YUKON RIVER SALMON 2007 SEASON SUMMARY AND 2008 SEASON OUTLOOK

Prepared by

THE UNITED STATES AND CANADA
YUKON RIVER JOINT TECHNICAL COMMITTEE

March 2008
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Alaska Department of Fish and Game
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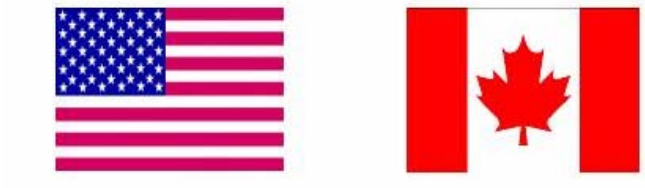
Anchorage, AK 99518, USA



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, Special Publications and the Division of Commercial Fisheries Regional Reports. 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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The Regional Information Report Series was established in 1987 and was redefined in 2006 to meet the Division of Commercial Fisheries regional need for publishing and archiving information such as project operational plans, area management plans, budgetary information, staff comments and opinions to Board of Fisheries proposals, interim or preliminary data and grant agency reports, special meeting or minor workshop results and other regional information not generally reported elsewhere. Reports in this series may contain raw data and preliminary results. Reports in this series receive varying degrees of regional, biometric and editorial review; information in this series may be subsequently finalized and published in a different department reporting series or in the formal literature. Please contact the author or the Division of Commercial Fisheries if in doubt of the level of review or preliminary nature of the data reported. Regional Information Reports are available through the Alaska State Library and on the Internet at: http://www.sf.adfg.ak.us/statewide/divreprots/htlm/intersearch.cfm.

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1.0 ABSTRACT

The Joint Technical Committee (JTC) of the United States and Canada serves as a scientific advisory body to the Yukon River Panel. The JTC discusses harvest and escapement goals, management trends, postseason reviews and preseason outlooks, and results of cooperative research projects. The report summarizes the status of salmon stocks (Chinook, coho, summer and fall chum salmon) in 2007 with reference to historical data, presents an outlook for the 2008 season, and provides data on the utilization of salmon species by commercial and subsistence (aboriginal) harvests, personal use (domestic) and sport (recreational) fishery. The report further compiles summaries of Yukon River projects (e.g., mark–recapture, sonar, stock identification) and a review of salmon bycatch in the groundfish and pollock fisheries of the Bering Sea and the Gulf of Alaska. Yukon River escapement goals for Chinook, chum and coho salmon remained unchanged for 2008.

Keywords: Yukon watershed, Yukon River Salmon Agreement, Chinook salmon, chum salmon, coho salmon, escapement, season outlook.

2.0 INTRODUCTION

The United States and Canada Joint Technical Committee (JTC) was established in 1985 and serves as a scientific advisory body to the Yukon River Panel. The JTC meets semi-annually to discuss harvest and escapement goals, management trends, preseason outlooks and postseason reviews, and results of cooperative research projects. The fall JTC meeting was held November 6–8, 2007 at the Canadian Department of Fisheries and Oceans Board Room in Whitehorse, Yukon Territories. The JTC reviewed all Canadian and U.S. proposals to the Restoration and Enhancement (R&E) fund (specific comments were received) and discussed enhancement of conceptual proposals. The JTC R&E sub-committee held a meeting to discuss a variety of issues associated with the proposal process. A JTC technical group was assembled to address the issue of how escapement and border passage targets for Chinook salmon could be established on the basis of sonar estimates rather than using the traditional estimates from mark and recapture studies in Canada. Several approaches were discussed and the team was tasked to assemble details on these proposals for the next meeting. A second team was established to revisit escapement goals for Fishing Branch River (Porcupine River) fall chum salmon. Postseason summaries were provided for Chinook and summer chum salmon (Steve Hayes, ADF&G), fall chum and coho salmon (Bonnie Borba, ADF&G) and Canadian fisheries (Pat Milligan, DFO). Mary Ellen Jarvis provided an overview and update of Canadian aboriginal fisheries. Lara Dehn (ADF&G) updated the committee on *Ichthyophonus* studies and Pat Milligan (DFO) summarized the coded wire tag (CWT) program at the Whitehorse Hatchery. In Dick Wilmot's (NMFS) absence, Eric Volk provided an overview of marine fisheries issues including an update of current bycatch of Chinook and chum salmon in the BSAI/GOA Pollock fishery.

The spring JTC meeting was held March 3–6 at the Alpine Inn, Fairbanks, Alaska. The R&E sub-committee convened the first day for review of 55 Canadian and U.S. detailed proposals to the R&E fund. Funding recommendations to the Yukon River Panel were based upon priorities established by the Panel and JTC, and the quality and technical merit of the proposals. The entire JTC began their meeting on Tuesday March 4. Preseason run outlooks for 2008 were summarized for U.S. Chinook and summer chum salmon (Steve Hayes and Dani Evenson), U.S. fall chum and coho salmon (Bonnie Borba and Fred Bue) and Canadian chum and Chinook salmon (Pat Milligan). Management strategies for 2008 were also discussed. The JTC heard reports from sub-committees, including stock identification and genetics, *Ichthyophonus*, and salmon size. The chair briefly reviewed membership of the committees and suggested that the

stock identification and genetics sub-committees be combined. Hamachan Hamazaki (ADF&G) provided an independent, preliminary analysis of Chinook salmon size trends through time. A significant portion of the meeting was devoted to discussing a Canadian Chinook salmon escapement goal as estimated from the sonar project at Eagle, Alaska. Gene Sandone (ADF&G) presented a brief history of escapement goal development for Yukon River Chinook and a detailed spawner-recruit analysis for Canadian Chinook that provided a foundation for continued discussions. The work group appointed at the previous JTC meeting (see above) met to discuss options for a recommended target, and summarized their deliberations and approaches to the entire JTC. A consensus was reached within the JTC to recommend an interim escapement target of 45,000 Chinook as estimated by Eagle sonar. The JTC also deliberated on possible revisions to the Fishing Branch River chum salmon escapement goal. Bonnie Borba (ADF&G) provided a detailed presentation reviewing previous analyses by Eggers (ADF&G), some of the criticisms behind that work and a suggested approach for applying the Bue-Hasbrouck method to available escapement data. Following a brief discussion, the JTC agreed to recommend a revised interim escapement target for Fishing Branch River chum salmon of 22,000–49,000 for the next 3 years. Glen Martin (Alaska Power and Telephone) described a proposed project to supply the town and village of Eagle, Alaska with power generated from small, in-river turbines. The JTC made comments on study needs to determine the potential impact of the tethered turbines to juvenile and adult fish. The marine report was limited to a discussion of bycatch topics, including the range of options before the North Pacific Council for limiting bycatch, the sampling plan that would better define impacts to specific runs, and the recent attention to *Ichthyophonus* as an alternative explanation for smaller observed run sizes. The JTC heard two specific reports for R&E funded projects; the weight and girth study (Bob DuBey, YRDFA) and the ageing consistency study (Larry Dubois, ADF&G). The JTC R&E sub-committee provided its recommended project priorities to the entire body for review and additional input. Priorities were assigned in recognition of the Budget Priorities Framework document and the JTC Research plan. Several important projects were advanced as joint efforts between ADF&G and CDFO. The meeting concluded with a review of projects and activities planned for the 2008 field season and assignments for presentations to the Panel at their April, 2008 meeting in Whitehorse.

Meeting participants and affiliations:

Meeting Attended:

* Fall only
[#] Spring only

Fisheries and Oceans Canada (DFO)

Sandy Johnston (JTC Co-Chair)	Patrick Milligan
Mary Ellen Jarvis[*]	Al von Finster
Jacque Jobin	Steve Cox-Rogers[#]

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Chris Stark[#]

Yukon River Drainage Fisheries Association (YRDFA)

Robert Dubey

3.0 COMMERCIAL FISHERY–ALASKA

3.1 CHINOOK AND SUMMER CHUM SALMON

The Yukon River drainage is divided into fishery districts and sub-districts for management purposes (Figure 1). The Alaska Department of Fish and Game (ADF&G) uses an adaptive management strategy that evaluates run strength in season to determine a harvestable surplus above escapement requirements and subsistence uses. Preseason, a management strategy was developed in cooperation with federal subsistence managers that outlined run and harvest outlooks along with the regulatory subsistence salmon fishing schedule described in an information sheet. The 2007 strategy was to implement the subsistence salmon fishing schedule as salmon began to arrive in each district or sub-district in a stepwise manner. Before implementing this schedule, subsistence fishing would be allowed 7 days a week to provide opportunity to harvest non-salmon species, such as whitefish, sheefish, pike, and suckers. Additionally, an informational sheet was used to prepare fishers for possible reductions to the subsistence salmon fishing schedule or to allow for a small commercial fishery contingent on how the runs developed. The information sheet was mailed to Yukon River commercial permit holders and approximately 2,800 families identified from ADF&G's survey and permit databases. State and federal staff presented the management strategy to the Yukon River Drainage Fisheries Association (YRDFA), State of Alaska Advisory Committees, Federal Regional Advisory Councils, and other interested and affected Parties.

3.1.1 Chinook Salmon

In 2002–2005, preseason management strategies were developed to not allow commercial fishing until near the midpoint of the Chinook salmon run. This interim strategy was designed to pass fish upstream for escapement, cross-border commitments to Canada, and subsistence uses in the event of a very poor run as occurred in 2000. However, a drawback to this approach is the harvest is not spread out over the entire run and commercial fishing is concentrated on only those stocks migrating during the latter half of the run. Furthermore, if the run is strong, delaying commercial fishing can result in foregone commercial harvest opportunities. The preferred strategy for managing commercial fisheries is to spread the harvest over the middle 50% of the run, starting near the first quarter point of the run. This strategy was in place before the decline in 1998. Additional harvest after the third quarter point can occur late in the season based on information from escapement projects. In 2007, based on the preseason projections, a short commercial fishing period was scheduled on the historic first quarter point (June 15) to target Chinook salmon, while the majority of the commercial harvest was spread over the middle 50% of the run.

Lower Yukon Test Fishery (LYTF) indices, subsistence harvest reports, and Pilot Station sonar passage estimates provide information ADF&G uses to assess the inseason salmon run. As the run progresses upriver, other projects provide additional run assessment information.

Yukon River Chinook salmon return primarily as age-5 and age-6 fish, although age-4 and age-7 fish also contribute to the run[1]. The 4-year-old component in 2006 was below average, whereas the 5-year-old component was above average. The previous 2 years (2005 and 2006) runs have been near average indicating good production from the poor runs of 2000 and 2001. In 2001, the

[1] Salmon ages given in this document represent the combined freshwater and saltwater age.

brood year producing 6-year-old fish returning in 2007, successful aerial survey observations were made in all eight Yukon River index tributaries used for escapement assessment. Minimum aerial survey sustainable escapement goals (SEGs) have been established in the East and West Fork Andreafsky, Anvik, North and South Fork Nulato, and Gisasa rivers. With the exception of the East and West Fork Andreafsky rivers, all aerial survey goals were met. Upper ranges of the biological escapement goals for the Chena and Salcha rivers were exceeded. The Canadian Yukon River mainstem spawning escapement in 2001 was the second largest on record.

Assuming an approximately normal return of 5-year-old and 6-year-old fish, the 2007 run was expected to be average to below average and similar in abundance to the 2006 run. It was anticipated the run would provide for escapements, support a normal subsistence harvest, and a below average commercial harvest. Therefore, ADF&G developed a conservative preseason management strategy in 2007 with a potential harvest ranging from 30,000 to 60,000 Chinook salmon.

Ice breakup in the lower river occurred on May 18, 4 days earlier than the historic average of May 22 (1979–2004). River conditions in the lower river early in the season were characterized as having lower than normal water levels. The first subsistence catch of Chinook salmon was reported on June 2 near Emmonak. The department's LYTF recorded the first Chinook salmon catch on June 3. The subsistence salmon fishing schedule was initiated on May 28 in District 1 and implemented upriver chronologically consistent with migratory timing as the run progressed upstream.

Early run assessment indicated the Chinook and summer chum salmon runs were of adequate strength to allow subsistence salmon fishing to continue on the regulatory fishing schedule. Further assessment indicated that a surplus of Chinook and summer chum salmon was available for other uses. Once it is projected that there is a surplus beyond escapement requirements and subsistence uses, the schedule typically reverts to the pre-2001 Alaska Board of Fisheries (BOF) subsistence fishing regulations and the commercial season is opened. However, despite a short commercial opening on June 15 in District 2 occurring earlier in the run, the subsistence schedule was not terminated until June 19, 4 days after the opening of the commercial season in that district and on June 18 in District 1. The schedule was relaxed in Districts 3–5 in the same manner it was instituted, chronologically upriver based on run timing, to afford similar protection to the early run fish as in the lower river.

According to the LYTF catch per unit effort (CPUE) data, approximately 50% (the midpoint) of the Chinook salmon run had entered the lower river by June 21, 1 day later than the average date for the midpoint (Figure 2). The Pilot Station sonar preliminary passage estimate was approximately 125,553 Chinook salmon (Appendix Table A2). The first quarter point, midpoint, and third quarter point were on June 19, June 24, and July 1, respectively. The cumulative LYTF CPUE in 2007 was 19.21 (Figure 2). Compared to previous years, this CPUE was below the 1989–2006 average of 22.99, and below the 1989–1997 (before the run decline) and 2003–2004 average of 25.74. The first quarter point, midpoint, and third quarter point were on June 16, June 22, and June 28 respectively.

Similar to the management strategy utilized in 2006, ADF&G scheduled a short, early commercial fishing period based on the preseason projection. The opening was intended to foster early commercial interest. The first commercial fishing period in the lower river occurred in District 2 on Friday, June 15 for 3-hours with unrestricted mesh size gillnets; this was the second

shortest commercial opening targeting Chinook salmon on record. The commercial harvest was 2,081 Chinook and 142 chum salmon.

The LYTF nets observed the first and largest pulse of Chinook salmon from June 14 through June 17 (Figure 2). Based on this pulse, the Chinook salmon run was estimated to be slightly later than average. ADF&G delayed opening the next commercial period targeting Chinook salmon until June 18, 2 days after the first quarter point of the Chinook salmon run at the LYTF in District 1. During the second pulse from June 20 to June 24, it appeared that Chinook salmon were entering the river at a slow, steady rate rather than the more typical pulse-like entry pattern, and the run was not as strong overall as anticipated. A strong first pulse followed by a weaker second pulse is unusual. During the poor runs of 1998 and 2000, the LYTF CPUE and Pilot Station sonar estimates were lower than average throughout the run. As the 2007 run progressed, it became clear that the Chinook salmon run was not developing as expected and was weaker than the run observed in 2006.

The border passage estimate from the Eagle sonar project was approximately 41,200 Chinook salmon. However, the escapement target into Canada, which is based on the Canadian fish wheel mark–recapture border passage estimate, and is currently being managed at the rebuilt escapement level of 33,000–43,000 Chinook salmon, was not met in 2007. The border passage estimate provided by the Canadian assessment project was approximately 17,000 fish. However, the escapement target had been achieved consistently from 2001–2005. In summary, the 2007 Chinook salmon run was weaker than the run of 2006, and below the recent 10-year average of 210,000 Chinook salmon.

3.1.2 Summer Chum Salmon

The summer chum salmon runs have exhibited steady improvements since 2001 with harvestable surpluses in each of the past 6 years (2002–2007). However, it appears that production was poorer for spawning tributaries in the lower portion of the drainage such as the Andreafsky and Anvik rivers during this time period, whereas production was much higher for spawning tributaries upstream of the Anvik River. Weak chum salmon runs from 1998 through 2001 are attributed to reduced run size, and not the result of low levels of parent year escapements as spawning escapements were well above average from 1994–1996.

The 2007 run outlook was for an average to above average run, which would provide for escapement, support a normal subsistence harvest, and a surplus for commercial harvest. The commercial harvest in Alaska was projected to be from 500,000 to 900,000 summer chum salmon depending on salmon market conditions.

The Yukon River summer chum salmon run was managed according to the guidelines described in the Yukon River Summer Chum Salmon Management Plan (Appendix Table A3). The management plan provides for escapement needs and subsistence use priority before other consumptive uses such as commercial, sport, and personal use fishing. The plan allows for varying levels of harvest opportunity depending on the run size projection. ADF&G uses the best available data to assess the run including: preseason run outlooks, Pilot Station sonar passage estimate, test fishing indices, age and sex composition, subsistence and commercial harvest reports, and information from escapement monitoring projects.

The summer chum salmon entry in 2007 was average in run timing. The 2007 summer chum salmon run passage at the Pilot Station sonar project was the 7th highest on record

(approximately 1.7 million fish), (Appendix Table A2). By June 22, the summer chum salmon run at Pilot Station was projected to be near 1.6 million fish, a level that would allow a directed summer chum salmon fishery. The first quarter point, midpoint, and third quarter point were on June 21, June 27, and July 2, respectively. In 2007, there was a renewed market interest for summer chum salmon. Based on the projected near average run estimate for summer chum salmon, ADF&G initiated short commercial periods restricted to 6-inch maximum mesh size in districts 1 and 2 directed at chum salmon. Because of the uncertainty in Chinook salmon run strength, only restricted mesh openings were allowed after June 25. The department attempted to schedule these chum-directed commercial periods when Chinook salmon abundance was low. Additionally, three commercial periods were established in Subdistrict 4-A and seven commercial periods were established in District 6 which were directed at summer chum salmon. The total commercial harvest was 198,201 summer chum salmon.

3.1.3 Harvest and Value

In 2007, a total of 33,634 Chinook and 198,201 summer chum salmon were commercially harvested (Appendix Table A1) and sold in the round in the Alaskan Yukon River drainage. The historical commercial harvest includes the number of salmon sold in the round and the estimated number of salmon harvested to produce roe sold. The Chinook salmon commercial harvest was 23% below the 1997–2006 average harvest of 43,428 fish. The summer chum salmon harvest was 315% above the 1997–2006 average harvest of 47,713 fish.

A total of 591 permit holders participated in the Chinook and summer chum salmon fishery, which was 4% below the 1997–2006 (not including 2001) average of 614 permit holders. The Lower Yukon Area (Districts 1–3) and Upper Yukon Area (Districts 4–6) in Alaska are separate Commercial Fisheries Entry Commission (CFEC) permit areas. A total of 564 permit holders fished in the Lower Yukon Area in 2007, which was 4% below the 1997–2006 average of 585 permit holders. In the Upper Yukon Area in Alaska, 27 permit holders fished, which was 16% below the 1997 2006 (not including 2001) average of 32 permit holders. Yukon River fishermen in Alaska received an estimated $2.2 million for their Chinook and summer chum salmon harvest in 2007, approximately 13% below the 1997–2006 average of $2.6 million.

3.1.4 Results by District

Districts 1–3

Similar to the management strategy utilized in 2006, ADF&G scheduled a short, early commercial period based on the preseason projection. The commercial harvest was 2,081 Chinook and 142 chum salmon.

Due to the uncertainty about the Chinook salmon run strength after the second pulse, management of the Chinook salmon commercial fishery was conservative in order to meet escapement and subsistence needs and Canadian Border passage obligation. After June 25, no additional unrestricted commercial periods targeting Chinook salmon were allowed in the lower river districts.

A total of 22,986 Chinook salmon were taken during eight unrestricted mesh size openings and 9,121 Chinook salmon were incidentally harvested in fifteen restricted periods, which were composed of approximately 70% males in Districts 1–3. The combined total harvest of all openings in Districts 1, 2, and 3 was 32,112 (includes 5 Chinook salmon harvested in the fall season) Chinook salmon. The average weight of Chinook salmon in unrestricted mesh openings

in Districts 1, 2, and 3 was 20.1 pounds. The average weight of Chinook salmon in restricted mesh openings in Districts 1 and 2 was 12.2 pounds.

Estimated age and sex composition of Chinook salmon in the lower river commercial harvest was combined for Districts 1, 2, and 3, and is provided for both restricted and unrestricted mesh periods. The Chinook salmon age composition from the lower river unrestricted commercial harvest was 3.0% age-4, 16.9% age-5, 78.1% age-6, and 1.8% age-7 fish. Sex composition of the harvest was 52.2% females. The Chinook salmon age composition from the lower river restricted commercial harvest was 26.2% age-4, 32.4% age-5, 40.8% age-6, and 0.6% age-7 fish. Sex composition of the harvest was 36.2% females.

In 2007, there was a renewed market interest for summer chum salmon. Based on the projected near average run estimate for summer chum, ADF&G initiated short commercial periods restricted to 6-inch maximum mesh size in the lower river districts directed at chum salmon beginning in District 2 with a 2-hour commercial period on June 19. Because of the uncertainty about the Chinook salmon run strength, only restricted mesh openings were allowed after June 25.

In 2007, 6 unrestricted mesh size commercial fishing periods were scheduled in Districts 1 and 2 combined and 15 restricted mesh size (6-inch or less) commercial fishing periods. Additionally, two commercial fishing periods occurred in District 3 with unrestricted mesh size. The combined commercial summer chum salmon harvest in District 1, 2, and 3 was 176,223 fish. Average weight of summer chum salmon in Districts 1, 2, and 3 commercial harvests was 6.5 pounds. The summer chum salmon age composition from the lower river restricted commercial harvest was 32.1% age-3, 50.7% age-5, 17.1% age-6, and 0.1% age- 7 fish. Sex composition of the harvest was 51.3% females.

Districts 4–6

Limited salmon markets resulted in lower effort and subsequently lower harvest rates in District 4. The Anvik River had an escapement of approximately 459,000 summer chum salmon. The projection required to allow an inriver commercial fishery is 500,000 fish, and the Anvik River Management Area remained closed to commercial fishing in 2007.

Historically, the Subdistrict 4-A fishery targets summer chum salmon. The dominant gear type, fish wheels, and the location of the fishery, result in a very high chum-to-Chinook salmon ratio. Commercial fishing in Subdistrict 4-A consisted of three periods for a total of 408 hours in 2007. A total of 5 fishers harvested 7,304 summer chum salmon (Appendix Table A1). A total of 5,938 pounds of summer chum salmon roe were sold in Subdistrict 4-A. The renewed summer chum commercial fishery in 2007 was the first since 1997. No commercial deliveries were reported in 2007 in Subdistrict 4-B and 4-C because of a lack of a market.

Subsistence fishermen in the middle river reported difficulties in catching Chinook salmon, and ADF&G responded by providing additional fishing opportunities. By emergency order, the department allowed subsistence fishing 7 days per week in District 4 on July 6 and allowed an additional 7 days of drift gillnet fishing for Chinook salmon from July 16 through July 23 in Subdistrict 4-A.

Three commercial fishing periods were allowed in Subdistricts 5-B and 5-C for a total of 36 hours of fishing time. A total of 12 fishers harvested 1,241 Chinook salmon (Appendix Table A1). The combined commercial Chinook salmon harvest in Subdistricts 5-B and 5-C was

3% above the 1997–2006 average harvest of 1,206 fish. Typically, the harvest of summer chum salmon is low in these subdistricts as they are located far above the vast majority of summer chum salmon spawning areas, and no summer chum salmon were harvested commercially in 2007. No commercial fishing periods were announced for Subdistrict 5-D due to lack of a market.

The age and sex of Chinook salmon from the upper river commercial harvests in Alaska (District 5) was 15.6% age-4, 37.7% age-5, 45.9% age-6, and 0.8% age-7 fish. Sex composition was 37.9% females. Fish wheels, the dominant gear type in the Upper Yukon Area, are generally biased in their harvests, tending to catch a higher number of smaller Chinook salmon (Meehan 1961), which are mostly males.

In 2007, commercial fishing in District 6 consisted of seven periods for a total of 492 hours. Summer chum salmon were targeted during these commercial fishing periods, although some Chinook salmon were incidentally harvested. Test fish wheel and commercial catches indicated that the summer chum salmon run in the Tanana River was below average. The total estimated commercial harvest was 281 Chinook and 14,674 summer chum salmon harvested by 10 fishers. The Chinook salmon harvest was well below the guideline harvest range of 600–800 fish.

The age and sex of Chinook salmon from the upper river commercial harvests in Alaska (District 6) was 37.4% age-4, 18.8% age-5, 42.1% age-6, and 1.6% age-7 fish. Sex composition was 35.4% females. The age and sex of summer chum salmon was 0.5% age-3, 65.8% age-4, 31.7% age-5, and 2.1% age-6 fish. Sex composition was 48.8% females.

3.2 Fall Chum and Coho Salmon

In response to the guidelines established in the *Policy for the Management of Sustainable Salmon Fisheries*, the Alaska Board of Fisheries discontinued the stock of concern classification for the Yukon River fall chum salmon stock as a yield concern in February 2007 after reviewing stock status information and public input during the regulatory meeting. The determination was based on the availability of a near historical average harvestable surplus of fall chum salmon above escapement needs since 2003, a record run in 2005, an above average run in 2006, and an anticipated near-average run in 2007. These runs reflect a return to near average production rates.

The *Yukon River Drainage Fall Chum Salmon Management Plan* (Appendix Table A4) incorporates the U.S./Canada treaty obligations for border passage of fall chum salmon and provides guidelines necessary for escapement and prioritized uses. There are incremental provisions in the plan to allow varying levels of subsistence salmon fishing balanced with requirements to attain escapement objectives. Commercial fishing is generally only allowed on the portion of the surplus above the upper end of the drainage-wide Biological Escapement Goal (BEG) range of 300,000 to 600,000 fall chum salmon. The intent of the plan aligns management objectives with the established BEG's, provides flexibility in managing subsistence harvest when the stocks are low, and bolsters salmon escapement as run abundance increases.

In 2007, the Yukon River fall chum salmon run was exceptionally late which contributed to a commercial harvest of both fall chum and coho salmon well below the preseason outlook for both species. The outlook was for a run size of 900,000 to 1.2 million fall chum salmon and an above average run of coho salmon. However, the inseason run size estimate fluctuated between 600,000 and 700,000 due to the late run timing of fall chum salmon. Because of the lower than anticipated run size projection, a more conservative management approach was adopted. Subsistence fishing opportunity remained on the normal pre-2001 fishing schedule throughout

the season, while commercial fishing periods were constrained by the *Yukon River Drainage Fall Chum Salmon Management Plan* limiting harvest to the available surplus as it is projected by inseason assessment.

Postseason assessment information collected well after the fishery suggests overall fall chum salmon run abundance may have been near 1.0 million fish with surplus escapements. Accurate inseason assessment is complicated by the exaggerated pulsed entrance pattern exhibited by fall chum salmon. An underestimation was in part due to the exceptionally late run timing of fall chum salmon with pulses entering the river after Pilot Station sonar had ceased operations on August 31. Conversely, the 2007 coho salmon run began entering the river early and appeared strong, but dropped off early, ending with an overall run size slightly above average. Additionally, the commercial harvest of coho salmon was constrained out of concern for the late fall chum run and subsequent low inseason run projection.

The fall commercial season was extended and fishing time was increased as fish continued to enter the lower river late in the season. A large surplus of fall chum salmon was identified by the time they reached the upriver districts, but the primary market did not develop until late in the season when the cooler weather temperatures were needed to maintain product quality. However, freezing temperatures forced the end the fall season even though catch rates and abundance remained high in the Tanana River drainage.

3.2.1 Fall Chum Salmon Management Overview

The fall chum salmon run was exceptionally late and near initial run size expectations. The first significant pulse began entering the mouth of the Yukon River on August 6, 1 day after the average midpoint for the drift test fish project at Emmonak. The pulse lasted 3 days and the abundance was estimated to be approximately 265,000 fish by the Pilot Station sonar. The second pulse followed closely beginning on August 12, it lasted 3 days, and it was estimated to include approximately 140,000 fall chum salmon. However, during the passage of the second pulse, high water was eroding the river bank immediately upstream of the sonar project, resulting in an unusually high silt load that interfered with the sonar counter's ability to detect fish. Consequently, the passage was estimated for that timeframe by extrapolation using the passage immediately before and after to fill in the missed time. The lower river test fishery projects indicated additional pulses entering the river on August 24 and August 28 whereas the Pilot Station sonar noted only slight increase in passage for the corresponding dates.

The Pilot Station sonar cumulative total estimate of fall chum salmon for the 2007 season was 684,000 fish through August 31 (Appendix Table A2). Although the run began late, the strength of the first pulse, which occurred near the average midpoint in run timing, dominated the season resulting in the appearance of a compressed run that was only 3 days late at the midpoint and 2 days early at the average three-quarter point. However, as stated earlier, pulses of salmon were observed entering the river after the sonar project had ceased operations meaning the run was more protracted than indicated by the sonar. The end of season run reconstruction of 1.0 million fall chum salmon suggests that the total run size may have been as much as 250,000 fish larger than accounted for by the Pilot Station sonar estimate with consideration for removal of harvest. Project reviews and investigations are looking into explanations or causes of the discrepancies in the assessment and how to improve future assessment.

The 2007 preseason run size projection ranged from 900,000 to 1.2 million fall chum salmon. A point estimate of 1.0 million was derived by utilizing the 1974 to 1983 odd/even maturity

schedules to represent the recent trend of higher production. The projection range was based on the upper and lower values of the 80% confidence bounds for the point projection. A run of this size was anticipated to provide for escapement requirements and for subsistence and personal use fisheries with a surplus of 50,000 to 400,000 fall chum salmon available for commercial harvest. The wide harvest range was due to the difficulties in selecting representative production rates which have been highly variable in recent years.

With an expectation of continued strong production, the 2007 preseason management strategy was to begin the fall season on the pre-2001 subsistence fishing regulations in accordance with the management plan. Commercial fishing was anticipated to begin near the first quarter point in run timing for the lower river (July 30) dependent upon early run assessment. This would have allowed time for late summer chum salmon to move out of the area thereby improving market quality and providing a window for some of the early upriver fall chum salmon stocks to pass through the area unharvested. The relationship between the summer and fall chum salmon runs (1993–1995, 1997–2004, and 2006) suggested the fall run would perform similarly and thereby increased manager's confidence in the fall chum salmon preseason projection at the beginning of the 2007 fall season.

On July 16, the fall chum salmon management plan went into effect and subsistence fishing management actions, initiated during the summer season, were continued into the fall season. The Coastal District, Districts 1–4 and the Innoko River were open 7 days per week and pre-2001 subsistence salmon fishing regulations were applied to Upper Yukon Area districts.

The first pulse of fall chum salmon passed through the Lower Yukon Area with little exploitation and was expected to benefit escapement and upriver fishers. Commercial salmon markets were limited. Districts 1 and 2 and Subdistrict 6-B had buyer commitments prior to the season with additional buyers expressing interest in purchasing salmon in District 4 and Subdistrict 5-C. The first commercial periods were opened in the lower river District 1 on August 14 and on August 15 in District 2. The Pilot Station sonar cumulative estimate through August 14 of 422,000 fall chum salmon was near the historical average of 438,000 for that date. The total season run size was projected to be 668,000 fish based on average run timing and 764,000 for late run timing. However, a developing assessment project utilizing genetic analysis to identify and quantify various sock components of the run suggested that approximately 100,000 of the chum salmon that had entered the river during the early portion of the fall season were summer chum salmon. Using this genetic assessment information, it could be reasoned that fewer fall chum salmon were in the river than indicated by the Pilot Station sonar estimate. The effect would have dropped the abundance below the threshold necessary to allow a directed fall chum salmon commercial fishery. However, run size, as applied to the *Yukon River Drainage Fall Chum Salmon Management Plan*, is based on the date of the fall season July 19 at Pilot Station.

Fisheries managers worked closely with commercial fish buyers to maximize processing capacity and available transportation opportunities. Frequent short periods were provided based on daily market capacity. Buyers and fishers also worked together to improve the quality of their harvest by more careful fish handling, improved icing techniques, and quicker deliveries. Furthermore, in an effort to maximize fishing efficiency, fishing times in District 1 were scheduled to coincide with daily high tides which typically carry new fish into the river where they become available for harvest. Late season night-time darkness becomes a factor so daylight fishing times were scheduled to maintain fishermen safety. No commercial fishing periods were opened in District 3 due to lack of market, but some District 3 residents fished in Districts 1 and 2.

With the increased frequency of commercial fishing periods, the amount of subsistence fishing closure time around commercial periods was reduced from 12 hours to 6 hours before, during, and after each commercial fishing period. In Districts 1, 2, and 3, subsistence fishing was open 7-days a week, 24-hours a day except for closures around each commercial salmon fishing period. The length of closed subsistence fishing time was reduced beginning on August 13 prior to the first commercial period.

The commercial salmon fishing season in the lower Yukon River closes on or before September 1 by regulation. In 2007, the first half of the season was weak with no commercial fishing because the run size appeared to be only adequate to support escapement and subsistence needs. However, with the late run timing, the lower river commercial fishing season was extended because a harvestable surplus was identified and there was market interest.

The increased strength of recent fall chum salmon runs has renewed interests for commercial fishing in upriver districts. The commercial salmon fishing season was opened in District 4 with fishing periods scheduled during the summer season, but the interest dropped off as summer progressed and no periods were opened during the fall season. Subsistence fishing was on a schedule of 5-days a week in District 4 during most of the fall season and was extended to 7-days a week beginning October 5 to provide increased opportunity for subsistence fishers to harvest late running fish.

One commercial fishing period was opened in Subdistricts 5-B and 5-C beginning August 26 which harvested 427 fall chum salmon out of the first pulse of fish moving upriver. The small market was satisfied until interest rose again late in season for Subdistrict 5-B fish when one period was announced to begin September 26. Fishing time was extended twice in an effort to develop a new operation. However, plans did not work out and no additional commercial fish were landed in District 5. Subsistence fishing in Subdistricts 5-B and 5-C was on a schedule of fishing 5-days a week and concurrent with commercial periods through most of the season until September 30 when fishing time was extended to 7-days a week , similar to Subdistrict 5-D. Subsistence fishing in Subdistrict 5-A was on a schedule of two 48-hour periods a week consistent with the *Tanana River Salmon Management Plan* for most of the fall season and was also relaxed to 7-days a week on September 30.

Commercial salmon fishing in District 6 began September 10 on a schedule of two 42-hour periods a week. The Tanana River is managed under the *Tanana River Salmon Management Plan* which provides guidelines to manage District 6 as a terminal fishery based on the assessed strength of the stocks in the Tanana River drainage. The commercial harvest in District 6 was comprised of predominantly female salmon with the primary product bound for roe markets. One commercial period was canceled on September 17 because of inadequate catch reporting. The commercial fishing season in the Tanana River ended on October 10 due to freezing temperatures decreasing product value. Subsistence and personal use fishing was open concurrent with the commercial fishing periods. Personal use periods remained on the two 42-hour fishing periods per week while subsistence fishing in Subdistricts 6-A and 6-B was relaxed to 7-days a week in accordance with the *Tanana River Salmon Management Plan* at the close of the commercial fishing season. The Tanana River commercial harvest of 15,999 fall chum salmon was within the guideline harvest range (GHR) of 2,750 to 20,500 fish. The male portion of the harvest was reported as caught but not sold and used for subsistence. Even with the commercial fishery, the post season assessment indicated that escapement goals were exceeded in the Tanana River.

The 2007 total run of fall chum salmon was approximately 1.0 million fish and was within the projected range. The commercial harvest of 90,700 fall chum salmon was well above both the recent 5-year average harvest of 33,700 fish and the 10-year average of 20,500 fish. Preliminary indications are that the subsistence harvest was near 80,000 fall chum salmon and is slightly higher than the recent 5-year average of 74,000. The preliminary Yukon River drainage-wide escapement of 900,000 fall chum salmon is the second largest since 1995.

3.2.2 Coho Salmon Management Overview

The 2007 coho salmon run was managed to provide for escapement needs, subsistence, personal use, and commercial harvest. However, the commercial harvest was dependent to a large extent upon the abundance of fall chum salmon and the accompanying management strategies. The 2007 coho salmon outlook was for a continuation in the trend of above average runs, below average subsistence harvests because of low effort, with an expected commercial harvest of 50,000 to 70,000 fish.

The coho salmon run exhibited early run timing and the index of run size was above average based on Pilot Station sonar. Test fishery projects at Emmonak, Mountain Village, Kaltag, and in the Tanana River provided similar run assessment of magnitude and run timing. The run size estimate at Pilot Station sonar through August 31 was approximately 173,000 fish, which was above the historical average (1995–2006) passage estimate of 140,000 coho salmon (Appendix Table A2).

The preseason market outlook favored fall chum salmon, but readily accepted coho salmon and paid a slightly higher price per pound as the season progressed. Even though the primary focus of commercial fishing was to target fall chum salmon, fishing periods were also controlled to spread harvest impacts throughout the run of the smaller coho salmon stock. As with fall chum salmon, transportation costs were a major limiting factor in the coho salmon fishery. Fish buyers only operated near the transportation hubs in the lower river Districts 1 and 2 and upriver in Subdistrict 6-B near Nenana. Fishers had to weigh the price of gas in relation to the benefits of potential commercial harvests. The extended commercial season and liberalized subsistence fishing time increased fishing opportunity for coho salmon throughout the drainage.

3.2.3 Harvest and Value

The 2007 total commercial harvest for the Yukon River fall season included 90,677 fall chum and 44,575 coho salmon for the Alaskan portion of the drainage (Appendix Table A1). Both the fall chum and coho salmon harvests were the third highest since 1997. A total of 74,678 fall chum and 43,207 coho salmon were harvested in the Lower Yukon Area and 15,999 fall chum and 1,368 coho salmon were harvested in the Upper Yukon Area. All salmon were sold in the round with no salmon roe sold separately. However, in District 6 whole female salmon were selectively purchased for roe extraction during the fall season. The 2007 Yukon Area fall chum salmon commercial harvest was approximately 21% of the previous 10-year average (1997-2006) of 74,873 fish and 54% above the 10-year average of 29,450 coho salmon (Appendix Tables B4 and B5).

There were a total of 16 commercial fishing periods in the lower river Districts 1 and 2 combined (8 periods in Y-1; 8 periods in Y-2). No periods were opened in District 3 due to the lack of a market. The commercial fishing season was open in District 4, but no periods were opened due to lack of market. Subdistricts 5-B and 5-C had one 48-hour commercial period early in the fall

season with two fishers landing 427 fall chum salmon. Subdistrict 5-B was opened later in the season for 264 hours to provide opportunity for commercial fishing, but no commercial harvest was reported. In the Tanana River, District 6, there were eight 42-hour commercial salmon fishing periods beginning September 10 until October 10 when the weather became too cold to hold fish outdoors without freezing thereby damaging the catch.

The preliminary 2007 commercial fall chum and coho salmon season value for the Yukon Area was $290,400 ($272,100 for the Lower Yukon Area, $18,300 for the Upper Yukon Area). The previous 10-year average value for the Yukon Area was $102,400 ($88,700 and $13,700 for the Lower and Upper Yukon Area, respectively).

Yukon River fishers received an average price of $0.27 per pound for fall chum salmon in the Lower Yukon Area and $0.20 per pound in the Upper Yukon Area in 2007. This compares to the 1997–2006 average of $0.23 per pound and $0.13 per pound, respectively. For coho salmon, fishers received an average price of $0.39 per pound and $0.20 per pound in the Lower and Upper Yukon areas compared to the recent 10-year average price of $0.28 and $0.12 per pound, respectively.

Fishing effort has increased in recent years. A total of 313 fishers participated in the 2007 fall chum and coho salmon fishery (303 for the Lower Yukon Area and 10 for the Upper Yukon Area) compared to the recent 10 year average of 118 permit holders (113 for the Lower Yukon Area, 5 for the Upper Yukon Area). Even though the effort appears high, participation is concentrated around a few buying stations rather than spread throughout the drainage as it was prior to the mid 1990's.

4.0 COMMERCIAL FISHERY–CANADA

4.1 CHINOOK SALMON

Low run strength resulted in a closure of the commercial fishery during the Chinook salmon season. The commercial harvest of other species included 7,109 fall chum salmon and 2 coho salmon (Appendix Table A5). The combined species catch of 7,111 salmon was 12.5% below the 1997–2006 average commercial harvest of 8,127 salmon. Since 1997, there has been a marked decrease in commercial catches of Upper Yukon River Chinook and fall chum salmon that have resulted from a limited market as well as reduced fishing opportunities in some years due to below average run sizes.

Canadian Upper Yukon River commercial, non-commercial and Porcupine River Chinook salmon harvests for the 1961 to 2007 period are presented in Appendix Table B7, while similar information for fall chum salmon is presented in Appendix Table B8. During 2007, 17 of 21 eligible commercial fishing licenses were issued. Twenty commercial fishing licenses were issued in 2005 and 2006 while 21 were issued in 2003 and 2004.

The total run size of Canadian-origin Upper Yukon[2] River Chinook salmon in 2007 was expected to be average with a preseason outlook of 93,700 fish. This outlook was based on the average of a stock/recruitment (S/R) outlook and a sibling outlook. The outlook derived from the S/R model developed from the 1982 to 2000 brood years was 74,500 fish, while the outlook from the sibling relationship was 112,900 fish. Uncertainty regarding recent outlooks is apparent from

[2] The Upper Yukon River is defined as the Canadian portion of the Yukon River drainage excluding the Porcupine River drainage.

the poor run sizes of Upper Yukon River Chinook salmon within the 1998 to 2001 period, which were significantly lower than expected, despite healthy brood year escapements.

In April 2007, the Yukon River Panel met to develop recommendations regarding spawning escapement goals for 2007. Prior to making their recommendation, the Panel considered the status of spawning escapements in the brood years that would contribute to the 2007 run. The Panel concluded that the 2007 Chinook salmon run should be considered to be a rebuilt run since the major contributing brood years achieved or exceeded the escapement goal range for rebuilt stocks as defined in the Yukon River Salmon Agreement (YRSA). As a result, the Panel recommended that the 2007 Upper Yukon River Chinook salmon spawning escapement goal should be 33,000–43,000 fish (Appendix Table A17).

Upon considering the Panel outcome, the Yukon Salmon Committee (YSC) recommended a spawning escapement goal of >33,000 Upper Yukon River Chinook salmon for 2007. This marks at least a 5,000 fish increase over the goal in recent years and resulted in modifications to the trigger points in the decision matrix used to determine the conduct of Canadian fisheries.

Compared to decision matrices developed in previous years when the spawning escapement goal was >28,000 Chinook salmon, the 2007 matrix included a wider Yellow Zone and higher trigger point for the Green Zone. The increase in the escapement goal to >33,000 in 2007 moved the trigger point for the Green Zone to 42,000 (from 37,000 in 2006), and the Yellow Zone was defined as a run size projection (to the border) of between 19,000 and 42,000 Chinook salmon. Therefore, the consequences of planning to put more fish on the spawning grounds were as follows:

i. The commercial, domestic and recreational fisheries would not be opened unless it was expected the border escapement will be greater than 42,000 Chinook salmon (the 2006 threshold was 37,000 fish); and

ii. Consideration would be given to restricting First Nation fisheries if the run size to the border was within the 19,000 to 42,000 range (in 2006 restrictions could be implemented if the run was within the 19,000 to 37,000 range). Closures would be considered if the run projection was <19,000 fish, the same guideline used in previous years.

4.1.1 Determination of Run Status In Season

An early indication of the run strength comes from data collected by U.S. management agencies (ADF&G and USF&W) and other U.S. projects. This data includes: test fisheries at the mouth of the Yukon River and at Rampart Rapids, sonar estimates from Pilot Station (combined with stock ID data if available) and Eagle projects, and Alaskan commercial and subsistence fishery data. Although this information is not specific to Canadian stocks in the absence of stock ID information, it is useful in obtaining a preliminary “sense” of the run strength. Contact with U.S. managers usually commences in early June followed by weekly updates. By the time stocks reach the Canadian section of the drainage, the relative abundance of the various salmon runs and run timing characteristics have been generally ascertained in the lower river. This information serves as an advanced early warning of runs that deviate from preseason outlooks and allows time to prepare Canadian managers and fish harvesters for potential changes to fishing plans. The initial openings or closures in the Canadian fisheries are often influenced by this information.

In the past, when the Chinook salmon run has reached the Canada/U.S. border, the focus usually shifted to stock assessment programs conducted in Canada, namely the Yukon River

mark-recapture program. This program provides inseason projections of the border escapement, i.e., the run size as it enters the Canadian section of the Upper Yukon River, which guides weekly abundance-based management decisions. Inseason mark–recapture projections are generally available from the third week of July through mid-August. Traditionally, the recapture of tags in the commercial fishery has provided the data used to determine inseason run projections. In recent years, when the commercial fishery has not opened due to conservation concerns, a test fishery funded by the Yukon River Panel, has provided the information used for inseason run projections.

4.1.2 Chinook Salmon Season Start-up Regime in 2007

In the first week of the 2007 summer season, U.S. run assessments at the Rampart Rapids fish wheel and Eagle sonar programs were used to determine whether a Canadian commercial or test fishery would be chosen for assessment purposes. If the U.S. upriver assessment was >15%, above the 2006 data (adjusted for run timing), a commercial fishery would be initiated. Similarly, a test fishery would be initiated if the U.S. upriver assessment information was <15% than observed in 2006. It was postulated that in order to meet the new escapement goal range, the Alaskan run indices in the upper Yukon River would need to be at least 15% higher than they were in 2006 for the commercial fishery to open. In the second week of the Chinook salmon season, inseason estimates from the DFO mark–recapture program as well as information from the Rampart Rapids fish wheel and Eagle sonar program were to be used to determine whether or not to open the commercial fishery. After the second week, the mark–recapture program was to be used to make decisions about the commercial fishery, although consideration would also be given to the Eagle sonar data.

4.1.3 Canadian Integrated Fisheries Management Plan

The key elements of the 2007 Integrated Fisheries Management Plan (IFMP) for Yukon River Chinook salmon developed by the Yukon Salmon Committee (YSC) were as follows:

i) A minimum spawning escapement target of >33,000 Upper Yukon River Chinook salmon consistent with the Yukon River Panel recommendation from the April 2007 Yukon River Panel meeting in Fairbanks, Alaska. The YSC recommended allowing First Nation (FN) fisheries to occur as long as the spawning escapement was >18,000 Chinook salmon and the First Nation catch was consistent with the Yukon River Salmon Agreement harvest sharing provisions.

ii) Commercial, recreational and domestic fisheries would be given opportunities to fish if inseason run projections indicated that requirements for conservation, i.e. the target spawning escapement goal of >33,000, and First Nations harvests would likely be achieved.

In recent years, the opening of the commercial fishery has frequently been delayed in response to conservation concerns and/or uncertainties concerning the status of the run. When tag recoveries are unavailable due to the absence of a commercial fishery, there is a need to implement a test fishery to provide stock assessment data for inseason run assessment, because there is little other information to rely on for inseason run projections. The option of using just the DFO fish wheel catch has not been chosen because of a poor historical relationship between the fish wheel catch and run size estimates.

Early in the 2007 season, information from the U.S. test fishery at Emmonak, the Pilot Station sonar program, and the initiation of a U.S. commercial fishery on the lower Yukon River suggested that the Canadian Chinook salmon escapement target would likely be achieved and a Total Allowable Catch (TAC) would be established. Based on this information it was deemed unlikely that FN fisheries would be restricted and fishing opportunities would likely be available for the Canadian commercial, domestic[3] and recreational fisheries. However, it became apparent that the 2007 run was weaker than anticipated and there was a shift in the lower river commercial openings (Districts Y1 and Y2) from unrestricted commercial openings directed at Chinook salmon to restricted openings directed at summer chum salmon.

Based on information from the inseason run abundance indicators in Alaska outlined in Section 3.1.1, it was decided that a Canadian test fishery was required and commercial Chinook salmon fishing opportunities in Canada were unlikely.

Chinook salmon were first caught in the Department of Fisheries and Oceans Canada (DFO) fish wheels on July 3, 3 days later than the 1997–2006 average date of June 30. The first Chinook salmon was caught in early July in 8 of the 23 years within the 1985–2007 period. Since 1999, during 5 of the 8 years Chinook salmon were first caught in early July. A total of 1,462 Chinook salmon was caught in the fish wheels, 90.8% of the 1997–2006 average catch of 1,611 fish.

The primary purpose of DFO fish wheels is to live-capture salmon throughout the run for tagging purposes. Recoveries of tagged fish, primarily in the Dawson area commercial fishery, are used to estimate the abundance of fish throughout the season. Inseason projections of the total run into Canada, also referred to as "border escapement", are developed by expanding the point estimates of run size developed from the mark–recapture data by historical run timing information. These projections are a key component in Canadian management decisions.

Throughout the 2007 season, inseason border escapement run projections were usually produced twice weekly. Early in the season, run size projections are very sensitive to the run timing information used because the early timing information represents a very small proportion of the total run. The border escapement run projections are expanded based on what is considered to be the most likely timing scenario (i.e., early, average or late timing) given the information at hand (i.e., U.S. fishery and assessment data and early indications in Canada). The intent of applying different expansions is to ensure that the projections cover an appropriate range of the potential run timing scenarios.

Inseason run projections were consistently well below the decision threshold that would have triggered a commercial fishery. Consequently, the Chinook salmon commercial fishery was closed throughout the 2007 season and there were no reports of Chinook salmon harvested during the fall chum salmon commercial openings (Appendix Table A5). For comparison, the previous 10-year average (1997–2006) commercial catch was 2,642 Chinook salmon (Appendix Table B7). The average does not include the year 2000, when the fishery was closed, however, it includes very low catches in 1998 and 2002 when the commercial fishery was severely restricted.

4.2 FALL CHUM AND COHO SALMON

The preseason outlook for the 2007 Upper Yukon River fall chum salmon run was for a below average to average run of 94,600 to 147,600 fish. For odd-years returns, on average, 69% of

[3] The domestic fishery is opened on the same schedule as the commercial fishery.

Upper Yukon River adult chum salmon return as age–4, and 29% return as age-5. These percentages suggested the major portion of the 2007 chum salmon run would originate from the 2002 and 2003 brood years. The estimated escapements for these years were 98,695 and 142,683, respectively; both exceeded 80,000 fish and therefore achieved the escapement goal for rebuilt Upper Yukon River fall chum salmon. The weighted (by age) brood escapements contributing to the 2007 Upper Yukon River fall chum salmon run was 127,700 fish.

Since 2002, preseason outlooks have been based on stock/recruitment models incorporating escapement and subsequent associated adult return-by-age data. Annual runs were reconstructed using mark–recapture data and assumed contributions to U.S. catches. Although insufficient stock identification data were available for accurately estimating the annual U.S. catch of Upper Yukon River fall chum salmon, rough estimates were made using the following assumptions:

i. 30% of the U.S. catch of fall chum salmon was composed of Canadian-origin fish;

ii. U.S. catch of Canadian-origin Upper Yukon River and Canadian-origin Porcupine River chum salmon were proportional to the ratio of their respective border escapements; and

iii. Porcupine River border escapement consisted of the Old Crow aboriginal fishery catch plus the Fishing Branch River weir count.

All of these assumptions require additional evaluation as some recent Porcupine River mark-recapture data are available and advances in genetic stock ID will permit more accurate estimates of the proportion of Canadian fall chum salmon run harvested in U.S. fisheries.

The Canadian fall chum salmon management plan for 2007 acknowledged the recent improvements in run size from 2003 through 2006 and the likelihood of an average run in 2007. The plan contained the following key elements:

i. A minimum spawning escapement target of >80,000 Upper Yukon River fall chum salmon consistent with the April 2007 Yukon River Panel recommendation;

ii. A limited fall chum salmon commercial fishery would occur early in the 2007 season if DFO anticipated that the spawning escapement goal and First Nation's requirements would likely be achieved. Information from this early chum salmon fishery would be used for inseason run projections; and

iii. A minimum spawning escapement target of >34,000 fall chum salmon to the Fishing Branch River consistent with the April 2007 Yukon River Panel recommendation.

In 2007, funding was available, if required, from the Yukon River Restoration and Enhancement fund for a live-release fall chum salmon test fishery in the Dawson City area. This project is designed to provide catch and tag recovery data that are used to develop inseason population estimates. A similar project was conducted jointly by the Yukon River Commercial Fishing Association and the Tr'ondek Hwech'in First Nation in 2002–2004. Prior to 2002, projections of fall chum salmon border escapement were developed from either the DFO fish wheel catch data or from fish wheel tagging data and tag recovery from two fisheries located in the Dawson City area: the commercial fishery and the Tr'ondek Hwech'in First Nation aboriginal fishery.

Similar to the decision matrix developed for Chinook salmon, a fall chum salmon decision matrix was presented in the 2007 Integrated Fisheries Management Plan (IFMP). Red, Yellow and Green management zones were described by specific reference points (run sizes into

Canada) and expected management actions. The Red Zone included run projections of less than 40,000 fall chum salmon when closures in all fisheries except for the live release test fishery could be expected. The Yellow Zone included run projections within the 40,000 to 83,000 range; within this zone, commercial, domestic and recreational fisheries would be closed and the First Nation fishery would be reduced with restrictions increasingly more severe the closer the run projection was to the lower end of the Yellow Zone. The Green Zone included run size projections greater than 83,000 fall chum salmon and indicated that First Nation fisheries would be unrestricted and harvest opportunities within the commercial, domestic, and recreational fisheries would be considered depending on run abundance and international harvest sharing provisions. The difference between the escapement goal (>80,000) and the trigger point for the Green Zone was 3,000 fall chum salmon, a total of which would fully satisfy the needs of the Canadian aboriginal fishery. Management discretion is used when the inseason projections are close to the trigger points.

The total fall chum salmon catch in the DFO fish wheels in 2007 of 11,940 was the second highest on record and was 136% above the 1997 to 2007 average of 5,064 fish. The 2007 fall chum salmon was unusually late. Information from stock assessment projects conducted in the U.S. including the Pilot Station sonar program, inseason GSI analyses of Pilot Station DNA samples, the Rampart Rapids fish wheel program, and the Eagle sonar program, all indicated that the Canadian Upper Yukon River fall chum salmon escapement target would likely be achieved and a Total Allowable Catch (TAC) would be established. There were indications that a live-release test fishery was unnecessary in 2007; however, DFO managers were concerned that the commercial fishery information would provide insufficient data for the mark–recapture program. For this reason, a live-release test fishery was conducted concurrently with the commercial fishery. A 4-day commercial fishery initiated on September 18 was extended by 3 days and the commercial fishery was subsequently opened for 14 days from September 28 to October 12. The domestic fishery was opened on the same schedule as the commercial fishery. Despite liberal fishing opportunities, the number of fishers participating in the 2007 commercial fishery was very low. Similar to most previous years, no domestic fishers fished for fall chum salmon (Appendix Table A5).

The total 2007 commercial fall chum salmon catch of 7,109 fish was 11.3% higher than the 1997 to 2006 average of 6,386 (Appendix Table B8; Appendix Figure B7). Within the 1997–2006 period, the commercial fall chum salmon catch ranged from zero in 1998, when the fishery was closed due to conservation concerns, to 11,931 fall chum salmon in 2005. The fall chum salmon commercial fishery is somewhat of a misnomer as virtually all of the catch is used for what could be termed personal needs. License holders use most of the catch to feed their personal sled dog teams. This situation could change with the development of local processing capability and a move towards the sale of value-added products such as smoked fall chum salmon and salmon caviar. Two coho salmon were recorded in the commercial catch in 2007.

5.0 SUBSISTENCE, PERSONAL USE, ABORIGINAL, DOMESTIC, AND SPORT FISHERIES

5.1 ALASKA

5.1.1 Subsistence Salmon Fishery

Subsistence salmon fishing activities in the Yukon Area typically begin in late May and continue through early October. Salmon fishing in May and October is highly dependent upon river ice conditions. Fishing activities are usually based from a fish camp or a home community. Extended family groups, representing two or more households, often work together to harvest, cut, and preserve salmon for subsistence use. Some households from communities not located along the mainstem Yukon River operate fish camps along the mainstem Yukon River.

Throughout the drainage most Chinook salmon harvested for subsistence use are dried, smoked or frozen for later human consumption. Summer chum, fall chum and coho salmon harvested in the lower Yukon Area are primarily utilized for human consumption and are also dried, smoked, or frozen for later use. In the upper Yukon Area, small Chinook (jack), summer chum, fall chum, and coho salmon are all an important source of food for humans, but a larger portion of the harvest is fed to dogs which are used for recreation, transportation and drafting activities (Andersen 1992). Most subsistence salmon used for dog food are dried (summer chum salmon) or frozen in the open air "cribbed" (fall chum and coho salmon).

In 2007, all salmon runs were judged sufficient to provide for escapement and subsistence needs within Alaska as well as border passage commitments for fall chum salmon to Canada. However, Chinook salmon border passage was below expectations, resulting in low Canadian escapements and low harvest. In Alaska, subsistence fishing for Chinook and summer chum salmon was open 7 days a week prior to commencement of the *Yukon River King Salmon Management Plan*. The plan enforces a conservative regulatory window schedule which began May 28 in the lower Yukon Area District 1. The regulatory subsistence fishing schedule was in place for approximately 3 weeks and implemented sequentially in upriver districts according to dates consistent with the Chinook salmon migratory timing. After a short commercial fishing period on June 15 in District 2, the Chinook and summer chum salmon runs were assessed to have a surplus above escapement needs and subsistence use, and the subsistence salmon fishing schedule reverted back to the pre-2001 Alaska Board of Fisheries subsistence fishing schedule. The schedule was implemented in the same manner as it was instituted, chronologically upriver based on run timing, to afford similar protection as in the lower river to the early run fish. Consequently, the subsistence salmon fishing schedule provided additional fishing opportunities to harvest Chinook and summer chum salmon.

The inseason management strategy for the fall season was to continue the pre-2001 subsistence summer fishing schedule into the fall season. This management decision was based on the satisfactory performance of the summer chum salmon run that provided confidence in the 2007 preseason projection that the fall chum salmon run would be more than sufficient to meet escapement goals and subsistence needs, and provide for commercial fishing opportunities. Coho salmon abundance was also assessed as large enough to meet escapement objectives and provide for additional subsistence and commercial salmon fishing opportunities. However, the 2007 fall chum salmon run was exceptionally late in arriving leading to a more conservative management approach. Subsistence fishing opportunity remained on the pre-2001 schedule during the first

half of the fall season with no commercial fishing periods in accordance with the *Yukon River Drainage Fall Chum Salmon Management Plan*. As the fall season developed, the late abundance of the fall chum salmon run provided the confidence to extend the commercial fishing season and fishing time. In much of the drainage where commercial fishing did not occur, subsistence salmon fishing opportunities were open 7 days per week. In districts and subdistricts where commercial salmon fishing took place, the amount of subsistence salmon fishing time was increased by allowing additional openings around the commercial fishing periods.

Throughout the summer and fall fishing seasons, fishing opportunities for non-salmon fish species were also available during subsistence salmon closed periods. Stipulations for harvesting non-salmon species during closed salmon periods required the use of gillnets with 4 inch or less stretch mesh, but prohibited the operation of fish wheels. A new regulation adopted by the BOF for the 2007 season was implemented in Yukon Area Districts 1–3, from June 1 to July 15. The regulation required fishers to remove both tips (lobes) of the tail fin of Chinook salmon taken for subsistence use to provide assurance that subsistence caught Chinook salmon were not sold or purchased commercially (Figure 6).

In 2007, inseason fishers' reports suggested that most mainstem Yukon Area subsistence fishing households met their subsistence needs for salmon. Subsistence households in the lower Yukon River reported good catches of Chinook and summer chum salmon, and they commonly reported meeting their needs. Poor drying weather may have contributed to loss of fish due to spoilage, and in some cases the subsistence harvest for specific households was greater than usual to replace lost fish. In Koyukuk River communities, inseason reports and the postseason ADF&G's subsistence survey indicated that households did not meet or had trouble meeting their needs for Chinook and chum salmon and for other non-salmon species. Difficulties in meeting needs as reported by Koyukuk River fishers were initially due to high water and debris conditions followed by reports of poor quality (sickly) fish being caught. These reports indicated substantial numbers of dead and/or sick chum salmon, sheefish, and whitefish that could not be used for subsistence purposes. Drainage-wide, many surveyed fishers who indicated they met their subsistence household needs for Chinook salmon, reported they had to work harder than normal to harvest the fish. Chinook salmon flesh quality was reported as being generally better than in recent years, while fish size ranged from small to medium. Some upper mainstem Yukon River fishers reported harvesting larger Chinook salmon than in recent years. Fishers who targeted the late arriving fall chum salmon generally had to fish longer into the fall season to meet their needs. In addition to the poor fishing conditions from high water and weather conditions, many fishers indicated fishing efforts were further hampered because the fishing schedule and Chinook salmon run timing in their area did not coincide, most notably in the lower Yukon River communities. A commonly cited reason for not meeting needs was that the fishing schedule conflicted with work opportunities, and when the regulatory fishing schedule was lifted most of the "good" Chinook salmon had already traveled past their area. Other factors contributing to the inability to meet subsistence salmon needs included the high price of gasoline, fuel shortage, health, elders unable to fish, lack of fishing gear, and mechanical problems. Fishers in many communities avoided repetitive travel to fish camps because of high fuel costs. In many cases, they fished near their home community or waited until the peak of the run occurred in their area before attempting to fish. Similarly, as in the past couple years, many individuals took advantage of work opportunities on fire-fighting crews outside of Alaska. They consequently did not fish and relied on others to provide them with fish.

Documentation of the subsistence salmon harvest is necessary to determine if sufficient salmon are returning to the Yukon Area for escapement and subsistence requirements, and if enough fishing opportunities are provided to meet subsistence needs. Most subsistence users in the Alaskan portion of the Yukon River drainage are not required to report their salmon harvest, so the primary method of estimating this harvest is the annual subsistence salmon harvest survey conducted by ADF&G. These surveys are conducted from September through early November. Typically 33 communities are visited and fishers from randomly selected households are interviewed based on their recent historical harvest pattern. Survey data are expanded to estimate total subsistence harvest in surveyed communities. In 2007, approximately 1,300 households were selected to be surveyed. In addition to postseason surveys, subsistence "catch calendars" are mailed to approximately 1,600 households in the non-permit portions of the Yukon River drainage. The calendars supplement the survey information and provide harvest reports for households that are unavailable to be surveyed.

In portions of the upper Yukon and Tanana River drainages that are road accessible, fishers are required to obtain subsistence fishing permits. Data collected from over 430 subsistence permits issued in 2007 are added to the total estimate of the subsistence salmon harvest provided by the survey portion. Subsistence harvest totals also include salmon that are harvested from test fisheries and distributed to residents of communities near the projects. Data collected from subsistence surveys and fishing permits also include other information such as non-salmon harvest and demographic information. Data compilation is ongoing, and results of the 2007 survey and permit summary will be available in late spring of 2008.

The survey program results for the 2006 season estimated 1,180 households fished for salmon from 31 communities (not including the Coastal District communities of Hooper Bay and Scammon Bay) (Busher et al. *In prep*). Additionally, 188 subsistence household permit holders fished for salmon in 2006. The estimated 2006 salmon harvest in the Alaska portion of the Yukon River drainage totaled 47,710 Chinook (Appendix Table B2), 90,922 summer chum (Appendix Table B3), 83,800 fall chum (Appendix Table B4), and 19,371 coho salmon (Appendix Table B5). Included in the estimated total harvest are 89 Chinook, 262 summer chum, 333 fall chum, and 279 coho salmon taken in the personal use salmon fishery, and 2,153 Chinook, 3,620 summer chum, 3,996 fall chum, and 967 coho salmon distributed for subsistence use from the various test fish projects.

5.1.2 Personal Use Fishery

The Fairbanks Non-subsistence Area, located in the middle portion of the Tanana River, contains the only personal use fishery within the Yukon River drainage. Subsistence or personal use permits have been required in this portion of the drainage since 1973. Personal use fishing regulations were in effect from 1988 until July 1990 and from 1992 until April 1994. In 1995, the Joint Board of Fisheries and Game reestablished the Fairbanks Non-subsistence Area, and it has been managed consistently under personal use regulations since then. Historical harvest data must account for these changes in status. Subsistence fishing is not allowed within non-subsistence areas.

The management area known as Subdistrict 6-C is completely within the Fairbanks Non-subsistence Area and therefore falls under personal use fishing regulations. Personal use salmon and whitefish/sucker permits and a valid resident sport fishing license are required to fish within the Fairbanks Non-subsistence Area. The harvest limit for a personal use salmon

household permit is 10 Chinook, 75 summer chum, and 75 fall chum and coho salmon combined. The personal use salmon fishery in Subdistrict 6-C has a harvest limit of 750 Chinook salmon, 5,000 summer chum salmon, and 5,200 fall chum and coho salmon combined.

In 2007, the personal use salmon fishery followed the regulatory fishing time of two 42-hour periods per week. In 2007 65 personal use salmon and 3 personal use whitefish and sucker household permits were issued. Data compilation for the 2007 fishing season will not be completed until late spring of 2008.

The results for the 2006 season personal use harvest in Subdistrict 6-C included 89 Chinook, 262 summer chum, 333 fall chum, and 279 coho salmon (Appendix Tables B2, B3, B4 and B5) (Busher et al. *In prep*). In addition, personal use permit holders reported harvesting 287 whitefish, 5 sheefish, 4 burbot, 2 pike, 1 grayling, and 184 suckers. A total of 67 personal use permits were issued and returned. Of these, 35 household fished for salmon and four households fished for whitefish, suckers and other miscellaneous fish species in the Fairbanks Non-subsistence Area in 2006.

5.1.3 Sport Fishery

Sport fishing effort for anadromous salmon in the Yukon River drainage is directed primarily at Chinook and coho salmon, with little effort directed at chum salmon. In this report, all of the chum salmon harvested in the sport fishery are categorized as summer chum salmon. Although a portion of the genetically distinct fall chum salmon stock may be taken by sport fishers, most of the sport chum salmon harvest is thought to be made up of summer chum salmon, because: 1) the run is much more abundant in tributaries where most sport fishing occurs, and 2) the chum salmon harvest is typically incidental to efforts directed at Chinook salmon, which overlap in run timing with summer chum salmon.

Most of the drainage's sport fishing effort occurs in the Tanana River drainage along the road system. From 2002–2006 the Tanana River on average made up 85% of the total Yukon River drainage Chinook salmon harvest, 29% of the summer chum salmon harvest, and 60% of the coho salmon harvest. Most Chinook and chum salmon are harvested from the Chena, Salcha, and Chatanika rivers, while most coho salmon are harvested from the Delta Clearwater and Nenana river systems.

In 2007, no emergency orders were issued or special restrictions for any of the salmon sport fisheries in the Yukon River drainage. Alaskan sport fishing effort and harvests are monitored annually through a statewide sport fishery postal survey. Harvest estimates are typically not available until approximately 1 calendar year after the fishing season; therefore, the 2007 harvest estimates will be available in the 2008 JTC report. The total sport harvest of salmon in the Alaskan portion of the Yukon River drainage in 2006 was estimated at 739 Chinook, 583 summer chum, and 1,000 coho salmon (Appendix Tables B2, B3, and B5). The recent 5 year (2002–2006) average Yukon River drainage sport salmon harvest was estimated at 1,188 Chinook, 649 summer chum and 1,164 coho salmon (Appendix Tables B2, B3, and B5).

5.2 CANADA

5.2.1 Aboriginal Fishery

In 2007, as part of the implementation of the Yukon River Final Agreements (comprehensive land claim agreements), the collection of inseason harvest information for the Upper Yukon

River was conducted by First Nations within their respective Traditional Territories. Before the start of the fishing season, locally hired surveyors distributed catch calendars to known fishers and asked them to voluntarily record catch and effort information on a daily basis. Interviews were then conducted in season to obtain more detailed catch, effort, gear, location and tag recovery information at fish camps or in the community, one to three times weekly. In most cases, weekly summaries were completed by the surveyors and sent to the Department of Fisheries and Oceans Canada (DFO) office in Whitehorse by fax or e-mail. Late or incomplete information was obtained post season and reviewed by First Nation staff in conjunction with DFO.

With a preseason outlook for an average run of Upper Yukon River Chinook salmon and a below average to average outlook for Upper Yukon River fall chum salmon, it was anticipated that aboriginal fisheries would not likely be restricted by conservation concerns. Recent run size trends and harvest levels suggested that 2007 Chinook and fall chum salmon escapement goals and aboriginal catch requirements would be achieved. However, a strategy was developed whereby aboriginal fisheries could be restricted, subject to international harvest sharing provisions, to address conservation concerns. For Chinook salmon, restrictions were not implemented although communities were advised that the border escapement was weaker than anticipated. For fall chum salmon, inseason run assessment information indicated that there were no apparent conservation concerns and First Nations were notified that a normal harvest level would be permitted.

Fish harvesters and First Nation staff commented that the Chinook salmon run was late, and it was an overall poor fishing season. While some fish camps reported good catches early in the run, others had limited success during the same period. Many fish camps reported their catch dropped off after the first week to 10 days of fishing and did not improve. It was reported that the majority of remote camps were closed down earlier than usual and the needs of most aboriginal communities were not met.

In 2007, the Upper Yukon River aboriginal Chinook salmon catch was 4,175, 36% below the recent 10-year average of 6,574 fish and 27% below the 2006 total of 5,757 fish (Appendix Table B7). In addition to 4,175 Chinook salmon caught in the aboriginal fishery, 617 Chinook salmon were caught in the test fishery and distributed to Yukon River First Nations by the Tr'ondëk Hwëch'in First Nation.

The 2007 aboriginal catch recorded by the Tr'ondëk Hwëch'in First Nation in the Dawson area (1,067) and Ross River Dene Council near Ross River (330), were 9% and 21% above the 1997-2006 averages of 979 and 272 fish, respectively. The 2007 aboriginal catches recorded by Selkirk First Nation in the Pelly area and Little Salmon Carmacks First Nation in the Carmacks area, normally the two largest aboriginal fisheries in the mid-area of Upper Yukon River drainage, were 918 and 860 fish, respectively; these catches were 44% and 50% below the 1997–2006 averages of 1,639 and 1,712 fish, respectively. A below average catch was also reported by the First Nation of Na-Cho Nyäk Dun on the Stewart River; the 2007 harvest was 681 fish, 27% below the 1997–2006 average of 928 salmon. The Teslin Tlingit Council reported their lowest harvest since voluntary restrictions were implemented in 2000; a total of 298 Chinook salmon were reported, 42% of the 1997–2006 average of 707 fish. The total fishing effort for the 2007 Chinook salmon season is not available because several communities did not report fishing effort.

