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Escapements of Chinook Salmon in Southeast Alaska and Transboundary Rivers in 2003

by

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May 2005

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

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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 Department of Fish and Game	ADF&G
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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ABSTRACT

As part of a continuing stock assessment program in Southeast Alaska, the Division of Sport Fish obtained indices of escapement for Chinook salmon *Oncorhynchus tshawytscha* in designated streams and transboundary rivers. The estimated total escapement in 2003 was 121,306 large (age .3 and older) Chinook, a 14% decrease from the escapement of 143,673 fish estimated in 2002. Two out of eleven escapement indices increased from 2002, however indices were below escapement goal ranges in the Blossom and King Salmon Rivers. Estimated age and sex composition and mean length at age of all stocks sampled in 2003 are presented.

Key words: Chinook, *Oncorhynchus tshawytscha*, escapement, escapement goals, Taku River, Stikine River, Alsek River, Chilkat River, Unuk River, Chickamin River, Blossom River, Keta River, King Salmon River, Situk River, Andrew Creek, U.S./Canada Treaty, transboundary rivers

INTRODUCTION

Chinook salmon *Oncorhynchus tshawytscha* are known to occur in 34 rivers in, or draining into, the Southeast region of Alaska from British Columbia or Yukon Territory, Canada, (Kissner 1977). In the mid-1970s it became apparent that many of the Chinook salmon stocks in this region were depressed relative to historical levels of production (Kissner 1977), and a fisheries management program was implemented to rebuild stocks in Southeast Alaska streams and in transboundary rivers (rivers that originate in Canada and flow into Southeast Alaska coastal waters; ADF&G *Unpublished*). Initially, this management program closed commercial and recreational fisheries in terminal and near-terminal areas in U.S. waters.

In 1981, this program was formalized and expanded to a 15-year (roughly 3 life-cycles) rebuilding program for the transboundary Taku, Stikine, Alsek, Unuk, Chickamin, and Chilkat rivers and the non-transboundary Blossom, Keta, Situk, and King Salmon rivers (ADF&G *Unpublished*) (Figure 1). The program used region-wide, all-gear catch ceilings for Chinook salmon, designed to rebuild spawning escapements by 1995 (ADF&G *Unpublished*). In 1985, the Alaskan program was incorporated into a comprehensive coast-wide rebuilding program for all wild stocks of Chinook salmon, under the auspices of the U.S./Canada Pacific Salmon Treaty (PST).

To track the spawning escapement, the Alaska Department of Fish and Game (ADF&G), the Canadian Department of Fisheries and Oceans (DFO), the Taku River Tlingit First Nation (TRTFN), and the Tahltan First Nation (TFN) count spawning Chinook salmon in a designated set of eleven watersheds (Appendix A1). These streams were selected on the basis of their historical importance to fisheries, size of the population, geographic distribution, extent of the historical database, and ease of data collection. Counts from each of these streams are considered to be indicators of relative abundance, based on the assumption that counts are a relatively constant proportion of the annual escapement in an index area or watershed.

Programs to estimate total escapement and survey count-to-escapement expansion factors for index counts have been implemented for all 11 index stocks. Long-term annual programs are in place on the Situk, Alsek, Chilkat, Taku, Stikine and Unuk rivers. Short-term (2–3 year) projects were used to estimate expansion factors for the other 5 systems. Estimates of escapement from these mark-recapture and weir studies are generally superior to expanded survey count estimates, and are preferentially employed whenever they are available.

Escapement data are provided annually to the Joint Chinook Technical Committee (CTC) of the Pacific Salmon Commission (PSC), who use them to evaluate the status of the indicator stocks (PSC 1997). Estimates of the total escapement of large spawners are provided to the CTC for six stocks (Situk, Chilkat, Taku, Stikine, Andrew and King Salmon rivers) and index counts for the remaining five stocks are used to track trends in escapement.

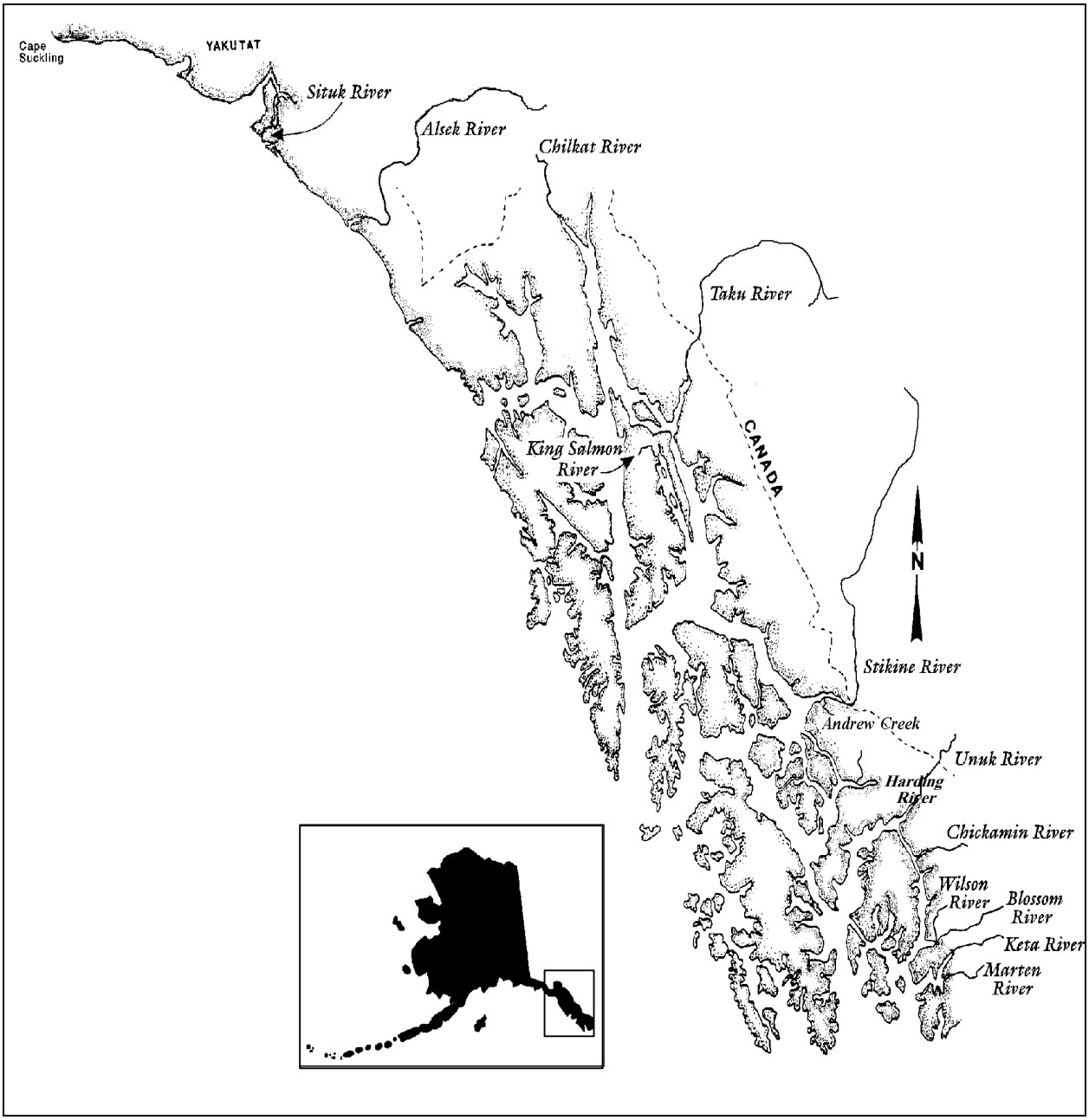

Figure 1.–Location of selected Chinook salmon systems in Southeast Alaska, Yakutat, and transboundary rivers.

In addition to these applications, Biological Escapement Goals (BEGs 5AAC 39.222) have been established for all 11 systems and fisheries are managed to achieve those escapement goal ranges.

This project obtained indices of spawner abundance for major Chinook salmon stocks in Southeast Alaska. Objectives for 2003 were to count large (≥660 mm mid-eye to fork length, or ocean-age 3 and older) spawning Chinook salmon during the time of peak abundance in tributaries and mainstem areas of the Stikine, Taku, Alsek, Situk, Unuk, Chickamin, Keta, Blossom, King Salmon rivers and in Andrew Creek, and to compile and compare the indices to those from past years.

Description of Study Sites

Many individual spawning areas are surveyed annually in a designated set of watersheds. Detailed descriptions and maps of these areas are found in Mecum and Kissner (1989), and general descriptions of the watersheds are below.

The Taku River originates in northern British Columbia and flows into the ocean 48 km east of Juneau, Alaska. The Taku River drainage covers over 17,000 km^2; average monthly flows range from 60 m^3/sec in February to 1,097 m^3/sec in June (Bigelow et al. 1995). Principal tributaries are the Sloko, Nakina, Sheslay, Inklin, and Nahlin rivers. The clearwater Nakina and Nahlin rivers contribute less than 25% of the total drainage discharge; most is from glacier-fed streams on the eastern slope of the Coast Range of British Columbia. Upstream of the abandoned mining community of Tulsequah, British Columbia, the drainage remains in pristine condition, with very few mining, logging, or other development activities. The upper Taku River area is extremely remote, with no road access and few year-round residents. All of the important Chinook salmon spawning areas are in tributaries in the upper drainage in British Columbia.

Stock assessment of Chinook salmon has been conducted intermittently on the Taku River since the 1950s, and standardized helicopter surveys of the index areas have been conducted annually since 1973. Survey index areas include portions of the Nakina, Nahlin, Dudidontu, Tatsamenie, and Kowatua rivers. In addition, since 1973 the DFO, TRTFN, and ADF&G have operated a carcass collection weir below the major spawning area on the Nakina river, which provides an estimate of the age and size composition of the escapement. Mark-recapture experiments are providing annual independent estimates of total escapement since 1995 (McPherson *In prep;* McPherson et al. 1998c).

The Stikine River originates in British Columbia and flows to the sea approximately 32 km south of Petersburg, Alaska. Its drainage covers about 52,000 km^2, much of which is inaccessible to anadromous fish because of natural barriers and velocity blocks. The Stikine River's principal tributaries include the Tahltan, Chutine, Scud, Iskut, and Tuya rivers. The lower river and most tributaries are glacially occluded (e.g., Chutine, Scud, and Iskut rivers).

Only 2% of the Stikine River drainage is in Alaska (Beak Consultants Limited 1981), and the majority of the Chinook salmon spawning areas in the Stikine River are located in British Columbia, Canada, in the mainstem Tahltan and Little Tahltan rivers (including Beatty Creek). However, Andrew Creek, in the U.S. portion of the lower Stikine River, supports a significant run of Chinook salmon. The upper drainage of the Stikine is accessible via the Telegraph Creek Road.

Helicopter surveys of the Little Tahltan River index area have been conducted annually since 1975, and the DFO and TFN have operated a fish counting weir at the mouth of the Little Tahltan River since 1985. Counts from the weir represent the total escapement to that tributary. Since 1996, mark-recapture experiments have provided independent estimates of total escapement to the Stikine River (Pahlke and Etherton 1997; 1999; 2000; Pahlke et al. 2000; Der Hovanisian et al. 2001, 2003, 2004).

Andrew Creek flows into the lower Stikine River in Alaska, not far from the limit of tidal influence. From 1976 to 1984, a weir was operated on Andrew Creek to provide brood stock for hatcheries. Foot, aerial and helicopter surveys to count Chinook salmon have been conducted annually since 1985. A new weir was operated on Andrew Creek in 1997 and 1998.

The Alsek River originates in Yukon Territory, Canada, and flows in a southerly direction into the Gulf of Alaska approximately 75 km south-east of Yakutat, Alaska. Its largest tributaries are the Dezadeash and Tatshenshini rivers. The Alsek River drainage covers about 28,000 km^2 (Bigelow et al. 1995), but much of it, including the mainstem of the Alsek itself, is inaccessible to anadromous salmonids because of velocity barriers. The significant spawning areas for Chinook salmon are found mostly in tributaries of the Tatshenshini River, including the Klukshu, Blanchard, and Takhanne rivers and in Village and Goat creeks. The Klukshu and upper Tatshenshini rivers are accessible by road near Dalton Post, Yukon Territory.

Counts of Chinook salmon have been collected on the Alsek River since 1962. Beginning in 1976, the DFO has operated a weir at the mouth of the Klukshu to count Chinook, sockeye *O. nerka*, and coho salmon O. *kisutch*. The count of Chinook salmon through the Klukshu River weir is used as the index for the Alsek River. Some aboriginal harvest takes place above the weir. Aerial surveys to count spawning Chinook salmon have been conducted by ADF&G with a helicopter since 1981. Prior to 1981, surveys were made from fixed-wing aircraft. The escapement to the Klukshu River is difficult to count by aerial, boat or foot surveys because of deep pools and overhanging vegetation. However, surveys of the Klukshu River are conducted periodically to provide some continuity in estimates in the event that funding for the weir is discontinued. The Blanchard and Takhanne Rivers and Goat Creek, three smaller tributaries of the Tatshenshini River, are also surveyed annually, but are not used to index escapements. Since 1998, mark-recapture studies have been conducted annually to estimate the escapement of spawning Chinook salmon in the Alsek River and radio telemetry studies were conducted in 1998 and 2002 to estimate the distribution of spawning Chinook salmon (Pahlke et al. 1999; Pahlke and Etherton 2001a, b; Pahlke and Etherton 2002; Pahlke and Waugh 2003).

The Unuk, Chickamin, Blossom, and Keta river drainages all feed into Behm Canal—a narrow passage of water east of Ketchikan, Alaska. Misty Fiords National Monument/ Wilderness Area surrounds the eastern or "back" Behm Canal and includes the Boca de Quadra fjords. Many of the mainland rivers in the area support Chinook salmon; the Unuk, Chickamin, Blossom and Keta rivers are designated Chinook salmon escapement index systems.

The Unuk River originates in a glaciated area of British Columbia and flows 129 km to Burroughs Bay, 85 km northeast of Ketchikan, Alaska; only the lower 39 km of the river are in Alaska. The Unuk is a large braided, glacially occluded river with a drainage of approximately 3,885 km^2. Most (~85%) spawning occurs in tributaries of the Alaska portion of the river (Pahlke et al. 1996). The escapement index areas are all small clear-water tributaries: Eulachon River and Cripple, Genes Lake, Clear, Lake, and Kerr creeks. Cripple Creek and Genes Lake Creek cannot be surveyed by air because of heavy vegetation, so fish are counted by foot survey. Chinook salmon have been counted annually by foot or helicopter surveys in these areas since 1977. Chinook salmon have been periodically counted in Boundary Creek, but survey conditions there are often poor and the counts are not included in the index. Total escapement was estimated by a mark-recapture project in 1994 (Pahlke et al. 1996) and annually since 1997 (Jones III et al. 1998a; Jones III and McPherson 1999, 2000; 2002; Weller and McPherson 2003a, b; 2004).

The Chickamin River is a large, glacial river that originates in British Columbia, and flows into Behm Canal approximately 32 km southeast of Burroughs Bay and 65 km northeast of Ketchikan. Although it is technically a transboundary river, there are no Chinook spawning areas on the Chickamin River upstream from the Canadian border (Pahlke 1997a). Important spawning tributaries are the South Fork of the Chickamin and Barrier, Butler, Indian, Leduc, Humpy, King, and Clear Falls creeks. Chinook salmon have been counted by foot or helicopter surveys in index areas of the Chickamin River each year since 1975. Total escapement was estimated by mark-recapture projects in 1995, 1996 and 2001- 2003, and spawning distribution was estimated by radio-telemetry in 1996 (Freeman and McPherson 2003, 2004; Pahlke 1996a; Pahlke 1996b; Pahlke 1997a).

The Blossom, Keta, Wilson, and Marten rivers are non-transboundary rivers that flow into Behm Canal approximately 45 km east of Ketchikan. These rivers lie inside the boundaries of the Misty Fiords National Monument in southern Behm Canal but are within an area that has been specifically excluded from Wilderness designation, because of the potential development of a large-scale molybdenum mine (Quartz Hill) near the divide of the Blossom and Keta rivers. The mine is presently undeveloped, but an access road has been completed; it

terminates at salt water near the mouth of the Blossom River.

The Keta River drainage covers about 192 km^2 and the Blossom, about 176 km^2 (Bigelow et al. 1995) and have been surveyed by helicopter annually since 1975. Chinook salmon escapements to the Wilson and Marten rivers have been monitored on an intermittent basis in recent years. Mark-recapture experiments were conducted in 1998 to estimate the escapement of Chinook salmon in the Blossom and Keta rivers (Brownlee et al. 1999) and were repeated on the Keta River in 1999 and 2000 (Freeman et al. 2001).

The King Salmon River drains an area of approximately 100 km^2 on Admiralty Island, flowing into King Salmon Bay on the eastern side of Stephens Passage about 48 km south of Juneau. The King Salmon River is the only island river system in Southeast Alaska to support more than 100 spawning Chinook salmon. ADF&G operated a weir on the King Salmon River from 1983 through 1992 to count Chinook salmon and collect broodstock for Snettisham Hatchery. Helicopter surveys have been conducted annually since 1975 and foot surveys since 1992.

The Chilkat River is a large glacial river which originates in Yukon Territory, Canada, and flows into Chilkat Inlet at the head of northern Lynn Canal near Haines, Alaska. Helicopter and foot surveys are an ineffective index of abundance for this system (Johnson et al. 1992) and were suspended in 1993, in favor of annual estimates of escapement using mark-recapture methods. Total escapement has been estimated annually since 1991 (Ericksen 2004).

The Situk River is located about 16 km east of Yakutat, Alaska. The Situk supports a large run of sockeye salmon which are harvested in commercial and subsistence set gillnet fisheries concentrated at the mouth of the Situk River. Situk River Chinook salmon are harvested both incidentally and targeted in the set gillnet fisheries, depending on run strength, and in a recreational fishery in the river. A weir was operated on the Situk River at the upper limit of the intertidal area from 1928 to 1955 to count all five species of Pacific salmon spawning in the river. Since 1976, a weir has been operated primarily to count Chinook and sockeye salmon. The proportion of the recreational harvest above the weir varies from year to year (Howe et al. 2001).

