Special Publication No. 06-36

Yukon River Fall Chum Salmon Stock Status and Fall Season Salmon Fisheries; a Report to the Alaska Board of Fisheries

by

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and

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December 2006

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

Symbols and Abbreviations

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

Weights and measures (metric)

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

Weights and measures (English)

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

Time and temperature

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

Physics and chemistry

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

General

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

Measures (fisheries)

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

Mathematics, statistics

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

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December 2006

The Division of Sport Fish Special Publications series was established in 1991 for the publication of techniques and procedures manuals, informational pamphlets, special subject reports to decision-making bodies, symposia and workshop proceedings, application software documentation, in-house lectures, and other documents that do not fit in another publication series of the Division of Sport Fish. Since 2004, the Division of Commercial Fisheries has also used the same Special Publication series. Special Publications are intended for fishery and other technical professionals. Special Publications are available through the Alaska State Library and on the Internet: http://www.sf.adfg.state.ak.us/statewide/divreports/html/intersearch.cfm. This publication has undergone editorial and peer review.

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This document should be cited as:
Bue, F. J., B. M. Borba, and D. J. Bergstrom. 2006. Yukon River fall chum salmon stock status and fall season salmon fisheries; a report to the Alaska Board of Fisheries . Alaska Department of Fish and Game, Special Publication No. 06-36, Anchorage.

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ABSTRACT

In response to the guidelines established in the *Policy for the Management of Sustainable Salmon Fisheries* (SSFP; 5 AAC 39.222), the Alaska Board of Fisheries (BOF) classified the Yukon River fall chum salmon *Oncorhynchus keta* stock as a yield concern and classified the Toklat and Fishing Branch Rivers fall chum salmon stocks as management concerns at the September 2000 work session. An action plan was developed by the Alaska Department of Fish and Game (ADF&G, department) and acted upon by the BOF in January 2001. The SSFP directs ADF&G to assess salmon stocks in areas addressed during the BOF regulatory cycle to identify stocks of concern and to reassess the stock of concern status. In 2003, the department recommended continuation of the Yukon River fall chum salmon classification as a stock of yield concern, which was supported by the BOF at its January 2004 meeting. The Toklat River stock was removed as a management concern because the BOF realigned the escapement objective from an optimal escapement goal (OEG) to the established biological escapement goal (BEG) which did not fit the criteria of a management concern. However, the Toklat River fall chum salmon stock was included in the drainage-wide yield concern classification. The Fishing Branch River stock was also removed as a management concern because management of that portion of the drainage is covered by an annex to the Pacific Salmon Treaty, the U.S./Canada Yukon River Salmon Agreement (Agreement) which is governed under the authority of the Yukon River Panel (Panel). Based on the much improved run size since 2002 and large available surpluses in 2003, 2005 and 2006 being near the historical yield, the Yukon River fall chum salmon stock no longer meets the stock of yield concern criteria. Therefore, ADF&G recommends the Yukon River fall chum salmon stock no longer be considered as a stock of concern. BEGs for fall chum salmon and the Yukon River Drainage Fall Chum Salmon Management Plan were both reviewed and updated at the January 2004 BOF meeting. Escapement and harvest monitoring projects are in place to aid in managing for sustained yield objectives. Proposal 173 has been submitted to the BOF for considering changes to the Yukon River Coho Salmon Management Plan to coordinate management of the overlapping fall chum and coho salmon fisheries.

Key words: Yukon River, fall chum salmon, *Oncorhynchus keta, coho salmon, Oncorhyncus kisutch,* stock of concern, commercial, fishing, ADF&G, sustainable salmon fisheries policy, Alaska Board of Fisheries.

INTRODUCTION

The *Policy for the Management of Sustainable Salmon Fisheries* (SSFP; 5 AAC 39.222, effective 2000, amended 2001) directs the Alaska Department of Fish and Game (ADF&G) to provide the Alaska Board of Fisheries (BOF) with reports on the status of salmon stocks and identify any salmon stocks that present a concern related to yield, management, or conservation during regular BOF meetings. This report provides ADF&G's reassessment of the Yukon Area fall chum salmon *Oncorhynchus keta* stock of concern and also provides a review of the fall season fishery, including coho salmon *Oncorhyncus kisutch*.

In response to the guidelines established in the SSFP, the BOF classified the Yukon River fall chum salmon stock as a yield concern and classified the Toklat and Fishing Branch Rivers fall chum salmon stocks as management concerns at the September 2000 work session. A stock of management concern is defined as "a concern arising from a chronic inability, despite use of specific management measures, to maintain escapements for a salmon stock within the bounds of the Sustainable Escapement Goal (SEG), Biological Escapement Goal (BEG), Optimum Escapement Goal (OEG), or other specified management objectives for the fishery" (5 AAC 39.222(f)(21)). A "yield concern" is defined as, "a concern arising from a chronic inability, despite use of specific management measures, to maintain expected yields, or harvestable surpluses, above a stock's escapement needs." The SSFP further goes on to define chronic inability as the continuing or anticipated inability to meet escapement objectives (management concern) or average surplus yield (yield concern) over a 4 to 5 year period. The determination for the entire Yukon River fall chum salmon stock as a yield concern was based on the substantial

decrease in yields and harvestable surpluses during the period 1998–2000 and the anticipated very low run expected in 2001. The determination for the Toklat and Fishing Branch River stocks as management concerns was based on escapements not meeting the OEG of 33,000 for the Toklat from 1996 to 2000 and not meeting the escapement objective of 50,000–120,000 salmon for the Fishing Branch River from 1997 to 2000. An action plan was subsequently developed by the ADF&G (ADF&G 2000) and acted upon by the BOF in January 2001.

ADF&G reassessed the salmon stocks during the 2003–2004 regulatory cycle and presented recommendations to the BOF (Bue et al. 2004). Based on these recommendations and supporting materials, the BOF determined that the Yukon River fall chum salmon would continue to be classified as a yield concern because the combined commercial and subsistence harvests showed a substantial decrease in fall chum salmon yield from the 10-year period of 1989 to 1998 to the more recent 5-year (1999–2003) average. The Toklat River stock was removed as a management concern as a result of the BEG review presented at that BOF meeting (ADF&G 2004). However, as a component of the Yukon River drainage, the Toklat River fall chum salmon stock was included in the drainage-wide yield concern classification. The Fishing Branch River stock was also removed as a management concern because management of that portion of the drainage is covered by an annex to the Pacific Salmon Treaty, the U.S./Canada Yukon River Salmon Agreement (Agreement), which is governed under the authority of the Yukon River Panel (Panel).

Based on definitions provided in SSFP (5 AAC 39.222(f)(21) and (42)), only the most recent 5-year yield and escapement history (2002–2006) and the historical (1989–1998) level of yield or harvestable surplus were considered in the current analysis and subsequent recommendations regarding stock of concern status. ADF&G recommended discontinuing the Yukon River fall chum salmon stock as a yield concern at the October 2006 BOF work session. Run strength was poor from 1998 through 2002 however steady improvement has been observed since 2003 (JTC 2006). The 2005 run was the largest in 30 years and 2006 was above average for an even-numbered year run. The drainage-wide OEG of 300,000 fall chum salmon was exceeded the last 5 years. The recent 5-year-average (2002–2006) total reconstructed run of approximately 950,000 fish is greater than the 1989–1998 10-year average of approximately 818,000 fish, indicating a return to historical run levels. Therefore, the Yukon River fall chum salmon stock no longer meets the criteria for a yield concern.

STOCK ASSESSMENT BACKGROUND

Fall chum salmon run strength was poor from 1998 through 2002 with dramatic improvements in drainage-wide run size since 2003. The drainage-wide OEG of 300,000 fall chum salmon has been exceeded every year since 2001 (Figure 1) as well as most tributary escapement goals were met throughout the Alaska portion of the drainage. The year 2000 was the worst fall chum salmon run on record, with 1998 and 2001 close behind as all time low runs. Current fall chum salmon biological escapement goals within the Yukon River drainage were developed in 2000 (Eggers 2001) and reevaluated in 2003 (ADF&G 2004).

ESCAPEMENT

Biological escapement goals in the Chandalar and Delta Rivers have been met or exceeded the past 10 years, except for low escapements in 2000 (Table 1). The Sheenjek River biological escapement goal was met four times since 1997. Escapement objectives for fall chum salmon stocks in the Yukon River Canadian mainstem and Fishing Branch River were originally

recommended by the U.S./Canada Joint Technical Committee (JTC) and specifically stipulated in the Agreement by the U.S./Canada Panel. However, during the 1990s, a three-cycle rebuilding plan was in place for the Canadian Yukon River mainstem stock, resulted in annual escapement targets that were below the established objective. Because of recent poor runs, the Panel in 2003 again agreed upon a lower escapement target for the Canadian mainstem fall chum salmon stock to allow for some U.S. subsistence and Canadian aboriginal harvest while rebuilding the stock over three life cycles. However the escapement objective of >80,000 for this stock, has been exceeded since 2002.

Escapement in the Fishing Branch River in Canada, although improved, has only met the escapement objective established in 1987 of 50,000 to 120,000 fall chum salmon once in the past 10 years (2005). ADF&G developed a biological escapement goal range (BEG) for this stock of 27,000 to 56,000 in conjunction with total run reconstruction analysis in 2000 (Eggers 2001), however this goal has only been met three times since 1997. Like the Canadian mainstem stock, the Fishing Branch River fall chum salmon stock is managed based on recommendations of the Panel that are addressed annually. For example, the Panel agreed to an interim management goal of 28,000 fish for the 2006 season, which was exceeded. Similarly, the Fishing Branch River interim goals have been established and met since initiated in 2003. Escapement goals for Canadian stocks are currently under review by the JTC who provide recommendations to the Panel.

In 1993, the BOF established the Toklat River OEG of 33,000 fall chum salmon based on an average return for this system. As part of the total run reconstruction analysis conducted by Eggers (2001), a BEG range of 15,000 to 33,000 fall chum salmon was recommended and adopted by ADF&G. The BOF removed the OEG from regulation in 2004. Based on the BEG range, the goal has been met each year since 2002. The results of mark–recapture projects on both the Kantishna and the Tanana Rivers suggest that the index streams of the Toklat and Delta Rivers support a relatively small proportion of the fall chum salmon and mainstem spawning may be common in the upper reaches.

Some have criticized that over harvest caused poor runs in recent years. However, parent year escapement from 1994 through 1996 were some of the largest escapements on record, yet they produced the extremely poor fall chum salmon runs from 1998 through 2000 (Figure 1). Extremely poor production from those very large escapements, in some cases dramatically less than 1.0 return per spawner, resulted in the extremely poor runs observed from 1998 through 2000 (Table 2). Because escapements in these parent years were deemed more than adequate, the resulting poor runs cannot be attributed to over harvest (Figure 2). Most individuals in the scientific community attribute the poor production to poor ocean environments (Scheuerell and Williams 2005). Poor wild-stock runs occurred throughout Western Alaska. Note, in the past there have been as bad or worse escapements as occurred during the recent crash and those low escapement also produced large returns.

YIELD

Combined commercial and subsistence harvests show a substantial decrease in yield from the 10-year period of 1989 to 1998 to the recent 5-year period of 2002 to 2006 (Figure 1). The 1989 to 1998 average harvest of approximately 255,000 fish is nearly two times the recent 5-year average harvest of approximately 133,000 fish. Most of this difference in harvest is because of poor to below average runs in 2002 and 2004, decreased subsistence harvests caused by changes

in harvest patterns after extremely poor runs, and unharvested commercial surplus in 2003, 2005 and 2006. As a result of previous poor fall chum salmon runs and subsequent fishing restrictions and closures, it appears subsistence fishing effort and harvest has remained relatively low even in those years with much larger runs, as in 2003, 2005 and 2006. With the exception of 1995, fall chum salmon commercial harvests have been low since 1992 because of weak market conditions which have continued as underutilization of the stock in 2004, 2005, and 2006 along with a redistribution of market interest to locations that have more economical transportation opportunities.

STOCK OF CONCERN RECOMMENDATION

Although the fall chum salmon escapement goals for both the Sheenjek and Fishing Branch Rivers were not met during 2002–2004, other tributary goals as well as the drainage-wide OEG of 300,000 fall chum salmon have been achieved in all of the last 5 years (2002–2006). Further, all Yukon River fall chum salmon escapement goals were exceeded in 2005 and either exceeded or met in 2006, excluding the Toklat River which was not surveyed. Recent subsistence and commercial harvests continue to be below average and do not fully utilize the available surplus. However, based on the much improved run size since 2002 and large available surpluses in 2003, 2005 and 2006 being near the historical yield, the Yukon River fall chum salmon stock no longer meets the stock of yield concern criteria. Therefore, ADF&G recommends the Yukon River fall chum salmon stock no longer be considered a stock of concern.

OUTLOOK

The preliminary outlook for 2007 is for a fall chum salmon run size ranging from 700,000 to 1,000,000. Typically, fall chum salmon show an odd-even year abundance cycle, with even-numbered years producing average returns of 650,000 fish while odd-numbered years averaging 1 million fish. Evidently there was a favorable shift, as predicted, in ocean productivity as the return per spawner, which typically averages about 2.0, exceeded 8.0 for the 2001 brood year. The 4-year-old component in the 2005 run was excellent, producing 2 million fish alone followed by a 2006 return of 600,000 5-year-olds. The 4-year-old component in 2006 was only 400,000 fish, but aside from the contributions in 2003 and 2005, it had not been that high since 1997. During this time period of recovery, information from previous Bering Sea studies (BASIS) and trawl bycatch data indicated a higher abundance of all salmon species and, although showing some decrease in numbers, they still appear high for chum salmon. Depending on the origination of these salmon, the 2007 run may be near average for an odd-numbered year. Given the inherent difficulties in managing this complex fishery, an average return would be anticipated to provide for normal subsistence harvests, as well as, commercial fisheries.

ALASKA BOARD OF FISHERIES ACTION

In response to the guidelines established in the *Policy for Management of Sustainable Salmon Fisheries*, it is anticipated that the BOF, during the January 31–February 5, 2007 regulatory meeting, will discontinue the stock of concern classification for the Yukon River fall chum salmon stock as a yield concern.

REVIEW OF YUKON RIVER DRAINAGE FALL CHUM SALMON MANAGEMENT ACTION PLAN, 2001–2006

CURRENT STOCK STATUS

In response to the guidelines established in the *Policy for the Management of Sustainable Salmon Fisheries*, the department recommended discontinuing the stock of concern classification for the Yukon River fall chum salmon stock as a stock of yield concern at the October 2006 BOF work session. The BOF, after reviewing stock status information and public input during the February 2007 regulatory meeting, is anticipated to discontinue the stock of concern classification for Yukon River fall chum salmon stock as a yield concern. This determination is anticipated to be based on the availability of a near historical average harvestable surplus of fall chum salmon above escapement needs since 2004, a record run in 2005, an above average run in 2006, and anticipated near average run in 2007. These runs reflect a return to average productions rates. With most escapement goals attained or exceeded since 2003 and when applying recent average productions rates, it is anticipated that Yukon River fall chum salmon will produce an average yield in 2007.

YUKON RIVER FALL CHUM SALMON ACTION PLAN GOAL

ADF&G will continue to manage the fall season fishery as prescribed in the *Yukon River Drainage Fall Chum Salmon Management Plan* that was amended by the BOF in January 2004. The plan aligned the escapement goal threshold with the lower end of the established BEG range of 300,000 to 600,000 fall chum salmon. This provides more subsistence fishing opportunity in years of poor runs than had previously been allowed while still attaining escapement goals. Drainage-wide commercial fishing is allowed on the projected surplus above 600,000 fish which provides for the subsistence use priority and bolsters escapement on strong runs. As performance measures, the department will continue to monitor run abundance and harvest levels in relation to the established individual tributary BEGs and the drainage-wide BEG to assess changes in productivity and benefits to the users.

