development of spawner-recruit models used for establishing escapement goals (e.g., Clark and Sandone 2001). The information can also be used for forecasting future runs, and to illustrate long-term trends in ASL composition (for example, Bigler et al. 1996).

Chinook Salmon

Age 1.2 was the dominant age class for both escapement and commercial ASL estimates and the percentages were similar at 58.3 and 46.6 respectively for a difference of 11.7% (Figure 5, Tables 6 and 14). This is encouraging for future returns as such high percentages of age-1.2 fish in both estimates indicates a good return of age-1.3 fish in 2005. Males were dominant in both the weir and commercial estimates and the percentages were nearly identical at 86.4% and 86.0% for a difference of only 0.4%. The high male percentage in both estimates was likely a function of the high percentage of age-1.2 fish which were predominantly male with only 0.6% and 0.5% female age-1.2 fish in the weir and commercial estimates respectively. Males exhibited length partitioning by age class for both weir escapement and commercial ASL estimates (Figure 6). Mean male lengths by age class were nearly identical between the escapement and commercial estimates which indicate a distinct increase in mean length with age class. Females exhibited similar mean length partitioning by age class (Figure 7). Mean Female length by age class was also nearly identical between escapement and commercial ASL estimates which indicate a distinct increase in mean length with age class except for age-1.5 female fish. This discrepancy may be caused by the small number of age-1.5 female fish in the escapement and commercial samples.

Sockeye Salmon

Age 1.2 was the dominant age class for escapement and age 1.3 was dominant for the commercial ASL estimates (Tables 8 and 16, Figure 5). This discrepancy may have been caused by a sampling bias in the estimates, a harvest bias that selected for age-1.3 fish in the 2004 commercial fishery, or a trend which cannot yet be analyzed until additional data are collected in coming years. In 2002 and 2003, the only other years for comparison, the percentage of age-1.2

and age-1.3 sockeye salmon were nearly identical between the escapement and commercial estimates (Figure 8). Male to female percentages were approximately 50-50 for the escapement and commercial ASL estimates with male escapement at 56.5% and male commercial at 52.9%. Males did not exhibit length partitioning by age class for both weir escapement and commercial ASL estimates (Figure 6). Mean male lengths by age class were nearly identical between the escapement and commercial estimates which did not indicate any increase in mean length with age class. Females exhibited minor mean length partitioning by age class (Figure 7). Mean Female length by age class was also nearly identical between escapement and commercial ASL estimates and although they indicated a slight increase in mean length with age class, overall mean length did not increase dramatically with age class.

Chum Salmon

Age 0.3 was the dominant age class for escapement and age 0.4 was dominant for the commercial ASL estimates (Figure 5, Tables 10 and 18). This discrepancy may also indicate a sampling or harvest bias: however, it is somewhat minor in comparison to sockeye salmon in 2004 and it has occurred in previous years. In 2002, the percentages of age-0.3 and age-0.4 chum salmon were also contrary to each other and in 2003 the percentages were nearly identical (Figure 8). Collection of paired escapement and commercial ASL data in coming years will aid in analyzing this discrepancy as a trend or bias. Male to female percentages were approximately 50-50 for the escapement and commercial ASL estimates with male escapement at 51.8% and male commercial at 55.7%. Males exhibited minor mean length partitioning by age class for both weir escapement and commercial ASL estimates (Figure 6). Mean male lengths by age class were nearly identical between the escapement and commercial estimates which indicate a minor increase in mean length with age class except for commercial age-0.5 male fish. This discrepancy may be caused by the small number of age-0.5 male fish in the commercial samples. Females did not exhibit mean length partitioning by age class (Figure 7). Mean female lengths by age class were nearly identical between the escapement and commercial estimates which did not indicate any increase in mean length with age class.

Coho Salmon

Age 2.1 was the dominant age class for both escapement and commercial ASL estimates and the percentages were similar at 95.5% and 94.3% respectively for a difference of 1.2% (Tables 12 and 20, Figure 5). This is typical of coho salmon age structure where age-2.1 fish are the predominant age class. Male to female percentages were approximately 50-50 for the escapement and commercial ASL estimates with male escapement at 47.4% and male commercial at 53.7%. Males exhibited minor mean length partitioning by age class for both weir escapement and commercial ASL estimates (Figure 6). Mean male lengths by age class were nearly identical between the escapement and commercial estimates which indicate a minor increase in mean length with age class. Females did not exhibit mean length partitioning by age class (Figure 7). Mean female lengths by age class were nearly identical between the escapement and commercial estimates, which did not indicate any increase in mean length with age class.

CONCLUSIONS

Since the inception of the resistance board floating weir in 2001 the project has:

1. Demonstrated the ability to successfully install and operate a weir in Kanektok River during the targeted time frame.
2. Demonstrated the ability to achieve its annual objectives with the exception of ASL sample objectives.
3. Provided escapement and run timing information for Kanektok River salmon and Dolly Varden populations.
4. Provided a platform for the collection of ASL information from the salmon escapement and Dolly Varden migrating past the weir.

RECOMMENDATIONS

Establishing long term funding for the project would ensure a long term escapement, run timing, and ASL database needed to better understand the spawning populations in Kanektok River. A long term database would lead to the establishment of Biological Escapement Goals for the spawning salmon populations, improving management of the spawning stocks for sustainable yields.

Implementing an inriver Chinook salmon radio telemetry study would increase the accuracy in determining the number of Chinook salmon spawning below the Kanektok River weir, and in turn increase the accuracy of drainage escapement estimates. Radio telemetry could also be used to compare and contrast distribution of salmon observed from aerial surveys with radio telemetry results in order to ground truth aerial survey distribution estimates. Such a study could be expanded in the future to examine the number chum and coho salmon spawning below the weir in addition to their spawning distribution.

The current Chinook, sockeye, and chum salmon ASL sample objectives should be reevaluated and modified. The current sample objectives are unrealistic based on run timing and differential abundance throughout the salmon runs. The ASL objectives should be modified to reflect ASL objectives used at other Kuskokwim Area ASL assessment projects where a minimum of 3 pulse samples representing each third of the overall run is required, but may be exceeded and analyzed accordingly if ASL results allow.

Continue the cooperative effort between NVK, USFWS, and ADF&G, with ADF&G maintaining its proactive role in the mentoring of NVK technicians, the development of the project, and the oversight of seasonal operation. Regular consultations between ADF&G, NVK, and USFWS occurred throughout the field season, coordinating logistics, discussing results, and exchanging ideas. NVK provided 2 technicians for the 2004 season. USFWS used the weir as a platform for a Dolly Varden population study to better understand their spawning populations in Kanektok River. The project can be used in future years as a platform for the study of other anadromous and resident freshwater species in Kanektok River.

Installation of the weir should continue to occur in mid to late April to ensure the weir is operational by mid to late June. High water level and water flow inherent to Kanektok River in May has the potential to substantially delay installation until July or later depending on the severity and duration of high water conditions. In future years, crews should install the passage chute with a debris deflecting structure in order to increase the possibility of full operation by mid-June.

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TABLES AND FIGURES

Table 1.–District W-4 commercial harvest by period and exvessel value, 2004.

	Date	No. Permits	Chinook		Sockeye		Chum		Coho	
Period	**Caught**	**Fished**	**Harvest**	**Pounds**	**Harvest**	**Pounds**	**Harvest**	**Pounds**	**Harvest**	**Pounds**
1	6/15	40	3,788	44,042	124	858	203	1,549	0	0
2	6/17	44	3,179	34,923	258	1,741	619	4,420	0	0
3	6/22	50	2,625	31,118	1,508	11,000	1,404	10,790	0	0
4	6/24	72	3,429	41,236	2,555	18,030	3,074	23,508	0	0
5	6/29	59	3,424	42,394	2,897	19,464	1,678	12,233	0	0
6	7/1	45	1,959	23,784	3,156	21,243	1,908	14,370	0	0
7	7/5	63	2,269	27,261	6,099	39,437	2,876	20,324	0	0
8	7/7	54	1,562	20,122	4,742	29,153	1,909	13,088	0	0
9	7/9	56	811	10,448	4,836	30,300	2,549	17,254	0	0
10	7/12	53	699	9,798	3,011	18,142	3,367	22,976	0	0
11	7/14	41	881	10,646	2,533	15,109	3,243	21,345	0	0
12	7/16	31	412	5,720	1,444	9,478	1,562	10,175	0	0
13	8/2	35	89	1,210	375	1,977	447	2,881	4,131	30,043
14	8/4	36	83	1,146	226	1,250	325	2,054	4,876	35,575
15	8/6	36	38	550	174	996	195	1,356	2,534	18,474
16	8/9	44	50	920	133	839	118	866	8,977	66,717
17	8/11	41	44	638	103	606	96	659	10,267	76,374
18	8/13	30	31	360	56	348	26	161	5,618	41,308
19	8/16	53	28	406	49	307	48	322	9,861	72,880
20	8/18	53	21	289	220	1,648	63	435	8,966	67,291
21	8/20	46	14	245	92	631	51	378	6,736	51,434
22	8/23	37	9	160	17	109	20	155	7,284	55,225
23	8/25	44	9	207	13	90	27	179	6,113	46,408
24	8/27	39	11	263	6	36	12	83	7,035	55,155
Total		116	25,465	307,886	34,627	222,792	25,820	181,561	82,398	616,884
Avgerage Weight				12.09		6.43		7.03		7.49
Average Price				$0.35		$0.35		$0.10		$0.36
Exvessel value				$107,752		$77,956		$18,156		$222,272

Total Number of Fish	168,310
Total Pounds	1,329,123
Total Exvessel Value	$426,135

Table 2.–Daily and cumulative Chinook, sockeye, chum, and coho salmon passage, Kanektok River weir, 2004.

	Chinook		Sockeye		Chum		Coho	
Date	**Daily**	**Cum.**	**Daily**	**Cum.**	**Daily**	**Cum.**	**Daily**	**Cum.**
6/29	8	8	309	309	82	82	0	0
6/30	129	137	2,155	2,464	586	668	0	0
7/1	180	317	2,632	5,096	648	1,316	0	0
7/2	94	411	1,609	6,705	240	1,556	0	0
7/3	137	548	2,258	8,963	353	1,909	0	0
7/4	126	674	2,208	11,171	562	2,471	0	0
7/5	209	883	3,296	14,467	572	3,043	0	0
7/6	158	1,041	3,327	17,794	553	3,596	0	0
7/7	574	1,615	6,779	24,573	1,390	4,986	0	0
7/8	475	2,090	6,015	30,588	1,673	6,659	0	0
7/9	610	2,700	7,516	38,104	1,707	8,366	2	2
7/10	908	3,608	6,732	44,836	2,006	10,372	2	4
7/11	711	4,319	5,882	50,718	1,925	12,297	5	9
7/12	1,357	5,676	5,969	56,687	2,049	14,346	11	20
7/13	574	6,250	3,016	59,703	1,147	15,493	16	36
7/14	404	6,654	3,358	63,061	1,048	16,541	6	42
7/15	608[a]	7,262	3,021[a]	66,082	1,515[a]	18,056	5[a]	47
7/16	887	8,149	2,285	68,367	1,432	19,488	8	55
7/17	618	8,767	2,271	70,638	1,256	20,744	3	58
7/18	819	9,586	2,276	72,914	2,473	23,217	1	59
7/19	949[a]	10,535	2,421[a]	75,335	2,328[a]	25,545	1[a]	60
7/20	1,168	11,703	2,892	78,227	1,579	27,124	4	64
7/21	773	12,476	1,984	80,211	1,818	28,942	5	69
7/22	692	13,168	2,479	82,690	1,130	30,072	11	80
7/23	611	13,779	2,218	84,908	1,300	31,372	13	93
7/24	453	14,232	2,381	87,289	1,225	32,597	25	118
7/25	540	14,772	2,247	89,536	989	33,586	46	164
7/26	443	15,215	1,628	91,164	1,057	34,643	29	193
7/27	660	15,875	1,566	92,730	1,299	35,942	37	230
7/28	385	16,260	691	93,421	688	36,630	35	265
7/29	317	16,577	1,070	94,491	848	37,478	43	308
7/30	440	17,017	989	95,480	1,002	38,480	97	405
7/31	341	17,358	837	96,317	891	39,371	168	573
8/1	434	17,792	841	97,158	944	40,315	210	783
8/2	344	18,136	860	98,018	818	41,133	345	1,128
8/3	350	18,486	625	98,643	837	41,970	378	1,506
8/4	151	18,637	480	99,123	442	42,412	236	1,742
8/5	137	18,774	367	99,490	455	42,867	317	2,059
8/6	60	18,834	343	99,833	351	43,218	315	2,374
8/7	143	18,977	391	100,224	575	43,793	491	2,865
8/8	68	19,045	228	100,452	285	44,078	386	3,251
8/9	60	19,105	276	100,728	376	44,454	721	3,972
8/10	39	19,144	155	100,883	305	44,759	389	4,361
8/11	85	19,229	224	101,107	299	45,058	1,148	5,509
8/12	42	19,271	141	101,248	255	45,313	693	6,202

-continued-

Table 2.–(Page 2 of 2).

Date	Chinook Daily	Chinook Cum.	Sockeye Daily	Sockeye Cum.	Chum Daily	Chum Cum.	Coho Daily	Coho Cum.
8/13	37	19,308	122	101,370	200	45,513	1,370	7,572
8/14	31	19,339	121	101,491	159	45,672	2,083	9,655
8/15	13	19,352	102	101,593	95	45,767	1,494	11,149
8/16	26	19,378	155	101,748	150	45,917	2,182	13,331
8/17	23	19,401	128	101,876	123	46,040	2,671	16,002
8/18	18	19,419	62	101,938	75	46,115	2,522	18,524
8/19	8	19,427	45	101,983	33	46,148	1,156	19,680
8/20	18	19,445	52	102,035	56	46,204	2,412	22,092
8/21	7	19,452	79	102,114	42	46,246	1,986	24,078
8/22	4	19,456	50	102,164	38	46,284	1,645	25,723
8/23	7	19,463	36	102,200	26	46,310	1,240	26,963
8/24	5	19,468	62	102,262	33	46,343	1,830	28,793
8/25	9	19,477	58	102,320	13	46,356	2,212	31,005
8/26	8	19,485	72	102,392	24	46,380	4,103	35,108
8/27	3	19,488	21	102,413	6	46,386	1,875	36,983
8/28	3	19,491	21	102,434	3	46,389	782	37,765
8/29	3	19,494	39	102,473	4	46,393	576	38,341
8/30	9	19,503	21	102,494	8	46,401	1,144	39,485
8/31	6	19,509	33	102,527	8	46,409	2,543	42,028
9/1	5	19,514	39	102,566	7	46,416	3,466	45,494
9/2	1	19,515	31	102,597	5	46,421	3,818	49,312
9/3	1	19,516	28	102,625	2	46,423	2,974	52,286
9/4	1	19,517	21	102,646	2	46,425	1,989	54,275
9/5	0	19,517	19	102,665	0	46,425	1,640	55,915
9/6	3	19,520	27	102,692	4	46,429	2,376	58,291
9/7	0	19,520	19	102,711	2	46,431	2,030	60,321
9/8	2	19,522	20	102,731	0	46,431	2,982	63,303
9/9	1	19,523	27	102,758	5	46,436	3,577	66,880
9/10	2	19,525	20	102,778	1	46,437	2,897	69,777
9/11	0	19,525	18	102,796	1	46,438	2,789	72,566
9/12	0	19,525	13	102,809	0	46,438	2,827	75,393
9/13	0	19,525	8	102,817	0	46,438	1,439	76,832
9/14	0	19,525	4	102,821	1	46,439	1,294	78,126
9/15	2	19,527	12	102,833	2	46,441	1,546	79,672
9/16	0	19,527	10	102,843	1	46,442	1,517	81,189
9/17	0	19,527	3	102,846	0	46,442	1,220	82,409
9/18	0	19,527	5	102,851	1	46,443	1,573	83,982
9/19	0	19,527	7	102,858	1	46,444	1,941	85,923
9/20	1	19,528	9	102,867	0	46,444	1,905	87,828
Total	19,528		102,867		46,444		87,828	
Observed	19,406		102,443		46,194		87,827	
Estimate	122		424		250		1	
% Observed	99.4		99.8		99.5		100.0	

[a] Daily passage was partially estimated because of a breach in the weir.