METHODS

There are 34 river systems in the region (Figure 1) with populations of wild Chinook salmon. Three transboundary rivers, the Taku, Stikine, and Alsek, are classed as major producers–each with potential production (harvest plus escapement) greater than 10,000 fish (Kissner 1974). Nine rivers are classed as medium producers, each with production of 1,500 to 10,000 fish. The remaining 22 rivers are minor producers, with production less than 1,500 fish. Small numbers of Chinook salmon occur in other streams of the region but they are not included in the above list because successful spawning has not been documented. Chinook salmon are counted via aerial surveys or at weirs each year in all three major producing systems, in six of the medium producers, and in one minor producer (Appendix A2). Abundance in the Chilkat River is estimated only by a mark-recapture program. These index systems, along with the Chilkat River, are believed to account for about 90% of the total Chinook salmon escapement in Southeast Alaska and transboundary rivers (Pahlke 1998).

ESCAPEMENT GOALS

The initial rebuilding program established interim escapement goals in 1981 for nine systems: the Alsek, Taku, Stikine, Situk, King Salmon, Unuk, Chickamin, Keta and Blossom/Wilson rivers. Although the aim was to have escapement goals that provided the optimal level of harvest, little data were available to produce such goals. As a result, escapement goals were originally set based on the highest observed escapement count prior to 1981 (Pahlke 1997b). Goals for the Chilkat River and Andrew Creek were added in 1985, bringing the total number of regularly monitored river systems to eleven. Pahlke (Pahlke 1997b) provides detailed descriptions of the escapement goals and their origins. Escapement goals have been revised when sufficient new information warrants. Most of the revised escapement goals have been developed with spawner-recruit

analysis, as ranges of optimum escapement rather than a single point estimate (Appendix A1). Spawner-recruit analysis requires not only a long series of escapement estimates, but also annual age and sex-specific estimates of escapement (McPherson and Carlile 1997). The United States Section of the CTC developed data standards in 1997 for stock specific assessments of escapement, terminal runs, and forecasts of abundance which are used to evaluate existing stock assessment programs (PSC 1997). This data has been collected routinely at weirs and during mark-recapture studies and recently specific programs have been implemented to collect age, sex and length data from Chinook salmon in the Blossom, Keta, and King Salmon rivers and Andrew Creek.

INDICES OF ESCAPEMENT

Spawning Chinook salmon are counted at 26 designated index areas in nine of the systems; total escapement in the other two systems are estimated by complete counts of Chinook salmon at the Situk River weir and by annual mark-recapture estimates on the Chilkat River. Counts are made during aerial or foot surveys during periods of peak spawning, or at weirs. Peak spawning times, defined as the period when the largest number of adult Chinook salmon actively spawn in a particular stream or river, are well-documented from surveys of these index areas conducted since 1976 (Kissner 1982; Pahlke 1997b). The proportion of fish in pre-spawning, spawning and post-spawning condition is used to judge whether the survey timing is correct to encompass peak spawning. Index areas are surveyed at least twice unless turbid water or unsafe conditions preclude the second survey. Survey conditions on each index survey are rated as poor, normal or excellent for that particular index area, and coded as to whether that survey is potentially useful for indexing or estimating escapement. Factors that affect the rating include water level, clarity, light conditions, and weather.

Only large (typically age-.3, -.4, and -.5) Chinook salmon, ≥660 mm mideye-to-fork length (MEF), are counted during aerial or foot surveys. No attempt is made to accurately count small (typically age-.1 and -.2) Chinook salmon <660 mm (MEF) (Mecum 1990). These small Chinook salmon, also called jacks, are early maturing, precocious males considered to be surplus to spawning escapement needs. They are distinct from their older age counterparts under most conditions, because of their short, compact bodies and lighter color. They are, however, difficult to distinguish from other smaller species such as pink *O. gorbuscha* and sockeye salmon. In some systems age- 1.2 fish may be larger than 660 mm MEF and be difficult to avoid counting.

Aerial surveys are conducted from a Bell 206 or Hughes 500D helicopter[1]. Pilots are directed to fly the helicopter from 6 to 15 meters above the river bed at a speed of 6–16 km/h. The helicopter door on the side of the observer is removed, and the helicopter is flown sideways while observations of spawning Chinook salmon are made from the open space. Foot surveys are conducted by at least two people walking in the creek bed or on the riverbank.

Weather, distances involved, run timing, etc., can make it difficult for a single surveyor to complete all the index surveys annually under normal or excellent conditions. Thus, alternate surveyors are selected to conduct the counts when the primary surveyor is unavailable. Also, new surveyors take on primary responsibilities at infrequent intervals. Since between-observer variability and bias can be significant (Jones III et al. 1998b), new surveyors must be trained and calibrated against the primary surveyor to provide consistency and continuity in the data. Alternate observers accompany the primary observer on regularly scheduled surveys to learn survey methods and counting techniques (training flights). Each alternate observer also accompanies the primary observer on additional regularly scheduled surveys to independently count Chinook salmon (calibration flights). Each calibration flight consists of two passes over the index area so the two observers in turn sit in the preferred location in the helicopter during one pass along the river. Counts are not shared during the calibration

[1] Product names used in this report are included for scientific completeness, but do not constitute a product endorsement.

surveys, but are shared and discussed following the completion of the second pass of each flight. Calibration data will be collected annually for several years. The relationship between observer escapement counts will be determined from accumulated data and applied to counts as appropriate.

Several index areas are routinely surveyed by more than one method; e.g. Andrew Creek is surveyed from airplanes, helicopters and by foot. The various surveys are conducted as close as possible to each other to promote comparison and calibration of the different methods.

Counts and other observations from the 2003 surveys (Appendix A3) are entered into the ADF&G CFMD Integrated Fisheries Database (IFDB) in Juneau for archiving and general distribution.

Estimates of total escapement are needed to model total production, exploitation rates and other population parameters. To estimate escapement (since indices are only a partial count of spawning abundance), counts from index areas are increased by an expansion factor (Table 1). An expansion factor is an estimate of the proportion of the season's total escapement counted in a river system during the peak spawning period. Expansion factors are based on comparisons with weir counts, mark-recapture estimates, and spawning distribution studies. They vary among rivers according to how complete the coverage of spawning areas is and difficulties encountered in observing spawners, such as overhanging vegetation, turbid water conditions, presence of other salmon species (i.e., pink and chum *O. keta* salmon), or protraction of run timing. Expansion factors range from 1.5 for the King Salmon River to 5.2 for the Taku River (Table 1).

Escapement counts are obtained from a fish-counting weir on the Situk River and a mark-recapture program on the Chilkat River. Survey expansions are not necessary for those streams where weirs or other estimation programs are used to count all migrating Chinook salmon.

Finally, to estimate total regional escapement, escapement estimates from the 11 index systems are expanded to account for the unsurveyed systems. (Appendix A2). The total estimated escapement in the index areas represents approximately 90% of the region total (Pahlke 1998). Escapement estimates for the Chilkat River are not available prior to 1991. From 1991 to 1997 the estimated escapement to the Chilkat River averaged 6% of the estimated regionwide total. Therefore, prior to 1991 the expanded index counts represent approximately 84% of the estimated Southeast Alaska total escapement.

Expansion factors for individual rivers have been revised, based on results from experiments to estimate total escapement and spawning distribution. For example, estimated total escapement and radio-tracking distribution data were used to revise tributary expansion factors for the Taku and Unuk rivers (Pahlke et al. 1996; Pahlke and Bernard 1996 and McPherson et al. 1998b). Mark-recapture studies to estimate spawning abundance on the Unuk River in 1994 (Pahlke et al. 1996) and on the Chickamin River in 1995 and 1996 (Pahlke 1996a, 1997a) were used to revise expansion factors for those two rivers in 1996; results were also applied to the nearby Blossom and Keta rivers. More mark-recapture studies were conducted on all four rivers and the expansion factors for the Behm Canal systems were revised again in 2002 (McPherson et al. 2003). On Andrew Creek, a weir was operated over four years (1979, 1981, 1982, and 1984), during which index counts were also made, establishing a new expansion factor for that system in 1995. Also in 1997, ten years (1983–1992) of matched weir and index counts were used to revise the expansion factor for the King Salmon River (McPherson and Clark 2001). The expansion factors for the Taku River were revised in 1996 and again in 1999 based on the results of mark-recapture studies (McPherson et al. 2000; Pahlke and Bernard 1996).

These studies have helped to estimate total escapement in the region and have shown that, in most cases, the surveyed index areas provide reasonably accurate trends in escapements. How ever, Johnson et al. (1992) demonstrated that expansion factors used before 1991 on the Chilkat River system were highly inaccurate, because the index areas received less than 5% of the escapement. Consequently, since 1991,

Table 1.–Peak survey counts, survey expansion factors, estimated total escapement from expanded survey counts, mark-recapture projects or weir, for large Chinook salmon returning to Southeast Alaska and transboundary rivers in 2003.

	Survey area	Survey count	Survey expansion factor	Survey expansion estimated escapement [a]	Estimated total escapement (M-R or weir) [b]	Reference [c]
Major producers						
Alsek River	Klukshu	1,737	5.0	8,609[d]	4,932	Pahlke and Waugh 2004
Taku River	5 tributaries	5,481	5.2	28,501	36,435	Boyce et al. *In prep*
Stikine River	Little Tahltan	6,492	5.15	33,434	46,824	Derhovanisian et al. 2005
Category subtotal				70,544	88,191	
Medium producers						
Situk River	NA	NA	NA	NA	2,117[e]	
Chilkat River [f]	NA	NA	NA	NA	5,657	Ericksen 2004
Andrew Cr.	All	595	2.0	1,190	NA	
Unuk River	6 tributaries	1,121	5.0[g]	5,605	5,546	Weller and McPherson 2004
Chickamin River	8 tributaries	964	5.17[g]	4,984	4,579	Freeman and McPherson 2005
Blossom River	All	203	4.0[g]	812	NA	
Keta River	All	322	3.0[g]	966	NA	
Category subtotal					20,867	
Minor producers						
King Salmon R.	All	78	1.5	117	NA	
Index system total					109,175	M-R plus survey expansions
Region total			1/0.9		121,306	

[a] Estimated by multiplying survey count by expansion factor.
[b] Estimated from mark-recapture program or weir count. Final numbers used for ADF&G management.
[c] Reference document for mark-recapture estimate.
[d] Klukshu weir count × 5 minus aboriginal fishery harvest above weir (76)
[e] Situk River weir count, minus estimated sport harvest above weir (498)
[f] Mark-recapture estimates used instead of expansion factors.
[g] Unuk, Chickamin, Blossom and Keta River expansion factors revised 2002.

escapement to the Chilkat River has been estimated annually by mark-recapture experiments (Ericksen 2002). Studies on the Taku, Stikine, Alsek, Unuk, Chickamin, Blossom, Keta and King Salmon rivers, as well as on Andrew Creek, have shown that the index expansion factors used on those systems were much more accurate than those used on the Chilkat (Pahlke 1996a; 1997a; PSC 1991). Expansion factors will continue to be revised as additional data become available. Ongoing research projects should provide more information on the expansion factors for the Taku, Stikine, Unuk, Chickamin, and Alsek rivers. Estimates of escapement from expanded counts are included in this document to provide relative estimates of total spawner abundance over time, with the caveat that expansion factors may produce incorrect estimates or be revised in the future.

AGE, SEX, AND LENGTH COMPOSITION OF ESCAPEMENTS

I compiled estimates of escapement by age and sex for all 11 systems having Chinook salmon stock assessment projects in Southeast Alaska in 2003 (Appendix A4) to provide a basic statistical summary for managers and researchers. Estimates for the Chickamin, Unuk, Stikine, Taku, Chilkat and Alsek rivers were from mark-recapture projects (Der Hovanisian et al. *In prep*.; Ericksen 2004; Freeman and McPherson. *In prep.*; Pahlke and Waugh 2004; Weller and McPherson 2004; Boyce et al. *In prep.*). Results compiled from each of these projects are the reported estimates of escapement of medium- and large-sized Chinook salmon, except for the Stikine River, where the estimates include small fish (<2% of the population). Size classification of small and medium fish varies slightly between projects, with the cutoff at 400 mm MEF in most systems and

440 mm MEF in the remainder. Estimates for medium and large fish from the Situk River are based on age sampling and a total census of the escapement at a weir. Age composition estimates for the Blossom, Keta, and King Salmon rivers and Andrew Creek were calculated by multiplying the peak survey count by the escapement expansion factor (Table 1), and multiplying the result by the age proportions from sampling on the spawning grounds of each drainage in 2003. Standard errors include variance of the estimated escapements and proportions by age from sampling. Note that the survey index counts for the Blossom and Keta include many age 1.2 Chinook salmon because of their large size at age (65% to 75% of age-1.2 fish in these systems are ≥ 660 mm MEF) makes them part of the large-fish population counted in surveys. All fish in the medium and large size categories sampled and aged on the spawning grounds (most are age 1.2 and older) are used in the calculations reported in Appendix A4. Also note that there may be slight biases for some systems without mark-recapture estimates in 2003; however, we have employed sampling gear to minimize size or sex selective sampling in these spawning ground samples. The estimates for systems with mark-recapture or weir (Situk) projects, are the result of batteries of tests and stratification to produce unbiased estimate of age and sex structure.

Estimates of mean length by sex and age and their estimated variances were also calculated for each system (Appendix A5). These estimates are either the estimates reported in the publications cited above, or made using the spawning ground samples as noted above.

All Chinook salmon sampled for age, sex and length data were also examined for missing adipose fins which indicates the presence of a coded-wire tag (CWT). In most cases fish with missing adipose fins were sacrificed to recover the tag. On the Taku and Unuk Rivers most of the CWT tagged fish were wild fish tagged earlier in those rivers in ongoing projects. In all other systems any tags recovered were either from the Taku or Unuk Rivers or hatchery stocks. Sample sizes and tags recovered are summarized in Appendix Table A9.

RESULTS

In 2003, 37 locations, 24 of which were designated index areas, were surveyed specifically for Chinook salmon escapement (Appendix A3). Surveys generally progressed as planned.

From 1984 to 1993, the estimated escapement of Chinook salmon in Southeast Alaska increased steadily for 10 years, peaking in 1993 (Appendix A2). This was due primarily to strong returns to the Taku, Stikine, and Chilkat rivers, which together make up over 75% of the summed escapement goals in the region. Escapements declined in 1994 and 1995 and then peaked again in 1996 and 1997 as a result of record high escapements in the Taku River. In 1998 and 1999 escapements to the Taku River declined dramatically and have remained relatively low, but escapement to the Stikine River has increased greatly, including the highest on record in 2001.

The estimated escapement (expanded) of large Chinook salmon for all Southeast Alaska and transboundary rivers in 2003 was 121,306 (Table 1), a 14% decrease from the estimated 143,673 fish in 2002. The estimated total for the region decreased, primarily due to decreases in escapements to the Taku, Stikine and Alsek rivers.

TAKU RIVER

The count of 5,481 large Chinook salmon in the five index areas of the Taku River was down from 8,089 in 2002 and below the recent 10-year average of 9,058 (Table 2) with counts in all five tributaries below the 2002 counts (Table 3). Counts increased steadily from 1983 to 1993, and exceeded the upper limit of the survey goal range five times in the 1990s (Figure 2).

The sum of counts from the five index areas was expanded by a survey expansion factor of 5.2. The expansion factor was revised in 1999 based on five years of mark-recapture experiments on the Taku River (Table 4) (McPherson et al. 2000). McPherson et. al recommend an escapement goal range of 30,000 to 55,000 large spawners. These changes were adopted by the Transboundary River Technical Committee (TBTC) and the Chinook Technical Committee (CTC) of the PSC.

The revised PSC goal uses counts in five index areas expanded by 5.2 which corresponds to an index goal range of 5,800 to 10,600 fish. Expansion of the survey counts of 5,581 by 5.2 results in an escapement estimate of 28,501 large Chinook salmon in 2003. A mark-recapture experiment conducted in 2003 resulted in a higher escapement estimate (36,435 large; SE =6,755; Boyce et al. *In prep*).

Age, sex and length data were collected from carcasses at the Nakina, Nahlin, and Tatsamenie rivers, and live fish were sampled with angling gear at the Nahlin, Dudidontu and Tatsamenie rivers (Appendices A4H; A5H).

Stikine River

At the Little Tahltan River weir 6,492 Chinook salmon were counted in 2003. The weir count was 80% of the count of 8,110 in 2002 and similar to the 1993–2002 average of 6,533 (Table 5). Aerial surveys of Beatty Creek and the mainstem Tahltan River were discontinued as recommended in Bernard et al. (Bernard et al. 2000).

The peak aerial survey above the Little Tahltan River weir was 1,903 large fish in 2003. From 1985 to 2003, the proportion of the total escapement of Chinook salmon counted during peak aerial surveys has ranged from 28.4% to 56.6% and averaged 38.6% (Table 5). The proportion of the total escapement observed in a single survey often declined after the peak of spawning as fish died or were removed by predators. In 1998, 1999 and 2003, aerial survey conditions were not unusual and there is no explanation for the lower than average proportion of escapement observed. Age, sex and length data was collected from 837 fish sampled at the Little Tahltan River weir and from 688 post-spawning and dead fish sampled at Verrett Creek (Appendix A4E).

Based on a stock-recruit model, the BEG was revised in 1999 to a range of 14,000 to 28,000 large Chinook total in the Stikine River drainage or 2,700 to 5,300 at the Little Tahltan weir (Bernard et al. 2000). The 2003 weir count was above the revised escapement goal range for the Little Tahltan River, which has been met or exceeded every year since the weir was installed in 1985 (Figure 3). Expansion of the 2003 Little Tahltan weir count of 6,492 large Chinook salmon by the survey expansion factor (5.15) produced a total Stikine River escapement estimate of 33,434 large Chinook salmon. The estimate of total escapement to the Stikine River from a mark-recapture experiment conducted in 2003 is 46,824 large Chinook (SE = 3,631; Der Hovanisian et al. *In prep*.) which is well above the upper end of the escapement goal range for the drainage.

Andrew Creek

The 2003 survey count of Chinook salmon in Andrew Creek was 595 fish, compared to 876 in 2002 (Table 6). In 1998, a spawner recruit analysis was completed and a biological escapement goal range of 650 to 1,500 total (~325-750 index count) large spawners was adopted (Clark et al. 1998). Since 1985, Andrew Creek escapements have exceeded the lower limit of the goal in all but two years (Figure 4).