The 2007 Upper Yukon River fall chum salmon harvest in the aboriginal fishery was 2,221 (Appendix Table B8); this is 6% lower than the previous 10-year average of 2,373 fall chum

salmon, however the 2007 total does not include harvest data from Carmacks area and reported catch data from the Pelly area is incomplete. Participants in the 2007 fall chum salmon fishery described fishing as being excellent.

In 2007, with assistance from the Yukon River Restoration and Enhancement Fund, the Vuntut Gwitchin Government (VGG) conducted a mark–recapture program on the Porcupine River near the community of Old Crow, Yukon Territory. The main purpose of this project is to develop a tool that quantifies the inseason Porcupine River fall chum salmon run size at Old Crow thus enabling effective management of the local aboriginal fishery. Options to guide harvesting activity at various run sizes, and minimum spawning escapement thresholds for the Fishing Branch River are annually discussed with the VGG, Yukon Salmon Committee and DFO. For example, if the mark–recapture program estimate indicated a low abundance of fall chum salmon, the allowable aboriginal harvest at Old Crow could be lowered accordingly. This approach mirrors the abundance-based management system used on the Upper Yukon River in Canada for Chinook and fall chum salmon. In 2007, inseason information from the Porcupine mark–recapture program, the Fishing Branch River weir, and projects elsewhere in the Yukon River drainage indicated that restrictions in the Old Crow aboriginal fishery were not required.

Catch estimates of fall chum salmon on the Porcupine River near Old Crow are determined from locally conducted interviews using the catch calendar and a voluntary recording system described above. Data collection effort was more intensive during the fall chum salmon fishing season, as timely catch and tag recovery information was collected for use in the mark–recapture program. In 2007, the Chinook and coho salmon harvest estimates were derived from recent harvest averages and anecdotal information received from VGG staff; there is an ongoing effort to finalize the 2007 catch data for these species.

A total of 4,500 fall chum salmon was harvested in the 2007 Old Crow aboriginal fishery, 12% above the 1997–2006 average harvest of 4,027[4] chum salmon. Fall chum salmon fishing was described as excellent. An estimated 300 Chinook salmon were harvested; the 1997–2006 average was 281 fish. The 2007 coho salmon harvest was estimated at 500 fish; the 1997–2006 average coho salmon harvest was 229 fish.

5.2.2 Domestic Fishery

There was no catch recorded in the domestic fishery in 2007. This fishery was closed during the Chinook salmon season and open for 21 days during the fall season concurrently with the fall chum salmon commercial fishery. In recent years domestic fish harvesters have targeted primarily Chinook salmon. Domestic fishery catches of Chinook and fall chum salmon for the 1961–2007 period include 579 and 405 fish, respectively (Appendix Tables B7, B8).

5.2.3 Recreational Fishery

In 1999, the Yukon Salmon Committee (YSC) introduced a mandatory Yukon Salmon Conservation Catch Card (YSCCC) in an attempt to improve harvest estimates and to serve as a statistical base to ascertain the importance of salmon to the Yukon River recreational fishery. Anglers were required to report their catch by mail by late fall. The information requested includes the number, species, sex, size, date, and location of all salmon caught and released.

[4] This average includes below average catches within the 2002 to 2004 period when voluntary restrictions were used to conserve the Fishing Branch River fall chum salmon run.

In 2007, due to conservation concerns, the daily catch and possession limits in the recreational fishery were varied to zero effective August 2; most Chinook salmon had not yet reached the principal areas where recreational fishing normally occurs by this date. The preliminary estimate of the 2007 recreational catch was 2 Chinook salmon which were retained (Appendix Table B7) and 41 that were caught and released. The YSCCC program often involves some data interpretation and censoring, involving approximately 2% of the catch data submitted in 2007. For example, 1 sockeye salmon was reported as being caught and released; however, the catch of this species is highly unlikely as sockeye are not known to enter the Upper Yukon River drainage and coho salmon, which strongly resemble sockeye salmon in appearance, usually migrate much later than the date reported on the catch card. The sockeye record was therefore interpreted as a Chinook salmon misidentified as a sockeye salmon.

The YSCCC includes a location code that outlines 16 Yukon River locations, 4 Alsek River locations, a code for all other locations, and a request that fishers "please specify" the other locations. In 2007, the 2 Chinook salmon retained were both caught on the Yukon River within 1 kilometer of either side of the Tatchun Creek confluence. Approximately 95% of the Chinook salmon reported to have been released were also caught on the Yukon River within 1 kilometer of either side of the Tatchun Creek confluence. The locations where the remaining 2 Chinook salmon were reported to be caught and released were the Mayo River and Teslin Lake.

6.0 STATUS OF SPAWNING STOCKS IN 2007

Alaskan and Canadian researchers have developed projects to monitor escapement and to determine genetic composition, relative abundances, run characteristics, and other information pertinent to the annual salmon migration. Main river sonar, tributary sonar, weir, and counting tower projects and aerial surveys are used to monitor escapement. Other information collected at ground based projects may include, but is not limited to, salmon sex and length composition, scales for age determination, samples for genetic stock identification, data on resident species, and information from the recovery of tagged fish from various projects. Various government agencies, non-government organizations, and private contractors operate projects throughout the drainage (Appendix Tables A6 and A7).

6.1 CHINOOK SALMON

6.1.1 Alaska

The 2007 escapement goals for all monitored tributaries were achieved for Yukon River Chinook salmon. This assessment is based on escapement counts and estimates from selected tributaries. Sustainable escapement goals (SEG) for aerial survey assessments have been established for the East and West Fork Andreafsky, Anvik, Nulato and Gisasa rivers. All aerial survey escapement indices either met or exceeded their SEGs. Biological escapement goals (BEG) have been established for the Chena and Salcha rivers located in the Tanana River drainage. In 2007, the preliminary Chena River Chinook salmon escapement estimate was 3,564 fish counted at the tower project and was within the established BEG (2,800–5,700) for this system. In the Salcha River, preliminary Chinook salmon escapement was estimated to be 5,631 fish (BEG 3,300-6,500) by the counting tower project. The Salcha River escapement estimate is considered a minimum due to high water conditions affecting the counts. A summary of escapements can be

found in Appendix Tables B9 and B10 and Appendix Figure B9. Age and sex information collected from escapement projects in 2007 are presented in Appendix Table A9.

6.1.2 Canada

The preliminary mark–recapture estimate of the total spawning escapement for the Canadian portion of the Upper Yukon River drainage is 17,326 Chinook salmon. This is well below the 2007 spawning escapement target established by the Yukon River Panel of 33,000 to 43,000 Chinook salmon and 42.9% below the 1997–2006 average spawning escapement of 30,363 Chinook salmon (Appendix Table B11). Similar to 2005 and 2006, the 2007 estimate of border escapement derived from mark–recapture data appears biased low when compared to estimate derived from the Eagle sonar program located near the community of Eagle, Alaska downstream of the U.S./Canada border.

Aerial surveys of the Little Salmon, Big Salmon, Wolf, and Nisutlin river index areas were conducted by the Department of Fisheries and Oceans Canada (Appendix Table B11; Appendix Figure B10). Survey results relative to the previous cycle averages are presented below. Single (or multiple) aerial surveys do not count the entire escapement within an aerial index area as runs are usually protracted with the early spawning fish disappearing before the late ones arrive. Weather and water conditions, the density of spawning fish, as well as observer experience and bias also affect survey accuracy. Index surveys are rated according to survey conditions. Potential ratings include excellent, good, fair and poor. Survey ratings that rank higher than poor are considered useful for inter-annual comparisons. Historical counts are documented in Appendix Table B11.

The Little Salmon aerial survey was flown on August 16. Survey conditions were rated as being excellent and surveyors counted 451 Chinook salmon, 49.1% of the 1997–2006 average count of 919 fish. The Big Salmon, Nisutlin, and Wolf river index areas were surveyed on August 15th under fair to good survey conditions. The Big Salmon count of 601 was 57.6% of the 10-year average of 1,043 fish. The Nisutlin River index count of 137 was 34.6% of the 10-year average count of 396 fish. The Wolf River count of 54 was 32.1% of the 10-year average count of 168 fish.

In 2007, the Blind Creek weir was operational from July 17 to August 16 with 304 Chinook salmon being counted (Appendix Table B11); the 1997–2006 average count is 762. A total of 101 fish was sampled for age-sex-length data and 41 (40.6%) of these were female. Based on a sample of 61 aged fish, the age-5 and age-6 year components represented 34.4% and 45.9% of the sample, respectively.

A total of 4,450 Chinook salmon was counted at the Big Salmon sonar station between July 15 and August 26 in 2007. A peak daily migration of 435 fish occurred on August 1 and 90% of the run had passed the station by August 14. The counts for the 2 previous years this program operated were 5,584 in 2005 and 7,308 in 2006.

The Whitehorse Rapids Fishway Chinook salmon count of 427 was 30.4% of the 1997–2006 average count of 1,403 fish (Appendix Table B11). The overall sex composition observed at the fishway was 39.2% female (n=167). Hatchery-produced fish accounted for 55.7% of the run through the fishway and included 164 males and 74 females. The non-hatchery count accounted for 44.3% of the run and consisted of 96 wild males and 93 wild females. The run midpoint and the peak daily count both occurred on August 16th when 38 fish were counted. Historical fishway counts are given in Appendix Table B11.

6.2 SUMMER CHUM SALMON ALASKA

The 2007 summer chum salmon run was average with a total run of approximately 2.1 million fish. The upper end of the drainage-wide escapement objective for the Yukon River of 800,000 to 1,600,000 fish based on the Pilot Station sonar project was exceeded with an estimated 1,726,885 summer chum salmon passing the sonar site (Appendix Table A2), which is above the 1997–2006 average of 1,423,801 fish.

The 2007 summer chum salmon escapement levels were near average in most tributaries (Appendix B12; Appendix Figure B11). The Anvik River sonar-based escapement of 459,038 summer chum salmon was within the BEG range of 350,000 to 700,000 and the East Fork Andreafsky River weir-based escapement of 69,642 summer chum salmon was within the BEG of 65,000 to 130,000 fish. The relative contribution of these two tributaries to the total run has decreased from over 50% to approximately 25% in the past 5 years indicating a production shift to spawning tributaries higher in the drainage. Despite having an average total run in 2007, escapements were slightly below average in monitored tributaries of the Koyukuk and Tanana River drainages. However, high numbers of summer chum salmon were observed in the Nulato River aerial survey. Because summer chum salmon tributary escapements have been in flux in recent years, ADF&G and USFWS are collecting genetic samples at the Pilot Station Sonar to provide inseason mixed stock analysis. Age and sex composition data collected from escapement projects in 2007 are presented in Appendix Table A10.

6.3 FALL CHUM SALMON

6.3.1 Alaska

The preliminary Yukon River drainage-wide escapement of 900,000 fall chum salmon is well above the drainage-wide escapement goal range of 300,000 to 600,000 fish. Although final assessments of overall run size, spawner distribution, and age composition are not available at this time, preliminary assessments of run size can be made using several methods. Fishery management initially places a considerable amount of weight on the Pilot Station sonar abundance estimate until upriver monitoring projects can provide data. The preliminary fall chum salmon passage estimate, based on Pilot Station sonar for the period July 19 through August 31, was 684,011 fish with a 90% confidence interval of 636,566 to 731,456 fish (Figure 3; Appendix Table A2). One method to determine total run size is based on the Pilot Station sonar abundance estimate with the addition of estimated commercial and subsistence harvests downstream of the sonar site, including test fisheries (approximately 81,000 fish), and an estimated 5% for fall chum salmon that pass into the river after termination of the project. Therefore, the preliminary total run size for the Yukon River drainage, primarily calculated from the main river sonar at Pilot Station, is estimated to be approximately 800,000 fall chum salmon. Based on the location of the project, in this case, Pilot Station (river mile 123), the abundance estimate includes Koyukuk River drainage stocks.

A second method to calculate run size is by using the individually monitored systems in the upper Yukon River and Tanana River including the estimated U.S. and Canadian harvests. For 2007, this method results in a preliminary estimate of 1,100,000 fall chum salmon. This method however does not include an escapement estimate of approximately 25,000 for stocks located in tributaries downstream of the confluence of the Tanana River such as in the Koyukuk River (Eggers 2001). The estimates for the U.S./Canada border are provided by two methods: 1) the border mark–recapture project, and 2) Eagle sonar project. Both estimates are very similar for the

second year of evaluation. The estimate of run size based on individual projects is typically higher than that based on Pilot Station sonar. Harvests were again conservative allowing for large escapements in most areas and the estimated total run was within the preseason projection range of 900,000 to 1,200,000 based on applicable production rates.

In 2007, the return of age-4 (76%) and age-5 (21%) fish was near average while the age-6 (3%) fish was the highest on record, since collections began in 1977. The strength in the age-6 fish was expected due to the continued exceptional return from the 2001 brood year. The 2001 brood year returns are now complete resulting in a record return of approximately 3.0 million fall chum salmon and an estimated 9.0 return per spawner. The second highest return per spawner in the data set is 3.2 and the odd-numbered year average is only 2.3 return per spawner. Total return of fall chum salmon in 2007 was also average, at 1.0 million fish. The summer and fall chum salmon runs are split by a calendar date (July 15, at the mouth of the Yukon River), where overlap is known to occur. In 2007, the run is characterized as a week late in timing as the first quartile was not until August 7, a day later than the average midpoint. The first pulse did not materialize until August 6 followed by pulse two on August 12, a third pulse on August 24 and the project operations terminated on a possible 4th pulse on August 28. Pulses three and four did not materialize as expected at Pilot Station however commercial fishing may have affected enumeration and estimates of abundance late in the run. Pilot Station sonar operations detected two large pulses with the third pulse substantially lower than what projects downstream (Mt. Village drift test fish) and upstream (Kaltag drift test fish) indicated in 2007. The low magnitude of the last two pulses and the late run timing, as detected by Pilot Station sonar in combination with genetic stock identification results, caused the Tanana River stocks as well as late stocks to the upper Yukon River to appear weaker than was anticipated and as a result, management of fisheries was more conservative than necessary.

The average size run for an odd-numbered year combined with a conservative harvest provided sufficient strength to meet or exceed the majority of the Biological Escapement Goals (BEG). However, weakness is still evident in the Porcupine River system. Although the runs and established interim goals for the Fishing Branch River have increased steadily since 2004, weakness in 2007 was again anticipated and the interim goal was established preseason at 33,667 fish. The weir passage was approximately 34,000 fish.

The Sheenjek River, also a system in the Porcupine River, escapement was monitored by a sonar project operated from August 11 through September 24, 2007. During the 44-day period of operation, the cumulative count at termination was approximately 65,000 chum salmon. The Sheenjek River project utilized Dual-Frequency Identification Sonar (DIDSON) gear on both right and left banks. The right bank estimate of approximately 38,000 fish was 24% below the lower end of the BEG range of 50,000 to 104,000 fall chum salmon. Historical Sheenjek River escapement estimates, most of which were only estimated from the right bank, ranged from 14,229 in 1999 to 246,889 fall chum salmon in 1996, with the high of 600,346 fish observed on both banks in 2005 (Appendix Table B13; Appendix Figure B12). The left bank count represented approximately 42% of the escapement estimate in 2007.

The Chandalar River sonar project ran from August 8 through September 26, 2007 and operated DIDSON equipment on both banks. The preliminary escapement estimate was approximately 228,000 fall chum salmon, about 25% higher than the 1997–2006 average of 172,000 fish. Chandalar River sonar estimates of fall chum salmon range from a low of 65,894 fish in 2000, to a high of 496,484 fish in 2005. The 2007 estimated escapement in the Chandalar River was 50%

above the upper end of the BEG range of 74,000 to 152,000 fall chum salmon (Appendix Table B13; Appendix Figure B12).

In 2007, the Eagle sonar was operated into the fall season for the second year to enumerate chum salmon. At the time the project ended, due to onset of winter, the passage estimate was 235,871 fall chum salmon but was still passing >8,000 fish per day. The estimate to the cessation of fish passage was therefore expanded to include 46,500 fish. The estimate of 282,000 fall chum salmon can be used as a surrogate for the U.S./Canada Border passage estimate after exclusion of the harvests from the community of Eagle. The preliminary subsistence harvest for all of Eagle residents is estimated to be approximately 16,000 fish, resulting in a preliminary border passage estimate of 267,000 fall chum salmon. The estimated border passage, based on the DFO mark–recapture project is 236,000 fall chum salmon and is approximately 1.9 times higher than the mainstem goal of greater than 80,000 fall chum salmon. Overall the relative contribution of Canadian origin stock represents approximately 27% of the total escapements in 2007.

The 2007 inseason monitoring of the Tanana River drainage consisted of fall chum salmon run abundance estimates from mark–recapture techniques (Section 7.1.5). Two population estimates were generated, one for the Kantishna River drainage (approximately 77,000 fish) and one for the upper Tanana River drainage (approximately 307,000 fish). The Tanana River established BEG range of 61,000 to 136,000 includes the Toklat River index area's BEG range of 15,000 to 33,000 fall chum salmon. To represent the upper Tanana River, the Toklat River range is subtracted, leaving a BEG range of 46,000 to 103,000 fall chum salmon used to compare with the mark–recapture estimate. In 2007, the estimate of abundance of fall chum salmon in the upper Tanana River was nearly three times the upper end of the goal.

The Toklat River is the primary producer of fall chum salmon in the Kantishna River drainage and the Kantishna River estimate of abundance is combined with the upper Tanana River to estimate the contribution to the Tanana River as a whole. The 2007 combined population estimates for the Tanana River, minus appropriate harvests, is approximately 361,000 fish for escapements which is 1.7 times higher than the upper end of the BEG range of 61,000 to 136,000 fall chum salmon. Overall the relative contribution of the Tanana River stock represents 41% to the total escapements in 2007 (Appendix Figure B13).

The Delta River a tributary in the upper Tanana River drainage, has a BEG range of 6,000 to 13,000 fall chum salmon. Evaluation of run to the Delta River in 2007 was based on nine replicate foot surveys conducted between October 5 and December 6. The Delta River escapement was estimated to be 18,610 fall chum salmon based on the area under the curve method. This level of escapement was 43% higher than the upper end of the BEG range (Appendix Figure B13).

The run timing in 2007 can be characterized as a function of the evaluation project rather than timing of actual fish passage due to late run timing (on average 7 days late for projects above the confluence of the Tanana River) and the relatively large size of the last component both in the Tanana and the upper Yukon areas where projects were still passing large amounts of fish when they had to be terminated due to the onset of winter. For example, the Eagle sonar project warranted expansion based on the high numbers of fish passage at termination and the ability to derive an estimate whereas estimates dependent on mark–recapture were not expanded. These efforts attempt to determine the overall run size of fall chum salmon. Age and sex composition data collected from escapement projects in 2007 are presented in Appendix Table A22.

6.3.2 Canada

The preliminary fall chum salmon spawning escapement estimate based on mark–recapture data is 226,626 fish (details are presented in Section 7.2.1.2). This is the second highest fall chum spawning escapement estimate on record and is 71.4% above the 1997–2006 average of 132,240 fish. The highest estimated fall chum salmon spawning escapement of 437,733 occurred in 2005.

Aerial surveys of the mainstem Yukon, Kluane and Teslin river index areas were not conducted in 2007. Estimates of the relative abundance of fall chum salmon in these areas were developed from GSI collected in conjunction with the tagging program. Historical aerial survey data are presented in Appendix Table B13 and Appendix Figures B13 and B14.

In the Porcupine River drainage, the Fishing Branch River weir count of fall chum salmon through October 10 (29,704) was adjusted to a total count of 33,750 fall chum salmon. It was necessary to adjust the 2007 weir count using average weir timing data because the run was unusually late and a significant, although undetermined, portion of the run occurred after the program ended. Unfortunately, other assessment programs were not conducted late enough in the 2007 fall season to more precisely determine the proportion of the Fishing Branch River run which may have entered the Fishing Branch River after the program ended. The adjusted weir count (33,750) is 14.1% higher than the 1997–2006 average of 29,577 fall chum salmon, and very close to the escapement target of >34,000 fall chum salmon established by the Yukon River Panel for 2007. Based on anecdotal catch reports from the Old Crow test and aboriginal fisheries, its likely the late run strength was sufficient to exceed the 2007 Fishing Branch River escapement target of >34,000. Details of the 2007 weir operation are presented in Section 7.2.6. The 2007 Fishing Branch River escapement fell below the lower end of the interim escapement goal range of 50,000 to 120,000 fall chum salmon (Appendix Table A17). The interim escapement goal range is currently under review by the JTC.

7.0 PROJECT SUMMARIES

7.1 ALASKA

7.1.1 Pilot Station Sonar

The goal of the Yukon River sonar project at Pilot Station is to estimate the daily upstream passage of Chinook, chum and coho salmon. The project has been in operation since 1986. Sonar equipment is used to estimate total fish passage, and CPUE from the drift gillnet test fishing portion of the project is used to estimate species composition.

Prior to 1993, ADF&G used dual-beam sonar equipment that operated at 420 kHz. In 1993, ADF&G changed the existing sonar equipment to operate at a frequency of 120 kHz to allow greater ensonification range and to minimize signal loss. The newly configured equipment's performance was verified using standard acoustic targets in the field in 1993. Use of lower frequency equipment increased fish detection at long range.

Up until 1995, ADF&G attempted to identify direction of travel of detected targets by aiming the acoustic beam at an upstream or downstream angle relative to fish travel. This technique was discontinued in 1995. Significant enhancements that year included refinements to the species apportionment process and implementation of an aiming strategy designed to consistently maximize fish detection. Because of these changes in methodology, data collected from 1995 to

2007 are not directly comparable to previous years. In 2001, the equipment was changed from the dual beam to the current split-beam sonar system. This technology allows better testing of assumptions about direction of travel and vertical distribution.

Early in the 2005 season, the Yukon River experienced high water levels and erosion in the river bottom profile, which, along with a combination of changes in fish movement and distribution, affected detection of fish with the split beam sonar within 20 m of shore on the left (south) bank. On June 19, a Dual Frequency Identification Sonar (DIDSON) was deployed in this area to supplement estimates generated with the split-beam sonar. With its wider beam angle, the DIDSON system was able to detect fish passage within 20 m despite high water levels and problematic erosion nearshore, and was operated for the remainder of the season (Figure 4).

In 2006, the DIDSON was integrated into the sampling routine on left bank for the whole season, operating side-by-side with the split-beam sonar. The DIDSON sampled the first 20 m offshore; the remainder of the 250 m range was sampled by the split-beam. The DIDSON estimates accounted for 28% of Chinook salmon, 27% of summer chum, and 16% of fall chum, and 8.6% of coho salmon total passage estimates, which was similar to the contribution seen in 2005.

Though proportions of passage detected nearshore with the DIDSON were significant in 2005 and 2006, the left bank had been monitored in previous years and the profile and fish distributions did not appear to be as problematic prior to 2005. Therefore, estimates for fish passage prior to 2005 have not been adjusted or changed. The DIDSON was deployed on the right bank in 2005 as an assessment of nearshore detection, and the counts were comparable to those obtained with the split-beam. This was an expected result because the rocky, stable substrate on the right bank has maintained a consistently good profile throughout the project's history. The use of the DIDSON has not been necessary on the right bank.

In 2007, split-beam sonar was operated on both banks from June 2 through August 31. Test fishing began on May 30, 6 days before the first Chinook was caught at the Pilot Station camp. The DIDSON was again deployed on the south bank and integrated into the sampling routine for the entire season. However, the DIDSON-generated passage estimates contributed much less to the total passage than previous seasons, accounting for only 4.3% of the Chinook salmon, 2.7% of the summer chum, and 1.8% of the fall chum, and 1.8% of coho salmon total passage estimates.

Fish passage estimates at Pilot Station are based on a sampling design in which sonar equipment is operated daily in three 3-hour intervals, and drift gillnets are fished twice each day between sonar periods to apportion the sonar counts to species. During most seasons, on designated days, sonar sampling is expanded to a single 24-hour period as a simple qualitative assessment. Estimates obtained in the regular 3-hour intervals are then compared with those found when the sonar runs continuously. Results of these comparisons have historically shown relatively close agreement between the established three 3-hour sampling schedule and the 24-hour sonar periods. In 2007, continuous 24-hour sonar periods were conducted on June 19 and August 5. The three 3-hour estimates were 3.2% lower than the 24-hour estimates on June 19, and 8.4% higher than the 24-hour estimates on August 5.

The test fishing program, used to apportion the sonar counts to species, utilizes an assortment of gillnets, 25 fathoms long with mesh sizes ranging from 7.0 cm to 21.6 cm (2.75 inches to 8.5 inches), drifted through the sonar sampling areas twice daily between sonar data collection periods. In the 2007 season, as part of a separate Capital Improvement Program (CIP) funded genetic study, an extra period of gillnetting was conducted in order to collect additional Chinook

salmon samples. The drifts were located upriver of the area sampled by the sonar, and three gillnet mesh sizes (6.5, 7.5, and 8.5 inches) were used to target all size classes of Chinook salmon. All other species captured during this extra period were immediately released, and not sampled.

Drift gillnetting resulted in a catch of 7,120 fish including: 551 Chinook salmon (179 of which were caught in the extra test fishing period); 2,725 summer chum salmon; 1,595 fall chum salmon; 351 coho salmon; and 1,246 other species. Chinook salmon were sampled for age, sex and length, and genetic samples were taken from both Chinook and chum salmon. Any captured fish that were not successfully released alive were distributed daily to nearby residents in Pilot Station.

The left bank substrate continued to be unstable throughout most of the summer, and problems with a reverberation band were encountered. For brief periods during the fall season, bank erosion upstream caused large plumes of silt to pass through the sonar sampling area, undermining optimal detection of targets. This problem was significant for the period of August 15 and 16; therefore estimates were partially interpolated for these days. As in previous years, the right bank substrate was consistently stable, so problems of this nature were not encountered on that bank.

The 2007 passage estimates for Pilot Station are 125,553 Chinook; 1,726,885 summer chum; 684,011 fall chum; 173,289 coho; and 1,157,015 other species. Detailed historical passage estimates for 1995 and 1997–2007, are listed in Appendix Table A2. Historical passage estimates were revised in 2006 using the most current apportionment model to allow direct comparison between the years 1995 and 1997–2007.

7.1.2 Yukon River Chinook Salmon Stock Identification

Scale pattern analysis, age composition estimates, and geographic distribution of harvests has been used by ADF&G on an annual basis from 1981 through 2003 to estimate stock composition of Chinook salmon in Yukon River harvests. Three region-of-origin groupings of Chinook salmon, or stock groups, have been identified within the Yukon River drainage. The lower and middle stock groups spawn in Alaska and the upper stock group spawns in Canada.

Beginning in 2004, genetic analysis replaced scale pattern analysis as the primary method for stock identification. Tissue samples were collected from fish in mixed stock harvests from Districts 1 through 5 and paired with age data. Genetic analysis was performed on these samples by age group, age-1.3 and -1.4; and results from these analyses were combined with specific harvest age composition to provide the stock composition by harvest. Age groups not used for genetic analysis, age-1.1, -1.2, -2.2, -2.3, -2.4, -1.5, -1.6, and -2.5, were apportioned to stock groups using stock composition of analogous age groups, harvest age composition, and escapement age composition. Harvests from the Tanana River, the upper Koyukuk River, and Alaskan tributaries upstream from the confluence of the Yukon and Tanana rivers were assigned to the middle stock group based on geographic location. Harvests occurring in Fort Yukon and above were assigned to the upper stock group under the assumption that these fish were bound for Canada.

The historical proportion by stock group in the total drainage-wide Chinook salmon harvest (U.S. and Canada) is presented in Appendix Table A11. All fish from the lower and middle stock groups were harvested only in Alaskan fisheries. Analysis from 2006 shows drainage wide harvest proportions were: 0.175 from the lower stock group, 0.279 from the middle stock group, 0.460 from the upper stock group in Alaska, 0.087 from the upper stock group in Canada, and

0.546 from the upper stock group total (Appendix Table A11). Comparing the 2006 harvest stock proportion estimates to the averages (1981–2005), the lower stock group was slightly below average (-0.031), the middle stock group was above average (+0.044), and the upper stock group was near average (-0.013).

The Alaskan harvest proportion of fish attributed to lower, middle, and upper river stock groups is shown in Appendix Table A12. In 2006, the Alaskan harvest proportions from the lower, middle and upper stock groups were 0.192, 0.305, and 0.503, respectively (Appendix Table A12). Comparing the 2006 Alaskan harvest stock proportion estimates the averages (1981–2005), the lower stock group was slightly below average (-0.037), the middle stock group was above average (+0.044), and the upper stock group was near average (-0.007).

The upper stock group proportion harvested in Alaskan and Canadian fisheries is shown in Appendix Table A13. The 2006 proportion of the upper stock group harvested in Alaska and Canada were 0.841 and 0.159, respectively (Appendix Table A13). Comparing these 2006 proportions to the 1981–2005 average, the Alaskan proportion was slightly above average (+0.021) and the Canadian proportion was slightly below average.

7.1.3 Lower Yukon River Chinook and Chum Salmon Genetic Sampling

7.1.3.1 Chinook salmon

During 2007, field crews collected tissue samples (axillary processes preserved in ethanol) from Chinook salmon harvested by subsistence and commercial fisheries in the U.S. portion of the Yukon River. Tissue collections consisted of 1,672 samples from the subsistence harvest in Districts 1–5 and 3,844 samples from the commercial harvest in Districts 1–2 and 5. An additional 786 samples were collected from the Y5 subsistence fishery at Rapids by the Rapid Research Center, and 423 Chinook salmon were sampled from nets at the Eagle sonar site.

ADF&G in cooperation with USFWS collected paired data at Pilot Station from 550 Chinook salmon samples during the 2007 field season. Baseline samples from 165 Chinook salmon were collected in the following drainages, collaborators in parentheses: Anvik River (Anvik River Lodge), Henshaw Creek (Tanana Chiefs Conference), Chatanika River (ADF&G), Goodpaster River (Bering Sea Fisherman's Association/Tanana Chiefs Conference), and Kandik River (Mark Richards).

The baseline of 51 single nucleotide polymorphism (SNP) markers that was used to estimate the stock composition of the 2006 fishery harvests is in the process of being evaluated with additional samples from the above baseline collections.

7.1.3.2 Chum salmon

In 2007, ADF&G collected 4,693 chum salmon samples from commercial fisheries in District 1 of the Yukon River as part of the Western Alaska Salmon Stock Identification Program (WASSIP). As described for Chinook salmon, ADF&G in cooperation with USFWS collected paired data at Pilot Station from 4,281 chum salmon. In addition, 300 chum salmon were sampled by ADF&G from fish passing the Eagle sonar site.

7.1.4 Yukon River Chum Salmon Mixed-Stock Analysis

Since 2004, the stock compositions of chum salmon have been estimated from samples collected from Pilot Station sonar test fisheries for the period spanning July 1 through August 31. A baseline of standardized data collected at 21 microsatellite loci was constructed from the following stocks:

Andreafsky River (N=261), Chulinak River (N=100), Anvik River (N=100), Nulato River (N=100), Gisasa River (N=200), Henshaw River (N=200), South Fork Koyukuk River (N=200), Jim Creek (N=160), Melozitna River (N=146), Tozitna River (N=200), Chena River (N=172), Salcha River (N=185), Big Salt River (N=71), Kantishna River (N=161), Toklat River (N=192), Delta River (N=80), Chandalar River (N=338), Sheenjek River (N=263), Black River (N=112), Fishing Branch River (N=481), Big Creek (N=200), Minto River (N=166), Pelly River (N=84), Tatchun River (N=175), Kluane River (N=462), Donjek River (N=72), and Teslin River (N=143). Results from this analysis were reported for each pulse or time strata and distributed by email to fishery managers within 24–48 hours of receiving the samples. Stock abundance estimates were derived by combining the sonar passage estimates with the stock composition estimates. To evaluate the concordance of various data sources, an analysis was conducted to compare these stock specific abundance estimates against escapement and harvest estimates. This analysis revealed that the data were concordant for 2004–2006. An analysis is ongoing for the 2007 data, and preparations are underway to continue the project for the 2008 season.

7.1.5 Tanana and Kantishna River Fall Chum Salmon Mark–Recapture Study

A cooperative fall chum salmon mark–recapture project was initiated in 1995 on the Tanana River, and has operated annually through 2007. Western Alaska Disaster Relief Grant funds (WADG) were provided to the AYK region because of poor salmon runs in Western Alaska in 1997 and 1998. In 1999, WADG funding was used to expand the scope of the project and begin a fall chum mark–recapture study on the Kantishna River (Cleary and Bromaghin 2001). Although funding sources changed, sufficient financial support for the project assisted in operation of fall chum mark–recapture studies on both the Tanana and Kantishna rivers. Collaborators in 2007 included the Bering Sea Fishermen's Association and the Tanana Chiefs Conference.

The objectives for the 2007 season were to provide inseason and post season fall chum abundance estimates, (with 95% confidence intervals) for the upper Tanana River (upstream from the mouth of the Kantishna River) and in the Kantishna River. This information is used by fishery managers to determine the total return and escapement of fall chum salmon to the Yukon River. This project provides management staff with fall chum and coho salmon catch-per-unit effort data from the tag deployment and recovery wheels. Further, tag data is used to estimate migration rates of fall chum between the tag deployment and recovery wheel sites.

In the Tanana River, tags were deployed from a fish wheel approximately 9 km upstream of the Kantishna River mouth and counted using digital video at a second wheel located 73 km upstream from the tagging site. In the Kantishna River, tags were deployed from a fish wheel on the lower Kantishna River and recovered at two sites. One recovery site was 89 km upstream on the Toklat River where two fish wheels operated on opposite banks and the second site was 148 km upstream in the upper Kantishna River where one fish wheel was operated on the right bank. The upper Kantishna fish wheel contractor operated a second wheel on the left bank to catch fish for subsistence use during the last 2 weeks in September. This data was also reported to ADF&G and included for use in calculating the Kantishna watershed abundance estimate.

At the Tanana tag deployment wheel a total of 3,499 tagged fish were released from a total catch of 5,782 chum salmon. At the Kantishna River tag deployment wheel, 3,892 tagged fish were released from a total catch of 5,872. The Tanana River tag recovery fish wheel captured 11,196 chum salmon of which 149 were tagged. In the Toklat River, recovery fish wheels captured a total of 2,531 chum salmon of which 124 were tagged (both wheels combined). In the upper

Kantishna River, a total of 1,150 chum salmon were captured of which 78 were tagged (both wheels combined).

Preliminary fall chum abundance estimates are 248,126 (SE = 20,056) for the Tanana River and 67,056 (SE = 4,564) for the Kantishna River. This is the third largest estimate for the Tanana River and the 5th largest estimate for the Kantishna River. Both estimates are greater than the long-term averages.

Nine foot surveys of the Delta River were conducted during October through December 2007. The fall chum abundance estimate of 18,610 fish in the Delta River was determined based on the "area under the curve" method. During the weekly surveys, 34 tags were observed on fish that were unrecoverable and throughout the course of the surveys 36 tags were recovered. Age, sex and length data was collected from fall chum in the Delta, lower Kantishna, Chandalar, and Sheenjek River escapements in 2007 (Appendix Table A22).

7.1.6 *Ichthyophonus*

Ichthyophonus hoferi (*Ichthyophonus* here after) is a marine-derived protozoan parasite infecting a variety of marine and anadromous fish species, including salmonids (McVicar 1999; Kocan et al. 2004; Tierney and Farrell 2004; Gavryuseava 2007).

Ichthyophoniasis has led to mass mortalities in herring and recent low abundance of Chinook salmon raises questions about the possible involvement of *Ichthyophonus* in these declines, either due to pathogen-induced mortality, reduced fecundity or the inability of Chinook salmon to successfully migrate and spawn in tributaries. Prior research suggested that *Ichthyophonus* is an emerging parasite in the AYK region and that the disease can have significant effects on pre-spawning mortality of Chinook salmon. Moreover, Yukon River Chinook salmon appear to be particularly susceptible to *Ichthyophonus* compared to Chinook salmon from some British Columbia stocks (Jones and Dawe 2002). In fact, exposure of naïve immune systems to *Ichthyophonus* results in high mortality (Kocan et al. 1999).

In 2007, Chinook salmon *Ichthyophonus* sampling (funded by the U.S./Canada Restoration and Enhancement Fund) continued near the community of Emmonak at the mouth of the Yukon River as part of the Big Eddy test fishery operated by ADF&G. The Big Eddy test fish project utilizes set gillnets with 8.5 inch mesh. Samples of cardiac muscle (n=150) were collected over the course of the Chinook salmon run (from June 5 to July 15). Collection of samples over the entire run is of importance as Kocan et al. (2004) noted that salmon returning early in the season seem to be relatively free of typical *Ichthyophonus* lesions, while fish tend to be more severely infected later in the season.

Cardiac muscle samples of Chinook salmon were collected with extreme care using sterile, disposable sampling supplies to avoid cross-contamination with *Ichthyophonus* DNA between samples. Concurrently, fish morphometric data was recorded (i.e., length, sex, weight). The sex composition of acquired samples was 42% male (58% female) as determined by internal examination of gonads. The mean length of all sampled fish was 845 mm (from mideye to tail fork) with a mean weight of 21.3 pounds. The majority of Chinook salmon collected was age-6 (79.3%), followed by 16.0% age-5. Age composition of remaining samples was 1.3% age-4, 0.7% age-7 and 2.7% of unknown age. Age of Chinook salmon was estimated by scale pattern analysis with scales collected from the preferred area on the left side of the fish above the lateral

line (Bales 2007). Average water temperature at Emmonak in 2007 was 13.3ºC and 18.1ºC for June and July, respectively.

Heart samples were fixed in 95% ethanol at time of collection and were analyzed for the presence of *Ichthyophonus* 18s rDNA using polymerase chain reaction (PCR) following the procedure described by Whipps et al. (2006). Briefly, approximately 50mg of ethanol fixed tissue was placed in a 1.5ml microfuge tube. Nucleic acid extractions were conducted following the manufacturers protocol for the DNeasy Tissue kit (QIAGEN Inc. Valencia, California). Clinical signs typical for *Ichthyophonus* infection were noted at the time of collection in 10% (15 of 150) of all fish sampled. However, white, granulomatous lesions are a general inflammatory response of fish to foreign bodies and do not necessarily establish actual infection with the parasite (Corbel 1975). In 2007, prevalence of *Ichthyophonus* in Chinook salmon sampled at Emmonak was 16.7% (25 of 150) using PCR. Of infected fish 68% were female. Mean length and weight of infected fish was 855.6 ± 57.3 mm and 21.3 ± 4.6 pounds, respectively. Most infected salmon were age-6 (80%), followed by 12% age-5, and 8% of undeterminable age. The increased likelihood of infection with *Ichthyophonus* in older age classes has also been noted in other species (Hershberger et al. 2002; Rahimian and Thulin 1996).

Chinook salmon *Ichthyophonus* monitoring near the community of Emmonak at the mouth of the Yukon River has been ongoing since 1999. Cyclic *Ichthyophonus* epizootics have been described in herring (Sindermann 1965) and a similar cyclic pattern is noticeable in the Chinook salmon time series data from Emmonak (Figure 7). Reasons for this temporal variability are poorly understood, although high mortality associated with these periodic outbreaks in herring warrant increasing awareness and study of this disease in Chinook salmon. Further, environmental change can affect temporal and geographical distribution of pathogens and alter dynamics of infectious disease and parasite-host interactions (Kutz et al. 2004; Ward and Lafferty 2004). Over the past 30 years, June water temperatures in the Yukon River have increased by approximately 4ºC. Okamoto et al. (1987) showed a positive relationship between *Ichthyophonus*-related mortality and water temperature and described a dramatic increase in fish mortality between 10°C and 15°C, with 100% mortality occurring at 15°C to 20°C after approximately 1 month. Equally detrimental effects of temperature on *Ichthyophonus*-infected sculpin (*Enophrys bison*) have been illustrated by Halpenny et al. (2002). However, cause and effect can sometimes be difficult to discern as inflammatory response in general is temperature dependent in poikilotherms (Finn and Nielsen 1971).

7.1.7 Eagle Sonar

In 2003, ADF&G began investigating the feasibility of using sonar to estimate Chinook and fall chum salmon passage in the Yukon River near the U.S./Canada border. This effort was initiated in response to concerns about the current assessment methodologies and the importance of accurate border passage information when reviewing whether the annual objectives of the U.S./Canada salmon treaties have been met. A suitable section of river was identified near Eagle, Alaska for a potential sonar project. In 2004, ADF&G carried out a 2-week study to evaluate the performance of sonar at two preferred sites, Calico Bluff and Six-Mile Bend (Carroll et al. 2007). It was found that Six-Mile Bend was the superior site, that Dual Frequency Identification Sonar (DIDSON) should be deployed on the shorter, steeper right bank, and split-beam sonar should be deployed on the longer, more linear left bank.

A full-scale project was initiated at Six-Mile Bend in 2005 to estimate Chinook salmon passage using sonar (Carroll et al. 2007). Since 2006 both Chinook and fall chum salmon passage has been estimated at the same location (Dunbar and Crane 2007). The DIDSON was the ideal system for the right bank, where the profile is steep and less linear than the left bank. The split-beam system worked well on the left bank and appeared to have a satisfactory detection rate nearshore, while still adequately detecting targets out to 150 m. In 2007, the total Chinook salmon passage estimate at the Eagle sonar site was 41,697 for the dates July 7 through August 22 and the total fall chum salmon passage estimate was 235,871 for the dates August 23 through October 6 (Table 1).

Table 1.–Eagle sonar project passage estimates, and border passage estimates, 2005–2007.

	Sonar Estimate		Eagle Subsistence Harvest		Border Passage Estimate	
Date	Chinook	Chum	Chinook	Chum	Chinook	Chum
2005	81,528		2,387		79,141	
2006[a]	73,691	236,386	2,283	17,760	71,408	218,626
2007[a]	41,697	235,871 [b]	1,972	18,673	39,725	217,198

Note: All estimates for subsistence caught salmon (between sonar and border) include an unknown portion caught below the sonar. Most likely in the hundreds for Chinook salmon, and a few thousand chum salmon. Starting in 2008 the number of salmon caught between the sonar and the border will be documented on subsistence permits.

[a] Subsistence estimates are preliminary.

[b] Chum passage estimate does not include expansion for fish passing after sonar operations ceased (see Section 6.3.1).

In addition to operating the sonar in 2005 and 2006, a drift gillnet program was conducted at Six-Mile Bend to gain a better understanding of species composition, behavior and spatial distribution of the fish passing the sonar site. Standard age, sex and length (ASL) data, and genetic samples were collected from captured Chinook and chum salmon. Six gillnets, 25 fathoms in length and with mesh sizes ranging from 2.75 to 8.5 inches, were fished in an effort to effectively capture all size classes of fish present and detectable by the hydroacoustic equipment. Set gillnets were also deployed with varied results to investigate nearshore passage. Catches from these earlier studies indicated that most of the non-salmon species were close to shore and smaller than salmon. Given the size disparity between the majority of the salmon and non-salmon species a two-pronged approach was used in 2007 to determine the other species component. Salmon-sized fish were sampled using gillnets with mesh sizes ranging from 5.25 to 8.5 inches. Smaller non-salmon fish were examined with a DIDSON to determine the number of small fish passing and, because split-beam thresholds are optimized for salmon, the number of small non-salmon species actually counted on the split-beam sonar.

Data collected in 2006 and 2007 from a DIDSON operated side-by-side with the left bank split-beam sonar suggests that non-salmon species appear to be present in small numbers (about 3%) in the 0 m to 20 m range on the left bank. The split-beam sonar only detected 20% of the smaller non-salmon species, for a total 0.6% small non-salmon misidentified as salmon in the 0-20 m range on the left bank. There were no small non-salmon species detected by the DIDSON beyond 20 m. Since 2005, the drift gillnets have only captured 17 non-salmon fish in the drifts beyond the fish lead and represent less than 1.0% of the overall catch. Given the very low abundance of non-salmon species observed in the gillnets and the results of the DIDSON side-

by-side comparison, it is concluded that non-salmon species are not biasing the Chinook and chum salmon estimates to a significant degree. On the right bank, where the DIDSON was operated, very few non-salmon were counted. Non-salmon targets were distinguished from salmon based on the shape of the trace on the echogram and the size, swim motion, and behavior as seen on DIDSON video image.

Although there were some chum salmon present in the river during the Chinook run and vice versa, Chinook and chum salmon runs appear to be largely discrete in time based on test fish results, local knowledge of catches, data collected in Canada, and past projects in the area.

7.1.8 Sheenjek River Sonar

The Sheenjek River sonar project has estimated fall chum salmon escapement since 1981 and has undergone a number of changes in recent years. The project originally operated Bendix single-beam sonar equipment and, although the Bendix sonar functioned well, the manufacturer ceased production in the mid 1990s and no longer supports the system. In 2000, ADF&G purchased an HTI model 241 split-beam digital echosounder system for use on the Sheenjek River to continue providing the best possible data to fishery managers. In 2000 and 2002, the new system was deployed alongside the existing single-beam sonar and it produced results comparable to the Bendix equipment (Dunbar 2004). In 2003 and 2004, the split-beam sonar system was used exclusively to enumerate chum salmon in the Sheenjek River.

In 2002, ADF&G began testing a new Dual Frequency Identification Sonar (DIDSON) for counting salmon in small rivers. Based on the results of these tests, which showed this equipment to be easier to use, more accurate, and capable of operating with substrate profiles that are unacceptable for split-beam systems (Maxwell and Gove 2004), the Sheenjek River was selected as an ideal candidate for this system. In 2004, the project began transitioning to DIDSON, and in preparation, it was operated side-by-side with the split-beam sonar on the right bank. The DIDSON produced an estimate 29% greater than the split-beam system during this initial testing.

Because of the large discrepancy with the side-by-side comparison in 2004, the DIDSON was again operated next to the split-beam in 2005. For the 2005 study, the DIDSON produced an estimate 18% larger than the split-beam on the right bank over the period August 18 through September 5. The split-beam sonar was operated at a constant slow ping-rate throughout the season, which resulted in lower detection rates after September 5, when chum salmon were observed swimming noticeably faster. This happened to coincide with peak passage for the Sheenjek River, with data collected after September 5 and happened to coincide with peak passage. The right bank DIDSON count was 32% higher than the split-beam count if data collected after September 5 were included. It is unlikely that the late-season data is representative of the typical relationship as the ping-rate was lower than usual.

Historically, due to unfavorable conditions for transducer placement on the left bank, only the right bank of the Sheenjek River has been used to estimate fish passage. Drift gillnet studies in the early 1980's suggested that distribution of the upstream migrant chum salmon was primarily concentrated on the right bank of the river at the sonar site, with only a small but unknown proportion passing on the left bank (Barton 1985). In 2003, a DIDSON was deployed on the left bank to better understand the distribution of migrating chum salmon. Results showed that approximately 33% of the fish were migrating up the left bank. Due to large numbers of fish observed on the left bank, ADF&G began operating DIDSON on both banks in 2005.

The 2005 season marked a successful transition from a single split-beam system on the right bank to DIDSON systems deployed on both banks. The new equipment was both easier to use and produced more accurate estimates. In 2007, the combined passage estimate for both banks was 65,435 chum salmon, with an estimate for the right bank alone of 39,548 chum salmon. Over the past three seasons, the left bank has consistently contributed about 40% to the overall chum salmon run on the Sheenjek River. It will take several more years of data collection to determine how best to treat the historical estimates, but in order to provide the best escapement number possible the left bank must continue to be monitored. The transition from split-beam to DIDSON has gone smoothly and this equipment will continue to provide accurate escapement estimates in future years.

7.1.9 Yukon River Chinook Salmon Comparative Mesh Size Study

The goal of this 3-year study is to gain information about catch composition from 7, 7 ½, and 8 inch stretch-mesh drift gillnets from a test fishery in District 1 near Emmonak. The objectives of this study are to determine whether the proportion of Chinook salmon and chum salmon caught varies by mesh size, determine whether the age, sex, length, weight, and girth of individual Chinook salmon caught varies by mesh size, and to evaluate the marketability of the catch from the various mesh sizes. This information may provide insight into ways to implement management strategies and regulations to sustain Yukon River Chinook salmon while continuing to maintain subsistence and commercial fisheries.

The project operated from June 15 to July 1, 2007. Fishing occurred on 12 days for a total of 20 fishing periods composed of 10 morning shifts and 10 evening shifts. A total of 456 Chinook salmon and 572 summer chum salmon were caught using 7.0, 7.5, and 8.0 inch mesh (Table 2). This was considerably less than the targeted sample size of 400 Chinook salmon per mesh size. All Chinook salmon harvested were measured for age, sex, length, weight and girth.

Table 2.–Number of Chinook and summer chum salmon harvested in the Lower Yukon River test fishery by mesh size, 2007.

Mesh Size	Chinook Salmon	Chum Salmon
7.0 inch	147	268
7.5 inch	180	146
8.0 inch	129	158
Total	456	572

7.1.10 Tanana Fall Chum Radio Telemetry

Fall chum salmon originating in the Tanana River represent on average 30% of the total run abundance within the Yukon River drainage. They are harvested in important subsistence, personal use and commercial fisheries enroute to spawning locations. The relationship between known tributary escapements and drainage abundance estimates suggest that a significant contribution to the fall chum salmon population maybe from Tanana River mainstem spawners. Previous telemetry results indicate large concentrations of adult chum salmon in the mainstem Tanana, but the extent of spawning remains poorly understood. The main objectives of this research include: 1) confirm that fall chum salmon are using the mainstem Tanana River for spawning; 2) identify and characterize mainstem spawning habitats used by fall chum salmon; 3)

determine relative contributions of mainstem spawners to overall upper Tanana River fall chum salmon populations; and 4) construct mainstem spawning habitat location prediction models. The impacts of urbanization and resource development, including agriculture, timber, minerals, and petroleum are greatest within the Tanana River drainage. This study will assist with resource development in the area while simultaneously protecting habitat supporting the fishery resource.

In 2007, the Alaska Department of Fish and Game (ADF&G) and the Tanana Chiefs Conference (TCC), in conjunction with the University of Alaska Fairbanks (UAF), the U.S. Geological Suryey (USGS) and the U.S. Fish and Wildlife Service (USFWS), conducted field work from August through December. In early September, four new remote tracking stations (RTS) were installed to complement the existing five RTS for a total of nine RTS (Figure 8) currently covering the Tanana River mainstem and major tributaries from Manley to the Gerstle River east of Delta Junction.

Testing of tags occurred from September 8–11 and was composed of three tag sizes applied 40 times each on 120 female chum salmon. The test fish were held in totes with circulating water for 2 hours and then removed for necropsy. The largest and smallest tag types seemed to be regurgitated most often while the medium sized tags appeared to have the best stomach seat. The stomachs were still elastic, but fairly thin upon inspection.

A total of 30 female fall chum salmon were tagged and released, half on September 17 and the remainder on September 19. Overall, 27 (90%) fish showed significant upriver movement. Three fish regurgitated their tags near the tagging wheel, 2 fish were caught in the Nenana fishery, and 1 fish migrated to the Tolovana River. A total of 24 (80%) tagged fish migrated past Fairbanks and the majority were distributed upstream to the Little Delta River (Figure 9) in the mainstem Tanana River with 1 fish migrating into the middle channel of the Delta River.

Twenty-eight aerial surveys were conducted twice weekly from 17 September through 18 December in order to document; 1) radio tagged fish locations, 2) areas where fish were visually observed, 3) open water upwelling locations, and 4) monitor radio tag battery life. Data analysis is ongoing to determine the significance of the three tag types during migration and the impact on final locations. Radio tags will be purchased for the second year of this project based on performance and fish behavior.

On December 5–6, habitat monitoring equipment was installed in four locations in the study area where spawning fish were present. Open water mapping was also conducted during this time and periodic flights are scheduled to monitor upwelling areas this winter. Recovery of monitoring equipment is scheduled to be conducted during late April or early May of 2008. Preparations for deployment of 370 radio tags throughout the course of the run in 2008 are being made.

7.1.11 Yukon River Chinook Salmon Aging Consistency Study

Since 1964, ADF&G has collected age-sex-length (ASL) samples from Chinook salmon in the lower Yukon River. Yukon River Chinook salmon ASL trends have come to the forefront at fishery-related meetings as research, anecdotal information, and traditional knowledge suggests the size and age of Chinook salmon has decreased in recent years. Appropriate age estimation is an inherent assumption of historical ASL trend analysis. During 43 years (1964–2006) of Chinook salmon aging estimates by ADF&G, many different readers have interpreted scale growth patterns and assigned ages. This highlights the need to verify that ADF&G has aged

Chinook salmon scales consistently over time. The objective of this project was to examine aging consistency of Yukon River Chinook salmon scales by ADF&G.

A total of 491 cellulose acetate cards from lower Yukon River commercial harvests in Districts 1 and 2, and the lower Yukon River test fisheries at Flat Island, Big Eddy, and Middle Mouth were selected for this study. The selected acetates represent 7,301 individual Chinook salmon from 14,681 scales collected and aged by ADF&G over a 43-year span. The acetate cards were selected systematically and older-aged fish were targeted in the selection process. The selected acetates were sent to three independent scale readers employed by ADF&G, Canadian Department of Fisheries and Oceans, and Washington Department of Fish and Wildlife. Measures of ageing consistency (i.e., bias and precision) were evaluated for each combination of age estimates generated by ADF&G and the independent readers; by five temporal strata and age type: freshwater, saltwater, and total age. Consistency in estimating age composition was addressed using Chi-square goodness of fit. Systematic ageing bias was addressed using age frequency tables, pairwise *t*-tests, and age bias plots. Precision in age estimates was addressed using percent agreement and coefficient-of-variation.

Estimates of age composition did not differ between ADF&G and the independent readers over time. Temporally consistent biases in age estimation by ADF&G relative to the independent readers were observed; however, the magnitude of these biases were small and likely not biologically meaningful. The levels of precision between age estimates generated by ADF&G and the independent readers were generally high and consistent. Collectively, the results suggest ADF&G has consistently aged Yukon River Chinook salmon scales and any observed changes in Yukon Chinook ASL composition is likely not a statistical artifact associated with age estimation.

7.1.12 Juvenile Chinook salmon study near U.S./Canada border

The rearing of subyearling Chinook salmon in non-natal streams is well documented in the upper Canadian portion of the Yukon River drainage. Further downstream in U.S. waters, little information is available concerning the utilization of non-natal rearing habitat by juvenile salmon. In the summer of 2006 and 2007, a study by USFWS, Fairbanks Fish and Wildlife Field Office, investigated whether Canadian-origin Chinook salmon reared in U.S. streams. Seven Yukon River tributaries were selected for study in a 260-km segment between the U.S./Canada border and Circle, AK. Subyearling Chinook salmon were found in all seven streams. Genetic samples from captured juveniles were collected (over 800 samples) and preliminary mixed-stock genetic analysis (2006 samples) suggested that captured fish were from Canadian source populations. The majority of the samples (93%) were from source populations over 500 km upstream of the study area (Carmacks/Mainstem regional group). The Lower and Upper Canada regional groups were represented in the 2006 samples, but the large river systems, i.e., Stewart, Pelly, and Teslin groups were not present. Future work will focus on detailed genetic population structure analysis to more clearly define the geographic distribution among different source populations. A final report will be available June 1, 2008. This study provided an initial assessment of the extent to which Canadian-origin juvenile Chinook salmon rear in U.S. streams and will help direct future research into quantifying the importance of U.S. habitat to Canadian-origin Chinook salmon. This project was funded by USFWS and the National Park Service.

7.2 CANADA

7.2.1 Upper Yukon River Salmon Tagging Program (Yukon Territory)

The Department of Fisheries and Oceans Canada (DFO) has conducted a tagging program on salmon stocks in the Canadian section of the Upper Yukon River drainage since 1982 (excluding 1984). The objectives of this program are to provide inseason estimates of the border escapement of Chinook and fall chum salmon for management purposes and to provide postseason estimates of the total spawning escapements, harvest rates, migration rates and run timing. Spaghetti tags are applied to salmon live-captured in two fish wheels located upstream from the Canada/U.S. border. The two fish wheels, White Rock and Sheep Rock, are situated approximately 7 kilometers apart on the north bank of the river. Tagging methodology for many years involved two daily tagging events, morning and evening. In recent years, additional tagging shifts have been implemented for both the Chinook and fall chum salmon migratory periods to reduce the stress on fish held in the live-boxes prior to tagging. For example, the Chinook salmon tagging schedule now involves three to four tagging events each day (i.e., wheel checks every 6–8 hours) throughout most of the run, while the fall chum salmon tagging schedule usually involves three tagging events per day. Subsequent tag recoveries are made in the different fisheries and spawning areas located upstream and infrequently, in downstream fisheries in Alaska. Each year, less than three tag recoveries are reported downstream of the tagging site near the community of Eagle, Alaska where an active Chinook and fall chum salmon subsistence fishery takes place.

The lower Canadian commercial fishery located downstream of the Stewart River, the area where most intensive fishing activity and catch monitoring is conducted, is used for population estimates if it proceeds. Commercial fishers are legally required to report catches, tag recovery and associated data no later than 8 hours after the closure of each fishery and there is also a requirement that catch forms be either received by the Whitehorse office or post-marked within 10 business days after the closure of each commercial opening. A toll-free telephone catch line is also available for catch reporting.

Although consistency in the fish wheel sites and fishing methods permits some inter-annual and inseason comparisons, the primary purpose of the fish wheels is to live-capture salmon for the mark–recapture program. In the absence of recapture information, fish wheel catch data is generally not useful for assessing Chinook salmon run abundance. In general, fish wheel counts have limited correlation with border escapement estimates derived from mark–recapture estimates, particularly with respect to Chinook salmon runs. Chinook salmon catches tend to be highest during high water conditions when the fish are most vulnerable to the shore-based gear and lower during low water conditions. Similarly, fall chum salmon fish wheel catches are often directly related to water levels, although the fish wheels are highly efficient at capturing fall chum salmon migrating close to shore. In 2006, the daily wheel catches of fall chum salmon were highly correlated with the daily counts of fall chum salmon derived from a sonar estimate at Eagle, Alaska. The fish wheels appear to be less efficient at capturing fall chum salmon during the latter part of the migration period, usually in late September and early October. During this period most fish are caught overnight. It is assumed that migrating fall chum salmon are better able to avoid the gear during the daylight hours due to an increase in water clarity associated with less turbid water conditions.

In 2007, with the exception of short periods that involved maintenance and repair, both fish wheels ran 24 hours per day during an operational period that started in late June and ended in

early October. Chinook salmon were tagged three times per day throughout most of the 2007 run and four times per day during the later part of the run. Fall chum salmon were tagged three times per day (morning, afternoon and evening) throughout most of the 2007 run. Population estimates were developed in 2007 using spaghetti tag recoveries from a test fishery during the Chinook salmon run and commercial and test fishery tag recoveries during the fall chum salmon run. Aboriginal catch and tag recovery information from the Dawson area was used to supplement test fishery data when the initial postseason Chinook salmon estimate was calculated; however, due to inconsistencies in this data, this information was ultimately not used in the final postseason estimate.

7.2.1.1 Chinook Salmon

On July 3, the first 2 Chinook salmon were caught in the White Rock fish wheel, 3 days later than the average date of June 30. The combined total fish wheel catch of 1,462 Chinook salmon in 2007 was 91% of the 1997–2006 average of 1,611 fish. The sex composition of Chinook salmon caught was 29.6% female. A peak weekly catch of 496 fish was recorded in statistical week 29, July 15 to 21.

In 2007, the tag recovery component of the Chinook salmon mark–recapture study involved data from a gillnet test fishery conducted by the Yukon River Commercial Fishing Association and Tr'ondëk Hwëch'in First Nation with funding provided by the Yukon River Panel. Test fishery data was initially supplemented with data (catch and tag recovery) from the Tr'ondëk Hwëch'in First Nation aboriginal fishery; however, this information was later not used due to inconsistencies in the data. Due to low run strength of the 2007 Upper Yukon River Chinook salmon migration, a commercial fishery was not initiated thus commercial catch and tag recovery data was unavailable. The information used to determine the 2007 Chinook salmon estimate involved the number of effective tags deployed to the end of statistical week 31 (1,306), the test fishery catch which was examined for tags (617) and 40 tag recoveries. The recovery data used to calculate the estimate, the number of fish examined for tags and number of tags recovered, was lower than desired. This was due to the test fishery catch being lower than expected as a result of the low run strength in 2007.

The preliminary border passage estimate for 2007 is 22,120 Chinook salmon. This estimate was derived from a Maximum Likelihood Darroch estimate of 20,145 (95% CI 14,201–26,089) through August 4 derived using the Stratified Population Analyses System (SPAS) and was then expanded using fish wheel timing. Very limited Chinook salmon catch and tag recovery data was available for the period after August 4. After subtracting the Upper Yukon River Chinook salmon harvest of 4,794 (0 commercial, 0 domestic, 2 recreational, 4,175 aboriginal, and 617 test), a total of 17,326 Chinook salmon was estimated to have reached spawning areas. This estimate is well below the escapement goal of 33,000 to 43,000 adopted by the Yukon River Panel for the 2007 season (Appendix Table B11; Appendix Figure B15). A preliminary reconstruction[5] of the 2007 Chinook salmon run suggests that total run size of Upper Yukon River Canadian Chinook salmon was lower than the preseason outlook; approximately 61,000 Chinook vs. the preseason outlook of 93,700 Chinook salmon.

Comparative border and spawning escapement estimates from the tagging program for 1982 through 2007 are presented in Appendix Table B11. The 2005–2007 border escapement

[5] This reconstruction was developed using border escapement derived from the tagging program and preliminary GSI analyses.

estimates appear to be biased low when compared to estimates of Chinook salmon derived from the border sonar program located near the community of Eagle, Alaska during the same period. Additional years are required where comparisons between mark–recapture and sonar estimates are available before it can be determined if there is a systemic problem associated with the fish wheel tagging program that consistently biases the estimates low.

7.2.1.2 Fall Chum Salmon

The 2007 fall chum salmon run into the Upper Yukon River drainage was unusually late. A total of 11,940 fall chum salmon was caught in the DFO fish wheels between August 1 and October 6 of which 7,506 were tagged. After September 12, the daily fish wheel catches were much higher than average and included a number of days when record daily catches were recorded. Late in the season most fish were caught overnight; it is assumed that increased water clarity during this period resulted in gear avoidance during daylight hours. High daily fish wheel catches were recorded in the last few days of the 2007 program suggesting that an undetermined and considerable portion of the run was not assessed. The 2007 fish wheel catch was the second highest on record and it was well above the 10-year average total of 5,064 fall chum salmon.

The first fall chum salmon was captured on August 1 in the Sheep Rock fish wheel. The midpoint of the fish wheel catch occurred on September 20. The peak weekly catch of fall chum salmon in 2007 was 5,576 in statistical week 38 (September 16–22).

In 2007, DFO fish wheel captured 11,940 fall chum salmon of which 7,506 were marked with spaghetti tags. The tag recovery effort involved a commercial and live-release test fishery occurring concurrently. The number of tags applied was reduced to account for four tags recovered in the Eagle Alaska subsistence fishery and one tag recovered in the Canadian Chinook salmon test fishery. Prior to the 2007 season, there was a suggestion from a number of commercial fishers that their effort and catch would be low. For this reason, a test fishery funded through the Yukon River Restoration and Enhancement Fund was conducted for portions of statistical weeks 36 through 41 to ensure that there would be no gaps in the tag recovery effort. However, the commercial effort and catch was much higher than anticipated. The commercial fishery occurred over portions of 4 statistical weeks (statistical weeks 38–41); the total commercial catch was 7,109 fish and 170 tags were recovered. There were five live-release test fishery periods commencing on September 8 and ending on October 8 covering portions of 6 statistical weeks (statistical weeks 36–41). A live-release fish wheel was operated for four of the periods in a lower area located near the confluence of the Fortymile and Yukon rivers, while another live-release fish wheel was operated for all five periods near Dawson City. The total test fishery catch was 3,765 fish and 173 tags were recovered. Tags were removed at both the lower and upper test wheels to provide an enhanced opportunity for the crew to accurately record the spaghetti tag number; all of the tagged fish were then marked with a lower (lower test wheel) or upper (upper test wheel) caudal fin punch. Prior to data analyses, adjustments were made to the number of tagged fish released at the lower test wheel to account for the fish released with caudal punches. There was also an adjustment to the number of tagged fish captured as all of the fish with a lower caudal punch released at the lower test fish wheel and recaptured at the upper test fish wheel were treated as tag recoveries. Overall, a low number of adjustments were made, although considerable effort was required to check and finalize the test fish data.

In summary, the effective number of tagged fish released (7,600: 7,501 spaghetti tags plus 99 caudal punches), the combined commercial (7,109) and test (3,765 reduced to 3,755) fishery

catches, and the tag recoveries (170 commercial and 173 test increased to 179) were used to determine fall chum salmon abundance estimates using the Stratified Population Analyses System (SPAS).

The preliminary postseason fall chum salmon estimate is 235,956 (Appendix Table B13) with a 95% confidence interval range from 212,237 to 259,674 fish. The late timing of the 2007 fall chum salmon run, high daily fish wheel catches during the last few days of the tagging program and high daily Eagle sonar estimates during the same period, suggest that the operational period of the Canadian tagging program missed a significant portion of the migration period, i.e., the program terminated before the run had subsided. There is no timing information readily available that can be used to expand the estimate.

A pooled Petersen estimate was used to calculate the 2007 fall chum salmon run size because extensive pooling was required to derive estimates using other estimation techniques (i.e., the Maximum Likelihood Darroch). The spawning escapement is estimated to be 226,626, well above the spawning escapement target of >80,000 Upper Yukon River fall chum salmon established by the Yukon River Panel. Comparative border and spawning escapement estimates from the tagging program for 1980 through 2007 are presented in Appendix Table B13.

7.2.2 Big Salmon Sonar

A long range dual frequency identification sonar (DIDSON-LR) was used by Jane Wilson and Associates to enumerate Chinook salmon returning to the Big Salmon River in 2007, as well as determining run timing, and diel migration patterns. This was the third year a sonar program operated at this site with funding from the Yukon River Panel's Restoration and Enhancement Fund. The sonar site was located on the Big Salmon River approximately 1.5 km upstream of the Yukon River confluence, the same location used for the 2005 and 2006 programs. Partial weirs placed on both sides of the river were used to restrict fish movement through a 34 m opening. The sonar unit was configured to provide a 29º conical ensonified field that was 40 m in depth and covered the water column within the fish passage opening.

A total of 4,450 targets identified as Chinook salmon were counted past the sonar station between July 15 and August 26, 2007. A peak daily migration of 435 fish occurred on August 1, and 90% of the run had passed the station by August 14. The 2007 run timing appeared to peak a few days earlier than was observed in 2005 and 2006 and the strength of the latter part of the 2007 run appeared much weaker than the latter parts of the 2005 and 2006 runs. The 2005 and 2006 counts were 5,584 and 7,308, respectively.

A carcass sampling program was implemented on the Big Salmon River in 2007; 150 ASL and 75 genetic samples were obtained. Based on a sample of 122 aged fish, the age-5 and age-6 year components represented 19.7% and 76.2% of the sample, respectively.

7.2.3 Whitehorse Rapids Fishway Chinook Salmon Enumeration

A total of 427 Chinook salmon ascended the Whitehorse Rapids Fishway between July 20 and September 3, 2007. This total was 30.4 % of the 1997–2006 average count of 1,403 fish. The sex ratio was 39.2% female (167 fish). Hatchery-produced fish accounted for 55.7% of the return: 164 males and 74 females. The non-hatchery count consisted of 96 wild males and 93 wild females. The run midpoint and the peak daily count both occurred on August 16 when 38 fish were counted.

The 2007 return represents the first year that 5-year old adult fish have returned from a recent series of lower hatchery releases. As a result of hatchery modifications that resulted in a change from Capillano troughs to circular tanks, the annual hatchery fry release goal was reduced to a target of 150,000 effective in brood year 2002. The average fry release from the Whitehorse Rapids Hatchery prior to BY 2002 was ~250,000 while the average release for brood years 2002-2006 was ~151,600.

In 2007, fish were not specifically removed from the fishway for coded wire tag sampling; however, several samples were obtained from the brood stock collected. No weirs (i.e., Wolf or Michie creeks) were operated in the drainage upstream of the Whitehorse Rapids Fishway in 2007.

7.2.4 Whitehorse Hatchery Operations

All 166,154 fry of the 2006 brood year Chinook salmon reared at the Whitehorse Rapids Fish Hatchery were released between May 24 and June 8, 2007. All fish released were marked with an adipose fin clip. The fry[6] were released into various locations upstream of the Whitehorse Rapids hydroelectric dam. The numbers of fry released by location were as follows:

Wolf Creek:	41,184
Michie Creek:	50,590
M'Clintock River	38,771
Mainstem Yukon River	35,609
TOTAL	166,154

Included in the above numbers were 2,632 fry that were considered to be too small or unfit for tagging. These fish had their adipose fins removed[7], and were released in Wolf Creek on June 03, 2007. A summary of Chinook salmon releases into the Upper Yukon River from instream incubation and rearing sites is presented in Appendix Table A14.