Table 3.–Daily and cumulative pink salmon, Dolly Varden, whitefish, and rainbow trout passage, Kanektok River weir, 2004.

	Pink Salmon		Dolly Varden		Whitefish		Rainbow Trout	
Date	**Daily**	**Cum.**	**Daily**	**Cum.**	**Daily**	**Cum.**	**Daily**	**Cum.**
6/29	5	5	2	2	2	2	2	2
6/30	68	73	12	14	3	5	6	8
7/01	73	146	20	34	7	12	5	13
7/02	37	183	8	42	5	17	5	18
7/03	38	221	15	57	15	32	2	20
7/04	68	289	17	74	0	32	5	25
7/05	84	373	25	99	4	36	7	32
7/06	75	448	81	180	8	44	0	32
7/07	157	605	325	505	11	55	4	36
7/08	169	774	248	753	20	75	10	46
7/09	296	1,070	337	1,090	8	83	5	51
7/10	372	1,442	375	1,465	32	115	6	57
7/11	461	1,903	374	1,839	24	139	0	57
7/12	546	2,449	237	2,076	12	151	3	60
7/13	351	2,800	86	2,162	5	156	1	61
7/14	325	3,125	74	2,236	1	157	0	61
7/15	333 [a]	3,458	101 [a]	2,337	4 [a]	161	1 [a]	62
7/16	385	3,843	109	2,446	0	161	0	62
7/17	319	4,162	94	2,540	0	161	0	62
7/18	601	4,763	243	2,783	2	163	0	62
7/19	703 [a]	5,466	480 [a]	3,263	0 [a]	163	0 [a]	62
7/20	949	6,415	341	3,604	5	168	3	65
7/21	1,237	7,652	342	3,946	2	170	1	66
7/22	1,167	8,819	235	4,181	3	173	1	67
7/23	1,261	10,080	254	4,435	1	174	3	70
7/24	2,384	12,464	261	4,696	4	178	6	76
7/25	2,922	15,386	314	5,010	1	179	14	90
7/26	2,864	18,250	237	5,247	1	180	0	90
7/27	5,416	23,666	237	5,484	3	183	5	95
7/28	2,864	26,530	104	5,588	5	188	1	96
7/29	3,371	29,901	132	5,720	1	189	3	99
7/30	3,924	33,825	125	5,845	1	190	5	104
7/31	4,050	37,875	173	6,018	1	191	1	105
8/01	7,135	45,010	228	6,246	4	195	2	107
8/02	6,124	51,134	431	6,677	1	196	3	110
8/03	9,367	60,501	303	6,980	2	198	5	115
8/04	4,493	64,994	153	7,133	3	201	0	115
8/05	2,959	67,953	141	7,274	2	203	0	115
8/06	1,496	69,449	320	7,594	5	208	0	115
8/07	4,731	74,180	390	7,984	1	209	0	115
8/08	2,086	76,266	58	8,042	3	212	0	115
8/09	2,504	78,770	200	8,242	5	217	0	115
8/10	1,788	80,558	148	8,390	2	219	0	115
8/11	2,089	82,647	155	8,545	3	222	0	115

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Table 3.–Page 2 of 2.

	Pink Salmon		Dolly Varden		Whitefish		Rainbow Trout	
Date	**Daily**	**Cum.**	**Daily**	**Cum.**	**Daily**	**Cum.**	**Daily**	**Cum.**
8/12	2,334	84,981	98	8,643	2	224	6	121
8/13	2,003	86,984	47	8,690	2	226	0	121
8/14	1,292	88,276	39	8,729	2	228	1	122
8/15	862	89,138	169	8,898	12	240	0	122
8/16	1,679	90,817	242	9,140	3	243	4	126
8/17	1,459	92,276	195	9,335	4	247	2	128
8/18	954	93,230	139	9,474	6	253	0	128
8/19	399	93,629	36	9,510	4	257	2	130
8/20	715	94,344	48	9,558	1	258	0	130
8/21	520	94,864	51	9,609	1	259	0	130
8/22	384	95,248	8	9,617	1	260	0	130
8/23	277	95,525	23	9,640	1	261	1	131
8/24	480	96,005	36	9,676	4	265	4	135
8/25	509	96,514	63	9,739	0	265	1	136
8/26	277	96,791	24	9,763	1	266	0	136
8/27	109	96,900	3	9,766	0	266	0	136
8/28	122	97,022	3	9,769	0	266	0	136
8/29	170	97,192	0	9,769	0	266	0	136
8/30	109	97,301	2	9,771	0	266	0	136
8/31	155	97,456	2	9,773	0	266	0	136
9/01	162	97,618	4	9,777	0	266	2	138
9/02	164	97,782	2	9,779	1	267	1	139
9/03	75	97,857	1	9,780	1	268	0	139
9/04	28	97,885	0	9,780	0	268	0	139
9/05	25	97,910	4	9,784	1	269	0	139
9/06	38	97,948	2	9,786	0	269	0	139
9/07	30	97,978	3	9,789	0	269	0	139
9/08	24	98,002	9	9,798	0	269	0	139
9/09	17	98,019	8	9,806	0	269	0	139
9/10	12	98,031	7	9,813	1	270	0	139
9/11	8	98,039	7	9,820	2	272	0	139
9/12	8	98,047	2	9,822	0	272	1	140
9/13	3	98,050	6	9,828	0	272	0	140
9/14	3	98,053	5	9,833	0	272	0	140
9/15	2	98,055	1	9,834	2	274	0	140
9/16	1	98,056	5	9,839	2	276	1	141
9/17	1	98,057	3	9,842	1	277	0	141
9/18	3	98,060	4	9,846	4	281	0	141
9/19	0	98,060	3	9,849	4	285	0	141
9/20	0	98,060	12	9,861	0	285	1	142
Total		98,060		9,861		285		142

[a] Partial day counts because of a breach in the weir, no estimates were made.

Table 4.–Daily fish carcass count, Kanektok River weir, 2004.

Date	Chinook	Sockeye	Chum	Pink	Coho	Other [a]
6/29	0	0	0	0	0	0
6/30	0	0	1	0	0	1RB
7/01	0	0	3	0	0	0
7/02	0	0	3	0	0	0
7/03	0	0	7	0	0	0
7/04	0	0	0	0	0	1RB
7/05	0	1	1	0	0	0
7/06	0	0	4	0	0	1RB
7/07	0	1	11	1	0	0
7/08	0	1	11	0	0	0
7/09	0	0	6	0	0	0
7/10	0	2	51	0	0	1WF, 1RB
7/11	0	4	17	0	0	0
7/12	0	2	40	0	0	0
7/13	0	1	42	0	0	0
7/14	0	3	64	1	0	0
7/15	1	2	89	0	0	1DV
7/16	0	0	90	0	0	0
7/17	0	0	80	0	0	0
7/18	1	2	89	0	0	0
7/19	0	2	60	1	0	0
7/20	1	2	84	0	0	0
7/21	2	3	128	3	0	0
7/22	1	4	136	4	0	1DV
7/23	0	2	151	5	0	0
7/24	4	3	213	8	0	0
7/25	6	2	260	14	0	0
7/26	3	8	290	21	0	0
7/27	17	4	296	31	0	0
7/28	19	13	271	33	0	0
7/29	12	2	268	46	0	0
7/30	33	5	313	62	0	0
7/31	24	16	251	42	0	0
8/01	45	8	234	57	0	0
8/02	93	24	549	94	0	1DV
8/03	36	3	103	31	0	1DV
8/04	108	14	235	77	0	1DV
8/05	70	6	125	45	0	0
8/06	73	10	242	76	0	0
8/07	104	20	237	83	0	0
8/08	91	18	166	65	0	0
8/09	89	29	171	58	0	1DV
8/10	88	24	176	38	0	0
8/11	84	39	130	70	0	0
8/12	52	28	75	29	0	0
8/13	82	66	241	58	0	1DV

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Date	Chinook	Sockeye	Chum	Pink	Coho	Other [a]
8/14	60	54	113	60	0	0
8/15	56	38	127	20	0	2DV
8/16	49	60	109	28	0	1DV
8/17	42	32	69	49	2	3DV
8/18	24	41	63	18	1	1DV
8/19	23	66	86	11	1	1DV
8/20	19	45	66	22	0	0
8/21	14	44	61	14	1	0
8/22	12	35	39	20	0	0
8/23	38	51	25	39	2	1DV,1RB
8/24	3	37	13	29	1	0
8/25	4	20	30	44	0	0
8/26	1	49	24	68	0	0
8/27	0	8	5	22	1	2DV
8/28	1	42	18	66	2	0
8/29	0	9	10	43	0	0
8/30	1	10	5	44	0	1GR
8/31	1	24	7	110	2	0
9/01	0	15	3	93	1	0
9/02	1	11	2	106	2	1DV
9/03	1	17	5	129	1	1DV, 1WF
9/04	0	17	2	109	5	0
9/05	1	17	1	71	1	1DV
9/06	0	5	3	56	1	0
9/07	2	17	0	60	5	0
9/08	0	4	0	23	4	0
9/09	1	11	0	36	7	1DV
9/10	2	4	1	18	5	1DV
9/11	0	10	2	27	20	2DV
9/12	0	8	3	20	11	0
9/13	1	8	1	9	3	0
9/14	0	3	0	11	13	0
9/15	0	8	0	10	28	0
9/16	0	7	0	1	19	0
9/17	0	3	1	4	43	0
9/18	0	5	0	5	27	0
9/19	0	8	0	3	33	0
9/20	0	7	0	0	56	0
Total	1,496	1,224	6,908	2,551	298	25DV, 5RB, 1GR, 1WF

[a] DV = Dolly Varden, RB = Rainbow Trout, GR = Arctic Grayling, WF = Whitefish Spp.

Table 5.–Escapement summary for the Kanektok River drainage, 2004.

Escapement estimate upstream of the weir	Chinook	Sockeye	Chum	Coho
Weir Escapement	19,528	102,867	46,444	87,828
Aerial Survey Count	12,914	61,140	[a]	[a]
Percentage Upstream of Weir	45.5	78.0	[a]	[a]

Escapement estimate downstream of the weir	Chinook	Sockeye	Chum	Coho
Escapement Estimate	23,380	29,006	[a]	[a]
Aerial Survey Count	15,461	17,240	[a]	[a]
Percentage Downstream of Weir	54.5	22.0	[a]	[a]

Total drainage escapement estimate	Chinook	Sockeye	Chum	Coho
Drainage Escapement	42,908	131,873	[a]	[a]
Drainage Aerial Survey	28,375	78,380	[a]	[a]
Aerial Survey (SEG)	3,500–8,000	14,000–34,000	>5,200	7,700–36,000

Total Run and Exploitation	Chinook	Sockeye	Chum	Coho
District W-4 Commercial Harvest	25,465	34,627	25,820	82,398
Subsistence Harvest	[b]	[b]	[b]	[b]
Sport Fishing Harvest	[b]	[b]	[b]	[b]
Total Run Estimate [c]	72,561	168,215	[a]	[a]
Harvest Exploitation (%)[d]	40.9	21.6	[a]	[a]

[a] No estimate made in 2004.

[b] Unavailable at time of Publication.

[c] Total Run estimate based on drainage escapement estimate, District W-4 commercial harvest, and 10-year averages (1994–2003) of Quinhagak subsistence and Kanektok River sport harvest.

[d] Exploitation rate based on District W-4 commercial harvest and 10-year averages (1994–2003) of Quinhagak subsistence and Kanektok River sport harvest.

Table 6.–Age and sex composition of Chinook salmon escapement, Kanektok River weir, 2004.

Sample Dates (Stratum)	Pulse Sample Size	Aged Sample Size	Sex	Age Class 1.1 Esc.	1.1 %	1.2 Esc.	1.2 %	1.3 Esc.	1.3 %	1.4 Esc.	1.4 %	1.5 Esc.	1.5 %	Total Esc.	Total %
7/6–11	195	183	M	31	0.5	3,257	57.4	1,303	23.0	310	5.4	31	0.5	4,932	86.9
(6/29–7/12)			F	0	0.0	0	0.0	155	2.7	589	10.4	0	0.0	744	13.1
			Subtotal	31	0.5	3,257	57.4	1,458	25.7	899	15.8	31	0.5	5,676	100.0
7/14–15, 17	136	125	M	0	0.0	1,971	50.4	907	23.2	438	11.2	0	0.0	3,315	84.8
(7/13–18)			F	0	0.0	31	0.8	156	4.0	375	9.6	31	0.8	594	15.2
			Subtotal	0	0.0	2,002	51.2	1,063	27.2	813	20.8	31	0.8	3,910	100.0
7/19,22,24,28–31	141	120	M	0	0.0	6,055	60.9	2,157	21.7	418	4.2	0	0.0	8,620	86.7
8/5–7,10–11			F	0	0.0	80	0.8	249	2.5	905	9.1	80	0.8	1,322	13.3
(7/19–9/20)			Subtotal	0	0.0	6,134	61.7	2,406	24.2	1,322	13.3	80	0.8	9,942	100.0
Season	472	428	M	31	0.2	11,282	57.8	4,368	22.4	1,165	6.0	31	0.2	16,867	86.4
			F	0	0.0	111	0.6	560	2.9	1,869	9.6	111	0.6	2,661	13.6
			Total	31	0.2	11,393	58.3	4,928	25.2	3,035	15.5	142	0.7	19,528	100.0
Grand		875	M	701	1.4	20,618	41.4	9,008	18.1	4,637	9.3	129	0.3	35,093	70.4
Total [a]			F	0	0.0	1,879	3.8	1,569	3.1	10,767	21.6	537	1.1	14,752	29.6
			Total	701	1.4	22,496	45.1	10,578	21.2	14,403	30.9	666	1.3	49,845	100.0

Note: The number of fish in each stratum category are derived from sample percentages; discrepancies are attributed to rounding errors. The number of fish in "Season" summaries are the strata sums. "Season" percentages are derived from the sums.

[a] The number of fish in the "Grand total" are the sum of historical "Season" totals; percentages are derived from those sums. Years included are 1997, and 2002 through 2004.