From 1976 to 1984 a weir was operated on Andrew Creek to provide brood stock for hatcheries. Total spawners removed from the creek ranged from 12 in 1978 to 275 in 1982 (Pahlke 1995). Surveys were also conducted on the system during four of those years and, on the basis of those paired counts, the survey expansion factor was revised in 1995 from 1.6 (1/.625) to 2.0 (see Table 1). No survey expansion was necessary for the years when the weir provided total escapement counts (Appendix A2).

Both helicopter and foot surveys were conducted of Andrew Creek on 12 August, 2003 with 595 and 907 Chinook salmon counted respectively (Appendix A3). The helicopter count was used as the peak count based on experience of the surveyors and distribution of the fish, which were mostly schooled up low in the river. Expansion of the helicopter count of 595 large Chinook salmon by the survey expansion factor (2) produced a total Andrew Creek escapement estimate of 1,190 large Chinook salmon.

Age, sex, and length data was collected from 256 pre-spawning fish in Andrew Creek, using angling gear and dip nets (Appendix A4F, A5F).

Table 2.–Counts of spawning Chinook salmon in index areas of the Taku River, 1951–2003.

Year[a]	Nakina River		Nahlin River		Kowatua River		Tatsamenie River		Dudidontu River		5 Trib. total	Tseta Creek[f]	
1951	5,000	(F)[b]	1,000	(F)	–		–		400	(F)	6,400	100	(F)
1952	9,000	(F)	–		–		–		–		9,000		
1953	7,500	(F)	–		–		–		–		7,500		
1954	6,000	(F)	–	(F)	–		–		–		6,000		
1955	3,000	(F)	–		–		–		–		3,000		
1956	1,380	(F)	–		–		–		–		1,380		
1957	1,500[c]	(F/W)	–		–		–		–		1,500		
1958	2,500[c]	(F/W)	2,500	(A)	–		–		4,500	(A)	9,500		
1959	4,000[c]	(F/W)	–		–		–		–		4,000		
1962	–		216	(A)	–		–		25	(A)	241	81	(A)
1965	3,050	(H)	35	(A)	200	P(A)	50	P(A)	110	(A)	3,445	18	(A)
1966	3,700	P(A)	300	(A)	14	P(A)	100	P(A)	252	(A)	4,366	151	(A)
1967	700	(A)	300	P(A)	250	P(A)	–		600	(A)	1,850	350	(A)
1968	300	P(A)	450	(A)	1,100	(A)	800	E(A)	590	(A)	3,240	230	(A)
1969	3,500	(A)	–		3,300	(A)	800	E(A)	–		7,600	–	
1970	–		26	(A)	1,200	P(A)	530	E(A)	10	(A)	1,766	25	(A)
1971	500	(A)	473	(A)	1,400	E(A)	360	E(A)	165	(A)	2,898	–	(A)
1972	1,000	(F)	280	(A)	170	(A)	132	(A)	102	(A)	1,684	80	P(A)
1973	2,000	N(H)	300	E(H)	100	N(H)	200	E(H)	200	E(H)	2,800	4	(A)
1974	1,800	E(H)	900	E(H)	235	(A)	120	(A)	24	(A)	3,079	4	(A)
1975	1,800	E(H)	274	E(H)	–		–		15	N(H)	2,089	–	
1976	3,000	E(H)	725	E(H)	341	P(A)	620	E(H)	40	(H)	4,726	–	
1977	3,850	E(H)	650	E(H)	580	E(A)	573	E(H)	18	(H)	5,671	–	
1978	1,620	E(H)	624	E(H)	490	N(H)	550	E(H)	–		3,284	21	E(H)
1979	2,110	E(H)	857	E(H)	430	N(H)	750	E(H)	9	E(H)	4,156	–	
1980	4,500	E(H)	1,531	E(H)	450	N(H)	905	E(H)	158	E(H)	7,544	–	
1981	5,110	E(H)	2,945	E(H)	560	N(H)	839	E(H)	74	N(H)	9,528	258	N(H)
1982	2,533	E(H)	1,246	E(H)	289	N(H)	387	N(H)	130	N(H)	4,585	228	N(H)
1983	968	E(H)	391	N(H)	171	E(H)	236	E(H)	117	E(H)	1,883	179	N(H)
1984[d]	1,887	(H)	951	(H)	279	E(H)	616	E(H)	–		3,733	176	(H)
1985	2,647	N(H)	2,236	E(H)	699	E(H)	848	E(H)	475	(H)	6,905	303	E(H)
1986	3,868	(H)	1,612	E(H)	548	E(H)	886	E(H)	413	E(H)	7,327	193	E(H)
1987	2,906	E(H)	1,122	E(H)	570	E(H)	678	E(H)	287	E(H)	5,563	180	E(H)
1988	4,500	E(H)	1,535	E(H)	1,010	E(H)	1,272	E(H)	243	E(H)	8,560	66	E(H)
1989	5,141	E(H)	1,812	E(H)	601[e]	(W)	1,228	E(H)	204	E(H)	8,986	494	E(H)
1990	7,917	E(H)	1,658	E(H)	614[e]	(W)	1,068	N(H)	820	E(H)	12,077	172	N(H)
1991	5,610	E(H)	1,781	E(H)	570	N(H)	1,164	E(H)	804	E(H)	9,929	224	N(H)
1992	5,750	E(H)	1,821	E(H)	782	E(H)	1,624	N(H)	768	N(H)	10,745	313	N(H)
1993	6,490	E(H)	2,128	N(H)	1,584	E(H)	1,491	E(H)	1,020	E(H)	12,713	491	N(H)
1994	4,792	N(H)	2,418	E(H)	410	P(H)	1,106	N(H)	573	N(H)	9,299	614	E(H)
1995	3,943	E(H)	2,069	E(H)	550	N(H)	678	N(H)	731	E(H)	7,971	786	E(H)
1996	7,720	E(H)	5,415	E(H)	1,620	N(H)	2,011	N(H)	1,810	N(H)	18,576	1,201	N(H)
1997	6,095	E(H)	3,655	E(H)	1,360	N(H)	1,148	N(H)	943	N(H)	13,201	648	N(H)
1998	2,720	E(H)	1,294	N(H)	473	N(H)	675	E(H)	807	E(H)	5,969	360	E(H)
1999	1,900	N(H)	532	N(H)	561	E(H)	431	N(H)	527	E(H)	3,951	221	N(H)
2000	2,907	N(H)	728	P(H)	702	N(H)	953	N(H)	482	N(H)	5,772	160	N(H)
2001	1,552	P(H)	935	N(H)	1,050	N(H)	1,024	N(H)	479	N(H)	5,040	202	N(H)
2002	4,066	E(H)	1,099	N(H)	945	N(H)	1,145	N(H)	834	N(H)	8,089	192	N(H)
2003	2,126	N(H)	861	E(H)	850	E(H)	1,000	N(H)	644	E(H)	5,481	436	N(H)
93-02 Average	4,219		2,027		926		1,066		821		9,058	488	

[a] Counts before 1975 may not be comparable due to changes in survey dates and methods; foot surveys may include jacks.

[b] (F) = foot survey, — = no survey conducted, (A) = fixed-wing aircraft, (H) = helicopter, P = survey conditions hampered by glacial or turbid waters, N = normal water flows and turbidity–average survey conditions, E = conditions excellent.

[c] Partial survey of Nakina River in 1957–59; comparisons made from carcass weir (W) counts.

[d] Surveys in 1984 conducted by DFO; partial survey of Tseta Creek and Nahlin.

[e] Carcass weir at Kowatua River used to partially count escapement due to unfavorable water conditions, 1989, 1990.

[f] Tseta Creek removed from index areas in 1999.

Table 3.–Distribution of spawning Chinook salmon among index areas of the Taku River during years when all index areas were surveyed.

Year	Nakina River	%	Nahlin River	%	Kowatua River	%	Tatsamenie River	%	Dudidontu River	%	Tseta Creek	%	Total
1981	5,110	52	2,945	30	560	6	839	9	74	1	258	3	9,786
1982	2,533	53	1,246	26	289	6	387	8	130	3	228	5	4,813
1983	968	47	391	19	171	8	236	11	117	6	179	9	2,062
1985	2,647	37	2,236	31	699	10	848	12	475	7	303	4	7,208
1986	3,868	51	1,612	21	548	7	886	12	413	5	193	3	7,520
1987	2,906	51	1,122	20	570	10	678	12	287	5	180	3	5,743
1988	4,500	52	1,535	18	1,010	12	1,272	15	243	3	66	1	8,626
1989	5,141	54	1,812	19	601	6	1,228	13	204	2	494	5	9,480
1990	7,917	65	1,658	14	614	5	1,068	9	820	7	172	1	12,249
1991	5,610	55	1,781	18	570	6	1,164	11	804	8	224	2	10,153
1992	5,750	52	1,821	16	782	7	1,624	15	768	7	313	3	11,058
1993	6,490	49	2,128	16	1,584	12	1,491	11	1,020	8	497	4	13,210
1994	4,792	48	2,418	24	410	4	1,106	11	573	6	614	6	9,913
1995	3,943	45	2,069	24	550	6	678	8	731	8	786	9	8,757
1996	7,720	39	5,415	27	1,620	8	2,011	10	1,810	9	1,201	6	19,777
1997	6,095	44	3,655	26	1,360	10	1,148	8	943	7	648	5	13,849
1998	2,720	43	1,294	20	473	7	675	11	807	13	360	6	6,329
1999	1,900	46	532	13	561	13	431	10	527	13	221	5	4,172
2000	2,907	49	728	12	702	12	953	16	482	8	160	3	5,932
2001	1,552	30	935	18	1,050	20	1,024	20	479	9	202	4	5,242
2002	4,066	49	1,099	13	945	11	1,145	14	834	10	192	2	8,281
Average	4, 253	48	1,867	21	736	9	987	12	585	7	365	4	8,794
2003	2,126	36	861	15	850	14	1,000	17	644	11	436	7	5,917

ALSEK RIVER

The count of large Chinook salmon through the Klukshu River weir in 2003 was 1,737 fish, a 23% decrease from the count of 2,241 in 2002 (Table 7; Figure 5). The escapement to the Klukshu, estimated by subtracting the Aboriginal Fishery (AF) harvest (76) and sport harvest (0) above the weir from the weir count, was 1,661 fish, within the escapement goal range of 1,100 to 2,300, adopted in 1998 (McPherson et al. 1998a; McPherson et al. 1998b). All of the sport and some of the AF harvest was below the weir.

No aerial survey of the Klukshu River was conducted in 2003. However, in helicopter surveys we counted 105 large Chinook salmon in the Takhanne River, 127 in the Blanchard River, and 10 in Goat Creek.

There is no agreement in the PSC on use of expansion factors for the Alsek River; expansion factors used in the past have ranged from 1.56 to 2.5, based on assumptions that the Klukshu River represented 40 to 64 percent of the escapement to the entire drainage (Pahlke 1997b). Results from the 1998 tagging study to estimate distribution and escapement of Alsek River Chinook salmon indicated the Klukshu River accounts for about 16–25% of the Chinook salmon escapement to the Alsek River drainage (Pahlke et al. 1999). Results from the 1999 and 2000 studies indicate less than 20% of the escapement to the Alsek drainage is accounted for in the Klukshu River (Pahlke and Etherton 2001b; 2002). On the basis of the results of those two studies, the expansion factor was revised to 5.0 (Table 8). The escapement to the entire drainage was then estimated by expanding the weir count by 5.0 and subtracting the above-weir (76) harvest, resulting in an estimated escapement of 8,609 fish. Results of a mark-recapture experiment indicate a total escapement of 4,932 large Chinook salmon (SE = 525;Pahlke and Waugh 2004). Age, sex and length data were collected from 687 live fish sampled at the Klukshu River weir, other spawning areas and at a lower river tagging project (Appendix A4J; A5J).

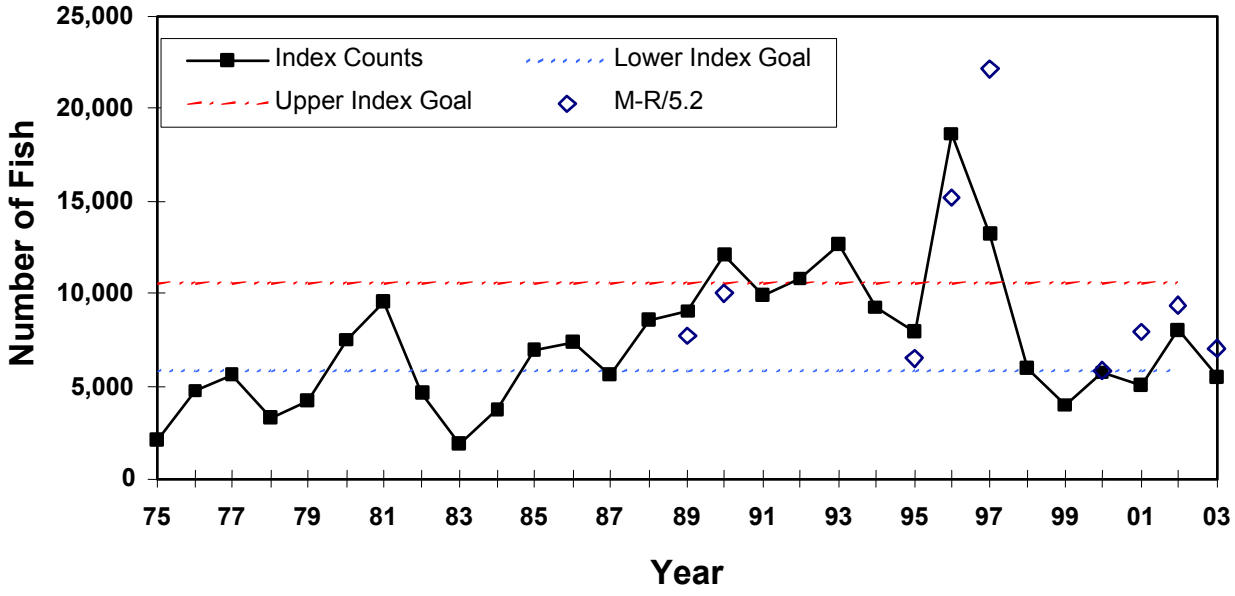

Figure 2.–Counts of Chinook salmon in index areas of the Taku River, 1975–2003 and mark-recapture estimates divided by expansion factor of 5.2.

UNUK RIVER

In 2003, 1,121 large Chinook salmon were counted in all index areas of the Unuk River (Table 9), a 25% increase over the count in 2002 and similar to the recent 10-year average of 1,013 (Table 10). The total count was within the index goal range of 650 to 1,400 (McPherson and Carlile 1997). Index counts have been below the lower end of the escapement goal range only three times since 1981 (Figure 6).

Table 4.–Index counts of large Chinook salmon in the Taku River, mark-recapture estimates of escapement, percent of escapement observed, and expansion factor (π).

Year	Counts[a]	M-R	SE	% Observed	π
1989	8,986	40,329	5,646	22.3	4.5
1990	12,077	52,142	9,326	23.2	4.3
1995	7,971	33,805	5,060	23.6	4.2
1996	18,576	79,019	9,048	23.5	4.2
1997	13,201	114,938	17,888	11.5	8.7
Ave.	12,162	64,047		19.0	5.2
1998	5,969	not available			
1999	3,951	not available			
2000	5,772	not available			
2001	5,040	41,179	6,236	12.2	8.2
2002	8,089	48,848	5,906	16.6	6.0
2003	5,481	36,435	6,755	15.0	6.7

[a] Sum of five tributaries, not 6 as prior to 1999.

Based on results of mark-recapture and radio-tracking studies, the expansion factors were revised in 1996 from 1.6 to 4.0 times the summed tributary counts on the Unuk and Chickamin rivers (Pahlke et al. 1996; Pahlke 1997a, b). After 5 more years of mark-recapture estimates the expansion factors were revised in 2002 to 5.0 on the Unuk and 5.17 on the Chickamin River (Table 11; McPherson et al. 2003). The expansion factor produced an estimated escapement of 5,605 large Chinook salmon to the Unuk River in 2003. The ongoing mark-recapture program estimated an escapement of 5,546 large Chinook salmon (SE = 433;) in 2003 (Weller and McPherson 2004).

As part of that project, 1,080 fish were sampled for age, sex and size data (Appendix A4D, A5D). Live fish were sampled with angling gear and carcasses were collected by spear.

Table 5.–Counts of spawning Chinook salmon in the Little Tahltan River, Stikine River, 1975–2003.

Year	Weir count	Above-weir catch [b]	Escapement	Aerial survey		
				Peak count [a, c]		Percent counted
1975	-			700	E(H)	
1976	-			400	N(H)	
1977	-			800	P(H)	
1978	-			632	E(H)	
1979	-			1,166	E(H)	
1980	-			2,137	N(H)	
1981	-			3,334	E(H)	
1982	-			2,830	N(H)	
1983	-			594	E(H)	
1984	-			1,294	(H)	
1985	3,114	0	3,114	1,598	E(H)	51.3
1986	2,891	0	2,891	1,201	E(H)	41.5
1987	4,783	0	4,783	2,706	E(H)	56.6
1988	7,292	0	7,292	3,796	E(H)	52.1
1989	4,715	0	4,715	2,527	E(H)	53.6
1990	4,392	0	4,392	1,755	E(H)	40.0
1991	4,506	0	4,506	1,768	E(H)	39.2
1992	6,627	0	6,627	3,607	E(H)	54.4
1993	11,449	12	11,437	4,010	P(H)	35.1
1994	6,387	14	6,373	2,422	N(H)	38.0
1995	3,072	0	3,072	1,117	N(H)	36.4
1996	4,821	0	4,821	1,920	N(H)	39.8
1997	5,557	10	5,547	1,907	N(H)	34.4
1998	4,879	6	4,873	1,385	N(H)	28.4
1999	4,738	0	4,738	1,379	N(H)	29.1
2000	6,640	9	6,631	2,720	N(H)	41.0
2001	9,730	0	9,730	4,158	N(H)	42.7
2002	8,110	0	8,110	no survey		
93-02 Avg.	6,533	5	6,528	2,335		35.7
2003	6,492	0	6,492	1,903	N(H)	29.3

[a] (F) = foot survey; N = normal survey conditions; (H) = helicopter survey; P = survey conditions hampered by glacial or turbid waters; E = excellent survey conditions; — = no survey conducted .
[b] Above weir harvest includes broodstock collection and Aboriginal fishery catch.
[c] Peak count equals peak survey above weir plus count below weir on that date.