The 2007 release was the 12th year in which all fit fish released from the Whitehorse Rapids Fish Hatchery into the Yukon River were marked, i.e., 1995–2006 brood years. With the exception of all fish released from the 1998 BY, which were adipose-clipped but not tagged, all of the 1995–2006 brood year releases involved adipose fin removal and application of coded wire tags to all fit fish; approximately 94% of the 1994 BY release was tagged with coded wire tags. The initiative to mark all of the fish released from the hatchery provides an opportunity to accurately determine the hatchery contribution as adult fish migrate upstream through the Whitehorse Rapids Fishway and it is also helpful during brood stock collection.

Tag retention for the fish tagged from the 2006 brood year release was calculated to be 98.8%. This means that an estimated 2,028 of the tagged fish did not retain their tag. The total 2007 release therefore includes 161,494 adipose-clipped with tags, 2,028 fish which were estimated to have lost their tags and 2,632 small (or unfit) fish which were clipped but not tagged for a total release of 166,154 fish.

[6] The fish released are referred to as fry, however virtually all of them emigrate to the ocean shortly after release, and they may more accurately be referred to as pre-smolts.

[7] These fish were not tagged with CWT's.

In August 2007, brood stock collection began after 122 Chinook salmon had migrated through the Whitehorse Rapids Fishway. Brood stock was collected from August 14 to August 30. An attempt was made to collect two males for each female during brood stock collection to allow matrix spawning. Matrix spawning has been used for 19 years in an effort to maintain genetic diversity.

A total of 37 males were retained and used for the brood stock program; 23 of these fish were adipose-clipped (hatchery) and 14 had intact adipose fins (wild). Milt was collected from an additional 13 males (6 hatchery and 7 wild) which were then released back into the fishway to continue their migration. The total number of males used as Whitehorse Rapids Hatchery brood stock in 2007 was therefore 50 fish. In total, 19.2% of the total male return of 260 was used for brood stock.

A total of 26 females were collected for the brood stock program. Three of these perished during holding and an additional two females which were not maturing were released back into the Yukon River above the Whitehorse Rapids Fishway. A total of 21 females were successfully spawned; female brood collected consisted of 8 adipose-clipped fish (hatchery) and 13 fish with intact adipose fins (wild fish). In addition to the females collected for brood stock, an additional 9 females were opportunistically captured and used for the broodstock program when they failed to migrate through the fishway; these females consisted of 6 adipose-clipped fish (hatchery) and 3 fish with intact adipose fins (wild fish). The final total number of females used for the Whitehorse Rapids Hatchery brood stock in 2007 was therefore 30 fish. In total, 18.0% of the total female return of 167 was used for brood stock.

An additional female collected at the Whitehorse Rapids Fishway was fertilized and used at the McIntyre Creek facility located downstream of the Whitehorse Rapids Hatchery. Egg takes began on 16 August and were completed on September 2. An estimated total of 135,235 green eggs were collected from the 31 spawned females (30 Whitehorse Rapids Fishway and one McIntyre Creek facility). Average fecundity was estimated at 5,000 eggs per female and the fertilization rate was estimated to be 83%. Shocking and second inventory of the eggs began on October 2 and was completed by October 14.

7.2.5 Bering Strait Recoveries of Chinook Salmon Fry Released from the Whitehorse Rapids Hatchery

Three recoveries of coded wire tagged Chinook salmon released from the Whitehorse Rapids Hatchery in the spring of 2007 were made during the BASIS cruise on September 13. Length and weight data collected at the time of capture is provided in Table 3. Recovery locations[8] are presented in Figure 10. Recovered fish had an agency only coded wire tag (CWT) code first used for brood year 2006 fish released in 2007. The average weight at the time of release was ~2.9 grams.

[8] The recovery information was provided by J. Murphy, Fishery Research Biologist Auke Bay Laboratories, Alaska Fisheries Science Center, NOAA Fisheries.

Table 3.–Data from three coded wire tagged Chinook salmon fry released from the Whitehorse Rapids Fish Hatchery and caught in the BASIS cruise on September 13, 2007 at 65.19° N and 168.07° W.

Fish	Length (mm)	Weight (g)
1	176	58
2	125	18
3	179	58

7.2.6 Porcupine River Investigations

7.2.6.1 Fishing Branch River Fall Chum Salmon Weir

Fall chum salmon returns to the Fishing Branch River have been assessed since 1971 when an aerial survey count of 115,000 was adjusted to a total estimated return of approximately 250,000-300,000. A weir established to enumerate fall chum salmon escapement to the Fishing Branch River has operated during the following periods: 1972 to 1975; 1985–1989; and, annually since 1991 when Fisheries and Oceans Canada and the Vuntut Gwitchin Government conducted the weir program cooperatively. Escapement estimates for the Fishing Branch River, including aerial expansions for years lacking complete weir counts, have ranged from approximately 5,100 fall chum salmon in 2000, to 353,300 chum salmon in 1975 (Appendix Table B13; Appendix Figure B14).

In 2007, the weir was operated from September 2 to October 10. A total of 29,704 fall chum salmon were counted. The total included 60 fish counted on the morning of October 11, which was an incomplete daily count conducted before the commencement of weir disassembly. The estimated midpoint of the 2007 run, September 27, occurred 9 days later than the average (1997-2006) midpoint of September 18. The peak daily weir count of 3,067 fish occurred on September 27, the midpoint of the run. It is unlikely that many fish arrived before the weir was installed. However, the unusually late timing of the 2007 fall chum salmon run at the Fishing Branch River weir suggested that the operational period missed a significant, although undetermined, portion of the migration period at the end of the run. Unusually late run timing was observed elsewhere in the Yukon River drainage including the Rampart Rapids fish wheel program, Eagle sonar program, and at the Fisheries and Oceans Canada (DFO) fish wheels. Timing information that can be used to expand the weir count is not readily available because all 2007 U.S. and Canadian assessment programs ended with significant numbers of fall chum salmon still migrating. The Fishing Branch River weir count was expanded to 33,750 based on average timing information. The expanded 2007 count exceeds the recent 10-year average count of 29,577 chum salmon by 4,173 fish and represents 99.3% of the escapement target of >34,000 chum salmon established for 2007. Based on anecdotal catch reports from the Old Crow test and aboriginal fisheries, its likely that the late run strength was sufficient to exceed the 2007 Fishing Branch River escapement target of >34,000.

Generally, a low number of coho salmon are observed at the weir each year. However, the weir is not in operation long enough to obtain quantitative information on coho salmon escapement; 3 coho salmon were observed passing through the weir in October 2007.

7.2.6.2 Porcupine River Fall Chum Salmon Mark–Recapture Program

A mark–recapture program, funded by the Yukon River Panel Restoration and Enhancement Fund, was conducted on the Porcupine River near the community of Old Crow, Yukon, in 2007 by the Vuntut Gwitchin Government (VGG) and Environmental Dynamics Incorporated (EDI), a consulting firm. The purpose of this project was to continue the development of an inseason fall chum salmon management tool for the community of Old Crow and Fisheries and Oceans Canada (DFO) fishery managers. It was hoped that inseason information from this program and the Fishing Branch River weir could be used to determine inseason harvest opportunities and promote conservation of the Fishing Branch River chum salmon returns.

In 2007, 830 fall chum salmon were captured by gillnet, tagged, and released downstream of the community of Old Crow. A total of 2,622 chum salmon were caught in a test fishery and 56 tagged fish were observed. Weekly mark–recapture estimates were developed throughout this program as well as a total estimate of 38,240 (95% CI 28,821 to 47,658) (Table 4).

One limitation of this program was the relatively low number of tag recoveries (n=56) observed in the test fishery catch. Because additional catch and tag recovery information was available from the aboriginal fishery (AF) centered around the community of Old Crow, catch and tag recovery information from this fishery was added to the existing data and a second population estimate was calculated (Table 5). The combined data included an examined catch of 6,592 (2,622 test fishery catch and 3,970 AF) and 114 associated tag recoveries. The total estimate using the combined fishery was 47,641 with a 95% confidence interval from 39,643 to 55,638 (Table 5).

Table 4.–Estimation of the number of fall chum salmon at Old Crow Y.T. derived from a mark–recapture program.

Week	Period	# Tagged	# Test	Tags Recovered	Chapman's Estimate	Var (Nc)	95% CI	95% Run Est (-)	95% Run Est (+)
1	28 Aug–3 Sep	5	13	0	83	2730	103	-20	186
2	4 Sep–10 Sep	84	247	5	3,512	1,599,236	2,485	1,027	5,997
3	11 Sep–16 sep	357	1,527	36	14,783	5,032,711	4,408	10,375	19,192
4	17 Sep–24 Sep	287	670	10	17,567	24,331,680	9,693	7,874	27,260
5	25 Sep–30 Sep	97	165	5	2,710	950,258	1,916	795	4,626
Project Total		830	2,622	56	15,858	22,973,080	9,418	28,821	47,658

The estimates in Table 5 attempt to quantify all populations of fall chum salmon within the Porcupine River upstream of Old Crow. Based on the tag recovery information presented, there were potentially 772 tags at large; however, there may have been additional tag recoveries in the Old Crow aboriginal fishery catch which were not included in the data analysis (Table 5).

Table 5.–Estimation of the number of fall chum salmon at Old Crow Y.T. derived from a mark–recapture program using test fishery and Vuntut Gwitchin aboriginal fishery catch and tag recovery data.

Period	# Tagged	# Test & Aboriginal	Tags recovered	Chapman's Estimate	Var (Nc)	95% CI	95% Run Est (-)	95% Run Est (+)
28 Aug–30 Sep	830	6,592	114	47,641	16,564,731	7,998	39,643	55,638

A total of 309 of the 772 tags which potentially migrated past Old Crow were observed and/or recovered during the operation of the Fishing Branch River weir in 2007; this total represents

only 40% of the tags applied which potentially moved upstream of Old Crow. The proportion of tags observed at the weir was much lower than was observed in previous years; the percentage of tags observed at the Fishing Branch River weir in the 2003–2005 period was as follows: 88% in 2003; 59% in 2004; and 71% in 2005. The lower percentage observed in 2007 could possibly be attributed to a combination of factors including: lateness of the 2007 run and incomplete operational period of the Fishing Branch River weir, unreported tag recoveries in the Old Crow aboriginal fishery, presence of other spawning locations, tag loss, and mortality of tagged fish. The Fishing Branch River weir count to October 10th, including adjustments to account for days when the weir was not in operation, was 33,750 fall chum salmon.

7.2.6.3 Stock Identification of Yukon River Chinook and Fall Chum Salmon using Microsatellite DNA Loci

Stock identification of the 2007 Chinook and fall chum salmon migration past the Fisheries and Oceans Canada (DFO) fish wheel program at Bio Island, near the Yukon-Alaska border, was conducted through analysis of microsatellite variation. Variation of 12 microsatellite loci was surveyed for 747 Chinook salmon and variation of 14 microsatellite loci was surveyed for 737 chum salmon. The DNA samples collected were weighted using weekly and seasonal abundance estimates derived from the Eagle sonar program.

The populations and regional reporting groups for Chinook and fall chum salmon and are presented in Table 6 and Table 7, respectively. The estimated percentage stock composition by statistical week and the associated standard errors for Chinook salmon and fall chum salmon are presented in Table 8 and Table 9, respectively.

Table 6.–Baseline used to estimate stock compositions of Chinook salmon from the fish wheel tagging program at Bio Island, 2007.

Stock Aggregate Name	Populations in Baseline
North Yukon Tributaries	Chandindu River, Klondike River
White River	Tincup Creek
Stewart River	Mayo River, Stewart River
Pelly River	Big Kalzas, Little Kalzas, Earn, Pelly River, Glenlyon River, Blind Creek
Mid-mainstem Tributaries	Mainstem Yukon River, Nordenskiold River
Carmacks Area Tributaries	Little Salmon River, Big Salmon River, Tatchun Creek
Teslin River	Teslin Lake, Moreley River, Nisutlin River
Upper Yukon Tributaries	Wolf Creek, Michie Creek, Whitehorse Hatchery, Takhini River

Table 7.–Estimated stock composition of fall chum salmon (n=737) sampled from the Fisheries and Oceans Canada fish wheels at Bio Island, 2007.

Stock Aggregate Name	Populations in Baseline	Proportion ± SE
Yukon Early	Chandindu River	0.005 ± 0.004
White River	Kluane River, Donjek River	0.524 ± 0.019
Mainstem Yukon R.	Mainstem Yukon River at Pelly River, Tatchun Creek, Big Creek, Minto	0.466 ± 0.020
Teslin River	Teslin River	0.005 ± 0.005

For Chinook salmon, the eight regional reporting groups contributing to the 2007 run were as follows: Carmacks area tributaries (Big Salmon River, Little Salmon River, Tatchun Creek) (23.9%); Pelly River (21.3%); Stewart River (15.4%); Mid-mainstem Tributaries (14.8%); North Yukon Mainstem Tributaries (11.5%); Teslin River (9.6%); Upper Yukon River tributaries (2.4%); and White River (1.1%) (Table 8). Figure 11 shows the timing and relative abundance of selected Chinook salmon stocks derived from DNA analyses. Because there are many stocks currently not in the Chinook salmon baseline, the individual stock proportions (Figure 11) are likely biased high.

Table 8.–Estimated percentage stock composition of Chinook salmon migrating past the fish wheel tagging program at Bio Island, 2007. Stock compositions were estimated using 14 microsatellite loci and the baseline outlined in Table 6 (SE=Standard error of estimate). Although samples were collected at the Bio Island fish wheels, weighting was derived using the Eagle Sonar estimate.

Statistical Week	28		29		30		31		32–33		28–32	
Date	July 10–15		July 16–22		July 23–30		July 31–Aug 6		Aug 6–18		All	
Sample Size	*n*=67		*n*=298		*n*=159		*n*=144		*n*=79		*n*=747	
Region		SE		SE		SE		SE		SE		SE
North Yukon Tribs.	22.2	5.3	16.6	2.4	9.6	2.5	2.9	1.8	1.2	1.6	11.5	1.3
Mid-mainstem Tribs.	1.3	2.4	4.9	3.3	5.6	5.3	35.1	7.5	32.6	9.8	14.8	3.2
Carmacks Area Tribs.	5.8	6.0	15.3	4.1	31.8	6.1	37.6	7.8	48.5	9.4	23.9	3.4
White River	0.2	0.9	0.7	2.2	0.9	1.5	0.6	1.1	1.1	2.1	1.0	0.9
Stewart River	18.9	7.1	18.1	3.8	19.8	4.6	3.6	4.3	10.7	7.3	15.4	2.5
Pelly River	39.2	7.5	31.8	4.6	16.5	4.4	9.1	3.8	2.8	3.2	21.3	2.4
Upper Yukon Tribs.	0.3	1.2	1.5	0.8	5.4	2.3	3.3	1.8	0.8	2.0	2.4	0.7
Teslin River	12.3	5.0	11.2	2.5	10.5	3.4	7.8	3.2	2.2	3.3	9.6	1.6

Table 9.–Estimated percentage stock composition of fall chum salmon migrating past the fish wheel tagging program at Bio Island, 2007. Stock compositions were estimated using 13 microsatellite loci and the baseline outlined in Table 7 (SE=Standard error of estimate). Although samples were collected at the Bio Island fish wheels, weighting was derived using the Eagle Sonar estimate.

Statistical Week	37		38		39		40		37–40	
Date	Sept 9–15		Sept 16–22		Sept 23–29		Sept 30–Oct 6		ALL	
Sample Size	*n*=125		*n*=238		*n*=177		*n*=195		*n*=735	
Region		SE		SE		SE		SE		SE
Yukon Early	1.9	1.5	0.1	0.4	0.6	0.9	0.1	0.3	0.5	0.4
Mainstem Yukon River	35.6	4.5	45.7	3.4	52.5	4.2	47.8	3.8	46.6	2.0
White River	62.3	4.4	54.1	3.4	42.6	3.9	52.1	3.8	52.4	1.9
Teslin River	0.3	0.9	0.1	0.4	4.3	2.2	0.0	0.3	0.5	0.5

For fall chum salmon, 52.4% (SE 1.9) were estimated to originate from the regional reporting group spawning within the White River drainage and 46.6% (SE 2.0) were from the reporting group which includes a number of mainstem Yukon River spawning populations (Table 9). The two remaining reporting groups contributing to the run were the Teslin River (0.5%, SE 0.5) and

the Yukon Early group which is represented by the Chandindu River population (0.5%; SE 0.4). The standard errors associated with the White River and Mainstem Yukon reporting groups are low suggesting that the 95% confidence intervals for these groups are narrow. The timing and relative abundance of Upper Yukon River fall chum salmon stocks is presented in Figure 12.

7.2.7 Yukon Education Program 2006–2007

Fisheries and Oceans Canada continues to support the Stream to Sea program to all Yukon Schools. Fifteen Yukon schools in nine Yukon communities participated in classroom incubation projects in the 2006–2007 school year. Fry releases occurred between May 11 and June 12, 2007. Eight schools released fry back to the Takhini River drainage, or to the McIntyre facility for subsequent release to the Takhini by the Northern Research Institute. Two schools released fish back to Tatchun Creek. One school released fry to Morley River and Kluane Lake School released their chum salmon fry to Kluane River. Unfortunately, no Klondike River fry survived to release.

Classroom incubation equipment is being used in 17 Yukon schools in the 2007–2008 school year: Old Crow, Destruction Bay, Haines Junction and two Whitehorse classes are incubating chum salmon; Dawson City, Teslin, Ross River and most Whitehorse classes are incubating Chinook salmon; Pelly Crossing will be raising local fry in the spring. Morley River eggs were not available this year, as no adult Chinook salmon were observed at the usual broodstock collection site in 2007. Eyed eggs were delivered to schools between September 2007 (Kondike Chinook salmon eggs) and January 2008 (some Kluane chum salmon eggs). Three schools incubated chum salmon eggs from the newly fertilized stage, and two schools participated in chum salmon broodstock capture. Fry releases will take place in May and June 2008.

7.2.8 Chinook Salmon Habitat Investigations

7.2.8.1 Croucher Creek: Juvenile Chinook Salmon/Beaver Interactions

Juvenile Chinook salmon enter and ascend small streams in the upper Yukon River Basin to rear and overwinter. Beaver dams may obstruct access to these habitats. Concerns have been raised regarding the active management of beaver and their structures to maintain or restore access by fish to upstream habitats. Investigations are being conducted by DFO Oceans, Habitat and Enhancement Branch (OHEB) staff to address these concerns. Collaterally, the timing and characteristics of the upstream and downstream migration of juvenile Chinook salmon are being tracked.

In 2004, a pilot project was conducted in the lower 2 km of Croucher Creek, near Whitehorse. There was intense beaver activity in the study area, with two new beaver colonies established. A total of 12 cross-channel dams were built between early July and late August. High densities of young-of-year (0+) juvenile Chinook salmon were captured immediately downstream of the larger dams, implying delay or obstruction of the upstream migration.

In 2005, daily sampling was conducted from May 29–June 19 to monitor the migration of 1+ from the creek and the migration of 0+ juveniles into the creek. The 1+ downstream migration was completed by June 11. Upstream migrating 0+ juveniles reached a sampling point 500 meters from the mouth on June 2. Sampling was then conducted at lower intensity throughout the open water period. Beaver activity declined in 2005 relative to 2006. The first pulse of 0+ Chinook salmon was delayed for approximately 2 weeks by the furthest downstream beaver dam. Movement into the area upstream of the dam was then rapid. None of the 1665 juveniles captured were of Whitehorse Rapids Hatchery origin.

In 2006, daily sampling was conducted from May 25–July 14. The 1+ migration was completed on June 21. Upstream migrating 0+ juveniles reached the sampling point 500 meters from the mouth on June 18. Sampling was then conducted at lower intensity throughout the open water period. The status of each beaver colony and dam was monitored. Some dams built in 2005 degraded significantly due to the abandonment of area by the beaver. Movement of juveniles to upstream sampling areas was slow throughout the summer. None of the 1397 juveniles captured were of Whitehorse Rapids Hatchery origin.

In 2007, daily sampling was conducted from May 29–July 9. The 1+ migration was completed by June 18. Upstream migrating 0+ juveniles reached a sampling point 500 meters from the mouth on June 8. Sampling was then conducted at lower intensity throughout the open water period. The status of each beaver colony and dam was monitored. A chute had formed at the location of the furthest downstream dam and appeared to delay the upstream migration by about 1 week. Movement into the area upstream was then very rapid. None of the 3,377 juveniles captured were of Whitehorse Rapids Hatchery origin. Water temperatures have been recorded hourly since July, 2006. Monitoring continues through the winter of 2007–2008.

7.2.8.2 Klondike River Ground Water Channels: Juvenile Chinook Salmon Utilization

Development of ground water channels is a primary method of salmon habitat enhancement/stock restoration in the U.S. Pacific North West and the Canadian Pacific South West. There has been a single project of this type in the Yukon River Canadian sub-basin. An intermittently flowing side channel downstream of the Mayo hydro-electrical dam was deepened to provide additional habitat during low flows. The regulated nature of the river does not reflect natural flow regimes. Findings from the monitoring of this project may not be entirely transferable to areas with non-regulated flows. Additionally, seasonal use of natural ground water channels by juvenile Yukon River Chinook salmon has been minimally investigated. To address these concerns, investigations were initiated by DFO Oceans, Habitat and Enhancement Branch (OHEB) staff.

A pilot investigation commenced in 2004 on two ground water channels in the Klondike River watershed near Dawson City. The Germaine Creek Groundwater Channel (GCGC) flows into a seasonally abandoned channel of the Klondike River. The Viceroy Groundwater Channel (VGC) intercepts predominantly hyporheic flows from the North Klondike River and returns them to the river downstream. Sampling in 2005 implied that 0+ juvenile Chinook salmon entered these channels in July. They then moved slowly upstream in the channels during the summer, autumn and into the early winter. Data loggers were deployed in each channel in July 2005 and are downloaded annually.

Sampling focuses on juvenile Chinook salmon and is primarily conducted during the open water period. Preliminary results indicate that the waters of the channels are somewhat cooler than surface waters in the summer. The difference is greatest at the ground water discharge areas, and least in the lowest section of the channel. As temperatures decline in the autumn, the waters in the ground water channels become warmer than the surface waters. Sampling in 2006 and 2007 has supported the results of the 2005 investigation. Observations have also provided insight with respect to the variability of freezing of sections of the channels and of the effects of predators in the channels under winter conditions.

7.3 RESTORATION AND ENHANCEMENT FUND

7.3.1 Status of R&E Projects 2007

Project No.	Project Title	Contractor	Funding $U.S./Cdn[9]
URE-05-07	**Marshal Chinook Test Fishery**		
		AVCP[10]	$20,600*

Project completed and final report accepted.

* Project approved at $18,400 with authorized project budget increase to $20,600 to allow increased fuel and other costs; while actual expenditures were $16.4k, de-committing $4.2k.

URE-06-07	**Kaltag Fall Chum/Coho Gillnet Test Fishery**		
		City of Kaltag	$20,400

Field project satisfactorily completed, and final report accepted.

URE-07N-07	**Gillnet Catch Comp (A, S, L, W, G) – Lwr Ykn Rvr**		
		YRDFA[11]	$10,600

Project data collected and progress report accepted; with final reporting date extended to March 15, 2008.

URE-08-07	**Tech. Assistance, Dev., & Support – Fish wheel Video**		
		USFWS[12]	$ 5,500

Project completed, with achievements reported on in URE-09-07 final report.

URE-09-07	**Rampart Rapids All Species Video Monitoring**		
		Stan Zuray	$39,000

Project satisfactorily completed and final report accepted.

URE-10N-07	**Yukon River Chinook Aging Consistency**		
		ADF&G[13]	$28,500

Progress report accepted, with final report pending.

URE-11N-07	**Analysis DNA Samples Lower Yukon River**		
		ADF&G	$18,800

Samples collected and analysis completed - report pending.

URE-13-07	***Ichthyophonus* Sampling at Emmonak**		
		ADF&G	$10,500

Field sampling complete; final report in progress - due March 31 08.

CRE-06-07	**Spawning & Overwintering Access Restoration -N Klond River**		
		DDRRC[14]	$19,600

Project completed and final report accepted.

CRE-07-07	**2006 'First Fish' Youth Camp**		
		THFN[15]	$ 3,500

[9] The values noted are those approved by the Panel, while bracketed figures indicate an adjustment to the project budget detail noted in the text.
[10] Association of Village Council Presidents.
[11] Yukon River Drainage Fisheries Association.
[12] United States Fish and Wildlife Service.
[13] Alaska Department of Fish & Game.
[14] Dawson District Renewable Resources Council.

Project successfully completed and final report accepted.

CRE-08-07 Salmon Celebration

YRCFA[16] $10,000*

Project not implemented in consideration of related communication with THFN. Project funding de-committed.

CRE-09N-07 Tr'ondeck Hwech'in Student Steward

THFN $ 4,600

Project satisfactorily completed and final report accepted.

CRE-10-07 Size Selective Fishing – Live Catch Fish wheel

YRCFA $47,600*

Two release fish wheels constructed, adding to those previously available; wheels not activated; final report reviewed with final edits underway. Approximately $26k to be de-committed.

CRE-ll-07 In-Season Management Fund & Test Fisheries

YRCFA $50,000*

This 'contingency' project activated this year involving both chinook and chum salmon test fisheries; data provided to DFO; with final project report in preparation. Project estimated to require the full budget.

CRE-18-07 Porcupine River Coho Radio Tagging/Telemetry

Vuntut Gwitchin FN $66,800

Satisfactory progress report (tags attached, etc.), telemetry tracking completed; with final project report due March 15, 2008.

CRE-19-07 Mayo River Channel Reconstruction –Assess Juvenile Chinook Habitat

NDFN[17] $15,200

Field work completed and final project report accepted.

CRE-27-07 Porcupine River Chum Mark/Recapture

Vuntut Gwitchin FN $68,300

Field project completed and final report accepted.

CRE-28N-07 Porcupine River Chinook and DNA Sampling

Vuntut Gwitchin FN $ 3,000

Field project completed and final report accepted.

CRE-29-07 Chum Spawning Ground Recoveries - Minto Area

Selkirk RRC & SFN[18] $12,000

Field work completed and final project report accepted.

CRE-31-07 Pelly River Sub-Basin Community Stewardship

Selkirk RRC & SFN $25,000

Field work completed, with final project report overdue and being pursued.

CRE-37-07 Blind Creek Chinook Salmon Enumeration Weir

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[15] Tr'ondeck Hwech'in First Nation (mainstem Yukon River, Dawson City area)
[16] Yukon River Commercial Fishing Association
[17] First Nation of Nacho Nyak Dun (Mayo area, Yukon - Stewart River System)
[18] Selkirk Renewable Resources Council (Pelly Crossing area - middle mainstem of the Cdn section of the Yukon River, including Pelly River)

Jane Wilson $46,000

Project completed, progress report accepted, and final report in progress.

CRE-41-07 Chinook Sonar Enumeration Big Salmon River

Jane Wilson $75,000

Field project completed, and final report accepted.

CRE-47-07 Teslin River Sub-basin Community Stewardship

Teslin Tlingit Council $38,000

Field project completed and final report in progress.

CRE-50-07 KDFN Salmon Stewardship

Kwanlin Dun FN $26,500

Field project completed and final report accepted.

CRE-51N-07 Supplemental Juvenile Chinook Plantings – Michie Cr.

Kwanlin Dun FN $ 9,100

Project completion scheduled for June 08.

CRE-52N-07 Fox Creek Chinook Stock Restoration

Ta'an Kwach'an Council $12,500

This project involves undertaking permitting/regulatory processes; planning for and arranging incubation brood stock for 08/09; and, preparation of a long-term stock restoration plan. Due to the circumstances of the permitting/regulatory process this project the completion date has been extended to July 08.

CRE-54N-07 Ta'an Kwach'an Council Comm. Stewardship

Ta'an Kwach'an Council $45,000

Field project completed and final report accepted.

CRE-58-07 Community Salmon Stewardship

Kluane First Nation $15,000

Progress report accepted; with final project report overdue and being pursued.

CRE-61-07 Chinook Fry Release–Whitehorse Rapids Hatchery

R&D Env. Mngmt. $ 6,000

Field project completed and final report accepted.

CRE-62N-07 Chinook Incubation Success & Thermal Regime

Trix Tanner $3,600

Field work continuing with progress report due mid March - final report due June 08.

CRE-63-07 Whitehorse Rapids Hatchery CWT & Fisheries

YF&GA[19] $40,000

Operational project completed, with final report in progress.

CRE-65-07 McIntyre Creek Salmon Incubation Project

Yukon College-NRI $44,300

Project proceeding on target including satisfactory progress reports - final report due March 15, 2008.

CRE-67-07 Yukon Schools Fry Releases & Habitat Studies

Streamkeepers North Soc. $ 4,000

[19] Yukon Fish and Game Association

Spring 08 school activities pending - final report due May 08.

CRE-75-07 Yukon River Salmon Cooperative

YR Salmon Coop. $133,500*

This 07 project and funding approved pending an overall 'go forward' for 08 and beyond, including unexpended 06 approved project funds. Is being considered at the April 2008 Panel meeting (i.e., No project contract for 07).

CRE-78N-07 Collection of DNA Baseline Samples in Canada

DFO $35,000

Project underway - project report due March 2008. (Note: this relates to CRE-79-07 & CRE-111-07).

CRE-79-07 Stock ID Microsatellite Variation – Chinook & Chum

DFO $30,000

Ongoing research and baseline with regard to this technology – report due March 2008.

CRE-80-07 Data Loggers

DFO $ 3,000

Data loggers purchased ($2,998.74) – project completed with no need for a project report.

CRE-98-07 Yukon Stewardship

YFWMB $150,000*

Approved project progress report received, with final report due March 31, 2008. Project budget approved $150k, actual expenditure projected/contracted of $115k, estimating project de-commitment of $35k.

CRE-99N-07 Scientific Peer Review – Yukon Placer Regime & Support

YCS $ 8,000

Project completed and final report received.

CRE-110-07 Canadian Involvement in Eagle Sonar Project

DFO/PacEumetrics $62,000*

Administered in three contracts/agreements – (A) PacEumetrics, (B) DFO, & (C) J. Duncan; with combined final report received (A) and approved. Actual expenditures est. $50.7k with potential de-commitment of $13k.

CRE-111-07 Analysis of DNA Samples from R&E Projects

DFO max $20,000

Integrated with CRE-79-07 above– final report due March 31, 2008.

8.0 YUKON RIVER SALMON RUN OUTLOOKS 2008

8.1 CHINOOK SALMON

8.1.1 Drainage-Wide Chinook Salmon

The 2008 run is expected to be below average and similar to the 2007 run, although, it is anticipated that the 2008 run will provide for escapements, support a normal subsistence harvest, and a below average commercial harvest. Initial U.S. management will be based on preseason projections and shifted to inseason project assessment as the run develops.

The management strategy for 2008 will be to continue the regulatory subsistence salmon fishing schedule until run assessment indicates a harvestable surplus for additional subsistence

opportunity and other uses. From 2002–2005, ADF&G delayed commercial fishing until near the midpoint of the run to ensure escapement and subsistence needs would be met due to the uncertainty of the runs during these years. Because of the unexpected weak run in 2007, Chinook salmon directed commercial fishing in 2008 will be delayed until the projected midpoint of the run. At that time, Chinook salmon directed openings will only be considered if a surplus can be identified, based on the current run assessment information. However, there is a possibility that the run may not be large enough to support even a small directed commercial fishery. If inseason indicators of run strength suggest sufficient abundance exists to have a commercial Chinook salmon fishery, the U.S. commercial harvest could range from 5,000 to 30,000 Chinook salmon including the incidental harvest taken during anticipated summer chum salmon directed periods.

8.1.2 Canadian-Origin Upper Yukon Chinook Salmon

Spawning escapements in 2002 and 2003, the brood years producing age-6 and age-5 fish returning in 2008, respectively, were near average and well above average in Canada. However, the run of Canadian-origin Upper Yukon River Chinook salmon in 2008 is expected to be below average. The preseason outlook is for approximately 111,000 Canadian-origin Chinook salmon applicable to Eagle sonar total run estimates. This is based on a stock-recruitment (S/R) model developed from estimates of total spawning escapement and age-specific returns. However, due to the relationship between the expected and observed run size in 2007, expected 2008 run size could be as low as 80,000 fish.

Various stock-recruitment datasets were examined, including those developed from spawning escapements estimated from mark–recapture data and combinations of estimates derived from sonar, radio telemetry and aerial survey data. The S/R model selected for the 2008 outlook included border passage estimates developed from a combination of Eagle Sonar estimates (2005–2007) and radio-telemetry data (2002–2004). Total spawning escapements for 2002–2007 were calculated by subtracting the Canadian catch from these estimates. Linear regression of the estimated total spawning escapements versus the 3-area aerial survey index of Big Salmon, Little Salmon, and Nisutlin rivers for 2002 to 2007 was used to estimate historical spawning escapement estimates back to 1982. The escapement data set fit the observed trend in the escapement best as depicted by the 3-area index. Age-specific returns were then calculated based on age, harvest and escapement data in the return years. The resulting S/R model predicts a total run of 111,000 Canadian-origin Chinook salmon in 2008. However, the estimated run size in 2007 was approximately 30% lower than expected for reasons yet unknown. Although environmental factors and/or poor marine survival due to increased Chinook salmon bycatch in the Bering Sea trawl fishery targeting Alaskan Pollock could be associated with low returns. If these effects are similar in 2008, a run as low as 80,000 Canadian-Origin Upper Yukon River Chinook salmon may be possible.

The performance of run outlooks developed using S/R models for the 1998 to 2007 period are presented in Table 12. A review of the preseason outlook performance is an attempt to account for a recent decline in the Upper Yukon River Chinook salmon return per spawner values. Despite good brood year escapements, the observed run sizes within the 2000–2002 period and in 2007 were relatively low. Available information suggests that the observed low returns resulted from poor marine survival.

Even though the age-6 (2001) brood year spawning escapements were above average, the 2007 run was weak and the total spawning escapement was below target levels. It is therefore prudent

to enter the 2008 season (similarly good brood year escapements) with the expectation that management will be conservative.

8.2 SUMMER CHUM SALMON

The strength of the summer chum salmon runs in 2008 will be dependent on production from the 2004 (age-4 fish) and 2003 (age-5-fish) escapements as these age classes generally dominate the run. The total run during 2002 and 2003 was approximately 1.2 million summer chum salmon in each year, though tributary escapements were highly variable. It appears that production has shifted from major spawning tributaries in the lower portion of the drainage, such as the Andreafsky and Anvik rivers over the last 5 years, to higher production in spawning tributaries upstream.

In 2007, the return from the 2003 brood year produced a higher than average percentage of age-4 fish. Since summer chum salmon exhibit a strong sibling relationship from age-4 fish to age-5 fish, an above average percentage of age-5 fish is expected in 2008. The 2008 run is estimated using the Anvik River brood table, sibling relationships between age-4 and age-5 fish, and the 5-year average ratio between the Anvik River and Pilot Station Sonar. It is expected that approximately 600,000 summer chum salmon will return to the Anvik River in 2008 and the total run in the Yukon River could be approximately 2.0–2.5 million summer chum salmon which constitutes an average run.

The 2008 run is anticipated to be near average and provide for escapements and support a normal subsistence and commercial harvest. Summer chum salmon runs have exhibited steady improvements since 2001 with a harvestable surplus in each of the last 5 years (2003–2007). If inseason indicators of run strength suggest sufficient abundance exists to allow for a commercial fishery, the commercial harvest surplus in Alaska could range from 500,000 to 900,000 summer chum salmon. The actual commercial harvest of summer chum salmon in 2008 will likely be dependent on market conditions and may be affected by a potentially poor Chinook salmon run, as Chinook salmon are incidentally harvested in chum salmon-directed fisheries.

8.3 FALL CHUM SALMON

8.3.1 Drainage-Wide Fall Chum Salmon

Yukon River drainage-wide estimated escapements of fall chum salmon for the period 1974 through 2002 have ranged from approximately 180,000 (1982) to 1,500,000 (1975), based on expansion of escapement assessments for selected stocks to approximate overall abundance (Eggers 2001). Escapements in these years resulted in subsequent returns that ranged in size from approximately 311,000 (1996 production) to 3,000,000 (2001 production) fish, using the same approach to approximating overall escapement. Corresponding return per spawner rates ranged from 0.3 to 9.0, averaging 2.1 for all years combined (1974–2001).

A considerable amount of uncertainty has been associated with these run projections particularly recently because of unexpected run failures (1997 to 2002) followed by a strong improvement in productivity from 2003 through 2006. Weakness in salmon runs prior to 2003 has generally been attributed to reduced productivity in the marine environment and not as a result of low levels of parental escapement. Similarly, the recent improvements in productivity may be attributed to the marine environment. Projections have been presented as ranges since 1999 to allow for adjustments based on more recent trends in production. Historical ranges included the normal point projection as the upper end and the lower end was determined by reducing the projection

by the average ratio of observed to predicted returns from 1998 to each consecutive current year through 2004 (Table 10). In 2005, the average ratio of the years 2001 to 2004 was used, in attempts to capture some of the observed improvement in the run. Methods used to provide a range around the point estimate in 2006 through 2008 are described below.

Table 10.–Preseason Upper Yukon River Chinook salmon outlooks and observed run sizes for the 2000–2007 period.

Year	Expected Run Size (Preseason)	Observed Run Size (Post season)	Proportion of Expected Run
2000	127,800	52,800	0.41
2001	126,600	86,700	0.68
2002	114,700	81,500	0.72
2003	116,900	150,000	1.28
2004	123,500	119,700	0.97
2005	121,700	124,200	1.02
2006	115,900	119,800	1.03
2007	118,500	82,900	0.70
Average (1998 to 2007)			0.85

Yukon River fall chum salmon return primarily as age-4 and age-5 fish, although age-3 and age-6 fish also contribute to the run (Appendix Table A16). The 2008 run will be comprised of parent years 2002 to 2005 (Table 11). Estimates of returns per spawner based on brood year return were used to estimate production for 2002 and 2003. An auto-regressive Ricker spawner-recruit model was used to predict returns from 2004 and 2005. The point estimate in 2006 and 2007, utilized 1974 to 1983 even/odd maturity schedules to represent years of higher production. The 2008 estimated point projection uses years 1984–2001 of the even/odd maturity schedule, because current production is reduced from the pre-1984 level, and resulted in an estimate of 1.0 million fall chum salmon with the approximate age composition provided in Table 11.

Table 11.–Preseason drainage-wide fall chum salmon outlooks and observed run sizes for the Yukon River, 1998–2007.

Year	Expected Run Size (Preseason)	Estimated Run Size (Postseason)	Proportion of Expected Run
1998	880,000	334,000	0.38
1999	1,197,000	420,000	0.35
2000	1,137,000	239,000	0.21
2001	962,000	383,000	0.40
2002	646,000	425,000	0.66
2003	647,000	775,000	1.20
2004	672,000	614,000	0.92
2005	776,000	2,325,000	3.00
2006	1,211,000	1,144,000	0.94
2007	1,106,000	1,098,000	0.99
Average	(1998 to 2007)		0.90

The forecast range is based on the upper and lower values of the 80% confidence bounds for the point projection. Confidence bounds were calculated using deviation of point estimates and observed returns from 1987 through 2007. Therefore, the 2008 run size projection is expressed as a range from 890,000 to 1.2 million fall chum salmon. However, this projection appears to be high based on other information, such as the lack of immature chum salmon encountered in the high seas BASIS research as well as notable declines in chum salmon bycatch levels, and the low probability of another record even-numbered-year run.

Escapements for the 2002 and 2004 parent years, that will contribute age-6 and age-4 fish in the 2008 run, were below the upper end of the drainage-wide escapement goal of 300,000 to 600,000 fall chum salmon. The 2003 and 2005 escapements, that will contribute age-5 and age-3 fish in the 2008 return, were above the upper end of the drainage-wide escapement goal range. The major contributor to the 2008 fall chum salmon run is anticipated to be age-4 fish returning from the 2004 parent year. The average age-3 component is 1.8%, however, the contribution is expected to be low (0.52) based on poor returns per spawner for the 2005 brood year (Appendix Table A16).

Table 12.–Projected return of fall chum salmon based on parent year escapement for each brood year and predicted return per spawner (R/S) rates, Yukon River, 2002–2005.

Brood Year	Escapement	Estimated production (R/S)	Estimated Production	Contribution based on age	Current Return
2002	397,977	1.71	533,289	1.0%	10,083
2003	695,363	1.83	1,140,395	32.9%	346,163
2004	537,873	2.01	925,142	64.3%	675,059
2005	2,035,183	0.52	1,058,295	1.8%	19,345
Total expected run (unadjusted)					1,050,649
Total expressed as a range based on the forecasted vs. observed returns from 1987 to 2007 (80% CI):					890,000 to 1.2 million

The 2001 brood year produced exceptionally well with a return of approximately 3.0 million fish including record contributions in nearly all age classes. Return of age-4 fish from even-numbered brood years during the time period 1974 to 2001 typically average 385,000 chum salmon, and ranges from a low of 175,000 for brood year 1988 to a high of 2.2 million for brood year 2001. Based on the high production years from 1974 to 1983, the return of even-numbered brood years averages 436,000 chum salmon. Return of age-5 fish from even-numbered brood years during the time period 1974 to 2001 typically averages 187,000 chum salmon, and ranges from a low of 57,000 for brood year 1998 to a high of 675,000 for brood year 2001. The estimated 2002 brood year return appears to be above average for an even-numbered year and the 2003 brood year is on track to contribute an average return for an odd-numbered year.

If the 2008 run size is near the projected range of 890,000 to 1,200,000 million, it will be well above the upper end of the BEG range of 600,000 fall chum salmon. A run of this projected size should support normal subsistence fishing activities and provide opportunity for commercial ventures where markets exist. The strength of the run will be monitored inseason to determine

appropriate management actions and levels of harvest based on stipulations in the Alaska *Yukon River Drainage Fall Chum Salmon Management Plan.*

8.3.2 Canadian-Origin Upper Yukon River Fall Chum Salmon

The outlook for the 2008 Upper Yukon River fall chum salmon run is an above average run of 229,000 fish. The average Upper Yukon River fall chum salmon run size for the 1998–2007 period was estimated to be 181,000 fish.

The 2008 Upper Yukon River fall chum salmon outlook was developed using the potential production from the 2002–2005 brood years which will produce the 3 to 6 year old fish returning in 2008. For even-year returns, on average, 51% of Upper Yukon River adult fall chum salmon return as age-4 and 47% return as age-5. The major portion of the 2008 fall chum salmon run will originate from the 2003 and 2004 brood years. The estimated escapements for these years were 142,683 and 154,080 fish, respectively, based on the Fisheries and Oceans Canada (DFO) mark–recapture program[20]; both years exceeded the escapement goal for rebuilt Upper Yukon River fall chum salmon of >80,000 fish (Appendix Table A17). The weighted average (by age) brood escapement (2002–2005 BY's) contributing to the 2008 Upper Yukon River fall chum salmon run is approximately 152,700 fish.

Based on the Upper Yukon River spawner-recruitment model, poor production should be expected from escapements of this magnitude. However, the return from the escapements exceeding 100,000 fall chum salmon used in the stock recruitment model occurred during a period of low marine survival. Spawner-recruitment relationships have not been determined for the 2003–2007 runs when the estimated spawning escapements ranged from 143,000 to 438,000 fish. The 2008 outlook was therefore developed using a conservative R/S value of 1.5 for the 2002–2005 brood years. The expected 2008 production was then estimated by assuming that each brood year would produce the average age composition for even-year returns within the 1988 to 2006 period, i.e., 1.6% age-3, 50.6% age-4, 46.7% age-5, and 1.1% age-6. The estimated contribution from each brood year was then summed to estimate an above average run size of 229,000 Upper Yukon River fall chum salmon in 2008.

Prior to 2002, preseason outlooks for Upper Yukon River fall chum salmon were based on an assumed productivity of 2.5 returning adults per spawner (i.e., R/S). This was the same productivity used in the joint Canada/U.S. Upper Yukon River fall chum salmon rebuilding model. There was very low survival for the 1994 to 1997 brood years with R/S values equal to or below the replacement value (i.e., R/S=1.0). The average estimated production for the 1998-2002 brood years was 2.5, excluding 2001 with an unprecedented high R/S value of 20.3.

Since 2002, preseason outlooks have been based on stock/recruitment models, which incorporate escapement and subsequent associated adult return by age data. Annual runs were reconstructed using mark–recapture data and assumed contributions to U.S. catches. Although insufficient stock identification data was available to accurately estimate the annual U.S. catch of Upper Yukon River fall chum salmon, estimates have usually been made based on the following assumptions:

[20] Unlike Chinook salmon, the mark-recapture estimates for fall chum salmon generally agree with the Eagle sonar estimates.

i. 30% [21] of the total U.S. catch of fall chum salmon is composed of Canadian-origin fish;

ii. The U.S. catch of Canadian-origin Upper Yukon River and Canadian-origin Porcupine River fall chum salmon is proportional to the ratio of their respective border escapements; and

iii. The Porcupine River border escapement consists of the Old Crow aboriginal fishery catch plus the Fishing Branch River weir count.

All of these assumptions require additional evaluation as some recent Porcupine River mark-recapture data are available and advances in genetic stock identification (i.e., mixed stock analyses) should permit more accurate estimates of the proportion of Canadian fall chum salmon run harvested in U.S. fisheries.

A summary of preseason outlooks, postseason run size estimates and the proportion of the expected run size observed for the 1998 to 2007 period is presented in Table 13.

Table 13.–Preseason Upper Yukon River fall chum salmon outlooks and observed run sizes for the 1998–2007 period.

Year	Expected Run Size (Preseason)	Estimated Run Size (Postseason)	Proportion of Expected Run
1998	198,000	61,400	0.31
1999	336,000	98,400	0.29
2000	334,000	62,900	0.19
2001	245,000	45,100	0.18
2002	144,000	109,900	0.76
2003	145,000	179,800	1.18
2004	146,500	181,300	1.24
2005	126,000	515,200	4.09
2006	126,000	284,200	2.26
2007	147,000	278,500	1.89
Average	(1998 to 2007)		1.24

8.3.3 Canadian-Origin Porcupine River Fall Chum Salmon

Conservation concerns for the Fishing Branch River fall chum salmon run arose in the late 1990's and were heightened in year 2000 when the count through the Fishing Branch River weir was only 5,053 fish, the lowest on record. However, run sizes improved somewhat within the 2001–2007 period when observed counts ranged from a low of 13,563 in 2002 to a high of 121,413 in 2005.

The 2008 fall chum salmon run to Canadian portions of the Porcupine River drainage should originate primarily from the 2003 and 2004 escapements. The Fishing Branch River weir counts

[21] Recent tagging information has been incorporated into the Porcupine River run reconstruction and there has been some minor deviation from the assumption that 30% of the total U.S. catch of fall chum salmon is composed of Canadian-origin fish.

for these years were 29,519 and 20,274 fall chum salmon, respectively. These counts were 99.8% and 68.5% of the 1997–2006 average of 29,577 fish. The 2003 and 2004 counts both fell below the lower end of the Fishing Branch River escapement goal range of 50,000 to 120,000 fall chum salmon established under the Yukon River Salmon Agreement (Appendix Table A17). The weighted average (by age) base year escapement for the 2008 Fishing Branch River fall chum run is approximately 24,800 fish.

Assuming a return/spawner value of 2.5[22], and using the long-term average (1986–2006) even-year age at maturity for Fishing Branch River fall chum salmon of 49.8.% age-4 and 47.1% age-5 fish, as indicated in Table 14, an above average return of 62,000 fall chum salmon is expected in 2008 (Table 14).

Table 14.–Preseason outlook for the 2008 Fishing Branch River fall chum salmon run developed using brood year escapement data, a return per spawner value of 2.5 and an average age composition.

Brood Year	Escapement	Estimated Production @ 2.5 (R/S)	Contribution based on age	Expected 2007 Run
2003	29,519	73,798	47.1%	34,738
2004	20,274	50,685	49.8%	25,250
Sub-total				59,988
Total expected run (expanded for other age classes and rounded)				62,000

The 2008 outlook is the estimated number of fish entering the mouth of the Yukon River and this number will be decreased by U.S. and Canadian fisheries prior to the fish being counted at the Fishing Branch River weir. It has been difficult to accurately estimate the U.S. harvest rate (and catch) of Porcupine stocks, although DNA analyses may improve this situation in the near future. Nevertheless, the 2008 Fishing Branch River fall chum salmon run may be sufficiently strong to exceed the 1997–2006 average weir escapement of 29,577 fall chum salmon.

As was observed with the Upper Yukon River fall chum salmon stocks, the postseason estimates of the estimated Porcupine River fall chum salmon run sizes were consistently below preseason outlooks throughout the period 1998 to 2002 (Table 15). Postseason estimates consistently exceeded preseason outlooks from 2003 to 2005, and the 2006 postseason estimate was 10% lower than the preseason estimate. The 2007 postseason run size estimate was 34% lower than the preseason outlook; however, unusually late run timing may have adversely affected the principal assessment program, the Fishing Branch River weir, as there was no reliable timing information from 2007 assessment programs that could be used to expand the weir count which ended before the run had completely passed upstream. The Porcupine River outlook includes the Fishing Branch River as well as other spawning areas. While it is believed that most fall chum salmon return to the Fishing Branch River, there is little information available on other spawning locations.

[22] The R/S value (2.5) used for the 2008 Fishing Branch River fall chum salmon outlook is higher than the R/S value (1.5) used for the 2008 Upper Yukon River fall chum salmon outlook. The principal reason for this measure is that Upper Yukon River returns from escapements exceeding 100,000 chum salmon occurred during a period of low marine survival. A more conservative (i.e., lower) Upper Yukon River R/S value captures the uncertainty associated with returns from higher escapements.

Table 15.–Preseason Porcupine River fall chum salmon outlooks and observed run sizes for the 1998–2007 period.

Year	Expected Run Size (Preseason)	Estimated Run Size (Postseason)	Proportion of Expected Run
1998	112,000	24,700	0.22
1999	124,000	23,600	0.19
2000	150,000	12,600	0.08
2001	101,000	32,800	0.32
2002	41,000	19,300	0.47
2003	29,000	46,100	1.59
2004	22,000	31,700	1.44
2005	48,000	189,700	3.95
2006	53,500	48,200	0.90
2007	79,500	52,700	0.66
Average	(1998 to 2007)		0.98

8.4 COHO SALMON

Although there is little comprehensive escapement information on Yukon River drainage coho salmon, it is known that coho salmon primarily return as age-4 fish and overlap in run timing with fall chum salmon. The major contributor to the 2008 coho salmon run will be the age-4 fish returning from the 2004 parent year. Based on Pilot Station sonar operations from 1995, and 1997 through 2007, the 2004 passage estimate of 188,000 coho salmon was above average. The Delta Clearwater River (DCR) is the major producer of coho salmon in the upper Tanana River drainage, and the parent year escapement of 38,000 fish was 5th highest on record and 2.2 times the upper end of the Sustainable Escapement Goal (SEG) range of 5,200 to 17,000 coho salmon. DCR abundance has been on the increase since 1972, in particular within the last decade. Evaluations of coho salmon escapements in the Andreafsky, Nenana, and Richardson Clearwater rivers also indicated the run was average to above average. Assuming average survival, the 2008 coho salmon run, is anticipated to be average to above average based on good escapements in 2004.

The Alaska *Yukon River Coho Salmon Management Plan* allows a directed commercial coho salmon fishery, but only under unique conditions. Directed coho salmon fishing is dependent on the assessed levels in the return of both coho and fall chum salmon since they migrate together.

8.5 SPAWNING ESCAPEMENT TARGET OPTIONS IN 2008: CANADIAN ORIGIN CHINOOK AND FALL CHUM SALMON

8.5.1 Upper Yukon River Chinook Salmon

Cooperative Canada/U.S. management of Canadian-origin Yukon River Chinook salmon has utilized an agreed escapement goal range for rebuilt stocks of 33,000 to 43,000 fish. This goal was developed from, and has subsequently been monitored by a mark–recapture program located just upstream of the international border on the Yukon River. Since 2005, the Parties have developed a new and improved technique, the Eagle sonar program, to assess the abundance of salmon migrating into Canada. Estimates derived from the mark–recapture program have consistently been lower than those produced from the sonar program. It would therefore be

inappropriate to apply the existing escapement goal which is based on mark–recapture to an escapement assessment based on sonar.

The JTC recommends using the Eagle sonar project in 2008 as the primary assessment of border passage and is currently reviewing the best transition from the mark–recapture based goal to a new goal apply to and assessed by the sonar program. Considerable analyses have been conducted to construct a new database of stock and recruitment that are not solely based on mark–recapture estimates. These have included examining the relationships between aerial survey indices (Three scenarios: 3-area index; 4-area index; and a single index) and other independent border passage estimates, two scenarios, derived from the Eagle sonar program, and data compiled from a radio-telemetry program. A JTC working group was formed to review the analyses performed to date and after thorough discussion at the March 2008 JTC meeting, made proposals to the JTC as a whole.

The JTC discussed recommendations provided by the Chinook Salmon Escapement Goal working group for a minimum interim management escapement goal (IMEG) in 2008. Although working group members could justify IMEG targets ranging from 45,000 to 50,000, consensus was eventually achieved a target value. The JTC recommends that the Yukon River Panel adopt an IMEG of 45,000 Canadian-origin Upper Yukon River Chinook salmon for 2008 to be assessed using information from the Eagle sonar program. This recommendation is for 1 year only recognizing that further analysis of a biologically based escapement goal is required and additional factors such as habitat capacity have yet to be incorporated. Table 16 summarizes the management and harvest targets associated with the 2008 expected run size.

Table 16.–U.S. and Canadian allowable catches (AC) of Canadian-origin Upper Yukon River Chinook salmon based on the preseason run outlook and recommended interim management escapement goal (IMEG). Run outlook, border passage, and escapement target are based on Eagle sonar data.

Expected Run Size	Interim Management Escapement Goal	TAC	CDN Share (23%)	U.S. AC (CDN stock)	Estimated Total U.S. Harvest	Minimum Border Passage Target	Allowable U.S. Harvest Rate
80,000	45,000	35,000	8,000	27,000	54,000	53,000	34%
111,000	45,000	66,000	15,000	51,000	102,000	60,000	46%

8.5.2 Upper Yukon River Fall Chum Salmon

The 2008 run of Upper Yukon River fall chum salmon is considered to be a rebuilt run as the primary brood year spawning escapements achieved the level for a rebuilt stock as defined by the Yukon River Salmon Agreement, i.e., >80,000 fish. Because the mark–recapture and Eagle sonar estimates for 2006 and 2007 have been similar, the recommended target for 2008 is therefore a spawning escapement of >80,000 fish, which will be assessed using Eagle sonar estimates.

The 2008 outlook for the Canadian-origin fall chum salmon is 229,000 fall chum salmon. The expected total allowable catch (TAC), harvest shares, border escapement target and maximum allowable U.S. harvest rates were evaluated based on an escapement target of 80,000; results are summarized in Table 17. The total U.S. harvest estimate presented in Table 17 is based on an assumed stock composition of 25% Upper Yukon River fall chum salmon. Market conditions are

expected to be again reduced in 2008, and hence commercial exploitation will likely be relatively light. Catches will likely meet U.S. subsistence and Canadian First Nation needs and there should be opportunities for commercial harvests.

Table 17.–Expected 2008 Canadian-origin Upper Yukon River fall chum salmon run size and potential U.S. and Canadian allowable catches (AC) based on an escapement target of >80,000.

Lower and Upper Expected Run Size	Esc. Target	TAC	CDN Share (32%)	U.S. Share (CDN stock)	Estimated Total U.S. Harvest	Border Passage Target	Allowable U.S. Harvest Rate
229,000	>80,000	149,000	47,700	101,300	405,300	127,700	44%

8.5.3 Fishing Branch River Fall Chum Salmon

The Yukon River Salmon Agreement lists an escapement goal range of 50,000 to 120,000 fall chum salmon for the Fishing Branch River; a goal which has been achieved 10 times since 1974. In addition, the goal has been reached only five times since 1985 when the weir went back into operation. The escapement goal was reviewed in 2001 and after considerable analysis of the available data a recommendation was made for a biological escapement goal (BEG) of 27,000 to 56,000 chum salmon. However, due to concerns over data quality and analytical issues, this BEG recommendation was not accepted.

The inability to reach the goal of 50,000 to 120,000, particularly when considering the goal has only been achieved once over the last two fall chum salmon 4-year-cycles, and escapements to the Upper Yukon River in Canada were rebuilding, has lead the JTC to question if the lack of success is more related to an unrealistically high goal rather than other factors. As a result, the JTC Escapement Goal working group, referred to in Section 8.5.1, revisited the goal and attempted to address some of the issues raised during the peer review of the 2001 recommendation (Eggers 2001) ultimately leading to its rejection. Although there are some approaches that can improve data quality and analysis of a biological escapement goal (BEG), the sub-committee recommended postponing this analysis until the returns from the recent high escapement of 121,413 fall chum salmon in 2005 are documented. However, the age-5 component from this escapement will not return until 2010. The JTC accepted this recommendation and plans to continue the BEG analysis with the objective of having a revised BEG ready for peer review prior to the 2011 season.

For the period 2008–2010, the JTC recommends an interim management escapement goal (IMEG) range of 22,000 to 49,000 Fishing Branch River fall chum salmon. This recommendation is based on the Bue and Hasbrouck (*Unpublished*) method of determining a Sustainable Escapement Goal (SEG) and has been used elsewhere in Alaska. The Fishing Branch River SEG analyses incorporated weir counts from 1985 to 2007 (22 years; excluding 1990) and the contrast in these escapements, i.e., the ratio of the highest to lowest count (24:1). The escapement goal range reflects the approximated 25th and 75th percentiles of the 22 years of weir counts.

The 2008 run of Fishing Branch River fall chum salmon is expected to be 62,000 fish. Table 18 summarizes potential outcomes of using quarter points of the escapement goal range as point

targets in 2008 with an IMEG range of 22,000 to 49,000. The base level escapement for the 2008 run is approximately 25,000 fish.

Table 18.–Expected 2008 Fishing Branch River fall chum salmon run size, total allowable catch, and exploitation rate based on various escapement targets within the recommended interim management escapement goal (IMEG) range.

Interim management escapement goal range of 22,000 to 49,000				
Escapement Point Target	2008 IMEG Range	Expected Run Size	Total Allowable Catch	Exploitation Rate
Lower	22,000	62,000	40,000	0.645
¼ point	29,000	62,000	33,000	0.532
Mid point	36,000	62,000	26,000	0.419
¾ point	42,000	62,000	20,000	0.323
Upper	49,000	62,000	13,000	0.210

If the Vuntut Gwitchin First Nation wishes to harvest its needs of approximately 6,000 fish near the community of Old Crow, the available U.S. harvest, under the scenarios presented in Table 18, ranges from 7,000 to 34,000 fall chum salmon of Fishing Branch River origin. Allowable U.S. harvest rates range 11% to 55%.

9.0 STATUS OF ESCAPEMENT GOALS

ADF&G undertakes a triennial review of salmon escapement goals in preparation for its triennial Board of Fisheries (board) meeting. This review is governed by the state's Policy for the Management of Sustainable Salmon Fisheries (5AAC 39.222) and Policy for Statewide Salmon Escapement Goals (5AAC 39.223) adopted in 2001. Under these policies ADF&G sets either a biological escapement goal (BEG) or a sustainable escapement goal (SEG) (ADF&G 2004; Brannian et al. 2006). Biological escapement goal (BEG) refers to a level of escapement that provides the highest potential to produce maximum sustainable yield. Sustainable escapement goal (SEG) identifies a level of escapement known to provide for sustainable yield over a 5 to 10 year period.

Most Arctic-Yukon-Kuskokwim (AYK) Region escapement goals were set in the late 1970s or early 1980s. These goals were first documented by Buklis (1993) as required under the department's original escapement goal policy signed in 1992. Changes to these goals were adopted in 2001 when BEGs were set for Yukon River fall chum salmon (Eggers 2001), Anvik River summer chum salmon (Clark and Sandone 2001), and Andreafsky River summer chum salmon (Clark 2001). These 2001 goals were adopted prior to passage of the policies, but were consistent with the policies.

Beginning in December of 2002, ADF&G undertook the first full review of its escapement goals following the adoption of the policies. An escapement goal review team, consisting of staff from the Divisions of Sport Fish and Commercial Fisheries, met five times over a 14-month period. Federal agency biologists and representatives of Tribal and fishing groups were invited to attend and participate in the meetings. The team's recommendations were presented to the Alaska Board of Fisheries in January 2004 and formally adopted by ADF&G in 2005. During this review, analyses for escapement goals established in 2001 were updated with the latest

information and most goals were brought into compliance with the policies by making them ranges, rather than point goals.

In preparation for the January 2007 Alaska Board of Fisheries meeting, ADF&G again reviewed escapement goals. Formal meetings, open to agencies and the public, were held in April and November of 2005. Draft analyses were widely distributed for review and comment starting in January 2006 and a public review draft of recommendations for changes was distributed in March 2006. A final document summarizing the escapement goal review was submitted to the Board of Fisheries on April 10, 2006. No changes were recommended for Yukon River escapement goals in 2007.

9.1 CHINOOK SALMON

Five Chinook salmon aerial survey goals were converted to ranges and formally adopted in 2005 using the method devised by Bue and Hasbrouck (*Unpublished*). In the case of Nulato River, the goals for the two forks were combined into a single goal (Table 19). The escapement goal team recommended no changes to these escapement goals for 2008 and none were adopted by the Alaska Board of Fisheries.

Table 19.–Yukon River escapement goals set for Chinook salmon in 2005 were continued from 2006 through 2008

Chinook Salmon Stock	Previous Goal (Type) Year Established	Goal Adopted in 2005 (Type)
E. Fork Andreafsky River	>1,500 (EO[a]) 1992	960–1,700 (SEG)
W. Fork Andreafsky River	>1,400 (EO[a]) 1992	640–1,600 (SEG)
Anvik River	>1,300 (EO[a]) 1992	1,100–1,700 (SEG)
Gisasa River	>600 (EO[a]) 1992	420–1,100 (SEG)
Nulato N. and S. combined	None	940–1,900 (SEG)
Chena River	2,800–5,700 (BEG) 2001	No Change
Salcha River	3,300–6,500 (BEG) 2001	No Change

[a] Goals were called escapement objectives (EO) because they were inconsistent with definitions BEG and SEG within the policy.

9.1.1 JTC Discussion of BEG for Upper Yukon River Chinook Salmon

A comprehensive Biological Escapement Goal for Canadian origin Upper Yukon River Chinook salmon cannot be developed using available data and the Chinook Technical Committee criteria. At this time, the data are insufficient to warrant a Pacific Scientific Advice Review Committee (PSARC) review. The JTC will continue to reconcile minor differences in harvest and escapement estimates and investigate other methods to develop a less comprehensive BEG or a Spawning Escapement Goal (not to be mistaken for Sustainable Escapement Goal (SEG)). Available information on the return per spawner information for Yukon River Chinook salmon is presented in Appendix Table A8 and Figure 5.

Objective

Cooperative Canada/U.S. management of Canadian origin Yukon River Chinook salmon has utilized an agreed escapement goal range for rebuild stocks (33,000 to 43,000) which has been monitored through the use of a mark–recapture program. Since 2005, the Parties have developed

a new and improved estimation technique, the Eagle sonar program, to assess the abundance of Chinook salmon migrating into Canada. Comparisons between estimates derived from the mark-recapture and sonar programs suggest that the mark–recapture program has underestimated Chinook salmon abundance. In progression towards the transition from mark–recapture to sonar based assessment, it is necessary to develop a new spawning escapement goal that: a) is applicable to sonar; and b) is biologically defensible taking into account the data collected to date regarding escapement, returns, and factors known to limit production such as habitat capacity. At the present time, there are known technical concerns with the standard methodology used to assess escapement goals for Canadian-origin Yukon River Chinook salmon that may be addressed with additional habitat capacity evaluations.

Approach

Independent methods for assessing habitat capacity for Chinook salmon have been developed by Parken et al. (2006) based on relationships between various stock recruitment parameters (e.g., capacity) and watershed area for stream and ocean type Chinook salmon stocks along the Pacific Coast. There is good potential to apply this methodology to Canadian-origin Yukon River Chinook salmon. The JTC recommends that this work be a high priority in refining a biologically-based escapement goal.

The independent capacity estimate needs to be applied to a jointly agreed upon historical database relating escapement to recruitment. There are several ways to derive this database, such as utilizing the relationship between the 3-area escapement index and Eagle sonar/radio-telemetry (local) estimates to calculate historical border passage. The JTC believes this methodology should be pursued as it may be superior to using a scaling factor applied to the DFO mark–recapture (M/R) estimates of border passage because these estimates do not appear to have been consistent through time.

9.2 SUMMER CHUM SALMON

In 2005, aerial survey goals for summer chum salmon were discontinued for the East and West Forks of the Andreafsky River in favor of using the East Fork Andreafsky River weir escapement goal as an index of escapement into the system. No change was recommended for the East Fork Andreafsky River weir goal. The biological escapement goal for Anvik River summer chum salmon was revised from the 400,000 to 800,000 fish to a range of 350,000 to 700,000 as measured by the Anvik River sonar (Table 20). The escapement goal team recommended no changes to these escapement goals for 2008 and none were adopted by the Board of Fisheries.

Table 20.–Yukon River escapement goals set for summer chum salmon in 2005 were continued from 2006 through 2008.

Summer Chum Salmon Stock	Previous Goal and Year Established	Goal Adopted in 2005 (Type)
E. Fork Andreafsky R.	65,000–130,000 (BEG) 2001	No Change (weir)
E. Fork Andreafsky R.	35,000–70,000 (BEG) 2001	Discontinued (aerial)[a]
W. Fork Andreafsky R.	65,000–130,000 (BEG) 2001	Discontinued (aerial)[a]
W. Fork Andreafsky R.	35,000–70,000 (BEG) 2001	Discontinued (aerial)[a]
Anvik R.	400,000–800,000 (BEG) 2001	350,000–700,000 (sonar)

[a] Discontinued because of difficulty conducting aerial surveys of summer chum salmon.

9.3 FALL CHUM SALMON

Analyses for all biological escapement goals for Alaskan fall chum salmon stocks were updated in 2005 using the most recent data. There have been no changes to the Biological Escapement Goals (BEG's) established in 2001 for Alaskan fall chum salmon stocks (Table 21). There are no fall chum salmon BEG's for Canadian-origin stocks within the Upper Yukon River (mainstem) and Porcupine River drainages. The BEG's recommended by ADF&G in 2001 for the Upper Yukon (60,000–129,000) and Fishing Branch rivers (27,000–56,000) were not accepted by the Pacific Scientific Advice Review Committee (PSARC) review undertaken in 2002, due to concerns with the quality of the data.

Table 21.–Yukon River escapement goals set for fall chum salmon in 2007 and recommendations for 2008.

Fall Chum Salmon Stock	Previous Goal (Type) Established in 2001	2007 Goals	Goal Recommended in 2008
Yukon Drainage	300,000–600,000 (BEG)	No Change	No Change
Tanana River	61,000–136,000 (BEG)	No Change	No Change
Delta River	6,000–13,000 (BEG)	No Change	No Change
Toklat River	15,000–33,000 (BEG)	No Change	No Change
Upper Yukon R. Tributaries	152,000–312,000 (BEG)	No Change	No Change
Chandalar River	74,000–152,000 (BEG)	No Change	No Change
Sheenjek River	50,000–104,000 (BEG)	No Change	No Change
Canadian Upper Yukon River	>80,000 (Yukon Salmon Agreement)	No Change	No Change
Fishing Branch River	50,000–120,000 (Yukon Salmon Agreement)	>34,000	22,000–49,000

However, as is outlined in Section 8.5.3, the JTC has recommended an interim management escapement goal (IMEG) range of 22,000 to 49,000 to be used for the Fishing Branch River from 2008 to 2010. It is anticipated that a BEG for Fishing Branch River fall chum salmon will be developed by 2011. The JTC recommends that the current goal for rebuilt Upper Yukon River (mainstem) fall chum salmon of >80,000, as per the Yukon River Salmon Agreement, be maintained in 2008.

9.4 COHO SALMON

For coho salmon in 2005, the Delta Clearwater River boat survey goal was revised from >9,000 to a sustainable escapement goal range of 5,200 to 17,000 using the Bue and Hasbrouck (*Unpublished*) method. No changes were made to the escapement goal by the Alaska Board of Fisheries in 2007 and therefore existing goals will remain in effect for 2008.

10.0 MARINE FISHERIES INFORMATION

10.1 INTRODUCTION

Yukon River salmon migrate as juveniles out of the river and into the Bering Sea. Where they go once they enter the ocean is only partly understood, but evidence from tagging studies and the analysis of scale patterns indicate that these salmon spread throughout the Bering Sea, some move considerably south of the Aleutian Island chain into the Gulf of Alaska and North Pacific Ocean, and some move north into the Chukchi Sea. While in the ocean, they mix with salmon stocks from Asia and elsewhere in North America.

While in the ocean, some of these salmon are caught by commercial fisheries that take place in marine waters. Marine commercial fisheries with a bycatch that likely included some Yukon River salmon included: (1) the U.S. groundfish trawl fisheries in the Bering Sea-Aleutian Islands management area (BSAI) and in the Gulf of Alaska, and (2) the purse seine and gillnet salmon fishery in the South Alaska Peninsula ("False Pass") area. Other commercial fisheries which operate in marine waters of the Bering Sea and Gulf of Alaska where Yukon River salmon occur, but which catch few, if any, salmon include: (1) the U.S. longline fisheries for Pacific halibut, Pacific cod, and other groundfish, (2) the U.S. pot fisheries for Pacific cod and other groundfish, and Dungeness, king, and Tanner crab, and (3) the U.S. purse seine and gillnet fisheries for Pacific herring.