Table 7.–Mean length (mm) of Chinook salmon escapement, Kanektok River weir, 2004.

Sample Dates (Stratum Dates)	Sex		Age Class 1.1	1.2	1.3	1.4	1.5
7/6–11 (6/29–7/12)	M	Mean Length	413	594	696	802	928
		Std. Error	-	4	9	23	-
		Range	413–413	506–695	542–783	692–919	928–928
		Sample Size	1	105	42	10	1
	F	Mean Length			770	846	
		Std. Error			31	10	
		Range			666–837	768–900	
		Sample Size	0	0	5	19	0
7/14–15, 17 (7/13–18)	M	Mean Length		588	699	792	
		Std. Error		6	12	19	
		Range		438–648	543–800	659–897	
		Sample Size	0	63	29	14	0
	F	Mean Length		666	745	871	854
		Std. Error		-	13	15	-
		Range		666–666	700–783	794–962	854–854
		Sample Size	0	1	5	12	1
7/19,22,24,28–31 8/5–7,10–11 (7/19–9/20)	M	Mean Length		575	686	850	
		Std. Error		6	14	37	
		Range		437–690	519–827	792–983	
		Sample Size	0	73	26	5	0
	F	Mean Length		645	746	869	832
		Std. Error		-	49	20	-
		Range		645–645	649–797	776–965	832–832
		Sample Size	0	1	3	11	1
Season	M	Mean Length	413	583	692	815	928
		Range	413–413	437–695	519–827	659–983	928–928
		Sample Size	1	241	97	29	1
	F	Mean Length		651	753	862	838
		Range		645–666	649–837	768–965	832–854
		Sample Size	0	2	13	42	2
Grand Total [a]	M	Mean Length	410	539	690	823	827
		Range	390–470	412–593	505–815	578–990	759–759
		Sample Size	11	356	196	87	3
	F	Mean Length		610	764	846	882
		Range		480–640	714–798	722–990	770–980
		Sample Size	0	11	30	164	16

[a] "Grand Total" mean lengths are simple averages of historical "Season" mean lengths. Years included are 1997, and 2002 through 2004.

Table 8.–Age and sex composition of sockeye salmon escapement, Kanektok River weir, 2004.

Sample Dates (Stratum)	Pulse Sample Size	Aged Sample Size	Sex	Age Class 0.2 Esc.	0.2 %	0.3 Esc.	0.3 %	1.2 Esc.	1.2 %	1.3 Esc.	1.3 %	2.2 Esc.	2.2 %	1.4 Esc.	1.4 %	2.3 Esc.	2.3 %	Total Esc.	Total %
7/6–11	218	172	M	0	0.0	0	0.0	11,206	19.8	21,752	38.4	989	1.7	659	1.1	330	0.6	34,935	61.6
(6/29–7/12)			F	0	0.0	0	0.0	10,546	18.6	10,546	18.6	329	0.6	330	0.6	0	0.0	21,752	38.4
			Subtotal	0	0.0	0	0.0	21,752	38.4	32,298	57.0	1,318	2.3	989	1.7	330	0.6	56,687	100.0
7/14,15,17,	218	173	M	207	0.6	207	0.6	9,378	27.2	6,378	18.5	586	1.7	0	0.0	207	0.6	16,928	49.1
19,22–24			F	0	0.0	0	0.0	10,757	31.2	5,792	16.8	1,000	2.9	0	0.0	0	0.0	17,549	50.9
(7/13–26)			Subtotal	207	0.6	207	0.6	20,135	58.4	12,170	35.3	1,586	4.6	0	0.0	207	0.6	34,477	100.0
7/28–8/13	179	171	M	0	0.0	0	0.0	3,932	33.6	2,153	18.4	187	1.6	0	0.0	0	0.0	6,273	53.6
(7/26–9/20)			F	0	0.0	0	0.0	3,932	33.6	1,217	10.4	281	2.4	0	0.0	0	0.0	5,430	46.4
			Subtotal	0	0.0	0	0.0	7,864	67.2	3,370	28.8	468	4.0	0	0.0	0	0.0	11,703	100.0
Season	615	470	M	207	0.2	207	0.2	24,516	23.8	30,283	29.4	1,762	1.7	659	0.6	537	0.5	58,054	56.5
			F	0	0.0	0	0.0	25,235	24.5	17,555	17.1	1,610	1.6	330	0.3	0	0.0	44,622	43.5
			Total	207	0.2	207	0.2	49,751	48.4	47,838	46.5	3,372	3.3	989	1.0	537	0.5	102,867	100.0
Grand		2,231	M	198	0.1	4,448	1.2	62,624	16.4	111,558	29.2	2,379	0.6	4,635	1.2	5,518	1.4	193,192	50.1
Total [a]			F	207	0.1	1,478	0.4	77,235	20.6	97,388	25.5	2,305	0.6	4,364	1.1	6,120	1.6	192,042	49.9
			Total	405	0.1	5,926	1.5	139,859	37.0	208,947	54.7	4,684	1.2	8,999	2.3	11,638	3.0	385,233	100.0

Note: The number of fish in each stratum age and sex category are derived from the sample percentages; discrepancies are attributed to rounding errors. The number of fish in "Season" summaries are the strata sums; "Season" percentages are derived from the sums.

[a] The number of fish in the "Grand total" are the sum of historical "Season" totals; percentages are derived from those sums. Years included are 1997, and 2002 through 2004.

Table 9.–Mean length (mm) of sockeye salmon escapement, Kanektok River weir, 2004.

Sample Dates (Stratum Dates)	Sex		Age Class 0.2	0.3	1.2	1.3	2.2	1.4	2.3
6/24, 28–29	M	Mean Length			517	579	540	558	554
(6/21–7/3)		Std. Error			4	3	22	43	-
		Range			460–568	493–630	505–580	515–600	554–554
		Sample Size	0	0	34	66	3	2	1
	F	Mean Length			497	540	534	549	
		Std. Error			5	5	-	-	
		Range			450–565	441–595	534–534	549–549	
		Sample Size	0	0	32	32	1	1	0
7/14–15,17,19, 22–24	M	Mean Length	589	574	530	579	504		566
(7/13–26)		Std. Error	-	-	5	5	33		-
		Range	589–589	574–574	469–609	495–631	450–565		566–566
		Sample Size	1	1	47	32	3	0	1
	F	Mean Length			484	525	487		
		Std. Error			4	4	12		
		Range			430–554	469–562	442–507		
		Sample Size	0	0	54	29	5	0	0
7/28–8/13	M	Mean Length			528	561	549		
(7/26–9/20)		Std. Error			5	7	61		
		Range			470–600	489–628	488–610		
		Sample Size	0	0	42	23	2	0	0
	F	Mean Length			489	526	488		
		Std. Error			4	9	10		
		Range			441–555	463–568	473–506		
		Sample Size	0	0	42	13	3	0	0
Season	M	Mean Length	589	574	523	578	527	558	559
		Range	589–589	574–574	460–609	489–631	450–610	515–600	554–566
		Sample Size	1	1	123	121	8	2	2
	F	Mean Length			491	534	499	549	
		Range			430–565	441–595	442–534	549–549	
		Sample Size	0	0	128	74	9	1	0
Grand Total [a]	M	Mean Length	589	594	531	584	544	581	584
		Range	589–589	487–666	398–598	498–660	536–540	550–645	515–630
		Sample Size	1	33	406	516	14	26	39
	F	Mean Length	473	555	507	549	498	567.75	556
		Range	473–473	500–582	427–606	495–610	477–517	535–600	495–590
		Sample Size	1	18	566	522	16	28	45

[a] "Grand Total" mean lengths are simple averages of historical "Season" mean lengths. Years included are 1997 and 2002 through 2004.

Table 10.–Age and sex composition of chum salmon escapement, Kanektok River weir, 2004.

Sample Dates (Stratum)	Pulse Sample Size	Aged Sample Size	Sex	Age Class 0.2 Esc.	0.2 %	0.3 Esc.	0.3 %	0.4 Esc.	0.4 %	0.5 Esc.	0.5 %	Total Esc.	Total %
7/6–11	137	126	M	0	0.0	1,967	12.7	6,025	38.9	0	0.0	7,992	51.6
(6/29–7/13)			F	369	2.4	3,566	23.0	3,443	22.2	123	0.8	7,501	48.4
			Subtotal	369	2.4	5,533	35.7	9,468	61.1	123	0.8	15,493	100.0
7/14–15, 17, 19	113	99	M	361	3.1	3,292	28.3	3,757	32.3	0	0.0	7,397	63.6
(7/14–20)			F	233	2.0	2,117	18.2	1,884	16.2	0	0.0	4,234	36.4
			Subtotal	593	5.1	5,409	46.5	5,641	48.5	0	0.0	11,631	100.0
7/22–24	193	169	M	178	2.4	2,269	30.2	1,112	14.8	0	0.0	3,559	47.3
(721–26)			F	267	3.5	2,847	37.8	846	11.2	0	0.0	3,960	52.7
			Subtotal	445	5.9	5,116	68.0	1,958	26.0	0	0.0	7,519	100.0
7/28–29, 30–31	208	185	M	280	4.3	1,754	27.0	807	12.4	0	0.0	2,842	43.8
(7/27–8/2)			F	316	4.9	2,245	34.6	1,087	16.8	0	0.0	3,648	56.2
			Subtotal	596	9.2	3,999	61.6	1,894	29.2	0	0.0	6,490	100.0
8/4–13	190	157	M	169	3.2	1,218	22.9	879	16.6	0	0.0	2,266	42.7
(8/3–9/20)			F	474	8.9	1,894	35.7	677	12.7	0	0.0	3,045	57.3
			Subtotal	643	12.1	3,112	58.6	1,556	29.3	0	0.0	5,311	100.0
Season	841	736	M	988	2.1	10,500	22.6	12,580	27.1	0	0.0	24,056	51.8
			F	1,659	3.6	12,669	27.3	7,937	17.1	123	0.3	22,388	48.2
			Total	2,646	5.7	23,169	49.9	20,517	44.2	123	0.3	46,444	100.0
Grand Total [a]		3,303	M	1,580	0.9	44,278	24.6	44,849	25.0	1,446	0.8	92,153	51.3
			F	2,900	1.6	49,483	27.5	34,358	19.1	812	0.5	87,551	48.7
			Total	4,479	2.5	93,761	52.2	79,207	44.1	2,258	1.3	179,704	100.0

Note: The number of fish in each stratum age and sex category are derived from the sample percentages; discrepancies are attributed to rounding errors. The number of fish in "Season" summaries are the strata sums; "Season" percentages are derived from the sums.

[a] The number of fish in the "Grand total" are the sum of historical "Season" totals; percentages are derived from those sums. Years included are1997, and 2002 through 2004.

Table 11.–Mean length (mm) of chum salmon escapement, Kanektok River weir, 2004.

Sample Dates (Stratum Dates)	Sex		Age Class 0.2	0.3	0.4	0.5
6/24, 28–29	M	Mean Length		591	610	
(6/21–7/3)		Std. Error		5	4	
		Range		552–620	559–673	
		Sample Size	0	16	49	0
	F	Mean Length	508	553	566	545
		Std. Error	9	5	4	-
		Range	492–521	477–616	519–596	545–545
		Sample Size	3	29	28	1
7/14–15,17,19,	M	Mean Length	534	584	597	
22–24		Std. Error	10	5	5	
(7/13–26)		Range	515–551	530–657	535–666	
		Sample Size	3	28	32	0
	F	Mean Length	539	552	570	
		Std. Error	7	6	6	
		Range	532–545	496–592	530–615	
		Sample Size	2	18	16	0
7/28–8/13	M	Mean Length	552	572	595	
(7/26–9/20)		Std. Error	13	4	5	
		Range	514–577	483–648	555–660	
		Sample Size	4	51	25	0
	F	Mean Length	534	545	560	
		Std. Error	4	3	6	
		Range	519–545	490–590	512–611	
		Sample Size	6	64	19	0
7/28–8/13	M	Mean Length	544	573	588	
(7/26–9/20)		Std. Error	12	4	7	
		Range	505–599	530–640	531–638	
		Sample Size	8	50	23	0
	F	Mean Length	529	546	557	
		Std. Error	7	3	5	
		Range	509–558	498–597	496–634	
		Sample Size	9	64	31	0
7/28–8/13	M	Mean Length	534	566	593	
(7/26–9/20)		Std. Error	14	4	6	
		Range	507–589	486–610	512–646	
		Sample Size	5	36	26	0

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Sample Dates (Stratum Dates)	Sex		Age Class 0.2	0.3	0.4	0.5
7/28–8/13	F	Mean Length	526	541	555	
(7/26–9/20)		Std. Error	4	3	6	
(Cont.)		Range	495–554	502–601	508–600	
		Sample Size	14	56	20	0
Season	M	Mean Length	540	579	602	
		Range	505–599	483–657	512–673	
		Sample Size	20	181	155	0
	F	Mean Length	526	548	564	545
		Range	492–558	477–616	496–634	545–545
		Sample Size	34	231	114	1
Grand Total [a]	M	Mean Length	552	582	605	618
		Range	485–580	505–670	515–700	562–680
		Sample Size	31	825	807	27
	F	Mean Length	529	553	570	579
		Range	485–623	475–640	490–685	575–610
		Sample Size	56	919	621	17

[a] "Grand Total" mean lengths are simple averages of historical "Season" mean lengths. Years included are 1997, and 2002 through 2004.

Table 12.–Age and sex composition of coho salmon escapement, Kanektok River weir, 2004.

Sample Dates (Stratum)	Pulse Sample Size	Aged Sample Size	Sex	Age Class 1.1 Esc.	1.1 %	2.1 Esc.	2.1 %	3.1 Esc.	3.1 %	Total Esc.	Total %
8/4–11	72	55	M	113	1.8	1,804	29.1	0	0.0	1,917	30.9
(6/29–8/12)			F	0	0.0	3,834	61.8	451	7.3	4,285	69.1
			Subtotal	113	1.8	5,638	90.9	451	7.3	6,202	100.0
8/13,18,21	96	77	M	0	0.0	13,515	46.8	375	1.3	13,890	48.1
(8/13–26)			F	0	0.0	14,265	49.3	751	2.6	15,016	51.9
			Subtotal	0	0.0	27,780	96.1	1,126	3.9	28,906	100.0
8/30–31	80	69	M	556	2.9	9,167	47.8	1,111	5.8	10,834	56.5
(8/27–9/4)			F	0	0.0	8,333	43.5	0	0.0	8,333	43.5
			Subtotal	556	2.9	17,500	91.3	1,111	5.8	19,167	100.0
9/9	75	56	M	0	0.0	14,979	44.6	0	0.0	14,979	44.6
(9/5–20)			F	0	0.0	17,975	53.6	599	1.8	18,574	55.4
			Subtotal	0	0.0	32,954	98.2	599	1.8	33,553	100.0
Season	323	257	M	668	0.8	39,464	44.9	1,487	1.7	41,619	47.4
			F	0	0.0	44,408	50.6	1,801	2.0	46,209	52.6
			Total	668	0.8	83,872	95.5	3,288	3.7	87,828	100.0
Grand Total [a]		1,324	M	2,605	1.2	97,298	44.1	7,713	3.5	107,615	48.7
			F	1,933	0.9	100,571	45.5	10,690	4.8	113,194	51.3
			Total	4,538	2.1	197,869	89.6	18,403	8.3	220,809	100.0

Note: The number of fish in each stratum, age, and sex category are derived from the sample percentages; discrepancies are attributed to rounding errors. The number of fish in "Season" summaries are the strata sums; "Season" percentages are derived from the sums.