Chickamin River

In index areas on 8 tributaries of the Chickamin River, 964 large Chinook salmon were counted in 2003, down slightly from the counts of in 2001 and 2002 (Table 12). Counts in 2003 were above the 10-year average in 6 out of 8 Chickamin River tributaries (Table 13). The 2003 count was above the upper end of the index survey escapement goal range of 450 to 900 fish (Figure 7) (McPherson and Carlile 1997). The summed counts for 2003 were multiplied by a survey expansion factor of 5.17 to produce a total escapement estimate of 4,984 fish to the system. A mark-recapture program conducted in 2003 estimated a total escapement of 4,579 (SE = 592) large Chinook salmon (Freeman and McPherson, *In prep*.). Angling and spears were used to collect age, sex and length data from 913 fish in 2003 (Appendix A4C, A5C).

Blossom River

In index areas of the Blossom River, 203 large Chinook salmon were counted in 2003, down from 224 fish counted in 2002 (Table 14). The 2003 count was 19% below the lower limit of the

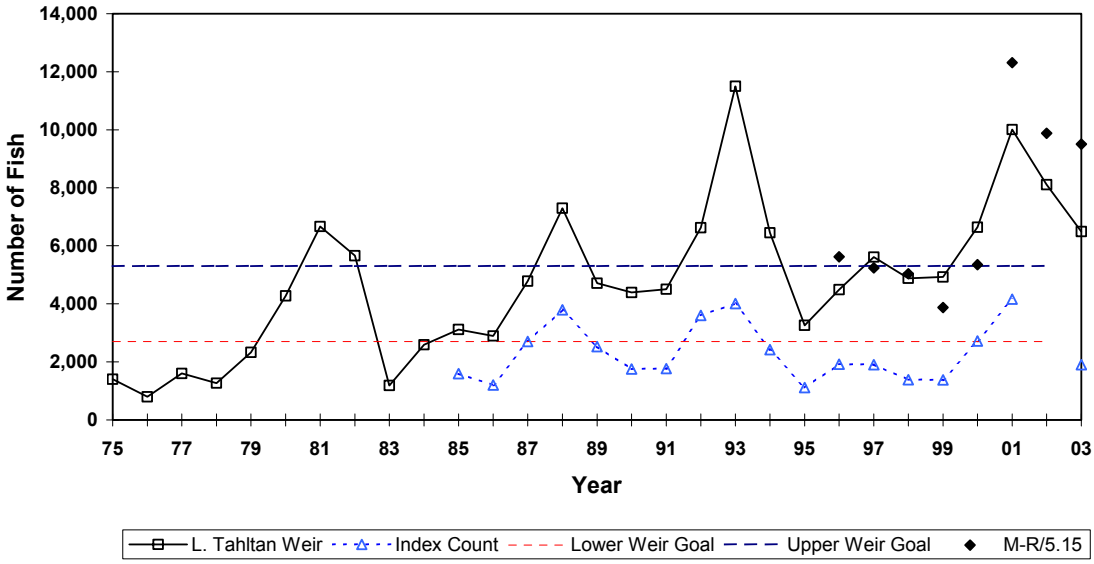

Figure 3.–Counts of Chinook salmon at the Little Tahltan River weir, Stikine River, 1975–2003. Mark-recapture estimates divided by expansion factor of 5.15. Data for 1985–2000 from weir counts, 1975–1984 estimated by doubling index count. Lines show upper and lower limits of escapement goal range.

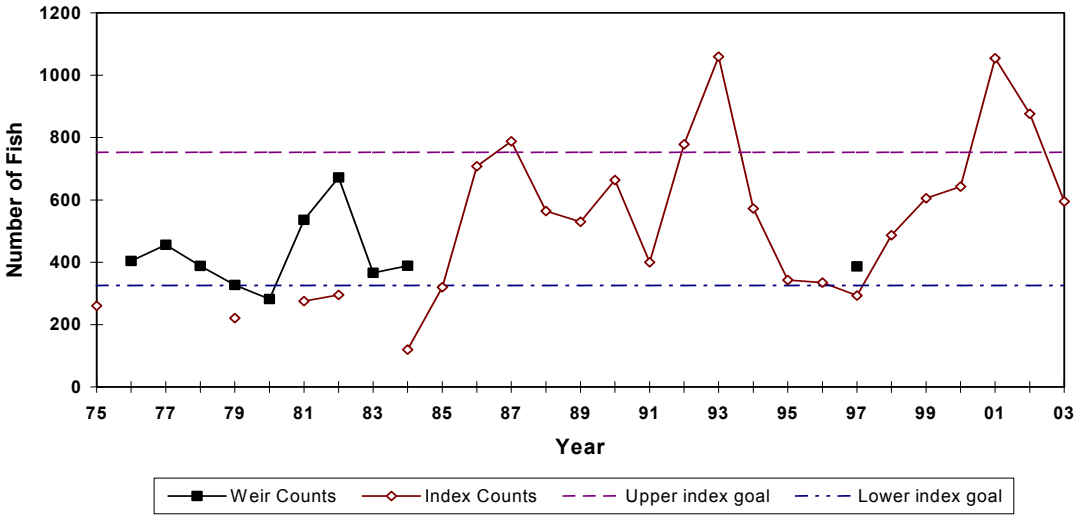

Figure 4.–Counts of Chinook salmon at the Andrew Creek Weir, 1976–1984, 1997 and in aerial/foot surveys, 1975, 1985–2003.

Table 6.– Counts of spawning Chinook salmon in selected rivers in central Southeast Alaska, 1956–2003.

Year	Andrew Cr.[a]		North Arm		Clear Creek		Harding River		Aaron Creek		Bradfield River N.Fork		Bradfield River E. Fork	
1956	4,500	(A)	–		–		–		–		–		–	
1957	3,000	(F/A)	–		–		–		–		–		–	
1958	2,500	(F/A)	–		–		–		–		–		–	
1959	150	(F/A)	–		–		–		–		–		–	
1960	287	(F)	200	(F)N	–		–		–		–		–	
1961	103	(F)	138	(F)	–		–		–		–		–	
1962	300	(A)	80	(A)N	–		–		–		–		–	
1963	500	(A/H)	187	(F)	–		–		–		–		–	
1964	400	(H)	–		–				–		–		–	
1965	100	(A)	–		–		25		–		–		–	
1966	75	(A)	–		–		–		–		–		–	
1967	30	(A)	–		–		–		–		–		–	
1968	15	–	–		–		–		–		–		–	
1969	12	(A)	–		–		–		–		–		–	
1970		–	–		–		–		–		–		–	
1971	305	(A)	–		–		–		–		–		–	
1972		–	–		–		–		–		–		–	
1973	40	(A)	–		–		10		–		–		–	
1974	129	(A)	–		–		35		–		–		–	
1975	260	(F)	–		–		–		–		–		–	
1976	404	(W/F)	–		–		12	N(A)	24		–		13	P(A)
1977	456	(W/F)	–		–		410	E(A)			–			
1978	388	(W/F)	24	E(F)	–		12	N(H)	–		–		63	P(A)
1979	327	(W/F)	16	E(F)	–		–		–		–		10	P(A)
1980	282	(W/F)	68	F(N)	–		–		–		30	P(H)	–	
1981	536	(W/F)	84	E(F)	4	P(F)	28	P(H)	12		84	P(H)	–	
1982	672	(W/F)	138	F(N)	188	N(F)	8	E(A)	–				–	
1983	366	(W/F)	15	F(N)	–		15	P(A)	–		55	N(H)	–	
1984	389	(W/F)	31	F(N)	–		35	N(B)	–		–		–	
1985	320	E(F)	44	E(F)	–		243	N(F)	179		58	N(A)	85	N(A)
1986	708	N(F)	73	F(N)	45	E(A)	240	N(B)	178		104	E(A)	215	E(A)
1987	788	E(H)	71	E(F)	122	N(F)	40	E(A)	51		186	P(A)	175	P(A)
1988	564	N(F)	125	F(N)	167	N(F)	70	P(A)	325		680	N(A)	410	N(A)
1989	530	E(F)	150	A(N)	49	N(H)	80	P(A)	135		193	P(A)	132	P(A)
1990	664	E(F)	83	F(N)	33	P(H)	24	P(A)	–		–		–	
1991	400	N(A)	38	A(N)	46	N(A)	42	N(F)	–		81	P(A)	320	P(A)
1992	778	E(H)	40	E(F)	31	N(A)	48	P(A)	30	P(A)	–		–	
1993	1,060	E(F)	53	E(F)	–		40	N(A)	–		33	P(A)	118	P(A)
1994	572	E(H)	58	E(F)	10	N(A)	87	N(H)	27	P(H)	15	P(H)	–	
1995	343	P(A)	28	A(P)	1	E(A)	38	N(H)	65	N(H)	16	P(A)	43	P(A)
1996	335	N(F)	35	F(N)	21	N(A)	75	N(A)	15	N(H)	78	N(A)	48	P(A)
1997	293	N(F)	–		–		–		55	N(H)	-		30	A(P)
1998	487	E(F)	35	N(A)	28	N(A)	75	N(A)	69	P(A)	-		66	P(A)
1999	605	E(A)	22	N(A)	–		–		550	N(A)	–		5	P(A)
2000	690	N(A)	35	N(A)	–		–		16	P(A)	–		33	N(A)
2001	1,054	N(F)	28	N(F)			150	N(H)	130	N(A)	248	E(A)	115	E(A)
2002	876	N(F)	34	N(F)	8	N(A)	33	A	15	A				
93–02	632		36		14		71		105		78		57	
2003	595	N(H)	39	F(N)	19	F(N)	5	P(A)	24	P(A)	-		95	N(A)

[a] Andrew Creek total return equals sum of weir count, counts below weir, and on North Fork, minus egg take, 1976–1984.

. (A) = survey conducted by fixed-wing aircraft; — = no survey conducted or data not comparable; (F/A) = combined foot and aerial count; (F) = survey conducted by walking; (H) = survey conducted by helicopter; (W/F) = weir and foot count; N = normal conditions; E = excellent conditions; P = poor conditions; (B) = escapement surveyed from boat.

Table 7.–Escapement of Chinook salmon to the Klukshu River and counts of spawning adults in other tributaries of the Alsek River, 1965–2003.

	Klukshu River													
	Aerial		Weir	Above-weir harvest			Escape-	Blanchard		Takhanne		Goat		
Year[a]	count		count	AF	Sport	Brood	ment[b]	River		River		Creek		Total[c]
1965	100		–	–	–		100	100		250		–		450
1966	1,000		–	–	–		1,000	100		200		–		1,300
1967	1,500		–	–	–		1,500	200		275		–		1,975
1968	1,700		–	–	–		1,700	425		225		–		2,350
1969	700		–	–	–		700	250		250		–		1,200
1970	500		–	–	–		500	100		100		–		700
1971	300	A	–	–	–		300	–		–		–		300
1972	1,100		–	–	–		1,100	12	(A)	250		–		1,362
1973	–		–	–	–		–	–		49	(A)	–		49
1974	62		–	–	–		62	52	(A)	132		–		246
1975	58		–	–	–		58	81	(A)	177	(A)	–		316
1976	–		1,278	150	64		1,064	–		–		–		1,064
1977	–		3,144	350	96		2,698	–		–		–		2,698
1978	–		2,976	350	96		2,530	–		–		–		2,530
1979	–		4,404	1,300	0		3,104	–		–		–		3,104
1980	–		2,673	150	0		2,487	–		–		–		2,487
1981	–		2,113	150	0		1,963	35	(H)	11	(H)	–		2,009
1982	633	N(H)	2,369	400	0		1,969	59	(H)	241	(H)	13	(H)	2,282
1983	917	N(H)	2,537	300	0		2,237	108	(H)	185	(H)	–		2,530
1984	–		1,672	100	0		1,572	304	(H)	158	(H)	28	(H)	2,062
1985	–		1,458	175	0		1,283	232	(H)	184	(H)	–		1,699
1986	738	P(H)	2,709	102	0		2,607	556	(H)	358	(H)	142	(H)	3,663
1987	933	E(H)	2,616	125	0		2,491	624	(H)	395	(H)	85	(H)	3,595
1988	–		2,037	43	0		1,994	437	E(H)	169	E(H)	54	E(H)	2,654
1989	893	E(H)	2,456	234	0	20	2,202	–		158	E(H)	34	E(H)	2,394
1990	1,381	E(H)	1,915	202	0	15	1,698	–		325	E(H)	32	E(H)	2,055
1991	–		2,489	241	0	25	2,223	121	N(H)	86	E(H)	63	E(H)	2,493
1992	261	P(H)	1,367	88	0	36	1,243	86	P(H)	77	N(H)	16	N(H)	1,422
1993	1,058	N(H)	3,303	64	0	18	3,221	326	N(H)	351	E(H)	50	N(H)	3,948
1994	1,558	N(H)	3,727	99	0	8	3,620	349	N(H)	342	E(H)	67	N(H)	4,378
1995	1,053	E(H)	5,678	260	0	21	5,397	338	P(H)	260	P(H)	–		5,995
1996	788	N(H)	3,599	215	0	2	3,382	132	N(H)	230	N(H)	12	N(H	3,756
1997	718	P(H)	2,989	160	0	0	2,829	109	P(H)	190	P(H)	–		3,128
1998	–		1,364	17	0	0	1,347	71	P(H)	136	N(H)	39	N(H)	1,593
1999	500	P(H)	2,193	27	0	0	2,166	371	N(H)	194	N(H)	51	N(H)	2,782
2000	–		1,365	44	0	0	1,321	168	N(H)	152	N(H)	33	N(H)	1,698
2001	–		1,825	87	0	0	1,738	543	N(H)	287	N(H)	21	N(H)	2,589
2002	–		2,241	100	0	0	2,141	351	N(H)	220	N(H)	86	E(H)	2,798
92–01 avg.	848		2,741	106	0	9	2,626	249		222		36		3,126
2003	–		1,737	76	0	0	1,661	127	N(H)	105	N(H)	10	N(H)	1,903

[a] Escapement counts prior to 1975 may not be comparable due to differences in survey dates and counting methods.
[b] Klukshu River escapement = weir count minus above weir Aboriginal Fishery (AF) catch and broodstock.
[c] Total = Klukshu escapement plus aerial counts of other systems.

(A) = aerial survey from fixed wing aircraft; (H) = helicopter survey; E = excellent survey conditions; N = normal conditions; P = poor conditions; – = no survey.

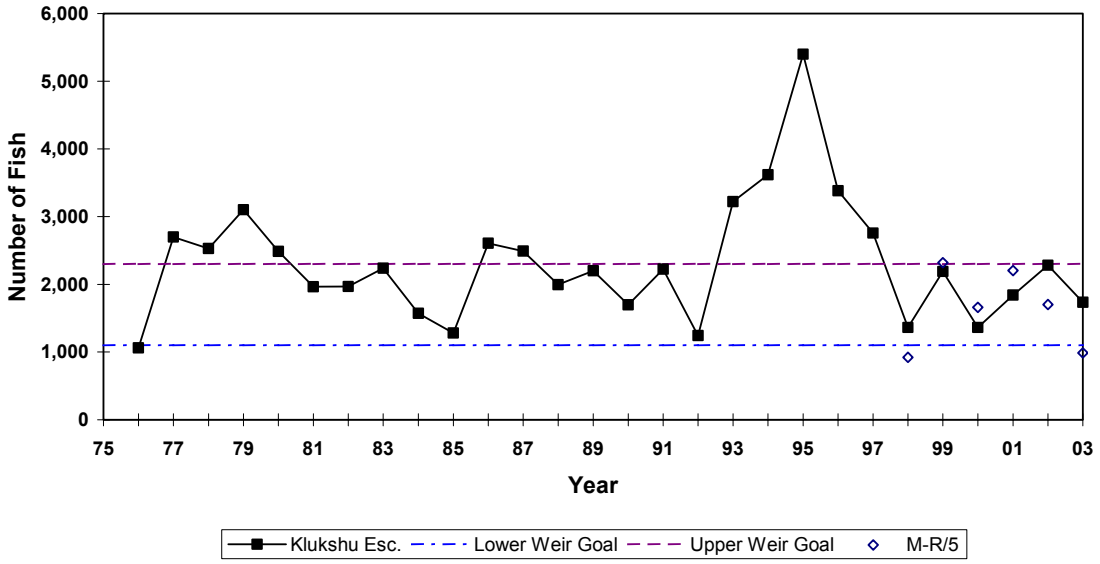

Figure 5.–Weir count of Chinook salmon to the Klukshu River tributary of the Alsek River, 1976–2003. Mark-recapture estimates divided by expansion factor of 5.0. Lines show upper and lower limits of revised escapement goal range.

index survey goal range of 250 to 500 (McPherson and Carlile 1997). Counts had exceeded the goal from 1982–1989, but since 1991 they have frequently been below the escapement goal range (Figure 8). Based on results of mark-recapture studies, the expansion factors for the Blossom and Keta rivers were revised in 1996 from 1.6 to 2.5 (Pahlke 1997b) and again in 2002 to 4.0 (McPherson et al. 2003). The count for 2003 was multiplied by the expansion factor of 4.0 to produce a total escapement estimate of 812 large fish. Angling was used to sample age, sex and length data and 37 samples were collected in 2003 (Appendix A4B, A5B).

Keta River

In 2003, 322 Chinook salmon were counted in the Keta River, down from 411 counted in 2002 (Table 14) and within the 1996 revised index goal range of 250 to 500 large fish (McPherson and Carlile 1997). Prior to 1990, counts of Chinook salmon in the Keta River increased steadily since implementation of the 1980 rebuilding program, and had exceeded the escapement goal range every year since 1981 (Figure 9). Based on results of mark-recapture studies in 1998–2000, the expansion factor for the Keta River was revised in 2001 from 2.5 to 3.0 (Freeman et al. 2001). The peak count for 2003 was multiplied by a survey expansion factor of 3 to produce a total escapement estimate of 966 large fish.

Angling was used to collect 174 age, sex and length samples from live fish (Appendix A4A, A5A).

Table 8.–Klukshu River weir counts of large Chinook salmon, mark-recapture estimates of escapement to Alsek River, percent of escapement observed at weir, and expansion factor (π).

Year	Counts	M-R	SE	% Observed	π
1998	1,184	4,621	1,430	25.6	3.9
1999	1,663	11,597	2,886	14.3	7.0
2000	1,218	8,295	1,597	14.7	6.8
2001	1,538	11,022	1,336	14.0	7.2
2002	2,067	8,504	623	24.3	4.1
2003	1,313	4,932	525	26.6	3.8
Ave.	1,497	8,162	1,399	19.9	5.5

From Pahlke and Waugh, 2004.