Until 1992, five large commercial fisheries in the ocean caught large numbers of salmon, some of which were likely Yukon River salmon. However, under international agreements, those fisheries no longer operate. They were (in order of decreasing salmon catches): (1) the Japanese high-seas mothership and land-based salmon gill net fisheries; (2) the high-seas squid gillnet fisheries in the North Pacific Ocean of Japan, the Republic of Korea, and the Republic of China (Taiwan); (3) the foreign groundfish fisheries of the Bering Sea and Gulf of Alaska, (4) the joint venture groundfish fisheries of the Bering Sea and the Gulf of Alaska, and (5) the groundfish trawl fishery by many nations in the international waters area of the Bering Sea ("the Doughnut Hole").

The South Unimak and Shumagin Islands June fisheries occur along the south side of the Alaska Peninsula and from 1975 through 2000 were managed on the basis of forecasted Bristol Bay sockeye salmon inshore harvests. These fisheries also harvest chum salmon which are destined for a wide range of locations. Consequently, the Alaska Board of Fisheries placed a chum salmon harvest cap on both South Alaska Peninsula June fisheries to protect Arctic-Yukon-Kuskokwim (AYK) Area chum salmon stocks in 1986 through 2000. In 2001 the BOF designated several AYK chum stocks plus the Kvichak River sockeye salmon as stocks of concern. From 2001 to 2003, the South Peninsula June fisheries were limited to no more than 9 fishing days for seine and drift gillnet gear with no harvest limits. Prior to the 2004 fishing season, many of the restrictions in place from 2001 to 2003 were replaced by a set fishing schedule, which is currently still in effect. Sockeye salmon harvests from 2004 through 2007 averaged 549,523 in the South Unimak and 669,127 in the Shumagin Islands June fisheries for an average total harvest of 1,218,650 fish. This average total harvest was lower than the 1975-2000 average, but above the 2001–2003 average. Chum salmon harvests from 2004 through 2007 for the South Unimak and Shumagin Islands June fisheries average 130,944 and 245,933, respectively. The average chum salmon harvest was below the 1975–2000 average total harvest, and above the 2001–2003 average (Figure 13; Appendix Table A18). The 2004–2006 average exvessel value for the June South Alaska Peninsula fishery was $3,716,011 (Poetter 2007).

Salmon runs were substantially better in the last 5 years than in previous years across a broad region of western Alaska, including the Yukon River in Alaska and Canada. However, they were still below average. The world catch of Chinook salmon has dropped significantly since the late 1970’s, but has rebounded some since the low in 2001 (Figure 14). The world chum catch remains high with most of the harvest by Japan (Figure 15). The causes for the production failures are not known, but attention has focused on the marine environment because of the broad scope of the production failures. Likely factors that have received the most attention to date have included the effects of El Nino, ocean and climate regime shifts, and competition relative to

ocean carrying capacity (i.e., hatchery/wild interactions). Nearly half the abundance of chum salmon in the North Pacific Ocean is now due to hatchery releases (Figure 16).

10.2 BERING SEA AND GULF OF ALASKA GROUNDFISH FISHERY

10.2.1 History and Management of the Groundfish Fishery

The U.S. groundfish fisheries in the Bering Sea-Aleutian Islands (BSAI) and in the Gulf of Alaska (GOA) are managed under the Magnuson-Stevens Fisheries Conservation and Management Act by the North Pacific Fishery Management Council (NPFMC), and are regulated by the National Marine Fisheries Service (NMFS).

In general, the groundfish fisheries of the GOA are managed and regulated separately from those in the BSAI. Both major areas contain a number of smaller regulatory areas, which are numbered. The groundfish fisheries east of 170º west longitude and north of the Alaska Peninsula are considered to be in the BSAI (Figures 17 and 18). The groundfish fisheries operating in waters south of the Alaska Peninsula and east of 170º west longitude are considered to be in the GOA.

The U.S. groundfish fishery off the coast of Alaska expanded rapidly during the last 15 years. In 1977, the year after the Magnuson Act went into effect, the U.S. groundfish harvest off Alaska amounted to only 2,300 metric tons (mt, 1 mt = 2,204.6 pounds), or only 0.2% of the total groundfish harvest off Alaska by all nations. Most of that U.S. catch was Pacific halibut caught with hook-and-line gear.

The Magnuson Act, which claimed exclusive fishery jurisdiction by the United States of waters to a distance 200 nautical miles seaward from the coast, allowed the U.S. to gradually replace the foreign groundfish fisheries by "joint-venture" fisheries, in which U.S. fishermen caught the fish and delivered them at sea to foreign fish processing vessels. The joint-venture fishery, in turn, was replaced by an entirely U.S. fishery. The estimated exvessel value of the total Alaskan commercial fisheries from 1982 through 2007 is given in Appendix Table A19 and Figure 19. The U.S. groundfish fisheries use basically three types of fishing gear: trawls, hook-and-line (including longline and jig), and pots. Of these types of fisheries, trawlers have by far the greatest impact on salmon bycatch numbers.

A major issue affecting the BSAI and GOA groundfish fisheries was a NMFS biological opinion concluding that continued fishing for groundfish, including pollock, Atka mackerel and Pacific cod, under the agency's existing rules is likely to jeopardize the western population of Steller sea lions and adversely affect its critical habitat. Many of the North Pacific Councils actions in 2001 were related to Steller sea lion protection measures establishing temporal and spatial dispersion of harvest and protection of Steller sea lion critical habitat. There will now be two seasons for the pollock, Atka mackerel and Pacific cod fisheries and the amount taken within sea lion critical habitat will be limited. Among several documents prepared in accordance with the National Environmental Policy Act of 1969, NMFS published a Final Programmatic SEIS (Supplemental Environmental Impact Statement) for the Alaska Groundfish Fisheries, a Final SEIS for Steller Sea Lion Protection Measures in the Alaska Groundfish Fisheries, and a Draft Environmental Impact Statement (EIS) for the essential fish habitat components of the several fishery management plans. The Western Alaska Community Development Quota (CDQ) Program has six groups representing the 65 eligible western Alaska communities expanded from pollock only to all federally managed BSAI groundfish species. Currently, the CDQ program is allocated

portions of the groundfish fishery that range from 10% for pollock to 7.5% for most other species. On January 1, 2000, the License Limitation Program (LLP) required that any person who wished to deploy a harvesting vessel in the king and Tanner crab fisheries in the BSAI and in the directed groundfish fisheries (except for the Individual Fishing Quota (IFQ) sablefish, and for demersal shelf rockfish east of 140° West longitude) in the GOA or the BSAI must hold a valid groundfish or crab license (as appropriate) issued under the LLP.

10.2.2 Observer Program

Under U.S. law and regulations, salmon may not be retained by the U.S. groundfish fishery and must be returned to the sea. One exception is the voluntary Salmon Donation Program which allows for distribution of Pacific salmon taken as bycatch in the groundfish trawl fisheries off Alaska to economically disadvantaged individuals by tax exempt organizations through a NMFS authorized distributor. This action supports industry initiatives to reduce waste from discards in the groundfish fisheries by processing salmon bycatch for human consumption. The groundfish observer program began in 1977 on foreign groundfish vessels operating within the U.S. Exclusive Economic Zone (200 nautical miles from the U.S. shore). It continued with the joint-venture fishery until its end. Until 1990, however, there was little information on the accidental or incidental catch of salmon by the U.S. groundfish fishery.

In 1990, the United States began a scientific observer program for the U.S. groundfish fishery off the coast of Alaska. In general, a groundfish harvesting or processing vessel must carry a NMFS certified observer on board whenever fishing or fish processing operations are conducted if the operator is required by the NMFS Administrator, Alaska Region, NMFS, (Regional Administrator) to do so, and a shoreside groundfish processing plant must have a NMFS certified observer present whenever groundfish is received or processed if the plant is required to do so by the Regional Administrator.

The amount of observer coverage is usually related to the length of the vessel or the amount of fish processed by a shoreside plant or mothership processing vessel. Groundfish harvesting vessels having a length of 125 feet or more are required to carry observers at all times when they are participating in the fishery. Vessels with lengths between 60 through 124 feet are required to carry observers during 30% of their fishing days during trips when they fish more than 3 days. Vessels shorter than 60 feet do not have to carry observers unless required to do so by the Regional Administrator. Mothership or Shoreside processing plants processing 1,000 metric tons (mt) or more per month are required to have 100% observer coverage, those processing between 500 and 1,000 mt per month are required to have 30% coverage, and those processing less than 500 mt per month need no observer coverage unless it was required specifically by the Regional Administrator.

Observers must be trained and certified. To be certified as an observer by the NMFS, an applicant must have a bachelor’s degree in fisheries, wildlife biology, or a related field of biology or natural resource management. Observers must be capable of performing strenuous physical labor, and working independently without direct supervision under stressful conditions. Because observers are not employees of the Federal Government but instead hired by certified contractors, applicants must apply directly to a certified contractor. If hired, the contractor will arrange for them to attend a 3-week observer training course in Seattle or Anchorage. Upon successful completion of the course, they will be certified as a groundfish observer.

In addition to the observer coverage, all groundfish harvesters over 60 feet and processors must maintain and submit logbooks on their groundfish harvests and their catch of the prohibited species, including crabs, halibut, herring, and salmon.

10.2.3 Estimated Catch of Salmon in the Groundfish Fisheries

NMFS estimates the number of salmon caught in the groundfish fisheries from the observer reports and the weight of groundfish caught. Observers are instructed to collect random samples of each net haul before it has been sorted, and to gather information from each salmon in a haul. Observers record the species caught and the number of each species, determine the sex of dead or dying salmon, record the weight and length of each salmon, collect scales, and check for missing adipose fins. If a salmon is missing its adipose fin, the observer removes and preserves the snout, which may contain a coded wire tag.

NMFS scientists then use the number of salmon of each species caught in each haul sampled, the weight of groundfish caught in each haul sampled, and the total weight of groundfish harvested during the sampling period to estimate the total number of salmon of each species caught by the entire groundfish fleet. Appendix Table A20 and Figure 20 present a summary of the estimated numbers of Chinook and other salmon caught by the U.S. groundfish fisheries from 1990 through 2007. Appendix Table A20 indicates that the number of salmon caught by the groundfish fisheries varies considerably by species of salmon, by year, and between the BSAI and the GOA. For the most part, Chinook and chum salmon make up most of the catch, with coho a distant third, and sockeye and pink salmon minor components.

The catch of salmon in the BSAI in 2007 was 124,512 Chinook and 90,874 other salmon and in the GOA the salmon catch was 40,149 Chinook and 3,619 other salmon (Appendix Table A20). Certain areas in the BSAI have been declared salmon savings areas for both chum and Chinook salmon (Figures 17 and 18) based on high rates of catch in the past[23]. After the 1998 season, because of the concerns regarding Chinook salmon conservation in western Alaska and in response to a proposal submitted by BSFA, the NPFMC lowered the allowable bycatch of Chinook salmon in the BSAI trawl fishery.

One of the main unanswered questions is what stocks of salmon are being caught by the U.S. groundfish fisheries and how many of each stock. Some information comes from coded wire tagged salmon recovered by observers. But that information only shows that certain coded wire tagged stocks are caught, it says nothing specific about the many stocks without coded wire tags. Canada has coded wire tagged upper Yukon River Chinook salmon for a number of years. To date, 16 have been recovered in the Bering Sea groundfish fisheries and six were picked up by the U.S. BASIS cruise in 2003 and 2007 (Figure 21; Appendix Table A21). In addition, 10 Chinook salmon captured and tagged on the high seas, have returned to the Yukon River drainage.

10.3 LAW ENFORCEMENT

The NPAFC Committee on Enforcement (ENFO) met in conjunction with the NPAFC Annual Meeting hosted by Russia, in Vladivostok, from October 8–9, 2007. All the Parties were well represented, and Taiwan participated as a welcomed observer.

[23] Information on past and present bycatch of salmon in the BSAI and GOA groundfish fisheries can be obtained from the NMFS Alaska Region web page at www.fakr.noaa.gov.

The major agenda item for the ENFO during the Annual Meeting is a report from each Party on enforcement actions and observed activities contrary to the provisions of the Convention. Noteworthy in 2007 was a near 50% reduction in observed suspicious IUU activity, coupled with the interdiction of seven vessels for illegal fishing activity. This was truly a team effort. Patrol ships from Russia and the United States interdicted these illegal vessels based on sighting information provided by Canadian, Japanese, and Russian surveillance flights. Although not a member, China assisted by sending a patrol vessel to take custody of and escort six of the seven vessels which were of Chinese registry. The 7th vessel, apprehended by Russia, was flying an Indonesian flag.

Canada again staged surveillance flights out of a U.S. airbase in the Aleutian Islands and sighted nine vessels suspected of driftnet fishing in the Convention Area. Japan patrolled with both ships and aircraft, and for the second year in a row, embarked a U.S. Coast Guard representative on a flight. This flight resulted in the subsequent seizure of an illegal fishing vessel. Russia also patrolled with both ships and aircraft. Their efforts resulted in the seizure of the Indonesian flagged Rong Sheng 828 with 90 tons of salmon on board. U.S. ships and aircraft, in close cooperation with the other Parties, apprehended six IUU fishing vessels. Taiwan reported patrolling for 240 days in the Convention Area and sighting seven driftnet vessels. All Parties pledged similar levels of enforcement efforts for 2008.

In addition to enforcement activities, the ENFO discussed the Integrated Information System (IIS) and cooperation with other North Pacific enforcement groups. IIS is the NPAFC's web based tool that enforcement agencies use to share information and coordinate enforcement activities. Captain Lukyanov of Russia was commended for his work on this system. All Parties were encouraged to expand the use of IIS for both coordinating at sea patrol efforts, as well as a tool for distributing information on vessels of interest down to the port enforcement agency level. Of particular note was a committee initiative to invite both the Western and Central Pacific Fisheries Commission (WCPFC) and North Pacific Coast Guard Forum to a tripartite meeting to be held in conjunction with the next EECM. All three commissions have an interest in IUU fishing in the North Pacific.

Robert Martinolich of Canada was elected as a new Chair of ENFO. Canada agreed to host the 2008 Enforcement Evaluation Coordination Meeting (EECM) in Vancouver February 27–29 where the Parties will plan enforcement activities for 2008.

10.4 BERING SEA RESEARCH

10.4.1 Background

Extensive research has begun in the Bering Sea in the last few years focusing on physical and biological oceanography and climate change. Many different organizations from several countries have been involved, and several international organizations have been formed to try and coordinate this research. The discussion that follows will concentrate on those studies directed towards Pacific salmon.

10.4.2 Bering-Aleutian Salmon International Survey

The Bering-Aleutian Salmon International Survey (BASIS) is an NPAFC-coordinated program of ecosystem research on salmon in the Bering Sea. The major goal of this program, which was developed in 2001, is to clarify how changes in the ocean conditions affect the survival, growth, distribution, and migration of salmon in the Bering Sea. Research vessels from U.S. (F/V Sea

Storm, F/V Northwest Explorer), Japan (R/V Kaiyo maru, R/V Wakatake maru), and Russia (R/V TINRO), have participated in synoptic BASIS research surveys in Bering Sea since in 2002.

The primary findings from the past 5 years (2002–2006) indict that there were special variations in distribution among species: juvenile coho and Chinook salmon tend to be distributed nearshore and juvenile sockeye, chum, and pink salmon tended to be distributed further offshore. In general, juvenile salmon were largest during 2002 and 2003 and smallest during 2006, particularly in the northeast Bering Sea region. Fish, including age-0 pollock and Pacific sand lance were important components of the diets for all species of juvenile salmon in some years, however, annual comparisons of juvenile salmon diets indicated a shift in primary prey for many of the salmon species during 2006 in both the northeast and southeast Bering Sea regions. In addition, the average CPUE of juvenile salmon fell sharply during 2006 in the southeast Bering Sea region. It is speculated that spring sea surface temperatures (SSTs) on the eastern Bering Sea shelf likely impact growth rate of juvenile western Alaska salmon through bottom-up control in the ecosystem. Cold spring SSTs lead to lower growth and marine survival rates for juvenile western Alaska salmon, while warm spring SSTs have the opposite effect.

Stock mixtures of salmon from BASIS surveys in the Bering Sea have provided new information on oceanic migration and distribution of regional stock groups in the Bering Sea. Recent results from Japanese surveys indicate that 81% of the immature chum salmon in the Bering Sea basin were from Asian (Russia and Japan) populations during August-September in 2002. Results from U.S. surveys on the Bering Sea shelf and Aleutian chain indicate considerable spatial variation in stock mixtures; however, when pooled over location mixtures were very similar to mixtures present in the basin with 80% of the immature chum salmon from Asian populations. Immature chum salmon from western Alaska comprised 2% and 8% of immature chum salmon on the southern Bering Sea shelf and northern Bering Sea shelf, respectively. Stock mixtures of juvenile chum salmon have identified where migratory routes of western Alaska and Russian chum salmon stocks overlap and has helped identify the contribution of Russian stocks to the total biomass of juvenile chum salmon on the eastern Bering Sea shelf.

In 2007, the U.S. BASIS program sampled in the Bering Straits and the Chukchi Sea (Figure 22), and found water temperatures warmer than in the Bering Sea. Substantial numbers of juvenile pink and chum salmon were caught that were larger than those caught south of the Bering Straits. Three juvenile Chinook salmon caught off the Seward Peninsula were coded wire tagged in the Canadian Yukon indicating a northward migrating component in juvenile Yukon River Chinook salmon (Figure 21). Juvenile chum salmon in this area and from the Chukchi Sea may also originate from the Yukon River. Auke Bay Laboratories are currently conducting genetic stock identification on these samples to determine river of origin.

Figure 23 shows the relative abundance of juvenile salmon in the Northern Shelf Region of the Bering Sea as determined by the U. S. BASIS cruises from 2002 to 2007. The very low numbers of chum juveniles in 2004 may explain the relatively low chum salmon bycatch in the BSAI groundfish fishery in 2007. The numbers of juvenile chum salmon appear to be rebounding in 2006 and 2007. Very high numbers of juvenile pink salmon were found in 2007 and may foretell a large return of adult pink salmon to Western Alaska in 2008. Relative abundance of juvenile Chinook salmon appears to be increasing after 3 straight years of decline.

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FIGURES

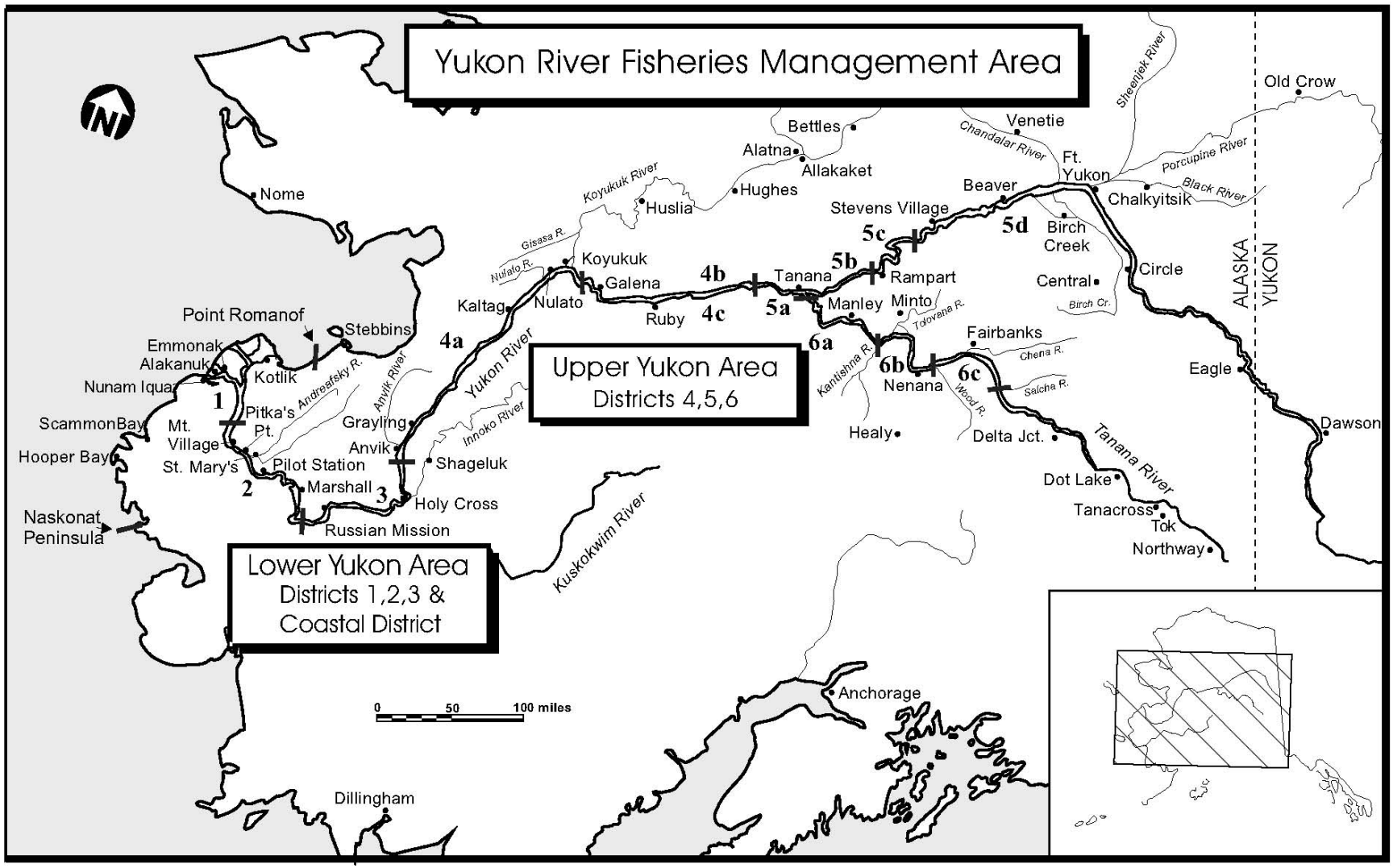


Figure 1.–Alaska portion of the Yukon River drainage showing communities and fishing districts.

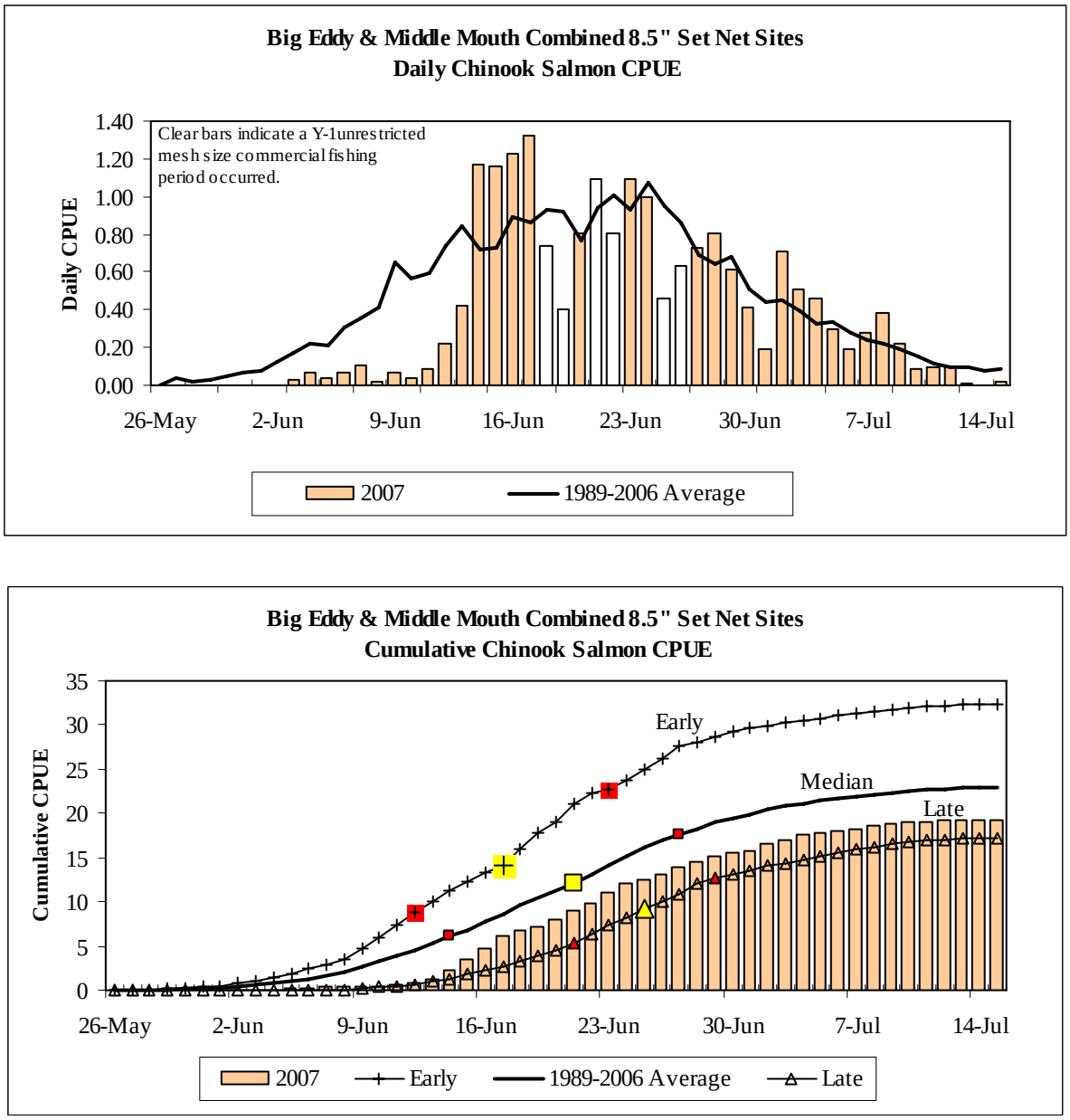


Figure 2.–Daily test fish CPUE for Chinook salmon in 2007 compared to the 1989–2006 average (top). The 2007 cumulative CPUE compared to the 1989–2006 early, average and late run timing (bottom).

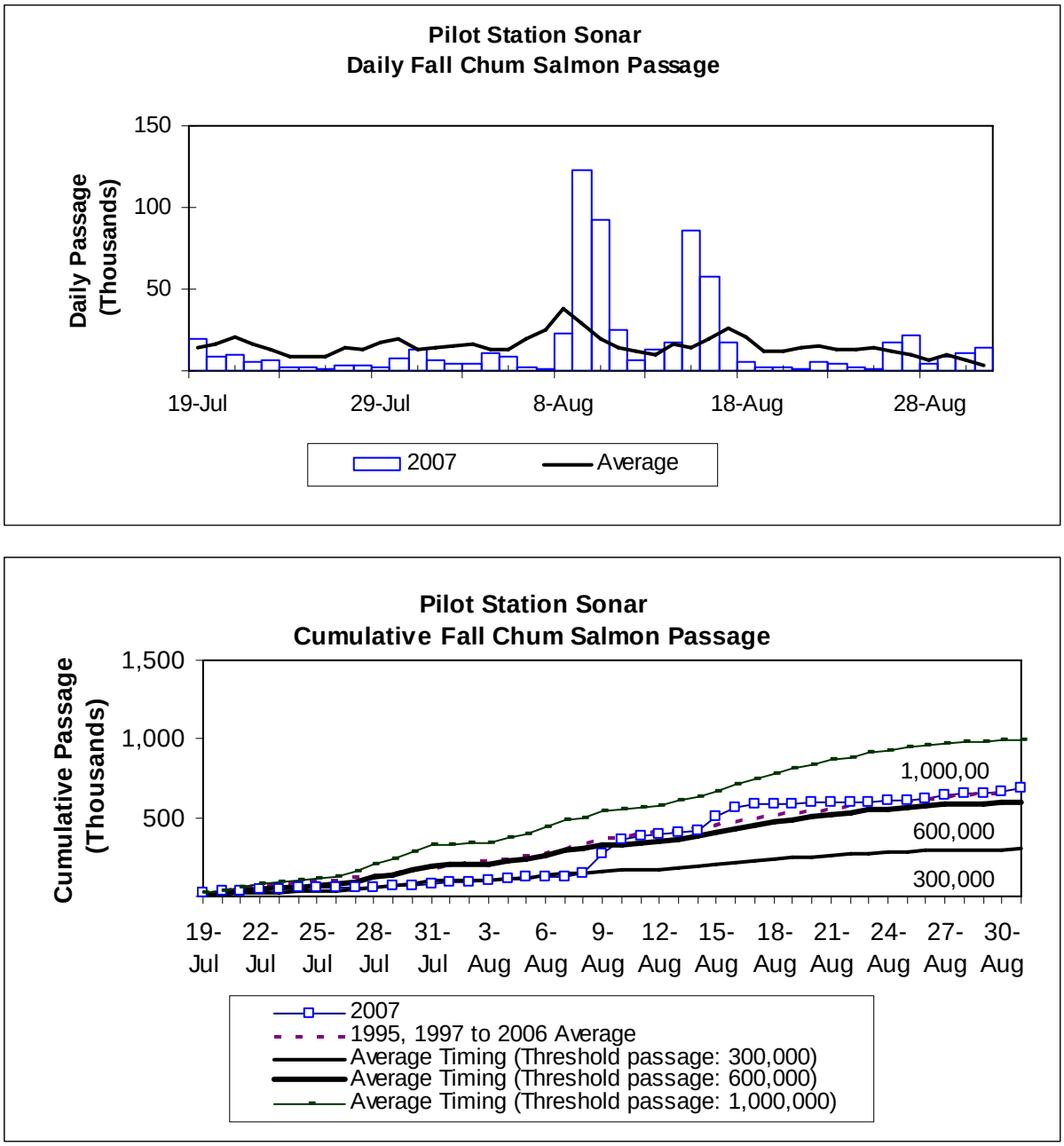


Figure 3.–Daily Pilot Station sonar passage counts attributed to fall chum salmon in 2007 (top), compared to 1995 and 1997 through 2006 average. Cumulative Pilot Station sonar passage counts attributed to fall chum salmon in 2007 (bottom), compared to 1995 and 1997 though 2006 average.

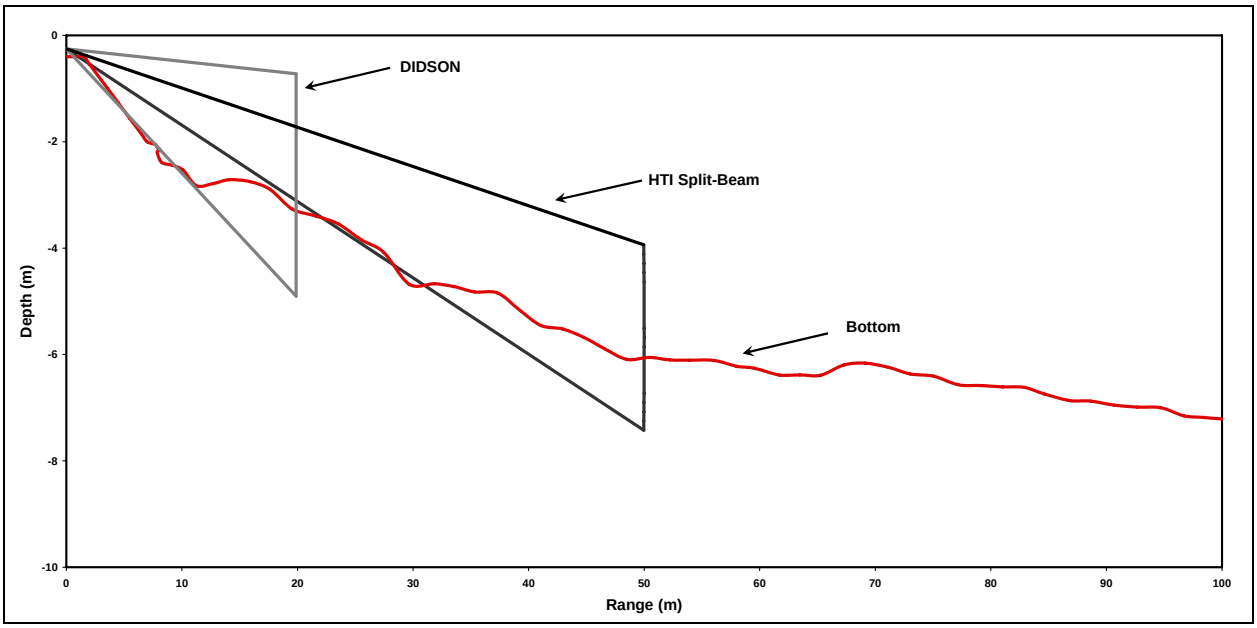
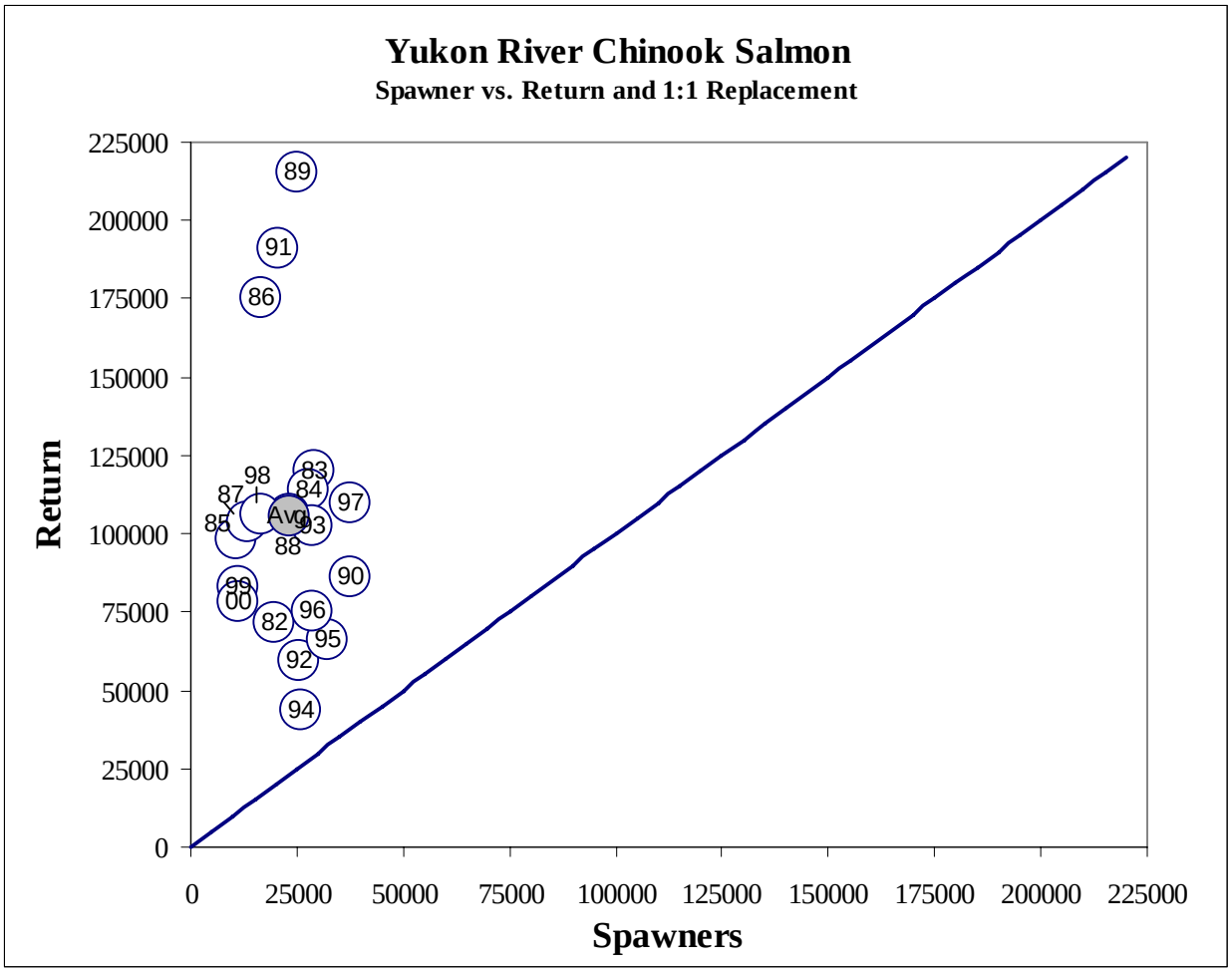


Figure 4.–Schematic representation of the approximate river profile in 2005 and associated nominal beam-width of the DIDSON and split-beam sonar of the first sampling stratum on the left bank used from 2005 through 2007.



Note: Years in the figure represent the brood years.

Figure 5.–Yukon River mainstem Canadian Chinook salmon spawners versus estimated returns and the 1:1 replacement line.

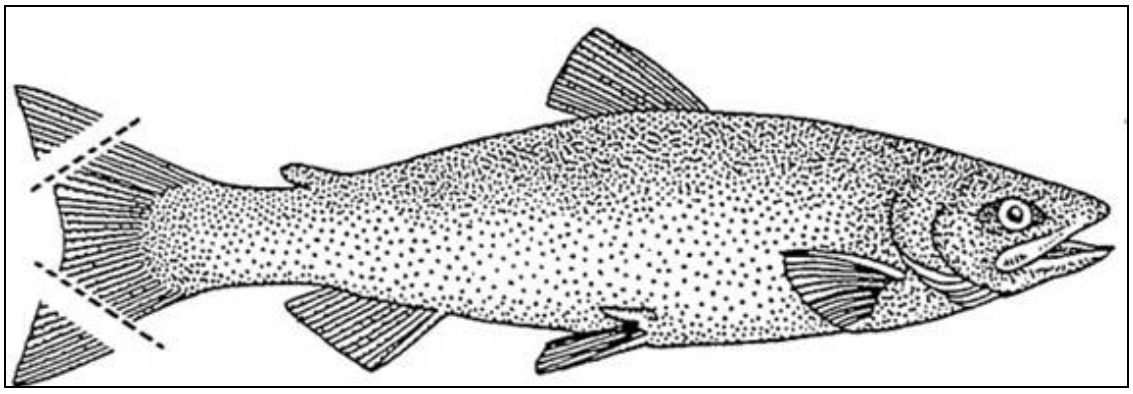
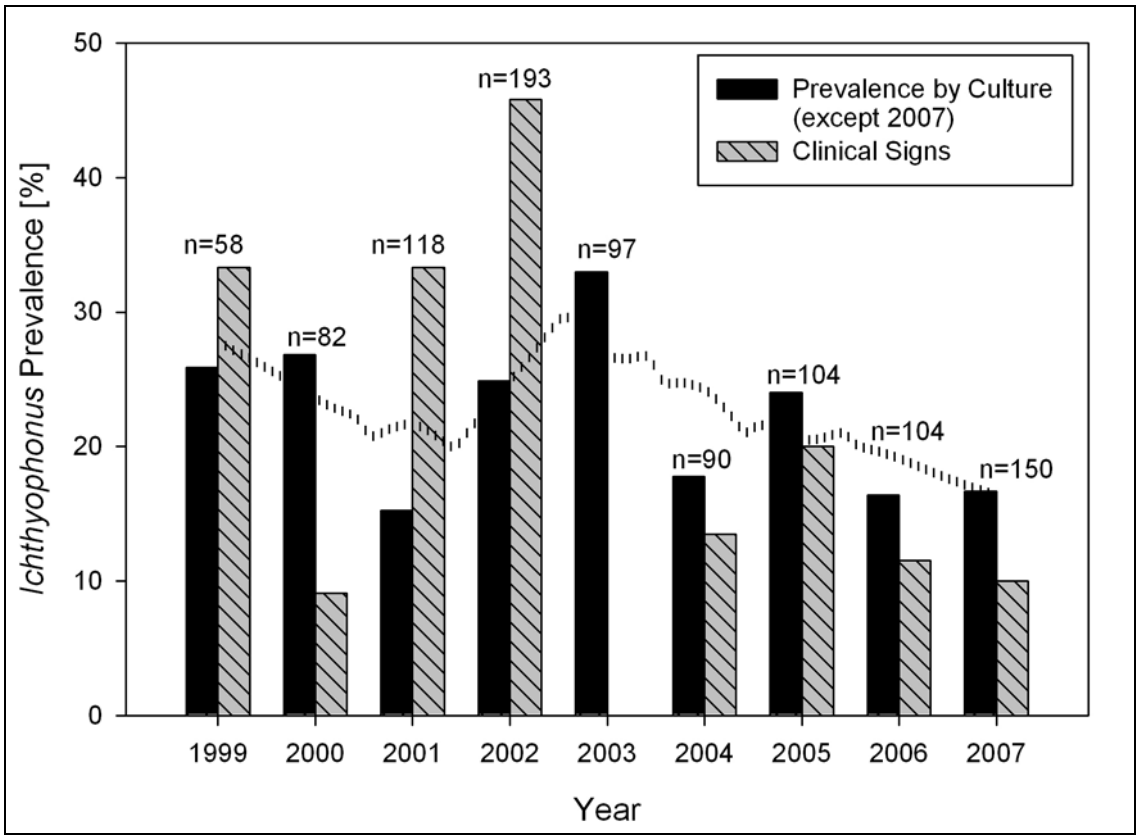


Figure 6.–New subsistence fishing marking requirements for Chinook salmon in Districts 1-3 from June 1 to July 15. Both lobes of the tail fin need to be removed before Chinook salmon are transferred from fishing sites. Fish with removed tail fins may not be sold or purchased.



Source: Historical data is based on studies by Kocan et al. (2004), Kocan and Hershberger (2006) and Kahler et al. (2007).

Figure 7.–Time series of *Ichthyophonus* prevalence at Emmonak, Alaska based on heart culture (PCR in 2007) in Chinook salmon (n = sample size). LOESS non-parametric smoothing (dashed line) was applied to visualize temporal trends of parasite prevalence.

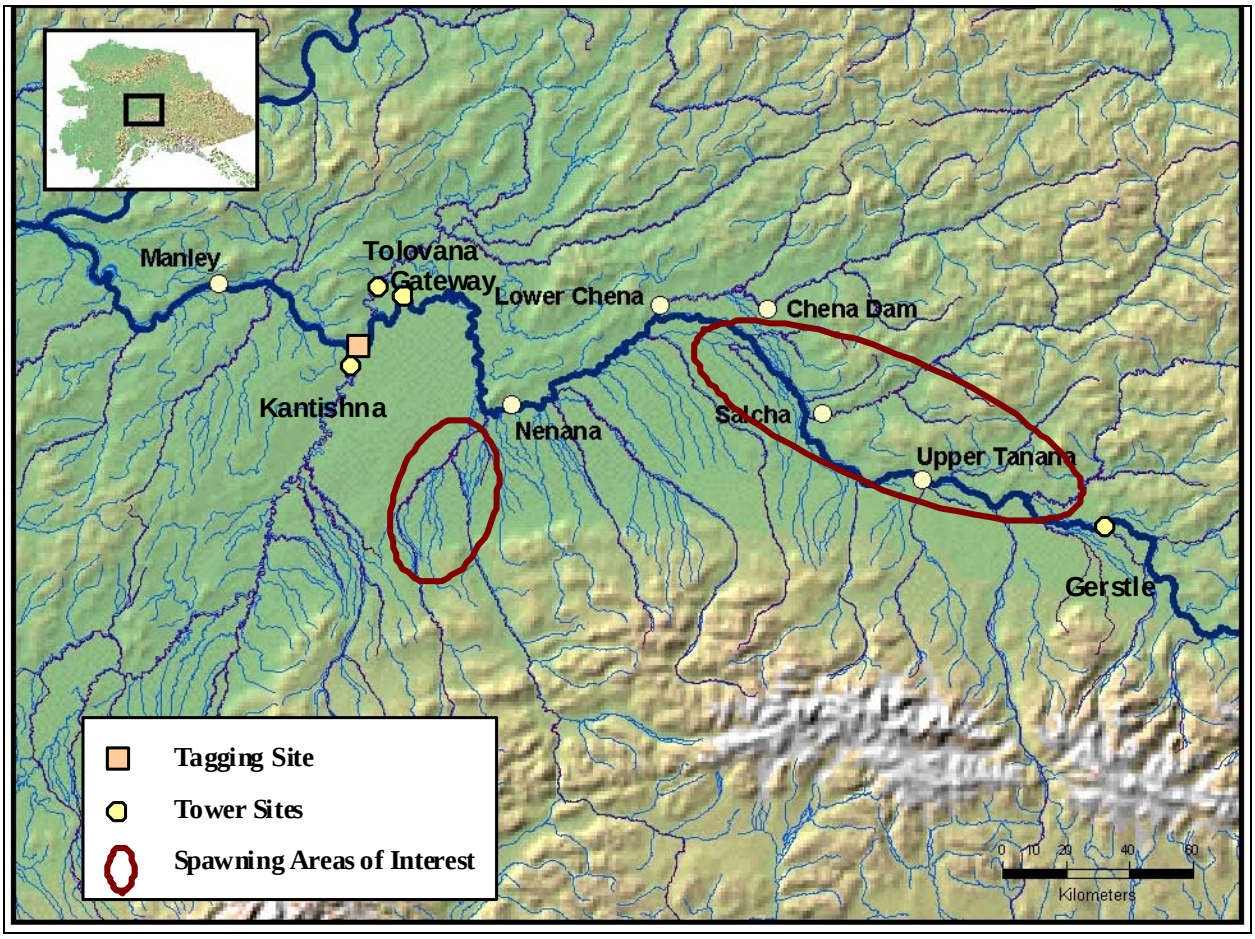


Figure 8.–Map of the Tanana River drainage indicating tagging site, names and locations of remote tracking stations, and particular locations of interest, 2007.

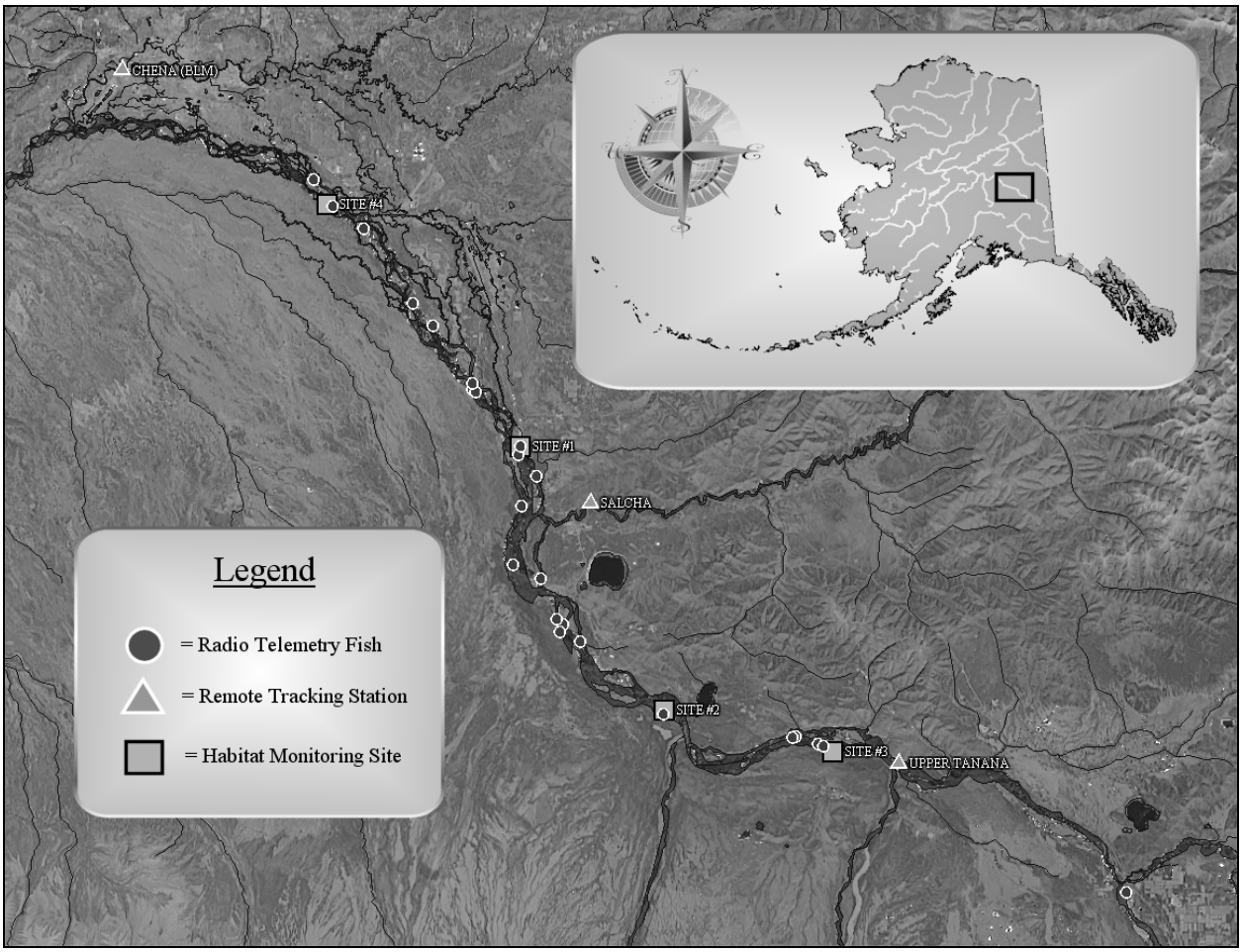


Figure 9.–Map of the final locations of radio tagged fall chum salmon in the upper Tanana River and locations of habitat monitoring sites, 2007.

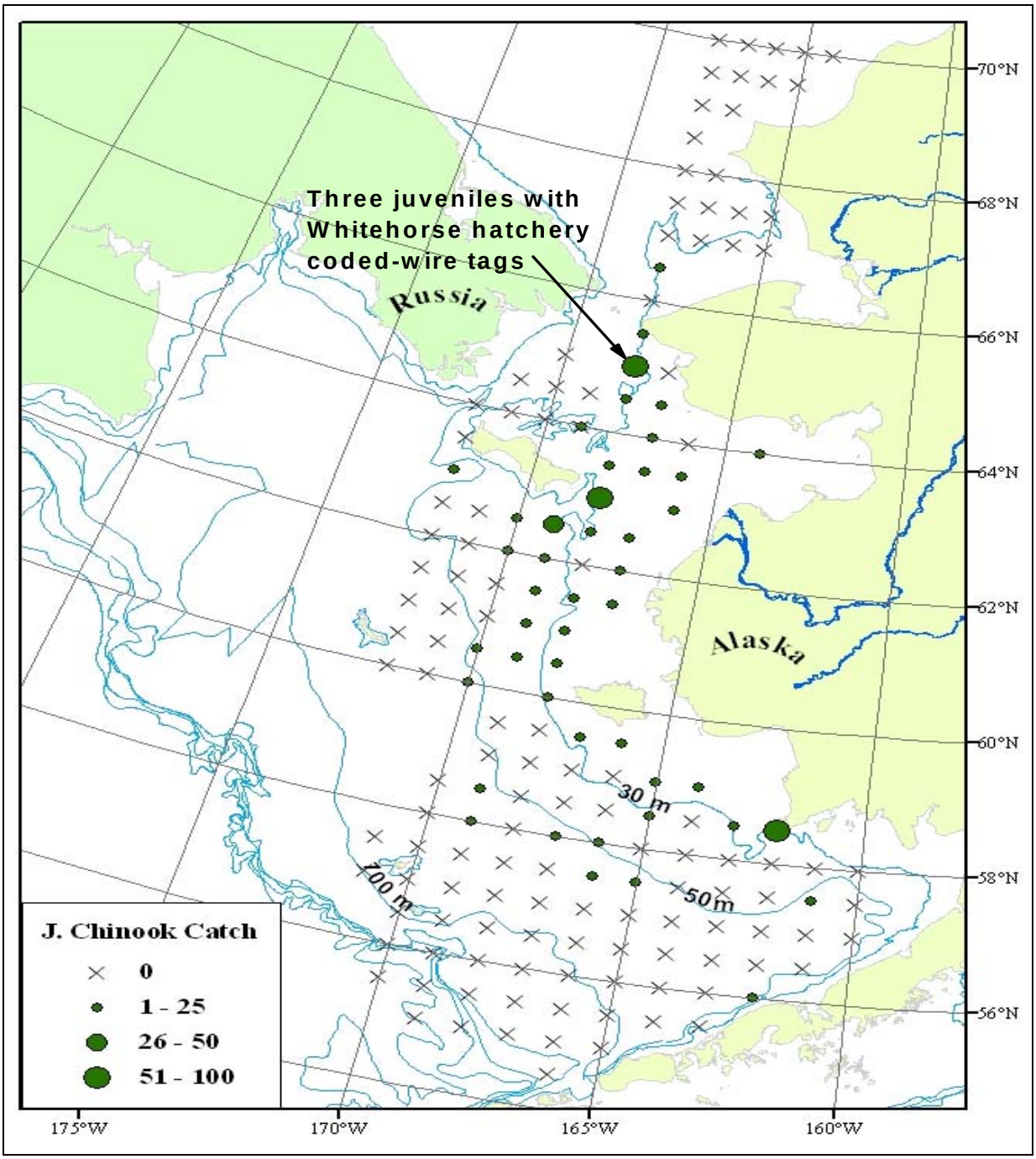


Figure 10.–Recovery location of the 2007 three coded wire tagged Chinook salmon fry released from the Whitehorse Rapids Fish Hatchery caught in the BASIS cruise on Sept. 13, 2007 at 65.19º N and 168.07º W.

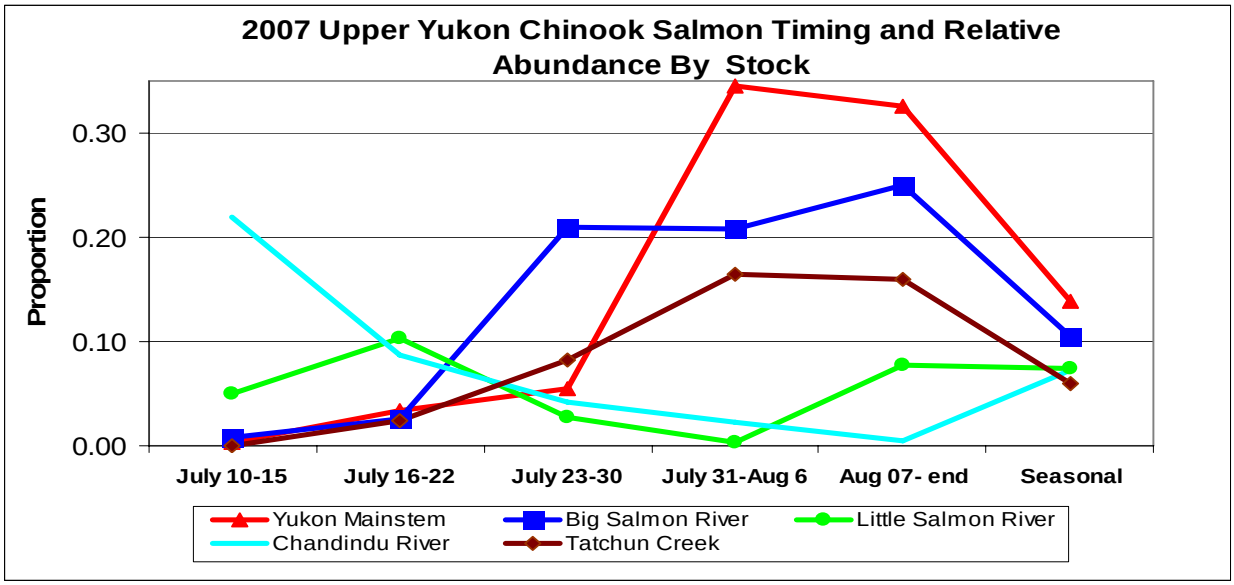


Figure 11.–Timing (and relative abundance) of Upper Yukon River Chinook salmon stocks in 2007 determined by Genetic Stock Identification (GSI) analyses.

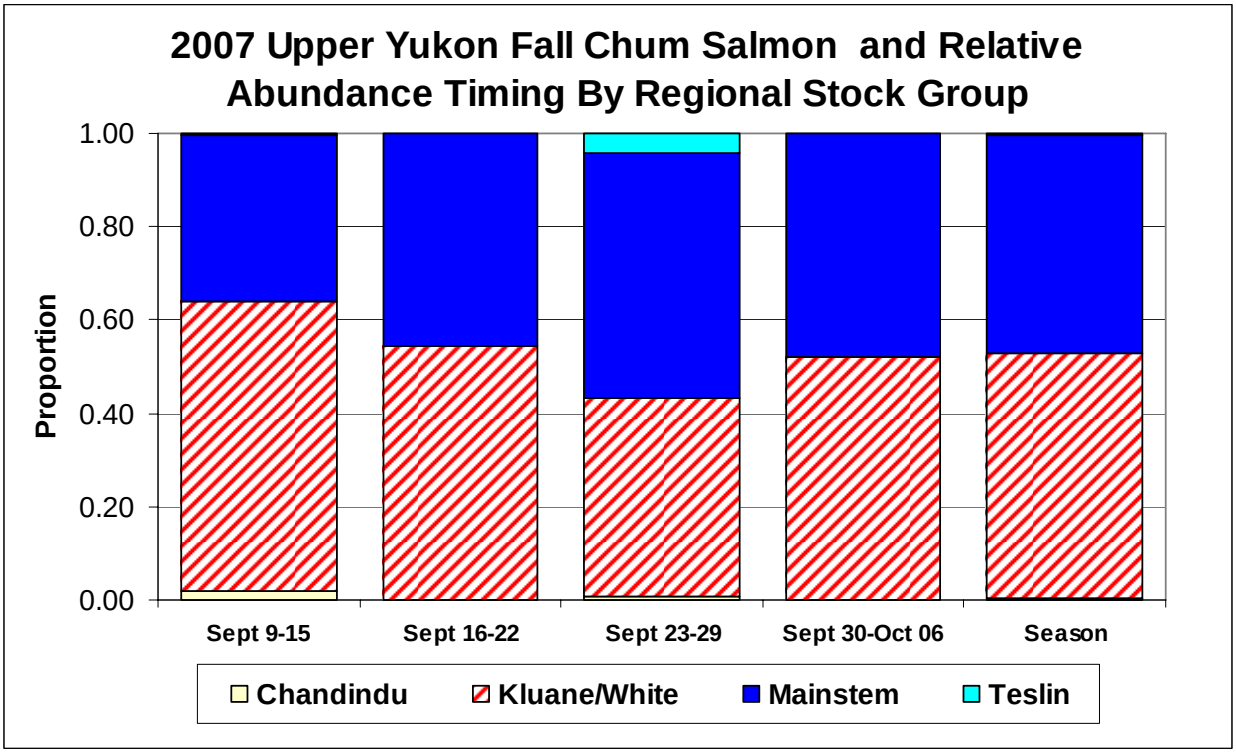


Figure 12.–Timing (and relative abundance) of Upper Yukon River fall chum salmon stocks in 2007 determined using Genetic Stock Identification (GSI) analyses.

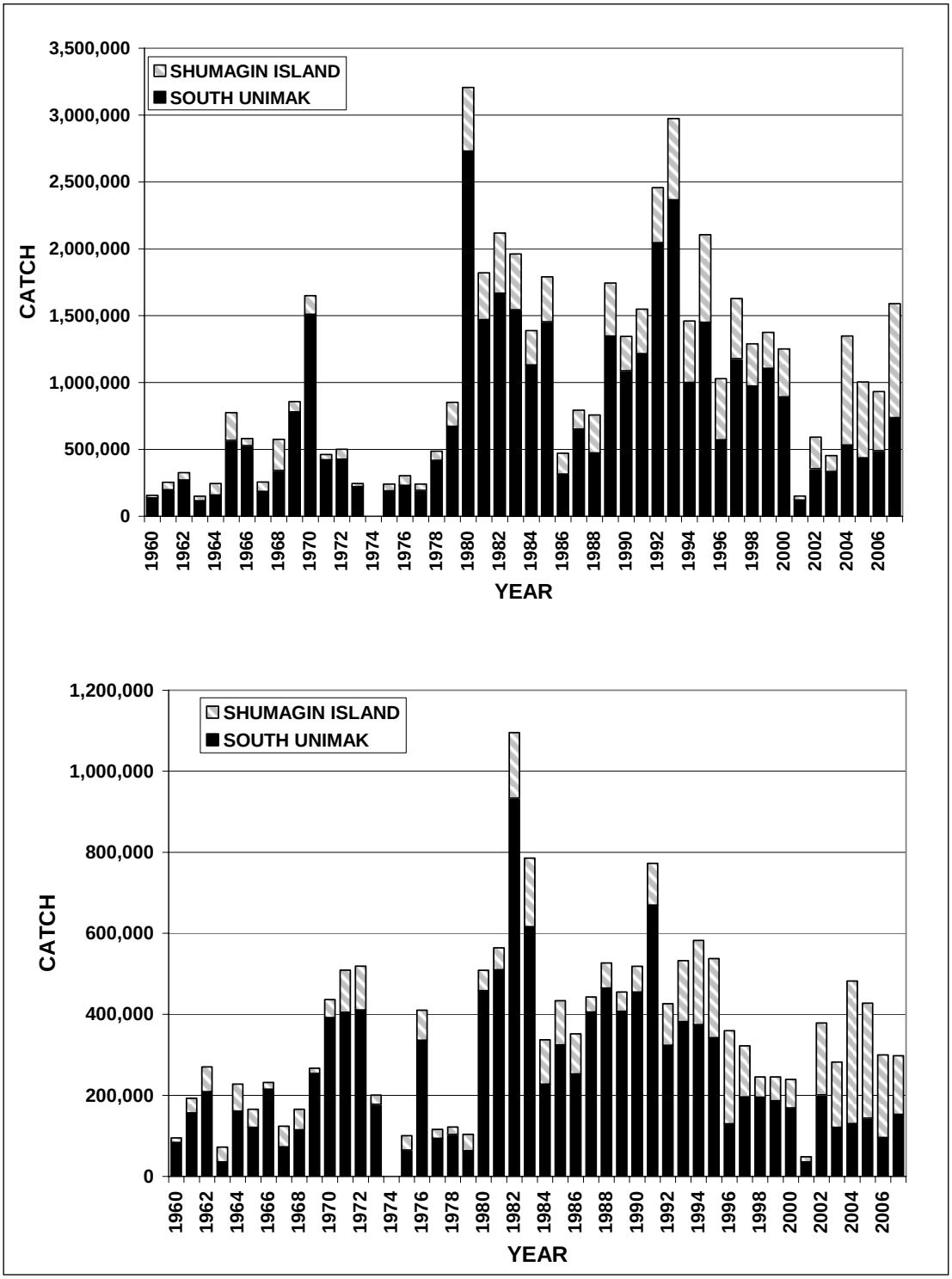


Figure 13.–Sockeye (top) and chum (bottom) salmon catch in the South Peninsula June fishery, 1980–2007.

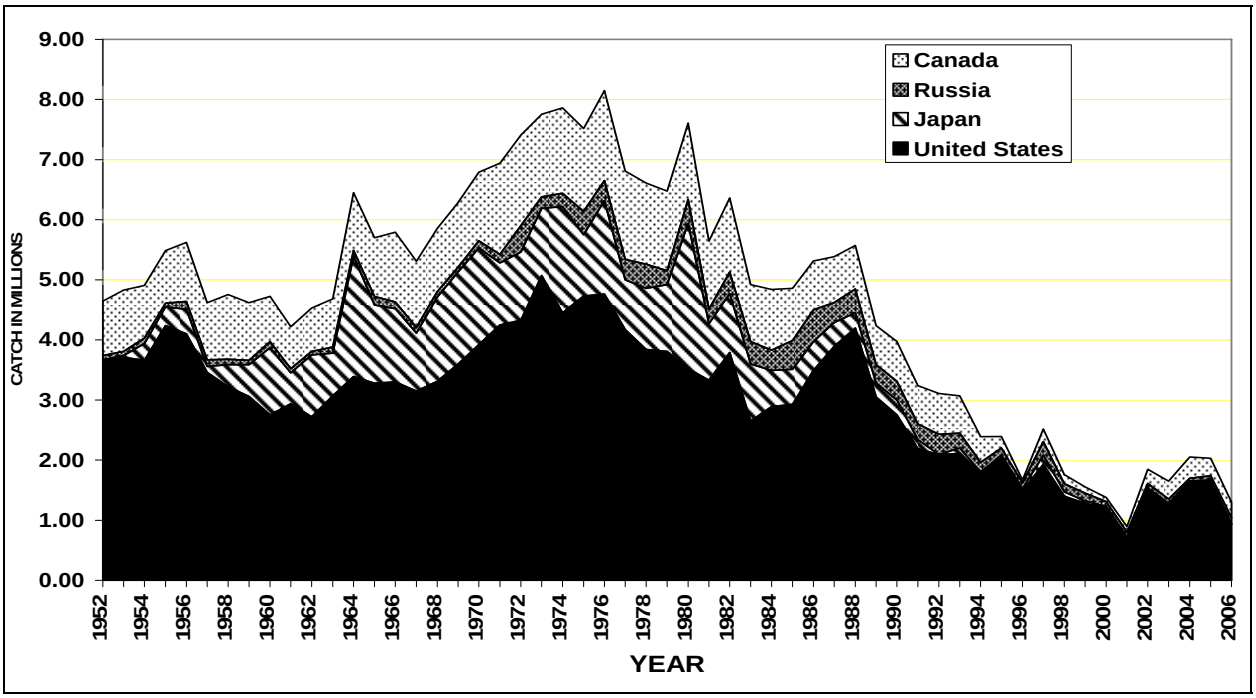


Figure 14.–World Chinook salmon catch, 1952–2006.

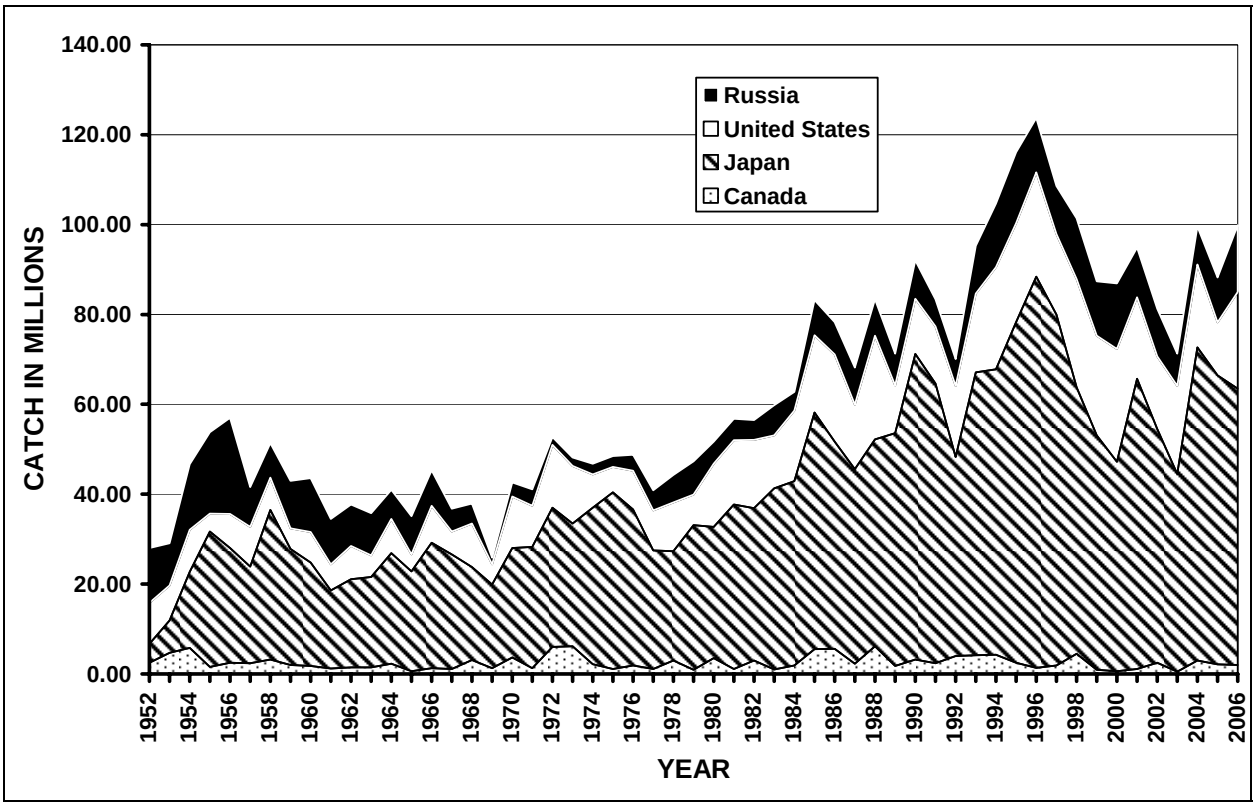
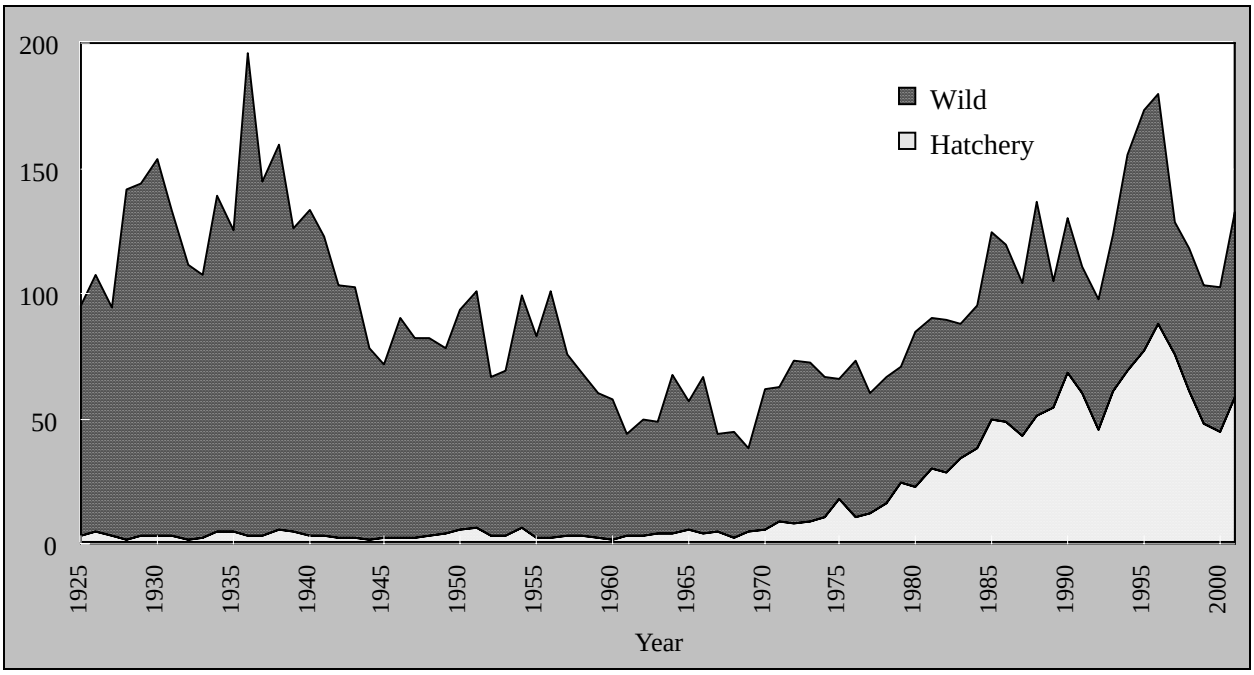


Figure 15.–World chum salmon catch, 1952–2006.