REVIEW OF MANAGEMENT ACTION PLAN

Existing Management Plan

5 AAC 01.249 YUKON RIVER DRAINAGE FALL CHUM SALMON MANAGEMENT PLAN.

Customary and Traditional Use Finding and Amounts Necessary for Subsistence Uses

In 1993, the BOF made a positive finding for customary and traditional use for all salmon in the Yukon-Northern Area. In 2001, the department recommended that the BOF amend 5 AAC 01.236 to include a revised finding of the amounts reasonably necessary for subsistence (ANS) for the Yukon Area using updated subsistence salmon harvest data (ADF&G 2000). After a thorough review of various options, the BOF made a finding of the ANS for the Yukon Area by species.

ANS Range for the Yukon River Drainage by Species

Chinook Salmon	45,500–66,704
Summer Chum Salmon	83,500–142,192
Fall Chum Salmon	89,500–167,900
Coho Salmon	20,500–51,980

Both fall chum and coho salmon were severely affected by a series of poor runs of fall chum salmon from 2000 through 2002. Since then the loss of markets and changes in subsistence fishing patterns have made it difficult to remain at historic levels even though the runs have since rebounded. Fall chum salmon subsistence harvests have been below the ANS range from 2000 through 2004. Subsistence harvests of fall chum salmon in 2005 were within the ANS range and preliminary 2006 data indicates ANS levels should also be reached. Tables 3 and 4 and Figures 4 and 5 present harvest trends by species as related to averages.

Regulation Changes Adopted in January 2001

In January 2001, after review of the management action plan options addressing fall chum salmon stock of concern, the BOF only removed the sunset clauses in 5 AAC 01.248 *Toklat River Fall Chum Salmon Rebuilding Management Plan.* and 5 AAC 01.249 *Yukon River Drainage Fall Chum Salmon Management Plan.*

The BOF adopted a fishing schedule for the subsistence salmon fisheries. The schedule is implemented chronologically, consistent with migratory timing as the run progresses upstream. This schedule may be altered by emergency order if preseason or inseason indicators suggest this is necessary.

5 AAC 01.210. Fishing Seasons and Periods

(1) Coastal District; Koyukuk River drainage; and Subdistrict 5-D: 7 days per week;

(2) Districts 1–3: two 36-hour periods per week;

(3) District 4 and Subdistricts 5-B and 5-C: two 48-hour periods per week;

(4) Subdistrict 5-A and District 6: two 42-hour periods per week; and

(5) Old Minto Area: 5 days per week.

Additionally, the Old Minto Area was extended in length to accommodate travel and ease of maintaining fish camps in this remote area where travel has become difficult between old Minto and New Minto via the Tolovana River to the Tanana River.

The BOF provided the department with greater flexibility by modifying the regulations to allow up to 42 hours of fishing time per week after August 15 within Subdistrict 5-A and District 6 commercial fishery instead of forcing it into one 42-hour period each week.

Subdistrict 4-A was included in the fall chum salmon guideline harvest range (5,000 to 40,000), which was previously allocated for only Subdistricts 4-B and 4-C.

Regulation Changes Adopted in January 2004

During the 2004 meeting, the BOF reviewed updated AYK stock status information and considered action plans for stocks of concern in addition to the regulatory proposals scheduled for the BOF cycle.

1. Subsistence fishing periods were shifted in District 4 to allow some fishing on weekends in an effort to increase opportunity while maintaining windows of open and closed fishing times.
2. The duration of subsistence fishing periods in Subdistrict 5-A were increased from two 42-hour periods per week to two 48-hour periods per week to simplify regulations by making fishing times in Subdistrict 5-A match the fishing times in Subdistrict 5-B which is the other side of the river in that location.

3. In Subdistrict 5-C the area in which a subsistence fishing permit is required was increased to include all of Subdistrict 5-C to improve harvest estimates due to an increasing number transient fishers not included in household surveys.
4. Subsistence gillnets of greater than 4 inches mesh size were required to be removed from the water and fish wheels not be operated during subsistence salmon fishing closures to reduce the unintended harvest of salmon during closed salmon periods.
5. Subdistrict 4-A commercial fishermen who operate fish wheels were allowed to use set gillnets to commercially harvest king salmon when summer chum salmon abundance is poor because use of fish wheels in that area would have a high incidental harvest of summer chum when targeting king salmon.
6. The *Yukon River Drainage Fall Chum Management Plan* was amended to incorporate elements of the *Toklat River Fall Chum Salmon Rebuilding Management Plan* and to align the management triggers with the department's biological escapement goals for Toklat River fall chum salmon (15,000–33,000) and drainage-wide fall chum salmon (300,000–600,000). This will provide for subsistence fishing opportunity at a lower run size. Commercial fishing drainage-wide will not be allowed until the run is projected to be greater than 600,000 fish. The *Toklat River Fall Chum Salmon Rebuilding Management Plan* was repealed.
7. Regulations were amended to clarify that subsistence fishing time in the Kantishna River is open 7 days per week.
8. The commercial fishing time restriction of no more than 42 hours in the Tanana River after August 15 was removed because fishing effort has significantly decreased in recent years and management has shifted to regulating harvest using variable fishing times to achieve escapement goals.
9. Subsistence fishing time in the Tanana River Subdistricts 6-A and 6-B may be allowed to increase to 7 days per week after September 30 which coincides with the end of the commercial fishing season to provide additional subsistence fishing opportunity when the fall salmon runs are abundant.

Management Review 2001–2006

Management of the Yukon River salmon fishery is complex due to: the overlapping multispecies salmon runs, generally high efficiency of existing fisheries, allocation issues, the immense size of the Yukon River drainage, and treaty obligations with Canada. Salmon entering the Yukon River may be more than 2,000 miles from their spawning grounds and it may take those salmon more than a month to traverse that distance (Figure 3). Accordingly, depending on the location of the spawning grounds, and timing of harvests, some salmon stocks are vulnerable to harvest for a month or more throughout the entire 2,000 mile length of the Yukon River.

The fall chum salmon run has a far more erratic entry pattern than the other salmon species and the run strength is difficult to project. Furthermore, low runs have resulted in lost market interest, which has lead to decline in the closely related commercial and subsistence efforts. Management has become much more responsive inseason to provide fishing opportunities wherever and whenever it may be possible to minimize the hardships during the period of poor production.

Conservative management strategies based on the fall chum salmon management action plans adopted by the BOF in 2001 have contributed to success in achieving escapement goals. As salmon production rates recovered, the amended *Yukon River Drainage Fall Chum Salmon Management Plan* adopted by the BOF in 2004 was successful in attaining established BEGs and in providing clear mechanisms to move out of the windows subsistence fishing schedule and enable commercial fishing opportunities.

Beginning in 2001, the subsistence salmon fishing schedule adopted by the BOF was implemented progressively upriver consistent with migratory timing. Overall, it appeared that the subsistence fishing schedule assisted in spreading opportunity among users by allowing time for fish to spread throughout the districts.

No commercial or sport fishing occurred in 2001 and 2002 based on very poor preseason run outlooks for fall chum salmon. Inseason management actions were taken near the middle of the runs to reduce subsistence fishing time less than the regulatory schedule. These runs were managed conservatively in an effort to provide subsistence opportunity and meet escapement needs. It was determined postseason that the 2001 escapement was slightly under the drainage-wide optimal escapement goal of 350,000 salmon and slightly over in 2002. In 2003, an unexpected large return nearly exceeded the drainage-wide escapement goal by two times. The 2004 run size was nearly average for an even-numbered year and was managed conservatively for attaining the upper end of the drainage-wide escapement goal range.

Varying abundance between fall chum salmon stocks makes achieving all individual goals difficult. During these times of improvements in overall escapements the Sheenjek River escapement goal range for fall chum salmon was still not met in 2003 and 2004. The Yukon River salmon fisheries are typically harvesting mixed stocks and currently the Canadian portion of the drainage has one strong (Yukon River Canadian Mainstem) and one weak stock (Fishing Branch River). The Canadian stock components of the total run are considerably different in scale with the upper mainstem portion representing approximately 20% whereas the Fishing Branch River only represents 5% based on the recent 2001 to 2005 escapement averages. Canadian escapement goals are negotiated annually and the Porcupine River system appears to be recovering more slowly than other stocks which may be partly due to Canadian harvest rates not declining during years of poor returns. Both the Yukon River Canadian Mainstem and Fishing Branch River interim goals were nearly doubled in 2003 and both were exceeded in 2005 and 2006. After numerous years of not being able to provide for commercial fisheries, the markets have diminished and significant potential commercial harvests have been foregone in 2003, 2005 and 2006.

The 2004 preseason outlook was for a fall chum salmon run size adequate to support escapement and subsistence needs in accordance with the management plan, but a commercial fishery appeared unlikely. Subsistence fishing time maintained the windowed schedule until the three-quarter point in the run timing when relaxations were implemented chronologically upriver. At that time, the department became confident the run size would exceed the 500,000 threshold necessary to lift restrictions on the subsistence fishery, but would not exceed the 600,000 required to allow commercial fishing in the main-river portion. A late pulse of fall chum salmon triggered management actions to open and extend the fall commercial fishing season to target coho salmon in Districts 1 and 6 with a small incidental harvest of fall chum salmon.

Because the performance of the 2005 summer chum salmon run increased confidence that the 2005 fall chum salmon run would come in as projected near 1 million fish, the subsistence fishing schedule was relaxed at the start of the fall season. A large surplus of fall chum salmon was anticipated and fisheries managers worked closely with fish buyers to maximize processing capacities of the available commercial markets that were limited by transportation expenses and the need to maintain high product quality. The 2005 fall chum salmon total run size was well above expectations ending at a 30-year high with a commercial harvest of less than 15% of the available surplus due to low market interest. Furthermore, the phenomenal return was the product of escapements in 2000 and 2001 which were among the lowest escapements on record.

Good returns of fall chum salmon continued in the 2006 season as a consequence of exceptional production in brood year 2001. Subsistence fishing was again off the windowed schedule from the beginning of the season and was further relaxed as the season progressed. Commercial fishing periods were scheduled to maximize available markets through close cooperation of salmon buyers with fishery managers. Most of the available surplus was harvested in accordance with established guideline harvest ranges and most escapement goals were exceeded.

BOARD OF FISHERIES REGULATORY PROPOSALS

- Yukon River Coho Salmon Management Plan – proposal number: 173.
- Fishing district and subdistrict boundaries – proposal numbers 171 and 172.

Most proposals before the BOF affecting Yukon River salmon are in regards to Chinook salmon conservation with little application for fall chum salmon management, except in setting precedence for fishing times and operation of gear that may carry over to the fall season. Proposal 173 seeks coordinated management of the overlapping fall chum and coho salmon fisheries with options for adaptation to changes in distribution of effort and market availability. Yukon River Drainage Fisheries Association will be presenting a coho salmon plan option for the BOF to consider which has been developed jointly with ADF&G. In addition to tables and figures already cited, Figures 8 and 9 illustrate harvest distribution by district for both fall chum and coho salmon. Proposals 171 and 172, as submitted, are intended to reallocate harvest of Chinook salmon by changing boundary lines which would also affect harvest and management of other Yukon River salmon fisheries.

YUKON RIVER FALL SEASON SALMON FISHERIES

Assessment of fall chum and coho salmon runs begin from the time the fish enter the mouth of the Yukon River and continues until they reach their spawning grounds in Alaska and Canada. Fall chum salmon typically take 34 days to migrate as far as the U.S./Canada border. For management purposes, the Yukon River is divided into fishery districts, subdistricts, and drainages (Figure 3). In managing the fall chum salmon fishery, the department follows guidelines provided by the BOF in 5 AAC 01.249. *Yukon River Drainage Fall Chum Salmon Management Plan*. Yukon River coho salmon have a slightly later, but overlapping, run timing with fall chum salmon and the department follows guidelines adopted by the BOF in 5 AAC 05.369. *Yukon River Coho Salmon Management Plan.*

In most years, fall chum salmon are the primary species of management concern and coho salmon are often considered a bycatch in the fall season fisheries (Figure 6). Prior to the 2004 BOF meeting, the coho management plan allowed a directed coho salmon commercial fishery

under unique circumstances at times when the smaller coho salmon stock is abundant, when fall chum salmon escapement and subsistence needs are provided for, and while at the same time the fall chum salmon run is not large enough to support a directed commercial fishery. Both the fall chum and coho salmon management plans were well coordinated and relied on thresholds in one plan to trigger actions in the other. However, in 2004, the BOF amended the fall chum salmon management plan without addressing impacts to the coho salmon management plan which resulted in the coho salmon management plan becoming ineffectual.

The dramatic decline of salmon stocks from 1998 through 2002 followed by the rapid recovery beginning in 2003 has significantly changed the character of the Yukon River salmon fisheries. Many fishers moved away from using long established fish-camps, fishing gear fell into disrepair or was replaced with other types, and market interest shifted to other available fisheries outside the region. With the recent run size improvements, fishers and markets are again becoming optimistic. Management has had to adapt to shifts in efficiency and distribution of fishing effort. The amended fall chum salmon management plan has worked well in attaining target escapement goals and providing fishing opportunities for subsistence and commercial fishers. The plan has also provided adequate flexibility to incorporate coho salmon management considerations into the overlapping fisheries.

SUBSISTENCE FISHERY

The subsistence harvests of fall chum and coho in the Alaska portion of the Yukon River drainage have increased significantly over the poor production years from 1998 through 2002, but remain below the average harvest levels for 1993 through 1997 (Tables 3 and 4; Figures 4 and 5). The average subsistence harvest during 1993–1997 was 111,000 fall chum salmon and 28,000 coho salmon. The average subsistence harvest during 1998–2002 was 46,000 fall chum salmon and 18,000 coho salmon. Preliminary subsistence harvest totals for 2006 are approximately 90,000 fall chum and 21,000 coho salmon.

COMMERCIAL FISHERY

The 2006 Alaskan commercial harvest of fall chum salmon was the second largest landing since 1995 and the commercial harvest of coho salmon was the largest landing since 1991 (Tables 5 and 6). The Yukon Area commercial harvest was approximately 3.6 times greater than the 1996–2005 average of 37,908 fall chum salmon and 2.3 times greater than the 10-year average of 19,669 coho salmon. However, weak market conditions and limited buying capacity limited the commercial harvest throughout the drainage.

The preliminary 2006 commercial season value of fall chum and coho salmon for the Yukon Area was $297,879 ($252,936 for the Lower Yukon Area, $44,943 for the upper Yukon Area) (Table 7). The previous 10-year average value for the Yukon Area was $93,093 ($77,968 for the Lower Yukon Area, $15,070 for the Upper Yukon Area). Yukon River fishers received an average price of $0.20 per pound for fall chum salmon in the Lower Yukon Area and $0.14 per pound in the Upper Yukon Area in 2006. This compares to the 1996–2005 average of $0.22 per pound and $0.13 per pound, respectively. For coho salmon, fishers received an average price of $0.20 per pound and $0.19 per pound in the Lower and Upper Yukon Areas compared to the recent 10-year average price of $0.29 and $0.10 per pound, respectively. An average of 117 permit holders fished the fall chum and coho salmon fishery (110 for the Lower Yukon Area, 7 for the Upper Yukon Area) during the previous ten fall seasons (1996–2005) as compared to 304

fishers who participated in 2006 (289 for the Lower Yukon Area, 15 for the Upper Yukon Area) (Table 8).