KING SALMON RIVER

Two helicopter surveys and two foot surveys were conducted on King Salmon River in 2003. The peak count during the helicopter surveys by the primary observer was 48 large Chinook salmon while 78 were counted during the foot survey. This was down from the 102 fish counted during foot surveys in 2002. (Table 15; Figure 10). The escapement goal was revised in 1997 to a range of 120 to 240 total large fish, (McPherson and Clark 2001). The resulting index goal range is 80–160 large fish observed. Counts exceeded the lower bound of the index goal range since 1993 but the 2003 count fell just below the range. The peak count of 78 was multiplied by the survey expansion factor of 1.5 to produce a total escapement estimate of 117 large fish to the system. Angling gear was used to collect age, sex and length data from 69 Chinook salmon in 2003 (Appendix A4G, A5G).

Situk River

The count of all Chinook salmon through the Situk River weir in 2003 was 3,278 fish (2,615 large). The estimate of sport harvest above the weir is 498 large fish. The escapement estimate of large fish (3-5 ocean age) as determined by analysis of length and age samples was 2,117 (Table 16; McPherson et al. 2003). Escapements have met or exceeded the escapement goal range of 450–1,050 large spawners (730 point) each year since 1984 (Figure 11). The proportion of the recreational harvest that is caught above the weir varies from year to year and is estimated by the local management biologists and from the statewide harvest survey (ADF&G 1998). The escapement counts from the base period all exceeded the revised escapement goal, indicating the Situk Chinook salmon stock was not depressed and never needed rebuilding.

Age, sex and length data was collected from 247 live fish sampled at the weir (Appendix A4K, A5K).

Chilkat River

The 2003 escapement to the Chilkat River was estimated by mark-recapture experiment to be 5,657 large Chinook salmon (SE = 690), a 32% increase over the escapement estimated in 2002 and above the 10 year average of 4,463 (Ericksen and McPherson 2004; Appendix A2).

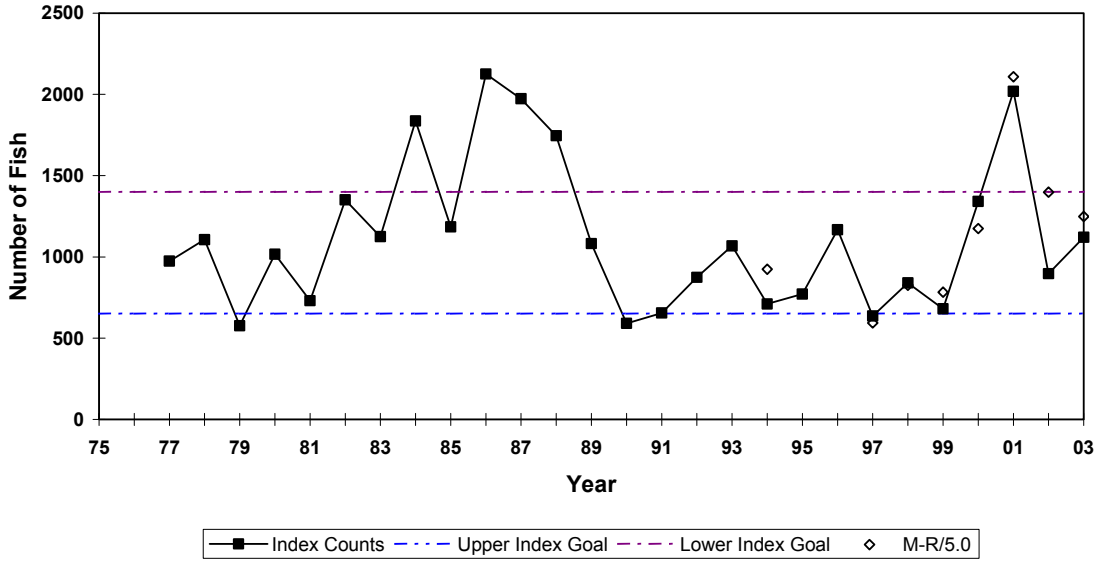

Figure 6.–Counts of large Chinook salmon in index areas of the Unuk River, 1975–2003, and mark-recapture estimates divided by expansion factor (5.0). Lines show upper and lower limits of index escapement goal range.

Table 9.–Peak escapement counts of Chinook salmon to index areas of the Unuk River, 1960–2003.

Year[a]	Cripple Creek		Genes Lake Creek		Eulachon Creek		Clear Creek		Lake Creek		Kerr Creek		Total
1960	–[b]		–		250	(A)	–		–		–		250
1961	3	(F)	200	(F)	270	(F)	65	(F)	–		53	(F)	591
1962	–		150	(A)	145	(A)	100	(A)	30	(A)	–		425
1963	100	(A)	750	(A)	150	(A)	25	(A)	–		–		1,025
1964	–		–		25	(A)	–		–		–		25
1965	–		–		–		–		–		–		0
1966	–		–		–		–		–		–		0
1967	–		–		60	(H)	–		–		–		60
1968	–		–		75	(H)	–		–		–		75
1969	–		–		150	(H)	–		–		–		150
1970	–		–		–		–		–		–		0
1971	–		–		30	(A)	–		–		–		30
1972	95	(A)	35	(A)	450	(A)	90	(A)	55	(A)	–		725
1973	–		–		64	(H)	–		–		–		64
1974	–		–		68	(H)	–		–		–		68
1975	–		–		17	(H)	–		–		–		17
1976	–[c]		–		3	(A)	–		–		–		3
1977	529[c]	(F)	339	(F)	57	(H)	34	(H)			15	(H)	974
1978	394[c]	(F)	374	(F)	218	(H)	85	(H)	20	(H)	15	(H)	1,106
1979	363	(F)	101	(F)	48	(H)	14	(H)	30	(H)	20	(H)	576
1980	748	(F)	122	(F)	95	(H)	28	(H)	5	(H)	18	(H)	1,016
1981	324	(F)	112	(F)	196	(H)	54	(H)	20	(H)	25	(H)	731
1982	538	(F)	329	(F)	384	(H)	24	(H)	48	(H)	28	(H)	1,351
1983	459	(F)	338	(F)	288	(H)	24	(H)	12	(H)	4	(H)	1,125
1984	644	(F)	647	(F)	350	(H)	113	(H)	32	(H)	51	(H)	1,837
1985	284	(F)	553	(F)	275	(H)	37	(H)	22	(H)	13	(H)	1,184
1986	532	(F)	838	(F)	486	(H)	183	(F)	25	(H)	62	(H)	2,126
1987	860	(F)	398	(F)	520	(H)	107	(H)	37	(H)	51	(H)	1,973
1988	1,068	(F)	154	(F)	146	(F)	292	(H)	60	(H)	26	(H)	1,746
1989	351	(F)	302	(F)	298	(H)	128	(H)	27	(F)	43	(H)	1,149
1990	86	(F)	284	(F)	81	(H)	103	(F)	26	(F)	11	(H)	591
1991	358	(W/F)	123	(F)	43	(H)	96	(F)	23	(F)	12	(H)	655[d]
1992	327	(W/F)	360	(F)	57	(F)	69	(F)	31	(H)	30	(H)	874[d]
1993	448	N(F)	330	N(F)	132	E(F)	137	N(F)	8	N(F)	13	P(H)	1,068
1994	161	P(F)	300	N(F)	52	N(H)	128	E(F)	18	N(F)	52	N(F)	711
1995	211	N(F)	347	N(F)	74	N(H)	66	E(H)	35	E(H)	39	N(H)	772
1996	417	N(F)	400	N(F)	79	N(F)	148	E(F)	25	E(H)	98	E(F)	1,167
1997	244	P(F)	154	N(F/H)	53	N(F)	113	N(F)	13	N(H)	59	E(F)	636
1998	311	N(F)	283	N(F)	39	N(H)	81	N(F)	22	N(F)	104	N(F)	840
1999	202	N(F)	307	N(F)	54	N(H)	67	N(F)	9	N(F)	41	N(F)	680
2000	450	N(F)	565	N(F)	116	N(H)	86	N(H)	56	E(H)	68	N(H)	1,341
2001	701	N(F)	806	N(F/H)	217	E(H)	167	N(H)	84	N(H)	44	P(H)	2,019
2002	156	P(F)	455	N(F/H)	78	N(H)	87	N(H)	61	N(H)	60	E(F)	897
93-02 Avg	330		395		89		108		33		58		1,013
2003	232	P(F)	448	N(F)	95	N(H)	198	E(F)	68	E(F)	80	N(F)	1,121

[a] Counts prior to 1975 may not be comparable due to differences in survey dates and counting methods.

[b] — = no survey conducted or data not comparable; (F) = escapement survey conducted by walking river; (A) = escapement survey conducted from fixed-wing aircraft; (H) = escapement survey conducted from helicopter; (W/F) = weir and foot count; N = survey conditions normal; E = excellent; P = poor.

[c] Not including 35 fish for egg take in 1976; 132 in 1977; 85 in 1978.

[d] Cripple Cr. weir count reduced by /0.625 to be comparable with foot surveys.

Table 10.–Distribution of spawning Chinook salmon among index areas of the Unuk River for years when all index areas were surveyed.

Year	Cripple Creek	%	Genes Lake Creek	%	Eulachon Creek	%	Clear Creek	%	Lake Creek	%	Kerr Creek	%	Total
1978	394	36	374	34	218	20	85	8	20	2	15	1	1,106
1979	363	63	101	18	48	8	14	2	30	5	20	3	576
1980	748	74	122	12	95	9	28	3	5	0	18	2	1,016
1981	324	44	112	15	196	27	54	7	20	3	25	3	731
1982	538	40	329	24	384	28	24	2	48	4	28	2	1,351
1983	459	41	338	30	288	26	24	2	12	1	4	0	1,125
1984	644	35	647	35	350	19	113	6	32	2	51	3	1,837
1985	284	24	553	47	275	23	37	3	22	2	13	1	1,184
1986	532	25	838	39	486	23	183	9	25	1	62	3	2,126
1987	860	44	398	20	520	26	107	5	37	2	51	3	1,973
1988	1,068	61	154	9	146	8	292	17	60	3	26	1	1,746
1989	351	31	302	26	298	26	128	11	27	2	43	4	1,149
1990	86	15	284	48	81	14	103	17	26	4	11	2	591
1991	358	55	123	19	43	7	96	15	23	4	12	2	655
1992	327	37	360	41	57	7	69	8	31	4	30	3	874
1993	448	42	330	31	132	12	137	13	8	0	13	1	1,068
1994	161	23	300	42	52	7	128	18	18	3	52	7	711
1995	211	27	347	45	74	10	66	9	35	5	39	5	772
1996	417	36	400	34	79	7	148	13	25	2	98	8	1,167
1997	244	38	154	24	53	8	113	18	13	2	59	9	636
1998	311	37	283	34	39	5	81	10	22	3	104	12	840
1999	202	30	307	45	54	8	67	10	9	1	41	6	680
2000	450	34	565	42	116	9	86	6	56	4	68	5	1,341
2001	701	35	806	40	217	11	167	8	84	4	44	2	2,019
2002	156	17	455	51	78	9	87	10	61	7	60	7	897
Avg.	425	38	359	32	175	14	97	9	30	3	39	4	1,127
2003	232	21	448	40	95	8	198	18	68	6	80	7	1,121

The escapement goal was reviewed in 2002 and revised slightly to a range of 1,750 to 3,500 large fish (Ericksen and McPherson 2004). The mark-recapture experiment also provided age, sex, and size data from 352 fish captured with nets and spears on the spawning grounds (Appendix A4I, A5I).

Table 11.–Index counts of Unuk River Chinook salmon, mark-recapture estimates of escapement, percent of escapement observed, and expansion factor (π).

Year	Counts	M-R	SE	% Observed	π
1997	636	2,970	277	21.4	4.7
1998	840	4,132	413	20.3	4.9
1999	680	3,914	490	17.4	5.8
2000	1,341	5,872	644	22.8	4.4
2001	2,019	10,541	1,181	19.1	5.2
Ave.	1,069	5,736	635	18.5	5.0
2002[a]	897	6,988	805	12.8	7.8
2003	1,121	5,546	433	20.2	4.9

[a] 2002 not included due to poor survey conditions.

(From Weller and McPherson, 2004).

Other Systems

Counts of Chinook salmon in the Marten and Wilson rivers are not included in the regional index program, and no official escapement goals have been set for these systems. However, periodic counts have been made in the two rivers since 1982 because of their proximity to other surveyed systems. Grant and Klahini rivers are small Chinook systems near the Unuk River in Behm Canal which have been surveyed sporadically. Since 1995 occasional surveys have been flown on the Harding River and Aaron Creek to determine the feasibility of adding these medium and small systems to the program. In 2003, no surveys were conducted on any of these

systems. (Table 7; 14). The remaining systems are too remote, and funds are not currently available for these surveys. However, several are routinely surveyed by the local management biologists and in 2003, 95 Chinook were counted in the East Fork of the Bradfield River (Table 6)

OBSERVER TRAINING

Calibration surveys were conducted on 15 different index areas in 2003. On mainland systems without pink or chum salmon, the agreement of individual primary and alternate observers' counts were extremely variable with differences in individual counts varying from 0% to 40%. However, the average difference across count was only 7% (Table 17). In the two surveys conducted on coastal systems with pink and chum salmon present, survey conditions were less than optimum and the average observer agreement was only 72%.

DISCUSSION

The utility of the index method as a measure of escapement is based on the assumption that the number of fish counted in an index area is a constant proportion of the escapement in the index area or watershed. Therefore, a change in the escapement is assumed to cause a proportional change in the index count. Consequently, if this assumption holds, even though index counts are not estimates of total escapement, multi-year trends in escapement are correct. Two types of error affect the accuracy of the survey counts.

First, factors intrinsic to each area interfere with the ability to count fish. Examples include heavily shaded areas or topography that prevent close approach with a helicopter, presence of other species that could be confused with Chinook salmon, and overhanging brush, or deep or occluded water. Also, not all spawning areas in a tributary or drainage are surveyed. These factors are accounted for by survey expansion factors.

Second, factors that affect counting efficiency may vary greatly from year to year and survey to survey. These include annual changes in migratory timing; changes in the distribution of spawners among the tributaries of a watershed among years; and inclement weather, turbidity events, or changes in pilot and/or observer experience. Also, the proportion of fish counted in an index area may vary with the number of fish in the index area, e.g. a lower proportion of fish may be counted when abundance is extremely high.

Weather, logistics, run timing, etc., can make it difficult for a single surveyor to complete all the index surveys annually under good or excellent conditions. Thus, alternate surveyors are selected to conduct the counts when the primary surveyor can not. Also, new surveyors take on primary responsibilities at infrequent intervals. Since between observer variability and bias can be significant (Jones III et al. 1998b), new surveyors must be trained and calibrated against the primary surveyor to provide consistency and continuity in the data.

Estimates of total escapement (direct estimates or expanded counts) are needed when comparing escapements among watersheds or for estimating exploitation rates and spawner/recruit relationships. Though survey and tributary expansion factors have been endorsed by the PSC since 1981, the original expansion factors were developed on the basis of judgment rather than on empirical data (Appendix B in Pahlke 1997b), and error associated with these expansions can be large. Johnson et al. (1992) showed that expansion factors for the Chilkat River, for example, greatly underestimated escapement to that watershed. ADF&G recognized the need to develop better expansions throughout the region, and has independently estimated distribution and escapement for Chinook salmon in the Unuk (Pahlke et al. 1996; Jones III and McPherson 1999, 2000), Chickamin (Pahlke 1996a, 1997a), Stikine (Pahlke and Etherton 1999; Bernard et al. 2000), Taku (Pahlke and Bernard 1996, McPherson et al. 1998a, 2005a *In prep*.), Keta (Brownlee et al. 1999) and Alsek rivers (Pahlke et al. 1999). Total escapement projects are continuing on many of those rivers.

On the basis of information collected on the Unuk and Chickamin rivers, expansion factors for the four Behm Canal systems were revised in 1996 and again in 2002. After three mark-recapture experiments the expansion factor for the Keta River was revised again in 2001. The

Table 12.–Counts of Chinook salmon in index areas of the Chickamin River, 1960–2003.