[a] The number of fish in the "Grand total" are the sum of historical "Season" totals; percentages are derived from those sums. Years included are 2001 through 2004.

Table 13.–Mean length (mm) of coho salmon escapement, Kanektok River weir, 2004.

Sample Dates (Stratum Dates)	Sex		Age Class 1.1	2.1	3.1
8/4–11	M	Mean Length	546	548	
(6/29–8/12)		Std. Error	-	11	
		Range	546–546	454–619	
		Sample Size	1	16	0
	F	Mean Length		534	536
		Std. Error		8	26
		Range		428–603	491–601
		Sample Size	0	34	4
8/13, 18, 21	M	Mean Length		538	595
(8/13–26)		Std. Error		8	-
		Range		435–624	595–595
		Sample Size	0	36	1
	F	Mean Length		561	543
		Std. Error		4	10
		Range		485–625	533–552
		Sample Size	0	38	2
8/30–31	M	Mean Length	534	561	561
(8/27–9/4)		Std. Error	42	6	44
		Range	492–576	494–638	431–625
		Sample Size	2	33	4
	F	Mean Length		561	
		Std. Error		6	
		Range		498–622	
		Sample Size	0	30	0
9/9	M	Mean Length		550	
(9/5–20)		Std. Error		11	
		Range		410–625	
		Sample Size	0	25	0
	F	Mean Length		563	501
		Std. Error		6	-
		Range		505–631	501–501
		Sample Size	0	30	1
Season	M	Mean Length	536	548	570
		Range	492–576	410–638	431–625
		Sample Size	3	110	5

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Sample Dates (Stratum Dates)	Sex		Age Class 1.1	2.1	3.1
	F	Mean Length		560	527
		Range		428–631	491–601
		Sample Size	0	132	7
Grand Total [a]	M	Mean Length	580	576	584
		Range	465–657	395–678	440–665
		Sample Size	24	600	44
	F	Mean Length	528	581	576
		Range	430–620	475–670	545–649
		Sample Size	15	579	62

[a] "Grand Total" mean lengths are simple averages of historical "Season" mean lengths. Years included are 2001 through 2004.

Table 14.–Age and sex composition of Chinook salmon from the District W-4 commercial fishery, 2004.

Sample Dates (Stratum)	Pulse Sample Size	Aged Sample Size	Sex	Age Class 1.1 Catch	1.1 %	1.2 Catch	1.2 %	1.3 Catch	1.3 %	1.4 Catch	1.4 %	1.5 Catch	1.5 %	Total Catch	Total %
6/17	70	59	M	0	0.0	3,188	45.8	2,244	32.2	827	11.8	236	3.4	6,495	93.2
(6/15, 17)			F	0	0.0	0	0.0	0	0.0	472	6.8	0	0.0	472	6.8
			Subtotal	0	0.0	3,188	45.8	2,244	32.2	1,299	18.6	236	3.4	6,967	100.0
6/24	70	61	M	0	0.0	2,382	39.3	1,886	31.1	893	14.7	0	0.0	5,161	85.2
(6/22, 24)			F	0	0.0	0	0.0	198	3.3	695	11.5	0	0.0	893	14.8
			Subtotal	0	0.0	2,382	39.3	2,084	34.4	1,588	26.2	0	0.0	6,054	100.0
7/1	70	64	M	120	1.6	3,587	46.9	1,554	20.3	478	6.3	120	1.6	5,859	76.6
(6/29, 7/1, 5)			F	0	0.0	119	1.5	598	7.8	957	12.5	119	1.5	1,793	23.4
			Subtotal	120	1.6	3,706	48.4	2,152	28.1	1,435	18.8	239	3.1	7,652	100.0
7/12	25	24	M	0	0.0	2,596	54.2	998	20.8	799	16.7	0	0.0	4,393	91.7
(7/7–8/27)			F	0	0.0	0	0.0	0	0.0	399	8.3	0	0.0	399	8.3
			Subtotal	0	0.0	2,596	54.2	998	20.8	1,198	25.0	0	0.0	4,792	100.0
Season	235	208	M	120	0.5	11,753	46.1	6,682	26.3	2,997	11.8	356	1.4	21,907	86.0
			F	0	0.0	119	0.5	796	3.1	2,523	9.9	119	0.5	3,558	14.0
			Subtotal	120	0.5	11,872	46.6	7,478	29.4	5,520	21.7	475	1.9	25,465	100.0
Grand		6,819	M	2,525	0.9	68,489	24.5	59,794	21.4	48,392	17.3	3,113	1.1	182,877	65.4
Total [a]			F	455	0.2	8,051	2.9	18,995	6.8	63,912	22.8	5,244	1.9	96,894	34.6
			Total	2,980	1.1	76,540	27.4	78,789	28.2	112,304	40.1	8,357	3.0	279,771	100.0

Note: The number of fish in each stratum age and sex category are derived from the sample percentages; discrepancies are attributed to rounding errors. The number of fish in "Season" summaries are the strata sums; "Season" percentages are derived from the sums.

[a] The number of fish in the "Grand total" are the sum of historical "Season" totals; percentages are derived from those sums.

Table 15.–Mean length (mm) of Chinook salmon from the District W-4 commercial fishery, 2004.

Sample Dates (Stratum Dates)	Sex		Age Class 1.1	1.2	1.3	1.4	1.5
6/17 (6/15, 17)	M	Mean Length		564	653	814	875
		Std. Error		6	21	41	100
		Range		465–615	520–840	695–985	775–975
		Sample Size	0	27	19	7	2
	F	Mean Length				819	
		Std. Error				13	
		Range				795–850	
		Sample Size	0	0	0	4	0
6/24 (6/22, 24)	M	Mean Length		575	682	800	
		Std. Error		8	16	21	
		Range		495–635	530–800	676–872	
		Sample Size	0	24	19	9	0
	F	Mean Length			751	846	
		Std. Error			4	25	
		Range			747–754	770–975	
		Sample Size	0	0	2	7	0
7/1 (6/29, 7/1, 5)	M	Mean Length	450	587	701	771	840
		Std. Error	-	6	11	52	-
		Range	450–450	510–665	635–765	685–900	840–840
		Sample Size	1	30	13	4	1
	F	Mean Length		635	787	844	830
		Std. Error		-	6	12	-
		Range		635–635	765–800	810–915	830–830
		Sample Size	0	1	5	8	1
7/12 (7/7–8/27)	M	Mean Length		595	778	914	
		Std. Error		9	55	20	
		Range		515–650	575–885	865–950	
		Sample Size	0	13	5	4	0
	F	Mean Length				895	
		Std. Error				40	
		Range				855–935	
		Sample Size	0	0	0	2	0
Season	M	Mean Length	450	580	691	830	863
		Range	450–450	465–665	520–885	676–985	775–975
		Sample Size	1	94	56	24	3
	F	Mean Length		635	778	848	830
		Range		635–635	747–800	770–975	830–830
		Sample Size	0	1	7	21	1

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Sample Dates (Stratum Dates)	Sex		Age Class 1.1	1.2	1.3	1.4	1.5
Grand Total [a]	M	Mean Length	388	541	697	828	889
		Range	314–513	390–805	617–878	621–1051	834–996
		Sample Size	65	1,148	1,155	890	37
	F	Mean Length	380	568	782	848	882
		Range	365–395	491–799	541–963	599–1012	833–950
		Sample Size	3	58	189	1,092	37

Note: "Season" mean lengths are weighted by the commercial harvest in each stratum.

[a] "Grand Total" mean lengths are simple averages of the "Season" mean lengths.

Table 16.–Age and sex composition of sockeye salmon from the District W-4 commercial fishery, 2004.

Sample Dates (Stratum)	Pulse Sample Size	Aged Sample Size	Sex	Age class 0.3 Catch	0.3 %	1.2 Catch	1.2 %	1.3 Catch	1.3 %	1.4 Catch	1.4 %	2.3 Catch	2.3 %	Total Catch	Total %
6/24	80	77	M	96	1.3	1,049	14.3	3,337	45.4	191	2.6	0	0.0	4,672	63.6
(6/15–29)			F	95	1.3	286	3.9	2,098	28.6	190	2.6	0	0.0	2,670	36.4
			Subtotal	191	2.6	1,335	18.2	5,435	74.0	381	5.2	0	0.0	7,342	100.0
7/1	80	72	M	583	4.2	1,555	11.1	3,305	23.6	389	2.8	0	0.0	6,026	43.1
(7/1, 5, 7)			F	0	0.0	972	7.0	6,026	43.1	583	4.1	194	1.4	7,971	56.9
			Subtotal	583	4.2	2,527	18.1	9,331	66.7	972	6.9	194	1.4	13,997	100.0
7/12	80	68	M	0	0.0	3,908	29.4	3,322	25.0	391	2.9	0	0.0	7,621	57.4
(7/9–8/27)			F	0	0.0	2,931	22.1	2,345	17.6	195	1.5	0	0.0	5,667	42.6
			Subtotal	0	0.0	6,839	51.5	5,667	42.6	586	4.4	0	0.0	13,288	100.0
Season	240	217	M	679	1.9	6,513	18.8	9,964	28.8	971	2.8	0	0.0	18,320	52.9
			F	95	0.3	4,189	12.1	10,469	30.2	969	2.8	194	0.6	16,307	47.1
			Total	774	2.2	10,702	30.9	20,433	59.0	1,940	5.6	194	0.6	34,627	100.0
Grand		6,962	M	16,395	2.4	100,783	14.6	211,138	30.6	9,837	1.4	7,578	1.1	356,464	51.6
Total [a]			F	16,292	2.4	85,960	12.4	209,029	30.3	7,858	1.1	7,738	1.1	334,364	48.7
			Total	32,687	4.7	186,743	27.0	420,163	60.8	17,694	2.6	15,317	2.2	690,859	100.0

Note: Age classes representing less than 1% of the Grand Total are excluded, discrepancies in sums are attributed to excluded age classes. The number of fish in each stratum age and sex category are derived from the sample percentages; discrepancies are attributed to rounding errors. The number of fish in "Season" summaries are the strata sums; "Season" percentages are derived from the sums.

[a] The number of fish in the "Grand total" are the sum of historical "Season" totals; percentages are derived from those sums.

Table 17.–Mean length (mm) of sockeye salmon from the District W-4 commercial fishery, 2004.

Sample Dates			Age Class				
(Stratum Dates)	Sex		0.3	1.2	1.3	1.4	2.3
6/24	M	Mean Length	600	485	577	610	
(6/15–29)		Std. Error	-	13	4	18	
		Range	600–600	415–535	514–620	592–628	
		Sample Size	1	11	35	2	0
	F	Mean Length	565	501	546	540	
		Std. Error	-	12	8	21	
		Range	565–565	479–521	409–610	519–560	
		Sample Size	1	3	22	2	0
7/1	M	Mean Length	585	496	587	583	
(7/1, 5, 7)		Std. Error	18	13	6	38	
		Range	565–620	440–535	540–635	545–620	
		Sample Size	3	8	17	2	0
	F	Mean Length		486	549	567	565
		Std. Error		9	5	13	-
		Range		470–520	490–665	545–590	565–565
		Sample Size	0	5	31	3	1
7/12	M	Mean Length		515	575	555	
(7/9–8/27)		Std. Error		6	6	20	
		Range		490–590	520–610	535–575	
		Sample Size	0	20	17	2	0
	F	Mean Length		497	551	555	
		Std. Error		3	6	-	
		Range		470–515	520–580	555–555	
		Sample Size	0	15	12	1	0
Season	M	Mean Length	587	506	580	577	
		Range	565–620	415–590	514–635	535–628	
		Sample Size	4	39	69	6	0
	F	Mean Length	565	494	549	559	565
		Range	565–565	470–521	409–665	519–590	565–565
		Sample Size	1	23	65	6	1
Grand Total [a]	M	Mean Length	585	524	582	596	580
		Range	528–656	377–596	484–700	540–688	497–664
		Sample Size	51	757	1,837	93	119
	F	Mean Length	553	504	550	567	553
		Range	474–623	440–590	469–625	504–631	483–610
		Sample Size	71	735	1,823	95	99

Note: "Season" mean lengths are weighted by the commercial harvest in each stratum.
[a] "Grand Total" mean lengths are simple averages of the "Season" mean lengths.

Table 18.–Age and sex composition of chum salmon from the District W-4 commercial fishery, 2004.

Sample Dates (Stratum)	Pulse Sample Size	Aged Sample Size	Sex	Age Class 0.2 Catch	0.2 %	0.3 Catch	0.3 %	0.4 Catch	0.4 %	0.5 Catch	0.5 %	Total Catch	Total %
6/17	80	74	M	0	0.0	271	12.2	963	43.3	0	0.0	1,233	55.4
(6/15, 17, 22)			F	0	0.0	150	6.7	842	37.8	0	0.0	993	44.6
			Subtotal	0	0.0	421	18.9	1,805	81.1	0	0.0	2,226	100.0
6/24	80	72	M	318	2.8	2,384	20.8	4,133	36.1	159	1.4	6,994	61.1
(6/24–7/7)			F	0	0.0	795	7.0	3,656	32.0	0	0.0	4,451	38.9
			Subtotal	318	2.8	3,179	27.8	7,789	68.1	159	1.4	11,445	100.0
7/12	80	79	M	615	5.0	3,076	25.3	2,461	20.3	0	0.0	6,151	50.6
(7/9–8/27)			F	154	1.3	3,691	30.4	2,153	17.7	0	0.0	5,998	49.4
			Subtotal	769	6.3	6,767	55.7	4,614	38.0	0	0.0	12,149	100.0
Season	240	225	M	933	3.6	5,731	22.2	7,556	29.3	159	0.6	14,379	55.7
			F	154	0.6	4,636	18.0	6,651	25.7	0	0.0	11,441	44.3
			Total	1,087	4.2	10,367	40.2	14,207	55.0	159	0.6	25,820	100.0
Grand		10,859	M	5,335	0.7	185,095	25.7	128,637	17.9	4,027	0.6	323,096	44.9
Total [a]			F	6,593	0.9	235,990	32.8	148,289	20.6	5,627	0.8	396,498	55.1
			Total	11,928	1.7	421,086	58.5	276,925	38.5	9,654	1.3	719,581	100.0

Note: The number of fish in each stratum age and sex category are derived from the sample percentages; discrepancies are attributed to rounding errors. The number of fish in "Season" summaries are the strata sums; "Season" percentages are derived from the sums.

[a] The number of fish in the "Grand total" are the sum of historical "Season" totals; percentages are derived from those sums.

Table 19.–Mean length (mm) of chum salmon from the District W-4 commercial fishery, 2004.