The preseason outlook for the 2006 fall commercial fishery did anticipate commercial harvest opportunity based on the record large return of 4-year-old fall chum salmon in 2005. Although both parent year escapements were less than 400,000 fall chum salmon, the 2001 brood year resulted in tremendous production providing a record return in 2005 and also provided the majority of the 2006 run which was above average. In 2006, limited markets, along with inseason run assessment resulted in fishing time that was well above normal levels. Nevertheless a large surplus remained unharvested because of the uncertainty in market location, assessment, and run timing of weak stocks.

ESCAPEMENT

Fall chum salmon BEG ranges have been established for the Yukon River drainage-wide as well as several major tributary stocks. All escapement goals including interim Canadian goals were exceeded (Table 1). Although the Pilot Station sonar passage estimate was 800,000 fish, the post-season run reconstruction using escapement projects upriver along with the harvests resulted in an estimated 2006 total run of approximately 1 million fall chum salmon.

There is only one established escapement goal for coho salmon in the Yukon River drainage, which is a SEG for the Delta Clearwater River of 5,200–17,000 (Table 9 and Figure 7). This goal was exceeded from 2001–2005. The 2006 boat count survey of the Delta Clearwater River estimated 16,748 coho salmon which is near the upper end of the SEG range. The 2006 Pilot Station sonar passage index of 131,900 was below the 2001–2005 average of 180,000 fish. Although the lower Yukon River assessment projects indicated the coho salmon run was below average, the upper Tanana River projects suggested the run was fairly strong.

RESEARCH PLAN

U.S.-CANADA JOINT TECHNICAL COMMITTEE PLAN

The U.S./Canada Yukon River Joint Technical Committee completed a research plan in 2005 that was initiated in 2002. The goals, issues, and needs contained in this plan provide a framework for research in the entire Yukon River basin. The intent of the plan is to help management meet and protect escapements while maximizing harvests. This plan provides focus and direction for research time and monies. Projects can be prioritized, and personnel and equipment allocated to those agreed most important. This plan guides the JTC on key research and conservation needs for the entire Yukon River basin. This plan will be used by each agency internally and to communicate with an international public. The plan's comprehensive listing of all research needs for the entire basin also provides a framework for other plans in the region.

MIXED STOCK ANALYSIS

The U.S. Fish and Wildlife Service's genetic laboratory is working in cooperation with ADF&G's Pilot Station sonar project to estimate the contribution of fall chum salmon stock components to the total run. Funding to collect and analyze the genetic samples is provided through the USFWS, Office of Subsistence Management. The intent is to develop an efficient technique that provides timely information on stock-specific harvests low in the drainage to support discrete stock management in a mixed-stock fishery. The project was operated from 2004 through 2006 and indicates a good relationship between inseason stock composition at Pilot Station sonar with postseason run reconstruction based on escapement estimates.

MARK–RECAPTURE

A mark–recapture project was initiated in 1999 to estimate abundance of fall chum salmon in the Kantishna River drainage originally funded by Western Alaska Disaster Grant funds. This project complements the inseason estimates provided by the Upper Tanana River (operated since 1995) together these escapement projects provide an important component in the equation for total run reconstruction. The Kantishna portion of the project is currently funded by USFWS, Office of Subsistence Management, with additional annual funding provided by NPS and Research and Management Treaty Implementation funds passed through BSFA. The goal of this multi-year cooperative study is to assess the abundance of fall chum salmon in the Kantishna River drainage of which the Toklat River is a major producing tributary. The project has now been operational for 8 years and has provided insight into the contributions of the Upper Kantishna and Toklat River stocks as well as providing understanding of the relationship of the population estimate and the long-standing estimates of abundance provided by ground surveys within the Toklat Springs (Cleary and Hamazaki 2006). The project also provides information on migratory characteristics of both fall chum and coho salmon within the Kantishna River drainage. Genetic samples were collected in the Upper Kantishna River for addition to both the chum and coho salmon baselines. The project has operated through both extremely low and high run sizes, providing contrast in the data. Analysis of the relationship between this system and the mainstem Tanana River will be used to provide better models for developing future and evaluating existing escapement goals.

BORDER SONAR

In 2003, ADF&G initiated a feasibility study for developing a sonar project near the U.S./Canada border due to concerns about the Canadian Department of Fisheries and Oceans (DFO) mark–recapture estimates which are insufficient and untimely for inseason management purposes of Alaskan fisheries. This effort was supported using U.S./Canada Treaty Implementation funding. The first season was devoted to site selection and two potential locations were identified. In 2004, sonar was tested for 2 weeks at the sites and it was determined that Six-Mile Bend was the most suitable location for the project. In 2005, the majority of the equipment for the project was purchased and a field camp was established 6 miles below Eagle, Alaska. Due to the cost associated with start-up, the project only operated through the Chinook salmon season in 2005 (mid-July to mid-August). In 2006, the remainder of the equipment (including DIDSON and split-beam sonar) was purchased using U.S./Canada Treaty Implementation and R&E funding and the project operated through both the Chinook and fall chum salmon runs (early July through mid-October).

The continuation of this project will provide population estimates of salmon crossing the U.S./Canada Border directly assisting in assessment of U.S. management and treaty commitments for escapement of Canadian origin salmon stocks. Currently, there is support from hydroacoustics experts on both sides of the border for the sonar project. It is likely that after a number of years of comparable data are obtained, DFO will terminate their mark–recapture project at the border. Sonar estimates of Chinook salmon are available for 2005 and 2006, while fall chum salmon estimates based on sonar are available only for 2006. From this limited data, it appears that there is little comparison between the sonar-based and the DFO mark–recapture estimates for Chinook salmon. Although the sonar-based estimates have been nearly twice as high as the DFO mark–recapture estimates, the relationship has been inconsistent. For fall chum salmon, however, the 2006 sonar-based estimate is higher, but within the confidence interval of

the DFO mark–recapture estimate. Currently, we are unsure about the origin of the differences between and among the estimates, but ADF&G is confident in the sonar-based salmon passage estimates. In the future, the sonar project will most likely be the sole project used in determining the passage of salmon into Canada.

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TABLES AND FIGURES

Table 1.–Fall chum salmon passage estimates and escapement estimates for selected spawning areas, Yukon River drainage, 1971–2006.

	Alaska									Canada	
		Tanana River Drainage					Upper Yukon River Drainage				
Year	Yukon River Mainstem Sonar	Toklat River	Kantishna / Toklat Rivers Tagging	Delta River	Bluff Cabin Slough	Upper Tanana River Tagging	Rampart Rapids Tagging	Chandalar River	Sheenjek River	Fishing Branch River	Mainstem Tagging Escapement
1971										312,800	
1972										35,125 [a]	
1973										15,989 [b]	
1974		41,798		5,915 [c]					89,966 [d]	31,525 [b]	
1975		92,265		3,734					173,371 [d]	353,282 [b]	
1976		52,891		6,312					26,354 [d]	36,584	
1977		34,887		16,876					45,544 [d]	88,400	
1978		37,001		11,136 [c]					32,449 [d]	40,800	
1979		158,336		8,355 [c]					91,372 [d]	119,898	
1980		26,346		5,137 [c]	3,190 [e]				28,933 [d]	55,268	22,912
1981		15,623		23,508 [c]	6,120 [e]				74,560	57,386 [f]	47,066
1982		3,624		4,235 [c]	1,156				31,421	15,901	31,958
1983		21,869		7,705 [c]	12,715				49,392	27,200	90,875
1984		16,758		12,411 [c]	4,017				27,130	15,150	56,633 [g]
1985		22,750		17,276	2,655 [e]				152,768	56,016 [b]	62,010
1986		17,976		6,703	3,458			59,313	84,207 [h]	31,723 [b]	87,940
1987		22,117		21,180 [c]	9,395			52,416	153,267 [h]	48,956 [b]	80,776
1988		13,436		18,024 [c]	4,481 [e]			33,619	45,206 [h]	23,597 [b]	36,786
1989		30,421		21,342	5,386 [e]			69,161	99,116 [h]	43,834 [b]	35,750
1990		34,739		8,992	1,632			78,631	77,750 [h]	35,000 [i]	51,735
1991		13,347		32,905	7,198				86,496	37,733 [b]	78,461
1992		14,070		8,893	3,615 [e]				78,808	22,517 [b]	49,082
1993	295,000	27,838		19,857 [c]	5,550 [e]				42,922	28,707 [b]	29,743
1994	407,000	76,057		23,777	2,277 [e]				150,565	65,247 [b]	98,358
1995	1,048,936	54,513 [j]		20,587 [c]	19,460	268,173		280,999	241,855	51,971 [b,k]	158,092
1996		18,264		19,758	7,074	134,563	654,296	208,170	246,889	77,278 [b]	122,429
1997	498,829	14,511		7,705	5,707	71,661	369,547	199,874	80,423 [l]	26,959 [b]	85,439
1998	341,227	15,605		7,804	3,549	62,384	194,963	75,811	33,058	13,564 [b]	46,305
1999	376,970	4,551	27,199	16,534	7,037	97,843	189,742 [m]	88,662	14,229	12,904 [b]	58,682
2000	226,929	8,911 [n]	21,450	3,001	1,595	34,844	[o]	65,894	30,084 [p]	5,053 [b]	53,742
2001	350,475	6,007	22,992	8,103	1,808 [e]	96,556 [q]	201,766	110,971	53,932	21,669 [b]	33,851
2002	328,350	28,519	56,665	11,992	3,116	109,961	196,186	89,850	31,642	13,563 [b]	98,695
2003	884,084	21,492	87,359	22,582	10,600 [e]	193,418	485,102	214,416	44,047 [r,s]	29,519 [b]	142,683
2004	609,088	35,480	76,163	25,073	10,270 [e]	123,879	618,579	136,703	37,878	20,274 [b]	154,080
2005	1,811,762	17,779 [j]	107,719	28,132	11,964 [e]	377,755	1,987,982	496,484	438,253 [t]	121,413 [b]	437,920
2006 [u]	790,563	-	61,476	14,055	-	197,312	-	245,090	160,178 [v]	30,233 [b]	230,000
All Years Avg.	660,656	31,243	57,628	14,230	5,963	147,362	544,240	147,416	92,547	56,196	91,926
5 Year Avg. 2001-2005	796,752	21,855	70,180	19,176	7,552	180,314	697,923	209,685	121,150	41,288	173,446
BEG	300,000	15,000	N/A	6,000	N/A	46,000 [w]	212,000 [x]	74,000	50,000	27,000	60,000
Range	600,000	33,000		13,000		103,000	441,000	152,000	104,000	56,000	129,000
									Treaty Negotiated Interim Objectives:	50,000–120,000	> 80,000
									Yukon River Panel Negotiated Objectives for 2006:	> 28,000	> 80,000

-continued-

Table 1.–Page 2 of 2.

Note: Latest table revision November 18, 2006.

Sources: Upper Toklat River drainage spawning index area total abundance estimates generated using stream life curve method developed with 1987 to 1993 data.

Kantishna and Toklat river drainages fall chum salmon passage estimate is based on tag deployment from a fish wheel located at the lower end of the Kantishna River and recaptures from three fish wheels; two located on the Toklat River (1999 to 2001) about 8 miles upstream of the mouth and one fish wheel on the Kantishna River (2000 and 2001) near the Bear Paw River.

Delta River population estimate generated from replicate foot surveys and stream life data (area under the curve method), unless otherwise noted.

Bluff Cabin Slough peak counts from foot surveys unless otherwise noted.

Upper Tanana River drainage fall chum salmon passage estimates based on tag deployment from a fish wheel (two fish wheels in 1995) located just upstream of the Kantishna River and recaptures from one fish wheel (two fish wheels from 1995 to 1998) located downstream from the village of Nenana.

Upper Yukon River drainage fall chum salmon passage estimates based on tag deployment at two fish wheels located at the "Rapids" and recaptured by a fish wheel located downstream from the village of Rampart, operational from 1996 to 2005.

Chandalar River estimates based on side-scan sonar estimate, in 1986 through 1990. Split beam sonar estimate since 1995.

Sheenjek River estimates based on side-scan sonar unless otherwise indicated. Counts prior to 1986 are considered conservative; approximating the period from the end of August through the middle of the fourth week of September.

Since 1991, total abundance estimates are for the approximate period from the second week in August through the middle of the fourth week of September.

Fishing Branch River is 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.

The Mainstem tagging escapement is estimated border passage minus Canadian mainstem harvest and excluding Canadian Porcupine River drainage escapement.

[a] Weir installed on September 22, 1972. Estimate consists of a weir count of 17,190 after September 22, and a tagging passage estimate of 17,935 prior to weir installation.

[b] Weir count. Counts for 1974, 1975, and 1998 revised from DFO, February 23, 2000.

[c] Total escapement estimate generated from the migratory time density curve method.

[d] Total escapement estimate generated from the migratory time density curve method.

[e] Peak counts aerial surveys.

[f] In 1981, the initial aerial survey count was doubled before applying the weir to aerial expansion factor of 2.72 since only half of the spawning area was surveyed.

[g] In 1984, the escapement estimate based on mark–recapture program is unavailable. Estimate is based on assumed average exploitation rate [h] Expanded estimates, using Chandalar River fall chum salmon run timing data, for the approximate period from mid-August through the middle of the fourth week of September 1986–1990.

[i] Population of spawners was reported by DFO as between 30,000 to 40,000 fish considering aerial survey timing. For purpose of this table an average of 35,000 fall chum salmon was estimated to pass by the weir. Note: A single survey flown October 26, 1990, counted 7,541 chum salmon. A population estimate of approximately 27,000 fish was made through date of survey, based upon historic average aerial to weir expansion of 28%.

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

[k] Minimal count because weir was closed while submerged due to high water, during the period August 31 to September 8, 1995.

[l] The passage estimate includes an additional 15,134 salmon that were estimated to have passed during 127 hours that the sonar was inoperable due to high water from August 29 until September 3, 1997.

[m] Due to transposed numbers, total does not match the population estimate in the U.S. Fish and Wildlife Service's Alaska Fisheries Technical Report Number 57, Estimated Abundance of Adult Fall Chum Salmon in the Middle Yukon River, Alaska, 1998–1999.

[n] Aerial survey count from 10/23/00. Unexpanded Toklat foot survey counts conducted from 10/11–10/16/00 was 2,496 fall chum salmon.

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

[p] Project ended early, sonar passage estimate was 18,652 (62% of normal run timing). The total sonar passage estimate, 30,083, was expanded to reflect the 1986–1999 average run timing through September 24.

[q] Due to low numbers of tags deployed and recovered on the Tanana the estimate has a large range in confidence interval (95% CI + 41,172).

[r] Project ended on peak daily passages due to late run timing, estimate was expanded based on run timing (87%) at Rapids.

[s] Split beam equipment was used beginning in 2003.

[t] Left bank count was enumerated with DIDSON. Right bank count was 266,963 and left bank was 171,291 for a total count of 438,254.

[u] Preliminary.

[v] Left bank count was enumerated with DIDSON. Right bank count was 106,397 and left bank was 53,781 for a total count of 160,178.

[w] Upper Tanana River goal is the Tanana River drainage BEG minus the lower and upper ranges of the Toklat River goal based on Eggers (2001) and is not an established BEG.

[x] Sum of BEG's for Chandalar, Sheenjek, Fishing Branch, and border escapements based on Eggers (2001) and is not an established BEG.

Table 2.–Fall chum salmon estimated brood year production and return per spawner estimates, Yukon Area, 1974–2006.