Source: Kaeriyama 2003.

Figure 16.–Number of wild and hatchery chum salmon in the North Pacific Ocean 1925–2002.

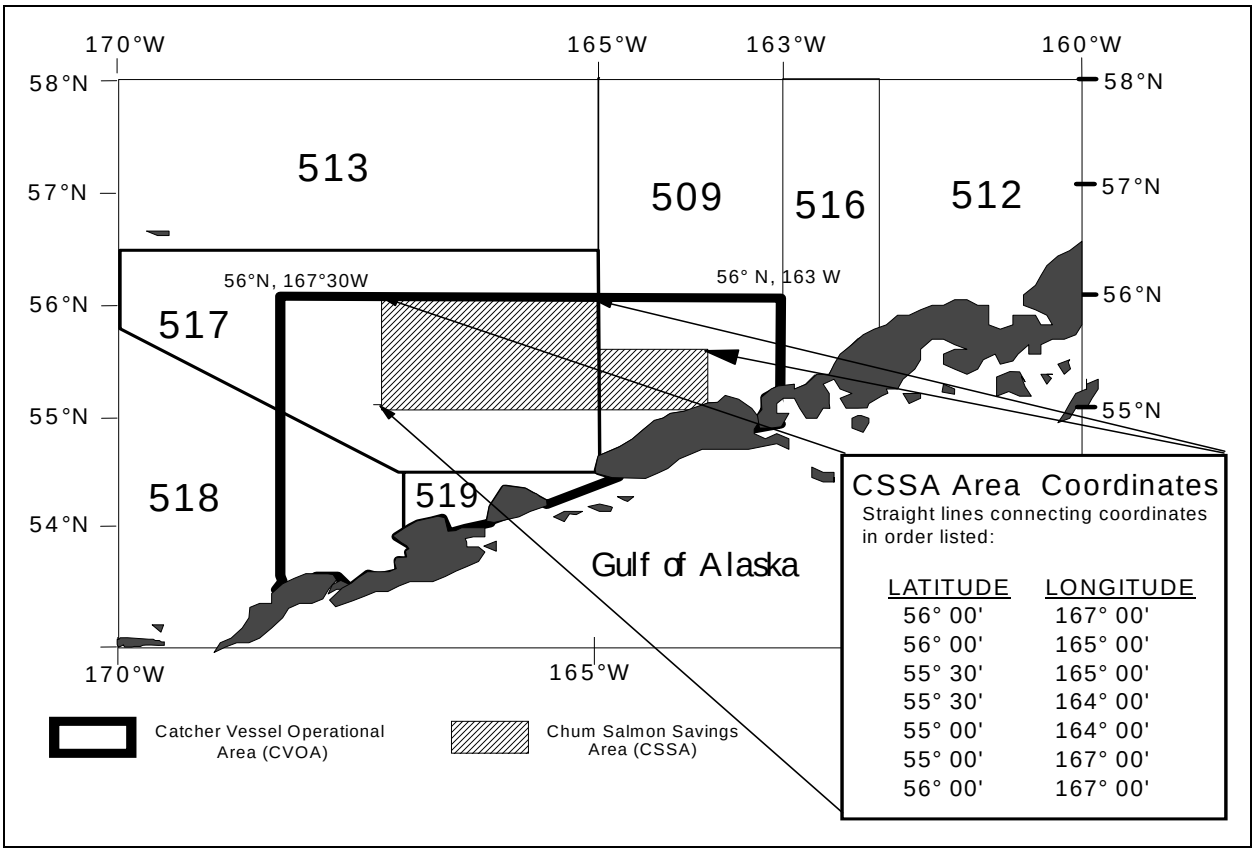


Figure 17.–Statistical reporting areas and chum salmon savings area for the U.S. groundfish fisheries in the Bering Sea.

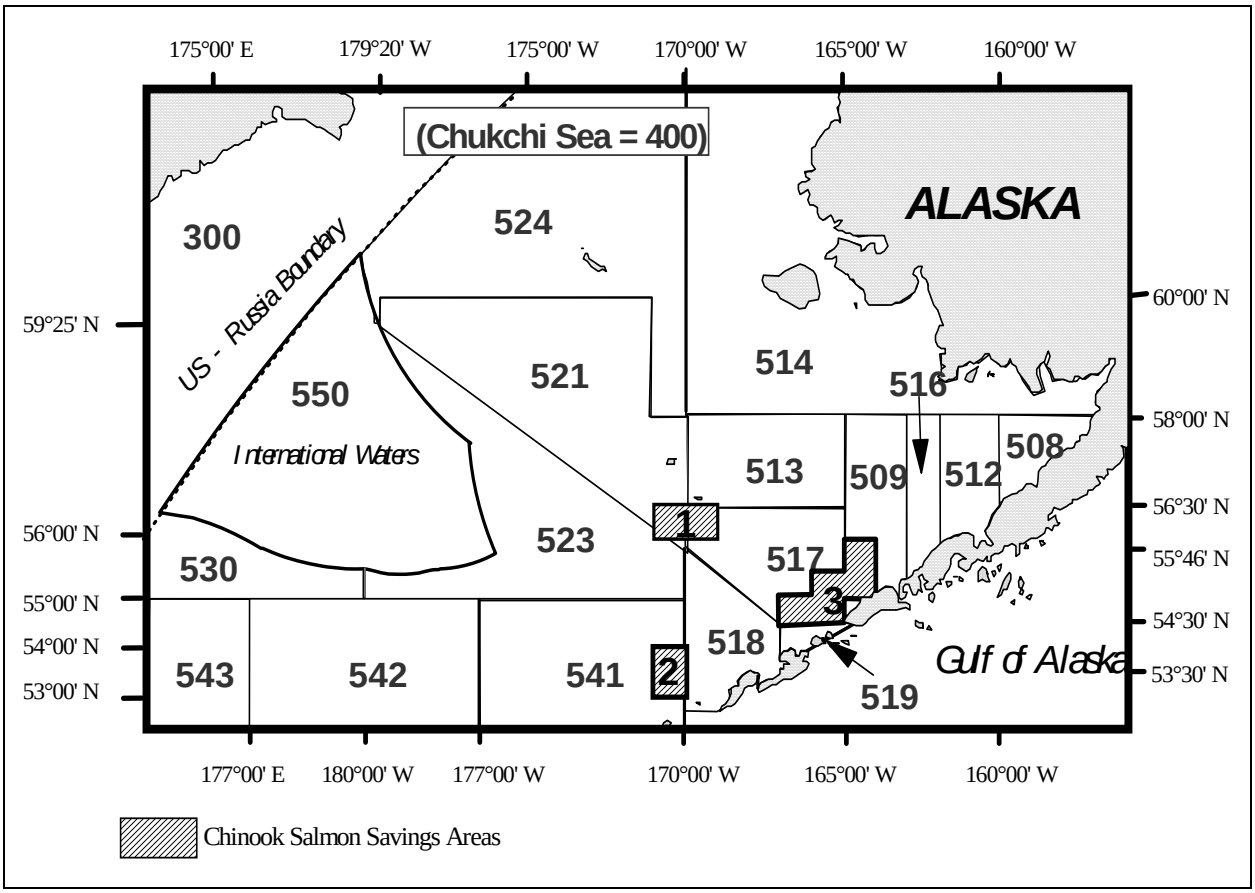


Figure 18.–Statistical reporting areas and Chinook salmon saving areas for the U.S. groundfish fisheries in the Bering Sea.

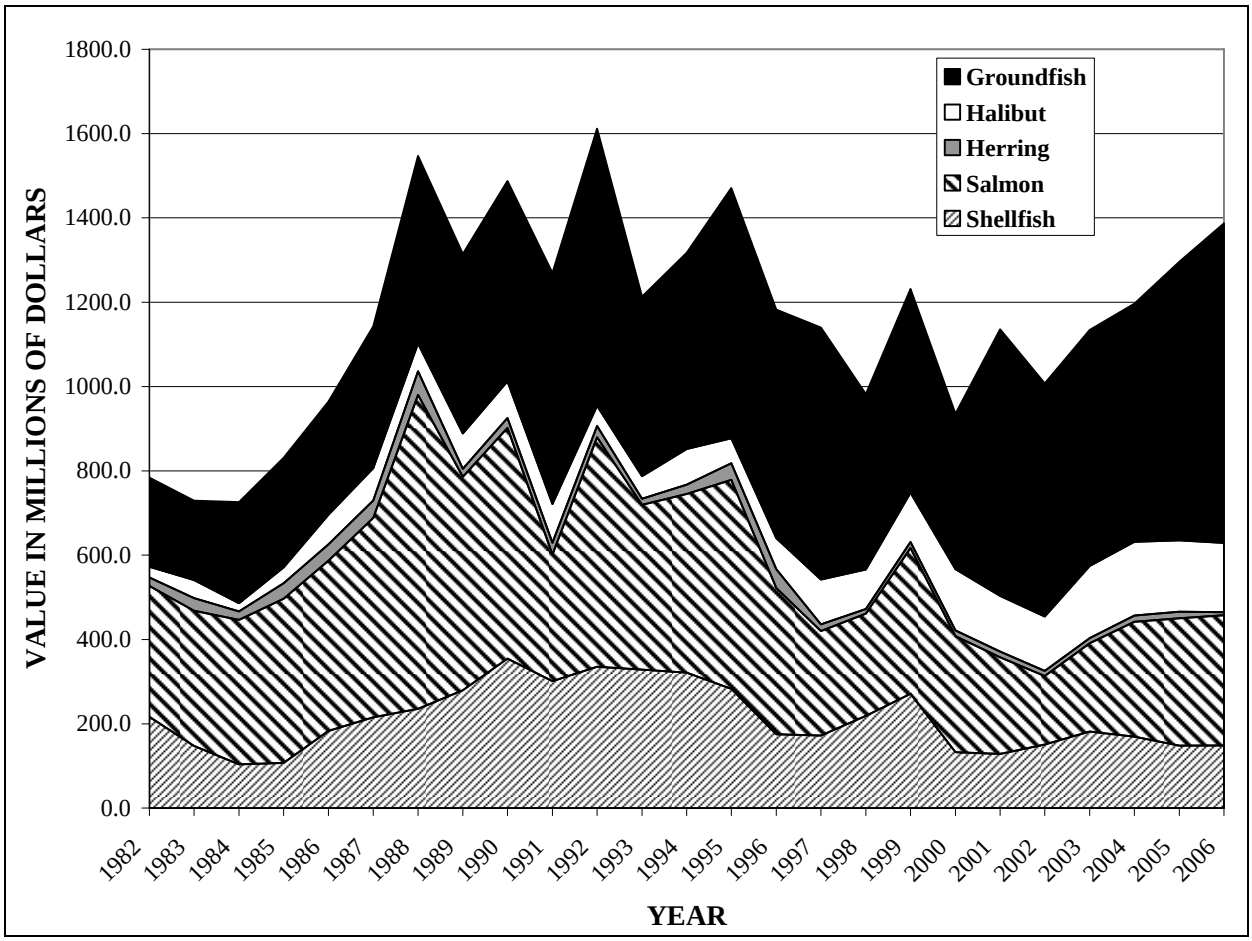


Figure 19.–Exvessel value of the catch in the commercial fisheries off Alaska by species in millions, 1982–2006.

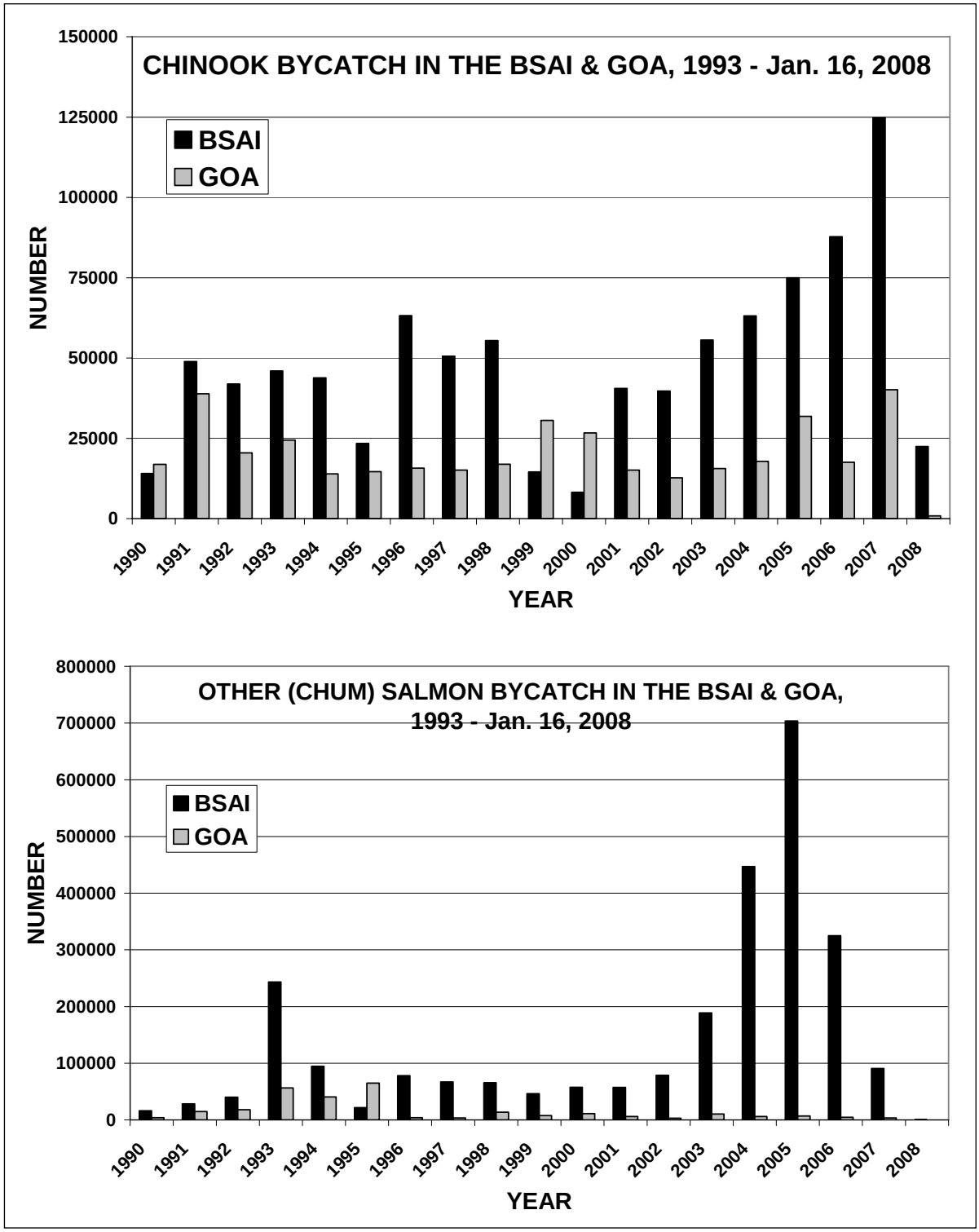
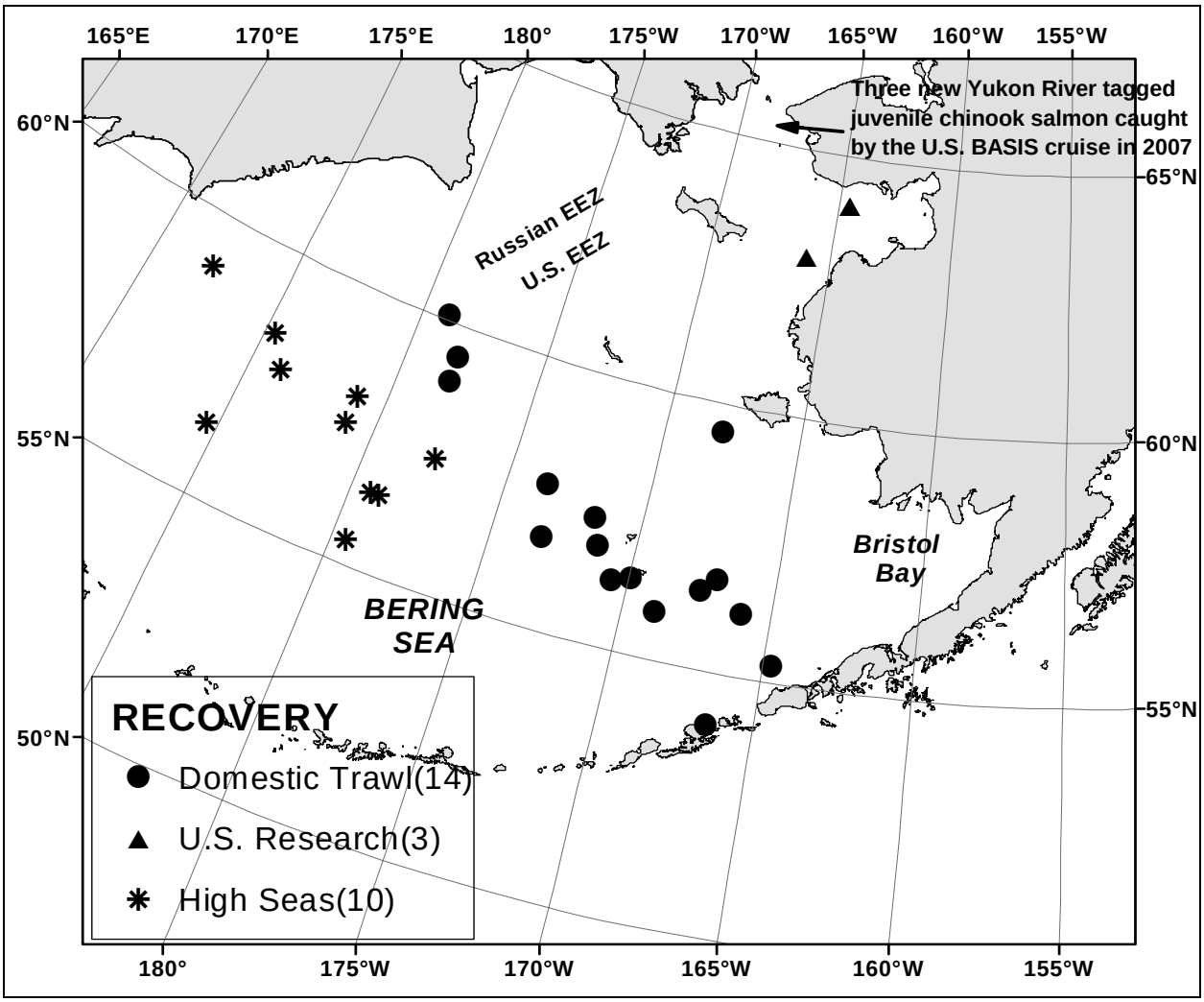


Figure 20.–Salmon bycatch in the Gulf of Alaska and Bering Sea groundfish fishery, 1990–2008.



Note: Three new recoveries were made by the 2007 U.S. BASIS cruise near the Bering Strait.

Figure 21.–Coded wire tagged Chinook salmon from the Whitehorse hatchery recovered from the domestic and research catches in the Bering Sea, and high seas tagged Chinook salmon recovered in the Yukon River.

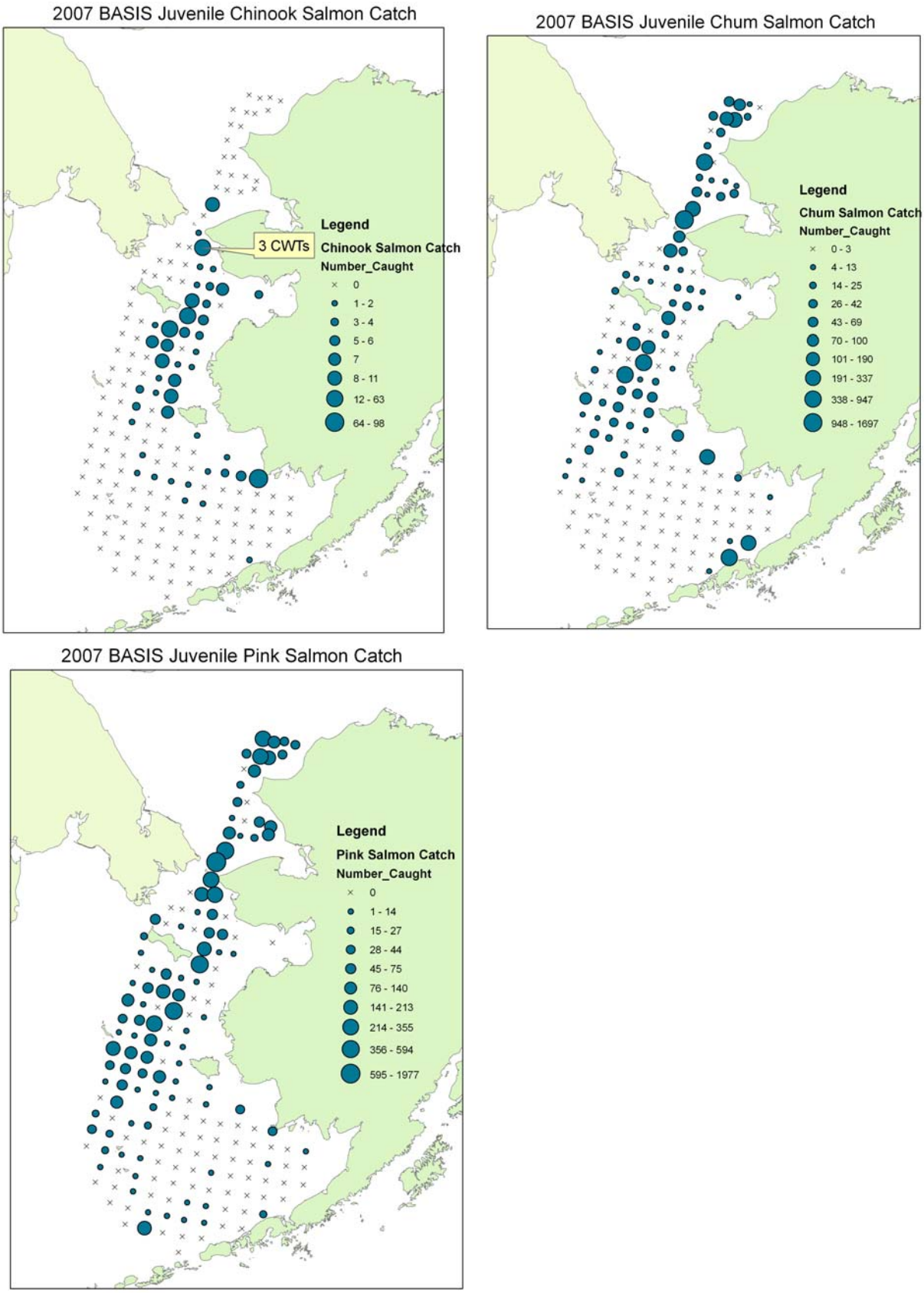


Figure 22.–U.S. BASIS juvenile Chinook, chum and pink salmon catches in 2007.

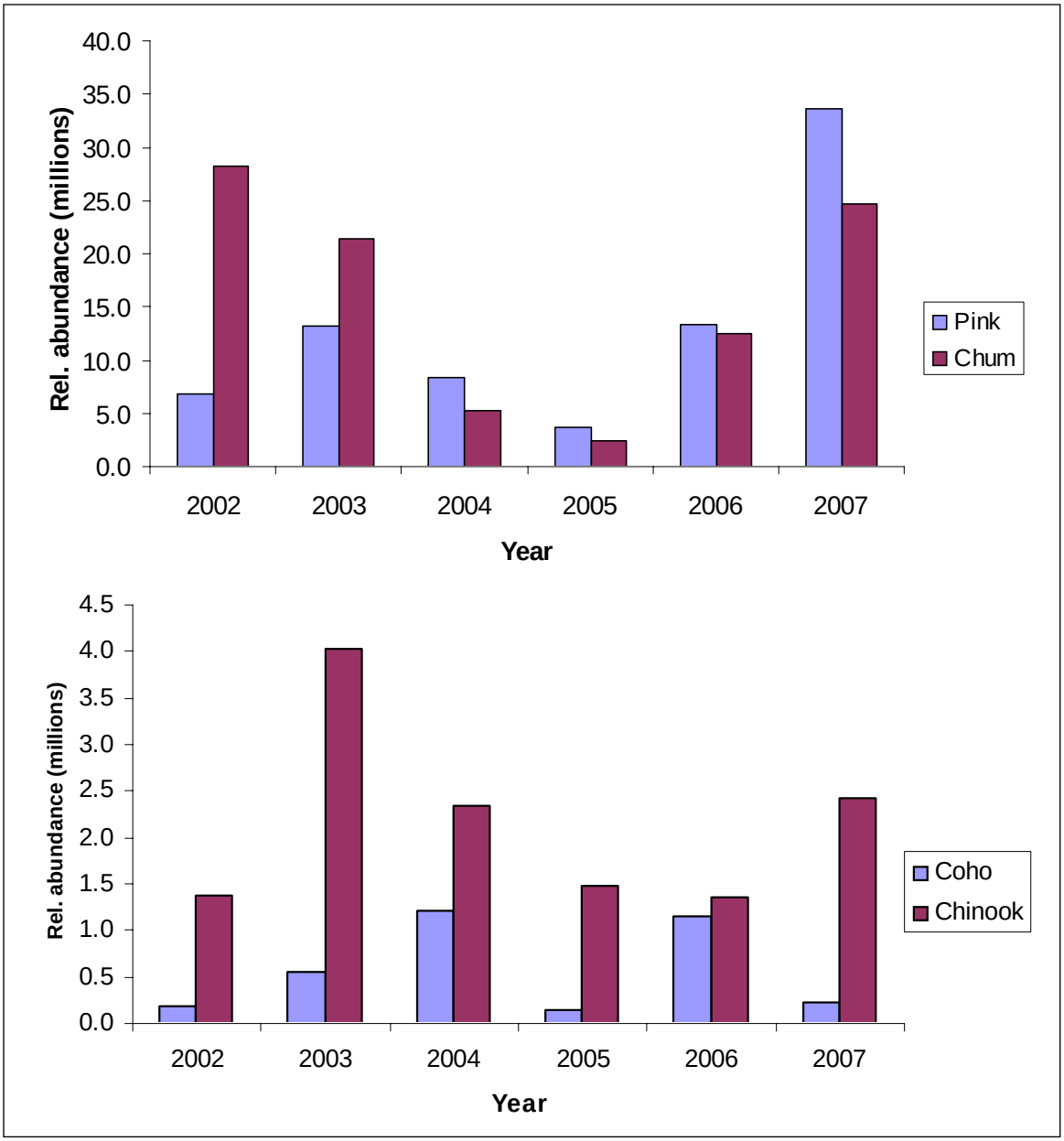


Figure 23.–Relative abundance of juvenile salmon in the Northern Shelf Region (60N-64N) of the U.S. BASIS survey.

APPENDIX A: TABLES

Appendix Table A1.–Alaskan commercial salmon sales and estimated harvest by district 2007.

District/ Subdistrict	Number of Fishermen[a]	Chinook Salmon			Summer Chum Salmon			Fall Chum Salmon			Coho Salmon		
		Sold in Round	Pounds of Roe	Estimated Harvest[b]	Sold in Round	Pounds of Roe	Estimated Harvest[b]	Sold in Round	Pounds of Roe	Estimated Harvest[b]	Sold in Round	Pounds of Roe	Estimated Harvest[b]
1	366	18,616	0	18,616	106,790	0	106,790	38,852	0	38,852	21,720	0	21,720
2	236	13,306	0	13,306	69,432	0	69,432	35,826	0	35,826	21,487	0	21,487
Subtotal	563	31,922	0	31,922	176,222	0	176,222	74,678	0	74,678	43,207	0	43,207
3	3	190	0	190	1	0	1	0	0	0	0	0	0
Total Lower Yukon	566	32,112	0	32,112	176,223	0	176,223	74,678	0	74,678	43,207	0	43,207
Anvik River	0	0	0	0	0	0	0	0	0	0	0	0	0
4-A	5	0	0	0	7,304	5,939	7,304	0	0	0	0	0	0
4-BC	0	0	0	0	0	0	0	0	0	0	0	0	0
4-D	0	0	0	0	0	0	0	0	0	0	0	0	0
Subtotal	5	0	0	0	7,304	5,939	7,304	0	0	0	0	0	0
5-ABC	13	1,241	0	1,241	0	0	0	427	0	427	0	0	0
5-D	0	0	0	0	0	0	0	0	0	0	0	0	0
Subtotal District 5	13	1,241	0	1,241	0	0	0	427	0	427	0	0	0
6	12	281	0	281	14,674	0	14,674	15,572	0	15,572	1,368	0	1,368
Total Upper Yukon	30	1,522	0	1,522	21,978	5,939	21,978	15,999	0	15,999	1,368	0	1,368
Total Alaska	**596**	**33,634**	**0**	**33,634**	**198,201**	**5,939**	**198,201**	**90,677**	**0**	**90,677**	**44,575**	**0**	**44,575**

-continued-

Appendix Table A1.–Page 2 of 2.

Note: See Appendix Tables B1–B5 and B8. See Appendix Figures B1–B5 and B8. Does not include ADF&G test fishery sales.

[a] Number of unique permits fished by district, subdistrict or area. Totals by area may not add up due to transfers between districts or subdistricts.

[b] Unless otherwise noted, estimated harvest is the number of fish sold in the round plus the estimated number of females harvested to produce roe sold (pounds of roe sold divided by weighted average roe weight per female).

Appendix Table A2.–Pilot Station sonar project estimates, Yukon River drainage, 1995, 1997–2007.

Date	Large Chinook	Small Chinook	Total Chinook	Summer Chum	Fall Chum	Coho	Pink	Others	Season Total
1995	130,271	32,674	162,945	3,556,445	1,053,245	101,806	24,604	1,011,855	5,910,900
1997	118,121	77,526	195,647	1,415,641	506,621	104,343	2,379	621,857	2,846,488
1998	71,177	16,675	87,852	826,385	372,927	136,906	66,751	277,566	1,768,387
1999	127,809	16,914	144,723	973,708	379,493	62,521	1,801	465,515	2,027,761
2000	39,233	5,195	44,428	456,271	247,935	175,421	35,501	361,222	1,320,778
2001 [a]	85,511	13,892	99,403	441,450	376,182	137,769	665	353,431	1,408,900
2002	92,584	30,629	123,213	1,088,463	326,858	122,566	64,891	557,779	2,283,770
2003	245,037	23,500	268,537	1,168,518	889,778	269,081	4,656	502,878	3,103,448
2004	110,236	46,370	156,606	1,357,826	594,060	188,350	243,375	637,257	3,177,474
2005 [b]	142,007	17,434	159,441	2,439,616	1,813,589	184,718	37,932	593,248	5,228,544
2006	145,553	23,850	169,403	3,767,044	790,563	131,919	115,624	875,899	5,850,452
2007	90,184	35,369	125,553	1,726,885	684,011	173,289	71,699	1,085,316	3,866,753
Average (1995–2006)	117,727	27,199	144,925	1,393,492	629,801	151,359	57,358	524,665	2,901,600

Note: Estimates for all years were generated with the most current apportionment model and may differ from earlier estimates.

The Pilot Station Sonar did not operate at full capacity in 1996 and therefore passage estimates do not exist.

Others include sockeye salmon, cisco, whitefish, sheefish, burbot, suckers, Dolly Varden, and northern pike.

Large Chinook salmon >655mm.

Estimates for fall chum and coho salmon may not include the entire run.

[a] Record high water levels experienced at Pilot Station in 2001, and therefore passage estimates are considered conservative.

[b] Estimates include extrapolations for the dates June 10 to June 18, 2005 to account for the time the DIDSON was deployed.

Appendix Table A3.–The Yukon River drainage summer chum salmon management plan overview 5AAC 05.362, 2007.

	Required Management Actions Summer Chum Salmon Directed Fisheries			
Projected Run Size [a]	Commercial	Personal Use	Sport	Subsistence
600,000 or Less	Closure	Closure	Closure	Closure [b]
600,000 to 700,000	Closure	Closure	Closure	Possible Restrictions [c]
700,001 to 1,000,000	Restrictions [d]	Restrictions [e]	Restrictions [e]	Normal Fishing Schedules
Greater Than 1,000,000	Open [f]	Open	Open	Normal Fishing Schedules

[a] The department will use best available data, including preseason projections, mainstem river sonar passage estimates, test fisheries indices, subsistence and commercial fishing reports, and passage estimates from escapement monitoring projects to assess the run size.

[b] The department may, by emergency order, open subsistence summer chum salmon directed fisheries where indicators show that the escapement goal(s) in that area will be achieved.

[c] The department shall manage the fishery to achieve drainage wide escapement of no less than 600,000 summer chum salmon, except that the department may, by emergency order, open a less restrictive directed subsistence summer chum fishery in areas where indicator(s) show that the escapement goal(s) in that area will be achieved.

[d] The department may, by emergency order, open commercial fishing in areas that show the escapement goal(s) in that area will be achieved.

[e] The department may, by emergency order, open personal use and sport fishing in areas where indicator(s) show the escapement goal(s) in that area will be achieved.

[f] The department may open a drainage-wide commercial fishery with the harvestable surplus distributed by district or subdistrict in proportion to the guideline harvest levels established in 5 AAC 05.362. (f) and (g).

Appendix Table A4.–The Yukon River drainage fall chum salmon management plan, 5AAC 01.249, 2007.

Run Size Estimate [b] (Point Estimate)	Recommended Management Action [a] Fall Chum Salmon Directed Fisheries				Targeted Drainagewide Escapement
	Commercial	Personal Use	Sport	Subsistence	
300,000 or Less	Closure	Closure	Closure	Closure [c]	300,000 to 600000
300,001 to 500,000	Closure	Closure [c]	Closure [c]	Possible Restrictions [c, d]	
500,001 to 600,000	Restrictions [c]	Open	Open	Pre-2001 Fishing Schedules	
Greater Than 600,000	Open [e]	Open	Open	Pre-2001 Fishing Schedules	

[a] Considerations for the Toklat River and Canadian mainstem rebuilding plans may require more restrictive management actions.

[b] The department will use the best available data, including preseason projections, mainstem river sonar passage estimates, test fisheries indices, subsistence and commercial fishing reports, and passage estimates from escapement monitoring projects.

[c] The fisheries may be opened or less restrictive in areas where indicator(s) suggest the escapement goal(s) in that area will be achieved.

[d] Subsistence fishing will be managed to achieve a minimum drainage-wide escapement goal of 300,000.

[e] Drainage-wide commercial fisheries may be open and the harvestable surplus above 600,000 will be distributed by district or subdistrict (in proportion to the guidelines harvest levels established in 5 AAC 05.365 and 5 AAC 05.367).

Appendix Table A5.–Canadian weekly commercial catches of Chinook, fall chum and coho salmon in the Yukon River in 2007.

Statistical Week	Week Ending	Start Date	Finish Date	Days Fished	Number Fishing	Boat Days	Chinook Salmon	Chum Salmon	Coho Salmon
27	7/7			closed	0	0	0	0	0
28	7/14			closed	0	0	0	0	0
29	7/21			closed	0	0	0	0	0
30	7/28			closed	0	0	0	0	0
31	8/4			closed	0	0	0	0	0
32	8/11			closed	0	0	0	0	0
33	8/18			closed	0	0	0	0	0
34	8/25			closed	0	0	0	0	0
35	9/1			closed	0	0	0	0	0
36	9/8			closed	0	0	0	0	0
37	9/15			closed	0	0	0	0	0
38	9/22	9/19	9/22	3	1.2	3.6	0	1,553	0
39	9/29	9/22	9/26	4	1.5	6	0	1,315	0
40	10/6	9/28	10/5	7	1.9	13	0	3,113	2
41	10/13	10/5	10/12	7	0.7	5	0	1,128	0
Dawson Area Subtotal				21	1.3	28	0	7,109	2
Upriver Commercial Subtotal				21	0	28	0	0	0
Total Commercial Harvest							**0**	**7,109**	**2**
Chinook & Chum Test Fisheries (Chum is live release)							617	(3765)	(2)
Domestic Harvest							0	0	0
Estimated Recreational Harvest							2	0	0
Aboriginal Fishery Catch							4,175	2,221	0
Total Upper Yukon Harvest							**4,794**	**9,330**	**2**
Old Crow Aboriginal Fishery							300	4,500	500
Old Crow Test Fishery								(2622)	

Appendix Table A6.–Salmon fishery projects conducted in the Alaskan portion of the Yukon River drainage in 2007.

Project Name	Location	Primary Objective(s)	Duration	Agency	Responsibility
Commercial Catch and Effort Assessment	Alaskan portion of the Yukon River drainage	-document and estimate the catch and associated effort of the Alaskan Yukon River and -commercial salmon fishery via receipts (fish tickets) of commercial sales of salmon	June - Oct.	ADF&G	all aspects
Commercial Catch Sampling and Monitoring	Alaskan portion of the Yukon River drainage	-determine age, sex, and size of Chinook, chum and coho salmon harvested in Alaskan Yukon River commercial fisheries; -monitor Alaskan commercial fishery openings and closures.	June - Oct.	ADF&G ADPS	all aspects enforcement
Subsistence and Personal Use Catch and Effort Assessment	Alaskan portion of the Yukon River drainage	-document and estimate the catch and associated effort of the Alaskan Yukon River subsistence salmon fishery via interviews, catch calendars, mail-out questionnaires, telephone interviews, and subsistence fishing permits, and of the personal use fishery based on fishery permits.	ongoing	ADF&G	all aspects
Sport Catch, Harvest and Effort Assessment	Alaskan portion of the Yukon River drainage	-document and estimate the catch, harvest, and associated effort of the Alaskan Yukon River sport fishery via post-season mail-out questionnaires.	post season	ADF&G	all aspects
Yukon River Chinook Microsatellite Baseline	Yukon River drainage	-survey standardized microsatellites and Yukon River Chinook salmon populations.	ongoing	ADF&G DFO	U.S. populations Canada populations
Yukon River Salmon Stock Identification	Yukon River drainage	-estimate Chinook salmon stock composition of the various Yukon River drainage harvests through genetic stock identification, age compositions, and geographical distribution of catches and escapements.	ongoing	ADF&G	all aspects
Yukon River Chum and Chinook Mixed-Stock Analysis	Pilot Station, RM 123	-estimate the stock compositions of Chinook and chum salmon using samples collected from Pilot Station sonar test fisheries	May-Aug	USFWS	all aspects
YRDFA Weekly Teleconference	Yukon River drainage	-acts as a forum for fishers along the Yukon River to interact with state and federal managers for the collection and dissemination of fisheries information.	May - Sept.	YRDFA	all aspects
Lower Yukon River Set Gillnet Test Fishing	South, Middle, and North mouths of the Yukon River delta, RM 20	-index Chinook salmon run timing and abundance using set gillnets. -sample captured salmon for age, sex, size composition information.	June - Aug.	ADF&G	all aspects

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Project Name	Location	Primary Objective(s)	Duration	Agency	Responsibility
Lower Yukon River Drift Test Fishing	South, Middle, and North mouths of the Yukon River delta, RM 20	-index Chinook, summer and fall chum, and coho salmon run timing and abundance using drift gillnets. -sample captured salmon for age, sex, size composition information.	June - Aug.	ADF&G	all aspects
Mountain Village Drift Gillnet Test Fishing	Mainstem Yukon River, RM 87	-index fall chum and coho salmon run timing and relative abundance using drift gillnets. -sample captured salmon for age, sex, size composition information.	July - Sept.	Asa'carsarmiut Trad. Council	all aspects R&M funding
East Fork Weir, Andreafsky River	mile 20 East Fork RM 124	-estimate daily escapement, with age, sex and size composition, of Chinook and summer chum salmon into the East Fork of the Andreafsky River.	June - Aug.	USFWS -	all aspects OSM funding
Yukon River Sonar	Pilot Station, RM 123	-estimate Chinook and summer and fall chum salmon passage in the mainstem Yukon River. Apportionment of species including coho salmon and other finfish.	June - Aug.	ADF&G AVCP	all aspects
Anvik River Sonar	Mile 40 Anvik River, RM 358	-estimate daily escapement of summer chum salmon to the Anvik River; -estimate age, sex, and size composition of the summer chum salmon escapement.	June - July	ADF&G	all aspects
Kaltag Creek Tower	Mile 1 Kaltag Creek, RM 451	-estimate daily escapement of Chinook and summer chum salmon into Kaltag Creek; -estimate age, sex, and size composition of the summer chum salmon escapement.	June - July	City of Kaltag ACES BSFA	all aspects provided funding provided funding R&E funding
Gisasa River Weir	Mile 3 Gisasa River, Koyukuk River drainage, RM 567	-estimate daily escapement of Chinook and summer chum salmon into the Gisasa River; -estimate age, sex, and size composition of the Chinook and summer chum salmon escapements.	June - Aug.	USFWS	all aspects OSM funding
Henshaw Creek Weir	mile 1 Henshaw Creek, RM 976	-estimate daily escapement of Chinook and summer chum salmon into Henshaw Creek; -estimate age, sex, and size composition of the Chinook and summer chum salmon escapements (OSM 2005-2007)	June - Aug.	TCC USFWS-OSM	all aspects oversite & funding report write-up
Chandalar River Sonar	mile 14 Chandalar River, RM 996	-estimate fall chum salmon passage using DIDSON sonar in the Chandalar River. -estimate sex and size composition of fall chum salmon escapement. -collect ASL data including vertebrae.	Aug. - Sept.	USFWS	all aspects R&M funding

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Project Name	Location	Primary Objective(s)	Duration	Agency	Responsibility
Sheenjek River Sonar	mile 6 Sheenjek River, Porcupine River drainage, RM 1,060	-estimate daily escapement of fall chum salmon into the Sheenjek River using DIDSON sonar and counted both left and right banks. -estimate age, sex, and size composition of the fall chum salmon escapement.	Aug. - Sept.	ADF&G	all aspects
Eagle Sonar	Mainstem Yukon River Eagle, RM 1,213	-estimate daily passage of Chinook and chum salmon in the mainstem Yukon River using both split-beam and DIDSON. -estimate age, sex, and size composition of salmon captured in the test nets.	Jul.-Oct.	ADF&G DFO	all aspects technical support
Kaltag Village Drift Gillnet Test Fishing	Mainstem Yukon River Kaltag, RM 451	-index fall chum and coho salmon run timing and relative abundance using drift gillnets. -sample captured salmon for age, sex, size composition information.	July - Sept.	City of Kaltag	all aspects R&E funding
Middle Yukon River Chinook Sampling Project	Mainstem Yukon River Kaltag, RM 451	-estimate age, sex, and size composition of Chinook salmon harvested in middle Yukon River subsistence fisheries	June - July	City of Kaltag USFWS-OSM	all aspects R&E funding
Nenana River Escapement Surveys	Nenana River drainage, above RM 860	-aerial and ground surveys for numbers and distribution of coho and chum salmon in 10 tributaries of the Nenana below Healy Creek.	Sept. - Oct.	ADF&G	all aspects
Rapids Fish Wheel Test Fishing	Mainstem Yukon River RM 730	-index run timing of Chinook and fall chum salmon runs as well as non-salmon species using video monitoring techniques.	June-Sept.	Zuray USFWS	all aspects R&E funding
Nenana Test Fish Wheel Test Fishing Tag Recovery	mainstem Tanana River Nenana, RM 860	-index the timing of Chinook, summer chum, fall chum, and coho salmon runs using test fish wheels. Tag recovery fish wheel for fall chum salmon for Tanana Tagging mark-recapture project.	June - Sept.	ADF&G OSM USFWS	all aspects fall season contract tech support R&M funding
Tanana Tagging Mark-recapture	mainstem Tanana River between RM 793 and 860.	-estimate the population size of the Tanana River fall chum salmon run above the confluence of the Kantishna River using mark-recapture methodology;	Aug. - Sept.	ADF&G OSM	all aspects funding
Tozitna River Weir	Mile 50 Tozitna River Yukon River, RM 681	-estimate daily escapement of Chinook and summer chum salmon into the Tozitna River, -estimate age, sex and size comp of the Chinook and summer chum escapement	June-Aug.	BLM TTC	all aspects

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Project Name	Location	Primary Objective(s)	Duration	Agency	Responsibility
Kantishna River Mark-recapture	Kantishna River RM 800	-provide a mark-recapture abundance estimate for fall chum salmon within the Kantishna River drainage.	Aug–Oct.	ADF&G BSFA TCC OSM	all aspects R&M funding for tagging fish wheel fund recovery fish wheels funding
Toklat River Tag Recovery	Toklat River Recovery RM 848	-index run timing of fall chum and coho salmon using test fish wheels. -recover tags from fall chum salmon for the Kantishna mark-recapture project.	Aug–Oct.	ADF&G	all aspects
Kantishna River Tag Recovery	Kantishna River RM 880	-index run timing of fall chum and coho salmon using test fish wheels. -recover tags from fall chum salmon for the Kantishna mark-recapture project.	Aug–Oct.	ADF&G TCC	all aspects funding for fish wheel contract
Delta River Ground Surveys	Tanana River drainage, RM 1,031	-estimate fall chum spawning escapement in Delta River. -recover tags from Upper Tanana mark-recapture program. -sample fall chum salmon carcasses for age, sex, and size composition information.	Oct.-Dec.	ADF&G	all aspects
Chena River Tower	Chena River, Tanana River drainage, RM 921	-estimate daily escapement of Chinook and summer chum salmon into the Chena River.	July–Aug.	ADF&G	all aspects
Salcha River Tower	Salcha River, Tanana River drainage, RM 967	-estimate daily escapement of Chinook and summer chum salmon into the Salcha River.	July–Aug.	BSFA	all aspects R&M funding
Goodpaster River Tower	Goodpaster River, Tanana River drainage, RM 1,049	-estimate daily escapement of Chinook and summer chum salmon into the Goodpaster River.	July	TCC	all aspects Pogo Mine funding
Upper Yukon River Chum Salmon Genetic Stock Identification	Yukon River drainage	-establish the feasibility of using DNA marks for genetic stock identification of chum salmon in the Yukon River. OSM 2006-2008	June–Oct	USFWS	all aspects
Ichthyophonus Sampling	Emmonak, RM 20	-determine prevalence of Ichthyophonus at lower Yukon Emmonak site.	May-July	ADF&G	all aspects R&E funding

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Project Name	Location	Primary Objective(s)	Duration	Agency	Responsibility
Marshall Test Fish	Mainstem Yukon River RM 161	-index Chinook, summer and fall chum, and coho salmon run timing and abundance using drift gillnets. -sample captured salmon for age, sex, size composition information.	June - July	AVCP	all aspects
Clear Creek Videography	Mile 1 Clear Creek Hogatza River drainage	-estimate daily escapement of summer chum salmon into Clear Creek using video monitoring equipment. Estimate sex composition of summer chum escapement.	June - Aug.	BLM	all aspects
Yukon River Inseason Salmon Harvest Interviews	Emmonak, Holy Cross, Nulato, Huslia, Galena, and Beaver Primary	-collect qualitative inseason subsistence salmon harvest information through weekly interviews.	June-Sept	USFWS YRDFA	all aspects OSM funding
Migratory Timing and Harvest Information of Chinook Salmon Stocks	Yukon River drainage	-enlarge existing allozyme and develop a DNA database to characterize the genetic diversity of Chinook salmon in the Yukon River within the U.S. and Canada. U.S. collections, microsatellites, allozyme. Can. Collections, microsatellites.	June-Aug.	USFWS ADF&G DFO OSM	all aspects
Juvenile Chinook Rearing in non-natal streams	Yukon River downstream of the Canadian border	-capture juvenile Chinook salmon in non-natal Yukon River tributary streams. -determine whether Canadian-origin juvenile Chinook salmon rear in Yukon River tributary streams of the United States using genetic techniques -describe non-natal stream rearing habitat characteristics for habitat characteristics for Yukon River Chinook salmon.	July-Aug.	USFWS	all aspects
Comparative Mesh Size Study	Y-1 near Emmonak	-determine if the proportion of Chinook and chum salmon caught varies by mesh size. -determine if age, sex, length, weight, and girth of individual Chinook salmon caught varies by mesh size. -evaluate the marketability of the catch from the various mesh sizes,	June-July 3 years	ADF&G YDFDA	all aspects

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Project Name	Location	Primary Objective(s)	Duration	Agency	Responsibility
Gillnet catch composition in lower and middle Yukon River fisheries	Yukon District Y-1	-determine the weight and girth of individual Chinook salmon caught in the Lower Yukon River Test Fishery at Big Eddy and Middle Mouth and Rampart Rapids fish wheels. -characterize the weight and girth composition of Chinook salmon caught in the Lower Yukon Test Fishery and Rampart Rapids fish wheels by run timing.		YRDFA ADF&G	all aspects R&E funding

Agency Acronyms:

ADF&G = Alaska Department of Fish and Game
ADPS = Alaska Department of Public Safety
AVCP = Association of Village Council Presidents, Inc.
BSFA = Bering Sea Fishermen's Association
BLM = Bureau of Land Management
DFO = Department of Fisheries and Oceans (Canada)
NPS = National Park Service
TCC = Tanana Chiefs Conference, Inc.
TTC = Tanana Tribal Council
USFWS = United States Fish and Wildlife Service
USFWS-OSM = United States Fish and Wildlife Service, Office of Subsistence Management
YRDFA = Yukon River Drainage Fisheries Association

Appendix Table A7.–List of harvest/escapement monitoring and incubation/rearing projects involving salmon in the Canadian portion of the Yukon River drainage in 2007.

Project Name	Location	Primary Objective(s)	Duration	Agency	Responsibility
Upper Yukon Tagging Program (mark-recapture)	Yukon River downstream of Dawson City	-to obtain population, and escapement estimates of Chinook and chum salmon in the Canadian section of the mainstem Yukon River -to collect stock ID, age, size, sex composition data -to participate in the Eagle sonar program	June - Oct	DFO	all aspects
Chinook and Chum Test Fishery	Yukon River near Dawson City	-to provide catch and tag recovery information for the mark recapture program as required (both required in 2007) -to provide ASL samples (the Chinook test fishey uses nets, while the chum test fishery uses live release fish wheels	July-Oct	YRCFA, THFN	all aspects
Commercial Catch Monitoring	Yukon River near Dawson City	-to determine weekly catches and effort in the Canadian commercial fishery (CM and CK), and recovery of tags -to collect ASL information and DNA samples	July - Oct	DFO	all aspects
Aboriginal Catch Monitoring	Yukon communities	-to determine weekly catches and effort in the aboriginal fishery and recover tags -to implement components of the UFA and AFS	July - Oct	YFN's DFO	joint project
Recreational Catch Monitoring	Yukon River mainstem and tributaries	-to determine the recreational harvest, landed and retained, of salmon caught in the Yukon through a catch card program	July-Oct	DFO	all aspects
DFO Escapement Index Surveys	Chinook and chum aerial index streams	-to obtain counts in index areas including: Big Salmon, L. Salmon Wolf, Nisutlin, Mainstem Yukon, Kluane & Teslin rivers	Aug - Nov	DFO	all aspects

-continued-

Appendix Table A7.–Page 2 of 3.

Project Name	Location	Primary Objective(s)	Duration	Agency	Responsibility
Escapement Surveys and DNA Collection	throughout upper Yukon R. drainage	-to conduct surveys of spawning fish by foot, boat, air etc. -to enumerate and recover tags in terminal areas -to collect DNA samples from spawning population and aggregate samples from fisheries and large migration corridors	July-Oct	various R&E Projects DFO YFN's AFS	all aspects
Fishing Branch Chum Salmon Weir	Fishing Branch River	-to enumerate chum salmon returning to the Fishing Branch River and obtain age, size, tag and sex composition data	Aug-Oct	DFO VGG	joint project
Whitehorse Rapids Fishway	Whitehorse	-to enumerate wild and hatchery reared Chinook returns to the Whitehorse fishway area and obtain age, size, sex and tag data	July-Aug	YF&GA	all aspects
Blind Creek Weir	Pelly River	-to enumerate Chinook escapement and recover tags -to collect ASL data and DNA samples	July-Aug	JW&A	all aspects
Big Salmon Sonar	Big Salmon River	-to install and operate a DIDSON sonar program for Chinook -carcass survery for tags, ASL, and DNA	July-Aug	JW&A	all aspects
Escapement Sampling	Various tributaries	-to collect ASL data and DNA samples	Aug-Oct	DFO	all aspects
Porcupine Mark-Recapture Program	Porcupine River	-to conduct chum marking and test fishery program -to establish method of conducting in-season local management	Aug-Oct	EDI & VGG	all aspects
Whitehorse Rapids Fish Hatchery and Coded-Wire Tagging Project	Whitehorse	-to rear and release ~150K Chinook fry produced from Whitehorse Rapids Fishway broodstock -to mark fry with a CWT, adipose clip, and release upstream of the Whitehorse hydroelectric facility	ongoing	RR, YEC YF&GA	all aspects coded wire tagging

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Appendix Table A7.–Page 3 of 3.

Project Name	Location	Primary Objective(s)	Duration	Agency	Responsibility
MacIntyre Incubation Box and Coded-Wire Tagging Project	Whitehorse	-to rear up to 120K Chinook fry from broodstock collected from	ongoing	DFO	technical support
		the Takhini River and/or Tatchun Creek		YC	field work, project
		-to mark fry with a CWT, adipose clip, and release at natal sites		NRI	monitoring

Acronyms:
AFS = Aboriginal Fisheries Strategy
DFO = Department of Fisheries and Oceans Canada
EDI = Environmental Dynamics Incorporated
JW&A = Jane Wilson & Associates
M&A = Mercer and Associates Ltd.
NRI = Northern Research Institute
RR = Government of Yukon- Renewable Resources
THFN = Tr'ondek Hwech'in First Nation
VGG = Vuntut Gwitchin Government
YC = Yukon College
YEC = Yukon Energy Corporation
YFN's = Yukon First Nation's
YFGA = Yukon Fish and Game Association
YRCFA = Yukon River Commercial Fishers Association
YSC = Yukon Salmon Committee

Appendix Table A8.–Yukon River Canadian Chinook salmon total run by brood year, and escapement by year, 1982–present, and recruits per spawner (R/S).

Brood	Age Group by Brood Year						Total		Return per
Year	3	4	5	6	7	8	Return	Escapement	Spawner
1974						596			
1975					27,199	162			
1976				75,458	19,698	30			
1977			15,436	100,941	16,171	593			
1978		3,616	20,758	51,613	22,839	1,136			
1979	1,534	3,159	16,001	80,761	39,130	851	141,436		
1980	15	4,830	10,413	58,879	27,603	3,409	105,149		
1981	0	1,050	29,283	97,369	49,079	1,348	178,129		
1982	0	5,083	13,907	32,119	20,417	334	71,860	19,790	3.63
1983	560	6,283	31,679	68,304	13,110	134	120,070	28,988	4.14
1984	69	12,586	28,841	61,586	10,591	114	113,787	27,615	4.12
1985	223	10,160	34,439	49,235	4,171	91	98,319	10,731	9.16
1986	347	20,207	40,128	99,601	14,798	138	175,219	16,414	10.67
1987	0	2,309	30,007	63,125	8,298	18	103,757	13,260	7.82
1988	0	6,491	32,391	60,038	7,393	68	106,381	23,118	4.60
1989	61	13,392	67,329	114,496	19,778	0	215,056	25,200	8.53
1990	45	6,185	22,572	48,488	8,586	9	85,885	37,700	2.28
1991	357	6,897	66,055	109,487	8,533	0	191,329	20,743	9.22
1992	6	2,459	22,318	33,018	1,556	0	59,357	25,381	2.34
1993	6	5,172	27,364	65,264	4,666	0	102,472	28,559	3.59
1994	0	597	16,123	21,496	5,290	0	43,506	25,889	1.68
1995	16	1,675	11,955	45,883	6,865	10	66,403	32,262	2.06
1996	6	194	20,831	43,183	11,230	2	75,446	28,410	2.66
1997	6	3,527	25,679	73,716	6,852	14	109,795	37,684	2.91
1998	0	3,419	30,372	69,404	3,109	0	106,304	16,751	6.35
1999	126	1,542	26,626	53,148	1,692	6	83,139	11,362	7.32
2000	0	5,555	29,100	41,245	5,029			11,344	
2001	0	1,483	39,931	55,237				42,438	
2002	39	1,950	29,138					40,145	
2003	28	3,045						47,486	
2004	13							37,165	
2005								31,268	
2006								27,990	
Average (1982-1999)							107,116	23,881	4.49

Contrast	**4.43**

Note: 2007 data (shaded cells) are preliminary.

Appendix Table A9.–Chinook salmon age and sex percentages from selected Yukon River escapement projects, 2007.

Location	Sample Size		Age 3	4	5	6	7	8	Total
East Fork	631	Males	0.0	25.5	18.0	11.5	0.4	0.0	55.3
Andreafsky River [a]		Females	0.0	16.2	7.7	20.6	0.3	0.0	44.7
		Total	0.0	41.7	25.7	32.0	0.6	0.0	100.0
Gisasa River [a]	336	Males	0.0	26.1	17.9	17.0	0.0	0.0	61.0
		Females	0.0	4.2	2.8	31.7	0.2	0.0	39.0
		Total	0.0	30.4	20.7	48.7	0.2	0.0	100.0
Henshaw Creek [a]	258	Males	0.0	46.6	15.9	12.6	0.0	0.0	75.1
		Females	0.0	0.0	4.5	20.5	0.0	0.0	24.9
		Total	0.0	46.6	20.4	33.0	0.0	0.0	100.0
Salcha River [b]	308	Males	0.0	22.1	23.4	18.8	0.0	0.0	64.3
		Females	0.0	0.3	3.6	31.5	0.3	0.0	35.7
		Total	0.0	22.4	26.9	50.3	0.3	0.0	100.0
Tozitna River [a]	217	Males	0.0	29.2	31.7	13.1	0.0	0.0	73.9
		Females	0.0	0.0	3.3	22.4	0.4	0.0	26.1
		Total	0.0	29.2	35.0	35.4	0.4	0.0	100.0

[a] Samples were collected from a weir trap.

[b] Samples were collected from carcasses.

Appendix Table A10.–Summer chum salmon age and sex percentages from selected Yukon River escapement projects, 2007.

Location	Sample Size		Age 3	4	5	6	7	Total
Anvik River [a]	560	Males	0.1	24.5	13.2	4.0	0.0	41.8
		Females	1.0	36.0	16.4	4.8	0.0	58.2
		Total	1.1	60.5	29.6	8.8	0.0	100.0
East Fork Andreafsky River [b]	805	Males	1.1	37.0	12.9	2.1	0.0	53.2
		Females	0.3	34.4	10.0	2.1	0.0	46.8
		Total	1.4	71.5	22.9	4.2	0.0	100.0
Gisasa River [b]	579	Males	0.8	25.0	15.7	2.9	0.0	44.4
		Females	1.5	30.5	20.9	2.7	0.0	55.6
		Total	2.3	55.5	36.6	5.6	0.0	100.0
Henshaw Creek [b]	540	Males	0.8	33.1	20.4	1.7	0.0	56.0
		Females	1.4	25.8	16.2	0.5	0.0	44.0
		Total	2.2	59.0	36.6	2.2	0.0	100.0
Tozitna River [b]	708	Males	1.3	36.4	17.7	2.0	0.0	57.4
		Females	0.7	28.1	13.2	0.7	0.0	42.6
		Total	2.0	64.5	30.9	2.7	0.0	100.0
Salcha River [c, d]	159	Males	1.3	18.2	14.5	5.0	1.9	40.9
		Females	3.1	30.8	18.9	6.3	0.0	59.1
		Total	4.4	49.1	33.3	11.3	1.9	100.0

[a] Samples were collected by beach seine.
[b] Samples were collected from a weir trap.
[c] Samples were collected from carcasses.
[d] Ages determined from vertebrae.

Appendix Table A11.–Total Yukon River Chinook salmon harvest proportion by stock group, 1981–2007.

Year [a]	Lower [b]	Middle [c]	U.S.	Upper [d] Canada	Total
1981	0.054	0.545	0.313	0.088	0.401
1982	0.139	0.247	0.513	0.101	0.614
1983	0.129	0.337	0.446	0.087	0.533
1984	0.253	0.402	0.251	0.094	0.345
1985	0.276	0.223	0.409	0.092	0.501
1986	0.195	0.096	0.587	0.122	0.709
1987	0.159	0.196	0.560	0.086	0.645
1988	0.218	0.158	0.498	0.126	0.625
1989	0.244	0.159	0.494	0.102	0.597
1990	0.202	0.252	0.433	0.114	0.547
1991	0.280	0.253	0.349	0.118	0.467
1992	0.163	0.218	0.523	0.096	0.619
1993	0.215	0.254	0.439	0.092	0.531
1994	0.182	0.214	0.494	0.110	0.604
1995	0.179	0.224	0.492	0.105	0.597
1996	0.210	0.104	0.562	0.124	0.686
1997	0.264	0.168	0.482	0.086	0.569
1998	0.327	0.174	0.442	0.056	0.498
1999	0.401	0.063	0.445	0.091	0.536
2000	0.339	0.123	0.441	0.097	0.538
2001	0.316	0.160	0.365	0.159	0.524
2002	0.194	0.292	0.393	0.121	0.514
2003	0.068	0.289	0.554	0.089	0.643
2004 [e]	0.153	0.288	0.468	0.091	0.559
2005	0.207	0.214	0.464	0.115	0.579
2006 [f]	0.175	0.279	0.460	0.087	0.546
2007 [g]					
Avg. (1981–2005)	0.206	0.235	0.459	0.101	0.560

[a] Stock identification methods from 1981 through 2003 were based on scale pattern analysis. Beginning in 2004, genetic analysis was used.

[b] From 1981 through 2003, the Lower River stock group included Koyukuk River stocks downstream from and including the Gisasa River, and those stocks spawning in Yukon River tributaries downstream from the Koyukuk River. Beginning in 2004, Yukon River tributaries between the Koyukuk and Tanana rivers were included with the Lower River stock group.

[c] From 1981 through 2003, the Middle River stock group included all Tanana River stocks, all Koyukuk River stocks upstream from the Gisasa River, and those stocks spawning in Yukon River tributaries between the Koyukuk and Tanana rivers. Beginning in 2004, those stocks spawning in Alaskan tributaries upstream of the Yukon River and Tanana River confluence were added to the Middle River stock group and Yukon River tributaries between the Koyukuk and Tanana rivers were excluded.

[d] From 1981 through 2003, the Upper River stock group included all stocks spawning upstream from the Yukon River and Tanana River confluence. Beginning in 2004, the Upper River stock group included all Yukon River stocks spawning upstream from Fort Yukon.

[e] Lower, Middle, and Upper stock group boundaries changed in 2004 based on genetic analysis. Commercial harvest samples collected in 2004 from Subdistricts 5-B and 5-C included Lower and Middle stock groups. Previously, fish harvested in these subdistricts were assumed to belong to the Upper stock group only.

[f] 2006 data are preliminary.

[g] 2007 data are not available.

Appendix Table A12.–Yukon River Chinook salmon harvest proportion by stock group in Alaska, 1981–2007.

Year [a]	Stock Group		
	Lower [b]	Middle [c]	Upper [d]
1981	0.059	0.598	0.343
1982	0.154	0.275	0.571
1983	0.142	0.370	0.489
1984	0.280	0.443	0.277
1985	0.304	0.246	0.451
1986	0.223	0.109	0.668
1987	0.174	0.214	0.612
1988	0.249	0.181	0.570
1989	0.272	0.177	0.551
1990	0.228	0.284	0.488
1991	0.318	0.287	0.396
1992	0.180	0.241	0.578
1993	0.237	0.280	0.483
1994	0.204	0.241	0.555
1995	0.200	0.250	0.550
1996	0.240	0.118	0.642
1997	0.289	0.183	0.528
1998	0.347	0.185	0.468
1999	0.441	0.069	0.490
2000	0.375	0.136	0.489
2001	0.375	0.190	0.434
2002	0.221	0.332	0.447
2003	0.075	0.317	0.608
2004 [e]	0.169	0.316	0.515
2005	0.234	0.242	0.524
2006 [f]	0.192	0.305	0.503
2007 [g]			
Average (1981-2005)	0.229	0.261	0.510

[a] Stock identification methods from 1981 through 2003 were based on scale pattern analysis. Beginning in 2004, genetic analysis was used.

[b] From 1981 through 2003, the Lower River stock group included Koyukuk River stocks downstream from and including the Gisasa River, and those stocks spawning downstream from the Koyukuk River. Beginning in 2004, Yukon River tributaries between the Koyukuk and Tanana rivers were included with the Lower River stock group.

[c] From 1981 through 2003, the Middle River stock group included all Tanana River stocks, all Koyukuk River stocks upstream from the Gisasa River, and those stocks spawning in Yukon River tributaries between the Koyukuk and Tanana rivers. Beginning in 2004, those stocks spawning in Alaskan tributaries upstream of the Yukon River and Tanana River confluence were added to the Middle River stock group and Yukon River tributaries between the Koyukuk and Tanana rivers were excluded.

[d] From 1981 through 2003, the Upper River stock group included all stocks spawning upstream from the Yukon River and Tanana River confluence. Beginning in 2004, the Upper River stock group included all Yukon River stocks spawning upstream from Fort Yukon.

[e] Lower, Middle, and Upper stock group boundaries changed in 2004 based on genetic analysis. Commercial harvest samples collected in 2004 from Subdistricts 5-B and 5-C included Lower and Middle stock groups. Previously, fish harvested in these subdistricts were assumed to belong to the Upper stock group only.

[f] 2006 data are preliminary.

[g] 2007 data are not available.

Appendix Table A13.–Upper stock group proportion, by country, from the Yukon River Chinook salmon harvest, 1981–2007.

	Upper Stock Group [a]	
Year [b]	Alaska	Canada
1981	0.781	0.219
1982	0.835	0.165
1983	0.837	0.163
1984	0.727	0.273
1985	0.816	0.184
1986	0.827	0.173
1987	0.867	0.133
1988	0.798	0.202
1989	0.829	0.171
1990	0.792	0.208
1991	0.748	0.252
1992	0.845	0.155
1993	0.826	0.174
1994	0.818	0.182
1995	0.824	0.176
1996	0.819	0.181
1997	0.848	0.152
1998	0.888	0.112
1999	0.830	0.170
2000	0.819	0.181
2001	0.698	0.303
2002	0.763	0.235
2003	0.862	0.138
2004 [c]	0.837	0.163
2005	0.801	0.199
2006 [d]	0.841	0.159
2007 [e]		
Average (1981-2005)	0.820	0.180

[a] From 1981 through 2003, the Upper Stock Group included all stocks spawning upstream from the Yukon and Tanana river confluence. Beginning in 2004, the Upper Stock Group included all Yukon River stocks spawning upstream of Fort Yukon.

[b] Stock identification methods from 1981 through 2003 were based on scale pattern analysis. Beginning in 2004, genetic analysis was used.

[c] The Upper Stock Group boundary changed in 2004 based on genetic analysis. Commercial harvest samples collected in 2004 from Subdistricts 5-B and 5-C included Lower and Middle stock groups. Previously, fish harvested in these subdistricts were assumed to belong to the Upper Stock Group only.

[d] 2006 data are preliminary.

[e] 2007 data are not available.

Appendix Table A14.–Summary of releases for coded wire tagged Chinook salmon from Whitehorse Hatchery, 1985–2007.