Sample Dates (Stratum Dates)	Sex		Age Class 0.2	0.3	0.4	0.5
6/17	M	Mean Length		580	599	
(6/15, 17, 22)		Std. Error		7	5	
		Range		535–605	555–680	
		Sample Size	0	9	32	0
	F	Mean Length		569	581	
		Std. Error		8	4	
		Range		540–580	525–615	
		Sample Size	0	5	28	0
6/24	M	Mean Length	485	600	612	549
(6/24–7/7)		Std. Error	21	6	5	-
		Range	464–505	564–641	555–649	549–549
		Sample Size	2	15	26	1
	F	Mean Length		571	581	
		Std. Error		8	4	
		Range		543–596	543–623	
		Sample Size	0	5	23	0
7/12	M	Mean Length	559	587	589	
(7/9–8/27)		Std. Error	23	6	7	
		Range	490–590	545–635	540–655	
		Sample Size	4	20	16	0
	F	Mean Length	570	561	580	
		Std. Error	-	5	3	
		Range	570–570	510–620	565–605	
		Sample Size	1	24	14	0
Season	M	Mean Length	533	592	603	549
		Range	464–590	535–641	540–680	549–549
		Sample Size	6	44	74	1
	F	Mean Length	570	563	581	
		Range	570–570	510–620	525–623	
		Sample Size	1	34	65	0
Grand Total [a]	M	Mean Length	536	585	608	608
		Range	454–675	462–710	492–735	530–694
		Sample Size	83	2,767	1,983	60
	F	Mean Length	534	562	580	588
		Range	486–578	325–683	492–695	516–651
		Sample Size	103	3,556	2,233	70

Note: "Season" mean lengths are weighted by the commercial harvest in each stratum.

[a] "Grand Total" mean lengths are simple averages of the "Season" mean lengths.

Table 20.–Age and sex of coho salmon from the District W-4 commercial fishery, 2004.

Sample Dates (Stratum)	Pulse Sample Size	Aged Sample Size	Sex	Age Class 1.1 Catch	1.1 %	2.1 Catch	2.1 %	3.1 Catch	3.1 %	Total Catch	Total %
8/4	70	54	M	1,140	5.6	9,499	46.3	380	1.9	11,019	53.7
(8/2, 4, 6, 9)			F	380	1.8	8,739	42.6	380	1.8	9,499	46.3
			Subtotal	1,520	7.4	18,238	88.9	760	3.7	20,518	100.0
8/18	70	62	M	560	1.6	21,835	62.9	0	0.0	22,395	64.5
(8/11, 13, 16, 18)			F	1,120	3.2	11,197	32.3	0	0.0	12,317	35.5
			Subtotal	1,680	4.8	33,032	95.2	0	0.0	34,712	100.0
8/25	80	70	M	388	1.5	10,479	38.6	0	0.0	10,867	40.0
(8/20, 23, 25, 27)			F	388	1.4	15,913	58.5	0	0.0	16,301	60.0
			Subtotal	776	2.9	26,392	97.1	0	0.0	27,168	100.0
Season	220	186	M	2,088	2.5	41,813	50.8	380	0.5	44,281	53.7
			F	1,888	2.3	35,849	43.5	380	0.4	38,117	46.3
			Total	3,976	4.8	77,662	94.3	760	0.9	82,398	100.0
Grand		6,333	M	26,899	3.7	317,193	43.2	15,219	2.1	392,323	53.4
Total [a]			F	24,222	3.3	271,570	37.0	13,908	1.9	342,409	46.6
			Total	51,120	7.0	588,763	80.1	29,126	4.0	734,732	100.0

Note: The number of fish in each stratum age and sex category are derived from sample percentages; discrepancies are attributed to rounding errors. The number of fish in "Season" summaries are the strata sums; "Season" percentages are derived from the sums.

[a] The number of fish in the "Grand total" are the sum of historical "Season" totals; percentages are derived from those sums.

Table 21.–Mean length (mm) of coho salmon from the District W-4 commercial fishery, 2004.

Sample Dates (Stratum Dates)	Sex		Age Class 1.1	2.1	3.1
8/4 (8/2, 4, 6, 9)	M	Mean Length	538	570	610
		Std. Error	16	8	-
		Range	520–570	480–635	610–610
		Sample Size	3	25	1
	F	Mean Length	570	575	560
		Std. Error	-	7	-
		Range	570–570	510–635	560–560
		Sample Size	1	23	1
8/18 (8/11, 13, 16, 18)	M	Mean Length	520	570	
		Std. Error	-	6	
		Range	520–520	478–638	
		Sample Size	1	39	0
	F	Mean Length	569	568	
		Std. Error	21	7	
		Range	548–590	480–608	
		Sample Size	2	20	0
8/25 (8/20, 23, 25, 27)	M	Mean Length	543	579	
		Std. Error	-	6	
		Range	543–543	512–639	
		Sample Size	1	27	0
	F	Mean Length	550	581	
		Std. Error	-	5	
		Range	550–550	515–647	
		Sample Size	1	41	0
Season	M	Mean Length	534	572	610
		Range	520–570	478–639	610–610
		Sample Size	5	91	1
	F	Mean Length	565	576	560
		Range	548–590	480–647	560–560
		Sample Size	4	84	1
Grand Total [a]	M	Mean Length	567	589	590
		Range	472–653	419–704	489–660
		Sample size	57	1,208	57
	F	Mean Length	588	590	575
		Range	441–661	412–676	528–594
		Sample size	45	912	41

Note: "Season" mean lengths are weighted by the commercial harvest in each stratum.

[a] "Grand Total" mean lengths are simple averages of the "Season" mean lengths.

Table 22.–Daily weather and hydrological observations from the Kanektok River weir site, 2004.

Date	Wind (Dir/Speed)	Air Temp. (˚C)	Water Temp. (˚C)	Cloud Cover %/altitude	Water level (cm)	Precip. (in)
16-Jun	NE 5–7	12.0	9.0	100/4000	65	Trace
17-Jun	SW 5–7	9.0	9.0	90/3000	62	0.05
18-Jun	SE 10–12	12.0	11.0	90/3000	60	0.10
19-Jun	SE 10–15	10.0	9.0	75/4000	60	0.00
20-Jun	SE 7–10	10.0	9.0	90/3000	58	0.00
21-Jun	SE 5–10	13.0	10.0	100/2500	57	Trace
22-Jun	SE 5	13.0	9.5	100/2500	56	Trace
23-Jun	SE 7–10	11.0	9.0	100/2200	56	0.05
24-Jun	Calm	9.0	9.0	100/1800	55	0.06
25-Jun	Calm	13.0	9.5	100/4000	54	0.00
26-Jun	VAR	25.0	11.0	CAVU	51	0.00
27-Jun	VAR	32.0	13.0	20/5000	50	0.00
28-Jun	SE 7–10	21.0	12.0	60/5000	48	0.00
29-Jun	NW 1–2	25.0	13.0	CAVU	50	0.00
30-Jun	Calm	25.0	14.0	CAVU	49	0.00
1-Jul	Calm	18.0	13.0	100/Haze	48	0.00
2-Jul	SE 5–7	15.0	12.0	100/VAR	48	0.00
3-Jul	Calm	18.0	11.0	100/5000	48	0.00
4-Jul	Calm	22.0	13.0	30/3000	46	Trace
5-Jul	Calm	12.5	12.0	60/800	46	Trace
6-Jul	W 3–5	15.0	11.5	40/SCT	44	Trace
7-Jul	Calm	12.0	12.0	100/OVC	42	Trace
8-Jul	W 3	20.0	13.0	CAVU	40	0.00
9-Jul	W 3–5	20.0	14.0	CAVU	39	0.00
10-Jul	W 5–8	24.0	15.0	5/7000	38	0.00
11-Jul	Calm	28.0	14.0	CAVU	37	0.00
12-Jul	SE 1–3	28.0	14.0	60/7000	36	0.00
13-Jul	SE 10–12	19.0	14.0	60/4000	35	0.00
14-Jul	ESE 5–7	17.0	14.0	70/5000	34	0.00
15-Jul	SE 3	23.0	14.0	100/3500	34	0.28
16-Jul	SE 5–8	15.0	13.0	99/2000	34	0.16
17-Jul	ESE 1–3	18.0	13.0	95/3000	34	Trace
18-Jul	Calm	17.0	12.5	60/1500	33	0.36
19-Jul	NW 3–5	18.0	13.0	95/1000	34	0.24
20-Jul	NW 5–7	14.0	13.0	100/900	33	0.14
21-Jul	Calm	21.0	14.0	80/1800	32	Trace
22-Jul	SE 3	24.0	13.0	40/2000	31	0.22
23-Jul	SE 5–7	19.0	13.0	40/4000	32	0.05
24-Jul	SE 10–20	18.0	13.0	85/4000	30	0.01
25-Jul	ESE 7–10	16.0	13.0	90/4000	29	0.00
26-Jul	ESE 1–3	19.0	14.0	100/4000	28	0.02
27-Jul	S 1–3	15.0	12.0	100/VAR	30	0.23
28-Jul	SE 1–2	17.0	13.0	100/4000	30	0.20
29-Jul	SE 1–3	16.0	13.0	100/1000	30	0.24

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Table 22.–Page 2 of 3.

Date	Wind (Dir/Speed)	Air Temp. (˚C)	Water Temp. (˚C)	Cloud Cover %/altitude	Water level (cm)	Precip. (in)
30-Jul	SE 1–4	18.0	13.0	100/2000	30	0.06
31-Jul	NW 1–3	14.0	12.0	100/1800	29	Trace
1-Aug	NW 3–5	17.0	14.0	70/5000	29	0.70
2-Aug	NE 1–2	24.0	15.0	60/8000	28	0.00
3-Aug	NW 7–10	12.0	13.0	100/700	30	0.48
4-Aug	NW 3–5	14.0	13.0	100/4000	30	0.05
5-Aug	NW 5–7	17.0	13.0	90/3000	30	0.19
6-Aug	Calm	28.5	13.0	20/3500	29	0.00
7-Aug	SE 8–10	16.0	13.0	100/3000	27	0.00
8-Aug	SE 8–13	17.0	13.0	100/2700	27	0.00
9-Aug	SE 3	19.0	13.0	95/5000	26	0.00
10-Aug	SE 1–3	20.0	14.0	100/2000	26	0.05
11-Aug	WSW 1–3	13.0	13.0	100/400	26	0.20
12-Aug	SE 8–10	15.0	13.0	100/2000	26	0.30
13-Aug	SE 10–25	15.0	13.0	100/2000	27	0.24
14-Aug	SE	16.5	13.0	99/3000	27	0.13
15-Aug	SE 3	25.0	14.0	30/5000	26	0.00
16-Aug	Calm	16.0	14.0	100/FOG	24	0.00
17-Aug	Calm	27.0	15.0	30/7000	24	0.00
18-Aug	SE 5	20.0	15.0	95/2000	23	0.00
19-Aug	Calm	18.0	14.0	95/800	23	0.07
20-Aug	Calm	21.0	15.0	30/7000	23	0.00
21-Aug	E 5–7	23.0	14.0	20/5000	23	Trace
22-Aug	SE 10	20.0	13.0	80/6000	22	0.00
23-Aug	E 3–5	16.0	12.0	100/6000	22	0.00
24-Aug	E 5–7	19.0	12.0	100/4000	22	0.00
25-Aug	NW 1–3	17.0	12.0	95/VAR	22	0.00
26-Aug	NW 5–7	11.0	12.0	100/1000	24	0.12
27-Aug	W 3–5	10.5	9.0	50/10000	24	0.00
28-Aug	NW 1–3	11.0	9.0	50/Haze	23	0.00
29-Aug	NW 1	9.0	8.0	50/Haze	22	0.00
30-Aug	Calm	12.0	10.0	100/VAR	22	0.02
31-Aug	SE 8–10	14.0	9.0	100/6000	21	Trace
1-Sep	SE 3–5	13.0	9.0	100/VAR	21	0.01
2-Sep	NW 1–2	16.0	10.5	60/VAR	21	0.00
3-Sep	NW 1–2	8.0	9.5	80/VAR	21	0.04
4-Sep	ESE 5–7	12.0	8.0	100/5000	21	0.00
5-Sep	NW 1	12.0	9.0	95/VAR	21	0.04
6-Sep	SE 1–2	12.0	9.0	95/4500	20	0.00
7-Sep	SE 7–10	13.0	9.0	85/6000	20	0.00
8-Sep	SE 35	12.0	9.5	100/1500	20	0.00
9-Sep	SE 3–5	16.0	9.0	95/VAR	20	0.01
10-Sep	SE 5–7	15.0	10.0	50/VAR	20	0.01
11-Sep	Calm	11.5	9.0	95/1500	20	0.06
12-Sep	NW 7–10	7.0	8.5	70/1200	21	0.20

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Table 22.–Page 3 of 3.

Date	Wind (Dir/Speed)	Air Temp. (˚C)	Water Temp. (˚C)	Cloud Cover %/altitude	Water level (cm)	Precip. (in)
13-Sep	Calm	14.0	8.0	95/1300	21	0.00
14-Sep	ESE 7–10	7.0	6.0	99/10,000	21	0.30
15-Sep	NW 5–8	4.5	7.0	100/2000	21	0.10
16-Sep	NW 1–2	4.0	7.0	100/FOG	20	0.06
17-Sep	SE 5–8	9.5	6.5	20/VAR	20	0.01
18-Sep	SE 5–8	4.0	6.5	100/3000	20	0.10
19-Sep	Calm	7.5	7.0	100/3000	21	0.31
20-Sep	NW 7–10	5.0	7.0	100/1000	23	0.16
21-Sep	VAR 7–10	10.0	7.0	100/1000	20	0.28

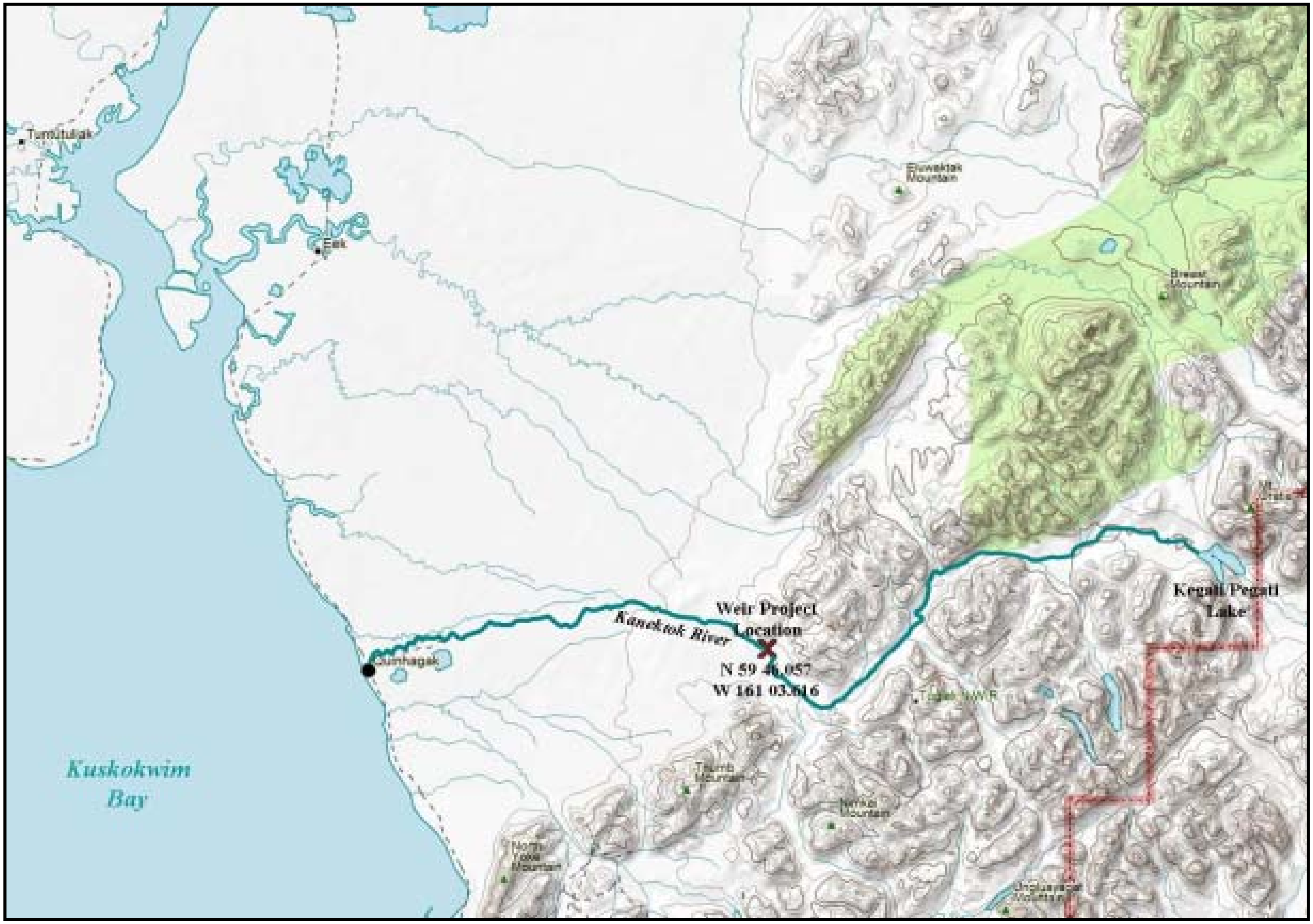

Figure 1.–Kanektok River, Kuskokwim Bay, Alaska.