	(P)			Estimated Brood Year Return								(R)	(R/P)
	Estimated Annual Totals			Number of Salmon [a]				Percent				Total Brood	Return/
Year	Escapement	Catch	Return	Age 3	Age 4	Age 5	Age 6	Age 3	Age 4	Age 5	Age 6	Year Return[a]	Spawner
1974	437,485	478,875	916,360	91,751	497,755	68,693	0	0.139	0.756	0.104	0.000	658,199	1.50
1975	1,465,213	473,062	1,938,275	150,451	1,225,440	61,227	123	0.105	0.853	0.043	0.000	1,437,241	0.98
1976	268,841	339,043	607,884	102,062	585,820	136,358	4,313	0.123	0.707	0.165	0.005	828,553	3.08
1977	514,843	447,918	962,761	102,370	1,069,856	175,578	4,186	0.076	0.791	0.130	0.003	1,351,992	2.63
1978	320,487	434,030	754,517	22,112	332,023	90,532	0	0.050	0.747	0.204	0.000	444,667	1.39
1979	780,818	615,377	1,396,195	41,088	769,082	274,310	3,894	0.038	0.707	0.252	0.004	1,088,374	1.39
1980	261,113	488,305	749,418	8,373	362,199	208,962	3,125	0.014	0.622	0.359	0.005	582,658	2.23
1981	551,192	677,257	1,228,449	45,855	955,725	278,386	8,888	0.036	0.742	0.216	0.007	1,288,853	2.34
1982	179,828	373,175	553,003	11,327	400,323	166,754	678	0.020	0.691	0.288	0.001	579,083	3.22
1983	347,157	525,016	872,173	12,569	875,355	223,322	2,304	0.011	0.786	0.201	0.002	1,113,550	3.21
1984	270,042	412,322	682,364	7,089	407,774	173,546	8,493	0.012	0.683	0.291	0.014	596,902	2.21
1985	664,426	515,481	1,179,907	46,605	871,500	270,268	3,194	0.039	0.731	0.227	0.003	1,191,566	1.79
1986	376,374	318,028	694,402	0	428,614	368,513	4,353	0.000	0.535	0.460	0.005	801,479	2.13
1987	651,943	406,143	1,058,086	12,380	617,519	290,767	7,720	0.013	0.665	0.313	0.008	928,386	1.42
1988	325,137	353,242	678,379	41,003	175,236	152,368	10,894 [b]	0.108	0.462	0.401	0.029	379,501	1.17
1989	506,173	541,177	1,047,350	2,744	282,905	345,136 [b]	20,290	0.004	0.435	0.530	0.031	651,075	1.29
1990	369,654	350,100	719,754	710	579,452 [b]	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 [b]	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	102,404	3,234	0.014	0.799	0.181	0.006	564,711	1.60
1994	769,920	169,225	939,145	4,322	225,209	149,481	1,603 [b]	0.011	0.592	0.393	0.004	380,615	0.49
1995	1,009,155	461,147	1,470,302	2,371	266,873	68,918 [b]	382	0.007	0.788	0.204	0.001	338,544	0.34
1996	800,022	260,923	1,060,945	420	165,691 [b]	136,796	8,295	0.001	0.532	0.440	0.027	311,201	0.39
1997	494,831	170,059	664,890	3,087 [b]	244,603	118,343	3,332	0.008	0.662	0.320	0.009	369,365	0.75
1998	263,121	70,770	333,891	650	269,653	57,962	6,698	0.002	0.805	0.173	0.020	334,963	1.27
1999	288,962	131,046	420,008	29,097	705,152	174,515	13,199	0.032	0.765	0.189	0.014	921,962	3.19
2000	210,756	28,543	239,299	8,446	297,167	111,092	0	0.020	0.713	0.267	0.000	416,705	1.98
2001	337,765	44,666	382,431	136,109	2,075,545	640,381	6,713	0.048	0.726	0.224		2,858,748 [c]	>8.46
2002	397,977	27,411	425,388	0	421,280	87,116						508,397 [d]	>1.28
2003	695,363	79,529	774,892	22,995									
2004	537,873	76,616	614,489										
2005	1,909,823	290,013	2,199,836										
2006	808,114	276,542	1,084,656										
2005 Avg.	539,824	319,921	859,744										
	496,132	All Brood Years (1974–2000)		28,335	545,952	192,180	6,138	0.0331	0.6895	0.2684	0.0090	772,605	1.85
	354,737	Even Brood Years (1974–2000)		21,187	363,102	166,109	5,918	0.0364	0.6548	0.2985	0.0104	556,308	1.89
	632,195	Odd Brood Years (1974–2000)		35,386	720,011	211,714	6,378	0.0296	0.7270	0.2360	0.0074	973,489	1.79

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

[b] Based upon expanded test fish age composition estimates for years in which the test fishery terminated early both in 1994 and 2000 (see footnote "b" Table 5).

[c] Brood year return for 3, 4, and 5 year fish, indicate that production (R/P) from brood year 2001 was at least 8.45. Recruits estimated for incomplete brood year.

[d] Brood year return for 3 and 4 year fish, indicate that production (R/P) from brood year 2002 was at least 1.27. Recruits estimated for incomplete brood year.

Table 3.–Estimated fall chum salmon subsistence and personal use harvest in numbers of fish by district, Yukon River, 1979–2006.

Year	District 1 Est. Harvest	District 1 % of Harvest	District 2 Est. Harvest	District 2 % of Harvest	District 3 Est. Harvest	District 3 % of Harvest	Lower Yukon Subtotal Est. Harvest	Lower Yukon Subtotal % of Harvest	District 4 Est. Harvest	District 4 % of Harvest	District 5 Est. Harvest	District 5 % of Harvest	District 6 Est. Harvest	District 6 % of Harvest	Upper Yukon Subtotal Est. Harvest	Upper Yukon Subtotal % of Harvest	Total Subsistence & Personal Use Harvest
1979	15,788	7%	14,622	7%	2,443	1%	32,853	15%	34,697	16%	102,695	48%	44,596	21%	181,988	85%	214,841
1980	7,433	4%	12,435	7%	2,320	1%	22,188	13%	19,328	12%	75,861	45%	50,260	30%	145,449	87%	167,637
1981	15,540	9%	11,770	7%	3,043	2%	30,353	17%	18,662	11%	104,612	59%	23,613	13%	146,887	83%	177,240
1982	10,016	8%	9,511	7%	1,659	1%	21,186	16%	20,152	15%	71,786	54%	18,968	14%	110,906	84%	132,092
1983	8,238	4%	10,341	6%	2,863	2%	21,442	11%	32,246	17%	105,103	56%	29,073	15%	166,422	89%	187,864
1984	8,885	5%	11,394	7%	2,233	1%	22,512	13%	28,937	17%	98,376	57%	22,670	13%	149,983	87%	172,495
1985	13,275	7%	11,544	6%	2,290	1%	27,109	13%	22,750	11%	117,125	57%	36,963	18%	176,838	87%	203,947
1986	9,000	6%	13,483	8%	2,155	1%	24,638	15%	26,126	16%	87,729	54%	24,973	15%	138,828	85%	163,466
1987	18,467	5%	13,454	4%	3,287	1%	35,208	10%	41,467	12%	141,335	41%	124,587	36%	307,389	90%	342,597
1988	5,475	4%	8,600	6%	1,747	1%	15,822	10%	16,958	11%	84,209	56%	34,597	23%	135,764	90%	151,586
1989	4,914	2%	10,015	5%	1,023	0%	15,952	8%	24,540	12%	112,001	53%	58,654	28%	195,195	92%	211,147
1990	5,335	3%	6,187	4%	2,056	1%	13,578	8%	19,241	11%	90,513	54%	44,568	27%	154,322	92%	167,900
1991	3,935	3%	5,628	4%	615	0%	10,178	7%	20,875	14%	74,002	51%	40,469	28%	135,346	93%	145,524
1992	5,216	5%	7,382	7%	2,358	2%	14,956	14%	21,232	20%	45,701	42%	25,713	24%	92,646	86%	107,602
1993	7,770	10%	3,094	4%	1,449	2%	12,313	16%	10,832	14%	43,764	57%	9,853	13%	64,449	84%	76,762
1994	4,887	4%	4,151	3%	862	1%	9,900	8%	13,325	11%	66,396	54%	33,597	27%	113,318	92%	123,218
1995	4,698	4%	3,317	3%	1,672	1%	9,687	7%	14,057	11%	57,594	44%	49,168	38%	120,819	93%	130,506
1996	4,147	3%	5,287	4%	2,706	2%	12,140	9%	16,786	13%	63,473	49%	36,467	28%	116,726	91%	128,866
1997	3,132	3%	4,680	5%	787	1%	8,599	9%	11,734	12%	55,258	58%	19,550	21%	86,542	91%	95,141
1998	3,163	5%	4,482	7%	1,561	2%	9,206	15%	7,898	13%	31,393	50%	14,370	23%	53,661	85%	62,867
1999	6,502	7%	4,594	5%	415	0%	11,511	13%	9,174	10%	53,580	60%	15,471	17%	78,225	87%	89,736
2000	5,294	27%	1,425	7%	598	3%	7,317	38%	1,759	9%	9,920	51%	311	2%	11,990	62%	19,307
2001	3,437	10%	3,256	9%	700	2%	7,393	21%	3,352	10%	20,873	59%	3,536	10%	27,761	79%	35,154
2002	1,881	10%	1,618	8%	164	1%	3,663	19%	1,549	8%	10,976	57%	3,205	17%	15,730	81%	19,393
2003	2,139	4%	2,901	5%	738	1%	5,778	10%	9,750	17%	28,270	49%	13,380	23%	51,400	90%	57,178
2004 [a]	2,067	3%	2,421	4%	298	0%	4,786	8%	7,797	12%	40,670	65%	9,183	15%	57,650	92%	62,436
2005 [a]	2,889	3%	3,257	4%	1,304	1%	7,450	8%	9,405	10%	51,663	56%	23,079	25%	84,147	92%	91,597
5 Yr Avg 2001–2005	2,483	5%	2,691	4%	641	1%	5,814	19%	6,371	14%	30,490	50%	10,477	26%	47,338	81%	53,152
10 Yr Avg 1996–2005	3,465	5%	3,392	5%	927	1%	7,784	15%	7,920	13%	36,608	51%	13,855	26%	58,383	85%	66,168
15 Yr Avg 1991–2005	4,077	5%	3,833	5%	1,082	1%	8,992	13%	10,635	14%	43,569	53%	19,823	22%	74,027	87%	83,019
20 Yr Avg 1986–2005	5,217	5%	5,462	5%	1,325	1%	12,004	13%	14,393	13%	58,466	51%	29,237	24%	102,095	87%	114,099

[a] Preliminary data.

Table 4.–Estimated coho salmon subsistence and personal use harvest in numbers of fish by district, Yukon River, 1979–2006.

	District 1		District 2		District 3		Lower Yukon Subtotal		District 4		District 5		District 6		Upper Yukon Subtotal		Total Subsistence
Year	Est. Harvest	% of Harvest	Est. Harvest	% of Harvest	Est. Harvest	% of Harvest	Est. Harvest	% of Harvest	Est. Harvest	% of Harvest	Est. Harvest	% of Harvest	Est. Harvest	% of Harvest	Est. Harvest	% of Harvest	& Personal Use Harvest
1979	3,184	33%	1,132	12%	74	1%	4,390	45%	197	2%	595	6%	4,612	47%	5,404	55%	9,794
1980	1,808	9%	4,801	24%	91	0%	6,700	33%	7,734	38%	561	3%	5,163	26%	13,458	67%	20,158
1981	3,769	18%	3,736	18%	510	2%	8,015	38%	2,239	11%	1,713	8%	9,261	44%	13,213	62%	21,228
1982	11,192	31%	10,229	28%	675	2%	22,096	62%	2,952	8%	3,428	10%	7,418	21%	13,798	38%	35,894
1983	3,590	15%	6,072	25%	917	4%	10,579	44%	3,946	17%	2,448	10%	6,932	29%	13,326	56%	23,905
1984	6,095	12%	7,066	14%	740	2%	13,901	28%	2,867	6%	17,467	36%	14,785	30%	35,119	72%	49,020
1985	3,246	10%	4,834	15%	376	1%	8,456	26%	3,949	12%	8,098	25%	11,761	36%	23,808	74%	32,264
1986	2,725	8%	9,140	27%	954	3%	12,819	37%	2,458	7%	5,870	17%	13,321	39%	21,649	63%	34,468
1987	6,396	8%	6,894	8%	754	1%	14,044	17%	3,479	4%	11,842	14%	53,006	64%	68,327	83%	82,371
1988	4,389	6%	7,104	10%	1,667	2%	13,160	19%	4,714	7%	19,755	29%	30,201	45%	54,670	81%	67,830
1989	5,077	12%	5,039	12%	537	1%	10,653	26%	4,030	10%	7,187	18%	18,841	46%	30,058	74%	40,711
1990	3,301	8%	6,344	15%	1,026	2%	10,671	25%	3,614	8%	11,562	27%	17,613	41%	32,789	75%	43,460
1991	1,808	5%	3,297	9%	1,340	4%	6,445	17%	4,451	12%	4,931	13%	21,561	58%	30,943	83%	37,388
1992	5,426	10%	6,587	13%	1,549	3%	13,562	26%	8,429	16%	12,376	24%	17,554	34%	38,359	74%	51,921
1993	2,343	15%	1,695	11%	279	2%	4,317	27%	1,167	7%	5,984	38%	4,304	27%	11,455	73%	15,772
1994	3,272	8%	3,881	9%	363	1%	7,516	18%	3,515	8%	4,174	10%	26,489	64%	34,178	82%	41,694
1995	2,251	8%	2,142	8%	891	3%	5,284	19%	1,934	7%	2,205	8%	18,802	67%	22,941	81%	28,225
1996	2,445	8%	3,475	11%	444	1%	6,364	21%	2,467	8%	6,588	22%	14,893	49%	23,948	79%	30,312
1997	1,823	8%	2,424	10%	766	3%	5,013	21%	3,754	16%	3,583	15%	11,595	48%	18,932	79%	23,945
1998	2,171	12%	2,297	13%	400	2%	4,868	27%	2,593	15%	2,839	16%	7,472	42%	12,904	73%	17,772
1999	1,730	8%	2,793	13%	610	3%	5,133	25%	2,049	10%	4,241	20%	9,394	45%	15,684	75%	20,817
2000	1,067	7%	2,351	16%	94	1%	3,512	24%	1,068	7%	4,987	34%	5,150	35%	11,205	76%	14,717
2001	1,274	6%	1,440	7%	0	0%	2,714	13%	2,266	10%	7,674	35%	9,000	42%	18,940	87%	21,654
2002	1,295	8%	1,233	8%	115	1%	2,643	17%	1,023	7%	2,076	14%	9,499	62%	12,598	83%	15,241
2003	1,260	5%	1,586	7%	711	3%	3,557	15%	5,773	24%	3,887	16%	10,363	44%	20,023	85%	23,580
2004 [a]	1,175	6%	1,500	7%	284	1%	2,959	14%	4,766	23%	1,423	7%	11,817	56%	18,006	86%	20,965
2005 [a]	976	4%	1,110	4%	217	1%	2,303	9%	2,971	11%	2,159	8%	19,645	73%	24,775	91%	27,078
5 Yr Avg 2001–2005	1,196	9%	1,374	10%	265	2%	2,835	21%	3,360	10%	3,444	19%	12,065	50%	18,868	79%	21,704
10 Yr Avg 1996–2005	1,522	9%	2,021	12%	364	2%	3,907	23%	2,873	9%	3,946	20%	10,883	48%	17,702	77%	21,608
15 Yr Avg 1991–2005	2,021	12%	2,521	15%	538	2%	5,079	29%	3,215	9%	4,608	19%	13,169	43%	20,993	71%	26,072
20 Yr Avg 1986–2005	2,610	13%	3,617	16%	650	3%	6,877	30%	3,326	12%	6,267	16%	16,526	40%	26,119	70%	32,996

[a] Preliminary data.

Table 5.–Commercial harvest of fall chum salmon by district, Yukon River, 1961–2006.