Release Location	Release Date*	Code	# Tagged & Clipped [c]	Adipose Clipped Only	% Tag-Loss	Days [a]	Sample Size	Total Clipped	Weight (grams)	Total Unclipped	Total Released
Michie	25-May-85	02-32-48	26,670	518	0.0191 [b]			27,188		0	
Michie	25-May-85	02-32-26	28,269	518	0.0180 [b]			28,787		0	
Michie	25-May-85	02-32-47	43,325	518	0.0118 [b]			43,843		0	
Wolf	1985	no-clip	0	0				0		10,520	10,520
SUM	1985		98,264	1,555				99,819		10,520	110,339
Michie	1986	02-37-31	77,170					77,170		1,000	78,170
Wolf	1986							0		5,720	5,720
SUM	1986		77,170					77,170		6,720	83,890
Michie	5-Jun-87	02-48-12	47,644	1,361	0.0278 [b]		?	49,005	2.50	9,598	58,603
Michie	5-Jun-87	02-48-13	49,344	808	0.0161 [b]		?	50,152	2.50	9,141	59,293
Michie	5-Jun-87	02-48-14	51,888	559	0.0107 [b]		?	52,447	2.50	9,422	61,869
Michie	5-Jun-87	02-48-15	43,367	2,066	0.0455 [b]		?	45,433	2.50	7,868	53,301
Michie	5-Jun-87	02-42-58	25,945	245	0.0094 [b]		?	26,190	2.50	4,171	30,361
Wolf	30-May-87	02-42-59	26,752	123	0.0046 [b]		?	26,875	2.50	422	27,297
SUM	1987		244,940	5,162				250,102		40,622	290,724
Michie	10-Jun-88	02-55-49	77,670	1,991	0.0250	15	?	79,661	2.80	84,903	164,564
Michie	10-Jun-88	02-555-0	78,013	1,592	0.0200	11	?	79,605	2.70	85,288	164,893
Wolf	5-Jun-88	no-clip	0	0				0		25,986	25,986
SUM	1988		155,683	3,583				159,266		196,177	355,443
Wolf	1989	no-clip	0	0				0		22,388	22,388
Michie	6-Jun-89	02-60-04	26,161	326	0.0123 [b]		500	26,487	2.30	0	26,487
Michie	6-Jun-89	02-60-05	24,951	128	0.0051 [b]		500	25,079	2.30	0	25,079
Michie	6-Jun-89	02-60-06	25,098	291	0.0115 [b]		500	25,389	2.40	0	25,389
Michie	6-Jun-89	02-60-07	25,233	156	0.0061 [b]		500	25,389	2.20	95,724	121,113
Fishway	6-Jun-89	02-60-08	25,194	357	0.0140 [b]		500	25,551	2.70	0	25,551
Fishway	6-Jun-89	02-60-09	25,190	351	0.0137 [b]		500	25,541	2.70	0	25,541
SUM	1989		151,827	1,609				153,436		118,112	271,548
Wolf	6-Jun-90	no-clip	0	0				0		11,969	11,969
Michie	2-Jun-90	02-02-38	24,555	501	0.0200 [b]		500	25,056	2.30	0	25,056
Michie	2-Jun-90	02-02-39	24,345	753	0.0300 [b]		500	25,098	2.30	0	25,098

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Appendix Table A14.–Page 2 of 6.

Release Location	Release Date*	Code	# Tagged Adipose & Clipped [c]	Clipped Only	% Tag-Loss	Days [a]	Sample Size	Total Clipped	Weight (grams)	Total Unclipped	Total Released
Fishway	2-Jun-90	02-02-60	24,508	501	0.0200 [b]		500	25,009	2.20	0	25,009
Fishway	2-Jun-90	02-02-63	25,113	254	0.0100 [b]		500	25,367	2.20	0	25,367
SUM	1990		98,521	2,009				100,530		11,969	112,499
Wolf	8-Jun-91	18-03-22	49,477	793	0.0158 [b]		500	50,270	2.30	0	50,270
Fishway	6-Jun-91	18-03-23	52,948	193	0.0036 [b]		500	53,141	2.30	0	53,141
Michie	6-Jun-91	18-03-24	50,020	176	0.0035 [b]		500	50,196	2.30	87,348	137,544
SUM	1991		152,445	1,162				153,607		87,348	240,955
Wolf	4-Jun-92	18-08-29	48,239	0	0.0000 [b]		500	48,239	2.40	0	48,239
Fishway	4-Jun-92	18-08-28	49,356	99	0.0020 [b]		500	49,455	2.30	0	49,455
Michie	4-Jun-92	18-08-30	52,946	643	0.0120 [b]		500	53,589	2.20	249,166	302,755
SUM	1992		150,541	742				151,283		249,166	400,449
Wolf	6-Jun-93	18-12-15	50,248	0	0.0000 [b]		500	50,248	2.30	0	50,248
Fishway	6-Jun-93	18-12-16	49,957	434	0.0086 [b]		500	50,391	2.30	0	50,391
Michie	6-Jun-93	18-12-17	50,169	0	0.0000 [b]		500	50,169	2.30	290,647	340,816
SUM	1993		150,374	434				150,808		290,647	441,455
Wolf	2-Jun-94	18-14-27	50,155	270	0.0054 [b]		500	50,425	2.30	0	50,425
Michie	2-Jun-94	18-14-28	50,210	127	0.0025 [b]		500	50,337	2.30	158,780	209,117
Fishway	2-Jun-94	18-14-29	50,415	125	0.0025 [b]		500	50,540	2.30	0	50,540
SUM	1994		150,780	522				151,302		158,780	310,082
Wolf	6-Jun-95	18-12-46	10,067	164	0.0160	3	100	10,231	1.67	0	10,231
Wolf	6-Jun-95	18-12-47	9,122	0	0.0000	3	100	9,122	1.53	0	9,122
Michie	6-Jun-95	18-18-26	25,231	337	0.0132	3	100	25,568	2.47	4,552	30,120
Michie	6-Jun-95	18-18-27	25,187	141	0.0056	3	100	25,328	2.33	0	25,328
SUM	1995		69,607	642				70,249		4,552	74,801
Wolf	26-May-96	18-07-48	10,131	102	0.0100	5		10,233	2.30	0	10,233
Fox	4-Jun-96	18-28-23	35,452	0	0.0000	5		35,452	2.43	0	35,452
Byng	4-Jun-96	18-10-41	25,263	516	0.0200	5		25,779	2.37	0	25,779
Michie	5-Jun-96	18-33-45	50,082	1,022	0.0200	5		51,104	2.51	0	51,104
Michie	5-Jun-96	18-33-46	50,260	508	0.0100	5		50,768	2.43	0	50,768
Michie	5-Jun-96	18-33-47	49,985	505	0.0100	5		50,490	2.32	0	50,490
Judas	4-Jun-96	18-33-48	49,798	1,016	0.0200	5		50,814	2.43	0	50,814

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Appendix Table A14.–Page 3 of 6.

Release Location	Release Date*	Code	# Tagged Adipose & Clipped [c]	Clipped Only	% Tag-Loss	Days [a]	Sample Size	Total Clipped	Weight (grams)	Total Unclipped	Total Released
McClintock	4-Jun-96	18-33-49	49,991	302	0.0060	5		50,293	2.27	0	50,293
SUM	1996		320,962	3,971				324,933		0	324,933
Wolf	1-Jun-97	18-23-25	14,850	150	0.0100	2		15,000	2.30	0	15,000
Wolf	1-Jun-97	18-23-26	20,334	0	0.0000	4		20,334		0	20,334
Wolf	8-Jun-97	18-29-06	10,158	0	0.0000	8		10,158		0	10,158
Fox	11-Jun-97	18-25-54	25,242	0	0.0000	3		25,242	2.43	0	25,242
Fox	11-Jun-97	18-25-55	24,995	253	0.0100	3		25,248		0	25,248
Byng	11-Jun-97	18-29-07	10,029	0	0.0000	1		10,029	2.37	0	10,029
Byng	11-Jun-97	18-29-05	10,155	0	0.0000	1		10,155		0	10,155
Michie	11-Jun-97	18-28-59	49,657	502	0.0100	3		50,159	2.51	0	50,159
Michie	11-Jun-97	18-28-60	50,130	0	0.0000	3		50,130	2.43	0	50,130
Judas	7-Jun-97	18-23-27	19,951	202	0.0100	3 to 7		20,153	2.43	0	20,153
Judas	11-Jun-97	18-25-53	25,146	0	0.0000	11		25,146	2.43	0	25,146
McClintock	11-Jun-97	18-25-51	25,399	0	0.0000	3		25,399	2.27	0	25,399
McClintock	11-Jun-97	18-25-52	24,792	251	0.0100	3		25,043		0	25,043
SUM	1997		310,838	1,358				312,196		0	312,196
Michie	12-Jun-98	18-41-22	49,243	1,004	0.0200	5		50,247	2.84	0	50,247
Michie	12-Jun-98	18-41-21	49,197	1,004	0.0200	5		50,201	2.81	0	50,201
Byng	12-Jun-98	18-31-60	24,518	1,022	0.0400	5		25,540	3.00	0	25,540
McClintock	12-Jun-98	18-40-43	49,810	503	0.0100	5		50,313	2.76	0	50,313
Judas	13-Jun-98	02-54-17	19,018	1,432	0.0700	5		20,450	2.55	0	20,450
Judas	12-Jun-98	18-31-59	25,331	256	0.0100	5		25,587	2.60	0	25,587
Wolf	6-Jun-98	02-19-58	10,104	421	0.0400	5		10,525	1.95	0	10,525
Wolf	4-Jun-98	02-46-06	34,813	710	0.0200	5		35,523	2.63	0	35,523
SUM	1998		262,034	6,352				268,386		0	268,386
Michie	6-Jun-99			80,393				80,393	3.13	0	80,393
Byng	6-Jun-99			64,430				64,430	2.92	0	64,430
McClintock	6-Jun-99			64,169				64,169	2.95	0	64,169
Wolf	6-Jun-99			31,048				31,048	3.07	0	31,048
SUM	1999			240,040				240,040		0	240,040
Michie	8-Jun-00	18-31-28	25,114	254	0.0100	5		25,368	2.80	0	25,368
Michie	8-Jun-00	18-31-29	25,037	253	0.0100	5		25,290	2.80	0	25,290
Michie	8-Jun-00	18-43-03	10,907	110	0.0100	5		11,017	2.84	0	11,017
McClintock	8-Jun-00	18-13-54	25,041	254	0.0100	5		25,295	2.70	0	25,295

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Appendix Table A14.–Page 4 of 6.

Release Location	Release Date*	Code	# Tagged Adipose & Clipped [c]	Clipped Only	% Tag-Loss	Days [a]	Sample Size	Total Clipped	Weight (grams)	Total Unclipped	Total Released
McClintock	8-Jun-00	18-13-55	25,016	253	0.0100	5		25,269	2.68	0	25,269
Wolf	4-Jun-00	18-23-53	25,071	253	0.0100	5		25,324	2.67	0	25,324
Wolf	4-Jun-00	18-23-54	25,012	254	0.0101	5		25,266	2.40	0	25,266
SUM	2000		161,198	1,631				162,829		0	162,829
Michie	8-Jun-01	18-44-16	25,318	256	0.0100	5		25,574	2.68	0	25,574
Michie	8-Jun-01	18-44-17	27,293	276	0.0100	5		27,569	2.68	0	27,569
Michie	8-Jun-01	18-44-18	27,337	276	0.0100	5		27,613	2.60	0	27,613
Michie	8-Jun-01	18-44-19	11,629	117	0.0100	5		11,746	2.60	0	11,746
McClintock	8-Jun-01	18-44-12	24,526	248	0.0100	5		24,774	3.13	0	24,774
McClintock	8-Jun-01	18-44-13	25,033	253	0.0100	5		25,286	3.13	0	25,286
McClintock	8-Jun-01	18-36-50	10,840	110	0.0100	5		10,950	3.13	0	10,950
Byng	8-Jun-01	18-44-14	25788	260	0.0100	5		26,048	2.84	0	26,048
Byng	8-Jun-01	18-44-15	25,136	254	0.0100	5		25,390	2.84	0	25,390
Wolf	28-May-01	18-44-10	26,205	265	0.0100	5		26,470	3.34	0	26,470
Wolf	28-May-01	18-44-11	23,902	241	0.0100	5		24,143	3.34	0	24,143
SUM	2001		253,007	2,556				255,563		0	255,563
Wolf	23-May-02	18-51-01	25,334	126	0.0049	5		25460	3.30	0	25460
Wolf	2-Jun-02	18-51-02	25,079	177	0.0070	5		25256	3.10	0	25256
McClintock	10-Jun-02	18-51-03	24,769	505	0.0200	5		25274	3.60	0	25274
Byng	10-Jun-02	18-51-04	24,907	0	0.0000	5		24907	3.00	0	24907
Byng	10-Jun-02	18-51-05	24,925	125	0.0050	5		25050	3.00	0	25050
Michie	10-Jun-02	18-51-06	27,114	191	0.0070	5		27305	3.20	0	27305
Michie	10-Jun-02	18-51-07	26,854	0	0.0000	5		26854	3.02	0	26854
Michie	10-Jun-02	18-50-61	27,850	281	0.0100	5		28131	3.20	0	28131
Michie	10-Jun-02	18-50-62	27,241	0	0.0000	5		27241	3.04	0	27241
Michie	10-Jun-02	18-50-63	8,481	86	0.0100	5		8567	3.20	0	8567
SUM	2002		242,554	1,491				244,045		0	244,045
Wolf	25-May-03	18-47-48	27,489	83	0.0030	5		27,572	2.72	0	27,572
Wolf	25-May-03	18-47-49	26,704	161	0.0060	5		26,865	2.69	0	26,865
Byng	2-Jun-03	18-47-47	23,483	71	0.0030	5		23,554	3.01	0	23,554
Byng	2-Jun-03	18-47-46	27,058	54	0.0020	5		27,112	2.98	0	27,112
Michie	2-Jun-03	18-49-58	28,485	0	0.0000	5		28,485	3.05	0	28,485
Michie	2-Jun-03	18-49-59	27,519	0	0.0000	5		27,519	2.98	0	27,519

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Appendix Table A14.–Page 5 of 6.

Release Location	Release Date*	Code	# Tagged Adipose & Clipped [c]	Clipped Only	% Tag-Loss	Days [a]	Sample Size	Total Clipped	Weight (grams)	Total Unclipped	Total Released
Michie	2-Jun-03	18-49-60	15,541	0	0.0000	5		15,541	3.07		15,541
SUM	2003		176,279	369				176,648		0	176,648
Wolf	5/28-30/2004	01-01-70	28,946	2,806		5		31,752	2.90	0	31,752
Mainstem	5/28-29/2004	02-01-69	24,920	431		5		25,351	3.10	0	25,351
Byng	8-Jun-04	02-01-68	24,401	626		5		25,027	3.36	0	25,027
McClintock	8-Jun-04	02-01-67	24,246	879		5		25,125	3.20	0	25,125
Michie	8-Jun-04	02-01-66	24,609	554		5		25,163	3.12	0	25,163
Michie	8-Jun-04	02-01-65	13,594	306		5		13,900	3.12	0	13,900
SUM	2004		140,716	5,602				146,318			146,318
Wolf	5/31-6/5	18-19-36	10,751	109	1.0000	5		10,860	2.50	0	10,860
Wolf	5/31-6/5	18-56-17	5,835	59	1.0000	5		5,894	2.50	0	5,894
Byng	13-Jun-05	18-56-18	5,853	119	2.0000	5		5,972	2.50	0	5,972
Byng	13-Jun-05	18-56-19	4,369	89	2.0000	5		4,458	2.50	0	4,458
McClintock	13-Jun-05	18-44-19	10,632	0	0.0000	5		10,632	2.50	0	10,632
Michie	13-Jun-05	02-01-64	4,870	0	0.0000	5		4,870	2.50	0	4,870
Michie	13-Jun-05	02-01-65	5,983	0	0.0000	5		5,983	2.50	0	5,983
Michie	13-Jun-05	08-01-65	28,082	284	1.0000	5		28,366	2.50	0	28,366
Michie	13-Jun-05	18-56-20	5,906	0	0.0000	5		5,906	2.50	0	5,906
Mainstem	6/2, 6/14, 7/7	08-01-68	28,991	293	1.0000	5		29,284	2.50	0	29,284
SUM	2005		111,272	953				112,225			112,225
Wolf	6/4–6/11	08-01-66	26,412	0	0.0000	2		26,412	2.66	0	26,412
Wolf	6/4–6/11	08-01-71	8,718	88	1.0000	2		8,806	2.66	0	8,806
Mainstem	8-Jun-06	08-01-72	6,761	427	1.5000	2		7,188	2.63	0	7,188
Mainstem	8-Jun-06	08-01-67	28,045	103	1.5000	2		28,148	2.63	0	28,148
Michie	14-Jun-06	08-01-69	39,164	596	1.5000	2		39,760		0	39,760
Michie	14-Jun-06	08-01-74	3,692	56	1.5000	2		3,748	2.41	0	3,748
McClintock	14-Jun-06	08-01-70	29,282	296	1.0000	5		29,578	2.58	0	29,578
McClintock	14-Jun-06	08-01-73	5,426	55	1.0000	5		5,481	2.89	0	5,481
Wolf	11-Jun-06		0	7,658	0.0000			7,658	3.02	0	7,658
SUM	2006		147,500	9,279				156,779			156,779
Wolf	5/24-6/3	Agency Tags18	37,781	771	2.0000	2		38,552		0	38,552
Wolf	3-Jun-07	Agency Tags18		2,632	0.0000			2,632	2.33	0	2,632
Mainstem	29-May-07	Agency Tags18	35,253	356	1.0000	2		35,609	2.87	0	35,609

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Appendix Table A14.–Page 6 of 6.

Release Location	Release Date*	Code	# Tagged & Clipped [c]	Adipose Clipped Only	% Tag-Loss	Days [a]	Sample Size	Total Clipped	Weight (grams)	Total Unclipped	Total Released
Michie	8-Jun-07	Agency Tags18	50,084	506	1.0000	2		50,590	3.22	0	50,590
McClintock	8-Jun-07	Agency Tags18	38,383	388	1.0000	2		38,771	3.22	0	38,771
SUM	2007		161,501	4,653				166,154			166,154
TOTAL			3,788,013	295,675				4,083,688		1,174,613	5,258,301

[a] The number of days refers to the time period when fish were held to determine tag loss.

[b] Unknown period.

[c] Usually corresponds to "tagged" category on MRP release forms. CWT Data recorded from CWT release sheets 1989–1994. CWT Data prior to 1987 not verified against SEP records.

Appendix Table A15.–Summary of releases of Chinook salmon from Yukon Territory instream incubation/rearing sites 1991–2007.

PROJECT	SPECIES	BROOD YEAR	STOCK	MARK	STAGE	RELEASE SITE	START DATE	END DATE	# TAGGED	# AD ONLY	# UN-MARKED	TOTAL REL.	WT. (GM)
Klondike R, Nor	Chinook	1990	Tatchun Ck.	02-01-01-02-12	Spring Fry	Tatchun Ck.	91/06/28	91/06/28	13593	21	650	14264	0.74
Klondike R, Nor	Chinook	1990	Tatchun Ck.	02-01-01-02-09	Spring Fry	Tatchun Ck.	91/06/28	91/06/28	15247	173	750	16170	0.74
Klondike R, Nor	Chinook	1991	Tatchun Ck.	18-06-45	Spring Fry	Tatchun Ck.	NA	92/08/31	11734	0	817	12551	2.47
Klondike R, Nor	Chinook	1991	Tatchun Ck.	02-33-56	Spring Fry	Tatchun Ck.	NA	92/08/31	6453	0	852	7305	2.47
Klondike R, Nor	Chinook	1991	Tatchun Ck.	18-06-44	Spring Fry	Tatchun Ck.	NA	92/08/31	11585	0	320	11905	2.47
Klondike R, Nor	Chinook	1991	Yukon R	NOCN9148	Spring Fry	Pothole Lk	92/06/	92/06/	0	0	1500	1500	0
Klondike R, Nor	Chinook	1993	Klondike R Nor	02-01-01-05-03	Spring Fry	Klondike R Nor	94/06/30	94/06/30	6174	10	54	6238	0.88
Klondike R, Nor	Chinook	1993	Tatchun Ck.	02-01-01-04-07	Spring Fry	Tatchun Ck.	94/06/30	94/06/30	12077	246	71	12394	0.99
Klondike R, Nor	Chinook	1993	Tatchun Ck.	02-01-01-05-05	Spring Fry	Tatchun Ck.	94/06/30	94/06/30	9982	0	61	10043	0.99
Klondike R, Nor	Chinook	1994	Klondike R Nor	02-01-01-06-03	Spring Fry	Klondike R Nor	95/07/04	95/07/04	2159	11	190	2360	0.75
Klondike R, Nor	Chinook	1994	Klondike R Nor	02-01-01-06-02	Spring Fry	Klondike R Nor	95/07/04	95/07/04	1809	16	56	1881	0.75
Klondike R, Nor	Chinook	1994	Tatchun Ck.	02-01-01-05-11	Spring Fry	Tatchun Ck.	95/07/04	95/07/04	12431	100	686	13217	0.81
Klondike R, Nor	Chinook	1994	Tatchun Ck.	02-01-01-05-15	Spring Fry	Tatchun Ck.	95/07/04	95/07/04	2490	33	177	2700	0.81
Klondike R, Nor	Chinook	1994	Tatchun Ck.	02-01-01-06-01	Spring Fry	Tatchun Ck.	95/07/04	95/07/04	1476	19	155	1650	0.81
Klondike R, Nor	Chinook	1994	Tatchun Ck.	02-01-01-05-13	Spring Fry	Tatchun Ck.	95/07/04	95/07/04	11649	238	413	12300	0.81
Klondike R, Nor	Chinook	1995	Klondike R Nor	02-01-01-04-08	Spring Fry	Klondike R Nor	96/06/22	96/06/22	11423	1707	0	13130	0.76

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Appendix Table A15.–Page 2 of 7.

PROJECT	SPECIES	BROOD YEAR	STOCK	MARK	STAGE	RELEASE SITE	START DATE	END DATE	# TAGGED	# AD ONLY	# UN-MARKED	TOTAL REL.	WT. (GM)
Mayo River	Chinook	1991	Mayo R	NOCN9147	Spring Fry	Mayo R	92/06/	92/06/	0	0	13000	13000	0
Mayo River	Chinook	1992	Mayo R	NOCN9292	Spring Fry	Mayo R	93/07/	93/07/	0	0	500	500	0
McIntyre Cr	Chinook	1990	Takhini R	02-33-55	Fall Fry 5-8 gm	Takhini R	91/09/13	91/09/13	7967	80	39	8086	3.2
McIntyre Cr	Chinook	1990	Takhini R	02-33-54	Fall Fry 5-8 gm	Takhini R	91/09/13	91/09/13	10789	109	101	10999	3.2
McIntyre Cr	Chinook	1991	Takhini R	02-01-01-03-08	Spring Fry	Flat Ck.	NA	92/07/04	12141	143	3425	15709	0.98
McIntyre Cr	Chinook	1991	Takhini R	02-01-01-03-09	Spring Fry	Flat Ck.	NA	92/07/04	13102	466	1398	14966	0.98
McIntyre Cr	Chinook	1991	Takhini R	02-01-01-03-10	Spring Fry	Flat Ck.	NA	92/07/04	4955	261	601	5817	0.98
McIntyre Cr	Chinook	1992	Klondike R Nor	02-01-01-04-04	Spring Fry	Klondike R Nor	93/07/01	93/07/01	12832	240	144	13216	1.14
McIntyre Cr	Chinook	1992	Klondike R Nor	02-01-01-04-05	Spring Fry	Klondike R Nor	93/07/01	93/07/01	7546	256	167	7969	1.14
McIntyre Cr	Chinook	1992	Takhini R	02-34-24	Spring Fry	Flat Ck.	93/08/17	93/08/17	9532	823	95	10450	2.71
McIntyre Cr	Chinook	1992	Takhini R	02-34-23	Spring Fry	Flat Ck.	93/08/17	93/08/17	9822	850	218	10890	2.71
McIntyre Cr	Chinook	1992	Takhini R	18-14-54	Spring Fry	Flat Ck.	93/08/17	93/08/17	10925	567	227	11719	2.71
McIntyre Cr	Chinook	1992	Takhini R	18-14-53	Spring Fry	Flat Ck.	93/08/17	93/08/17	10658	865	226	11749	2.71
McIntyre Cr	Chinook	1992	Takhini R	02-02-17	Spring Fry	Flat Ck.	93/08/17	93/08/17	2291	114	37	2442	2.71
McIntyre Cr	Chinook	1992	Takhini R	02-34-22	Spring Fry	Flat Ck.	93/08/17	93/08/17	10355	314	40	10709	2.71
McIntyre Cr	Chinook	1992	Tatchun Ck.	02-01-01-04-02	Spring Fry	Tatchun Ck.	93/06/17	93/06/17	4654	633	335	5622	0.76
McIntyre Cr	Chinook	1993	Takhini R	18-17-51	Spring Fry	Flat Ck.	94/08/26	94/08/31	7410	46	222	7678	2.6

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Appendix Table A15.–Page 3 of 7.

PROJECT	SPECIES	BROOD YEAR	STOCK	MARK	STAGE	RELEASE SITE	START DATE	END DATE	# TAGGED	# AD ONLY	# UN-MARKED	TOTAL REL.	WT. (GM)
McIntyre Cr	Chinook	1993	Takhini R	18-17-50	Spring Fry	Flat Ck.	94/08/26	94/08/31	11227	40	87	11354	2.6
McIntyre Cr	Chinook	1993	Takhini R	18-17-49	Spring Fry	Flat Ck.	94/08/26	94/08/31	11071	159	142	11372	2.6
McIntyre Cr	Chinook	1993	Takhini R	18-17-48	Spring Fry	Flat Ck.	94/08/26	94/08/31	11375	0	104	11479	2.6
McIntyre Cr	Chinook	1993	Takhini R	18-17-52	Spring Fry	Flat Ck.	94/08/26	94/08/31	10668	21	198	10887	2.6
McIntyre Cr	Chinook	1993	Takhini R	02-02-16	Spring Fry	Takhini R	94/08/30	94/08/30	9343	271	36	9650	2.8
McIntyre Cr	Chinook	1993	Takhini R	02-01-63	Spring Fry	Takhini R	94/08/30	94/08/30	10899	222	62	11183	2.8
McIntyre Cr	Chinook	1994	Takhini R	02-01-01-04-15	Spring Fry	Takhini R	95/08/14	95/08/14	9887	0	410	10297	2.2
McIntyre Cr	Chinook	1994	Takhini R	02-01-01-04-13	Spring Fry	Takhini R	95/08/14	95/08/14	14452	0	365	14817	2.2
McIntyre Cr	Chinook	1994	Takhini R	02-01-01-04-12	Spring Fry	Flat Ck.	95/08/14	95/08/14	14193	59	281	14533	2.2
McIntyre Cr	Chinook	1994	Takhini R	02-01-01-04-14	Spring Fry	Flat Ck.	95/08/14	95/08/14	13586	130	295	14011	2.2
McIntyre Cr	Chinook	1995	Takhini R	02-01-01-05-08	Spring Fry	Takhini R	96/08/12	96/08/12	15731	251	496	16478	2.1
McIntyre Cr	Chinook	1995	Takhini R	02-01-01-05-09	Spring Fry	Takhini R	96/08/12	96/08/12	8085	41	293	8419	2.1
McIntyre Cr	Chinook	1995	Takhini R	02-01-01-05-10	Spring Fry	Flat Ck.	96/08/07	96/08/07	10727	65	170	10962	2.01
McIntyre Cr	Chinook	1995	Tatchun Ck.	02-01-01-02-10	Spring Fry	Tatchun Ck.	96/06/27	96/06/27	14530	49	62	14641	0.81
McIntyre Cr	Chinook	1995	Tatchun Ck.	02-01-01-02-11	Spring Fry	Tatchun Ck.	96/06/27	96/06/27	13526	91	294	13911	0.81
McIntyre Cr	Chinook	1996	Takhini R	02-01-01-06-14	Spring Fry	Flat Ck.	97/07/02	97/07/04	15622	158	382	16162	0.8
McIntyre Cr	Chinook	1996	Takhini R	02-01-01-04-06	Spring Fry	Flat Ck.	97/07/02	97/07/04	14845	37	280	15162	0.8
McIntyre Cr	Chinook	1996	Tatchun Ck.	02-01-01-07-03	Spring Fry	Tatchun Ck.	97/06/27	97/06/27	1521	15	148	1684	1

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Appendix Table A15.–Page 4 of 7.

PROJECT	SPECIES	BROOD YEAR	STOCK	MARK	STAGE	RELEASE SITE	START DATE	END DATE	# TAGGED	# AD ONLY	# UN-MARKED	TOTAL REL.	WT. (GM)
McIntyre Cr	Chinook	1997	Tatchun Ck.	02-01-01-06-08	Spring Fry	Tatchun Ck.	98/06/19	98/06/19	9284	150	74	9508	1.1
McIntyre Cr	Chinook	1997	Tatchun Ck.	02-01-01-06-09	Spring Fry	Tatchun Ck.	98/06/19	98/06/19	10318	211	188	10717	1.1
McIntyre Cr	Chinook	1997	Tatchun Ck.	02-01-01-07-02	Spring Fry	Tatchun Ck.	98/06/19	98/06/19	2536	52	0	2588	1.1
McIntyre Cr	Chinook	1997	Takhini R	02-01-01-07-09	Spring Fry	Flat Ck.	98/06/22	98/06/22	11374	115	115	11604	1.1
McIntyre Cr	Chinook	1997	Takhini R	02-01-01-06-11	Spring Fry	Takhini R	98/06/23	98/06/23	12933	334	118	13385	1.1
McIntyre Cr	Chinook	1997	Takhini R	02-01-01-06-10	Spring Fry	Takhini R	98/06/23	98/06/23	12186	37	115	12338	1.1
McIntyre Cr	Chinook	1997	Takhini R	02-01-01-07-08	Spring Fry	Takhini R	98/06/23	98/06/23	12341	253	148	12742	1.1
McIntyre Cr	Chinook	1998	Tatchun Ck.	02-01-01-06-12	Spring Fry	Tatchun Ck.	NA	99/07/08	10363	0	67	10430	
McIntyre Cr	Chinook	1998	Tatchun Ck.	02-01-01-06-13	Spring Fry	Tatchun Ck.	NA	99/07/08	4733	0	82	4815	
McIntyre Cr	Chinook	1998	Takhini R.	02-01-01-07-10	Spring Fry	Takhini R.	NA	99/07/14	13753	28	148	13929	
McIntyre Cr	Chinook	1998	Takhini R.	02-01-01-07-11	Spring Fry	Flat Ck.	NA	99/07/15	11273	23	206	11502	
McIntyre Cr	Chinook	1999	Takhini River	02-01-0-07-07	Spring Fry	Flat Ck.	NA	06/23/00	11333	114	219	11666	0.8
McIntyre Cr	Chinook	1999	Takhini River	02-01-01-07-12	Spring Fry	Flat Ck.	NA	06/23/00	12246	0	214	12460	0.8
McIntyre Cr	Chinook	1999	Takhini River	02-01-01-06-04	Spring Fry	Takhini River	NA	06/24/00	11105	0	147	11252	0.9
McIntyre Cr	Chinook	1999	Takhini River	02-01-01-06-05	Spring Fry	Takhini River	NA	06/24/00	12044	0	88	12132	0.9
McIntyre Cr	Chinook	1999	Takhini River	02-01-01-06-06	Spring Fry	Takhini River	NA	06/24/00	4561	0	0	4561	0.9
McIntyre Cr	Chinook	1999	Tatchun Ck.	02-01-01-07-05	Spring Fry	Tatchun Ck.	NA	06/19/00	12239	188	409	12836	1
McIntyre Cr	Chinook	1999	Tatchun Ck.	02-01-01-07-06	Spring Fry	Tatchun Ck.	NA	06/19/00	987	10	0	997	1

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Appendix Table A15.–Page 5 of 7.

PROJECT	SPECIES	BROOD YEAR	STOCK	MARK	STAGE	RELEASE SITE	START DATE	END DATE	# TAGGED	# AD ONLY	# UN-MARKED	TOTAL REL.	WT. (GM)
McIntyre Cr	Chinook	2000	Takhini River	02-01-01-08-01	Spring Fry	Takhini River	NA	07/25/01	11724	163	123	12010	1.1
McIntyre Cr	Chinook	2000	Takhini River	02-01-01-08-02	Spring Fry	Flat Ck.	NA	07/26/01	9995	101	60	10156	1.1
McIntyre Cr	Chinook	2000	Tatchun Ck.	02-01-01-07-05	Spring Fry	Tatchun Ck.	NA	07/09/01	11654	360	10	12024	1.1
McIntyre Cr	Chinook	2000	Tatchun Ck.	02-01-01-07-06	Spring Fry	Tatchun Ck.	NA	07/09/01	6321	329	14	6664	1.1
McIntyre Cr	Chinook	2001	Takhini River	02-01-01-08-04	Spring Fry	Takhini River	NA	06/29/02	10109	314	301	10724	1
McIntyre Cr	Chinook	2001	Takhini River	02-01-01-08-05	Spring Fry	Takhini River	NA	06/29/02	9814	100	405	10319	1
McIntyre Cr	Chinook	2001	Takhini River	02-01-01-08-07	Spring Fry	Flat Ck.	NA	06/28/02	4161	42	0	4203	1
McIntyre Cr	Chinook	2001	Tatchun Ck.	02-01-01-08-03	Spring Fry	Tatchun Ck.	NA	06/27/02	6432	415	279	7126	1
McIntyre Cr	Chinook	2002	Takhini River	02-11-22-31-41	Spring Fry	Takhini River	NA	07/21/03	8431	0	55	8486	1.7
McIntyre Cr	Chinook	2002	Takhini River	02-11-22-31-42	Spring Fry	Takhini River	NA	07/21/03	14017	0	76	14093	1.7
McIntyre Cr	Chinook	2002	Takhini River	02-01-01-07-01	Spring Fry	Takhini River	NA	07/21/03	11589	13	104	11706	1.7
McIntyre Cr	Chinook	2002	Takhini River	02-11-21-38-46	Spring Fry	Flat Ck.	NA	07/22/03	6426	65	0	6491	1.7
McIntyre Cr	Chinook	2002	Tatchun Ck.	02-01-01-07-14	Spring Fry	Tatchun Ck.	NA	07/04/03	10746	50	79	10875	1.4
McIntyre Cr	Chinook	2002	Tatchun Ck.	02-01-01-07-15	Spring Fry	Tatchun Ck.	NA	07/04/03	13261	0	166	13427	1.4
McIntyre Cr	Chinook	2003	Tatchun Cr.	02-01-02-01-05	Spring Fry	Tatchun Ck.	NA	06/27/04	10701	805	0	11506	1.1
McIntyre Cr	Chinook	2003	Tatchun Cr.	02-01-02-01-04	Spring Fry	Tatchun Ck.	NA	06/27/04	9919	556	0	10475	1.1
McIntyre Cr	Chinook	2003	Tatchun Cr.	02-01-02-01-03	Spring Fry	Tatchun Ck.	NA	06/27/04	5249	395	0	5644	1.1
McIntyre Cr	Chinook	2003	Takhini River	02-01-02-02-01	Spring Fry	Takhini River	NA	07/12/04	10449	268	0	10717	1.3

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Appendix Table A15.–Page 6 of 7.

PROJECT	SPECIES	BROOD YEAR	STOCK	MARK	STAGE	RELEASE SITE	START DATE	END DATE	# TAGGED	# AD ONLY	# UN-MARKED	TOTAL REL.	WT. (GM)
McIntyre Cr	Chinook	2003	Takhini River	02 01 02 01 06	Spring Fry	Takhini River	NA	07/12/04	11685	178	0	11863	1.3
McIntyre Cr	Chinook	2003	Takhini River	02-01-02-01-08	Spring Fry	Flat Ck.	NA	08/16/04	7785	95	0	7880	1.1
McIntyre Cr	Chinook	2003	Tatchun Ck.	02-01-01-09-01	Spring Fry	Tatchun Ck.	NA	08/20/04	9381	143	0	9524	1.3
McIntyre Cr	Chinook	2003	Tatchun Ck.	02-01-01-08-08	Spring Fry	Tatchun Ck.	NA	08/20/04	5216	79	0	5295	1.5
McIntyre Cr	Chinook	2003	Takhini River	02-01-01-09-03	Spring Fry	Takhini River	NA	08/21/04	10112	154	0	10266	1.2
McIntyre Cr	Chinook	2003	Takhini River	02-01-01-09-02	Spring Fry	Takhini River	NA	08/21/04	10180	155	0	10335	1.2
McIntyre Cr	Chinook	2003	Takhini River	02-01-02-01-03	Spring Fry	Takhini River	NA	08/21/04	5390	82	0	5472	1.2
McIntyre Cr	Chinook	2004	Tatchun Cr.	02-01-01-08-09	Spring Fry	Tatchun Ck.	NA	06/27/05	2361	426	0	2787	1.3
McIntyre Cr	Chinook	2004	Takhini River	02-01-02-02-02	Spring Fry	Takhini River	NA	07/14/05	23068	2175	1100	26343	1.3
McIntyre Cr	Chinook	2004	Takhini River	02-01-02-02-03	Spring Fry	Takhini River	NA	07/14/05	9146	1016	1100	11262	1.3
McIntyre Cr	Chinook	2004	Takhini River	02-01-02-01-08	Spring Fry	Flat Ck.	NA	07/07/05	5592	233	0	5825	1.3
McIntrye Cr	Chinook	2005	Takhini River	02-1-2-2-5	Spring Fry	Takhini River	NA	07/10/06	10766	748	0	11514	1.3
McIntrye Cr	Chinook	2005	Takhini River	02-1-2-1-9	Spring Fry	Takhini River	NA	07/10/06	10952	534	0	11486	1.6
McIntrye Cr	Chinook	2005	Takhini River	02-1-2-2-6	Spring Fry	Takhini River	NA	07/10/06	11108	394	0	11502	1.6
McIntrye Cr	Chinook	2005	Takhini River	02-1-2-3-4	Spring Fry	Takhini River	NA	07/18/06	2520	152	0	2672	1.6
McIntrye Cr	Chinook	2005	Tatchun Ck.	02-1-2-1-7	Spring Fry	Tatchun Ck.	NA	07/07/06	9243	182	0	9425	2.4
McIntrye Cr	Chinook	2005	Tatchun Ck.	02-1-2-3-3	Spring Fry	Tatchun Ck.	NA	07/23/06	26094	847	0	26941	2.4
McIntyre Cr	Chinook	2006	Takhini River	02-01-02-03-09	Spring Fry	Takhini River	07/17/07	07/20/07	8422	936	552	9910	~1.6*

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Appendix Table A15.–Page 7 of 7.

PROJECT	SPECIES	BROOD YEAR	STOCK	MARK	STAGE	RELEASE SITE	START DATE	END DATE	# TAGGED	# AD ONLY	# UN-MARKED	TOTAL REL.	WT. (GM)
McIntyre Cr	Chinook	2006	Takhini River	02-01-02-03-07	Spring Fry	Takhini River	07/17/07	07/20/07	10108	645	185	10938	~1.6*
McIntyre Cr	Chinook	2006	Takhini River	02-01-02-03-08	Spring Fry	Takhini River	07/17/07	07/20/07	10080	420	183	10683	~1.6*
McIntyre Cr	Chinook	2006	Takhini River	02-01-02-04-01	Spring Fry	Takhini River	07/17/07	07/20/07	8881	567	688	10136	~1.6*
McIntyre Cr	Chinook	2006	Takhini River	02-01-02-04-04	Spring Fry	Takhini River	07/17/07	07/20/07	1500	131	55	1686	~1.6*
McIntyre Cr	Chinook	2006	Tatchun	02-01-02-04-02	Spring Fry	Tatchun Ck.	07/21/07	07/26/07	9775	182	185	10142	>2.4**
McIntyre Cr	Chinook	2006	Tatchun	02-01-02-04-03	Spring Fry	Tatchun Ck.	07/21/07	07/26/07	9450	476	113	10039	>2.4**
McIntyre Cr	Chinook	2006	Tatchun	02-01-02-03-05	Spring Fry	Tatchun Ck.	07/21/07	07/26/07	8972	955	196	10123	>2.4**
McIntyre Cr	Chinook	2006	Tatchun	02-01-02-03-06	Spring Fry	Tatchun Ck.	07/21/07	07/26/07	6261	261	101	6623	>2.4**

Notes for 2003 Brood Year Releases:

02-01-02-01-03	11506	thermal marked
02-01-02-01-04	10475	not thermal marked
02-01-02-01-03	5644	not thermal marked
02-01-02-01-08	7880	a portion actually released July 12
02-01-01-09-01	9524	not thermal marked
02-01-01-08-08	5295	thermal marked
02-01-02-01-03	5472	error resulted in having the same code as some Tatchun fry

Appendix Table A16.–Yukon River fall chum salmon estimated brood year production and return per spawner estimates 1974–2007.

				Estimated Brood Year Return								(R)	(R/P)
	(P)	Estimated Annual Totals		Number of Salmon [a]				Percent				Total Brood	Return/
Year	Escapement [b]	Catch	Return	Age 3	Age 4	Age 5	Age 6	Age 3	Age 4	Age 5	Age 6	Year Return[a]	Spawner
1974	436,485	478,875	915,360	91,751	497,755	68,693	0	0.139	0.756	0.104	0.000	658,199	1.51
1975	1,465,213	473,062	1,938,275	150,451	1,225,440	61,401	123	0.105	0.853	0.043	0.000	1,437,415	0.98
1976	268,841	339,043	607,884	102,062	587,479	137,039	4,316	0.123	0.707	0.165	0.005	830,895	3.09
1977	514,843	447,918	962,761	102,660	1,075,198	175,688	4,189	0.076	0.792	0.129	0.003	1,357,735	2.64
1978	320,487	434,030	754,517	22,222	332,230	90,580	0	0.050	0.747	0.204	0.000	445,032	1.39
1979	780,818	615,377	1,396,195	41,114	769,496	274,311	3,894	0.038	0.707	0.252	0.004	1,088,814	1.39
1980	263,167	488,373	751,540	8,377	362,199	208,962	3,125	0.014	0.622	0.359	0.005	582,663	2.21
1981	551,192	683,391	1,234,583	45,855	955,725	278,386	8,888	0.036	0.742	0.216	0.007	1,288,853	2.34
1982	179,828	373,519	553,347	11,327	400,323	166,754	679	0.020	0.691	0.288	0.001	579,083	3.22
1983	347,157	525,485	872,642	12,569	875,355	223,468	2,313	0.011	0.786	0.201	0.002	1,113,704	3.21
1984	270,042	412,323	682,365	7,089	408,040	174,207	8,516	0.012	0.683	0.291	0.014	597,852	2.21
1985	664,426	515,481	1,179,907	46,635	874,819	270,984	3,194	0.039	0.732	0.227	0.003	1,195,632	1.80
1986	376,374	318,028	694,402	0	429,749	368,513	4,353	0.000	0.535	0.459	0.005	802,614	2.13
1987	651,943	406,143	1,058,086	12,413	617,519	290,767	7,720	0.013	0.665	0.313	0.008	928,418	1.42
1988	325,137	353,685	678,822	41,003	175,236	152,368	10,894 [c]	0.108	0.462	0.401	0.029	379,501	1.17
1989	506,173	545,166	1,051,339	2,744	282,905	345,136 [c]	20,290	0.004	0.435	0.530	0.031	651,075	1.29
1990	369,654	352,007	721,661	710	579,452 [c]	418,448	30,449	0.001	0.563	0.407	0.030	1,029,059	2.78
1991	591,132	439,096	1,030,228	3,663 [c]	1,024,800	369,103	12,167	0.003	0.727	0.262	0.009	1,409,733	2.38
1992	324,253	148,846	473,099	6,763	653,648	197,073	3,907	0.008	0.759	0.229	0.005	861,392	2.66
1993	352,688	91,015	443,703	7,745	451,327	102,420	3,235	0.014	0.799	0.181	0.006	564,727	1.60
1994	769,920	169,225	939,145	4,322	225,243	149,527	1,603 [c]	0.011	0.592	0.393	0.004	380,695	0.49
1995	1,009,155	461,147	1,470,302	2,371	266,955	68,918 [c]	383	0.007	0.788	0.204	0.001	338,627	0.34
1996	800,022	260,923	1,060,945	420	165,691 [c]	136,906	8,295	0.001	0.532	0.440	0.027	311,312	0.39

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Appendix Table A16.–Page 2 of 3.

				Estimated Brood Year Return								(R)	(R/P)
	(P)	Estimated Annual Totals		Number of Salmon [a]				Percent				Total Brood	Return/
Year	Escapement [b]	Catch	Return	Age 3	Age 4	Age 5	Age 6	Age 3	Age 4	Age 5	Age 6	Year Return[a]	Spawner
1997	494,831	170,059	664,890	3,087 [c]	244,801	118,343	3,332	0.008	0.662	0.320	0.009	369,563	0.75
1998	263,121	70,820	333,941	651	269,653	57,962	6,694	0.002	0.805	0.173	0.020	334,960	1.27
1999	288,962	131,175	420,137	29,097	705,152	174,424	13,952	0.032	0.764	0.189	0.015	922,624	3.19
2000	210,756	28,543	239,299	8,446	297,012	117,431	0	0.020	0.702	0.278	0.000	422,889	2.01
2001	337,765	44,976	382,741	136,038	2,193,983	675,688	32,952	0.045	0.722	0.222	0.011	3,038,661	9.00
2002	397,977	27,411	425,388	0	444,507	232,089	2,134	0.000	0.655	0.342		678,731 [d]	>1.71
2003	695,363	79,529	774,892	24,263	833,346	411,457						1,269,066 [e]	>1.83
2004	537,873	76,296	614,169	0									
2005	2,035,183	290,183	2,325,366										
2006	873,987	270,471	1,144,458										
2007	903,601	194,786	1,098,387										
Average-2006	553,781	318,837	872,618										
	490,514	**All Brood Years (1974-2001)**		32,199	605,257	209,768	7,124	0.0335	0.6903	0.2671	0.0091	854,348	2.10
	369,863	Even Brood Years (1974-2001)		21,796	384,551	187,432	27,132	0.0364	0.6540	0.2993	0.0104	586,868	1.90
	611,164	Odd Brood Years (1974-2001)		42,603	825,963	244,931	8,331	0.0307	0.7267	0.2349	0.0077	1,121,827	2.31
	512,803	**All Brood Years (1974-1983)**		58,839	708,120	168,528	2,753	0.0611	0.7401	0.1960	0.0027	938,239	2.20
	293,762	Even Brood Years (1974-1983)		47,148	435,997	134,406	1,624	0.0692	0.7045	0.2239	0.0023	619,175	2.28
	731,845	Odd Brood Years (1974-1983)		70,530	980,243	202,651	3,881	0.0530	0.7757	0.1681	0.0031	1,257,304	2.11
	486,388	**All Brood Years (1984-2001)**		10,421	451,294	206,619	8,176	0.0166	0.6591	0.3116	0.0127	676,510	1.64
	412,142	Even Brood Years (1984-2001)		7,712	355,969	196,937	8,301	0.0181	0.6259	0.3412	0.0148	568,919	1.68
	544,119	Odd Brood Years (1984-2001)		27,088	740,251	268,420	10,803	0.0183	0.6994	0.2720	0.0103	1,046,562	2.42

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[a] The estimated number of salmon returning are based upon annual age composition observed in lower Yukon test nets each year, weighted by test fish CPUE.

[b] Contrast in escapement data is 11.36.

[c] Based upon expanded test fish age composition estimates for years in which the test fishery terminated early, both in 1994 and 2000.

[d] Brood year return for 3, 4, and 5 year fish, indicate that production (R/P) from brood year 2002 was at least 1.71. Recruits estimated for incomplete brood year.

[e] Brood year return for 3 and 4 year fish, indicate that production (R/P) from brood year 2003 was at least 1.83. Recruits estimated for incomplete brood year.

Appendix Table A17.–Escapement, rebuilding and interim goals for Canadian origin Chinook and fall chum salmon stocks, 1985–2007.

Year	Canadian Origin Stock Targets					
	Chinook Salmon		Fall Chum Salmon			
	Escapement Goal	Stabilization/ Rebuilding	Mainstem Escapement Goal	Stabilization/ Rebuilding	Fishing Branch Escapement Goal	Fishing Branch Interim Goal
1985	33,000-43,000					
1986	33,000-43,000					
1987	33,000-43,000		90,000-135,000		50,000-120,000	
1988	33,000-43,000		90,000-135,000		50,000-120,000	
1989	33,000-43,000		90,000-135,000		50,000-120,000	
1990	33,000-43,000	18,000	80,000		50,000-120,000	
1991	33,000-43,000	18,000	80,000		50,000-120,000	
1992	33,000-43,000	18,000	80,000	51,000	50,000-120,000	
1993	33,000-43,000	18,000	80,000	51,000	50,000-120,000	
1994	33,000-43,000	18,000	80,000	61,000	50,000-120,000	
1995	33,000-43,000	18,000	80,000	80,000	50,000-120,000	
1996	33,000-43,000	28,000	80,000	65,000	50,000-120,000	
1997	33,000-43,000	28,000	80,000	49,000	50,000-120,000	
1998	33,000-43,000	28,000	80,000	80,000	50,000-120,000	
1999	33,000-43,000	28,000	80,000	80,000	50,000-120,000	
2000	33,000-43,000	28,000	80,000	80,000	50,000-120,000	
2001	33,000-43,000	28,000	80,000	80,000	50,000-120,000	
2002	33,000-43,000	28,000	80,000	60,000	50,000-120,000	
2003	33,000-43,000	28,000 [a]	80,000	65,000	50,000-120,000	15,000
2004	33,000-43,000	28,000	80,000	65,000	50,000-120,000	13,000
2005	33,000-43,000	28,000	80,000	65,000	50,000-120,000	24,000
2006	33,000-43,000	28,000	80,000	80,000	50,000-120,000	28,000
2007	33,000-43,000	33,000-43,000	80,000	80,000	50,000-120,000	34,000

[a] In 2003 the goal was set at 25,000. However, if the U.S. decided on a commercial opening the goal would be increased to 28,000 fish.

Appendix Table A18.–June commercial sockeye and chum salmon harvest in South Unimak and Shumagin Islands, all gear combined, by year, 1960–2007.

	Sockeye			Chum		
Year	South Unimak	Shumagin Island	Total	South Unimak	Shumagin Island	Total
1960	137,000	19,000	156,000	84,000	11,000	95,000
1961	199,000	55,000	254,000	157,000	36,000	193,000
1962	272,000	54,000	326,000	209,000	61,000	270,000
1963	116,000	33,000	149,000	36,000	36,000	72,000
1964	159,000	85,000	244,000	161,000	67,000	228,000
1965	568,000	207,000	775,000	121,000	45,000	166,000
1966	528,000	54,000	582,000	215,000	17,000	232,000
1967	186,000	69,000	255,000	73,000	51,000	124,000
1968	342,000	233,000	575,000	115,000	51,000	166,000
1969	781,000	76,000	857,000	254,000	13,000	267,000
1970	1,510,373	139,735	1,650,108	391,568	44,909	436,477
1971	422,760	39,341	462,101	405,311	103,886	509,197
1972	426,799	74,398	501,197	411,000	107,810	518,810
1973	222,124	22,964	245,088	177,720	22,910	200,630
1974	0	0	0	0	0	0
1975	190,774	49,325	240,099	65,279	35,543	100,822
1976	231,568	72,016	303,584	336,161	74,109	410,270
1977	194,807	45,912	240,719	94,097	21,899	115,996
1978	418,935	67,876	486,811	103,413	18,479	121,892
1979	672,212	179,139	851,351	63,150	40,953	104,103
1980	2,731,148	475,127	3,206,275	458,499	50,366	508,865
1981	1,470,393	350,572	1,820,965	509,876	54,071	563,947
1982	1,668,153	450,548	2,118,701	933,728	161,316	1,095,044
1983	1,545,075	416,494	1,961,569	616,354	169,277	785,631
1984	1,131,365	256,838	1,388,203	227,913	109,207	337,120
1985	1,454,969	336,431	1,791,400	324,825	109,004	433,829
1986	315,370	156,027	471,397	252,721	99,048	351,769
1987	652,397	140,567	792,964	405,955	37,064	443,019
1988	474,457	282,230	756,687	464,765	61,946	526,711
1989	1,347,547	396,958	1,744,505	407,635	47,528	455,163

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Appendix Table A18.–Page 2 of 2.

Year	Sockeye			Chum		
	South Unimak	Shumagin Island	Total	South Unimak	Shumagin Island	Total
1990	1,088,944	255,585	1,344,529	455,044	63,501	518,545
1991	1,215,658	333,272	1,548,930	670,103	102,602	772,705
1992	2,046,022	411,834	2,457,856	323,891	102,312	426,203
1993	2,366,573	607,171	2,973,744	381,941	150,306	532,247
1994	1,001,250	460,013	1,461,263	374,409	207,756	582,165
1995	1,451,490	653,831	2,105,321	342,307	195,126	537,433
1996	572,495	456,475	1,028,970	129,889	229,931	359,820
1997	1,179,179	449,002	1,628,181	196,016	126,309	322,325
1998	974,628	314,097	1,288,725	195,454	50,165	245,619
1999	1,106,208	269,191	1,375,399	186,886	58,420	245,306
2000	892,016	359,212	1,251,228	168,888	70,469	239,357
2001	121,547	29,085	150,632	36,099	12,251	48,350
2002	356,157	234,949	591,106	201,211	177,606	378,817
2003	335,903	117,244	453,147	121,169	161,269	282,438
2004	531,955	816,118	1,348,073	130,626	351,683	482,309
2005	437,443	566,952	1,004,395	143,799	284,031	427,830
2006	491,053	441,238	932,291	96,016	203,811	299,827
2007	737,643	852,198	1,589,841	153,334	144,205	297,539

Source: Poetter 2006.

Appendix Table A19.–Exvessel value of the catch in the commercial fisheries off Alaska by species group, 1982–2007, (value in $ millions).

Year	Shellfish	Salmon	Herring	Halibut	Groundfish	Total
1982	216.5	310.7	19.9	25.7	211.0	783.8
1983	147.7	320.6	29.8	43.0	188.0	729.1
1984	103.4	343.0	20.4	19.6	239.4	725.8
1985	106.9	389.6	36.9	37.5	260.1	831.0
1986	183.0	404.1	38.4	70.1	268.6	964.2
1987	215.2	473.0	41.7	76.3	336.7	1142.9
1988	235.6	744.9	56.0	66.1	444.6	1547.2
1989	279.2	506.7	18.7	84.4	425.3	1314.3
1990	355.1	546.7	24.0	86.9	474.9	1487.6
1991	301.1	300.1	28.6	91.6	548.3	1269.7
1992	335.1	544.5	27.0	48.0	656.9	1611.5
1993	328.5	391.1	14.1	53.6	425.8	1213.1
1994	321.2	424.4	21.6	84.7	465.2	1317.1
1995	282.9	495.9	39.1	59.5	593.7	1471.1
1996	175.2	346.5	44.8	74.2	541.9	1182.6
1997	172.1	247.8	15.9	106.5	597.7	1140.0
1998	218.7	242.7	10.8	94.1	415.5	981.8
1999	271.2	345.7	14.2	116.9	483.4	1231.4
2000	132.6	275.1	14.0	145.0	369.0	935.7
2001	128.6	229.1	14.0	132.0	632.0	1135.7
2002	150.7	162.5	12.0	129.0	553.0	1007.2
2003	181.6	209.6	12.0	171.0	560.0	1134.2
2004	169.5	272.2	15.3	174.6	564.7	1196.3
2005	147.8	302.7	15.4	169.4	660.5	1295.8
2006	148.5	308.8	7.7	164.0	758.2	1387.7
2007[a]	132.8	374.3	8.3	190.0	825.0	1530.4

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Appendix Table A19.–Page 2 of 2.

Year	Percentage of Total Catch					
	Shellfish	Salmon	Herring	Halibut	Groundfish	Total
1982	27.6	39.6	2.5	3.3	26.9	100.0
1983	20.3	44.0	4.1	5.9	25.8	100.0
1984	14.2	47.3	2.8	2.7	33.0	100.0
1985	12.9	46.9	4.4	4.5	31.3	100.0
1986	19.0	41.9	4.0	7.3	27.9	100.0
1987	18.8	41.4	3.6	6.7	29.5	100.0
1988	15.2	48.1	3.6	4.3	28.7	100.0
1989	21.2	38.6	1.4	6.4	32.4	100.0
1990	23.9	36.8	1.6	5.8	31.9	100.0
1991	23.7	23.6	2.3	7.2	43.2	100.0
1992	20.8	33.8	1.7	3.0	40.8	100.0
1993	27.1	32.2	1.2	4.4	35.1	100.0
1994	24.4	32.2	1.6	6.4	35.3	100.0
1995	19.2	33.7	2.7	4.0	40.4	100.0
1996	14.8	29.3	3.8	6.3	45.8	100.0
1997	15.1	21.7	1.4	9.3	52.4	100.0
1998	22.3	24.7	1.1	9.6	42.3	100.0
1999	22.0	28.1	1.2	9.5	39.3	100.0
2000	14.2	29.4	1.5	15.5	39.4	100.0
2001	11.3	20.2	1.2	11.6	55.6	100.0
2002	15.0	16.1	1.2	12.8	54.9	100.0
2003	16.0	18.5	1.1	15.1	49.4	100.0
2004	14.2	22.8	1.3	14.6	47.2	100.0
2005	11.4	23.4	1.2	13.1	51.0	100.0
2006	10.7	22.3	0.6	11.8	54.7	100.0
2007[a]	8.7	24.5	0.5	12.4	53.9	100.0

Source: M. Plotnik, Commercial Fisheries Research Analyst, ADF&G, Juneau; personal communication.

[a] Data are preliminary.

Appendix Table A20.–Total groundfish catch and estimated number of Chinook and other salmon caught by the groundfish fisheries off the coast of Alaska, 1990 through 2007.

Year	Groundfish (mt)	Chinook Salmon	Chum Salmon	Coho Salmon	Sockeye Salmon	Pink Salmon	Total
Bering Sea and Aleutian Islands (BSAI)							
1990	1,706,379	14,085	16,202	153	30	31	30,501
1991	2,154,903	48,873	29,706	396	79	79	79,133
1992	2,057,849	41,955	40,090	1,266	14	80	83,405
1993	1,854,216	45,964	242,895	321	22	8	289,210
1994	1,958,788	44,380	95,978	231	20	202	140,811
1995	1,928,073	23,079	20,901	858	0	21	44,859
1996	1,847,631	63,205	77,771	218	5	1	141,200
1997	1,824,188	50,218	67,349	114	3	69	117,753
1998	1,615,685	55,427		65,631			121,058
1999	1,424,752	12,924		46,295			59,219
2000	1,607,549	7,470		57,600			65,070
2001	1,813,924	37,734		57,339			95,073
2002	1,934,957	37,605		78,454			116,059
2003	1,970,817	54,763		193,981			248,744
2004	1,978,721	62,459		447,196			509,655
2005	1,407,925	74,843		701,741			776,584
2006	1,974,928	85,764		326,296			412,060
2007	1,856,110	124,512		90,874			215,386
Gulf of Alaska (GOA)							
1990	244,397	16,913	2,541	1,482	85	64	21,085
1991	269,616	38,894	13,713	1,129	51	57	53,844
1992	269,797	20,462	17,727	86	33	0	38,308
1993	255434	24,465	55,268	306	15	799	80,853
1994	239,503	13,973	40,033	46	103	331	54,486
1995	216,585	14,647	64,067	668	41	16	79,439
1996	202,054	15,761	3,969	194	2	11	19,937
1997	230,448	15,119	3,349	41	7	23	18,539
1998	245,516	16,984		13,544			30,528
1999	227,614	30,600		7,530			38,130

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Appendix Table A20.–Page 2 of 2.

Year	Groundfish (mt)	Chinook Salmon	Chum Salmon	Coho Salmon	Sockeye Salmon	Pink Salmon	Total
Gulf of Alaska (GOA)							
2000	204,398	26,705		10,995			37,700
2001	182,011	15,104		6,063			21,167
2002	165,664	12,759		3,192			15,951
2003	176,433	15,877		10,599			26,475
2004	168,475	17,832		5,893			23,725
2005	133,171	31,896		6,841			38,737
2006	195,355	17,577		4,746			22,323
2007	161,930	40,149		3,619			43,768

Source: Berger 2003 and NMFS Alaska Region Catch Accounting.

Appendix Table A21.–Recoveries of Chinook salmon coded wire tags from the Whitehorse Rapids Fish hatchery in the U.S. groundfish fisheries.

Brood Year	Release Location	Release Date	Recovery Date	Latitude	Longitude	Gear Type
1995	Michie Cr.	06/11/97	03/16/00	55° 56’	168° 52’	Domestic Trawl
1997	Judas Cr.	06/12/98	03/28/01	56° 18’	170° 33’	Domestic Trawl
2000	McClintock R.	06/08/01	02/15/02	56° 10’	166° 00’	Domestic Trawl
2001	Michie Cr.	06/10/02	10/03/02	64° 06’	164° 31’	Research Trawl
2001	Wolf Cr.	06/02/02	10/03/02	64° 06	164° 31’	Research Trawl
2001	Michie Cr.	06/10/02	10/04/02	63° 00’	165° 58’	Research Trawl
2001	Michie Cr.	06/10/02	02/08/03	56° 44’	167° 00’	Domestic Trawl
1988	Michie Cr.	06/06/89	03/25/92	56° 44’	173° 15’	Domestic Trawl
1990	Wolf Cr.	08/08/91	03/14/94	60° 06’	178° 58’	Domestic Trawl
1992	Wolf Cr.	06/06/93	12/06/94	56° 52’	171° 18’	Domestic Trawl
1991	Michie Cr.	06/04/92	02/24/95	55° 19’	164° 43’	Domestic Trawl
1992	Yukon R.	06/15/93	06/02/97	59° 29’	167° 49’	Domestic Trawl
1993	Michie Cr.	06/01/94	03/10/98	59° 26’	178° 05’	Domestic Trawl
1995	Fox Cr.	06/04/96	03/29/98	58° 56’	178° 06’	Domestic Trawl
1995	Judas Cr.	06/04/96	03/30/99	57° 43’	173° 34’	Domestic Trawl
1999	Wolf Creek	06/10/00	03/03/03	56° 26’	169° 55’	Domestic Trawl
1988	McClintock R.	06/06/89	03/19/04	Area 513		Domestic Trawl
2001	Michie Cr.	06/10/02	03/15/05	57° 21’	171° 39’	Domestic Trawl
2001	Wolf Cr.	05/23/02	10/08/04	54°01’	166° 29’	Domestic Trawl

Appendix Table A22.–Fall chum salmon age and sex percentages from selected Yukon River escapement projects, 2007.

Location	Sample Size		Age 3	4	5	6	7	Total
Chandalar River [a]	175	Males	3.4	39.4	16.0	0.0	0.0	58.9
		Females	4.6	25.7	9.1	1.7	0.0	41.1
		Total	8.0	65.1	25.1	1.7	0.0	100.0
Delta River [b]	179	Males	0.6	43.6	14.0	1.7	0.0	59.8
		Females	1.7	29.6	8.9	0.0	0.0	40.2
		Total	2.2	73.2	22.9	1.7	0.0	100.0
Sheenjek River [c]	76	Males	0.0	26.3	18.4	7.9	0.0	52.6
		Females	0.0	26.3	17.1	3.9	0.0	47.4
		Total	0.0	52.6	35.5	11.8	0.0	100.0
Kantishna River [d]	179	Males	0.6	46.9	14.0	3.4	0.0	64.8
		Females	0.0	24.0	8.4	2.2	0.6	35.2
		Total	0.6	70.9	22.3	5.6	0.6	100.0

[a] Samples were handpicked by USFWS.
[b] Samples were handpicked from each of the three main channels as they peaked.
[c] Samples were collected by beach seine throughout the run.
[d] Samples were collected throughout the run from a fish wheel at the mouth of the Kantishna River.

APPENDIX B: TABLES

Appendix Table B1.–Alaskan and Canadian total utilization of Yukon River Chinook, chum and coho salmon, 1903–2007.

	Alaska [a,b]			Canada [c]			Total		
Year	Chinook Salmon	Other Salmon	Total	Chinook Salmon	Other Salmon	Total	Chinook Salmon	Other Salmon	Total
1903				4,666		4,666	4,666		4,666
1904									
1905									
1906									
1907									
1908				7,000		7,000	7,000		7,000
1909				9,238		9,238	9,238		9,238
1910									
1911									
1912									
1913				12,133		12,133	12,133		12,133
1914				12,573		12,573	12,573		12,573
1915				10,466		10,466	10,466		10,466
1916				9,566		9,566	9,566		9,566
1917									
1918	12,239	1,500,065	1,512,304	7,066		7,066	19,305	1,500,065	1,519,370
1919	104,822	738,790	843,612	1,800		1,800	106,622	738,790	845,412
1920	78,467	1,015,655	1,094,122	12,000		12,000	90,467	1,015,655	1,106,122
1921	69,646	112,098	181,744	10,840		10,840	80,486	112,098	192,584
1922	31,825	330,000	361,825	2,420		2,420	34,245	330,000	364,245
1923	30,893	435,000	465,893	1,833		1,833	32,726	435,000	467,726
1924	27,375	1,130,000	1,157,375	4,560		4,560	31,935	1,130,000	1,161,935
1925	15,000	259,000	274,000	3,900		3,900	18,900	259,000	277,900
1926	20,500	555,000	575,500	4,373		4,373	24,873	555,000	579,873
1927		520,000	520,000	5,366		5,366	5,366	520,000	525,366
1928		670,000	670,000	5,733		5,733	5,733	670,000	675,733
1929		537,000	537,000	5,226		5,226	5,226	537,000	542,226
1930		633,000	633,000	3,660		3,660	3,660	633,000	636,660
1931	26,693	565,000	591,693	3,473		3,473	30,166	565,000	595,166
1932	27,899	1,092,000	1,119,899	4,200		4,200	32,099	1,092,000	1,124,099
1933	28,779	603,000	631,779	3,333		3,333	32,112	603,000	635,112
1934	23,365	474,000	497,365	2,000		2,000	25,365	474,000	499,365
1935	27,665	537,000	564,665	3,466		3,466	31,131	537,000	568,131
1936	43,713	560,000	603,713	3,400		3,400	47,113	560,000	607,113
1937	12,154	346,000	358,154	3,746		3,746	15,900	346,000	361,900
1938	32,971	340,450	373,421	860		860	33,831	340,450	374,281
1939		327,650	355,687	720		720	28,757	327,650	356,407
1940	32,453	1,029,000	1,061,453	1,153		1,153	33,606	1,029,000	1,062,606
1941	47,608	438,000	485,608	2,806		2,806	50,414	438,000	488,414
1942	22,487	197,000	219,487	713		713	23,200	197,000	220,200
1943	27,650	200,000	227,650	609		609	28,259	200,000	228,259

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Appendix Table B1.–Page 2 of 3.

	Alaska [a,b]			Canada [c]			Total		
Year	Chinook Salmon	Other Salmon	Total	Chinook Salmon	Other Salmon	Total	Chinook Salmon	Other Salmon	Total
1944	14,232		14,232	986		986	15,218		15,218
1945	19,727		19,727	1,333		1,333	21,060		21,060
1946	22,782		22,782	353		353	23,135		23,135
1947	54,026		54,026	120		120	54,146		54,146
1948	33,842		33,842				33,842		33,842
1949	36,379		36,379				36,379		36,379
1950	41,808		41,808				41,808		41,808
1951	56,278		56,278				56,278		56,278
1952	38,637	10,868	49,505				38,637	10,868	49,505
1953	58,859	385,977	444,836				58,859	385,977	444,836
1954	64,545	14,375	78,920				64,545	14,375	78,920
1955	55,925		55,925				55,925		55,925
1956	62,208	10,743	72,951				62,208	10,743	72,951
1957	63,623		63,623				63,623		63,623
1958	75,625	337,500	413,125	11,000	1,500	12,500	86,625	339,000	425,625
1959	78,370		78,370	8,434	3,098	11,532	86,804	3,098	89,902
1960	67,597		67,597	9,653	15,608	25,261	77,250	15,608	92,858
1961	141,152	461,597	602,749	13,246	9,076	22,322	154,398	470,673	625,071
1962	105,844	434,663	540,507	13,937	9,436	23,373	119,781	444,099	563,880
1963	141,910	429,396	571,306	10,077	27,696	37,773	151,987	457,092	609,079
1964	109,818	504,420	614,238	7,408	12,187	19,595	117,226	516,607	633,833
1965	134,706	484,587	619,293	5,380	11,789	17,169	140,086	496,376	636,462
1966	104,887	309,502	414,389	4,452	13,192	17,644	109,339	322,694	432,033
1967	146,104	352,397	498,501	5,150	16,961	22,111	151,254	369,358	520,612
1968	118,632	270,818	389,450	5,042	11,633	16,675	123,674	282,451	406,125
1969	105,027	424,399	529,426	2,624	7,776	10,400	107,651	432,175	539,826
1970	93,019	585,760	678,779	4,663	3,711	8,374	97,682	589,471	687,153
1971	136,191	547,448	683,639	6,447	16,911	23,358	142,638	564,359	706,997
1972	113,098	461,617	574,715	5,729	7,532	13,261	118,827	469,149	587,976
1973	99,670	779,158	878,828	4,522	10,135	14,657	104,192	789,293	893,485
1974	118,053	1,229,678	1,347,731	5,631	11,646	17,277	123,684	1,241,324	1,365,008
1975	76,883	1,307,037	1,383,920	6,000	20,600	26,600	82,883	1,327,637	1,410,520
1976	105,582	1,026,908	1,132,490	5,025	5,200	10,225	110,607	1,032,108	1,142,715
1977	114,494	1,090,758	1,205,252	7,527	12,479	20,006	122,021	1,103,237	1,225,258
1978	129,988	1,615,312	1,745,300	5,881	9,566	15,447	135,869	1,624,878	1,760,747
1979	159,232	1,596,133	1,755,365	10,375	22,084	32,459	169,607	1,618,217	1,787,824
1980	197,665	1,730,960	1,928,625	22,846	23,718 [d]	46,564	220,511	1,754,678	1,975,189
1981	188,477	2,097,871	2,286,348	18,109	22,781 [d]	40,890	206,586	2,120,652	2,327,238

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Appendix Table B1.–Page 3 of 3.