Year[a]	South Fork Creek		Barrier Creek		Butler Creek		Leduc Creek		Indian Creek		Humpy Creek		King Creek		Clear Falls Creek		Total[c]
1960	–[b]		–		–		–		–		3	(A)	–		–		3
1961	–		36	(A)	77	(A)	42	(A)	5	(A)	120	(A)	48	(A)	–		328
1962	400	(A)	35	(A)	–		–		–		150	(A)	–		–		585
1963	350	(A)	115	(A)	–		–		–		3	(A)	200	(A)	–		668
1964	–		–		–		–		–		–		–		–		–
1965	–		–		–		–		–		–		75	(A)	–		75
1966	–		–		–		–		–		50	(F)	–		–		50
1967	–		–		–		–		–		-		45	(H)	–		45
1968	–		–		–		–		–		30	(H)	20	(H)	–		50
1969	–		–		–		–		–		10	(H)	45	(H)	–		55
1970	–		–		–		–		–		–		–		–		–
1971	–		–		–		–		–		–		–		–		–
1972	350	(A)	25	(A)	–		85	(A)	–		65	(A)	510	(A)	–		1,035
1973	–		–		–		–		–		14	(A)	65	(A)	–		79
1974	144	(H)	–		–		–		–		–		11	(H)	–		155
1975	141	(H)	9	(H)	66	(H)	6	(H)	90	(H)	7	(H)	30	(H)	–		370
1976	46	(H)	10	(H)	15	(H)	12	(H)	9	(H)	–		–		–		157
1977	52	(H)	66	(H)	30	(H)	26	(H)	53	(H)	0	(H)	–		–		363
1978	21	(H)	94	(H)	4	(H)	42	(H)	20	(H)	–		–		–		308
1979	63	(H)	17	(H)	29	(H)	0	(H)	31	(H)	–		–		–		239
1980	56	(H)	62	(H)	104	(H)	17	(H)	22	(H)	–		–		–		445
1981	51	(H)	105	(H)	51	(H)	25	(H)	12	(H)	4	(F)	105	(F)	31	(H)	384
1982	84	(H)	149	(H)	37	(H)	36	(H)	30	(F)	37	(F)	165	(F)	33	(H)	571
1983	28	(H)	138	(H)	91	(H)	30	(H)	47	(H)	–		212	(F)	30	(H)	599
1984	185	(H)	171	(H)	124	(H)	15	(H)	103	(H)	88	(F)	388	(F)	28	(H)	1,102
1985	163	(H)	129	(H)	92	(H)	8	(H)	125	(H)	50	(H)	377	(H)	12	(H)	956
1986	562	(H)	168	(H)	203	(H)	20	(H)	120	(H)	–		564	(H)	40	(H)	1,745
1987	261	(H)	76	(H)	120	(H)	19	(H)	115	(H)	26	(H)	310	(H)	48	(H)	975
1988	280	(H/F)	82	(H/F)	159	(H)	25	(H/F)	32	(H)	19	(H/F)	164	(H)	25	(H/F)	786
1989	226	(H/F)	90	(H)	137	(H)	57	(H)	84	(H)	22	(H/F)	224	(H)	94	(H)	934
1990	135	(F)	107	(H)	27	(H)	20	(H)	24	(H)	35	(H)	163	(H)	53	(H)	564
1991	125	(H)	18	(H)	49	(H)	14	(H)	38	(H)	13	(H)	185	(H)	45	(H)	487
1992	87	(H)	4	(H)	68	(H)	4	(H)	20	(H)	8	(H)	131	(H)	24	(H)	346
1993	67	N(H)	46	E(H)	68	N(H)	11	N(H)	29	N(H)	13	N(H)	80	N(H)	75	N(H)	389
1994	31	N(H)	29	E(H)	64	E(H)	18	E(H)	16	N(H)	44	N(H)	129	E(H)	57	E(H)	388
1995	87	E(H)	12	E(F)	59	E(F)	60	E(H)	36	N(F)	13	N(F)	62	N(H)	27	E(H)	356[d]
1996	72	N(H)	13	N(F)	74	E(H)	23	E(H)	48	N(F)	30	N(F)	106	E(F)	56	E(H)	422[d]
1997	28	P(H)	10	N(H)	43	N(H)	7	N(H)	24	N(H)	15	N(H)	95	N(H)	50	N(H)	272
1998	46	N(H)	0	N(H)	124	E(H)	16	P(H)	46	N(H)	28	N(H)	123	N(H)	8	P(H)	391
1999	54	N(H)	18	N(H)	106	N(H)	33	N(H)	52	N(F)	16	N(F)	200	N(H)	22	N(H)	501
2000	109	N(H)	27	N(H)	230	E(H)	61	N(H)	63	N(H)	20	N(H)	251	N(H)	40	P(H)	801
2001	264	E(H)	27	N(H)	270	E(H)	59	N(H)	61	N(H)	78	N(F)	221	N(H)	30	N(H)	1,010[d]
2002	329	N(H)	20	N(H)	102	N(H)	23	N(H)	146	E(H)	9	P(H)	361	E(H)	23	N(H)	1,013
93-02 Avg.	109		20		114		31		52		27		163		39		554
2003	183	E(H)	13	N(H)	172	N(H)	37	E(H)	21	N(H)	119	E(H)	363	N(H)	56	N(H)	964

[a] Escapement counts conducted prior to 1975 may not be comparable due to differences in survey dates and counting methods.

[b] — = no survey conducted or data not comparable; (A) = escapement surveyed by fixed-wing aircraft; (F) = escapement surveyed by walking stream; (H) = escapement surveyed by helicopter; (H/F) = escapement surveyed by combination of walking and helicopter; N = survey conditions normal; E = excellent.

[c] Totals for 1975–1980, 1983 and 1986 expanded for unsurveyed index areas by 1981–1992 average %.

[d] Mark-recapture estimates of escapement: 1995 = 2,309 large fish (SE 723); 1996 = 1,587 (SE 199); 2001= 5,177 (SE 1,025); 2002= 5,007 large fish (SE 780).

Table 13.–Distribution of spawning Chinook salmon among index areas of the Chickamin River for years when all index areas were surveyed.

Year	South Fork Creek	%	Barrier Creek	%	Butler Creek	%	Leduc Creek	%	Indian Creek	%	Humpy Creek	%	King Creek	%	Clear Falls Creek	%	Total
1981	51	13	105	27	51	13	25	7	12	3	4	1	105	27	31	8	384
1982	84	15	149	26	37	6	36	6	30	5	37	6	165	29	33	6	571
1984	185	17	171	16	124	11	15	1	103	9	88	8	388	35	28	3	1,102
1985	136	14	156	16	93	10	8	0	125	13	50	5	377	39	12	1	957
1987	261	27	76	8	120	12	19	2	115	12	26	3	310	32	48	5	975
1988	280	36	82	10	159	20	25	3	32	4	19	2	164	21	25	3	786
1989	226	24	90	10	137	15	57	6	84	9	22	2	224	24	94	10	934
1990	135	24	107	19	27	5	20	4	24	4	35	6	163	29	53	9	564
1991	125	26	18	4	49	10	14	3	38	8	13	3	185	38	45	9	487
1992	87	25	4	1	68	20	4	1	20	6	8	2	131	38	24	7	346
1993	67	17	46	12	68	17	11	3	29	7	13	3	80	21	75	19	389
1994	31	8	29	7	64	16	18	5	16	4	44	11	129	33	57	15	388
1995	87	24	12	3	59	17	60	17	36	10	13	4	62	17	27	8	356
1996	72	17	13	3	74	18	23	5	48	11	30	7	106	25	56	13	422
1997	28	10	10	4	43	16	7	3	24	9	15	6	95	35	50	18	272
1998	46	12	0	0	124	32	16	4	46	12	28	7	123	31	8	2	391
1999	54	11	18	4	106	21	33	7	52	10	16	3	200	40	22	4	501
2000	109	14	27	3	230	29	61	8	63	8	20	2	251	31	40	5	801
2001	264	26	27	3	270	27	59	6	61	6	78	8	221	22	30	3	1,010
2002	329	32	20	2	102	10	23	2	146	14	9	1	361	36	23	2	1,013
Avg.	148	22	67	10	105	15	27	4	58	8	28	4	210	31	39	6	682
2003	183	19	13	1	172	18	37	4	21	2	119	12	363	38	56	6	964

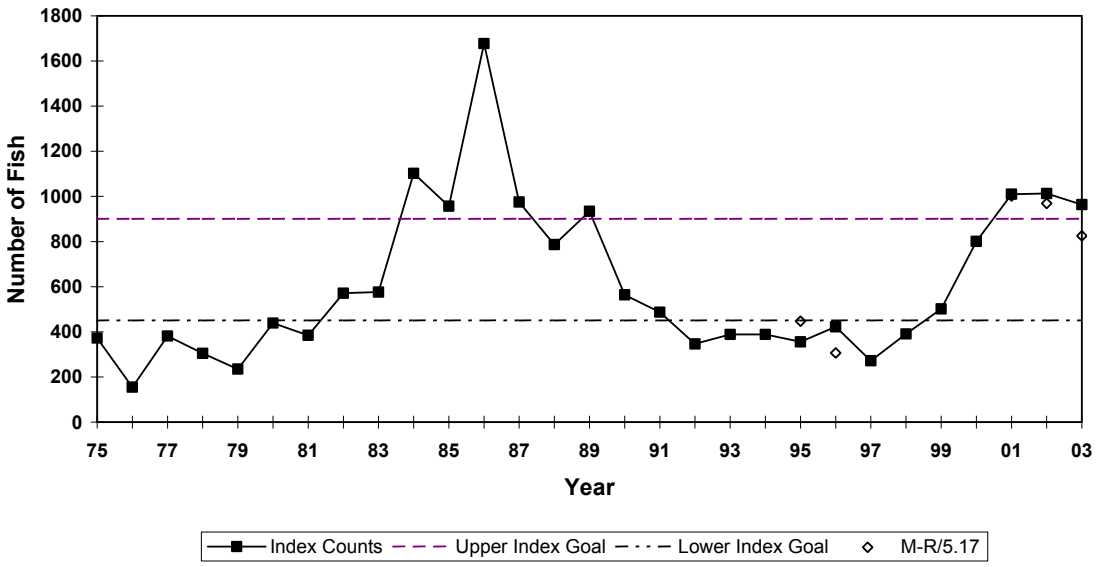

Figure 7.–Counts of Chinook salmon in index areas of the Chickamin River, 1975–2003 and mark-recapture estimates divided by expansion factor (5.17). Lines show upper and lower limits of index escapement goal range.

Table 14.–Counts of Chinook salmon for selected rivers in Behm Canal, 1961–2003.

Year[a]	Keta River		Blossom River		Wilson River		Marten River		Grant River		Klahini River		Total
1961	44	(F)	68	(F)	–		22	(F)	40	(A)	-		174
1962	–		–		–		–		6	(A)	100	(A)	106
1963	–		450	(A)	375	(A)	–		15	(A)	–		840
1964	–		–		–		–		–		–		–
1965	–		–		50	(A)	43	(H)	–		–		93
1966	75	(A)	200	(A)	60	(A)	10	(A)	100	(A)	3	(A)	448
1967	86	(H)	–		8	(H)	7	(H)	15	(H)	–		116
1968	–		–		–		–		4	(H)	–		4
1969	200	(A)	–		10	(A)	10	(A)	69	(H)	3	(H)	292
1970	–		100	(H)	–		–		–		–		100
1971	–				–		–		–		–		–
1972	255	(A)	225	(A)	275	(A)	–		25	(A)	150	(A)	930
1973	–		–		30	(A)	–		38	(A)	7	(H)	75
1974	25	(H)	166	(H)	–		–		–		–		191
1975	203	(H)	146	(H)	7	(H)	15	(H)	–		–		371
1976	84	(H)	68	(H)	–		–		–		–		152
1977	230	(H)	112	(H)	–		–		–		–		342
1978	392	(H)	143	(H)	–		2	(A)	–		–		537
1979	426	(H)	54	(H)	36	(H)	–		–		–		516
1980	192	(H)	89	(H)	–		–		–		–		281
1981	329	(H)	159	(H)	76	(F)	–		25	(H)	42	(F)	631
1982	754	(H)	345	(H)	300	(B)	75	(F)	33	(F)	79	(F)	1,586
1983	822	(H)	589	(H)	178	(B)	138	(B)	8	(A)	10	(H)	1,745
1984	610	(H)	508	(H)	133	(F)	12	(B)	124	(F)	54	(F)	1,441
1985	624	(H)	709	(H)	420	(H)	69	(F)	55	(F)	20	(F)	1,897
1986	690	(H)	1,278	(H)	–		–		–		–		1,968
1987	768	(H)	1,349	(H)	–		270	(H)	33	(A)			2,420
1988	575	(H)	384	(H)	–		543	(H)	–		40	(H)	1,542
1989	1,155	(H)	344	(H)	–		133	(H)	–		–		1,632
1990	606	(H)	257	(H)	–		283	(H)	–		–		1,146
1991	272	N(H)	239	N(H)	–		135	N(H)	–		–		646
1992	217	N(H)	150	N(H)	109	E(H)	76	(H)	25	N(H)	19	(H)	596
1993	362	E(H)	303	N(H)	63	P(H)	229	E(H)	–		–		957
1994	306	E(H)	161	N(H)	–		178	E(H)	–		–		645
1995	175	E(H)	217	N(H)	58	N(H)	171	E(H)	–		–		621
1996	297	N(H)	220	E(H)	23	P(H)	62	N(H)	–		–		602
1997	246	N(H)	132	N(H)	16	N(H)	56	N(H)	9	N(H)	–		459
1998	180	N(H)	91	N(H)	–		–		–		–		271
1999	276	E(H)	212	N(H)	–		–		–		–		488
2000	300	N(H)	231	N(H)	–		–		–		–		531
2001	343	E(H)	204	N(H)	79	E(H)	–		–		83	E(H)	626
2002	411	E(H)	224	E(H)	–		–		–		–		635
1993-02 avg.	290		200		48		139		9		83		584
2003	322	N(H)	203	E(H)	–		–		–		–		525

[a] Escapement counts prior to 1975 may not be comparable due to differences in survey dates or methods.

Survey types: F = foot, A = airplane, H = helicopter, – = no survey. Conditions: P = poor, N = normal, E = excellent.

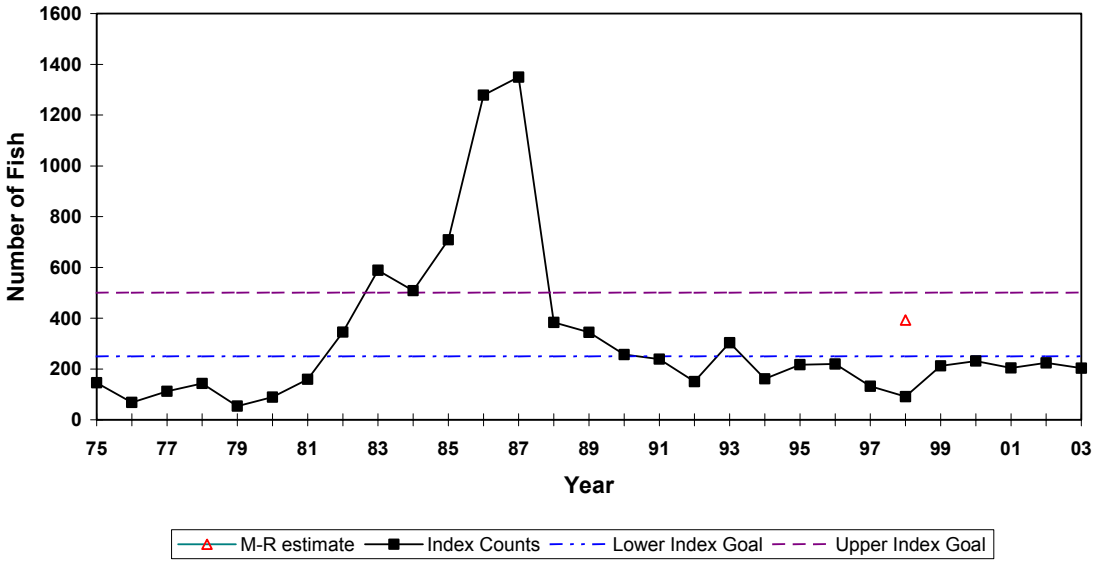

Figure 8.–Counts of Chinook salmon into the Blossom River, 1975–2003. Lines show upper and lower limits of index escapement goal range.

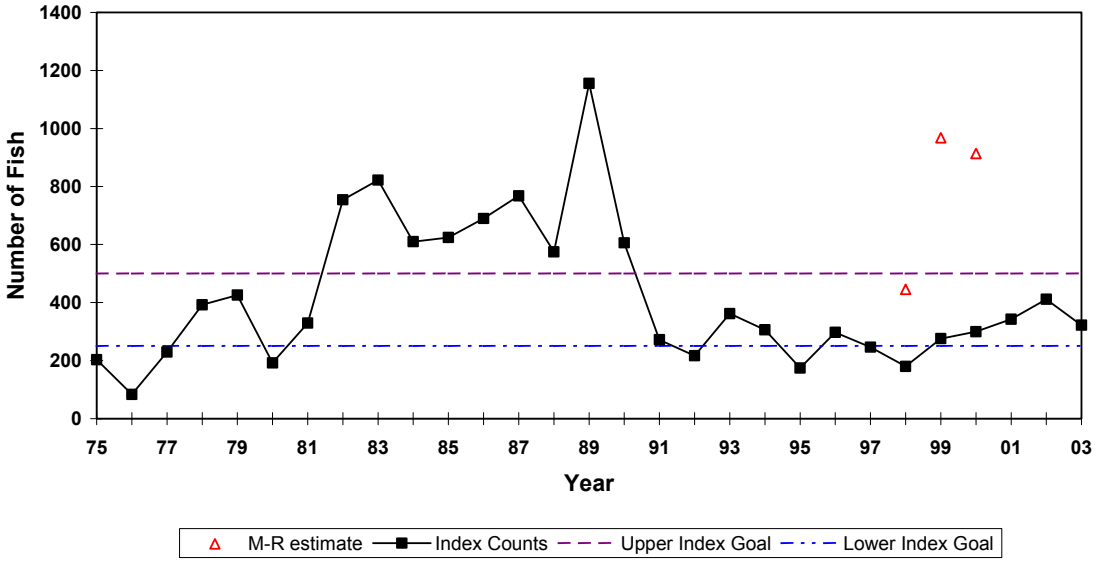

Figure 9.–Counts of Chinook salmon to the Keta River, 1975–2003 and mark-recapture estimates for 1998–2000. Lines show upper and lower limits of index escapement goal range.

Table 15.–Peak escapement counts and weir counts of spawning Chinook salmon in the King Salmon River, 1971–2003.

	Survey count			Survey as percent of weir count	Total egg take (adults)	Total weir count (adults)	Total weir count (jacks)[b]	Adults below weir (foot ct)	Total inriver (adults)	Total natural spawning
	Below weir	Above weir								
Year	A	B		B/(D-C)	C	D	E	F	D+F	D+F-C
1971	–	94	(F)	–	–	–	–	–	–	
1972	–	90	(F)	–	–	–	–	–	–	
1973	–	211	(F)	–	–	–	–	–	–	
1974	–	104	(F)	–	–	–	–	–	–	
1975	–	42	(H)	–	–	–	–	–	–	
1976	–	65	(H)	–	–	–	–	–	–	
1977	–	134	(H)	–	–	–	–	–	–	
1978	–	57	(H)	–	–	–	–	–	–	
1979	–	88	(H)	–	17	–	–	–	–	
1980	–	70	(H)	–	–	–	–	–	–	
1981	–	101	(H)	–	11	–	–	–	101	90
1982	–	259	(H)	–	30	–	–	–	259	229
1983	25	183	(H)	85%	37	252	20	30	282	245[c]
1984	14	184	(H)	71%	46	299	82	12	311	265[c]
1985	12	105	(H)	64%	29	194	45	10	204	175[c]
1986	9	190	(H)	80%	26	264	72	17	281	255[c]
1987	19	128	(H)	73%	31	207	62	20	227	196[c]
1988	5	94	(H)	50%[d]	35	231	54	12	243	208[c]
1989	34	133	(H)	63%	38[e]	249	71	29	278	240[c]
1990	34	98	(H)	57%	29	190	32	8	198	179[c]
1991	6	91	(H)	72%	20	146	89	8	154	134[c]
1992	–	58	(H)	59%[f]	18	47	16	70	117	99[c]
1993	–	175	E(H)	----------no weir or egg take----------						
1994	–	140	N(F)	----------no weir or egg take----------						
1995	–	97	P(H)	----------no weir or egg take----------						
1996	–	192	E(F)	----------no weir or egg take----------						
1997		238	N(F)	----------no weir or egg take----------						
1998		88	E(F)	----------no weir or egg take----------						
1999		200	E(F)	----------no weir or egg take----------						
2000		91	N(F)	----------no weir or egg take----------						
2001		98	N(F)	----------no weir or egg take----------						
2002		102	N(F)	----------no weir or egg take----------						
1983–92 Avg.	17	126		67%	31	209	56	22	231	188
2003		78	N(F)	----------no weir or egg take----------						

[a] — = no survey conducted or data not comparable; (F) = escapement surveyed by walking stream; (H) = escapement surveyed from helicopter; N = survey conditions normal; E = excellent; P = poor.