	District 1		District 2		District 3		Lower Yukon Subtotal		District 4		District 5		District 6		Upper Yukon Subtotal		Total
Year	Number Harvested [a]	% of Harvest	Number Harvested	% of Harvest	Number Harvested	% of Harvest	Number Harvested	% of Harvest	Est. Harvest [b]	% of Harvest	Est. Harvest [b]	% of Harvest	Est. Harvest [b]	% of Harvest	Est. Harvest [b]	% of Harvest	Commercial Harvest
1961	42,461	100%	-	-	-	-	42,461	100%	0	0%		-	-	-	0	0%	42,461
1962	53,116	100%	-	-	-	-	53,116	100%	0	0%	-	-	-	-	0	0%	53,116
1963	0	0%	-	-	-	-	0	0%	0	0%	-	-	-	-	0	0%	0
1964	8,347	100%	-	-	-	-	8,347	100%	0	0%	-	-	-	-	0	0%	8,347
1965	22,936	98%	-	-	-	-	22,936	98%	381	2%	-	-	-	-	381	2%	23,317
1966	69,836	98%	-	-	1,209	2%	71,045	100%	0	0%	-	-	-	-	0	0%	71,045
1967	36,451	95%	-	-	1,823	5%	38,274	100%	0	0%	-	-	-	-	0	0%	38,274
1968	49,857	94%	-	-	3,068	6%	52,925	100%	0	0%	-	-	-	-	0	0%	52,925
1969	128,866	98%	-	-	1,722	1%	130,588	99%	722	1%	-	-	-	-	722	1%	131,310
1970	200,306	96%	4,858	2%	3,285	2%	208,449	99%	1,146	1%	-	-	-	-	1,146	1%	209,595
1971	188,533	99%	0	0%	0	0%	188,533	99%	1,061	1%	-	-	-	-	1,061	1%	189,594
1972	136,711	90%	12,898	8%	1,313	1%	150,922	99%	1,254	1%	-	-	-	-	1,254	1%	152,176
1973	173,783	75%	45,304	20%	0	0%	219,087	94%	13,003	6%	-	-	-	-	13,003	6%	232,090
1974	176,036	61%	53,540	18%	552	0%	230,128	79%	9,213	3%	23,551	8%	26,884	9%	59,648	21%	289,776
1975	158,183	58%	51,666	19%	5,590	2%	215,439	78%	13,666	5%	27,212	10%	18,692	7%	59,570	22%	275,009
1976	105,851	68%	21,212	14%	4,250	3%	131,313	84%	1,742	1%	5,387	3%	17,948	11%	25,077	16%	156,390
1977	131,758	51%	51,994	20%	15,851	6%	199,603	77%	13,980	5%	25,730	10%	18,673	7%	58,383	23%	257,986
1978	127,947	52%	51,646	21%	11,527	5%	191,120	77%	12,709	5%	26,236	11%	16,946	7%	55,891	23%	247,011
1979	109,406	29%	94,042	25%	25,955	7%	229,403	61%	52,098	14%	55,556	15%	41,355	11%	149,009	39%	378,412
1980	106,829	36%	83,881	28%	13,718	5%	204,428	68%	32,730	11%	42,245	14%	19,519	7%	94,494	32%	298,922
1981	167,834	35%	154,883	32%	19,043	4%	341,760	70%	19,851	4%	94,793	20%	29,608	6%	144,252	30%	486,012
1982	97,484	43%	96,581	43%	5,815	3%	199,880	89%	4,061	2%	13,979	6%	7,370	3%	25,410	11%	225,290
1983	124,371	41%	85,645	28%	10,018	3%	220,034	72%	6,114	2%	43,993	14%	35,994	12%	86,101	28%	306,135
1984	78,751	38%	70,803	34%	6,429	3%	155,983	75%	9,841	5%	24,117	12%	17,785	9%	51,743	25%	207,726
1985	129,948	48%	40,490	15%	5,164	2%	175,602	65%	26,977	10%	25,338	9%	42,352	16%	94,667	35%	270,269
1986	59,352	42%	51,307	37%	2,793	2%	113,452	81%	2,045	1%	22,448	16%	2,074	1%	26,567	19%	140,019
1987	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0
1988	44,678	33%	31,845	23%	2,090	2%	78,613	58%	17,083	13%	16,989	12%	23,650	17%	57,722	42%	136,335
1989	77,876	27%	97,558	34%	15,332	5%	190,766	67%	15,183	5%	22,204	8%	56,443	20%	93,830	33%	284,596
1990	27,337	20%	37,077	27%	3,715	3%	68,129	50%	8,166	6%	8,976	7%	50,717	37%	67,859	50%	135,988
1991	59,724	23%	102,628	40%	9,213	4%	171,565	67%	6,091	2%	32,114	13%	44,448	17%	82,653	33%	254,218
1992	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	19,022	100%	19,022	100%	19,022
1993	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0
1994	0	0%	0	0%	0	0%	0	0%	0	0%	3,630	44%	4,639	56%	8,269	100%	8,269

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Table 5.–Page 2 of 2.

Year	District 1 Number Harvested [a]	District 1 % of Harvest	District 2 Number Harvested	District 2 % of Harvest	District 3 Number Harvested	District 3 % of Harvest	Lower Yukon Subtotal Number Harvested	Lower Yukon Subtotal % of Harvest	District 4 Est. Harvest [b]	District 4 % of Harvest	District 5 Est. Harvest [b]	District 5 % of Harvest	District 6 Est. Harvest [b]	District 6 % of Harvest	Upper Yukon Subtotal Est. Harvest [b]	Upper Yukon Subtotal % of Harvest	Total Commercial Harvest
1995	79,345	28%	90,831	32%	0	0%	170,176	60%	8,731	3%	30,033	11%	74,117	26%	112,881	40%	283,057
1996	33,629	32%	29,651	28%	0	0%	63,280	60%	2,918	3%	21,858	21%	17,574	17%	42,350	40%	105,630
1997	27,483	47%	24,326	42%	0	0%	51,809	89%	2,458	4%	3,920	7%	0	0%	6,378	11%	58,187
1998	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0
1999	9,987	49%	9,703	48%	0	0%	19,690	97%	681	3%	0	0%	0	0%	681	3%	20,371
2000	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0
2001	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0
2002	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0
2003	5,586	51%	0	0%	0	0%	5,586	51%	1,315	12%	0	0%	4,095	37%	5,410	49%	10,996
2004	660	18%	0	0%	0	0%	660	18%	0	0%	0	0%	3,071	82%	3,071	82%	3,731
2005	130,525	72%	0	0%	0	0%	130,525	72%	0	0%	0	0%	49,637	28%	49,637	28%	180,162
2006 [c]	101,254	58%	39,905	23%	0	0%	141,159	81%	0	0%	10,030	6%	23,353	13%	33,383	19%	174,542
5 Yr Avg 2001–2005	27,354	70%	0	0%	0	0%	27,354	70%	263	1%	0	0%	11,361	29%	11,624	30%	38,978
10 Yr Avg 1996–2005	20,787	55%	6,368	17%	0	0%	27,155	72%	737	2%	2,578	7%	7,438	20%	10,753	28%	37,908
15 Yr Avg 1991–2005	23,129	37%	17,143	27%	614	1%	40,886	65%	1,480	2%	6,104	10%	14,440	23%	22,023	35%	62,910
20 Yr Avg 1986–2005	27,809	34%	23,746	29%	1,657	2%	53,213	65%	3,234	4%	8,109	10%	17,474	21%	28,817	35%	82,029

[a] Numbers of fish harvested are based on reports from the State TIX and Zephyr programs.

[b] Estimated harvest is the number of fish sold in the round plus the estimated number of females to produce the roe sold.

[c] Preliminary data.

Table 6.–Commercial harvest of coho salmon by district, Yukon River, 1961–2006.

	District 1		District 2		District 3		Lower Yukon Subtotal		District 4		District 5		District 6		Upper Yukon Subtotal		Total
Year	Number Harvested [a]	% of Harvest	Number Harvested	% of Harvest	Number Harvested	% of Harvest	Number Harvested	% of Harvest	Est. Harvest [b]	% of Harvest	Est. Harvest [b]	% of Harvest	Est. Harvest [b]	% of Harvest	Est. Harvest [b]	% of Harvest	Commercial Harvest
1961	2,855	100%	-	-	-	-	2,855	100%	-	-	-	-	-	-	-	-	2,855
1962	22,926	100%	-	-	-	-	22,926	100%	-	-	-	-	-	-	-	-	22,926
1963	5,572	100%	-	-	-	-	5,572	100%	-	-	-	-	-	-	-	-	5,572
1964	2,446	100%	-	-	-	-	2,446	100%	-	-	-	-	-	-	-	-	2,446
1965	350	100%	-	-	-	-	350	100%	-	-	-	-	-	-	-	-	350
1966	19,254	100%	-	-	-	-	19,254	100%	-	-	-	-	-	-	-	-	19,254
1967	9,925	90%	0	0%	1,122	10%	11,047	100%	-	-	-	-	-	-	-	-	11,047
1968	13,153	99%	0	0%	150	1%	13,303	100%	-	-	-	-	-	-	-	-	13,303
1969	13,989	93%	0	0%	1,009	7%	14,998	99%	95	1%	-	-	-	-	95	1%	15,093
1970	12,632	96%	0	0%	0	0%	12,632	96%	556	4%	-	-	-	-	556	4%	13,188
1971	12,165	100%	0	0%	0	0%	12,165	100%	38	0%	-	-	-	-	38	0%	12,203
1972	21,705	98%	506	2%	0	0%	22,211	100%	22	0%	-	-	-	-	22	0%	22,233
1973	34,860	95%	1,781	5%	0	0%	36,641	100%	0	0%	-	-	-	-	-	-	36,641
1974	13,713	82%	176	1%	0	0%	13,889	83%	0	0%	1,409	8%	1,479	9%	2,888	17%	16,777
1975	2,288	90%	200	8%	0	0%	2,488	98%	0	0%	5	0%	53	2%	58	2%	2,546
1976	4,064	78%	17	0%	0	0%	4,081	79%	0	0%	0	0%	1,103	21%	1,103	21%	5,184
1977	31,720	82%	5,319	14%	538	1%	37,577	97%	0	0%	2	0%	1,284	3%	1,286	3%	38,863
1978	16,460	63%	5,835	22%	758	3%	23,053	88%	32	0%	1	0%	3,066	12%	3,099	12%	26,152
1979	11,369	66%	2,850	17%	0	0%	14,219	83%	155	1%	0	0%	2,791	16%	2,946	17%	17,165
1980	4,829	55%	2,660	30%	0	0%	7,489	86%	30	0%	0	0%	1,226	14%	1,256	14%	8,745
1981	13,129	55%	7,848	33%	419	2%	21,396	90%	0	0%	0	0%	2,284	10%	2,284	10%	23,680
1982	15,115	41%	14,179	38%	87	0%	29,381	79%	15	0%	0	0%	7,780	21%	7,795	21%	37,176
1983	4,595	34%	2,557	19%	0	0%	7,152	54%	0	0%	0	0%	6,168	46%	6,168	46%	13,320
1984	29,472	36%	43,064	53%	621	1%	73,157	90%	1,095	1%	0	0%	7,006	9%	8,101	10%	81,258
1985	27,676	48%	17,125	30%	171	0%	44,972	78%	938	2%	0	0%	11,760	20%	12,698	22%	57,670
1986	24,824	53%	21,197	45%	793	2%	46,814	99%	0	0%	0	0%	441	1%	441	1%	47,255
1987	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0
1988	36,028	42%	34,758	40%	1,419	2%	72,205	84%	2	0%	8	0%	13,972	16%	13,982	16%	86,187
1989	24,670	30%	38,397	46%	3,988	5%	67,055	81%	3	0%	84	0%	16,079	19%	16,166	19%	83,221
1990	13,354	29%	16,405	36%	918	2%	30,677	67%	0	0%	0	0%	14,804	33%	14,804	33%	45,481
1991	54,095	51%	40,898	38%	1,905	2%	96,898	91%	14	0%	0	0%	9,774	9%	9,774	9%	106,672
1992	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	7,979	100%	7,979	100%	7,979
1993	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0
1994	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	4,451	100%	4,451	100%	4,451

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Table 6.–Page 2 of 2.

Year	[a]	District 1 Number Harvested	District 1 % of Harvest	District 2 Number Harvested	District 2 % of Harvest	District 3 Number Harvested	District 3 % of Harvest	Lower Yukon Subtotal Number Harvested	Lower Yukon Subtotal % of Harvest	District 4 Est. Harvest [b]	District 4 % of Harvest	District 5 Est. Harvest [b]	District 5 % of Harvest	District 6 Est. Harvest [b]	District 6 % of Harvest	Upper Yukon Subtotal Est. Harvest [b]	Upper Yukon Subtotal % of Harvest	Total Commercial Harvest
1995		21,625	46%	18,488	39%	0	0%	40,113	85%	0	0%	0	0%	6,900	15%	6,912	15%	47,025
1996		27,705	49%	20,974	37%	0	0%	48,679	87%	161	0%	0	0%	7,142	13%	7,303	13%	55,982
1997		21,450	61%	13,056	37%	0	0%	34,506	98%	814	2%	0	0%	0	0%	814	2%	35,320
1998		0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0
1999		855	53%	746	47%	0	0%	1,601	100%	0	0%	0	0%	0	0%	0	0%	1,601
2000		0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0
2001		0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0
2002		0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0
2003		9,757	39%	0	0%	0	0%	9,757	39%	0	0%	0	0%	15,119	60%	15,486	61%	25,243
2004		1,583	8%	0	0%	0	0%	1,583	8%	0	0%	0	0%	18,649	92%	18,649	92%	20,232
2005		36,533	63%	0	0%	0	0%	36,533	63%	0	0%	0	0%	21,778	37%	21,778	37%	58,311
2006	[c]	39,323	61%	14,482	22%	0	0%	53,805	83%	0	0%	0	0%	11,137	17%	11,137	17%	64,942
5 Yr Avg 2001–2005		9,575	46%	0	0%	0	0%	9,575	46%	0	0%	0	0%	11,109	54%	11,183	54%	20,757
10 Yr Avg 1996–2005		9,788	50%	3,478	18%	0	0%	13,266	67%	98	0%	0	0%	6,269	32%	6,403	33%	19,669
15 Yr Avg 1991–2005		11,574	48%	6,277	26%	127	1%	17,978	74%	66	0%	0	0%	6,119	25%	6,210	26%	24,188
20 Yr Avg 1986–2005		13,624	44%	10,246	33%	451	1%	24,321	78%	50	0%	5	0%	6,854	22%	6,927	22%	31,248

[a] Numbers of fish harvested are based on reports from the State TIX and Zephyr programs.

[b] Estimated harvest is the number of fish sold in the round plus the estimated number of females to produce the roe sold.

[c] Preliminary data.

Table 7.–Value of commercial fall fishery to Yukon Area fishermen, 1977–2006.