	Alaska [a,b]			Canada [c]			Total		
Year	Chinook Salmon	Other Salmon	Total	Chinook Salmon	Other Salmon	Total	Chinook Salmon	Other Salmon	Total
1982	152,808	1,265,457	1,418,265	17,208	16,091 [d]	33,299	170,016	1,281,548	1,451,564
1983	198,436	1,678,597	1,877,033	18,952	29,490 [d]	48,442	217,388	1,708,087	1,925,475
1984	162,683	1,548,101	1,710,784	16,795	29,767 [d]	46,562	179,478	1,577,868	1,757,346
1985	187,327	1,657,984	1,845,311	19,301	41,515 [d]	60,816	206,628	1,699,499	1,906,127
1986	146,004	1,758,825	1,904,829	20,364	14,843 [d]	35,207	166,368	1,773,668	1,940,036
1987	188,386	1,246,176	1,434,562	17,614	44,786 [d]	62,400	206,000	1,290,962	1,496,962
1988	148,421	2,311,214	2,459,635	21,427	33,915 [d]	55,342	169,848	2,345,129	2,514,977
1989	157,606	2,281,566	2,439,172	17,944	23,490 [d]	41,434	175,550	2,305,056	2,480,606
1990	149,433	1,053,351	1,202,784	19,227	34,302 [d]	53,529	168,660	1,087,653	1,256,313
1991	154,651	1,335,111	1,489,762	20,607	35,653 [d]	56,260	175,258	1,370,764	1,546,022
1992	168,191	863,575	1,031,766	17,903	21,310 [d]	39,213	186,094	884,885	1,070,979
1993	163,078	341,953	505,031	16,611	14,150 [d]	30,761	179,689	356,103	535,792
1994	172,315	554,643	726,958	21,198	38,342	59,540	193,513	592,985	786,498
1995	177,663	1,437,837	1,615,500	20,884	46,109	66,993	198,547	1,483,946	1,682,493
1996	138,562	1,121,181	1,259,743	19,612	24,395	44,007	158,174	1,145,576	1,303,750
1997	174,625	544,879	719,504	16,528	15,880	32,408	191,153	560,759	751,912
1998	99,369	199,735	299,104	5,937 [e]	8,165	14,102	105,306	207,900	313,206
1999	124,315	234,221	358,536	12,468	19,736	32,204	136,783	253,957	390,740
2000	45,308	106,936	152,244	4,879 [f]	9,273	14,152	50,187	116,209	166,396
2001	53,738	116,477	170,215	10,139	9,822	19,961	63,877	126,299	190,176
2002	67,888	122,360	190,248	9,257	8,493	17,750	77,145	130,853	207,998
2003	99,150	199,882	299,032	9,619	11,885	21,504	108,769	211,767	320,536
2004	112,232	206,099	318,331	11,238	9,930	21,168	123,470	216,029	339,499
2005	85,507	478,749	564,256	11,371	18,348	29,719	96,878	497,097	593,975
2006	95,184	477,190	572,374	9,072	11,907	20,979	104,256	489,097	593,353
2007 [g,h]	87,506	511,045	598,551	5,094	14,309	20,226	93,423	525,354	618,777
Average									
1903-2006	91,095	737,489	724,345	8,756	17,917	18,964	87,844	729,932	688,517
1997-2006	95,732	268,653	364,384	10,051	12,344	22,395	105,782	280,997	386,779
2002-2006	91,992	296,856	388,848	10,111	12,113	22,224	102,104	308,969	411,072

[a] Catch in number of salmon. Includes estimated number of salmon harvested for the commercial production of salmon roe.

[b] Commercial, subsistence, personal-use, test fish retained for subsistence, and sport catches combined. Totals do not include the Coastal District communities of Hooper Bay and Scammon Bay.

[c] Catch in number of salmon. Commercial, Aboriginal, domestic and sport catches combined.

[d] Includes the Old Crow Aboriginal fishery harvest of coho salmon.

[e] Catch includes 761 Chinook salmon taken in the mark–recapture test fishery.

[f] Catch includes 737 Chinook salmon taken in the test fishery.

[g] Data are preliminary.

[h] Subsistence, Personal Use and Sport Fish harvest data are unavailable at this time Estimates are based on the previous 5-year average.

Appendix Table B2.–Alaskan catch of Yukon River Chinook salmon, 1961–2007.

Year	Commercial	Commercial Related [a]	Total	Subsistence [b]	Personal Use [c]	Test Fish Sales [d]	Sport Fish [e]	Total
1961	119,664	0	119,664	21,488				141,152
1962	94,734	0	94,734	11,110				105,844
1963	117,048	0	117,048	24,862				141,910
1964	93,587	0	93,587	16,231				109,818
1965	118,098	0	118,098	16,608				134,706
1966	93,315	0	93,315	11,572				104,887
1967	129,656	0	129,656	16,448				146,104
1968	106,526	0	106,526	12,106				118,632
1969	91,027	0	91,027	14,000				105,027
1970	79,145	0	79,145	13,874				93,019
1971	110,507	0	110,507	25,684				136,191
1972	92,840	0	92,840	20,258				113,098
1973	75,353	0	75,353	24,317				99,670
1974	98,089	0	98,089	19,964				118,053
1975	63,838	0	63,838	13,045				76,883
1976	87,776	0	87,776	17,806				105,582
1977	96,757	0	96,757	17,581			156	114,494
1978	99,168	0	99,168	30,785			523	130,476
1979	127,673	0	127,673	31,005			554	159,232
1980	153,985	0	153,985	42,724			956	197,665
1981	158,018	0	158,018	29,690			769	188,477
1982	123,644	0	123,644	28,158			1,006	152,808
1983	147,910	0	147,910	49,478			1,048	198,436
1984	119,904	0	119,904	42,428			351	162,683
1985	146,188	0	146,188	39,771			1,368	187,327
1986	99,970	0	99,970	45,238			796	146,004
1987	134,760	0	134,760 [f]	55,039	1,706		502	192,007
1988	100,364	0	100,364	45,495	2,125	1,081	944	150,009
1989	104,198	0	104,198	48,462	2,616	1,293	1,053	157,622
1990	95,247	413	95,660	48,587	2,594	2,048	544	149,433
1991	104,878	1,538	106,416	46,773		689	773	154,651
1992	120,245	927	121,172	47,077		962	431	169,642
1993	93,550	560	94,110	63,915	426	1,572	1,695	161,718
1994	113,137	703	113,840	53,902		1,631	2,281	171,654
1995	122,728	1,324	124,052	50,620	399	2,152	2,525	179,748
1996	89,671	521	90,192	45,671	215	1,698	3,151	140,927
1997	112,841	769	113,610	57,117	313	2,811	1,913	175,764
1998	43,618	81	43,699	54,124	357	926	654	99,760
1999	69,275	288	69,563	53,305	331	1,205	1,023	125,427
2000	8,518		8,518	36,404	75	597	276	45,870
2001				55,819	122		679	56,620
2002	24,128		24,128	43,742	126	528	486	69,010
2003	40,438		40,438	56,959	204	680	2,719	101,000
2004	56,151		56,151	55,713	201	792	1,513	114,370

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Appendix Table B2.–Page 2 of 2.

Year	Commercial	Commercial Related [a]	Total	Subsistence [b]	Personal Use [c]	Test Fish Sales [d]	Sport Fish [e]	Total
2005	32,029		32,029	53,409	138	296	483	86,355
2006 [g]	45,829		45,829	48,593	89	817	739	96,067
2007	33,634		33,634	51,683 [h]	152 [h]	849		87,506
Average								
1989-1998	100,011	684	100,695	51,625	989	1,578	1,502	156,092
2002-2006	39,715		39,715	51,683	152	623	1,188	93,360
1997-2006	48,092		48,218	51,519	196	961	1,049	97,024

[a] Includes salmon harvested for subsistence, and an estimate of the number of salmon harvested for the commercial production of salmon roe and the carcasses used for subsistence. These data are only available since 1990.

[b] Includes harvest from the Coastal District and test fish harvest that were utilized for subsistence.

[c] Prior to 1987, and 1990, 1991, and 1994 personal use was considered part of subsistence.

[d] Includes only test fish that were sold commercially.

[e] Sport fish harvest for the Alaskan portion of the Yukon River drainage. Most of this harvest is believed to have been taken within the Tanana River drainage (see Schultz et al. 1993; 1992 Yukon Area AMR).

[f] Includes 653 and 2,136 Chinook salmon illegally sold in Districts 5 (Yukon River) and 6 (Tanana River), respectively.

[g] Subsistence and personal use data are preliminary.

[h] Data are unavailable at this time. Estimated based on the previous 5-year average.

Appendix Table B3.–Alaska catch of Yukon River summer chum salmon, 1970–2007.

Year	Subsistence [a]	Commercial	Commercial Related [b]	Personal Use	Test Fish Sales [c]	Sport Fish [d]	Total
1970	166,504	137,006	0				303,510
1971	171,487	100,090	0				271,577
1972	108,006	135,668	0				243,674
1973	161,012	285,509	0				446,521
1974	227,811	589,892	0				817,703
1975	211,888	710,295	0				922,183
1976	186,872	600,894	0				787,766
1977	159,502	534,875	0			316	694,693
1978	171,383	1,052,226	25,761			451	1,249,821
1979	155,970	779,316	40,217			328	975,831
1980	167,705	928,609	139,106			483	1,235,903
1981	117,629	1,006,938	272,763			612	1,397,942
1982	117,413	461,403	255,610			780	835,206
1983	149,180	744,879	250,590			998	1,145,647
1984	166,630	588,597	277,443			585	1,033,255
1985	157,744	516,997	417,016			1,267	1,093,024
1986	182,337	721,469	467,381			895	1,372,082
1987	170,678	442,238	180,303	4,262		846	798,327
1988	196,599	1,148,650	468,032	2,225	3,587	1,037	1,820,130
1989	167,155	955,806	496,934	1,891	10,605	2,132	1,634,523
1990	115,609	302,625	214,552	1,827	8,263	472	643,348
1991	118,540	349,113	308,989		3,934	1,037	781,613
1992	125,497	332,313	211,264		1,967	1,308	672,349
1993	104,776	96,522	43,594	674	1,869	564	247,999
1994	109,904	80,284	178,457		3,212	350	372,207
1995	118,723	259,774	558,640	780	6,073	1,174	945,164
1996	102,503	147,127	535,106	905	7,309	1,854	794,804
1997	97,109	95,242	133,010	391	2,590	475	328,817
1998	86,004	28,611	187	84	3,019	421	118,326
1999	70,323	29,389	24	382	836	555	101,509
2000	64,895	6,624	0	30	648	161	72,358
2001	58,385	0	0	146	0	82	58,613
2002	72,260	13,558	19	175	218	384	86,614
2003	68,304	10,685	0	148	119	1,638	80,894
2004	69,672	26,410	0	231	217	203	96,733
2005	93,259	41,264	0	152	134	435	135,244
2006 [e]	115,093	92,116	0	262	502	583	209,032
2007	91,123 [f]	198,201	0	194	10 [f]		290,265
Average							
2002-2006	83,718	36,807	4	194	238	649	121,703
1997-2006	79,530	34,390	13,324	200	828	494	128,814

[a] Includes harvest from the Coastal District and test fish harvest that were utilized for subsistence.

[b] Includes salmon harvested for subsistence and an estimate of the number of salmon harvested for the commercial production of salmon roe and the carcasses used for subsistence.

[c] Includes only test fish that were sold commercially.

[d] The majority of the sport-fish harvest is believed to be taken in the Tanana drainage. Sport fish division does not differentiate between the summer and fall chum salmon. Sport fish harvest is assumed to be primarily summer chum salmon caught incidental to directed Chinook fishing.

[e] Subsistence and personal use data are preliminary.

[f] Data are unavailable at this time. Estimated based on the previous 5-year average.

Appendix Table B4.–Alaskan catch of Yukon River fall chum salmon, 1961–2007.

Year	Estimated Subsistence Use	[a]	Harvest					
			Subsistence	[b]	Commercial	[c]	Total	[d]
1961	101,772	[e, f]	101,772		42,461		144,233	
1962	87,285	[e, f]	87,285		53,116		140,401	
1963	99,031	[e, f]	99,031				99,031	
1964	120,360	[e, f]	120,360		8,347		128,707	
1965	112,283	[e, f]	112,283		23,317		135,600	
1966	51,503	[e, f]	51,503		71,045		122,548	
1967	68,744	[e, f]	68,744		38,274		107,018	
1968	44,627	[e, f]	44,627		52,925		97,552	
1969	52,063	[e, f]	52,063		131,310		183,373	
1970	55,501	[e, f]	55,501		209,595		265,096	
1971	57,162	[e, f]	57,162		189,594		246,756	
1972	36,002	[e, f]	36,002		152,176		188,178	
1973	53,670	[e, f]	53,670		232,090		285,760	
1974	93,776	[e, f]	93,776		289,776		383,552	
1975	86,591	[e, f]	86,591		275,009		361,600	
1976	72,327	[e, f]	72,327		156,390		228,717	
1977	82,771	[f]	82,771	[f]	257,986		340,757	
1978	94,867	[f]	84,239	[f]	247,011		331,250	
1979	233,347		214,881		378,412		593,293	
1980	172,657		167,637		298,450		466,087	
1981	188,525		177,240		477,736		654,976	
1982	132,897		132,092		224,992		357,084	
1983	192,928		187,864		307,662		495,526	
1984	174,823		172,495		210,560		383,055	
1985	206,472		203,947		270,269		474,216	
1986	164,043		163,466		140,019		303,485	
1987	361,663		361,663	[g]			361,663	
1988	158,694		155,467		164,210		319,677	
1989	230,978		216,229		301,928		518,157	
1990	185,244		173,076		143,402		316,478	
1991	168,890		145,524		258,154		403,678	
1992	110,903		107,602		20,429	[h]	128,031	
1993	76,925		76,925				76,925	
1994	127,586		123,218		7,999		131,217	
1995	163,693		131,369		284,178		415,547	
1996	146,154		129,222		107,347		236,569	
1997	96,899		95,425		59,054		154,479	
1998	62,869		62,869				62,869	
1999	89,999		89,998		20,371		110,369	

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Appendix Table B4.–Page 2 of 2.

Year	Estimated Subsistence Use [a]	Harvest		
		Subsistence [b]	Commercial [c]	Total [d]
2000	19,307	19,307		19,307
2001	35,154	35,154		35,154
2002	19,393	19,393		19,393
2003	57,178	57,178	10,996	68,174
2004	62,436	62,436	4,110	66,546
2005	91,597	91,597	180,162	271,759
2006 [i]	84,133	84,133	174,542	258,675
2007	62,947 [j]	62,947 [j]	90,677	153,624
Average				
1961-06	112,733	109,068	166,036	249,837
1997-06	61,897	61,749	74,873	106,673
2002-06	62,947	62,947	92,453	136,909

[a] Includes salmon harvested for subsistence and personal use purposes, and an estimate of number of salmon harvested for the commercial production of salmon roe and the carcasses used for subsistence. These data are only available since 1990. Does not include harvest from the Coastal District.

[b] Includes salmon harvested for subsistence and personal use. Does not include harvest from the Coastal District.

[c] Includes ADF&G test fish sales, fish sold in the round, and estimated numbers of female salmon commercially harvested for production of salmon roe (see Bergstrom et al. 1992; 1990 Yukon Area AMR).

[d] Does not include sport-fish harvest. The majority of the sport-fish harvest is believed to be taken in the Tanana River drainage. Sport fish division does not differentiate between the two races of chum salmon. However, most of this harvest is believed to be summer chum salmon.

[e] Catches estimated because harvest of species other than Chinook salmon were not differentiated.

[f] Minimum estimates because surveys were conducted prior to the end of the fishing season.

[g] Includes an estimated 95,768 and 119,168 fall chum salmon illegally sold in Districts 5 (Yukon River) and 6 (Tanana River), respectively.

[h] Commercial fishery operated only in District 6, the Tanana River.

[i] Subsistence and personal use data are preliminary.

[j] Data are unavailable at this time. Estimate based on the previous 5-year average.

Appendix Table B5.–Alaskan catch of Yukon River coho salmon, 1961–2007.

Year	Estimated Subsistence Use	[a]	Harvest Subsistence	[b]	Commercial	[c]	Sport	[d]	Total
1961	9,192	[e, f]	9,192	[e, f]	2,855				12,047
1962	9,480	[e, f]	9,480	[e, f]	22,926				32,406
1963	27,699	[e, f]	27,699	[e, f]	5,572				33,271
1964	12,187	[e, f]	12,187	[e, f]	2,446				14,633
1965	11,789	[e, f]	11,789	[e, f]	350				12,139
1966	13,192	[e, f]	13,192	[e, f]	19,254				32,446
1967	17,164	[e, f]	17,164	[e, f]	11,047				28,211
1968	11,613	[e, f]	11,613	[e, f]	13,303				24,916
1969	7,776	[e, f]	7,776	[e, f]	15,093				22,869
1970	3,966	[e, f]	3,966	[e, f]	13,188				17,154
1971	16,912	[e, f]	16,912	[e, f]	12,203				29,115
1972	7,532	[e, f]	7,532	[e, f]	22,233				29,765
1973	10,236	[e, f]	10,236	[e, f]	36,641				46,877
1974	11,646	[e, f]	11,646	[e, f]	16,777				28,423
1975	20,708	[e, f]	20,708	[e, f]	2,546				23,254
1976	5,241	[e, f]	5,241	[e, f]	5,184				10,425
1977	16,333	[f]	16,333	[f]	38,863		112		55,308
1978	7,787	[f]	7,787	[f]	26,152		302		34,241
1979	9,794		9,794		17,165		50		27,009
1980	20,158		20,158		8,745		67		28,970
1981	21,228		21,228		23,680		45		44,953
1982	35,894		35,894		37,176		97		73,167
1983	23,905		23,905		13,320		199		37,424
1984	49,020		49,020		81,940		831		131,791
1985	32,264		32,264		57,672		808		90,744
1986	34,468		34,468		47,255		1,535		83,258
1987	84,894		84,894	[g]			1,292		86,186
1988	69,080		69,080		99,907		2,420		171,407
1989	41,583		41,583		85,493		1,811		128,887
1990	47,896		44,641		46,937		1,947		93,525
1991	40,894		37,388		109,657		2,775		149,820
1992	53,344		51,921		9,608	[h]	1,666		63,195
1993	15,772		15,772				897		16,669
1994	48,926		44,594		4,451		2,174		51,219
1995	29,716		28,642		47,206		1,278		77,126
1996	33,651		30,510		57,710		1,588		89,808
1997	24,579		24,295		35,818		1,470		61,583
1998	17,781		17,781		1		758		18,540
1999	20,970		20,970		1,601		609		23,180

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Year	Estimated Subsistence Use [a]	Harvest			
		Subsistence [b]	Commercial [c]	Sport [d]	Total
2000	14,717	14,717		554	15,271
2001	21,654	21,654		1,248	22,902
2002	15,261	15,261		1,092	16,353
2003	24,129	24,129	25,243	1,477	50,849
2004	20,965	20,965	20,232	1,623	42,820
2005	27,078	27,078	58,311	627	86,016
2006 [k]	19,650	19,650	64,942	1,000	85,592
2007	21,417 [m]	21,417 [m]	44,575		67,156
Average					
1961-2006	24,342	23,972	29,773	1,078	51,212
1997-2006	20,678	20,650	29,450	1,046	42,311
2002-2006	21,417	21,417	42,182	1,164	56,326

[a] Includes salmon harvested for subsistence and personal use purposes, and an estimate of the number of salmon harvested for the commercial production of salmon roe and the carcasses used for subsistence. These data are only available since 1990. Does not include the Coastal District.

[b] Includes salmon harvested for subsistence and personal use. Does not include the Coastal District.

[c] Includes ADF&G test fish sales, fish sold in the round, and estimated numbers of female salmon commercially harvested for the production of salmon roe (see Bergstrom et al. 1992; 1990 Yukon Area AMR).

[d] Sport fish harvest for the Alaskan portion of the Yukon River drainage. The majority of this harvest is believed to have been taken within the Tanana River drainage (see Schultz et al. 1993; 1992 Yukon Area AMR).

[f] Catches estimated because harvest of species other than Chinook were not differentiated.

[g] Minimum estimates because surveys were conducted before the end of the fishing season.

[h] Includes an estimated 5,015 and 31,276 coho salmon illegally sold in Districts 5 and 6 (Tanana River), respectively.

[j] Commercial fishery operated only in District 6, the Tanana River.

[k] Subsistence and personal use data are preliminary.

[m] Data are unavailable at this time. Estimate based on the previous 5-year average.

Appendix Table B6.–Alaskan and Canadian total utilization of Yukon River Chinook and fall chum salmon, 1961–2007.

	Chinook Salmon			Fall Chum Salmon		
Year	Canada [a]	Alaska [b, c]	Total	Canada [a]	Alaska [b, c]	Total
1961	13,246	141,152	154,398	9,076	144,233	153,309
1962	13,937	105,844	119,781	9,436	140,401	149,837
1963	10,077	141,910	151,987	27,696	99,031 [d]	126,727
1964	7,408	109,818	117,226	12,187	128,707	140,894
1965	5,380	134,706	140,086	11,789	135,600	147,389
1966	4,452	104,887	109,339	13,192	122,548	135,740
1967	5,150	146,104	151,254	16,961	107,018	123,979
1968	5,042	118,632	123,674	11,633	97,552	109,185
1969	2,624	105,027	107,651	7,776	183,373	191,149
1970	4,663	93,019	97,682	3,711	265,096	268,807
1971	6,447	136,191	142,638	16,911	246,756	263,667
1972	5,729	113,098	118,827	7,532	188,178	195,710
1973	4,522	99,670	104,192	10,135	285,760	295,895
1974	5,631	118,053	123,684	11,646	383,552	395,198
1975	6,000	76,883	82,883	20,600	361,600	382,200
1976	5,025	105,582	110,607	5,200	228,717	233,917
1977	7,527	114,494	122,021	12,479	340,757	353,236
1978	5,881	130,476	136,357	9,566	331,250	340,816
1979	10,375	159,232	169,607	22,084	593,293	615,377
1980	22,846	197,665	220,511	22,218	466,087	488,305
1981	18,109	188,477	206,586	22,281	654,976	677,257
1982	17,208	152,808	170,016	16,091	357,084	373,175
1983	18,952	198,436	217,388	29,490	495,526	525,016
1984	16,795	162,683	179,478	29,267	383,055	412,322
1985	19,301	187,327	206,628	41,265	474,216	515,481
1986	20,364	146,004	166,368	14,543	303,485	318,028
1987	17,614	192,007	209,621	44,480	361,663 [d]	406,143
1988	21,427	150,009	171,436	33,565	319,677	353,242
1989	17,944	157,622	175,566	23,020	518,157	541,177
1990	19,227	149,433	168,660	33,622	316,478	350,100
1991	20,607	154,651	175,258	35,418	403,678	439,096
1992	17,903	168,191	186,094	20,815	128,031 [e]	148,846
1993	16,611	163,078	179,689	14,090	76,925 [d]	91,015
1994	21,198	172,315	193,513	38,008	131,217	169,225
1995	20,884	177,663	198,547	45,600	415,547	461,147
1996	19,612	138,562	158,174	24,354	236,569	260,923
1997	16,528	174,625	191,153	15,580	154,479	170,059
1998	5,937	99,369	105,306	7,951	62,869	70,820
1999	12,468	124,315	136,783	19,636	110,369	130,005
2000	4,879	45,308	50,187	9,236	19,307	28,543
2001	10,139	53,738	63,877	9,822	35,154 [d]	44,976

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Year	Chinook Salmon			Fall Chum Salmon		
	Canada [a]	Alaska [b, c]	Total	Canada [a]	Alaska [b, c]	Total
2002	9,257	67,888	77,145	8,018	19,393	27,411
2003	9,619	99,150	108,769	11,355	68,174	79,529
2004	11,238	112,232	123,470	9,750	66,546	76,296
2005	11,371	85,507	96,878	18,337	271,846	290,183
2006	9,072	95,184	104,256	11,796	258,675	270,471
2007 [f]	5,094	87,506	93,423	14,109	153,624	167,733
Average						
1961-2006	12,092	131,935	144,027	18,461	249,839	268,301
1997-2006	10,051	95,732	105,782	12,148	106,681	118,829
2002-2006	10,111	91,992	102,104	11,851	136,927	148,778

Note: Canadian managers do not refer to chum as fall chum.

[a] Catches in number of salmon. Includes commercial, aboriginal, domestic, and sport catches combined.

[b] Catch in number of salmon. Includes estimated number of salmon harvested for the commercial production of salmon roe (see Bergstrom et al. 1992; 1990 Yukon Area AMR).

[c] Commercial, subsistence, personal-use, and sport catches combined.

[d] Commercial fishery did not operate within the Alaskan portion of the drainage.

[e] Commercial fishery operated only in District 6, the Tanana River.

[f] Data are preliminary.

Appendix Table B7.–Canadian catch of Yukon River Chinook salmon, 1961–2007.

	Mainstem Yukon River Harvest							Porcupine River	Total
			Aboriginal		Test	Combined		Aboriginal	Canadian
Year	Commercial	Domestic	Fishery	Sport[a]	Fishery	Non-Commercial	Total	Fishery Harvest	Harvest
1961	3,446		9,300			9,300	12,746	500	13,246
1962	4,037		9,300			9,300	13,337	600	13,937
1963	2,283		7,750			7,750	10,033	44	10,077
1964	3,208		4,124			4,124	7,332	76	7,408
1965	2,265		3,021			3,021	5,286	94	5,380
1966	1,942		2,445			2,445	4,387	65	4,452
1967	2,187		2,920			2,920	5,107	43	5,150
1968	2,212		2,800			2,800	5,012	30	5,042
1969	1,640		957			957	2,597	27	2,624
1970	2,611		2,044			2,044	4,655	8	4,663
1971	3,178		3,260			3,260	6,438	9	6,447
1972	1,769		3,960			3,960	5,729		5,729
1973	2,199		2,319			2,319	4,518	4	4,522
1974	1,808	406	3,342			3,748	5,556	75	5,631
1975	3,000	400	2,500			2,900	5,900	100	6,000
1976	3,500	500	1,000			1,500	5,000	25	5,025
1977	4,720	531	2,247			2,778	7,498	29	7,527
1978	2,975	421	2,485			2,906	5,881		5,881
1979	6,175	1,200	3,000			4,200	10,375		10,375
1980	9,500	3,500	7,546	300		11,346	20,846	2,000	22,846
1981	8,593	237	8,879	300		9,416	18,009	100	18,109
1982	8,640	435	7,433	300		8,168	16,808	400	17,208
1983	13,027	400	5,025	300		5,725	18,752	200	18,952
1984	9,885	260	5,850	300		6,410	16,295	500	16,795
1985	12,573	478	5,800	300		6,578	19,151	150	19,301
1986	10,797	342	8,625	300		9,267	20,064	300	20,364
1987	10,864	330	6,069	300		6,699	17,563	51	17,614
1988	13,217	282	7,178	650		8,110	21,327	100	21,427
1989	9,789	400	6,930	300		7,630	17,419	525	17,944
1990	11,324	247	7,109	300		7,656	18,980	247	19,227
1991	10,906	227	9,011	300		9,538	20,444	163	20,607
1992	10,877	277	6,349	300		6,926	17,803	100	17,903
1993	10,350	243	5,576	300		6,119	16,469	142	16,611
1994	12,028	373	8,069	300		8,742	20,770	428	21,198
1995	11,146	300	7,942	700		8,942	20,088	796	20,884

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	Mainstem Yukon River Harvest							Porcupine River	Total
Year	Commercial	Domestic	Aboriginal Fishery	Sport[a]	Test Fishery	Combined Non-Commercial	Total	Aboriginal Fishery Harvest	Canadian Harvest
1996	10,164	141	8,451	790		9,382	19,546	66	19,612
1997	5,311	288	8,888	1,230		10,406	15,717	811	16,528
1998	390	24	4,687		737	5,448	5,838	99	5,937
1999	3,160	213	8,804	177		9,194	12,354	114	12,468
2000[b]			4,068		761	4,829	4,829	50	4,879
2001	1,351	89	7,416	146	767	8,418	9,769	370	10,139
2002	708	59	7,138	128	1,036	8,361	9,069	188	9,257
2003	2,672	115	6,121	275	263	6,774	9,446	173	9,616
2004	3,785	88	6,483	423	167	7,161	10,946	292	11,238
2005	4,066	99	6,376	436		6,911	10,977	394	11,371
2006	2,332	63	5,757	606		6,426	8,758	314	9,072
2007[c]		0	4,175	2	617	4,794	4,794	300	5,094
Average									
1961-2006	5,836	405	5,573	390	622	6,148	11,857	251	12,092
1997-2006	2,642	115	6,574	428	622	7,393	9,770	281	10,051
2002-2006	2,713	85	6,375	374	489	7,127	9,839	272	10,111

[a] Sport fish harvest unknown before 1980.

[b] A test fishery and aboriginal fisheries took place, but all other fisheries were closed.

[c] Data are preliminary.

Appendix Table B8.–Canadian catch of Yukon River fall chum salmon, 1961–2007.

	Mainstem Yukon River Harvest						Porcupine River	Total
Year	Commercial	Domestic	Test	Aboriginal Fishery	Combined Non-Commercial	Total	Aboriginal Fishery Harvest	Canadian Harvest
1961	3,276			3,800	3,800	7,076	2,000	9,076
1962	936			6,500	6,500	7,436	2,000	9,436
1963	2,196			5,500	5,500	7,696	20,000	27,696
1964	1,929			4,200	4,200	6,129	6,058	12,187
1965	2,071			2,183	2,183	4,254	7,535	11,789
1966	3,157			1,430	1,430	4,587	8,605	13,192
1967	3,343			1,850	1,850	5,193	11,768	16,961
1968	453			1,180	1,180	1,633	10,000	11,633
1969	2,279			2,120	2,120	4,399	3,377	7,776
1970	2,479			612	612	3,091	620	3,711
1971	1,761			150	150	1,911	15,000	16,911
1972	2,532				0	2,532	5,000	7,532
1973	2,806			1,129	1,129	3,935	6,200	10,135
1974	2,544	466		1,636	2,102	4,646	7,000	11,646
1975	2,500	4,600		2,500	7,100	9,600	11,000	20,600
1976	1,000	1,000		100	1,100	2,100	3,100	5,200
1977	3,990	1,499		1,430	2,929	6,919	5,560	12,479
1978	3,356	728		482	1,210	4,566	5,000	9,566
1979	9,084	2,000		11,000	13,000	22,084		22,084
1980	9,000	4,000		3,218	7,218	16,218	6,000	22,218
1981	15,260	1,611		2,410	4,021	19,281	3,000	22,281
1982	11,312	683		3,096	3,779	15,091	1,000	16,091
1983	25,990	300		1,200	1,500	27,490	2,000	29,490
1984	22,932	535		1,800	2,335	25,267	4,000	29,267
1985	35,746	279		1,740	2,019	37,765	3,500	41,265
1986	11,464	222		2,200	2,422	13,886	657	14,543
1987	40,591	132		3,622	3,754	44,345	135	44,480
1988	30,263	349		1,882	2,231	32,494	1,071	33,565
1989	17,549	100		2,462	2,562	20,111	2,909	23,020
1990	27,537	0		3,675	3,675	31,212	2,410	33,622
1991	31,404	0		2,438	2,438	33,842	1,576	35,418
1992	18,576	0		304	304	18,880	1,935	20,815
1993	7,762	0		4,660	4,660	12,422	1,668	14,090
1994	30,035	0		5,319	5,319	35,354	2,654	38,008

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Appendix Table B8.–Page 2 of 2.

	Mainstem Yukon River Harvest						Porcupine River	Total
Year	Commercial	Domestic	Test	Aboriginal Fishery	Combined Non-Commercial	Total	Aboriginal Fishery Harvest	Canadian Harvest
1995	39,012	0		1,099	1,099	40,111	5,489	45,600
1996	20,069	0		1,260	1,260	21,329	3,025	24,354
1997	8,068	0		1,218	1,218	9,286	6,294	15,580
1998[a]				1,792	1,792	1,792	6,159	7,951
1999	10,402	0		3,234	3,234	13,636	6,000	19,636
2000	1,319	0		2,917	2,917	4,236	5,000	9,236
2001	2,198	3	1 [b]	3,027	3,030	5,228	4,594	9,822
2002	3,065	0	2,756 [b]	3,093	3,093	6,158	1,860	8,018
2003	9,030	0	990 [b]	1,943	1,943	10,973	382	11,355
2004	7,365	0	995 [b]	2,180	2,180	9,545	205	9,750
2005	11,931	13		1,800	1,813	13,744	4,593	18,337
2006	4,096	0		2,521	2,521	6,617	5,179	11,796
2007[c]	7,109	0	3,765	2,221	2,221	9,330	4,500	13,830
Average								
1961-2006	11,193	579	1,186	2,531	2,879	13,828	4,736	18,461
1997-2006	6,386	2	1,186	2,373	2,374	8,122	4,027	12,148
2002-2006	7,097	3	1,580	2,307	2,310	9,407	2,444	11,851

[a] A test fishery and aboriginal fisheries took place, but all other fisheries were closed.
[b] The chum test fishery is a live-release test fishery.
[c] Data are preliminary.

Appendix Table B9.–Chinook salmon aerial survey indices for selected spawning areas in the Alaskan portion of the Yukon River drainage, 1961–2007.

	Andreafsky River				Anvik River				Nulato River							
Year	East Fork		West Fork		Drainage Wide Total		Index Area		North Fork		South Fork		Both Forks		Gisasa River	
1961	1,003				1,226				376	a	167				266	a
1962	675	a	762	a												
1963																
1964	867		705													
1965			344	a	650	a										
1966	361		303		638											
1967			276	a	336	a										
1968	380		383		310	a										
1969	274	a	231	a	296	a										
1970	665		574	a	368											
1971	1,904		1,682													
1972	798		582	a	1,198											
1973	825		788		613											
1974			285		471	a			55	a	23	a		a	161	
1975	993		301		730				123		81				385	
1976	818		643		1,053				471		177				332	
1977	2,008		1,499		1,371				286		201				255	
1978	2,487		1,062		1,324				498		422				45	a
1979	1,180		1,134		1,484				1,093		414				484	
1980	958	a	1,500		1,330		1,192		954	a	369	a		a	951	
1981	2,146	a	231	a	807	a	577	a			791					
1982	1,274		851												421	
1983					653	a	376	b	526		480				572	
1984	1,573	a	1,993		641	a	574	b								
1985	1,617		2,248		1,051		720		1,600		1,180				735	
1986	1,954		3,158		1,118		918		1,452		1,522				1,346	
1987	1,608		3,281		1,174		879		1,145		493				731	
1988	1,020		1,448		1,805		1,449		1,061		714				797	
1989	1,399		1,089		442	a	212	a								
1990	2,503		1,545		2,347		1,595		568	a	430	a		a	884	a
1991	1,938		2,544		875	a	625	a	767		1,253				1,690	
1992	1,030	a	2,002	a	1,536		931		348		231				910	
1993	5,855		2,765		1,720		1,526		1,844		1,181				1,573	
1994	300	a	213	a			913	a	843		952				2,775	
1995	1,635		1,108		1,996		1,147		968		681				410	
1996			624		839		709				100					
1997	1,140		1,510		3,979		2,690								144	a
1998	1,027		1,249	a	709	a	648	a	507		546				889	a
1999		a	870	a		a	950	a		a		a				a
2000	1,018		427		1,721		1,394			a		a				a
2001	1,065		570		1,420		1,172						1,884	b	1,298	
2002	1,447		917		1,713		1,329						1,584		506	

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Appendix Table B9.–Page 2 of 2.

Year	Andreafsky River		Anvik River		Nulato River			Gisasa River
	East Fork	West Fork	Drainage Wide Total	Index Area	North Fork	South Fork	Both Forks	
2003	1,116 [a]	1,578 [a]	1,100 [a]	973 [a]				
2004	2,879	1,317	3,679	3,475			1,321	731
2005	1,715	1,492	2,421	2,421			553	958
2006	590 [a]	824	1,876	1,776			1,292	843
2007	1,758	976	1,529	1,580			2,583	593
SEG [c]	960-1,700	640-1,600		1,100-1,700			940-1,900	420-1,100
Average								
1961-2006	1,386	1,137	1,257	1,199	774	564	1,327	781
1997-2006	1,333	1,075	2,069	1,683			1,327	767
2002-2006	1,549	1,226	2,158	1,995			1,188	760

Note: Aerial survey counts are peak counts only. Survey rating was fair or good unless otherwise noted.

[a] Incomplete, poor timing and/or poor survey conditions resulting in minimal or inaccurate counts.

[b] Sustainable Escapement Goal.

[c] In 2001, the Nulato River escapement goal was established for both forks combined.

Appendix Table B10.–Chinook salmon escapement counts for selected spawning areas in the Alaskan portion of the Yukon River drainage, 1986–2007.

Year	Andreafsky River		Nulato River Tower	Gisasa River Weir		Chena River w/corrected percent females		Salcha River w/corrected percent females	
	No. Fish	% Fem.	No. Fish	No. Fish	% Fem.	No. Fish	% Fem.	No. Fish	% Fem.
1986	1,530	23.3 [a]				9,065	20.0 [d]		35.8
1987	2,011	56.1 [a]				6,404	43.8 [d]	4,771	47.0 [d]
1988	1,339	38.7 [a]				3,346	46.0 [d]	4,562	36.6 [d]
1989		13.6				2,666	38.0 [d]	3,294	46.8 [d]
1990		41.6				5,603	35.0 [d]	10,728	35.4 [d]
1991		33.9				3,025	31.5 [d]	5,608	34.0 [d]
1992		21.2				5,230	27.8 [d]	7,862	27.3 [d]
1993		29.9				12,241	11.9 [a]	10,007	24.2 [a]
1994	7,801	35.5 [b, c]	1,795 [c]	2,888	[c]	11,877	34.9 [a]	18,399	35.2 [a]
1995	5,841	43.7 [b]	1,412	4,023	46.0	9,680	50.3	13,643	42.2 [a]
1996	2,955	41.9 [b]	756	1,991	19.5	7,153	27.0	7,570	26.3
1997	3,186	36.8 [b]	4,766	3,764	26.0	13,390	17.0 [a]	18,514	36.3 [a]
1998	4,034	29.0 [b]	1,536	2,414	16.2	4,745	30.5 [a]	5,027	22.4 [a]
1999	3,444	28.6 [b]	1,932	2,644	26.4	6,485	47.0 [a]	9,198	38.8 [a]
2000	1,609	54.3 [b]	908	2,089	34.4	4,694	20.0 [d]	4,595	29.9 [a]
2001		[c]	[c]	3,052	49.2 [c]	9,696	32.4 [a]	13,328	27.9 [a]
2002	4,123	21.1 [b]	2,696	2,025	20.7	6,967	27.0 [d]	4,644	34.8 [c]
2003	4,336	45.3 [b]	1,716 [c]	1,901	38.1	8,739	34.0 [c]	15,500	31.8 [c,f]
2004	8,045	37.3	[g]	1,774	30.1	9,645	47.0	15,761	47.0
2005	2,239	50.2	[g]	3,111	34.0		[c]	5,988	54.3
2006	6,463	42.6	[g]	3,030	28.2	2,936	34.0 [c]	10,679	33.0
2007 [h]	4,504	44.7	[g]	1,425	39.0	3,564	[k]	5,631	[k]
BEG [j]						2,800-5,700		3,300-6,500	
Average									
1986-2006	3,930	36.2	1,946	2,670	30.7	7,179	32.8	9,484	35.6
1997-2006	4,164	38.4	2,259	2,580	30.3	7,477	32.1	10,323	35.6
2002-2006	5,041	39.3		2,368	30.2	7,072	35.5	10,514	40.2

[a] Tower counts.

[b] Weir counts.

[c] Incomplete count because of late installation, early removal of project or inoperable.

[d] Mark–recapture population estimate.

[f] Expanded counts based on average run timing.

[g] Project did not operate.

[h] Data are preliminary.

[j] Biological Escapement Goals (BEG) established by the Alaska Board of Fisheries, Jan. 2001.

[k] Data not available.

Appendix Table B11.–Chinook salmon escapement counts for selected spawning areas in the Canadian portion of the Yukon River drainage, 1961–2007.

										Whitehorse Fishway		Canadian Mainstem		
Year	Tincup Creek [a]	Tatchun Creek [b]	Little Salmon River [a]	Big Salmon River [a, c]	Nisutlin River [a, d]	Ross River [a, f]	Wolf River [a, g]	Blind Creek	Chandindu River	Count	Percent Hatchery Contribution	Border Passage Estimate	Harvest	Spawning Escapement Estimate [j]
1961										1,068	0			
1962										1,500	0			
1963										483	0			
1964										595	0			
1965										903	0			
1966		7 [k]								563	0			
1967										533	0			
1968			173 [k]	857 [k]	407 [k]	104 [k]				414	0			
1969			120	286	105					334	0			
1970		100		670	615		71 [k]			625	0			
1971		130	275	275	650		750			856	0			
1972		80	126	415	237		13			391	0			
1973		99	27 [k]	75 [k]	36 [k]					224	0			
1974		192		70 [k]	48 [k]					273	0			
1975		175		153 [k]	249		40 [k]			313	0			
1976		52		86 [k]	102					121	0			
1977		150	408	316 [k]	77					277	0			
1978		200	330	524	375					725	0			
1979		150	489 [k]	632	713		183 [k]			1,184	0			
1980		222	286 [k]	1,436	975		377			1,383	0			
1981		133	670	2,411	1,626	949	395			1,555	0			
1982		73	403	758	578	155	104			473	0	36,598	16,808	19,790
1983	100	264	101 [k]	540	701	43 [k]	95			905	0	47,741	18,752	28,989
1984	150	153	434	1,044	832	151 [k]	124			1,042	0	43,911	16,295	27,616
1985	210	190	255	801	409	23 [k]	110			508	0	29,881	19,151	10,730

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Appendix Table B11.–Page 2 of 3.

Year	Tincup Creek [a]	Tatchun Creek [b]	Little Salmon River [a]	Big Salmon River [a, c]	Nisutlin River [a, d]	Ross River [a, f]	Wolf River [a, g]	Blind Creek	Chandindu River	Whitehorse Fishway Count	Whitehorse Fishway Percent Hatchery Contribution	Canadian Mainstem Border Passage Estimate	Canadian Mainstem Harvest	Canadian Mainstem Spawning Escapement Estimate [j]
1986	228	155	54 [k]	745	459 [k]	72 [p]	109			557	0	36,479	20,064	16,415
1987	100	159	468	891	183	180 [k]	35			327	0	30,823	17,563	13,260
1988	204	152	368	765	267	242	66			405	16	44,445	21,327	23,118
1989	88	100	862	1,662	695	433 [p]	146			549	19	42,620	17,419	25,201
1990	83	643	665	1,806	652	457 [k]	188			1,407	24	56,679	18,980	37,699 [q]
1991			326	1,040		250	201 [r]			1,266 [h]	51 [h]	41,187	20,444	20,743 [q]
1992	73	106	494	617	241	423	110 [r]			758 [h]	84 [h]	43,185	17,803	25,382 [q]
1993		183	184	572	339	400	168 [r]			668 [h]	73 [h]	45,027	16,469	28,558 [q]
1994	101 [k]	477	726	1,764	389	506	393 [r]			1,577 [h]	54 [h]	46,680	20,770	25,910 [q]
1995	121	397	781	1,314	274	253 [k]	229 [r]			2,103	57	52,353	20,088	32,265
1996	150	423	1,150	2,565	719	102 [k]	705 [r]			2,958	35	47,955	19,546	28,409
1997	193	1,198	1,025	1,345	277		322 [r]	957		2,084	24	53,400	15,717	37,683
1998	53	405	361	523	145		66	373	132	777	95	22,588	5,838	16,750
1999		252	495	353	330		131	892	239	1,118	74	23,716 [v]	12,354	11,362
2000	19 [t]	277 [e]	46	113	20		32		4 [w]	677	69	16,173 [v]	4,829	11,344
2001	39 [t]		1,035	1,020	481		154		129 [m]	988	36	52,207 [v]	9,769	42,438
2002			526	1,149	280		84		[l]	605	39	49,214 [v]	9,069	40,145 [q]
2003			1,658	3,075	687		292	1115	185 [i]	1,443	70	56,929 [v]	9,443	47,486
2004			1,140	762	330		226	792		1,989	76	48,111 [v]	10,946	37,165
2005			1519	952	807	363	260	525		2,632	57	42,245	10,977	31,268
2006			1381	1140	601		114	677		1,720	47	36,748	8,758	27,990
2007 [s]			451	601	137		54	304		427	56	22,120	4,794	17,326
Escapement Objective														28,000 [q]
Average														
1961-06	120	235	553	911	445	284	197	762	138	953	22	41,876	15,167	26,709
1997-06	76	533	919	1043	396	363	168	762	138	1403	59	40133	9770	30363
2002-06			1,245		541	363	195	777	185	1,678	58	46,649	9,839	36,811

-continued-

[a] Data obtained by aerial survey unless otherwise noted. Only peak counts are listed. Survey rating is fair to good, unless otherwise noted.
[b] All foot surveys prior to 1997 except 1978 (boat survey) and 1986 (aerial survey).
[c] For 1968, 1970, and 1971 counts are from mainstem Big Salmon River. For all other years counts are from the mainstem Big Salmon River between Big Salmon Lake and the vicinity of Souch Creek.
[d] One Hundred Mile Creek to Sidney Creek.
[e] Flood conditions caused early termination of this program.
[f] Index area includes Big Timber Creek to Lewis Lake.
[g] Index area includes Wolf Lake to Red River.
[h] Counts and estimated percentages may be biased high. In some or all of these years a number of adipose-clipped fish ascended the fishway, and were counted more than once. These fish would have been released into the fishway as fry between 1989 and 1994, inclusive.
[i] Combination RBW and conduit weir tested and operational from July 10–30.
[j] Estimated total spawning escapement excluding Porcupine River (estimated border escapement minus the Canadian catch).
[k] Incomplete and/or poor survey conditions resulting in minimal or inaccurate counts. Estimated spawning escapement from the DFO tagging study for years 1983, and 1985–1989.
[l] RBW tested for 3 weeks.
[m] Conventional weir July 1-September 8, but was breached from July 31-August 7.
[n] Information on area surveyed is unavailable.
[p] Counts are for Big Timber Creek to Sheldon Lake.
[q] Interim escapement objective. Stabilization escapement objective for years 1990–1995 was 18,000 salmon. Rebuilding step escapement objective for 2002 is 25,000 salmon for subsistence and 28,000 salmon for commercial.
[r] Counts are for Wolf Lake to Fish Lake outlet.
[s] Data are preliminary.
[t] Foot survey.
[v] The 1999 to 2004 Chinook border estimates were revised using a stratified "SPAS" analyses.
[w] High water delayed project installation, therefore counts are incomplete.

Appendix Table B12.–Summer chum salmon ground based escapement counts for selected spawning areas in the Alaskan portion of the Yukon River drainage, 1973–2007.

	East Fork Andreafsky R.		Anvik R. Sonar		Kaltag Crk. Tower	Nulato R. Tower		Gisasa R. Weir		Clear Crk. Weir		Chena R. Tower	Salcha R. Tower
Year	No. Fish	% Fem.	No. Fish	% Fem.	No. Fish	No. Fish	% Fem.	No. Fish	% Fem.	No. Fish	% Fem.	No. Fish	No. Fish
1980			492,676	60.7									
1981	147,312	[a]	1,486,182	54.7									
1982	181,352	64.6 [a]	444,581	69.4									
1983	110,608	57.4 [a]	362,912	56.5									
1984	70,125	50.7 [a]	891,028	60.9									
1985		58.1 [d]	1,080,243	55.8									
1986	167,614	55.4 [b]	1,189,602	57.8									
1987	45,221	58.6 [b]	455,876	65.1			44.9						
1988	68,937	49.3 [b]	1,125,449	66.1			60.9						
1989			636,906	65.6									
1990			403,627	51.3									
1991			847,772	57.9									
1992			775,626	56.6									
1993		48.6	517,409	52.0								5,400	5,809
1994	200,981	65.2 [c, d]	1,124,689	59.1	47,295	148,762	47.7 [d]	51,116	[d]			9,984	39,450
1995	172,148	48.9 [c]	1,339,418	40.1	77,193	236,890	55.6	136,886	45.7	116,735	62.1	3,519 [d]	30,784
1996	108,450	51.4 [c]	933,240	47.3	51,269	129,694	51.9	157,589	49.3	100,912	59.0	12,810 [d]	74,827
1997	51,139	[c]	609,118	53.6	48,018	157,975	51.9	31,800		76,454		9,439 [d]	35,741
1998	67,591	57.3 [c]	471,865	55.9	8,113	49,140	64.2	18,228	50.8	212	[d]	5,901 [d]	17,289
1999	32,229	56.4 [c]	437,631	58.1	5,300	30,076	63.0	9,920	53.1	11,283	[d]	9,165 [d]	23,221
2000	22,918	48.2 [c]	196,349	61.6	6,727	24,308	62.6	14,410	49.9	19,376	43.6	3,515	20,516
2001		52.0 [d]	224,058	55.3	[d]		[d]	17,936	50.3 [d]	3,674	32.4	4,773 [d]	14,900
2002	45,019	52.9	462,101	60.2	13,583	72,232	27.0	32,943	47.7	13,150	51.6	1,021 [d]	20,837 [d]
2003	22,603	44.8	251,358	55.3	3,056 [d]	17,814	[d]	24,379	45.9	5,230	40.5	573 [d]	[d]
2004	62,730	51.4	365,691	53.3	5,247		[e]	37,851	44.9	15,661	44.5	15,162	47,861
2005	20,127	44.0	525,391	48.0	22,093		[e]	172,259	46.3	26,420	45.8	[d]	193,085
2006	101,465	48.6	992,378	50.7 [f]	[e]		[e]	225,225	52.2	29,166	43.4 [g]	35,109 [d]	111,869
2007 [h]	69,642	46.8	459,038	58.2	[e]		[e]	46,257	55.6		[e]	4,705	11,196
BEG [i]	65-130		350-700										

-continued-

Appendix Table B12.–Page 2 of 2.

[a] Sonar count.
[b] Tower count.
[c] Weir count.
[d] Incomplete count caused by late installation and/or early removal of project, or high water events.
[e] Project did not operate.
[f] HTI and DIDSON sonar equipment used in 2006. Estimate reported is DIDSON derived, while the %female was calculated using the previously reported HTI estimate.
[g] Videography count.
[h] Data are preliminary.
[i] Biological Escapement Goals (in thousands of fish) established by the Alaska Board of Fisheries, Jan. 2001.

Appendix Table B13.–Fall chum salmon abundance estimates or escapement estimates for selected spawning areas in Alaskan and Canadian portions of the Yukon River Drainage, 1971–2007.

	Alaska							
	Tanana River Drainage					Upper Yukon River Drainage		
Year	Toklat River [a]	Kantishna River Abundance Estimate [b]	Delta River [c]	Bluff Cabin Slough [d]	Upper Tanana River Abundance Estimate [e]	Rampart Rapids Abundance Estimate [f]	Chandalar River [g]	Sheenjek River [h]
1971								
1972			5,384					
1973			10,469					
1974	41,798		5,915					89,966 [r]
1975	92,265		3,734 [s]					173,371 [r]
1976	52,891		6,312 [s]					26,354 [r]
1977	34,887		16,876 [s]					45,544 [r]
1978	37,001		11,136					32,449 [r]
1979	158,336		8,355					91,372 [r]
1980	26,346 [t]		5,137	3,190 [j]				28,933 [r]
1981	15,623		23,508	6,120 [j]				74,560 [v]
1982	3,624		4,235	1,156				31,421 [v]
1983	21,869		7,705	12,715				49,392 [v]
1984	16,758		12,411	4,017				27,130 [v]
1985	22,750		17,276 [s]	2,655 [j]				152,768 [v, aa]
1986	17,976		6,703 [s]	3,458			59,313	84,207 [z, aa]
1987	22,117		21,180	9,395			52,416	153,267 [z, aa]
1988	13,436		18,024	4,481 [j]			33,619	45,206 [z]
1989	30,421		21,342 [s]	5,386 [j]			69,161	99,116 [z]
1990	34,739		8,992 [s]	1,632			78,631	77,750 [z]
1991	13,347		32,905 [s]	7,198				86,496 [ac]
1992	14,070		8,893 [s]	3,615 [j]				78,808
1993	27,838		19,857	5,550 [j]				42,922
1994	76,057		23,777 [s]	2,277 [j]				150,565
1995	54,513 [t]		20,587	19,460	268,173		280,999	241,855
1996	18,264		19,758 [s]	7,074 [s]	134,563	654,296	208,170	246,889
1997	14,511		7,705 [s]	5,707 [s]	71,661	369,547	199,874	80,423 [ai]
1998	15,605		7,804 [s]	3,549 [s]	62,384	194,963	75,811	33,058
1999	4,551	27,199	16,534 [s]	7,037 [s]	97,843	189,741	88,662	14,229
2000	8,911	21,450	3,001 [s]	1,595	34,844	[ag]	65,894	30,084 [ah]
2001	6,007 [ai]	22,992	8,103 [s]	1,808 [j]	96,556 [aj]	201,766	110,971	53,932
2002	28,519	56,719	11,992 [s]	3,116	109,970	196,186	89,850	31,642
2003	21,492	87,359	22,582 [s]	10,600 [j]	193,418	485,102	214,416	44,047
2004	35,480	76,163	25,073 [s]	10,270 [j]	123,879	618,597 [ak]	136,706	37,878
2005	17,779 [t]	107,719	28,132 [s]	11,964 [j]	337,755	1,987,982	496,494	600,346 [aa, al, am]
2006		71,135	14,055 [s]		202,669		245,090	160,178 [aa, al]
2007 [an]		76,883	18,610 [s]		307,495		228,056	65,435 [aa, al]
BEG [ao]	15,000-33,000		6,000-13,000		46,000-103,000 [ap]		74,000-152,000	50,000-104,000
Average								
1971-2006	31,243	58,842	13,870	5,963	144,476	544,242	147,416	97,459
1997-2006	16,984	58,842	14,498	6,183	133,098	530,486	172,377	108,582
2002-2006	25,818	79,819	20,367	8,988	193,538	821,967	236,511	174,818

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Appendix Table B13.–Page 2 of 4.

	Canada							
						Canadian Mainstem		
Year	Fishing Branch River [i, j]	Mainstem Yukon River Index [j, k]	Koidern River [j]	Kluane River [j, l]	Teslin River [j, m]	Border Passage Estimate	Harvest	Spawning Escapement Estimate [n]
1971	312,800							
1972	35,125 [o]			198 [p, d]				
1973	15,989 [q]	383		2,500				
1974	31,525 [q]			400				
1975	353,282 [q]	7,671		362 [d]				
1976	36,584			20				
1977	88,400			3,555				
1978	40,800			0 [d]				
1979	119,898			4,640 [d]				
1980	55,268			3,150		39,130	16,218	22,912
1981	57,386 [u]			25,806		66,347	19,281	47,066 [w]
1982	15,901	1,020 [x]		5,378		47,049	15,091	31,958
1983	27,200	7,560		8,578 [d]		118,365	27,490	90,875
1984	15,150	2,800 [y]	1,300	7,200	200	81,900	25,267	56,633 [w]
1985	56,016 [q]	10,760	1,195	7,538	356	99,775	37,765	62,010
1986	31,723 [q]	825	14	16,686	213	101,826	13,886	87,940
1987	48,956 [q]	6,115	50	12,000		125,121	44,345	80,776
1988	23,597 [q]	1,550	0	6,950	140	69,280	32,494	36,786
1989	43,834 [q]	5,320	40	3,050	210 [p]	55,861	20,111	35,750
1990	35,000 [ab]	3,651	1	4,683	739	82,947	31,212	51,735
1991	37,733 [q]	2,426	53	11,675	468	112,303	33,842	78,461
1992	22,517 [q]	4,438	4	3,339	450	67,962	18,880	49,082
1993	28,707 [q]	2,620	0	4,610	555	42,165	12,422	29,743
1994	65,247 [q]	1,429 [p]	20 [p]	10,734	209 [p]	133,712	35,354	98,358
1995	51,971 [q, ad]	4,701	0	16,456	633	198,203	40,111	158,092
1996	77,278 [q]	4,977		14,431	315	143,758	21,329	122,429
1997	26,959 [q]	2,189		3,350	207	94,725	9,286	85,439
1998	13,564 [q]	7,292		7,337	235	48,047	1,792	46,255
1999	12,904 [q]			5,136	19 [p]	72,188 [af]	13,636	58,552
2000	5,053 [q]	933 [p]		1,442	204	57,978 [af]	4,236	53,742
2001	21,669 [q]	2,453		4,884	5	38,769 [af]	5,228	33,851
2002	13,563 [q]	973		7,147	64	104,853 [af]	6,158	98,695
2003	29,519 [q]	7,982		39,347	390	153,656 [af]	10,973	142,683
2004	20,274 [q]	3,440		18,982	167	163,625 [af]	9,545	154,080
2005	121,413 [q]	16,425		34,600	585	451,477	13,744	437,733
2006	30,849 [q]	6,553		18,208	620	217,810	6,617	211,193
2007 [an]	33,750 [q]					235,956	9,330	226,626
EO [aq]	50,000-120,000							>80,000
Average								
1971-2006	56,213	4,480	223	8,982	317	110,697	19,475	91,223
1997-2006	29,577	5,360	-	14,043	250	140,313	8,073	132,191
2002-2006	43,124	7,075	-	23,657	365	218,284	9,407	208,877

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Appendix Table B13.–Page 3 of 4.

Note: Canadian managers refer to summer and fall chum salmon as chum salmon.

[a] Expanded total abundance estimates for upper Toklat River index area using stream life curve (SLC) developed with 1987–1993 data. Index area includes Geiger Creek, Sushana River, and mainstem floodplain sloughs from approximately 0.25 mile upstream of roadhouse.

[b] Fall chum salmon abundance estimate for the Kantishna and Toklat River drainages is based on a mark–recapture program. Tag deployment occurs at a fish wheel located near the mouth of the Kantishna River and recaptures are collected at four fish wheels; two located 8 miles upstream of the mouth of the Toklat River (1999–2005) and one fish wheel on the Upper Kantishna River (2000–2002) and two fish wheels in 2003–2007.

[c] Estimates are a total spawner abundance, using migratory time density curves and stream life data, unless otherwise indicated.

[d] Foot survey, unless otherwise indicated.

[e] Fall chum salmon abundance estimate for the upper Tanana River drainage is based on a mark–recapture program. Tag deployment occurs from a fish wheel (two fish wheels in 1995) located just upstream of the Kantishna River and recaptures are collected from one fish wheel (two fish wheels in 1995) located downstream from the village of Nenana.

[f] Fall chum salmon abundance estimate for the upper Yukon River drainage is based on a mark–recapture program. Tag deployment occurs at two fish wheels (one fish wheel in 2004) located at the "Rapids" and recaptures are collected from a fish wheel (two fish wheels in 1996 to 1999) located downstream from the village of Rampart.

[g] Side-scan sonar estimate for 1986–1990, split-beam sonar estimate 1995 to 2006. DIDSON estimate in 2007.

[h] Side-scan sonar estimate beginning in 1981, split-beam sonar estimate 2002 to 2004, DIDSON since 2005.

[i] Located within the Canadian portion of the Porcupine River drainage. Total escapement estimated using weir to aerial survey expansion factor of 2.72, unless otherwise indicated.

[j] Aerial survey count, unless otherwise indicated.

[k] Index area includes Tatchun Creek to Fort Selkirk.

[l] Index area includes Duke River to end of spawning sloughs below Swede Johnston Creek.

[m] Index area includes Boswell Creek area (5 km below to 5 km above confluence).

[n] Excludes Fishing Branch River escapement (estimated border passage minus Canadian harvest).

[o] Weir installed Sept 22. Estimate consists of weir count of 17,190 after Sept 22, and tagging passage estimate of 17,935 before weir installation.

[p] Incomplete and/or poor survey conditions resulting in minimal or inaccurate counts.

[q] Weir count.

[r] Total escapement estimate using sonar to aerial survey expansion factor of 2.22.

[s] Population estimate generated from replicate foot surveys and stream life data (area under the curve method).

[t] Minimal estimate because of late timing of ground surveys with respect to peak of spawning.

[u] Initial aerial survey count doubled before applying the weir/aerial expansion factor of 2.72 since only half of the spawning area was surveyed.

[v] Project started late, estimated escapements expanded for portion missed using average run timing curves based on Chandalar (1986-1990) and Sheenjek (1991-1993) rivers.

[w] Escapement estimate based on mark–recapture program unavailable. Estimate based on assumed average exploitation rate.

[x] Boat survey.

[y] Total index area not surveyed. Survey included the mainstem Yukon River between Yukon Crossing to 30 km below Fort Selkirk.

[z] Expanded estimates for period approximating second week August through middle fourth week September, using annual Chandalar River run timing data (1986-1990).

[aa] Sonar counts include both banks in 1985-1987 and 2005-2007.

[ab] Weir not operated. Although only 7,541 chum salmon were counted on a single survey flown October 26, a population estimate of approximately 27,000 fish was made through date of survey, based upon historic average aerial-to-weir expansion of 28%. Actual population of spawners was reported by DFO as between 30,000–40,000 fish considering aerial survey timing.

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[ac] Total abundance estimates are for the period approximating second week August through middle fourth week of September. Comparative escapement estimates before 1986 are considered more conservative; approximating the period end of August through mid week of September.

[ad] Incomplete count caused by late installation and/or early removal of project or high water events.

[ae] Data interpolated due to high water from 29 August until 3 September 1997, during buildup to peak passage.

[af] 1999 to 2004 border passage estimates were revised using a stratified "SPAS" analysis.

[ag] Project ended early, population estimate through 19 August 2000 was 45,021 on average this represents 0.24% of the run.

[ah] Project ended early (September 12) because of low water.

[ai] Minimal estimate because Sushana River was breached by the main channel and uncountable.

[aj] Low numbers of tags deployed and recovered resulted in an estimate with an extremely large confidence interval (95% CI +/- 41,072).

[ak] Preliminary estimate for 2004 was 618,597 fall chum salmon with a high standard error (SE 60,714).

[al] In addition to the historical right bank count, the left bank was enumerated with DIDSON (right bank count for 2005-2007 was 266,963, 106,397 and 39,548, respectively).

[am] Project ended while still counting >10,000 fish per day, estimate was expanded based on run timing (73%) at Rampart.

[an] Data are preliminary.

[ao] Biological Escapement Goal (BEG) ranges recommended to the Board of Fisheries 2001.

[ap] The BEG for the Tanana River as a whole is 61,000 to 136,000. However it includes the Toklat plus and the Upper Tanana which was broke out for comparison to the upper Tanana River abundance estimates.

[aq] Escapement Objective (EO) based on U.S./Canada Treaty Obligations, some years stabilization or rebuilding goals are applied.

Appendix Table B14.–Coho salmon passage estimates or escapement estimates for selected spawning areas in the Alaskan portion of the Yukon River Drainage, 1972–2007.

				Nenana River Drainage				Upper Tanana River Drainage			
Year	East Fork Andreafsky River [a]	Yukon River Mainstem Sonar Estimate [b]	Kantishna River Drainage Geiger Creek [c]	Lost Slough	Nenana Mainstem [d]	Wood Creek	Seventeen Mile Slough	Delta Clearwater River [e]	Delta Clearwater River Tributaries [f]	Clearwater Lake and Outlet	Richardson Clearwater River [g]
1972								632		417	454 [h]
1973								3,322		551	375
1974				1,388			27	3,954 [h]		560	652
1975				943			956	5,100		1,575 [i]	4 [h]
1976			25 [g, h]	118			281	1,920		1,500 [i]	80 [h]
1977			60	524 [g]		310 [c]	1,167	4,793		730 [i]	327
1978				350		300 [c]	466	4,798		570 [i]	
1979				227			1,987	8,970		1,015 [i]	372
1980			3 [g, h]	499 [g]		1,603 [c]	592	3,946		1,545 [i]	611
1981	1,657 [g]			274		849 [a, j]	1,005	8,563 [k]		459 [g]	550
1982			81			1,436 [a, j]		8,365 [k]			
1983			42	766		1,042 [a]	103	8,019 [k]		253	88
1984			20 [g, h]	2,677		8,826 [a]		11,061		1,368	428
1985			42 [g, h]	1,584		4,470 [a]	2,081	6,842		750	
1986			5	794		1,664 [a]	218 [i]	10,857		1,800	146 [h]
1987			1,175	2,511		2,387 [a]	3,802	22,300		4,225 [i]	

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Appendix Table B14.–Page 2 of 3.

								Upper Tanana River Drainage				
	East Fork Andreafsky	Yukon River Mainstem Sonar	Kantishna River Drainage	Nenana River Drainage				Delta Clearwater	Delta Clearwater River	Clearwater Lake and	Richardson Clearwater	
Year	River [a]	Estimate [b]	Geiger Creek [c]	Lost Slough	Nenana Mainstem [d]	Wood Creek	Seventeen Mile Slough	River [e]	Tributaries [f]	Outlet	River [g]	
1988	1,913 [l]		159	348		2,046 [a]		21,600		825 [i]		
1989			155			412 [a]	824 [g]	12,600		1,600 [i]	483	
1990			211	688	1,308		15 [g]	8,325		2,375 [i]		
1991			427	564	447		52	23,900		3,150 [i]		
1992			77	372			490	3,963		229 [i]	500	
1993			138	484	419	666 [a, m]	581	10,875		3,525 [i]		
1994			410	944	1,648	1,317 [a, n]	2,909	62,675	17,565	3,425 [i]	5,800	
1995	10,901	100,664	142	4,169	2,218	500 [a]	2,972 [g]	20,100	6,283	3,625 [i]		
1996	8,037		233	2,040	2,171	201 [g, h]	3,666 [i]	14,075	3,300	1,125 [h]		
1997	9,472	105,956	274	1,524 [o]	1,446	[q]	1,996	11,525	2,375	2,775 [i]		
1998	7,193	129,076	157	1,360 [h]	2,771 [h]	[q]	1,413 [q]	11,100	2,775	2,775 [i]		
1999	2,963	60,886	29	1,002 [h]	745 [h]	[q]	662 [h]	10,975	2,805			
2000	8,451	169,392	142	55 [g, h]	68 [g, h]	[q]	879 [g, h]	9,225	2,358	1,025 [i]	2,175	
2001	15,896	132,283	578	242	859	699	3,753	46,875	11,982	4,425 [i]	1,531	
2002	3,577	117,908	744	0	328	935	1,910	38,625	9,873	5,900	874	
2003	8,231	265,119	973	85	658	3,055	4,535	105,850	27,057	8,800	6,232	
2004	11,146	199,884	583	220	450	840	3,370	37,950	9,701	2,925	8,626	

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Appendix Table B14.–Page 3 of 3.

		Yukon	Kantishna					Upper Tanana River Drainage			
	East	River	River	Nenana River Drainage				Delta			
	Fork	Mainstem	Drainage					Clearwater	Clearwater	Clearwater	Richardson
	Andreafsky	Sonar	Geiger	Lost	Nenana	Wood	Seventeen	Clearwater	River	Lake and	Clearwater
Year	River [a]	Estimate [b]	Creek [c]	Slough	Mainstem [d]	Creek	Mile Slough	River [e]	Tributaries [f]	Outlet	River [g]
2005	5,303	184,071	625	430	325 [h]	1,030	3,890	34,293	8,766	2,100	2,024
2006		131,919		194	160 [h]	634	1,916	16,748	4,281	4,375	271
2007 [r]		173,289		63	520	605	1,733	14,650	3,961	2,075	553
SEG [s]								5,200-17,000 [z]			
Average											
1972-2007	8,288	147,537	278	857	973	1,558	1,621	17,483	8,077	2,187	1,442

Note: Only peak counts presented. Survey rating is fair to good, unless otherwise noted.

[a] Weir count, unless otherwise indicated.

[b] Passage estimates for coho salmon are incomplete. The sonar project is terminated prior to the end of the coho salmon run.

[c] Foot survey, unless otherwise indicated.

[d] Index area includes mainstem Nenana River between confluence's of Lost Slough and Teklanika River.

[e] Boat survey counts of index area (lower 17.5 river miles), unless otherwise indicated.

[f] Helicopter surveys counted tributaries of the Delta Clearwater River, outside of the normal mainstem index area, from 1994 to 1998, after which an expansion factor was used to estimate the escapement to the areas.

[g] Aerial survey, fixed wing or helicopter.

[h] Poor survey.

[i] Boat Survey.

[j] Weir was operated at the mouth of Clear Creek (Shores Landing).

[k] Expanded estimate based on partial survey counts and historic distribution of spawners from 1977 to 1980.

[l] The West Fork Andreafsky was also surveyed and 830 chum salmon were observed.

[m] Weir project terminated on October 4, 1993. Weir normally operated until mid to late October.

[n] Weir project terminated September 27, 1994. Weir normally operated until mid-October.

[o] Survey of western floodplain only.