[b] Minimum count as jacks could pass through weir.

[c] Natural spawning (adults) = (total inriver - egg take; 1983–1992).

[d] Four females and two males were held but not spawned for egg take; % = 94/(231-37-6) = 50%.

[e] Includes holding mortality of 4 males and 6 females for egg take.

[f] Peak survey was after weir was removed 58/99 = 59%.

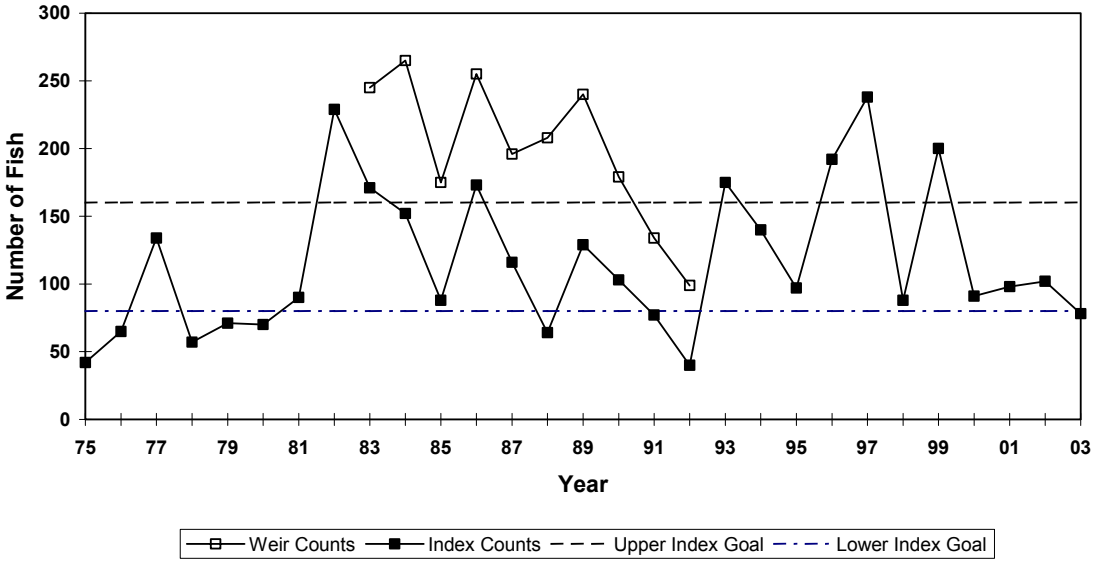

Figure 10.–Counts of Chinook salmon at a weir and in survey counts in the index area of the King Salmon River, 1975–2003. Lines show upper and lower limits of index escapement goal range.

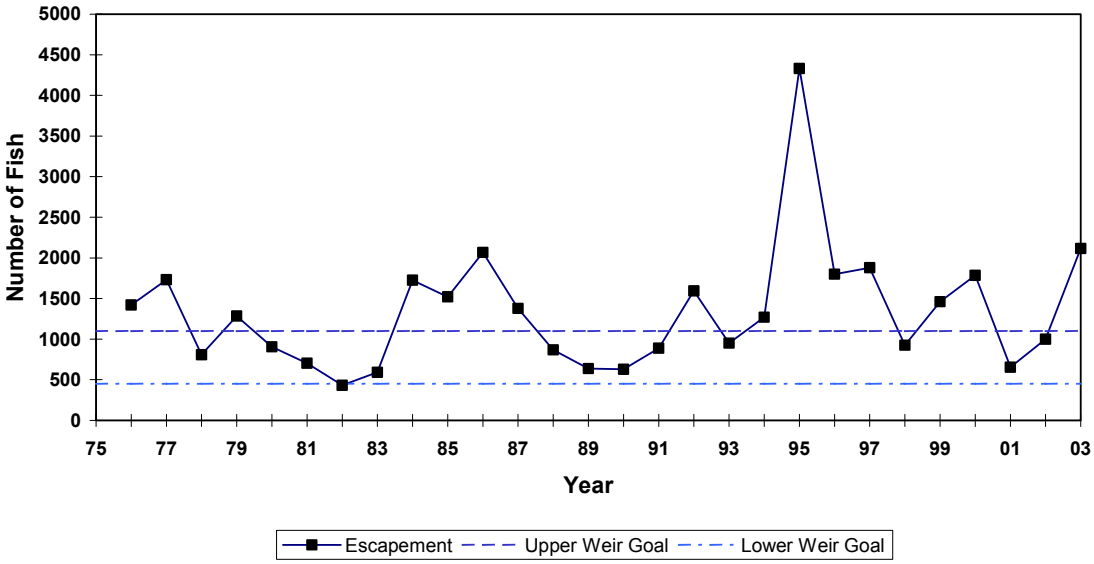

Figure 11.–Counts of large Chinook salmon at the Situk River weir, 1975–2003. Lines show upper and lower limits of escapement goal range.

Table 16.–Estimated harvests and escapement, by size class, of Situk River Chinook salmon, 1976–2003.

	Harvests Below Weir				Weir Count				Harvest Above Weir				Estimated Escapement[c]			
Year	182-70 Gillnet	Subsistence	Sport	Total	small	medium	large	Total	small	medium	large	Total	small[a]	medium	large	Total
1976	1,002	41	200	1,243		520	1,421	1,941						520	1,421	1,941
1977	833	24	244	1,101		148	1,732	1,880						148	1,732	1,880
1978	382	50	210	642		295	808	1,103						295	808	1,103
1979	1,028	25	282	1,335		470	1,284	1,754						470	1,284	1,754
1980	969	57	233	1,259		220	905	1,125						220	905	1,125
1981	858	62	130	1,050		105	702	807						105	702	807
1982	248	27	63	338		177	434	611						177	434	611
1983	349	50	52	451		257	592	849						257	592	849
1984	512	89	151	752		475	1,726	2,201						475	1,726	2,201
1985	484	156	511	1,151		461	1,521	1,982						461	1,521	1,982
1986	202	99	37	338		505	2,067	2,572						505	2,067	2,572
1987	891	24	395	1,310		505	1,379	1,884						505	1,379	1,884
1988	299	90	132	521		193	885	1,078		39	17	56		154	868	1,022
1989	1	496[a]	0	497	972	243	637	1,852		0	0	0	991	243	637	1,871
1990	0	516	0	516	147	499	628	1,274		0	0	0	236	499	628	1,363
1991	786	220	67	1,073	584	132	897	1,613	2	19	8	29	582	114	889	1,585
1992	1,504	341	127	1,972	131	236	1,618	1,985	3	28	23	54	129	207	1,595	1,931
1993	790	202	50	1,042	2,730	490	980	4,200	92	13	28	133	2,638	477	952	4,067
1994	2,656	367	397	3,420	1,634	1,471	1,311	4,416	50	80	40	170	1,584	1,391	1,271	4,246
1995	8,106	528	1,180	9,814	2,914	617	4,700	8,231	84	52	370	506	2,830	565	4,330	7,725
1996	3,717	478	1,270	5,465	1,374	602	2,175	4,151	568	107	375	1,050	1,061	495	1,800	3,356
1997	2,339	352	802	3,493	1,729	582	2,690	5,001	467	148	812	1,427	1,521	434	1,878	3,833
1998	2,101	594	494	3,189	3,125	851	1,353	5,329	405	206	429	1,040	2,902	645	924	4,471
1999	3,810	588	605	5,003	473	301	1,947	2,721	150	112	486	748	396	189	1,461	2,046
2000	1,318	594	352	2,264	413	161	2,518	3,092	211	60	733	1,004	381	101	1,785	2,267
2001	1,087	402	45	1,534	463	102	696	1,261	300	5	40	345	163	97	656	916
2002	1,078	416	63	1,557	300	448	1,024	1,772	18	24	24	66	282	424	1,000	1,706
93-02	2,700	452	526	3,678	1,516	563	1,939	4,017	235	81	334	649	1,376	482	1,606	3,463
2003	2,342	600	414	3,356	334	329	2,615	3,278	108	30	498	636	226	299	2,117	2,642

[a] Non-retention regulation in effect for commercial fisheries in 1989 and 1990; estimated personal use harvest of 400 large Chinook in 1990, 415 in 1990, and 109 in 1991.

[b] Small Chinook escapement includes 1- and 2-ocean jacks from 1990 to 1996; 1-ocean fish not counted before 1990.

[c] Escapement from McPherson et al. (2005b), based on age composition.

expansion factor for the King Salmon River was based on 10 years of weir counts compared with aerial surveys, and the expansion factor for Andrew Creek was based on 4 years of paired weir and survey counts. The expansion factor for the Taku River was revised in 1999 after 5 years of mark-recapture data (McPherson et al. 2000). The expansion factor for the Alsek River was revised in 2002 based on 4 years of mark-recapture studies.

Changing the escapement goals, however, requires a formal review by ADF&G and the Chinook Technical Committee of the PSC, as was done for the Situk River in 1991, the Behm Canal systems in 1994, and King Salmon River in 1997. The Andrew Creek escapement goal was also revised in 1998 to a range of 650 to 1,500 total large spawners (Clark et al. 1998). The Canadian Department of Fisheries and Oceans and the Transboundary Technical Committee are included in any review of Taku, Stikine or Alsek River goals. In 1998, a revised stock-recruitment analysis by ADF&G and DFO staff estimated that the escapement goal for the Klukshu River should range between 1,100 and 2,300 spawners (McPherson et al. 1998b). Escapement goals for the Taku and Stikine rivers were approved in 1999 (McPherson et al. 2000; Bernard et al. 2000) and for the Chilkat River in 2003 (Ericksen and McPherson 2004).

Expansion factors and escapement goals will continue to be revised as we complete more studies which include both index counts and estimates of total escapement. Any change in survey methods or observers must take into account the comparability of historical data with new data. Year-to-year consistency and repeatability of index counts may be more important than their absolute accuracy to

agencies that compare escapement estimates between years.

Currently, only one of the 22 minor producers in the region and six of nine medium (seven with Chilkat) producing watersheds are included in the index survey program. Prior to 1997, counts from these streams were expanded to represent the escapement of all streams in minor and medium producing categories. The King Salmon River is unique among Southeast Alaska Chinook populations as the only island system, and using it to represent the other 21 small systems most likely produced inaccurate estimates of total escapement. However, because escapement to small and medium systems are a small proportion of the total region escapement, errors in those estimates would have little effect on estimates of regional escapement. In 1997, the method used to expand the index counts to a total region escapement estimate was revised based on over 20 years of systematic escapement surveys in Southeast Alaska and the transboundary rivers (Pahlke 1998). The revised method assumes the sum of the expanded indices accounts for approximately 90% of the total escapement and that number is expanded to account for the remaining 10%. We think this method more accurately reflects the contribution to region-wide escapement of the unsurveyed systems.

Observer training and calibration flights conducted in 2000 and 2001 indicated a fairly consistent undercounting by the alternate observer when compared with the primary observer counts. Calibration flights conducted in 2003 with the same pair of observers, indicated on average a better agreement.

Escapement goal revisions based on spawner-recruit analysis require a long time series of age and sex composition data along with total escapement estimates. Age, sex, and length composition estimates for all sampled Chinook

Table 17.–Observer calibration flights conducted in 2003.

Index Area	Date	Visibility	Primary Observer	Alternate Observer	P - A	Percent	Comments
Nakina IA1	7/27/03	Normal	701	431	270	61.5%	backseat
Nakina IA2	7/27/03	Normal	68	110	-42	161.8%	backseat
Nakina IA3	7/27/03	Normal	556	675	-119	121.4%	backseat
Nakina IA4	7/27/03	Normal	101	185	-84	183.2%	backseat
Nakina total	7/27/03	Normal	1,426	1,401	25	98.2%	backseat
Nahlin IA1	7/27/03	Normal	196	200	-4	102.0%	backseat
Nahlin IA2	7/27/03	Normal	59	59	0	100.0%	backseat
Nahlin IA3	7/27/03	Normal	606	531	75	87.6%	backseat
Dudidontu R.	7/28/03	Excellent	644	614	30	95.3%	backseat
Tatsamenie IA1	8/19/03	Normal	716	466	250	65.1%	Replicate surveys
Tatsamenie IA2	8/19/03	Normal	284	391	-107	137.7%	Replicate surveys
Kowatua R.	8/19/03	Excellent	850	818	32	96.2%	backseat
Tseta Creek	7/27/03	Normal	436	377	59	86.5%	backseat
Little Tahltan	7/28/03	Normal	1,880	1,820	60	96.8%	Replicate surveys
Systems with Chinook and Sockeye only					Average	106.7%	
					median	97.5%	
King Salmon R.	7/26/03	Normal	48	31	17	64.6%	Replicate surveys
Andrew Cr.	8/7/03	Poor	249	198	51	79.5%	backseat
Systems with Chinook, Chum and Pink salmon					Average	72.1%	
					median	72.1%	

stocks in Southeast Alaska and transboundary rivers are presented in Appendix tables A4-A5. An interesting trend became apparent in 1999, with the largest fish occurring in the southern systems and average size decreasing towards the north. In 2000 and 2001, the largest fish were again seen in the southern systems, but the fish in two of the northern systems, Chilkat and Alsek rivers, were larger than Chinook salmon in the central systems. The trend was similar in 2002, however fish returning to the Taku River and Andrew Creek were the smallest in the region. Taku River Chinook salmon were again the smallest in the region in 2003. Many (up to 75%) of the 2-ocean fish sampled on the Blossom, Keta and Chickamin rivers were of legal size (28" total length; approximately 625mm MEF), which is uncommon in other systems. Mean lengths at age were tested for differences between systems, (Appendix A6).

The age-.2 (2-ocean-age jack) component was higher than in 2002, which may indicate above average survival rates for the 1999 brood year. The 3-ocean-age (1998 brood) class was dominant in most systems in 2003, however age-.4 fish comprised 50% percent of the return to the Chilkat River. The 1999 brood year (age-0.3) continued to dominate the return to the Situk River, as was noted in 2002.

Sampling strategies were designed to make the estimated age and sex distributions relatively unbiased for age-.2 to age-.5 fish. A weir was used to sample the Situk River; stratified mark-recapture studies were used on the Alsek, Chilkat, Taku, Stikine, Unuk and Chickamin rivers; and non-selective rod and reel and/or carcass sampling was used on the Blossom, Keta, Andrew Creek and King Salmon systems. Therefore, comparisons of length or age compositions between stocks within the age-.2. to age-.5 should be relatively unbiased. The Situk River is the only Chinook system in Southeast Alaska where the escapement of age-.1 jacks are estimated annually. The mean length at age data is unbiased for all stocks.

Eight of the Chinook salmon marked with coded-wire tags that were recovered in Southeast Alaska rivers were from systems other than the river they were recovered in (Appendix Table A9). Six tags were from five different hatchery release sites and for the second year in a row, a fish tagged in the Unuk River was recovered in the Chickamin River, and a fish tagged in the Taku was recovered in the lower Stikine River.

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APPENDIX A

Appendix A1.–Survey escapement goals and system goals for large Chinook salmon, Southeast Alaska and transboundary rivers, as accepted by ADF&G, DFO, CTC and TTC, 2003.

		Index survey goal[a]			System goal[b]		
			Range			Range	
River	Index areas	Point est.	Lower	Upper	Point est.	Lower	Upper
Alsek[c]	Klukshu		1,100	2,300			
Taku[d]	5 tributaries	7,000	5,800	10,600	36,000	30,000	55,000
Stikine[e]	Little Tahltan	3,300	2,700	5,300	17,500	14,000	28,000
Situk[f]	All				730	450	1,050
Chilkat[g]	All				2,200	1,750	3,500
Andrew Cr.[h]	All	400	325	750	800	650	1,500
Unuk[i]	6 tributaries	800	650	1,400			
Chickamin[i]	8 tributaries	525	450	900			
Blossom[i]	All	300	250	500			
Keta[i]	All	300	250	500			
King Salmon R. [j]	All	100	80	160	150	120	240

[a] Index survey goal corresponds to the peak or highest single day count of large spawners in annual survey counts.
[b] System goal corresponds to the estimated total escapement of large spawners in the river system, estimated from mark-recapture studies, weir counts or expanded survey counts.
[c] McPherson et al. 1998b.
[d] McPherson et al. 2000.
[e] Bernard et al. 2000.
[f] McPherson et al. 2005b.
[g] Ericksen and McPherson 2004.
[h] Clark et al. 1998.
[I] McPherson and Carlile 1997.
[j] McPherson and Clark 2001.

Appendix A2. –Estimated total escapements of large Chinook salmon to escapement indicator systems and to Southeast Alaska and transboundary rivers, 1975–2003.