	Fall Chum					Coho										
	Lower Yukon		Upper Yukon			Lower Yukon			Upper Yukon			Value by Species		Value by Area		
Year	$/lb	Value	$/lb	$/lb Roe	Value	$/lb	$/lb Roe	Value	$/lb	$/lb Roe	Value	Fall Chum	Coho	Lower	Upper	Total
1977	0.45	718,571	0.22		102,170	0.50		140,914	0.27		2,251	820,741	143,165	859,485	104,421	963,906
1978	0.47	691,854	0.25		103,091	0.60		96,823	0.24		6,105	794,945	102,928	788,677	109,196	897,873
1979	0.68	1,158,485	0.29		347,814	0.80		83,466	0.25		6,599	1,506,299	90,065	1,241,951	354,413	1,596,364
1980	0.28	394,162	0.27		198,088	0.36		17,374	0.29		2,374	592,250	19,748	411,536	200,462	611,998
1981	0.55	1,503,744	0.35		356,805	0.60		87,385	0.35		4,568	1,860,549	91,953	1,591,129	361,373	1,952,502
1982	0.55	846,492	0.28		53,258	0.69		135,828	0.37		18,786	899,750	154,614	982,320	72,044	1,054,364
1983	0.34	591,011	0.19		128,950	0.35		17,497	0.31		11,472	719,961	28,969	608,508	140,422	748,930
1984	0.32	374,359	0.26		103,417	0.50		256,050	0.24		12,823	477,776	268,873	630,409	116,240	746,649
1985	0.47	634,616	0.25		178,125	0.53		176,254	0.33		26,797	812,741	203,051	810,870	204,922	1,015,792
1986	0.49	399,321	0.14		30,309	0.71		211,942	0.21		556	429,630	212,498	611,263	30,865	642,128
1987	-	0	-		0	-		0	-		0	0	0	0	0	0
1988	1.01	638,700	0.32		151,300	1.38		734,400	0.37		34,116	790,000	768,516	1,373,100	185,416	1,558,516
1989	0.50	713,400	0.28		223,996	0.66		323,300	0.35		33,959	937,396	357,259	1,036,700	257,955	1,294,655
1990	0.45	238,165	0.29		174,965	0.66		137,302	0.34		37,026	413,130	174,328	375,467	211,991	587,458
1991	0.34	438,310	0.23	3.56	157,831	0.44		300,182	0.30	2.50	21,556	596,141	321,738	738,492	179,387	917,879
1992	-	0	0.39	4.50	54,161	-		0	0.39	2.18	19,529	54,161	19,529	0	73,690	73,690
1993	-	0	-		0	-		0	-		0	0	0	0	0	0
1994	-	0	0.16	1.50	8,517	-		0	0.48	1.50	8,739	8,517	8,739	0	17,256	17,256
1995	0.15	185,036	0.13	2.96	167,571	0.29		80,019	0.14	2.51	11,292	352,607	91,311	265,055	178,863	443,918
1996	0.10	48,579	0.13	1.71	45,438	0.26	2.96	96,795	0.09	2.16	13,020	94,017	109,815	145,374	58,458	203,832
1997	0.22	86,526	0.17	1.75	7,252	0.32		79,973	0.20		1,062	93,778	81,035	166,499	8,314	174,813
1998	-	0	-		0	-		0	-		0	0	0	0	0	0
1999	0.25	35,639	0.20		876	0.35		3,620	-		0	36,515	3,620	39,259	876	40,135
2000	-	0	-		0	-		0	-		0	0	0	0	0	0
2001	-	0	-		0	-		0	-		0	0	0	0	0	0
2002	-	0	-		0	-		0	-		0	0	0	0	0	0
2003	0.15	5,993	0.10		3,398	0.25		18,168	0.05		5,095	9,391	23,263	24,161	8,493	32,654
2004	0.25	1,126	0.05		848	0.25		2,774	0.06		6,372	1,974	9,146	3,900	7,220	11,120
2005	0.32	316,698	0.14		48,159	0.32		83,793	0.12		19,182	364,857	102,975	400,491	67,341	467,832
2006	0.20	202,637	0.14		33,806	0.20		50,299	0.19		11,137	236,443	61,436	252,936	44,943	297,879
1996–2005 Avg	0.22	82,427	0.13	1.73	6,424	0.29	2.96	28,512	0.10	2.16	4,473	60,053	32,985	77,968	15,070	93,039
2006 vs. Avg	-7.0%	145.8%	6.3%		426.3%	-30.1%		76.4%	82.7%		149.0%	293.7%	86.3%	224.4%	198.2%	220.2%

Table 8.–Number of commercial permit holders by district participating in the fall season salmon fishery, Yukon Area, 1971–2006.

	Fall Chum and Coho Salmon Season								Yukon
	Lower Yukon Area				Upper Yukon Area				Area
Year	District 1	District 2	District 3	Subtotal [a]	District 4	District 5	District 6	Subtotal	Total
1971	352	-	-	352	-	-	-	-	352
1972	353	75	3	431	-	-	-	-	431
1973	445	183	0	628	-	-	-	-	628
1974	322	121	6	449	17	23	22	62	511
1975	428	185	12	625	44	33	33	110	735
1976	422	194	28	644	18	36	44	98	742
1977	337	172	37	546	28	34	32	94	640
1978	429	204	28	661	24	43	30	97	758
1979	458	220	32	710	31	44	37	112	822
1980	395	232	23	650	33	43	26	102	752
1981	462	240	21	723	30	50	30	110	833
1982	445	218	15	678	15	24	25	64	742
1983	312	224	18	554	13	29	23	65	619
1984	327	216	12	536	18	39	26	83	619
1985	345	222	13	559	22	39	25	86	645
1986	282	231	14	510	1	21	16	38	548
1987	0	0	0	0	0	0	0	0	0
1988	328	233	13	563	20	20	32	72	635
1989	332	229	22	550	20	24	28	72	622
1990	301	227	19	529	11	11	27	49	578
1991	319	238	19	540	8	21	25	54	594
1992	0	0	0	0	0	0	22	22	22
1993	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	1	11	12	12
1995	189	172	0	357	4	12	20	36	393
1996	158	109	0	263	1	17	17	35	298
1997	176	130	0	304	3	8	0	11	315
1998	0	0	0	0	0	0	0	0	0
1999	146	110	0	254	4	0	0	4	258
2000	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0
2003	75	0	0	75	2	0	5	7	82
2004	26	0	0	26	0	0	6	6	32
2005	177	0	0	177	0	0	7	7	184
2006	218	71	0	289	0	4	11	15	304
Average									
1971–2005	238	129	10	368	11	18	18	47	409
1996–2005	76	35	0	110	1	3	4	7	117
2001–2005	56	0	0	56	0	0	4	4	60

Note: Number of permit holders which made at least one delivery.

[a] Since 1984, the subtotal for the Lower Yukon Area was the unique number of permits fished. Before 1984, the subtotals are additive for Districts, 1, 2, and 3. Some individual fishermen in the Lower Yukon Area may have operated in more than one district during the year.

Table 9.–Coho escapement estimates for selected spawning areas, Yukon River drainage, 1972–2006.

Year	East Fork Andreafsky River	Yukon River Mainstem Sonar Estimate	Anvik River	Kantishna River Drainage		Nenana River Drainage					Delta Clearwater River	Delta Clearwater River Tributaries	Clearwater Lake and Outlet	Richardson Clearwater River [b]
				Geiger Creek [a]	Barton Creek	Lost Slough	Nenana Mainstem	Wood Creek	Seventeen Slough	Lignite Springs [a]				
1972											632		417	454 [c]
1973											3,322		551	375
1974						1,388			27		3,954 [c]		560	652
1975						943			956		5,100		1,575 [d]	4 [c]
1976			467 [b]	25 [b c]		118			281		1,920		1,500 [d]	80 [c]
1977			81 [b]	60		524 [b]		310 [a]	1,167		4,793		730 [d]	327
1978						350		300 [a]	466		4,798		570 [d]	
1979						227			1,987		8,970		1,015 [d]	372
1980				3 [b c]		499 [b]		1,603 [a]	592		3,946		1,545 [d]	611
1981	1,657 [b]					274		849 [e f]	1,005		8,563 [g]		459 [b]	550
1982				81				1,436 [e f]			8,365 [g]			
1983				42		766		1,042 [e]	103		8,019 [g]		253	88
1984				20 [b c]		2,677		8,826 [e]			11,061		1,368	428
1985				42 [b c]		1,584		4,470 [e]	2,081		6,842		750	
1986				5	496	794		1,664 [e]	218 [d]		10,857		1,800	146 [c]
1987				1,175		2,511		2,387 [e]	3,802		22,300		4,225 [d]	
1988	1,913 [h]		1,203	159	437	348		2,046 [e]			21,600		825 [d]	
1989				155	12 [b]			412 [e]	824 [b]		12,600		1,600 [d]	483
1990				211		688	1,308		15 [b]		8,325		2,375 [d]	
1991				427	467 [b]	564	447		52		23,900		3,150 [d]	
1992				77	55 [b]	372			490		3,963		229 [d]	500
1993				138	141	484	419	666 [e i]	581		10,875		3,525 [d]	
1994				410	2,000 [e j]	944	1,648	1,317 [e k]	2,909	244	62,675	17,565	3,425 [d]	5,800
1995	10,901	101,806		142	192 [e l]	4,169	2,218	500 [e]	2,972 [b]		20,100	6,283	3,625 [d]	
1996	8,037			233	0 [e]	2,040	2,171	201 [c m]	3,668 [d]	282	14,075	3,300	1,125 [c]	
1997	9,472	104,343		274		1,524 [n]	1,446	[c m]	1,996	50 [e o]	11,525	2,375	2,775 [d]	
1998	7,193	136,906		157		1,360 [c]	2,771 [c]	370 [p q]	1,413 [p]	175 [e]	11,100	2,775	2,775 [d]	
1999	2,963	62,521		29		1,002 [c]	745 [c]	[q]	662 [c]		10,975	2,805		
2000	8,451	175,421		142		55 [b c]	66 [b c]	[q]	879 [b c]	95	9,225	2,358	1,025 [d]	2,175
2001	15,896	137,769	262 [b]	578		242	855	699	3,741	135	46,875	11,982	4,425 [d]	1,531
2002	3,577	122,566		744		0	328	935	1,910	130	38,625	9,873	5,900 [d]	874
2003	8,231	269,081		973		85	658	3,055	4,535	67	105,850	27,057	8,800	6,232
2004	11,146	188,350		583		220	450	840	3,370		37,950	9,701	2,925	8,626
2005 [r]	5,303	184,281		625		430	325	1,030	3,890		34,293	8,766	2,100	
2006 [r]	-	131,919									16,748	4,281	4,375	
All Years Average	7,757	146,815	503	278	422	906	1,057	1,589	1,607	147	17,563	8,394	2,191	1,515
5 Year Avg 2001–2005	8,831	180,409	262	701	-	195	523	1,312	3,489	111	52,719	13,476	4,830	4,316
Interim Escapement Objective											5,200 to 17,000 [s]			

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Table 9.–Page 2 of 2.

Note: Latest table revision December 22, 2006. Only peak counts presented. Survey rating is fair to good, unless otherwise noted.

Source: East Fork Andreafsky River estimates are base on a weir count, unless otherwise indicated. Yukon River Mainstem passage estimates for coho salmon are incomplete. The sonar project is terminated prior to the end of the coho salmon run. Mainstem Nenana River is between the confluences of Lost Slough and Teklanika River. Delta Clerwater River estimates based on boat survey counts in the lower 17.5 river miles, unless otherwise indicated. Delta Clearwater River Tributaries estimates are based on helicopter surveys that counted tributaries of the Delta Clearwater River, outside of the normal mainstem index area, from 1994 to 1999 after which an expansion factor was used to estimate the escapement to the areas.

[a] Estimate is based on foot survey, unless otherwise indicated.

[b] Aerial survey, fixed winged or helicopter.

[c] Poor survey.

[d] Boat survey.

[e] Weir count.

[f] Coho weir was operated at the mouth of Clear Creek (Shores Landing).

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

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

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

[j] A total of 298 coho salmon were passed between September 11 and October 4, 1994. However, it was estimated that 1,500 to 2,000 coho salmon passed the weir site within a 24-hour period beginning at approximately noon on October 4.

Weir operated from August 18 through morning of October 5, 1994.

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

[l] An additional 1,000 coho salmon were estimated pooled downstream of weir on October 2, 1995, just prior to weir removal.

[m] Beginning at confluence of Clear Creek, the survey includes counts of both Glacier and Wood Creeks to their headwaters.

[n] Survey of western floodplain only.

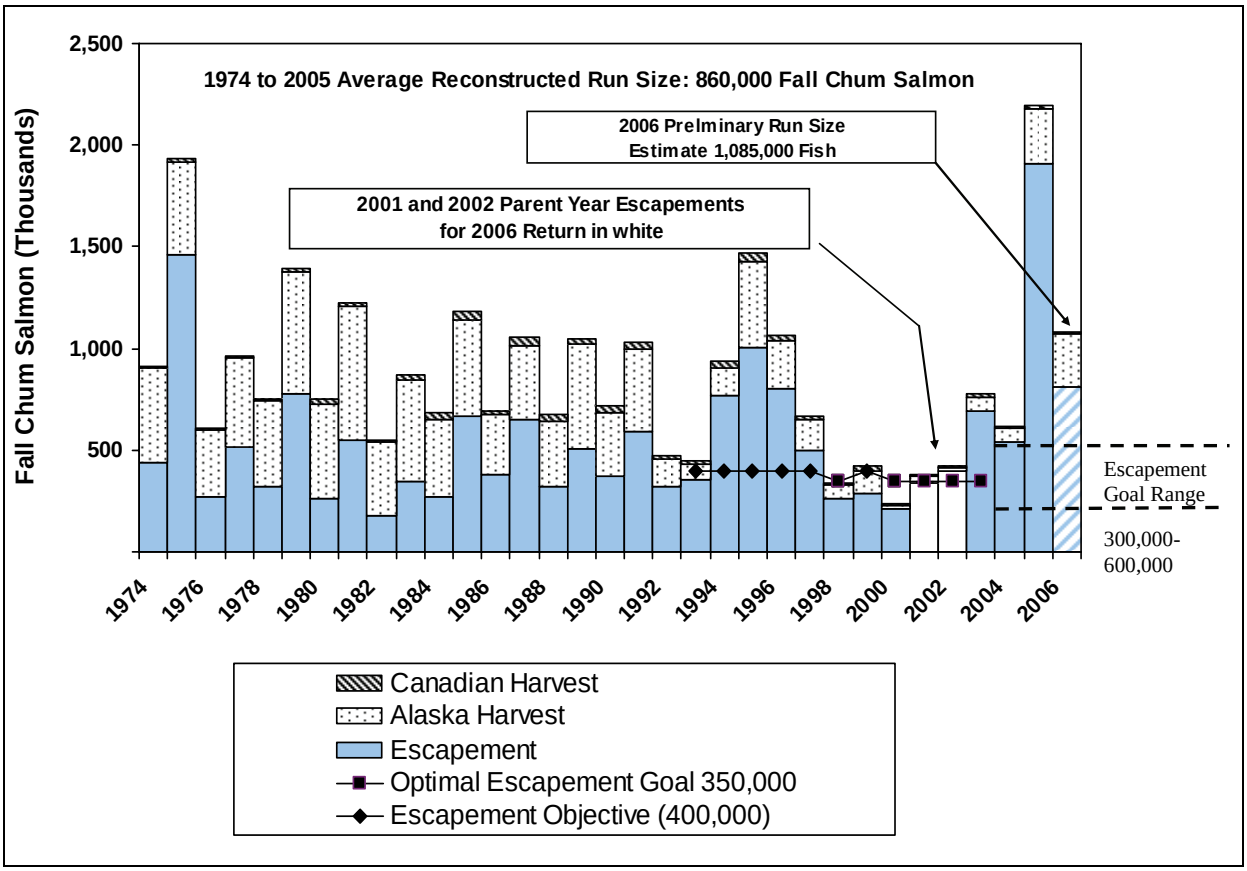
[o] Estimated count by Perry Corsetti, Healy school teacher, operating a school project weir, after coho salmon were illegally (shot) taken from spawing grounds prior to October 9, 1997.

[p] Combination foot and boat survey.

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

[r] Preliminary.

[s] Interim escapement objective 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. SEG established in 2004.