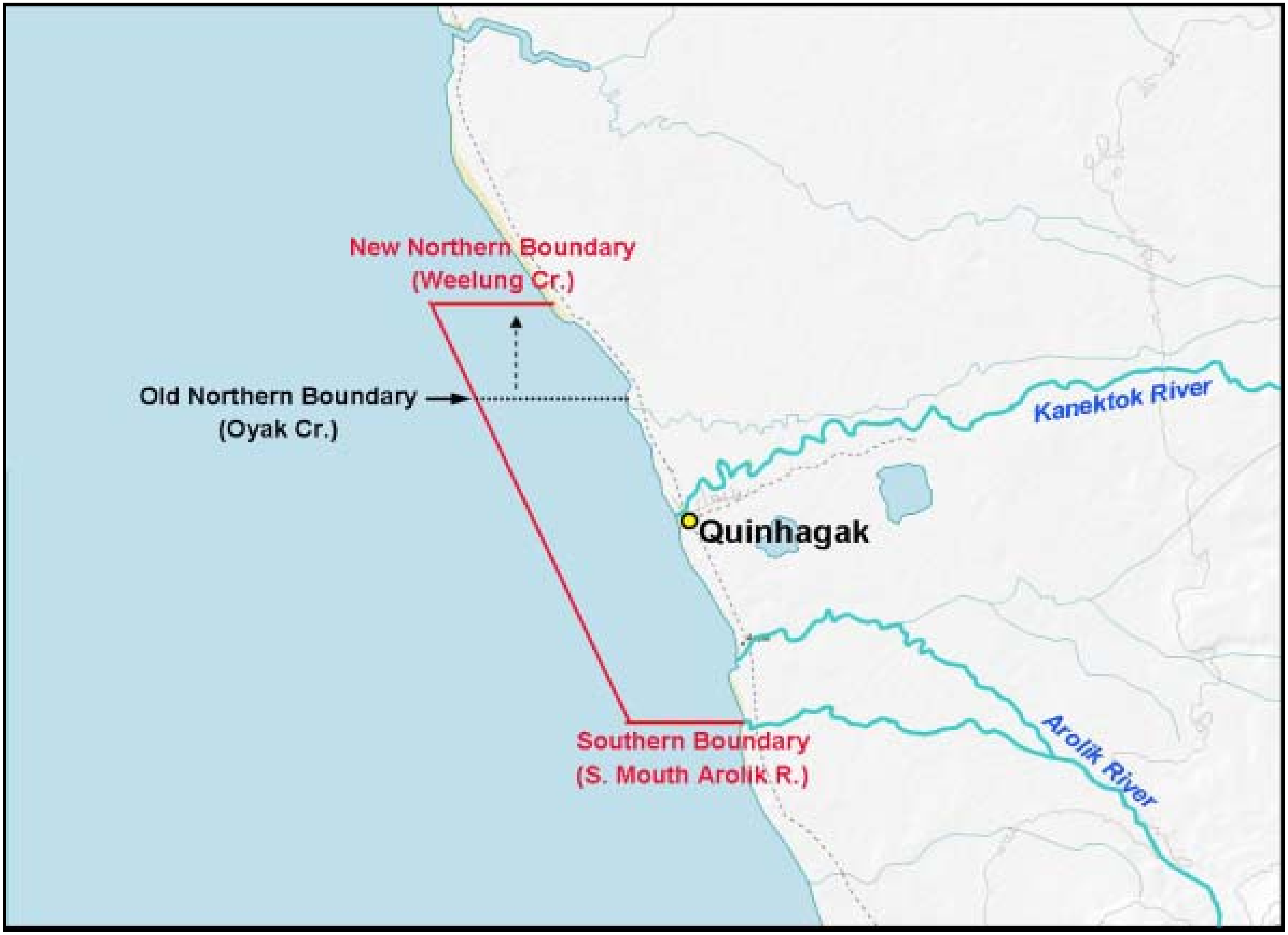

Figure 2.–Commercial Fishing District W-4, Kuskokwim Bay, Alaska, 2004.

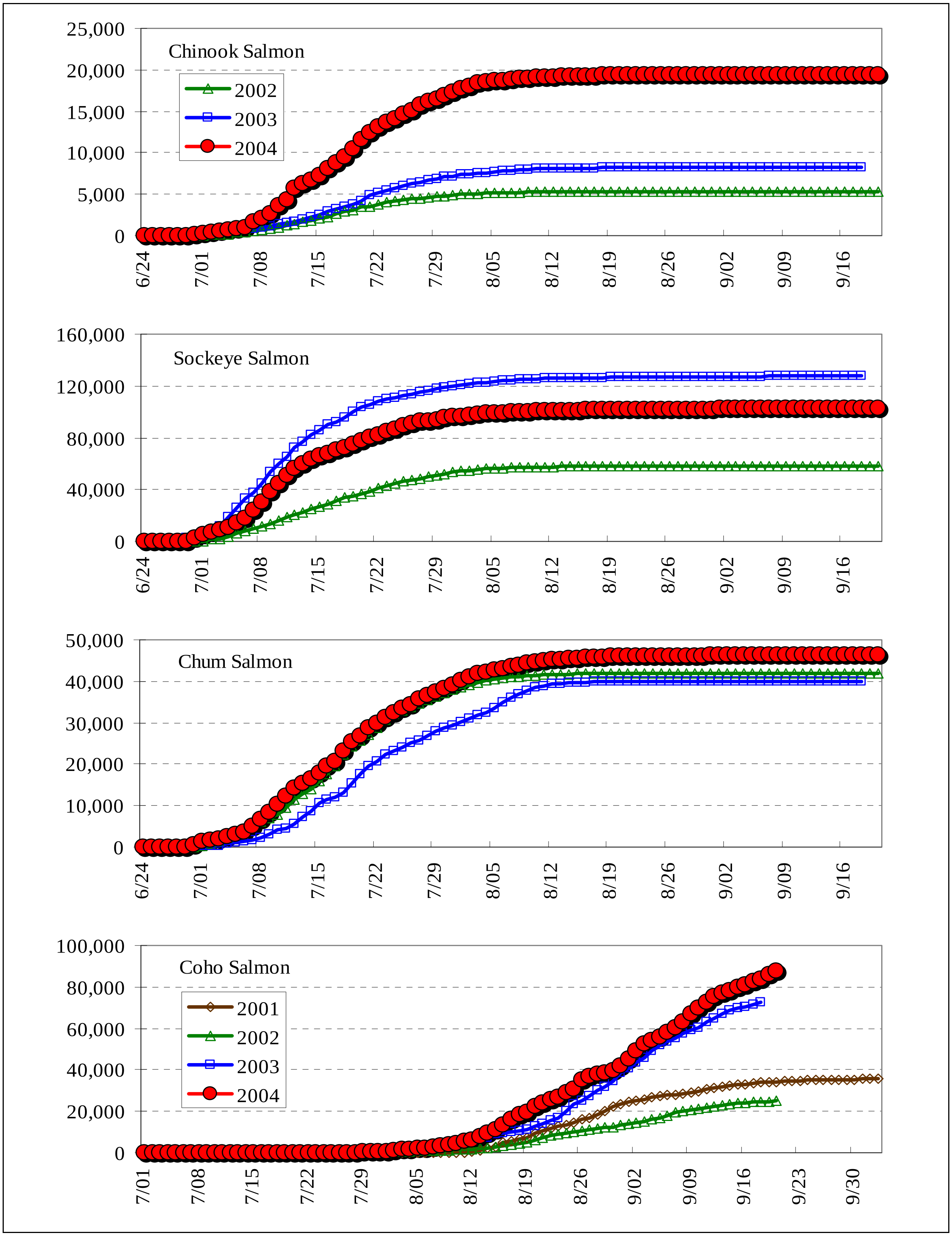

Figure 3.–Historical escapement of Chinook, sockeye, chum, and coho salmon at the Kanektok River weir.

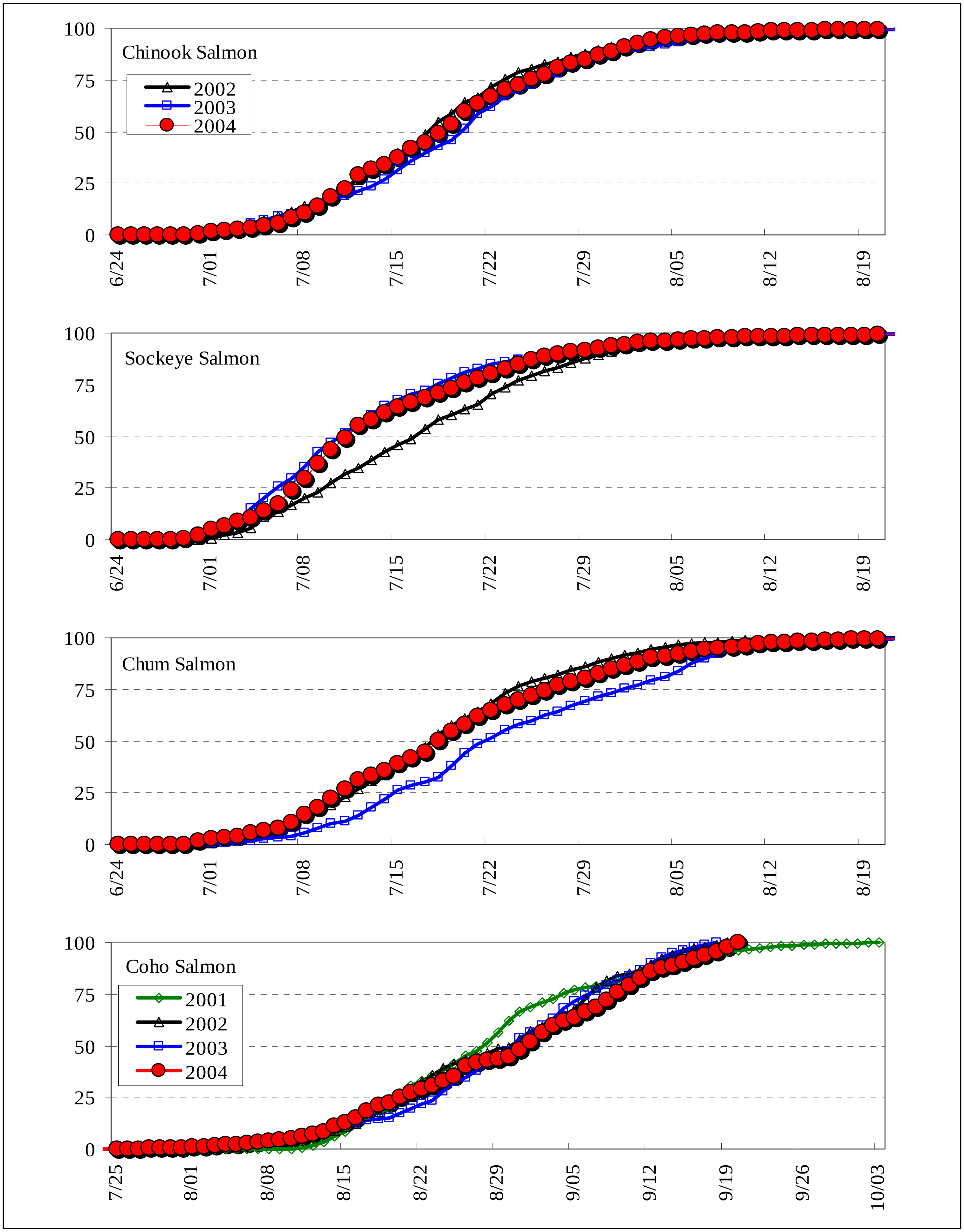

Figure 4.–Historical run timing of Chinook, sockeye, chum, and coho salmon at the Kanektok River weir.