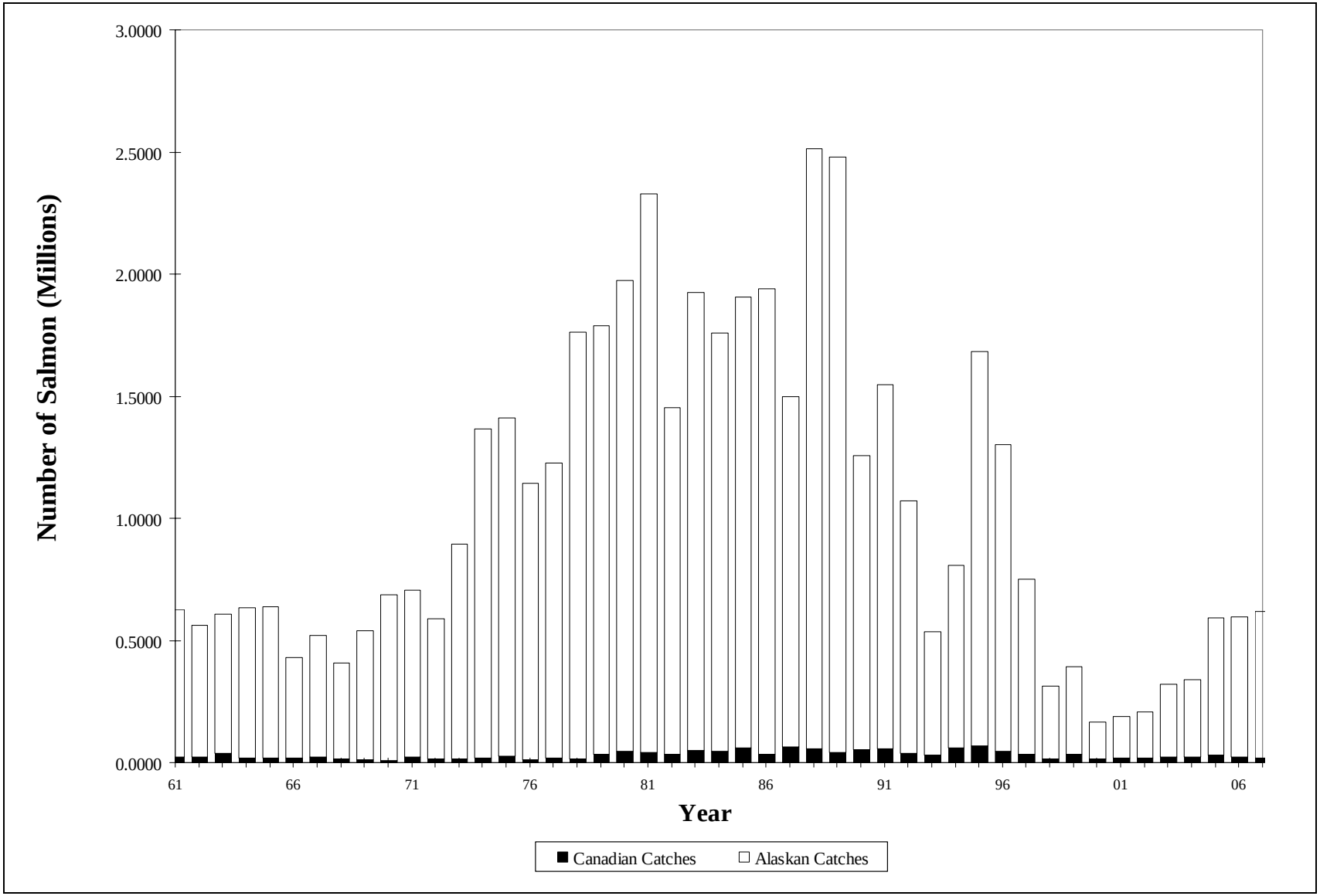
[p] No survey of Wood Creek due to obstructions in creek.

[q] Combination foot and boat survey.

[r] Data preliminary.

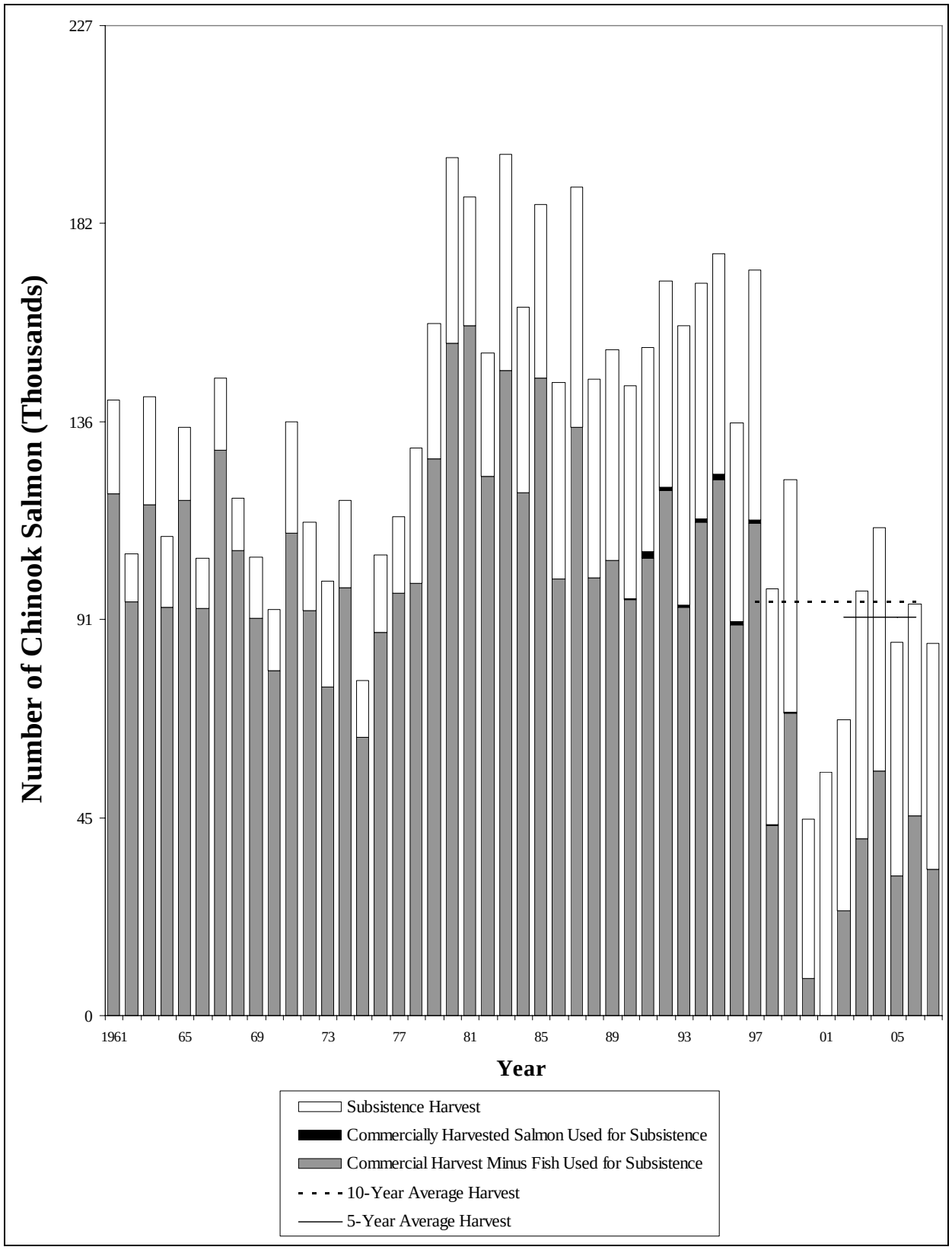
[s] Sustainable escapement goal (SEG) established January 2004, (replaces BEG of greater than 9,000 fish established March, 1993) based on boat survey counts of coho salmon in the lower 17.5 river miles during the period October 21 through 27.

APPENDIX B: FIGURES



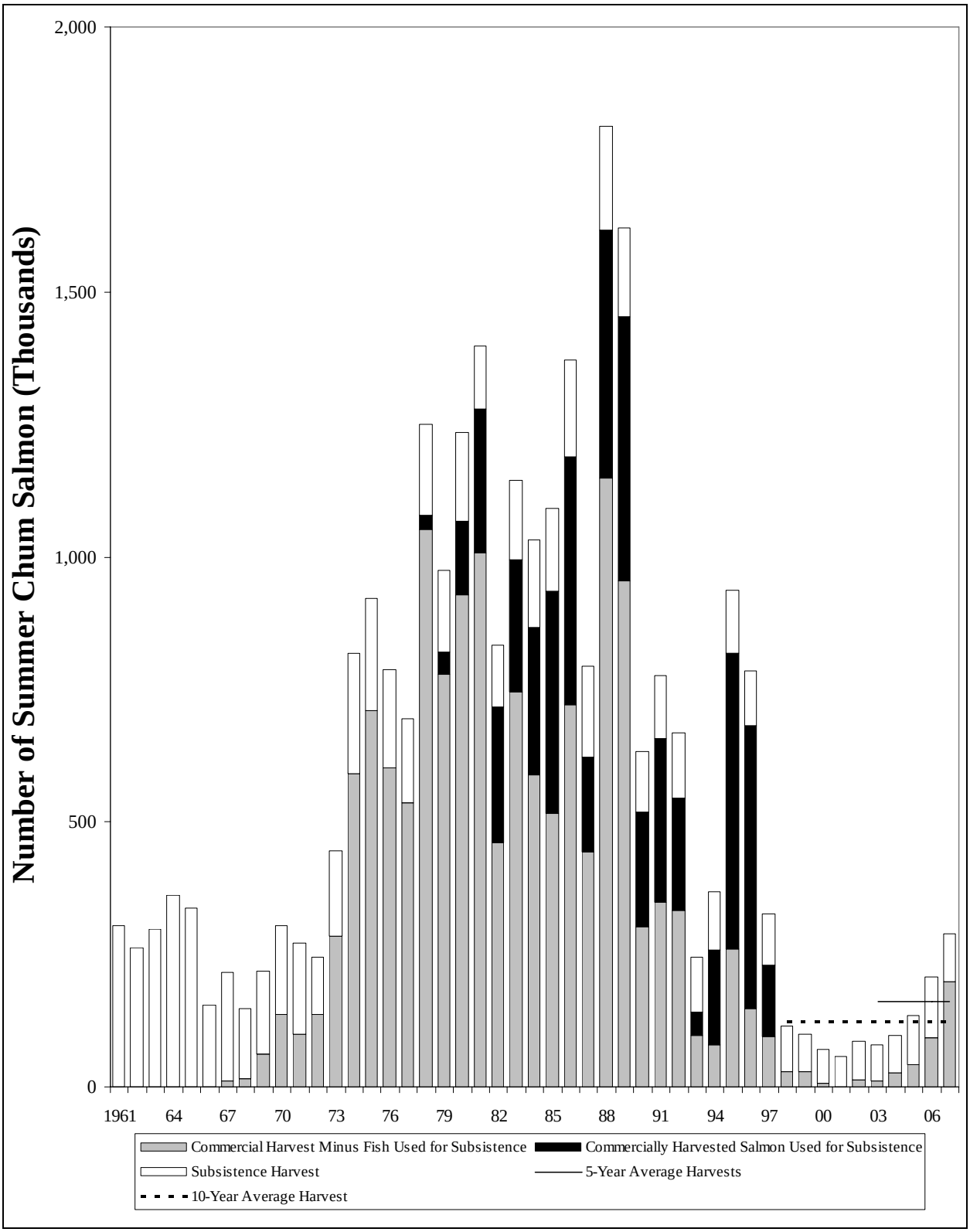
Note: Alaskan harvest estimates in 2007 other than commercial are preliminary.

Appendix Figure B1.–Total utilization of salmon, Yukon River, 1961–2007.



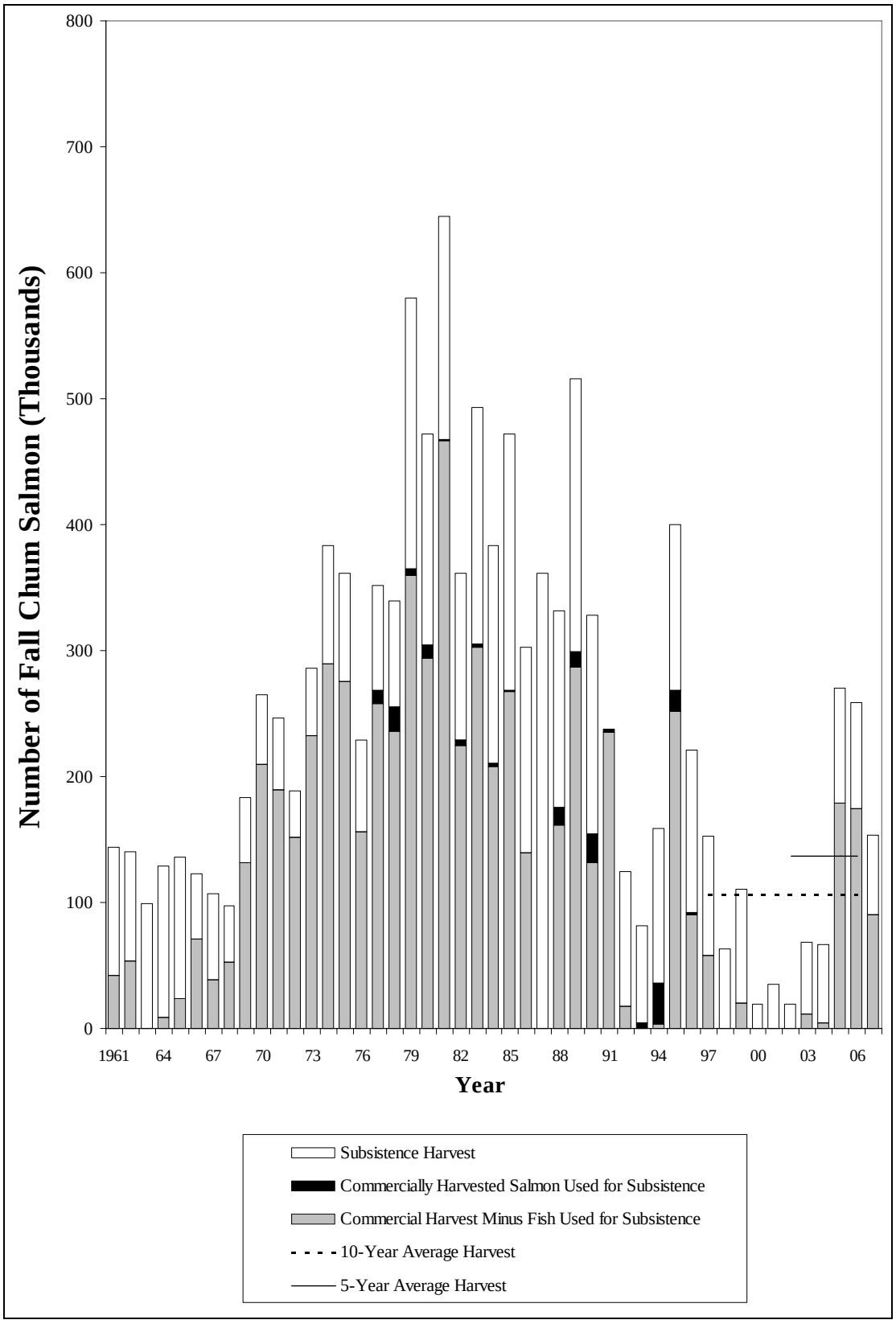
Note: The 2001 commercial fishery was closed. Alaskan harvest estimates in 2007 are preliminary.

Appendix Figure B2.–Alaskan harvest of Chinook salmon, Yukon River, 1961–2007.



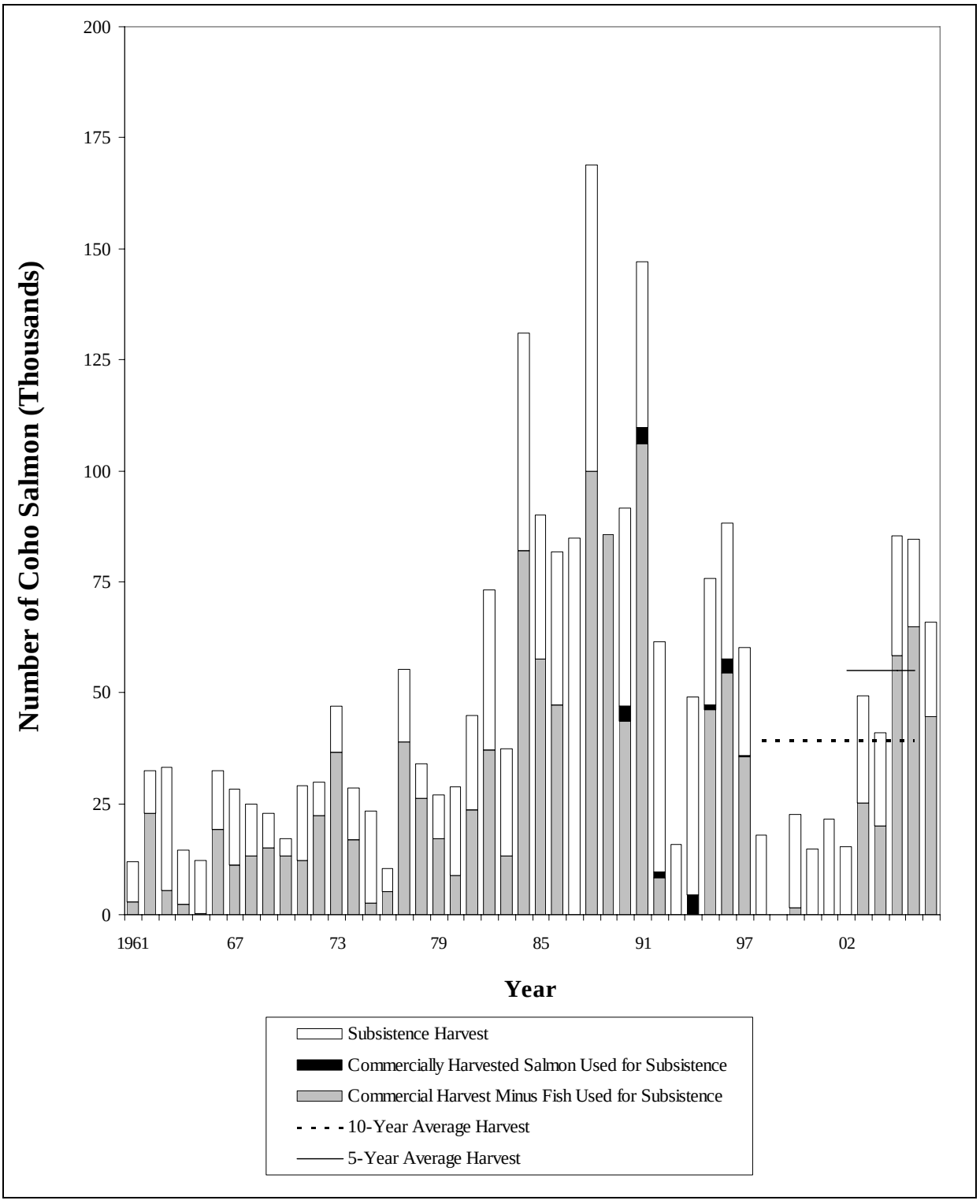
Note: The 2007 harvest estimates other than commercial are preliminary.

Appendix Figure B3.–Alaskan harvest of summer chum salmon 1961–2007.



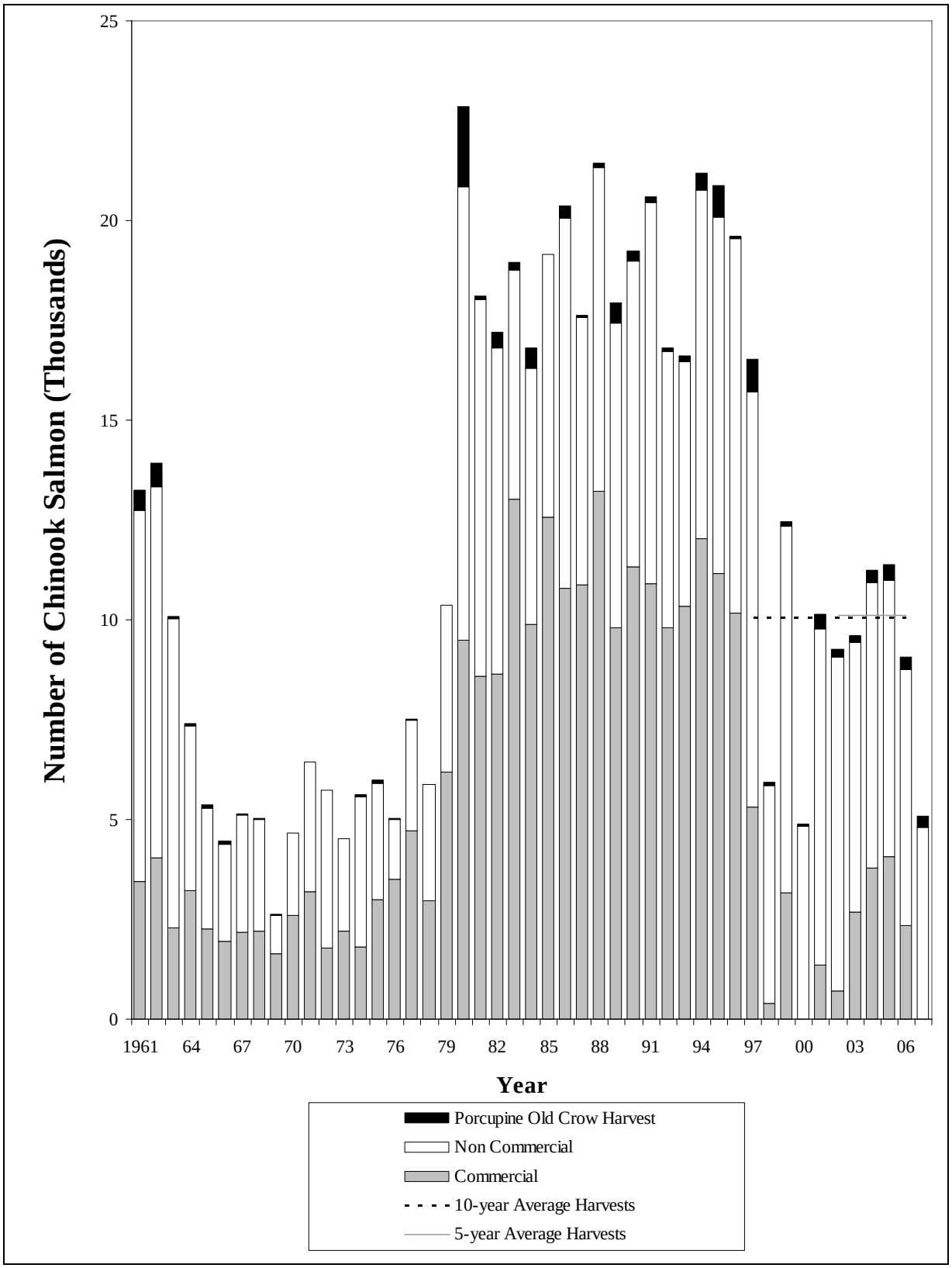
Note: The commercial fishery was closed 2000–2002. The 2007 subsistence harvest estimates are preliminary.

Appendix Figure B4.–Alaskan harvest of fall chum salmon, Yukon River, 1961–2007.



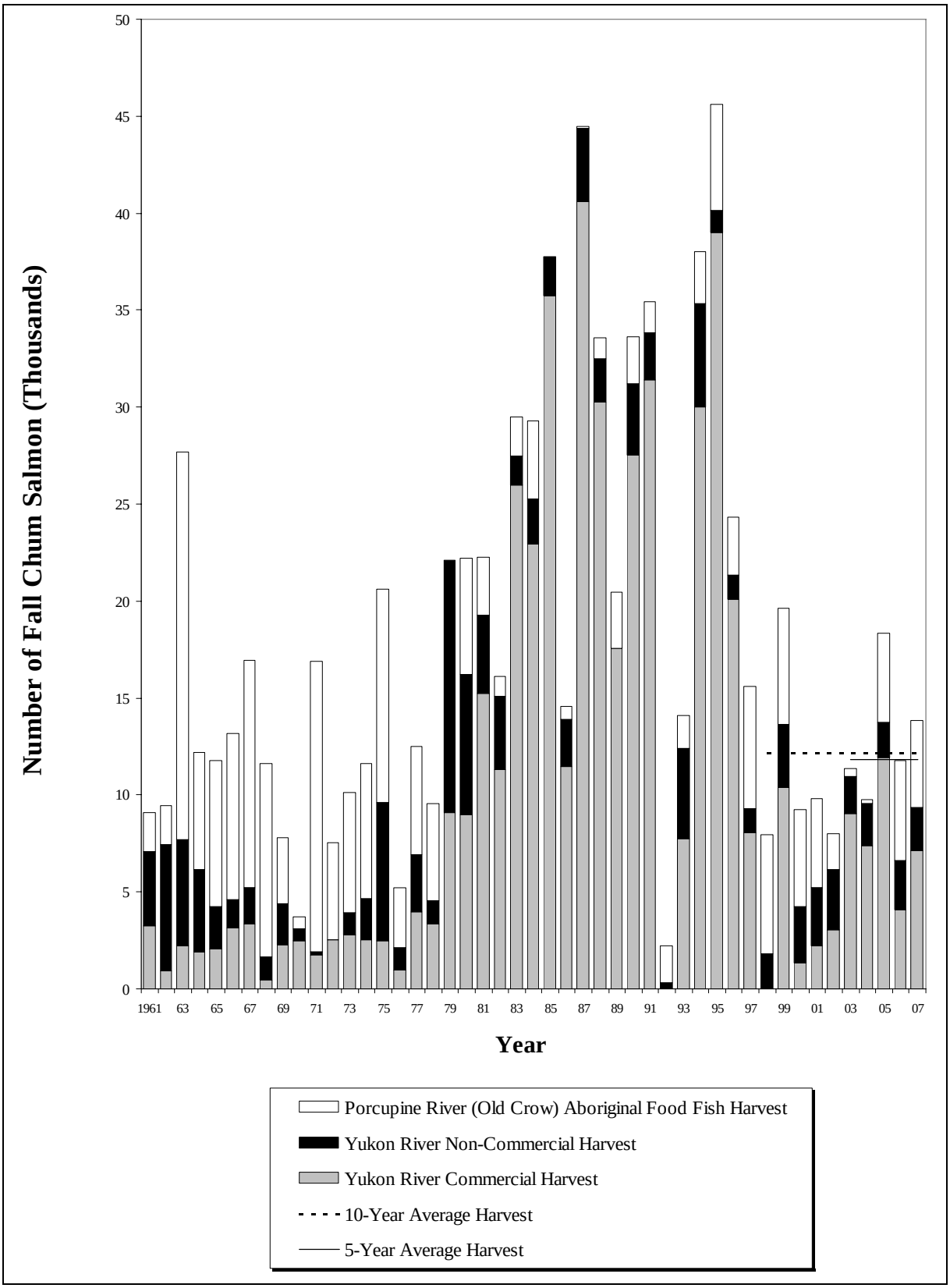
Note: The commercial fishery was closed 2000–2002. The 2007 subsistence harvest estimates are preliminary. Commercial harvest is not adjusted for subsistence use of commercially caught fish.

Appendix Figure B5.–Alaskan harvest of coho salmon, Yukon River, 1961–2007.



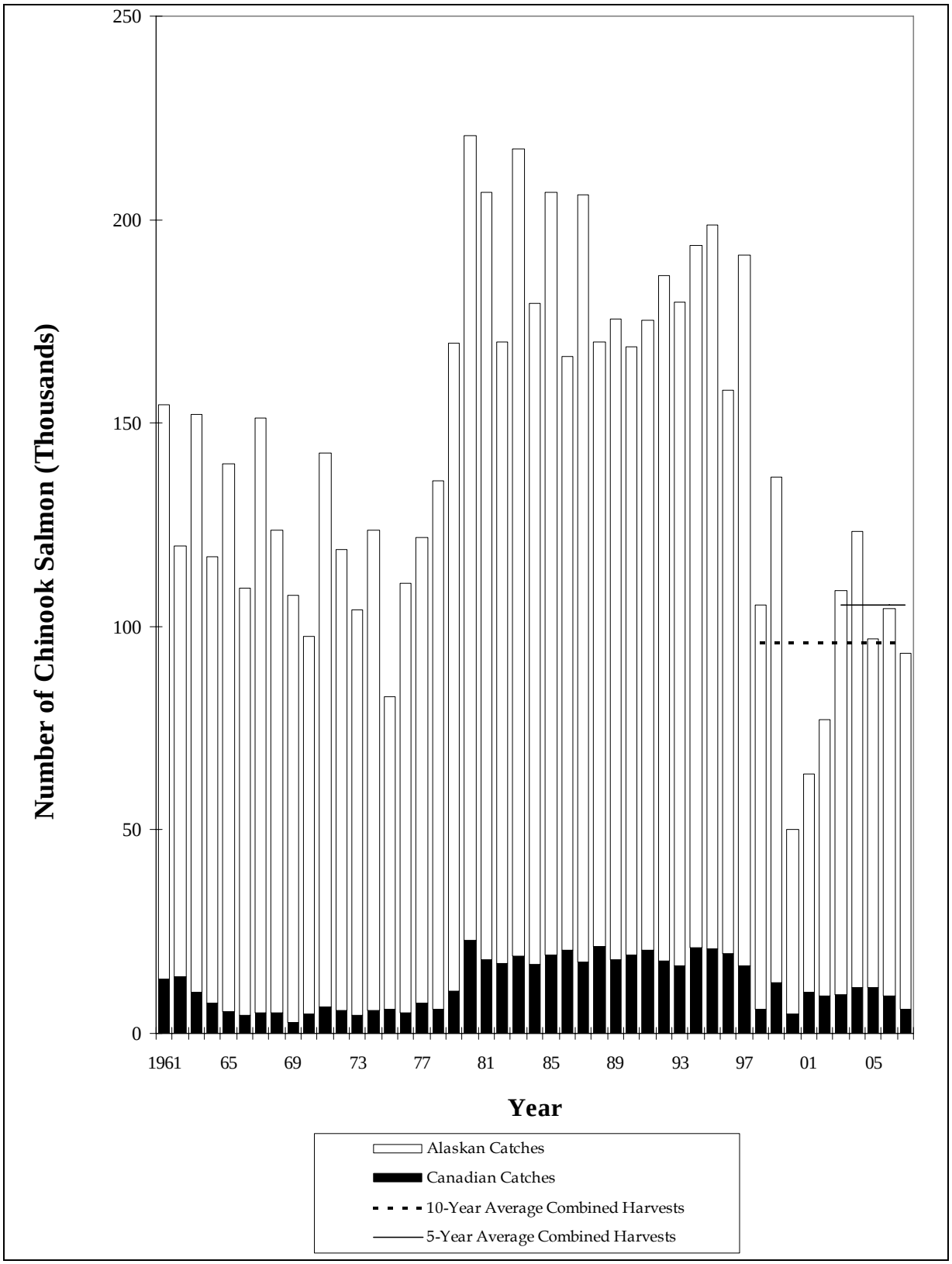
Note: Catch data for 2007 are preliminary.

Appendix Figure B6.–Canadian harvest of Chinook salmon, Yukon River, 1961–2007.



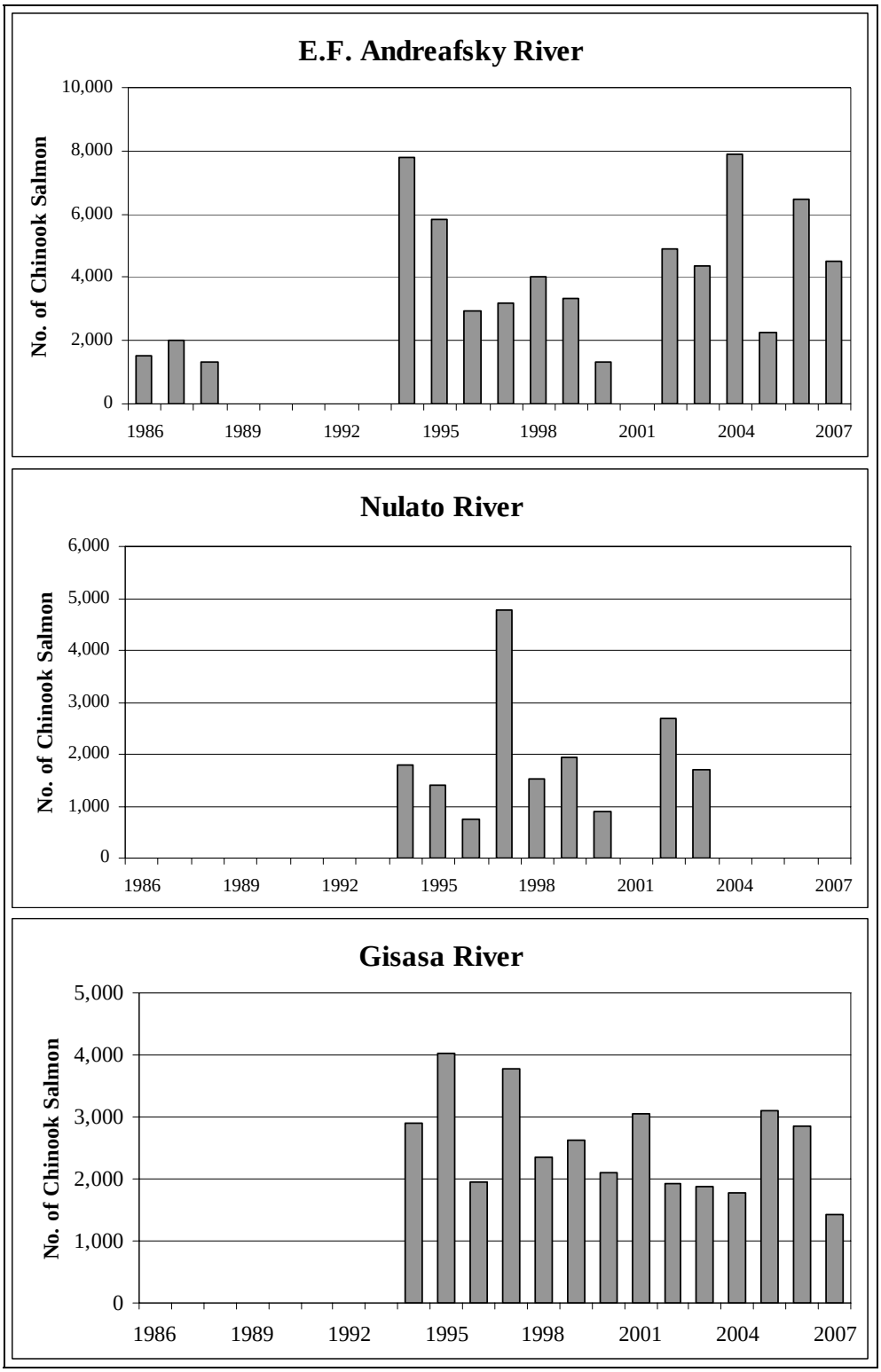
Note: Catch data for 2007 are preliminary.

Appendix Figure B7.–Canadian harvest of fall chum salmon, Yukon River, 1961–2007.



Note: Catch data for 2007 are incomplete and preliminary.

Appendix Figure B8.–Total utilization of Chinook salmon, Yukon River, 1961–2007.



Note: The BEG range is indicated by the horizontal lines for tributaries with BEGs. The vertical scale is variable.

Appendix Figure B9.–Chinook salmon ground based escapement estimates for selected tributaries in the Alaska portion of the Yukon River drainage, 1986–2007.

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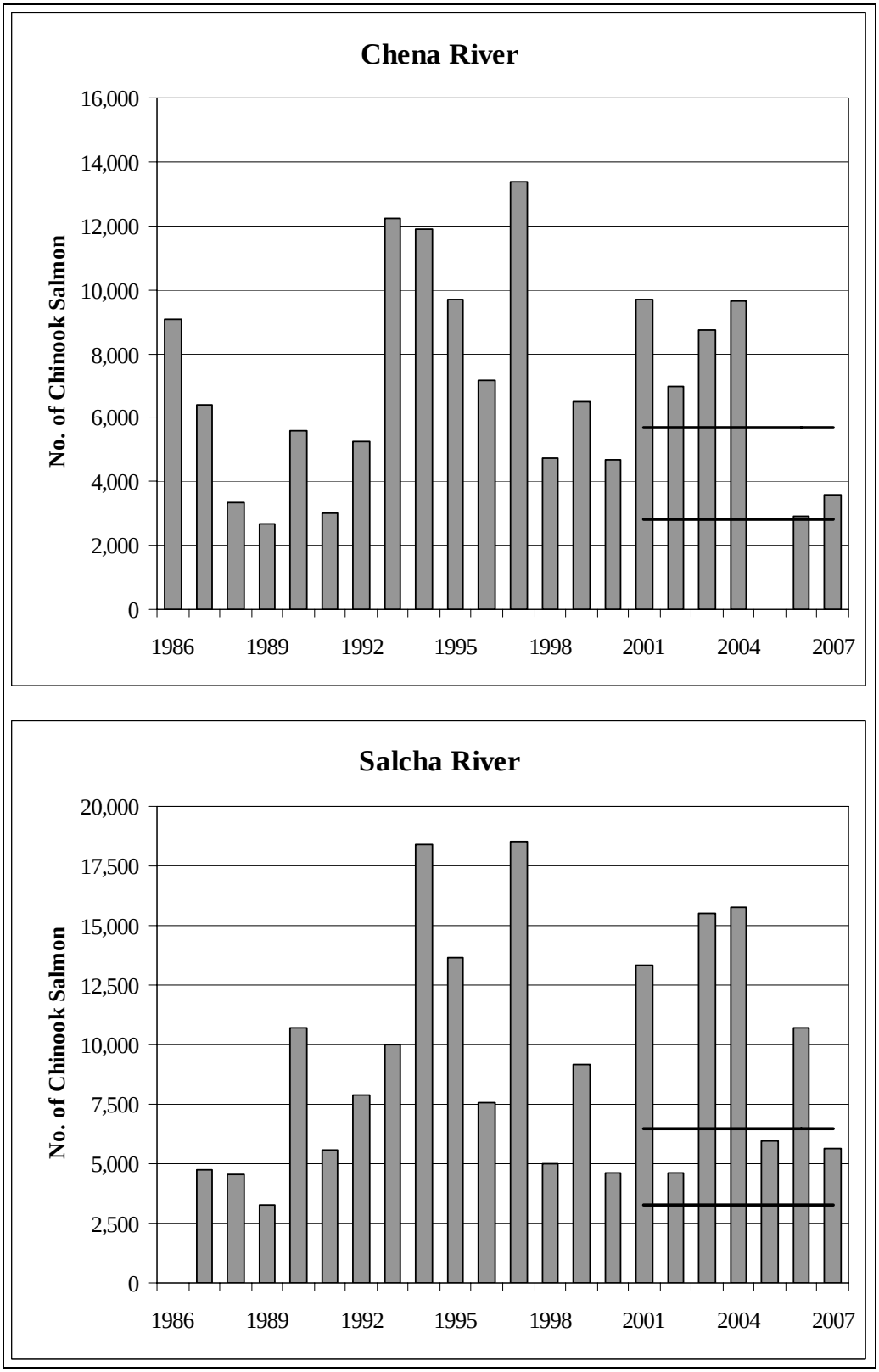
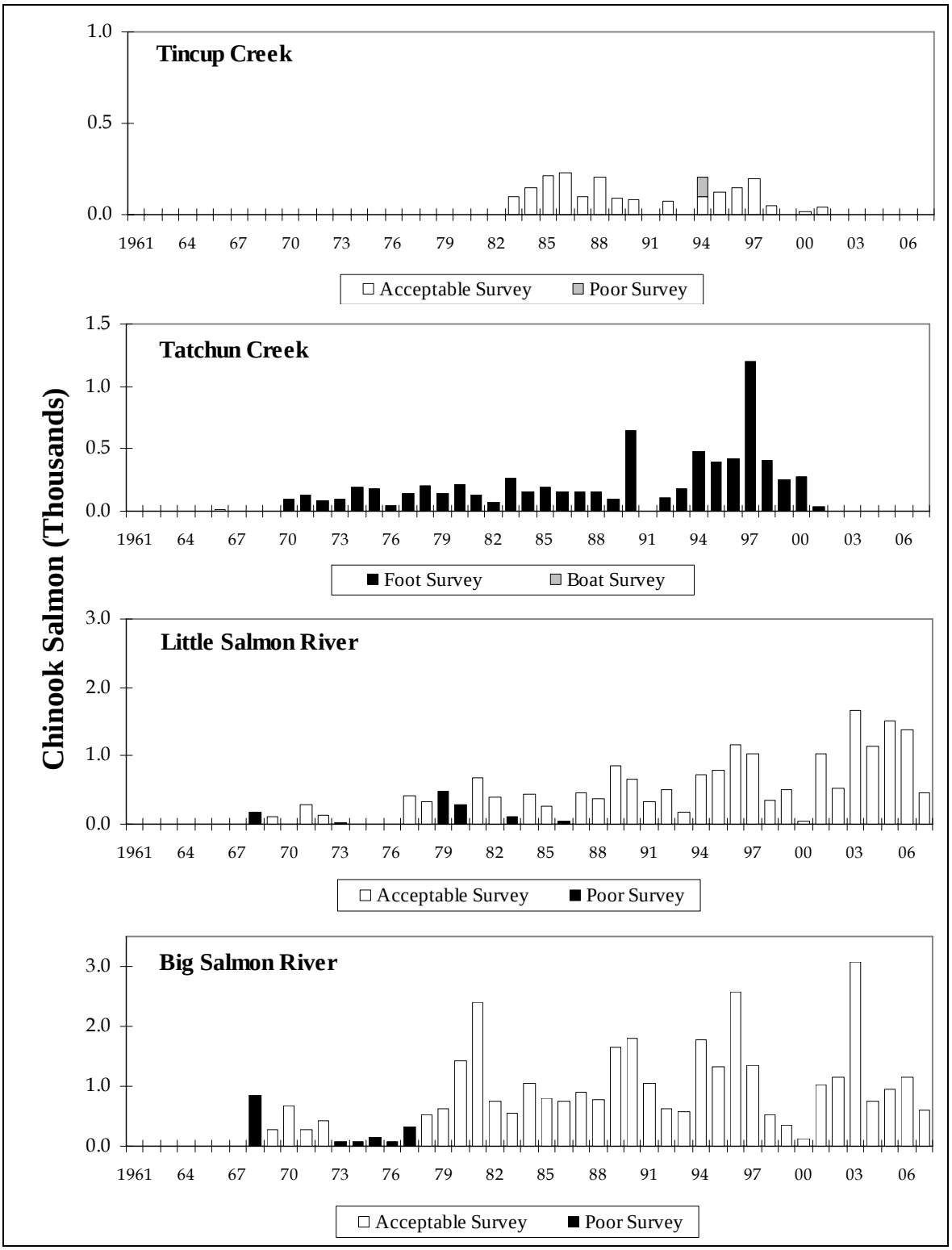


Note: The BEG range is indicated by the horizontal lines for tributaries with BEGs. The vertical scale is variable.



Note: Data are aerial survey observations unless noted otherwise. The vertical scale is variable.

Appendix Figure B10.–Chinook salmon escapement data for selected spawning areas in the Canadian portion of the Yukon River drainage, 1961–2007.

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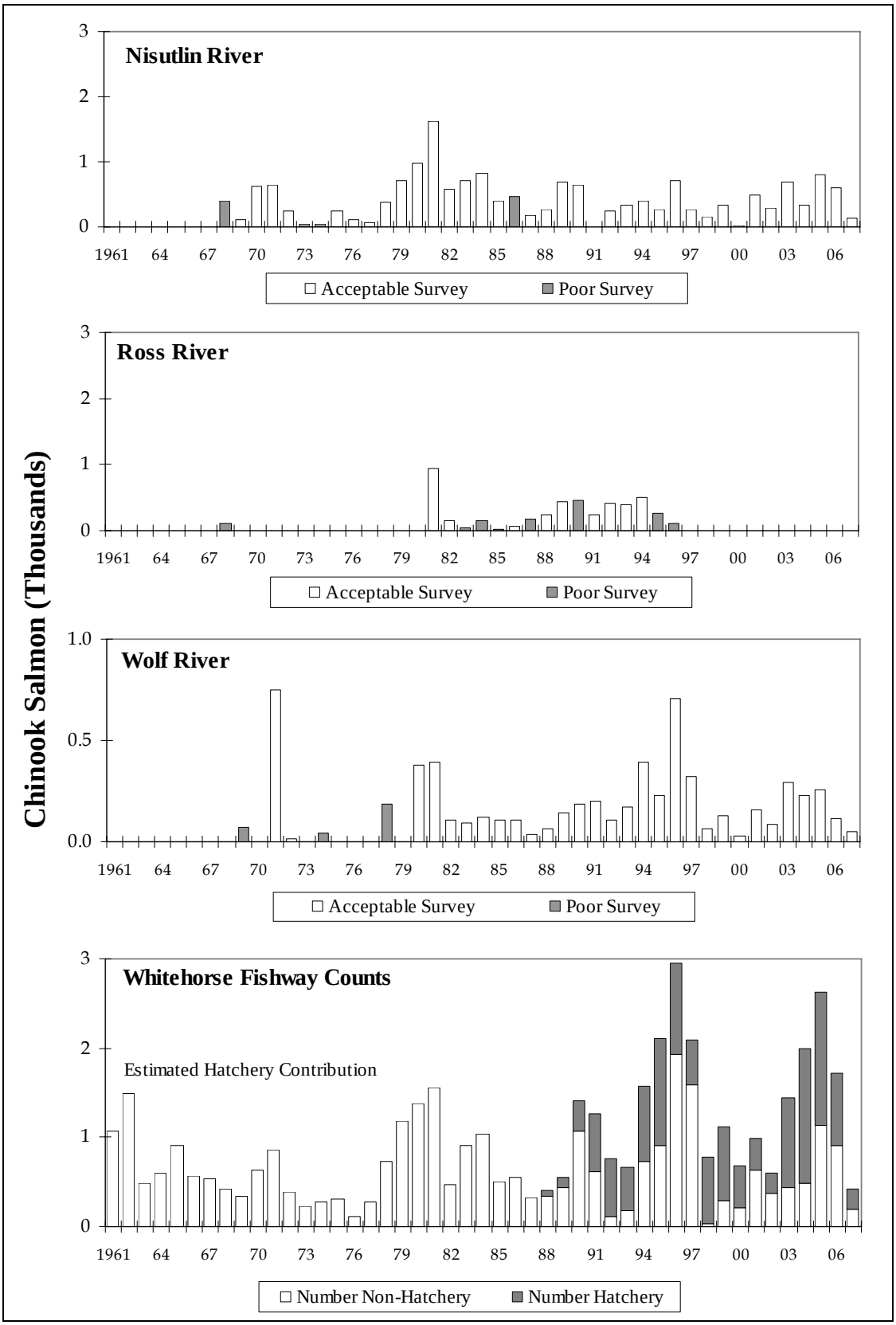
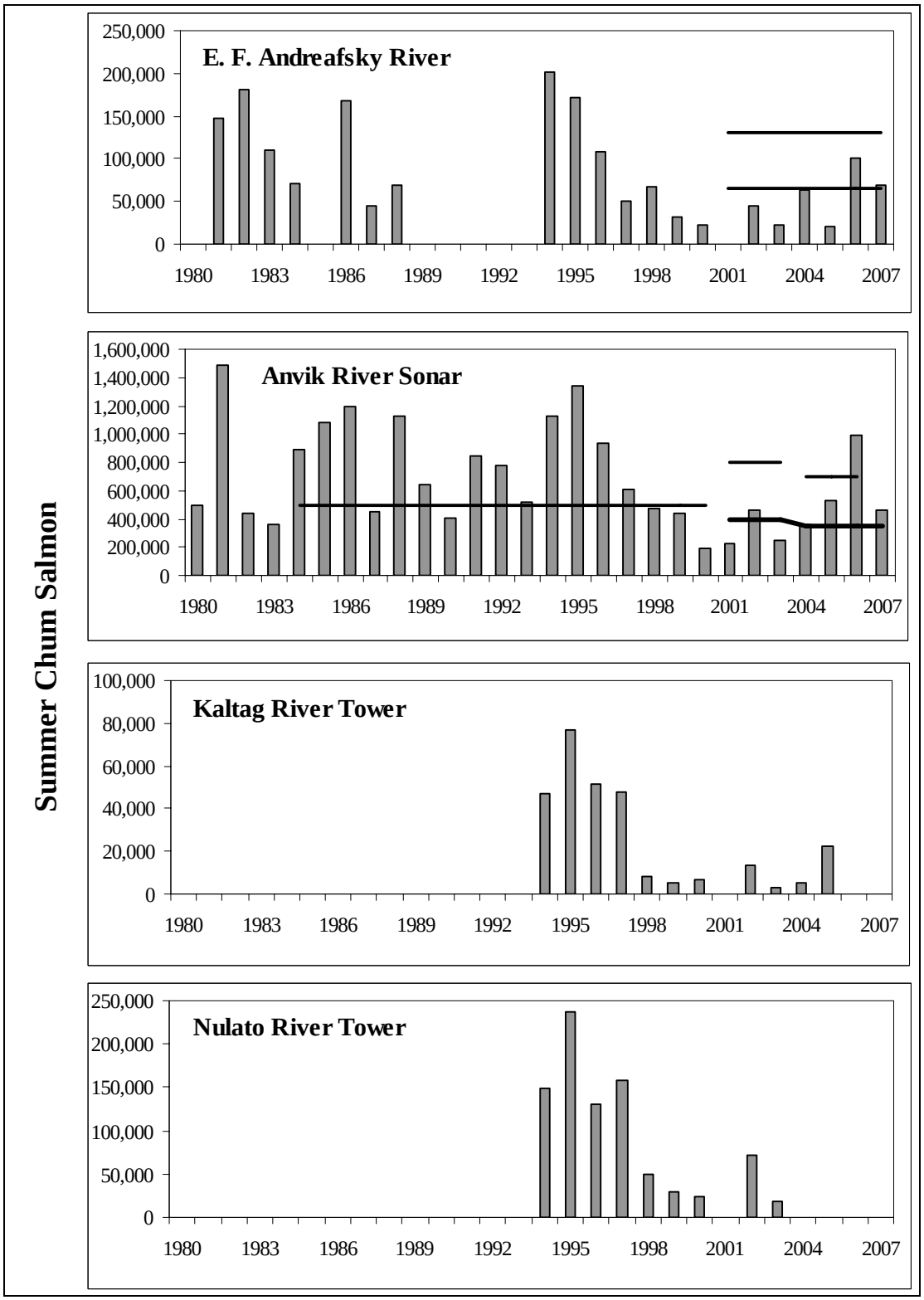
Appendix Figure B10.–Page 2 of 2.





Note: The BEG range is indicated by the horizontal lines for tributaries with BEGs. The vertical scale is variable.

Appendix Figure B11.–Summer chum salmon ground based escapement estimates for selected tributaries in the Alaskan Yukon River drainage, 1980–2007.

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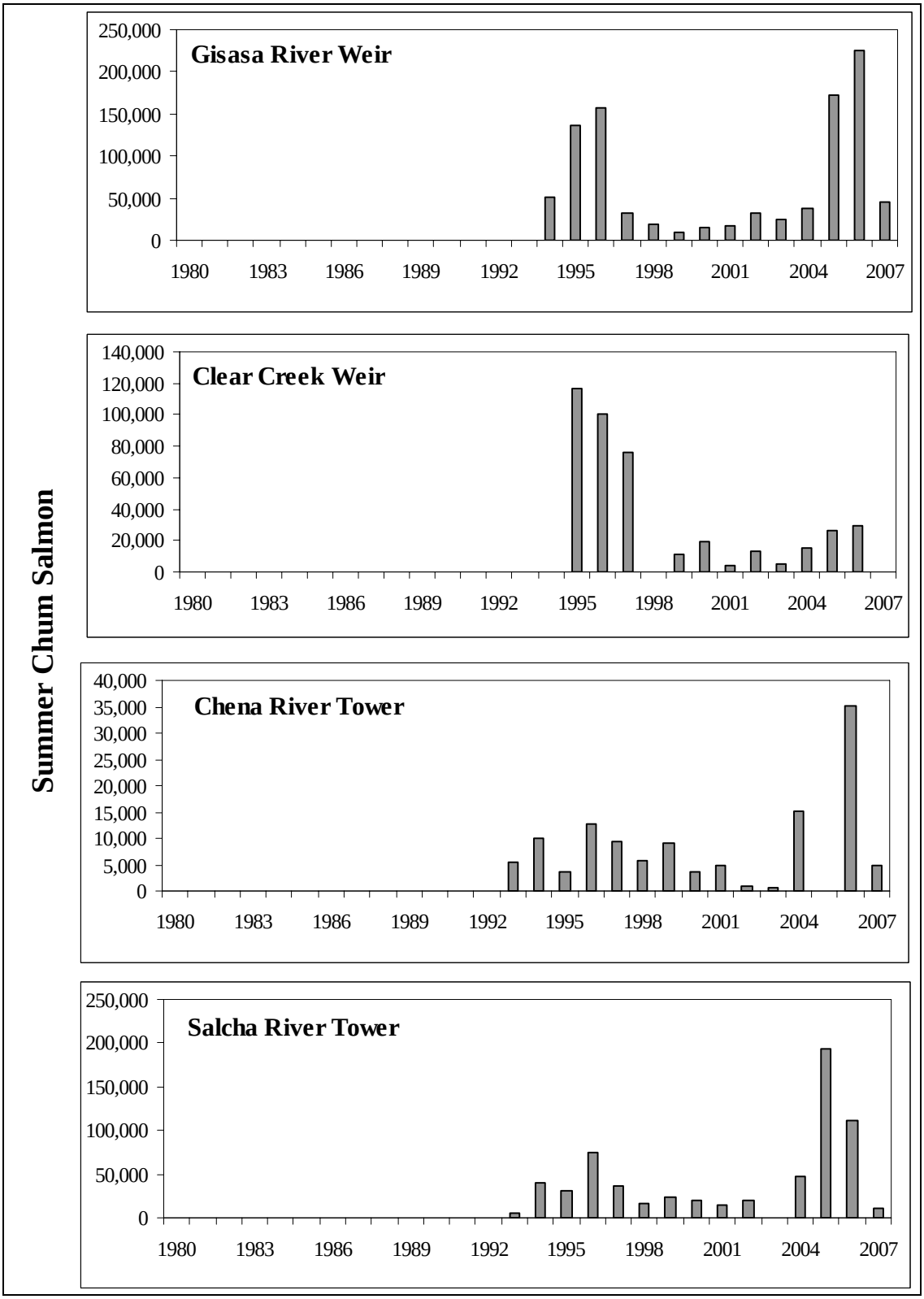
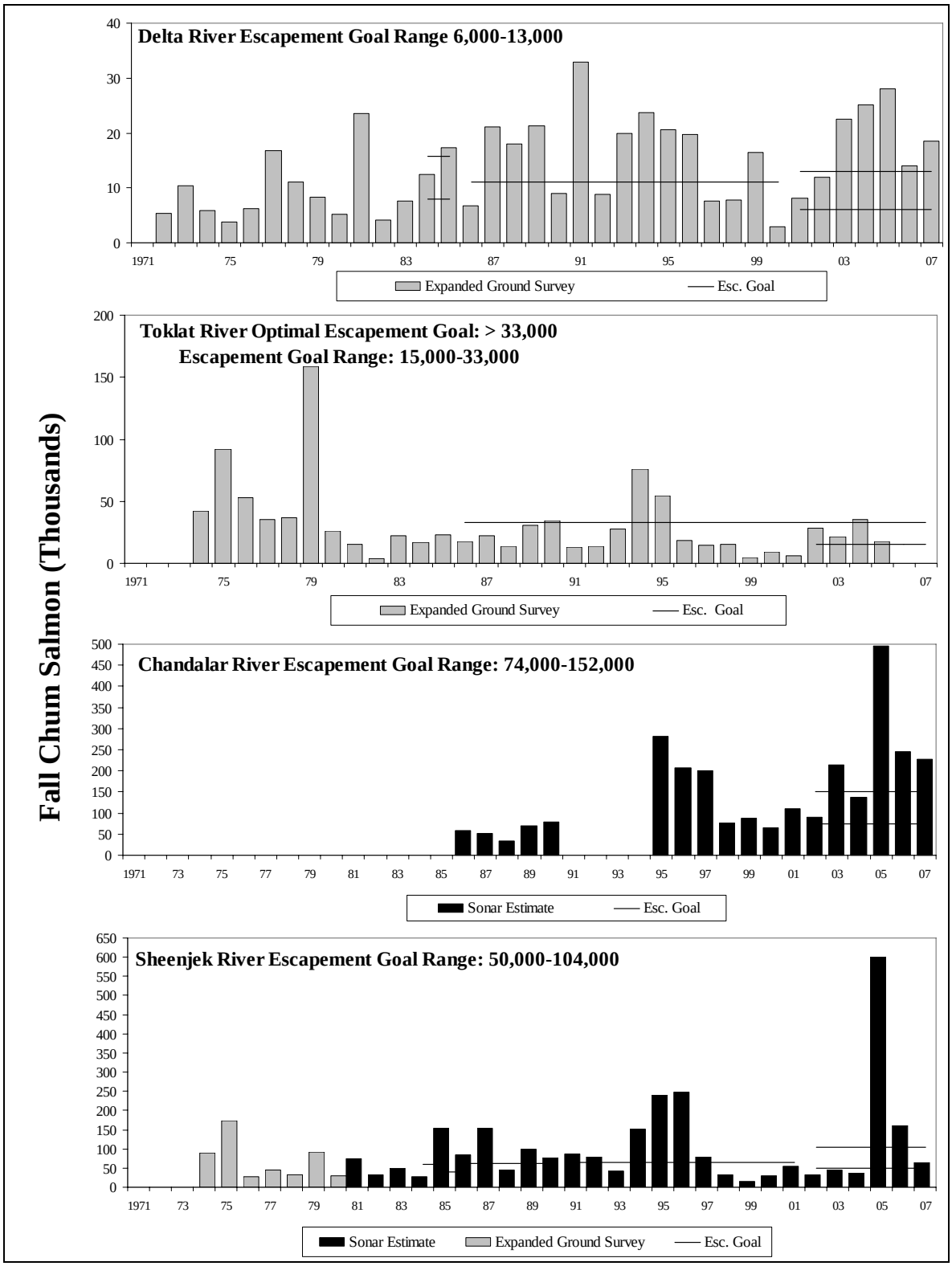
Appendix Figure B11.–Page 2 of 2.

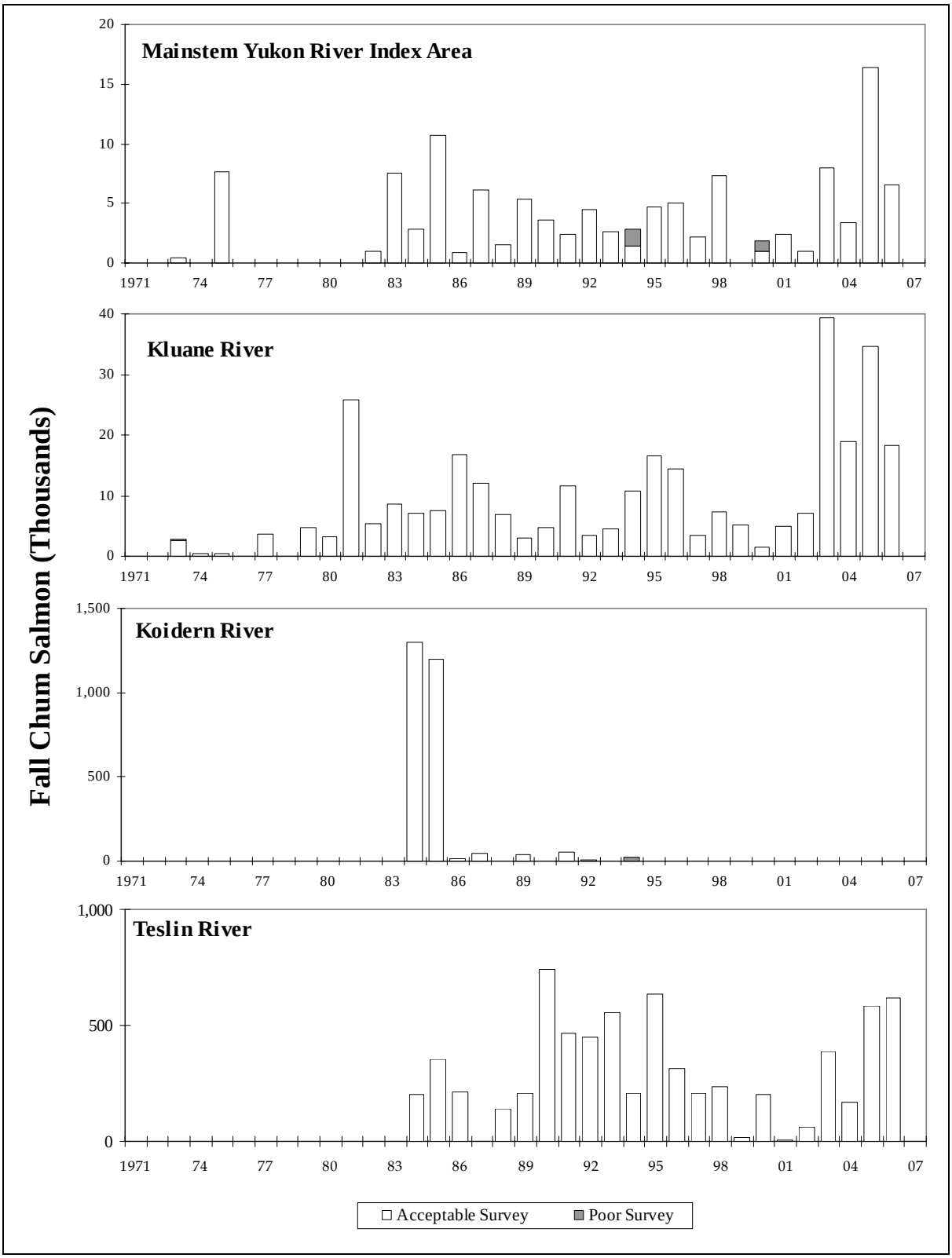


Note: Clear Creek estimates in 2006 by Videography.



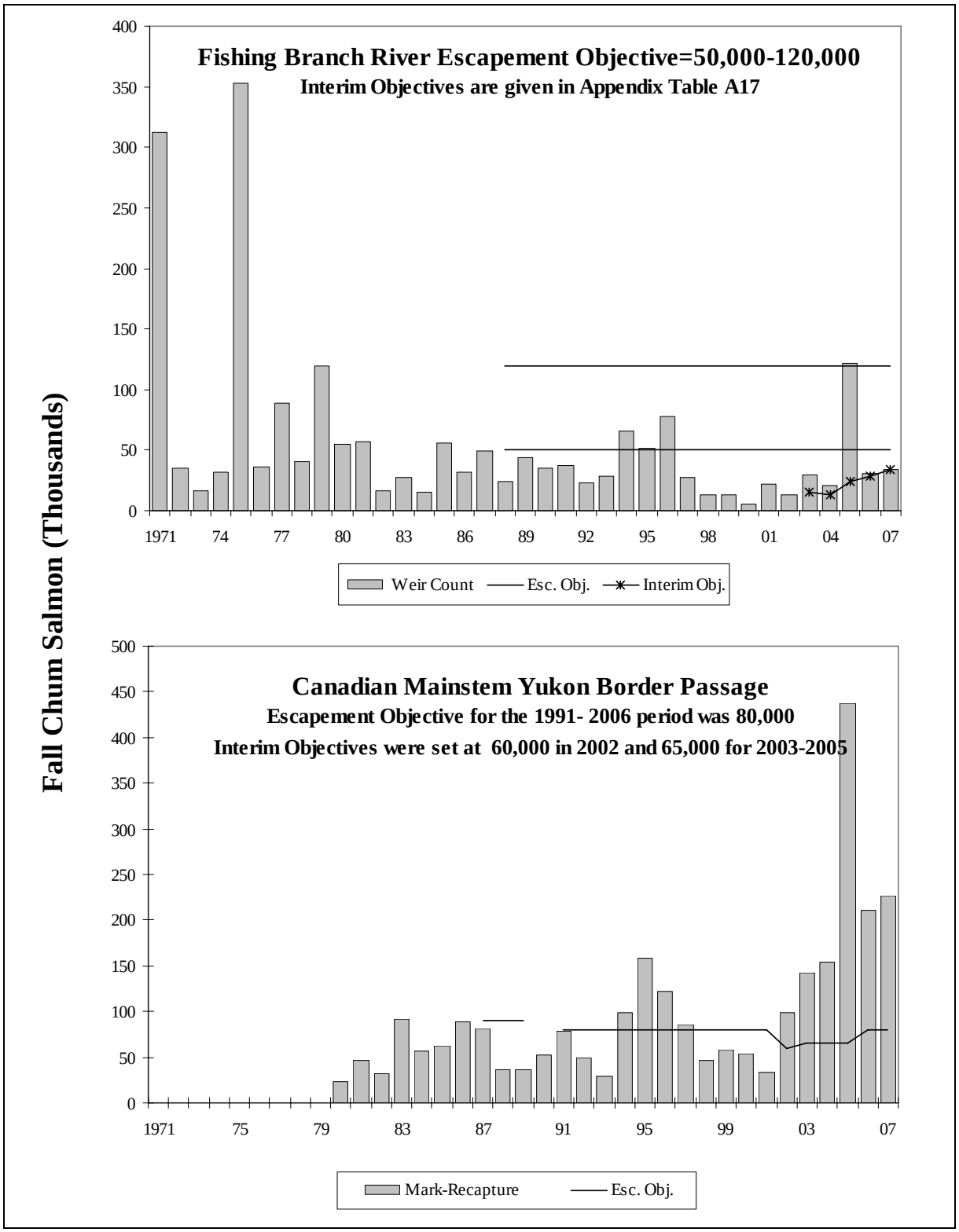
Note: Horizontal lines represent biological escapement goals or ranges. The vertical scale is variable.

Appendix Figure B12.–Fall chum salmon escapement estimates for selected spawning areas in the Alaskan portion of the Yukon River drainage, 1971–2007.



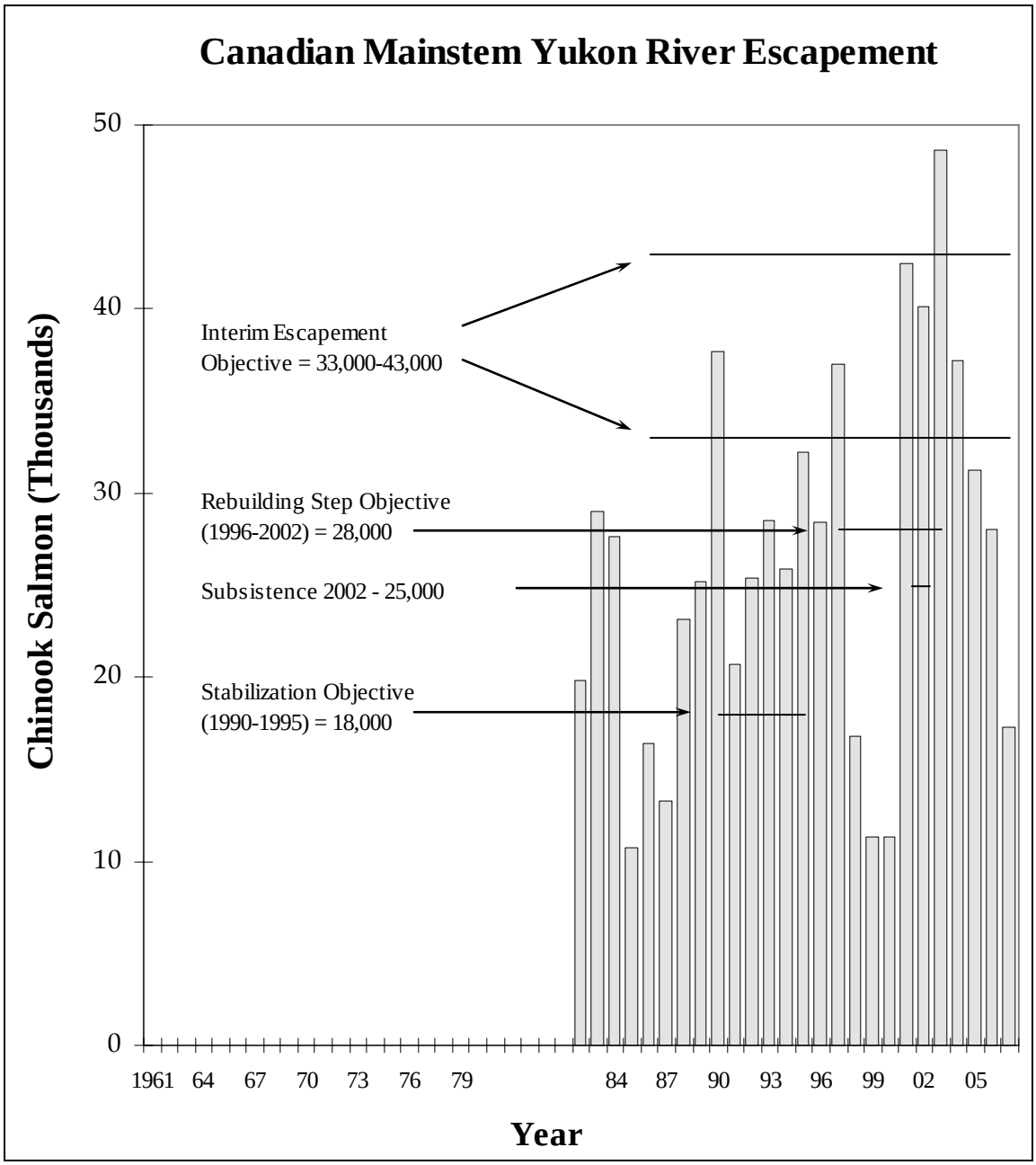
Note: vertical scale mainstem and Kluane in thousands, while the Koidern and Teslin are in hundreds.

Appendix Figure B13.–Fall chum aerial survey data for selected spawning areas in the Canadian portion of the Yukon River drainage, 1971–2007.



Note: Horizontal lines represent interim escapement goal objectives or ranges.

Appendix Figure B14.–Fall chum salmon escapement estimates for spawning areas in the Canadian portion of the Yukon River drainage, 1971–2007.



Note: Horizontal lines represent the interim escapement objective range of 33,000–43,000 salmon, the rebuilding step objective of 28,000 salmon and the stabilization objective of 18,000 salmon.

Appendix Figure B15.–Estimated total Chinook salmon spawning escapement in the Canadian portion of the mainstem Yukon River drainage, 1982–2007.