Note: The drainage-wide escapement goal of 400,000 fall chum salmon was established in 1993. In 1996 an optimal escapement goal of 350,000 fall chum salmon was established in the Yukon River Fall Chum Salmon Management Plan and was utilized in 1998, 2000, and 2001. In 2004, a drainage-wide escapement goal range of 300,000 to 600,000 fall chum salmon was established.

Figure 1.–Total run reconstruction based on estimated harvest and escapement of fall chum salmon, Yukon River drainage, 1974–2005 with the 2006 run size estimate.

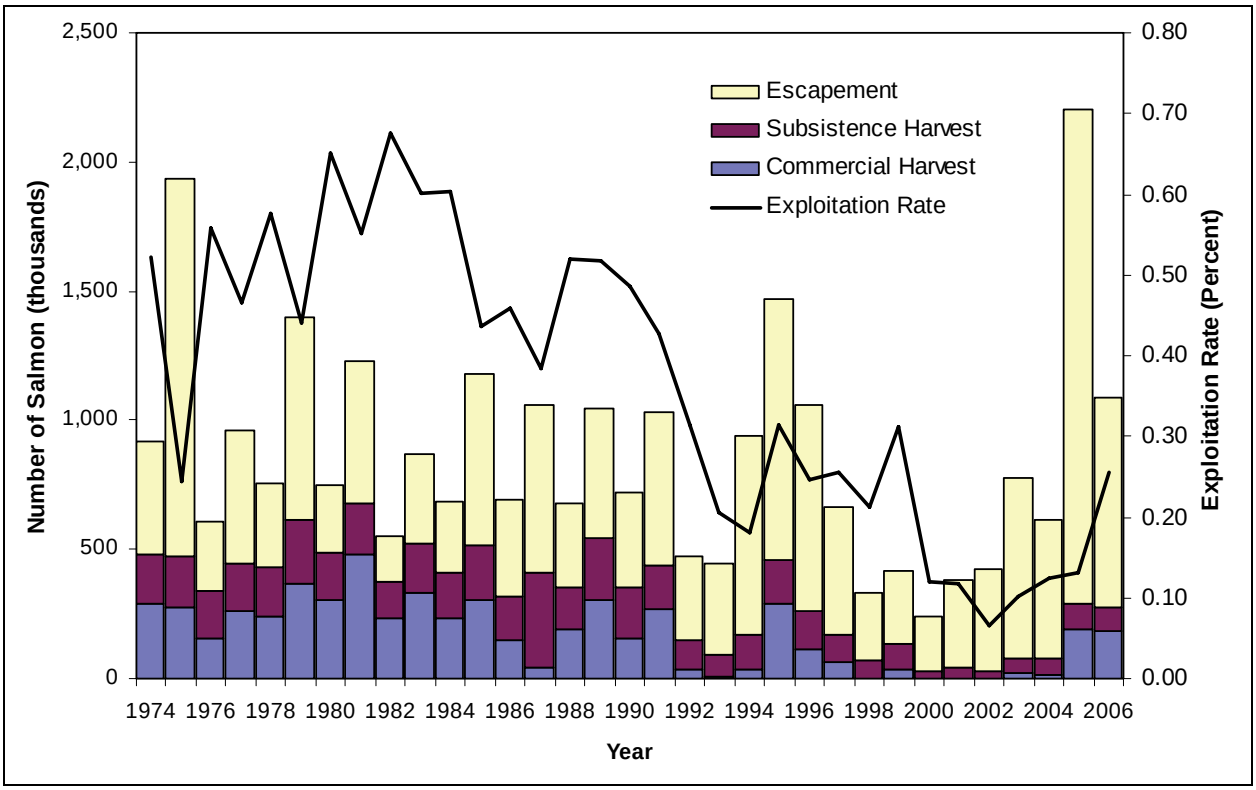


Figure 2.–Estimated fall chum salmon harvest and escapement with exploitation rate, Yukon Area, 1974–2006.

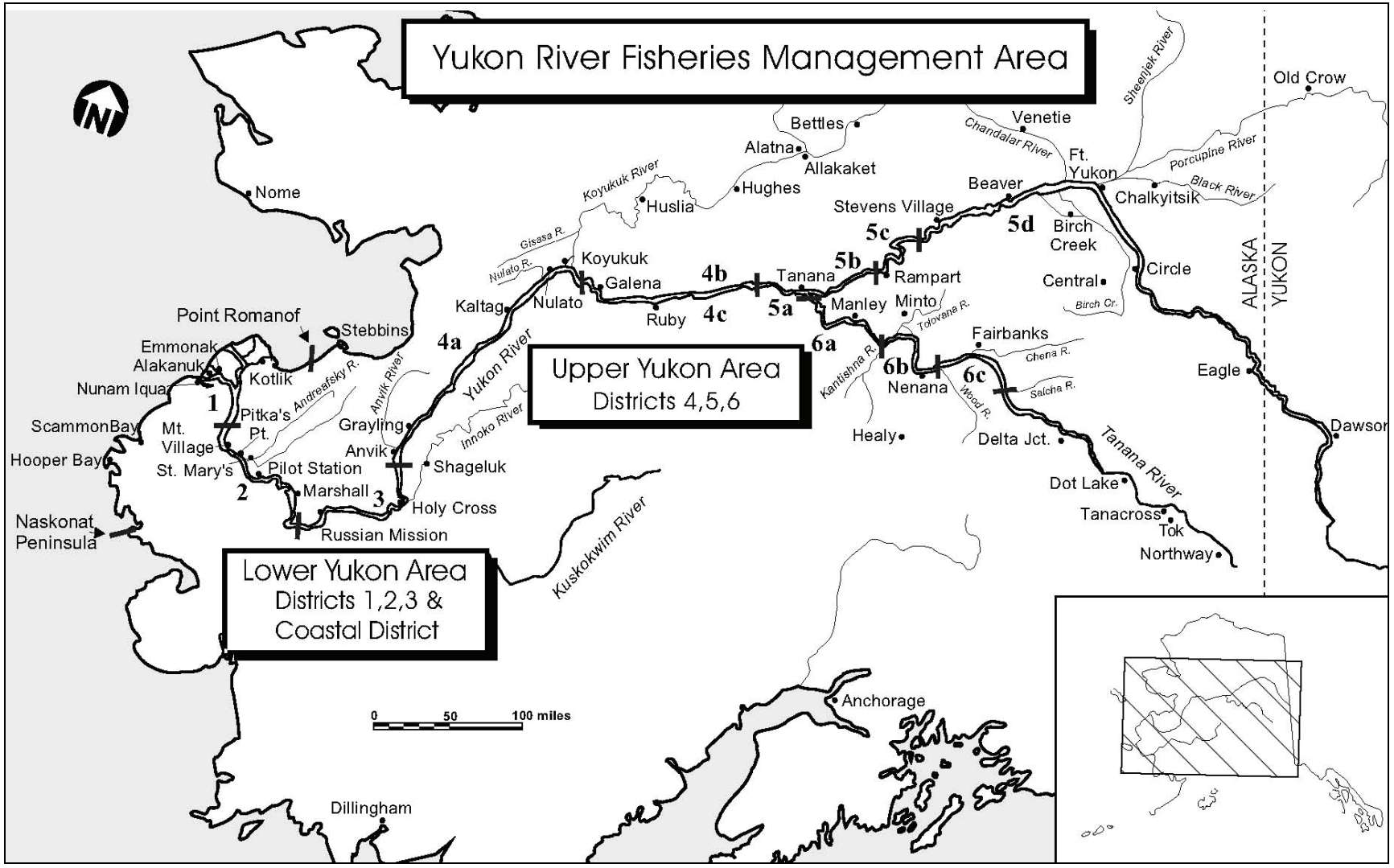


Figure 3.–Alaskan portion of the Yukon River drainage showing communities and fishing districts.

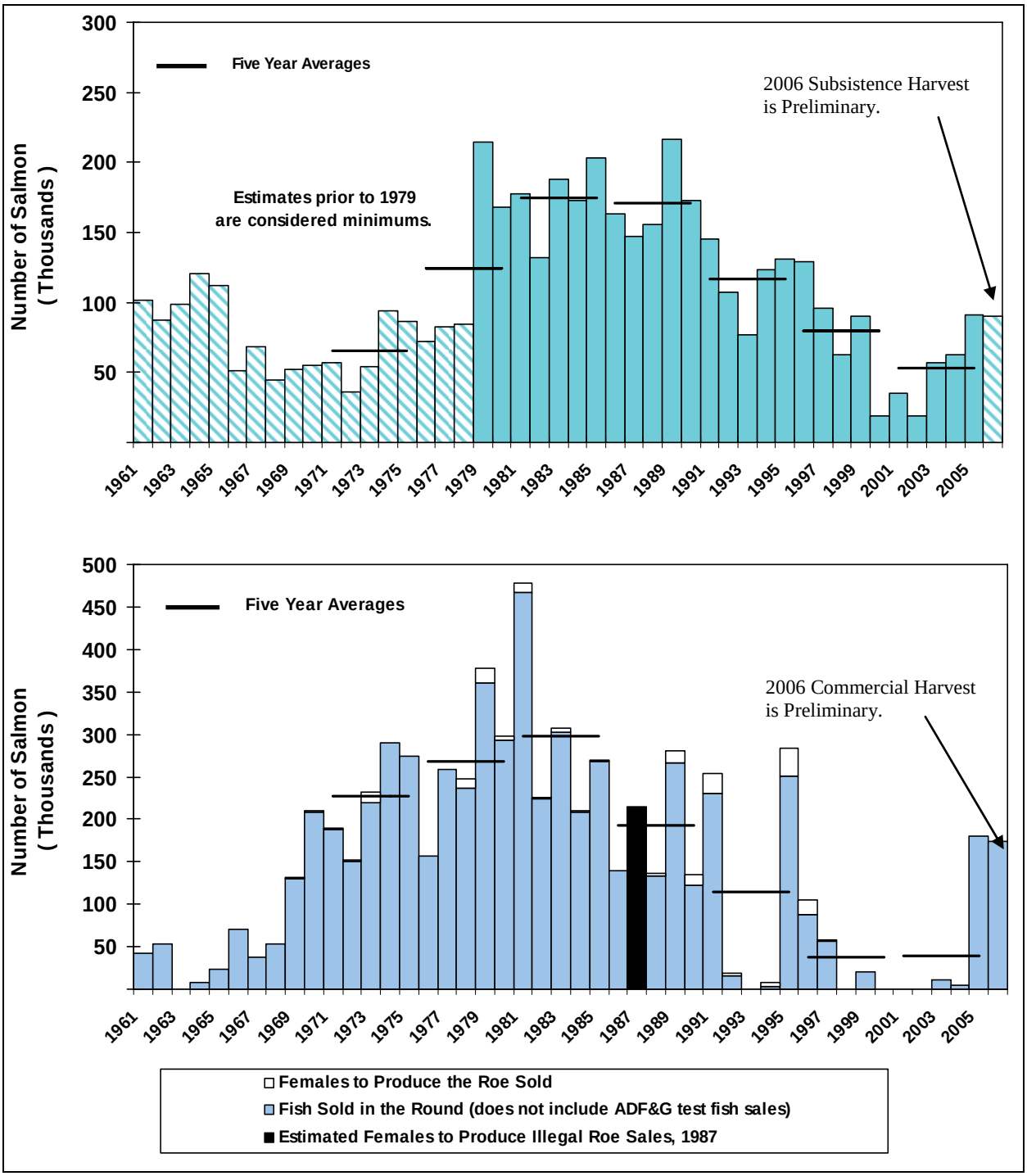


Figure 4.–Subsistence (top) and commercial (bottom) harvest of fall chum salmon, Yukon River drainage, Alaska, 1961–2006.

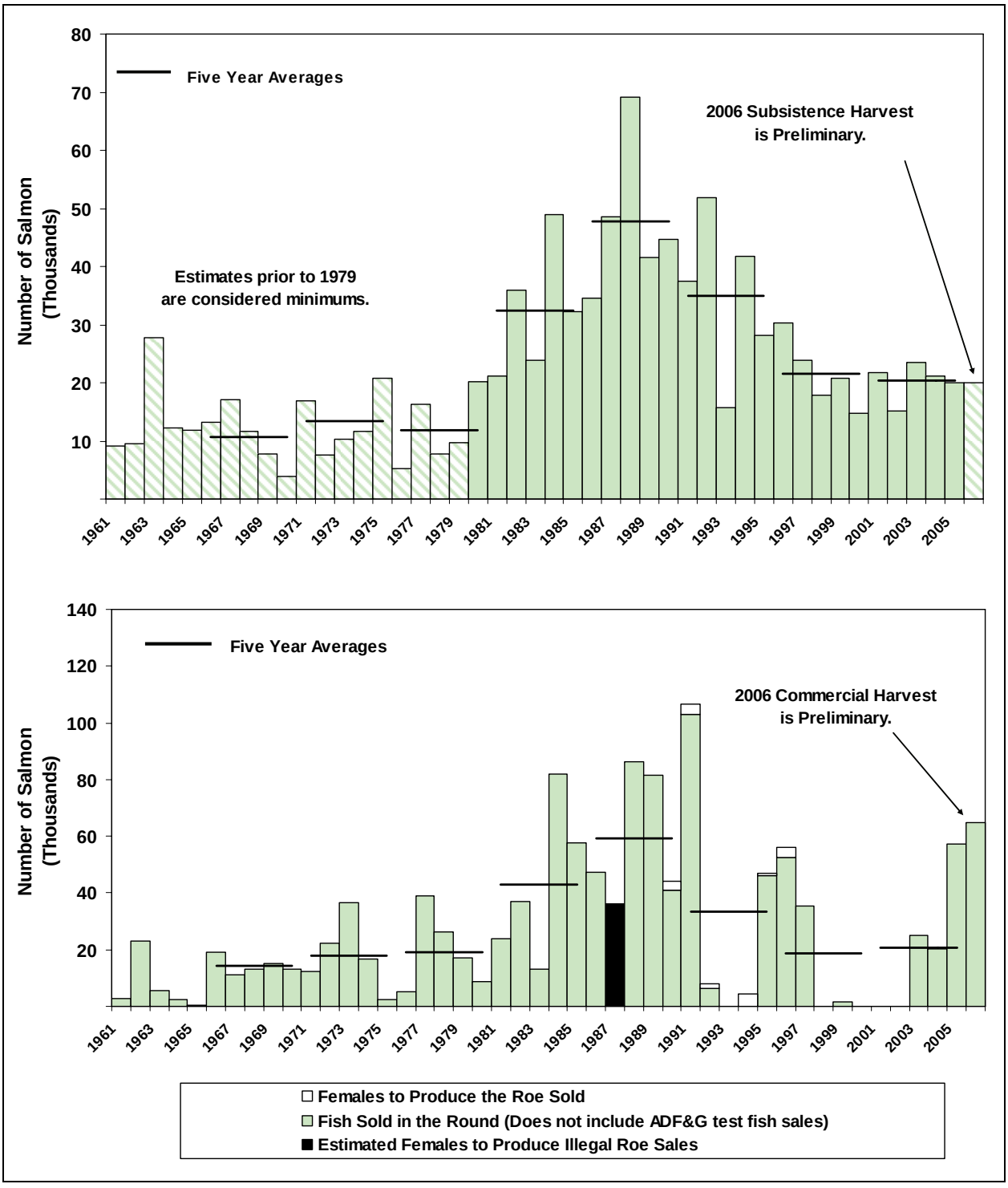


Figure 5.–Subsistence (top) and commercial (bottom) harvest of coho salmon, Yukon River drainage, Alaska, 1961–2006.