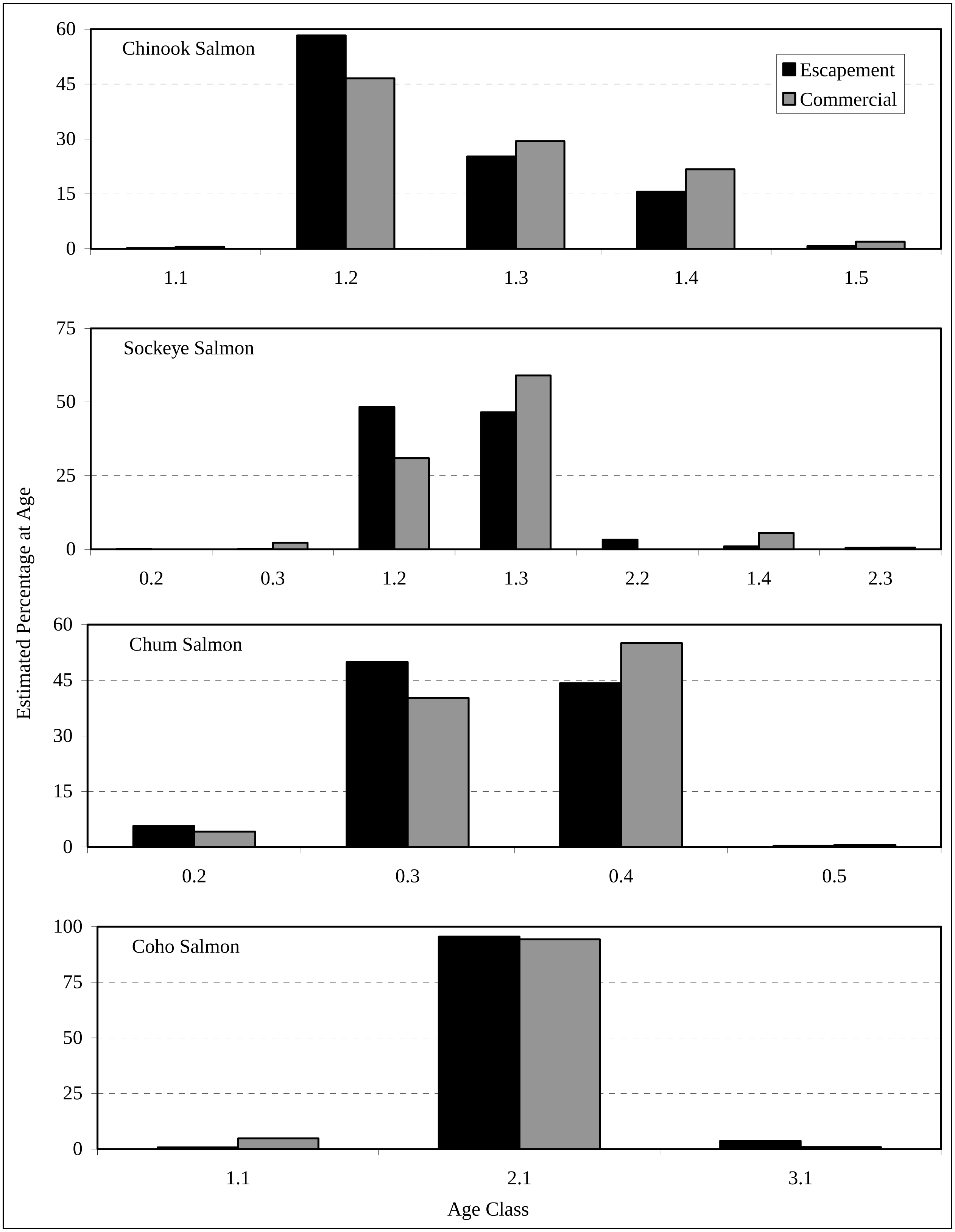

Figure 5.–Estimated age class percentages for Chinook, sockeye, chum, and coho salmon from Kanektok River weir escapement and the District W-4 commercial fishery, 2004.

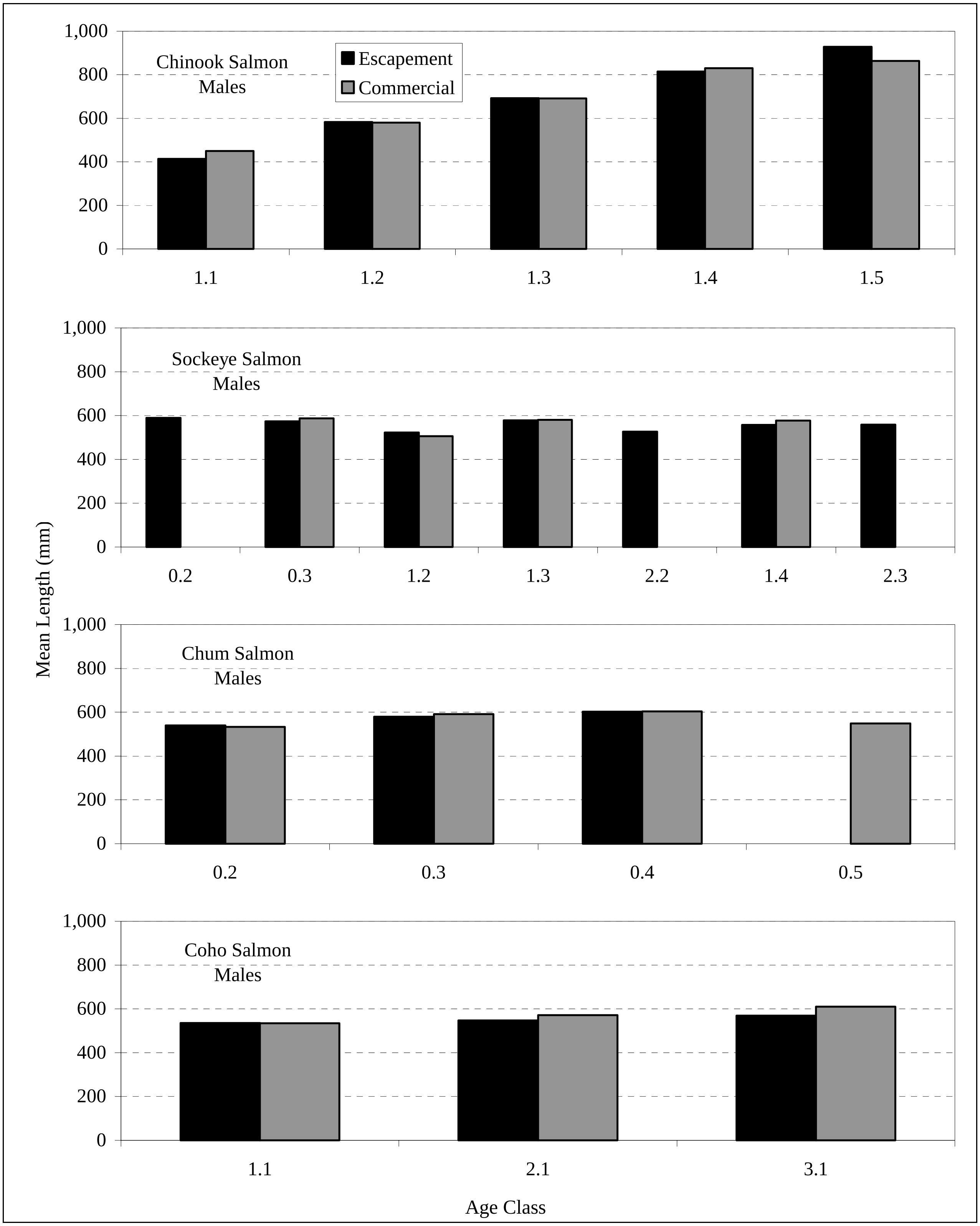

Figure 6.–Mean length by age class for male Chinook, sockeye, chum, and coho salmon from Kanektok River weir escapement and the District W-4 commercial fishery, 2004.

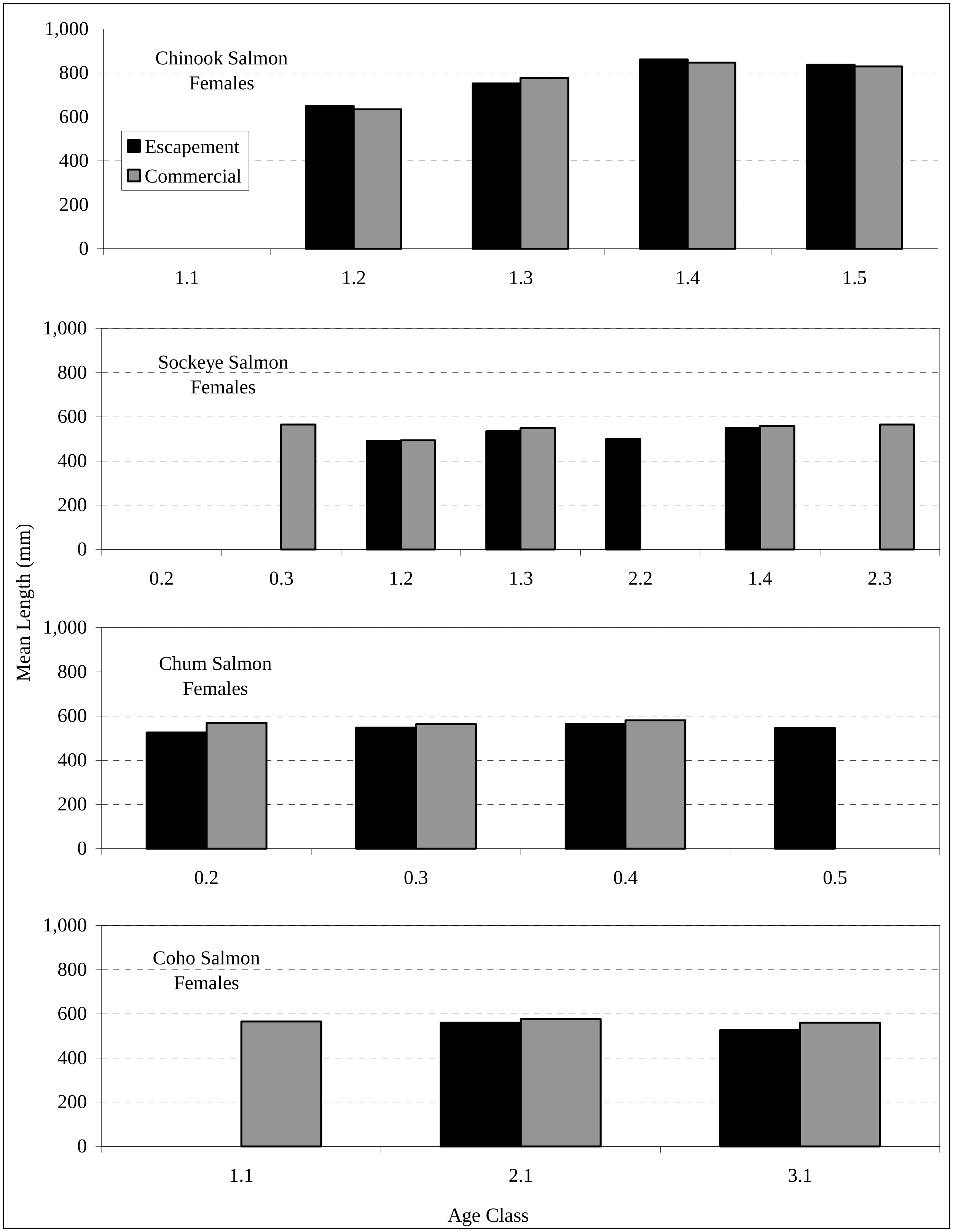

Figure 7.–Mean length by age class for female Chinook, sockeye, chum, and coho salmon from Kanektok River weir escapement and the District W-4 commercial fishery, 2004.

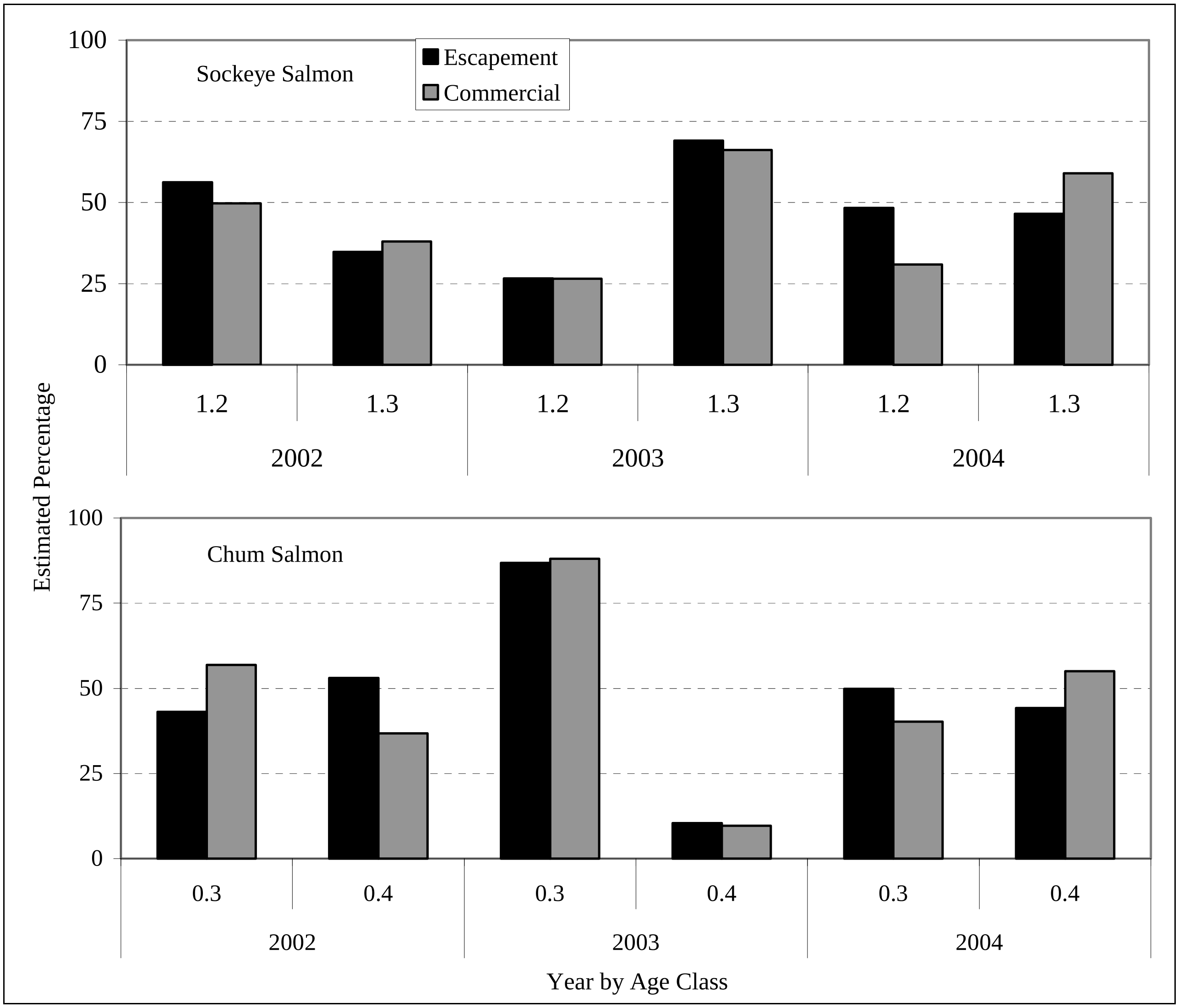

Figure 8.–Percentage of age-1.2 and -1.3 sockeye salmon and age-0.3 and -0.4 chum salmon from Kanektok River weir escapement and District W-4 commercial age, sex, and length (ASL) estimates, 2002 through 2004.

APPENDIX A. SALMON HARVESTS OF QUINHAGAK AREA

Appendix A1.–Historical commercial, subsistence, and sport fishing harvests of Chinook, sockeye, coho and chum salmon, Quinhagak area, 1960 through 2004.