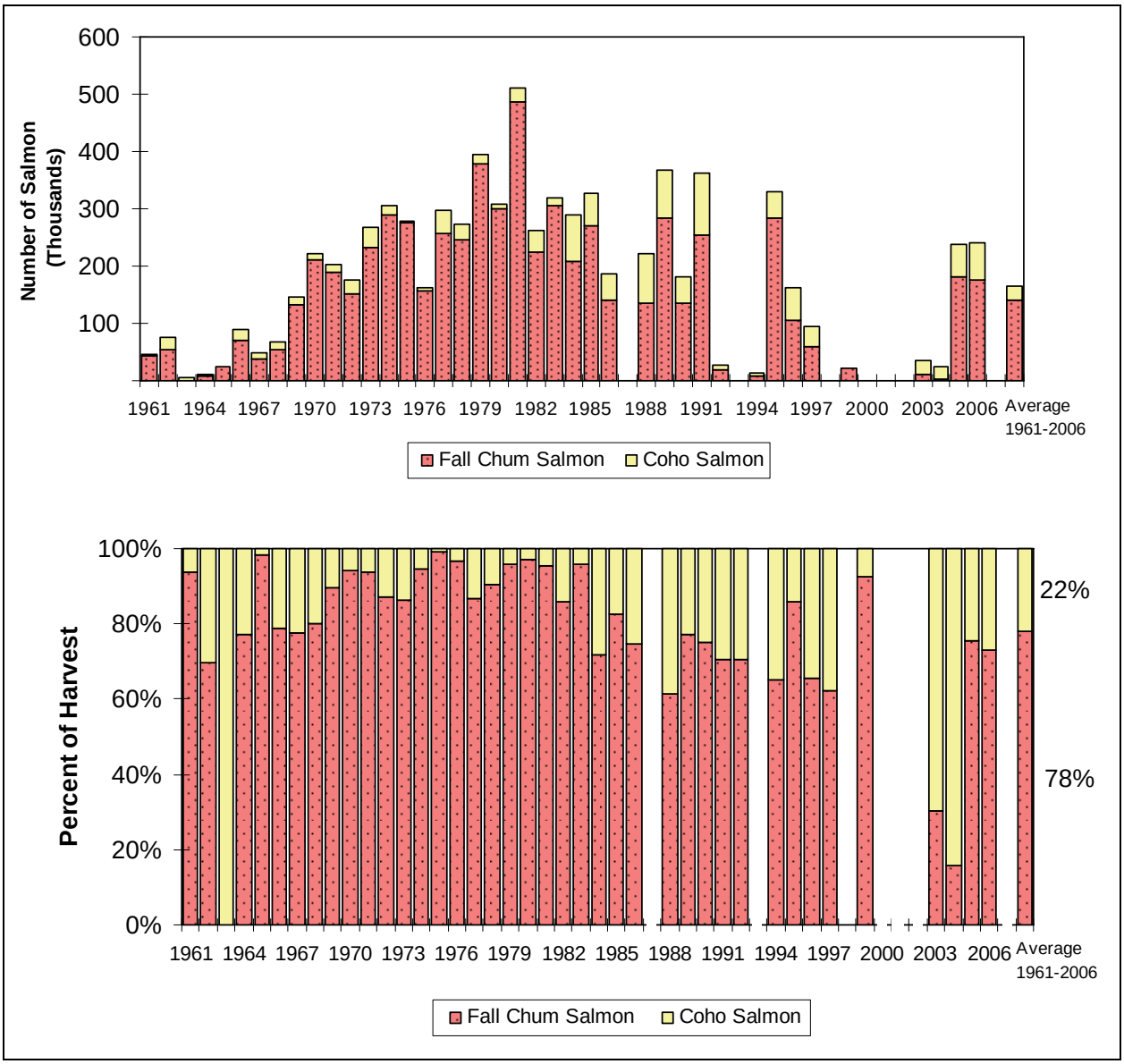


Figure 6.–Total commercial harvest of fall chum and coho salmon combined (top) and percent (bottom) of harvest by species in the Yukon River drainage, Alaska, 1961–2006.

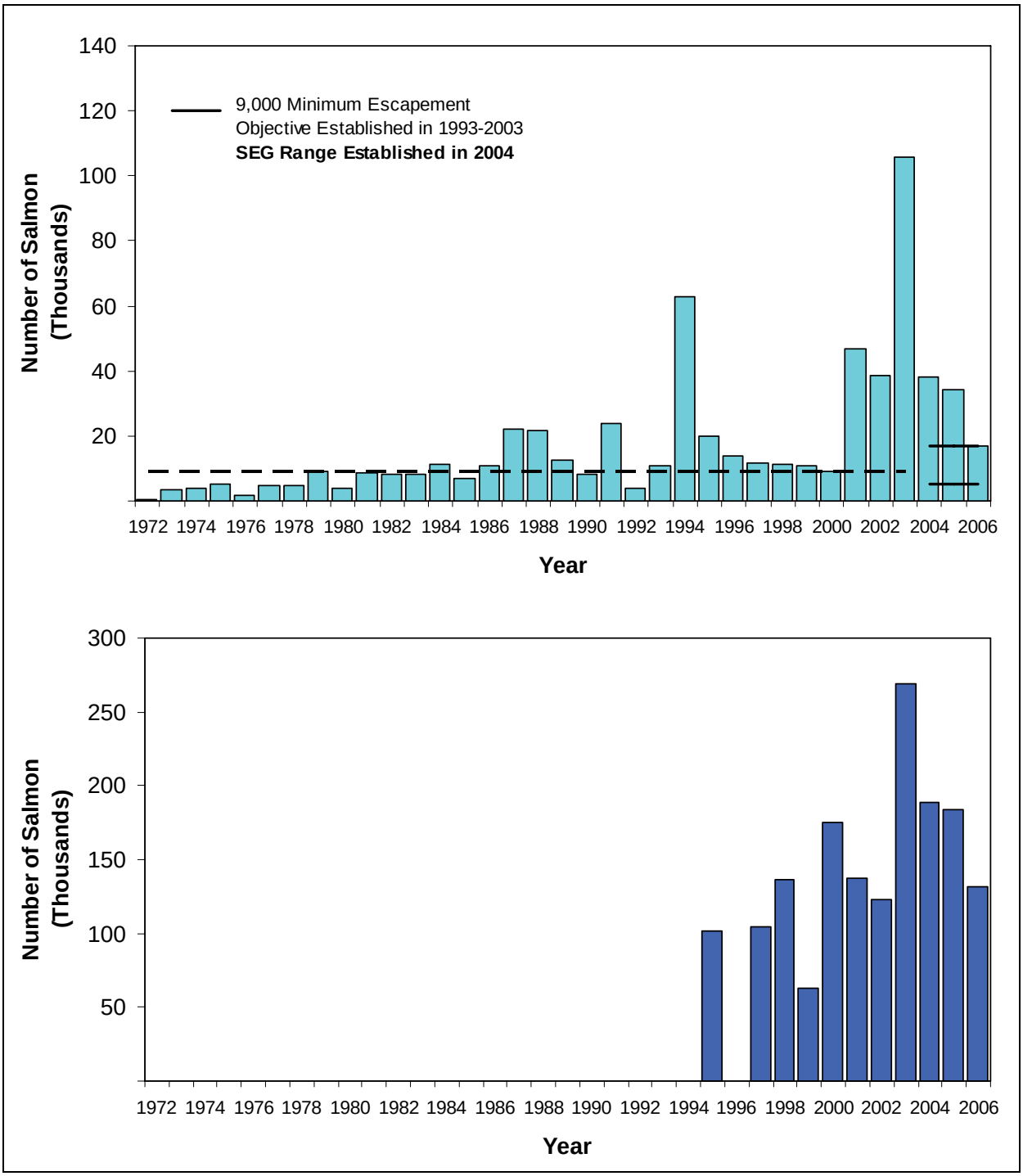


Figure 7.–Historical coho salmon assessment projects, Delta Clearwater River escapement (top) and Pilot Station sonar passage index (bottom), 1972–2006.

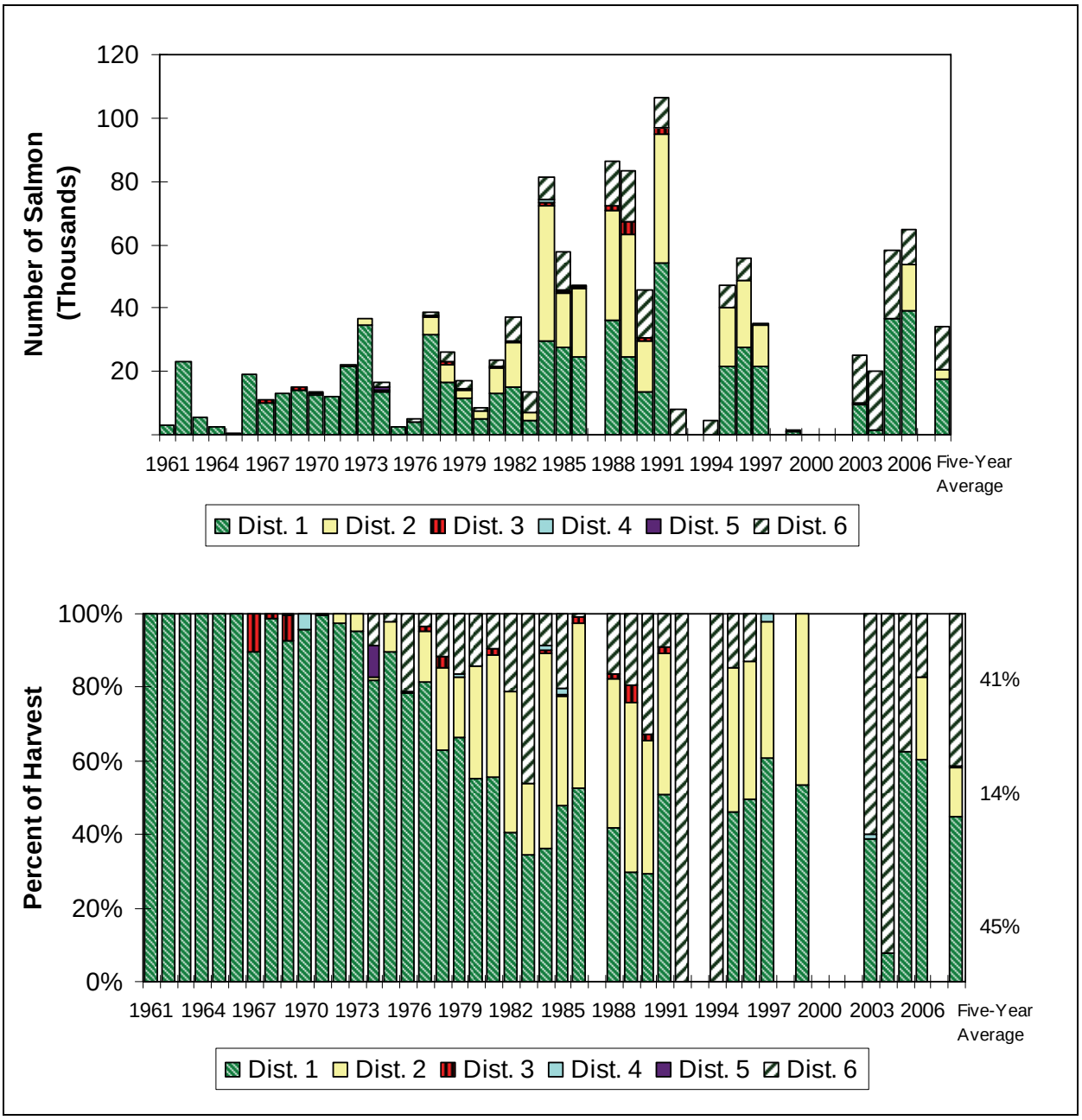


Figure 8.–Total commercial harvest of coho salmon (top) and percent (bottom) of harvest in the Yukon River drainage, 1961–2006.

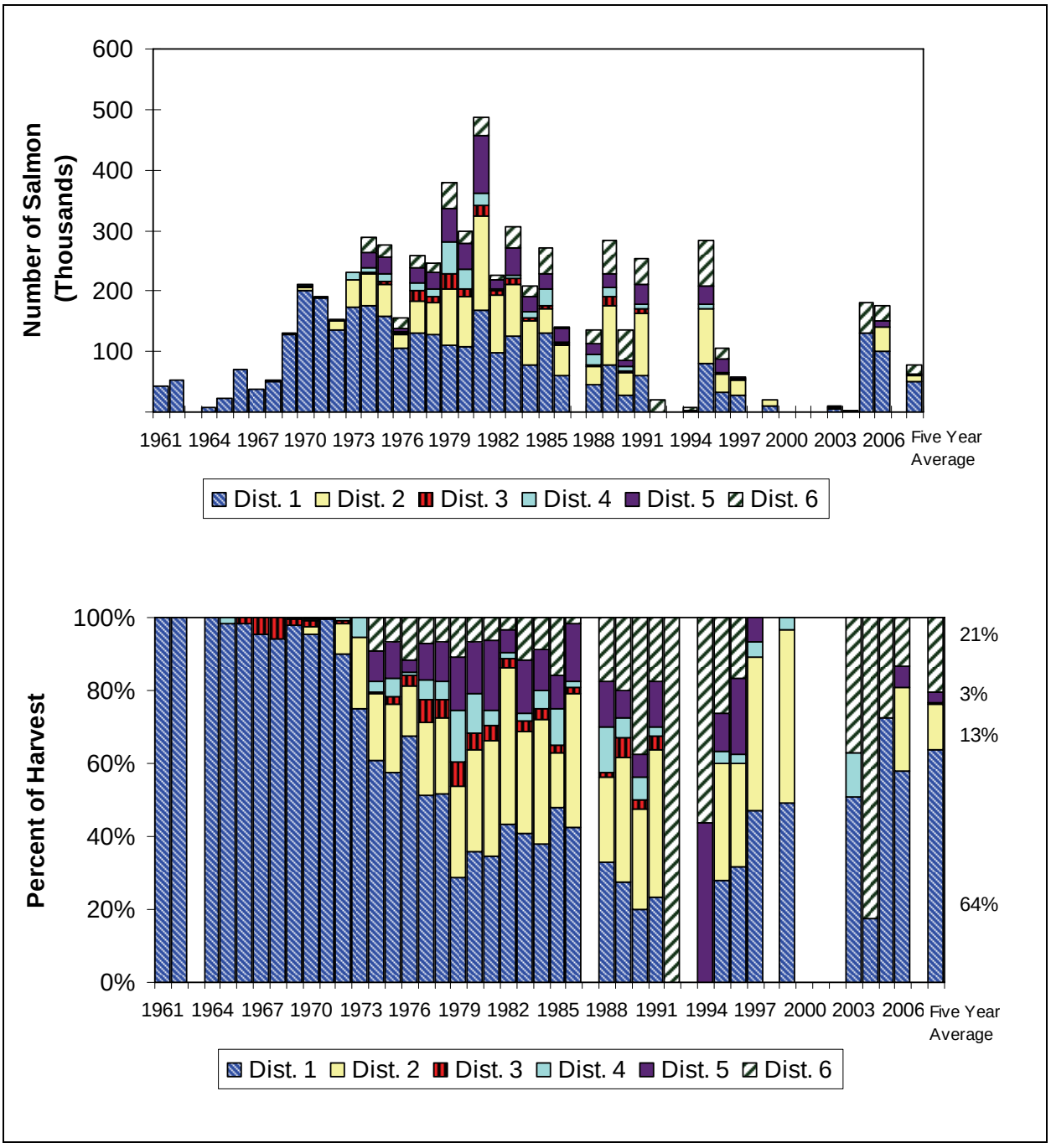


Figure 9.–Total commercial harvest of fall chum salmon (top) and percent (bottom) of harvest by district, Yukon River drainage, 1961–2006.