Year	Chinook			Sockeye			Coho			Chum		
	Commercial	Subsistence	Sport	Commercial	Subsistence	Sport	Commercial	Subsistence	Sport	Commercial	Subsistence	Sport
1960	0			5,649			3,000			0		
1961	4,328			2,308			46			18,864		
1962	5,526			10,313			0			45,707		
1963	6,555			0			0			0		
1964	4,081			13,422			379			707		
1965	2,976			1,886			0			4,242		
1966	278			1,030			0			2,610		
1967	0	1,349		652			1,926			8,087		
1968	8,879	2,756		5,884			21,511			19,497		
1969	16,802			3,784			15,077			38,206		
1970	18,269			5,393			16,850			46,556		
1971	4,185			3,118			2,982			30,208		
1972	15,880			3,286			376			17,247		
1973	14,993			2,783			16,515			19,680		
1974	8,704			19,510			10,979			15,298		
1975	3,928			8,584			10,742			35,233		
1976	14,110			6,090			13,777			43,659		
1977	19,090	2,012		5,519			9,028			43,707		
1978	12,335	2,328		7,589			20,114			24,798		
1979	11,144	1,420		18,828			47,525			25,995		
1980	10,387	1,940		13,221			62,610			65,984		
1981	24,524	2,562		17,292			47,551			53,334		
1982	22,106	2,402		25,685			73,652			34,346		
1983	46,385	2,542	1,511	10,263		0	32,442		367	23,090		315
1984	33,663	3,109	922	17,255		143	132,151		1,895	50,422		376
1985	30,401	2,341	672	7,876	106	12	29,992	67	622	20,418	901	149
1986	22,835	2,682	938	21,484	423	200	57,544	41	2,010	29,700	808	777
1987	26,022	3,663	508	6,489	1,067	153	50,070	125	2,300	8,557	1,084	111
1988	13,883	3,690	1,910	21,556	1,261	109	68,605	4,317	1,837	29,220	1,065	618

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Year	Chinook			Sockeye			Coho			Chum		
	Commercial	Subsistence	Sport	Commercial	Subsistence	Sport	Commercial	Subsistence	Sport	Commercial	Subsistence	Sport
1989	20,820	3,542	884	20,582	633	101	44,607	3,787	1,096	39,395	1,568	537
1990	27,644	6,013	503	83,681	1,951	462	26,926	4,174	644	47,717	3,234	202
1991	9,480	3,693	316	53,657	1,772	88	42,571	3,232	358	54,493	1,593	80
1992	17,197	3,447	656	60,929	1,264	66	86,404	2,958	275	73,383	1,833	251
1993	15,784	3,368	1,006	80,934	1,082	331	55,817	2,152	734	40,943	1,008	183
1994	8,564	3,995	751	72,314	1,000	313	83,912	2,739	675	61,301	1,452	156
1995	38,584	2,746	739	68,194	573	148	66,203	2,561	970	81,462	686	213
1996	14,165	3,075	689	57,665	1,467	335	118,718	1,467	875	83,005	930	200
1997	35,510	3,433	1,632	69,562	1,264	607	32,862	1,264	1,220	38,445	600	212
1998	23,158	4,041	1,475	41,382	1,702	942	80,183	1,702	751	45,095	1,448	213
1999	18,426	3,167	854	41,315	2,021	496	6,184	2,021	1,091	38,091	1,810	293
2000	21,229	3,106	833	68,557	1,088	684	30,529	1,088	799	30,553	912	231
2001	12,775	2,923	947	33,807	1,525	83	18,531	1,525	2,448	17,209	747	43
2002	11,480	2,475	779	17,802	1,099	73	26,695	1,099	1,784	29,252	1,839	446
2003	14,444	3,898	323	33,941	1,622	107	49,833	2,047	1,076	27,868	1,129	14
2004	25,465	[a]	[a]	34,627	[a]	[a]	82,398	[a]	[a]	25,820	[a]	[a]
10-Year Average[b]	19,834	3,286	902	50,454	1,336	379	51,365	1,751	1,169	45,228	1,155	202
Historical Average	15,717	3,538	898	24,343	1,333 [c]	260	34,441	2,383 [c]	1,135	33,263	1,366 [c]	268

Note: Commercial harvest from District W-4 (Quinhagak), subsistence harvest by the community of Quinhagak, subsistence harvest estimates prior to 1988 are based on a different formula and are not comparable with estimates from 1988 to present. Source: Whitmore et al. *in prep*.

[a] Not available at time of publication.

[b] 10-year average from 1994 through 2003.

[c] Historical average of subsistence harvest from 1988 through 2003.

APPENDIX B. KANEKTOK ESCAPEMENT

Appendix B1.–Historical escapement, Kanektok River escapement projects, 1996 through 2004.

Year	Method	Dates of Operation	Chinook	Sockeye	Chum	Pink [a]	Coho
1996	Counting Tower [b]	2–13, 20–25 July	6,827 [e]	71,637 [e]	70,617 [e]		
1997	Counting Tower [b]	11 June–21 August	16,731	96,348	51,180	7,872 [e]	23,172 [e]
1998	Counting Tower [b]	23 July–17 August	[e]	[e]	[e]	[e]	[e]
1999	Tower/Weir [b]	Not Operational					
2000	Resistance Board Weir [c]	Not Operational					
2001	Resistance Board Weir[d]	10 August–3 October	132 [e]	735 [e]	1,058 [e]	19 [e]	35,677
2002	Resistance Board Weir[d]	1 July–20 September	5,343	58,367	42,014	87,036	24,883
2003	Resistance Board Weir[d]	24 June–18 September	8,221	127,471	40,071	2,443	72,448
2004	Resistance Board Weir[d]	29 June–20 September	19,528	102,867	46,444	98,060	87,828

[a] Picket spacing of the weir panels allows pink salmon to freely pass through the weir unobserved.
[b] Project located approximately 15 river miles from the mouth of the Kanektok River.
[c] Project located approximately 20 river miles from the mouth of the Kanektok River.
[d] Project located approximately 42 river miles from the mouth of the Kanektok River.
[e] No counts or incomplete counts as the project was not operational during a large portion of species migration.

APPENDIX C. KANEKTOK AERIAL SURVEYS

Appendix C1.–Aerial survey estimates of the Kanektok River drainage by species, 1965 through 2004.

Year	Chinook	Sockeye	Coho	Chum
1962	935	43,108	–	–
1965	–	–	–	–
1966	3,718	–	–	28,800
1967	–	–	–	–
1968	4,170	8,000	–	14,000
1969	–	–	–	–
1970	3,112	11,375	–	–
1971	–	–	–	–
1972	–	–	–	–
1973	814	–	–	–
1974	–	–	–	–
1975	–	6,018	–	–
1976	–	22,936	–	8,697
1977	5,787	7,244	–	32,157
1978	19,180	44,215	–	229,290 [a]
1979	–	–	–	–
1980	–	–	–	–
1981	–	–	69,325	–
1982	15,900	49,175	–	71,840
1983	8,142	55,940	–	–
1984	8,890	2,340	–	9,360
1985	12,182	30,840	46,830	53,060
1986	13,465	16,270	–	14,385
1987	3,643	14,940	–	16,790
1988	4,223	51,753	20,056	9,420
1989	11,180	30,440	–	20,583
1990	7,914	14,735	–	6,270
1991	–	–	–	2,475
1992	2,100	44,436	4,330	19,052 [b]
1993	3,856	14,955	–	25,675
1994	4,670	23,128	–	1,285
1995	7,386	30,090	–	10,000
1996	–	–	–	–
1997	–	–	–	–
1998	6,107	22,020	23,656	7,040
1999	–	–	5,192	–
2000	1,118	11,670	10,120	10,000
2001	6,483	38,610	–	11,440
2002	–	–	–	–
2003	6,206	21,335	–	2,700
2004	28,375	78,380	–	–
Goal	3,500–8,000	14,000–34,000	7,700–36,000	>5,200

Note: Aerial surveys are those rated as fair to good, obtained between 20 July and 5 August for Chinook and sockeye salmon, 20–31 July for chum salmon, and 20 August and 5 September for coho salmon. Years with "–" indicate either a survey was not flown or did not meet acceptable survey criteria.

[a] Chum salmon count excluded from escapement objective calculation due to exceptional magnitude.

[b] Some chum may have been sockeye.

APPENDIX D. CUMULATIVE PERCENT PASSAGE

Appendix D1.–Historical Chinook, sockeye, chum, and coho salmon cumulative percent passage, Kanektok River weir.

	Chinook Salmon			Sockeye Salmon			Chum Salmon			Coho Salmon			
Date	2002	2003	2004	2002	2003	2004	2002	2003	2004	2001	2002	2003	2004
6/24	0	0		0	0		0	0		0	0	0	
6/25	0	0		0	0		0	0		0	0	0	
6/26	0	0		0	1		0	0		0	0	0	
6/27	0	0		0	1		0	0		0	0	0	
6/28	0	0		0	1		0	0		0	0	0	
6/29	0	0	0	0	2	0	0	0	0	0	0	0	0
6/30	0	1	1	0	3	2	0	0	1	0	0	0	0
7/01	1	1	2	0	5	5	0	0	3	0	0	0	0
7/02	2	2	2	2	6	7	2	1	3	0	0	0	0
7/03	2	3	3	3	9	9	4	1	4	0	0	0	0
7/04	4	5	3	6	15	11	5	2	5	0	0	0	0
7/05	7	7	5	11	20	14	8	3	7	0	0	0	0
7/06	9	9	5	14	26	17	9	4	8	0	0	0	0
7/07	11	10	8	17	30	24	12	4	11	0	0	0	0
7/08	14	12	11	20	35	30	15	6	14	0	0	0	0
7/09	15	14	14	23	42	37	17	8	18	0	0	0	0
7/10	20	17	18	27	47	44	19	10	22	0	0	0	0
7/11	24	19	22	32	52	49	23	11	26	0	0	0	0
7/12	27	21	29	35	57	55	27	14	31	0	0	0	0
7/13	32	23	32	38	60	58	31	18	33	0	0	0	0
7/14	34	27	34	42	65	61	33	22	36	0	0	0	0
7/15	40	31	37	46	68	64	38	26	39	0	0	0	0
7/16	42	36	42	48	71	66	42	28	42	0	0	0	0
7/17	48	39	45	54	72	69	47	30	45	0	0	0	0
7/18	55	43	49	58	75	71	53	33	50	0	0	0	0
7/19	59	46	54	60	78	73	58	38	55	0	0	0	0
7/20	64	51	60	63	81	76	61	44	58	0	0	0	0
7/21	66	59	64	65	83	78	64	49	62	0	0	0	0
7/22	72	62	67	70	85	80	68	52	65	0	0	0	0
7/23	75	67	71	74	86	83	73	56	68	0	0	0	0
7/24	79	70	73	77	87	85	77	58	70	0	0	0	0
7/25	80	73	76	80	88	87	79	60	72	0	0	0	0
7/26	83	77	78	82	89	89	80	63	75	0	0	0	0
7/27	84	78	81	83	90	90	82	64	77	0	0	0	0
7/28	86	82	83	86	91	91	85	67	79	0	0	0	0
7/29	88	84	85	87	92	92	86	69	81	0	0	0	0
7/30	89	86	87	89	93	93	88	72	83	0	0	0	0
7/31	91	87	89	91	94	94	90	73	85	0	0	0	1
8/01	93	89	91	93	95	94	92	75	87	0	1	1	1
8/02	93	91	93	94	95	95	93	77	89	0	1	1	1
8/03	95	91	95	95	96	96	94	79	90	0	2	1	2
8/04	96	92	95	96	96	96	96	81	91	0	3	1	2
8/05	96	93	96	97	97	97	97	84	92	0	4	2	2
8/06	97	95	96	97	97	97	97	87	93	0	4	2	3
8/07	97	96	97	98	98	97	98	90	94	0	5	3	3
8/08	98	96	98	98	98	98	98	92	95	0	5	4	4
8/09	98	97	98	98	98	98	98	94	96	0	5	5	5
8/10	98	98	98	98	98	98	99	96	96	0	6	6	5
8/11	98	98	98	98	99	98	99	97	97	1	6	6	6
8/12	98	98	99	99	99	98	99	98	98	2	7	8	7
8/13	99	99	99	99	99	99	99	98	98	3	8	9	9
8/14	99	99	99	99	99	99	99	99	98	6	9	10	11

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	Chinook Salmon			Sockeye Salmon			Chum Salmon			Coho Salmon			
Date	**2002**	**2003**	**2004**	**2002**	**2003**	**2004**	**2002**	**2003**	**2004**	**2001**	**2002**	**2003**	**2004**
8/15	99	99	99	99	99	99	99	99	99	8	10	12	13
8/16	99	99	99	99	99	99	100	99	99	14	12	13	15
8/17	99	99	99	99	99	99	100	99	99	16	16	14	18
8/18	99	99	99	99	99	99	100	100	99	18	18	14	21
8/19	100	99	99	100	99	99	100	100	99	20	21	15	22
8/20	100	99	100	100	99	99	100	100	99	27	25	18	25
8/21	100	99	100	100	99	99	100	100	100	30	29	19	27
8/22	100	99	100	100	99	99	100	100	100	33	33	22	29
8/23	100	100	100	100	100	99	100	100	100	35	36	23	31
8/24	100	100	100	100	100	99	100	100	100	38	39	28	33
8/25	100	100	100	100	100	99	100	100	100	41	42	32	35
8/26	100	100	100	100	100	100	100	100	100	45	43	34	40
8/27	100	100	100	100	100	100	100	100	100	48	45	38	42
8/28	100	100	100	100	100	100	100	100	100	52	46	42	43
8/29	100	100	100	100	100	100	100	100	100	57	48	44	44
8/30	100	100	100	100	100	100	100	100	100	62	49	48	45
8/31	100	100	100	100	100	100	100	100	100	66	53	53	48
9/01	100	100	100	100	100	100	100	100	100	69	57	56	52
9/02	100	100	100	100	100	100	100	100	100	71	59	60	56
9/03	100	100	100	100	100	100	100	100	100	73	61	63	60
9/04	100	100	100	100	100	100	100	100	100	75	65	68	62
9/05	100	100	100	100	100	100	100	100	100	77	68	72	64
9/06	100	100	100	100	100	100	100	100	100	78	72	74	66
9/07	100	100	100	100	100	100	100	100	100	79	78	77	69
9/08	100	100	100	100	100	100	100	100	100	80	81	79	72
9/09	100	100	100	100	100	100	100	100	100	81	84	82	76
9/10	100	100	100	100	100	100	100	100	100	84	85	84	79
9/11	100	100	100	100	100	100	100	100	100	85	87	87	83
9/12	100	100	100	100	100	100	100	100	100	87	90	90	86
9/13	100	100	100	100	100	100	100	100	100	89	92	93	87
9/14	100	100	100	100	100	100	100	100	100	90	94	95	89
9/15	100	100	100	100	100	100	100	100	100	92	95	96	91
9/16	100	100	100	100	100	100	100	100	100	93	97	98	92
9/17	100	100	100	100	100	100	100	100	100	94	98	99	94
9/18	100	100	100	100	100	100	100	100	100	95	99	100	96
9/19	100		100	100		100	100		100	96	100		98
9/20	100		100	100		100	100		100	96	100		100
9/21										97			
9/22										97			
9/23										98			
9/24										98			
9/25										99			
9/26										99			
9/27										99			
9/28										99			
9/29										99			
9/30										100			
10/01										100			
10/02										100			
10/03										100			

Note: The boxes represent the central 50% of the run and median date of passage. Shaded areas represent the central 80% of the run.