Year	MAJOR SYSTEMS				MEDIUM SYSTEMS									Total all systems	Expanded Region total
	Alsek	Taku	Stikine	Major subt.	Situk	Chilkat	Andrew	Unuk	Chick-amin	Blos-som	Keta	Med subt	King Salmon		
1975		12,920	7,571				520		1,914	584	609		63		
1976	5,320	24,582	5,723	35,625	**1,421**		**404**		810	272	252		98		
1977	13,490	29,496	11,445	54,431	**1,732**		**456**	4,870	1,875	448	690	10,071	201	64,703	77,027
1978	12,650	17,124	6,835	36,609	**808**		**388**	5,530	1,594	572	1,176	10,068	86	46,763	55,670
1979	15,520	21,617	12,610	49,747	**1,284**		**327**	2,880	1,233	216	1,278	7,218	113	57,078	67,950
77-79 Avg.	13,887	22,746	10,297	46,929	1,275		390	4,427	1,567	412	1,048	9,119	133	56,181	66,883
1980	12,435	39,239	30,573	82,247	**905**		**282**	5,080	2,299	356	576	9,498	104	91,849	109,344
1981	9,815	49,559	36,057	95,431	**702**		**536**	3,655	1,985	636	987	8,501	139	104,071	123,894
1982	9,845	23,847	40,488	74,180	**434**		**672**	6,755	2,952	1,380	2,262	14,455	**354**	88,989	105,939
1983	11,185	9,795	6,424	27,404	**592**		**366**	5,625	3,099	2,356	2,466	14,504	**245**	42,153	50,182
1984	7,860	20,778	13,995	42,633	**1,726**		**389**	9,185	5,697	2,032	1,830	20,859	**265**	63,757	75,901
1985	6,415	35,916	16,037	58,368	**1,521**		640	5,920	4,943	2,836	1,872	17,732	**175**	76,275	90,804
1986	13,035	38,110	14,889	66,034	**2,067**		1,414	10,630	9,022	5,112	2,070	30,315	**255**	96,604	115,004
1987	12,455	28,935	24,632	66,022	**1,379**		1,576	9,865	5,041	5,396	2,304	25,561	**196**	91,779	109,261
1988	9,970	44,524	37,554	92,048	**868**		1,128	8,730	4,064	1,536	1,725	18,051	**208**	110,307	131,318
1989	11,010	**40,329**	24,282	75,621	**637**		1,060	5,745	4,829	1,376	3,465	17,112	**240**	92,973	110,682
Avg.	10,403	33,103	24,493	67,999	1,083		806	7,119	4,393	2,302	1,956	17,659	218	85,876	102,233
1990	8,490	**52,142**	22,619	83,251	**628**		1,328	2,955	2,916	1,028	1,818	10,673	**179**	94,103	112,027
1991	11,115	51,645	23,206	85,966	**889**	**5,897**	800	3,275	2,518	956	816	15,151	**134**	101,251	112,501
1992	6,215	55,889	34,129	96,233	**1,595**	**5,284**	1,556	4,370	1,789	600	651	15,845	**99**	112,177	124,641
1993	16,105	66,125	58,962	141,192	**952**	**4,472**	2,120	5,340	2,011	1,212	1,086	17,193	263	158,648	176,276
1994	18,100	48,368	33,094	99,562	**1,271**	**6,795**	1,144	**4,623**	2,006	644	918	17,401	210	117,173	130,192
1995	26,985	**33,805**	16,784	77,574	**4,330**	**3,790**	686	3,860	**2,309**	868	525	16,368	146	94,088	104,542
1996	17,995	**79,019**	**28,949**	125,963	**1,800**	**4,920**	670	5,835	**1,587**	880	891	16,583	288	142,834	158,704
1997	14,145	**114,938**	**26,996**	156,079	**1,878**	**8,100**	586	**2,970**	1,406	528	738	16,206	357	172,642	191,824
1998	**4,621**	31,039	**25,968**	61,628	**924**	**3,675**	974	**4,132**	2,021	**364**	**446**	12,536	132	74,296	82,551
1999	**11,597**	**20,545**	**19,947**	52,089	**1,461**	**2,271**	1,210	**3,914**	2,544	848	**968**	13,216	300	65,605	72,894
Avg.	13,537	55,352	29,065	97,954	1,573	5,023	1,107	4,127	2,111	793	886	15,117	211	113,282	126,615
2000	**8,295**	30,014	**27,531**	65,840	**1,785**	**2,035**	1,380	**5,872**	4,141	924	**913**	17,050	137	83,027	92,252
2001	**11,022**	**41,179**	**63,523**	115,724	**656**	**4,517**	2,108	**10,541**	**5,177**	816	1,029	24,844	147	140,715	156,350
2002	**8,504**	**48,848**	**50,875**	108,227	**1,000**	**4,050**	1,752	**6,988**	**5,007**	896	1,233	20,926	153	129,306	143,673
2003	**4,932**	**41,678**	**46,824**	88,191	**2,117**	**5,657**	1,190	**5,546**	**4,579**	812	966	20,867	117	109,175	121,306
Avg.	8,188	39,248	47,188	94,624	1,390	4,065	1,608	7,237	4,611	862	1,035	20,807	139	115,685	128,538
CHANGE FROM 2002 to 2003:															
Number	(3,572)	(12,413)	(4,051)	(20,036)	1,117	1,607	(562)	(1,442)	(428)	(84)	(267)	(59)	(36)	(20,131)	(22,368)
Percent	-32%	-30%	- 6%	-17%	170%	36%	-27%	-14%	- 8%	-10%	-26%	-2%	-24%	-14%	-14%
Escapement goals:															
Lower	5,500	30,000	14,000	49,400	450	1,750	650	3,250	2,325	1,000	750	10,175	120	59,696	66,329
Point	8,500	36,000	17,500	62,000	730	2,200	800	4,000	2,700	1,200	900	14,920	150	75,370	83,744
Upper	11,500	55,000	28,000	92,200	1050	3,500	1,500	7,000	4,650	2,000	1,500	21,250	240	111,693	124,103
Average percent of goal:															
77-79	163%	63%	59%	76%	175%		52%	111%	45%	27%	93%	66%	89%	74%	
80-89	122%	92%	140%	110%	148%		108%	178%	126%	153%	174%	128%	145%	113%	
90-99	159%	154%	166%	158%	215%	228%	148%	103%	60%	53%	79%	110%	141%	149%	
00-03	96%	113%	260%	152%	190%	185%	214%	181%	132%	57%	92%	151%	92%	152%	

Numbers may be revised annually as data are collected. Index escapements are expanded for survey counting rates and unsurveyed tributaries, numbers in **bold type** are weir counts or mark-recapture estimates and are not expanded [region total expanded for 84% w/o Chilkat River, 90% with Chilkat escapement included].

Appendix A3.–Detailed 2003 Southeast Alaska Chinook salmon escapement surveys as entered into Commercial Fisheries Division Integrated Fisheries Database (IFDB/ALEX).

Stream no.	Stream	Date	Mouth	Live	Dead	Total	Survey	Obs[a]	Use[b]	Comment
10115085	Fish Creek-Hyder	8/12/03	-	-	1	1	F	SCH	2	
10130030	Keta River	8/14/03	-	288	-	288	H	KAP	3	200 below wall tent!, excellent vis
10130030	Keta River	8/22/03	-	322	-	322	H	KAP	3	missed top end
10130030	Keta River	9/4/03	-	226	-	226	H	KAP	2	late
10155040	Blossom River	8/14/03	-	203	-	203	H	KAP	2	excellent vis
10155040	Blossom River	8/22/03	-	129	-	129	H	KAP	2	
10155040	Blossom River	9/4/03	-	124	-	124	H	KAP	2	late
1017104A	Barrier Creek	8/8/03	-	13	-	13	H	KAP	3	
1017104A	Barrier Creek	8/13/03	-	9	-	9	H	KAP	2	
1017104B	Butler Creek	8/8/03	-	164	-	164	H	KAP	2	
1017104B	Butler Creek	8/9/03	-	237	2	239	F	KAP	3	
1017104B	Butler Creek	8/13/03	-	172	-	172	H	KAP	3	
1017104C	Clear Creek	8/2/03	-	75	-	75	F	DLM	2	
1017104C	Clear Creek	8/8/03	-	56	-	56	H	KAP	3	schooled up
1017104H	Humpy Creek	8/22/03	-	119	-	119	H	KAP	3	excellent vis, few pinks
1017104H	Humpy Creek	8/26/03	-	159	3	162	F	KAP	2	jason leavitt survey
1017104I	Indian Creek	8/8/03	-	21	-	21	H	KAP	2	
1017104I	Indian Creek	8/13/03	-	14	-	14	H	KAP	2	
1017104K	King Creek	8/12/03	-	222	-	222	H	KAP	2	early
1017104K	King Creek	8/22/03	-	363	-	363	H	KAP	3	
1017104L	Leduc River	8/8/03	-	37	-	37	H	KAP	3	excellent vis
1017104L	Leduc River	8/13/03	-	14	2	16	H	KAP	2	
1017104S	South Fork Chickamin	8/8/03	-	82	1	183	H	KAP	3	excellent vis
1017104S	South Fork Chickamin	8/13/03	-	181	-	181	H	KAP	3	
10175015	Eulachon River	7/22/03	-	10	-	10	F	NLZ	1	
10175015	Eulachon River	8/12/03	-	95	-	95	H	KAP	3	78 below fork
10175015	Eulachon River	8/25/03	-	50	5	55	F	CLH	2	
1017503B	Boundary Cr Unik R	8/8/03	-	17	-	17	H	KAP	1	
1017503B	Boundary Cr Unik R	8/22/03	-	45	5	50	F	CLH	2	plus 2 jacks
1017530C	Clear Creek-Unuk R	8/8/03	-	24	-	24	H	KAP	1	poor vis
1017530C	Clear Creek-Unuk R	8/10/03	-	30	1	31	F	CLH	2	very low water

Includes all surveys where Chinook salmon were observed, many are not used to estimate escapement.

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Stream no.	Stream	Date	Mouth	Live	Dead	Total	Survey	Obs[a]	Use[b]	Comment
1017530C	Clear Creek-Unuk R	8/13/03	-	49	-	49	H	KAP	2	water low, fish late
1017530C	Clear Creek-Unuk R	8/25/03	-	188	10	198	F	CLH	3	plus 7 jacks
1017530G	Genes Lake Creek-Unuk	8/8/03	225	-	-	225	H	KAP	2	lake only, water low
1017530G	Genes Lake Creek-Unuk	8/13/03	93	-	-	93	H	KAP	2	lake to helo rock
1017530G	Genes Lake Creek-Unuk	8/13/03	-	338	4	342	F	CLH	2	plus 10 jacks
1017530G	Genes Lake Creek-Unuk	8/17/03	-	448	-	448	F	CLH	3	plus 13 jacks
1017530K	Kerr Creek-Unuk R	7/27/03	-	24	-	24	F	NLZ	2	
1017530K	Kerr Creek-Unuk R	8/5/03	-	58	10	68	F	CLH	3	very low water
1017530K	Kerr Creek-Unuk R	8/8/03	-	11	-	11	H	KAP	1	
1017530K	Kerr Creek-Unuk R	8/12/03	-	80	-	80	F	CLH	2	plus 5 jacks
1017530K	Kerr Creek-Unuk R	8/13/03	-	22	-	22	H	KAP	1	vis poor
1017530L	Lake Creek-Unuk R	8/8/03	-	19	-	19	H	KAP	2	poor vis
1017530L	Lake Creek-Unuk R	8/13/03	-	23	-	23	H	KAP	3	
1017530L	Lake Creek-Unuk R	8/27/03	-	68	-	68	F	DLM	3	
1017530Q	Cripple Ck-Unuk R	8/8/03	-	225	7	232	F	DLM	2	plus 8 jacks
1017530Q	Cripple Ck-Unuk R	8/13/03	-	131	27	158	F	NLZ	2	plus 25 jacks
1017530Q	Cripple Ck-Unuk R	8/20/03	-	126	17	143	F	CLH	2	5 jacks
10180070	Hatchery Ck-Yes Bay	9/5/03	-	9	-	9	F	AWP	2	
10644031	Crystal Creek	6/25/03	-	-	-	-	A	TST	2	NO FISH BEING CAUGHT
10644031	Crystal Creek	7/24/03	-	20	-	170	A	WRB	2	20 IN PEN, 50 ABV RAPIDS 100 BLW
10740024	Aaron Creek	7/28/03	-	7	-	7	A	WRB	1	TOO MANY PINKS FOR GOOD KING CT
10740024	Aaron Creek	8/7/03	-	24	-	24	A	WRB	2	VERY GLACIAL, LOW CT
10740024	Aaron Creek	8/16/03	-	5	-	5	A	WRB	2	
10740038	Marten Ck Bradfield	8/5/03	-	12	-	12	F	TWR	2	
10740049	Harding River	7/28/03	-	5	-	5	A	WRB	1	TOO MANY PINKS FOR GOOD KING CT
10740052	Bradfield River N Fk	7/28/03	-	-	-	-	A	WRB	2	
10740053	Bradfield River E Fk	7/28/03	-	95	-	95	A	WRB	2	
10840016	Kikahe River	7/24/03	-	30	-	30	F	SNF	2	FIRST CONC IN POOL @ 0.5 MILE 2ND CONC IN POOL @ 0.75 MILE
10840017	Goat Ck Stikine R	7/24/03	-	16	-	16	F	SNF	2	FIRST CONC IN POOL @ 0.25 MILE
10840017	Goat Ck Stikine R	8/12/03	-	63	-	63	F	TST	2	
10840020	Andrews Creek	7/24/03	2	61	-	63	A	WRB	2	TOO MANY PINK FOR GOOD KING CT, 57 S FRK
10840020	Andrews Creek	7/28/03	-	37	-	37	A	WRB	1	TOO MANY PINKS FOR GOOD KING CT

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Stream no.	Stream	Date	Mouth	Live	Dead	Total	Survey	Obs[a]	Use[b]	Comment
10840020	Andrews Creek	8/7/03	-	198	-	198	H	JAD	2	119 in North Fork. Many in pools with pinks. Backseat replicate survey
10840020	Andrews Creek	8/7/03	-	249	-	249	H	KAP	1	poor survey, pooled low with pinks
10840020	Andrews Creek	8/7/03	-	55	1	56	A	WRB	1	VERY POOR CT BECAUSE OF HUGE # OF PINKS
10840020	Andrews Creek	8/12/03	-	853	54	907	F	SNF	2	221 M, 212 N FK, 420 S FK
10840020	Andrews Creek	8/12/03	-	575	20	595	H	KAP	3	350 in N fork and mouth
1084013A	W of Hot Springs	8/6/03	-	19	-	19	A	TST	2	
1084013A	W of Hot Springs	8/12/03	-	19	-	19	B	TST	2	
10841010	North Arm Creek	7/24/03	5	30	-	35	A	WRB	2	
10841010	North Arm Creek	8/6/03	-	25	-	25	A	TST	1	
10841010	North Arm Creek	8/7/03	-	24	-	24	A	WRB	1	
10841010	North Arm Creek	8/12/03	-	9	-	39	F	TST	2	
10880120	Little Talhtan River	7/28/03	-	1,820	-	1,820	H	JAD	2	Replicate survey. Sunglare, shadows
10880120	Little Talhtan River	8/7/03	-	1,713	190	1,903	H	KAP	3	170 below weir
11014007	Farragut River	7/25/03	-	4	-	4	A	WRB	2	PARTIALLY GLACIAL, TOO EARLY
11014007	Farragut River	8/8/03	-	17	-	17	A	WRB	2	GLACIAL
11032009	Chuck R Windham Bay	7/17/03	-	1	-	1	A	TST	2	
11032009	Chuck R Windham Bay	7/18/03	-	1	-	1	A	WRB	2	ABV GORGE
11032009	Chuck R Windham Bay	7/23/03	-	7	-	7	A	WRB	1	3 MILES UPSTREAM
11117010	King Salmon River	7/23/03	-	63	-	63	H	JAD	2	Backseat replicate survey
11117010	King Salmon River	7/26/03	-	31	-	31	H	JAD	2	Replicate survey
11117010	King Salmon River	7/26/03	-	4	-	4	F	JAD	2	jacks
11117010	King Salmon River	7/26/03	-	78	-	78	F	JAD	3	with KAP
11117010	King Salmon River	7/26/03	-	48	-	48	H	KAP	2	low water, fish pooled
11117010	King Salmon River	8/1/03	-	52	-	52	F	JAD	2	
11132220	Nakina River	7/27/03	-	430	1	431	H	JAD	2	I A I. Backseat replicate survey
11132220	Nakina River	7/27/03	-	110	-	110	H	JAD	2	I A II. Backseat replicate survey
11132220	Nakina River	7/27/03	-	675	-	675	H	JAD	2	I A III. Backseat replicate survey
11132220	Nakina River	7/27/03	-	101	-	101	H	KAP	3	IA4
11132220	Nakina River	7/27/03	-	701	-	701	H	KAP	3	IA1
11132220	Nakina River	7/27/03	-	556	-	556	H	KAP	3	IA3
11132220	Nakina River	7/27/03	-	68	-	68	H	KAP	3	IA2
11132220	Nakina River	7/27/03	-	185	-	185	H	JAD	2	I A IV. Backseat replicate survey
11132220	Nakina River	8/6/03	-	464	1	465	H	KAP	3	IA1

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Stream no.	Stream	Date	Mouth	Live	Dead	Total	Survey	Obs[a]	Use[b]	Comment
11132220	Nakina River	8/6/03	-	2,095	31	2,126	H	KAP	3	peak total
11132220	Nakina River	8/6/03	-	110	10	120	H	KAP	3	IA2
11132220	Nakina River	8/6/03	-	1,420	20	1,440	H	KAP	3	IA3
11132240	Kowatua Creek	8/12/03	-	425	-	425	H	KAP	2	windy, poor survey
11132240	Kowatua Creek	8/19/03	-	818	-	818	H	JAD	3	Backseat replicate survey
11132240	Kowatua Creek	8/19/03	-	849	1	850	H	KAP	3	20 above weir
11132255	Tatsamenie River	8/19/03	-	466	-	466	H	JAD	2	IAI, below L. Tats. Replicate survey
11132255	Tatsamenie River	8/19/03	-	282	2	284	H	KAP	3	IA2
11132255	Tatsamenie River	8/19/03	-	998	2	1,000	H	KAP	3	peak total
11132255	Tatsamenie River	8/19/03	-	716	-	716	H	KAP	3	IA1
11132255	Tatsamenie River	8/19/03	-	391	-	391	H	JAD	2	IA2, above L. Tats. Replicate survey
11132270	Nahlin River	7/21/03	-	638	2	640	H	KAP	2	IA3
11132270	Nahlin River	7/21/03	-	118	-	118	H	KAP	1	IA2, poor vis
11132270	Nahlin River	7/27/03	-	524	7	531	H	JAD	2	I A I. Front seat replicate survey
11132270	Nahlin River	7/27/03	-	200	-	200	H	JAD	2	I A III. Front seat replicate survey
11132270	Nahlin River	7/27/03	-	59	-	59	H	KAP	3	IA2
11132270	Nahlin River	7/27/03	-	196	-	196	H	KAP	3	IA1
11132270	Nahlin River	7/27/03	-	856	5	861	H	KAP	3	peak total
11132270	Nahlin River	7/27/03	-	601	5	606	H	KAP	3	IA3
11132270	Nahlin River	7/27/03	-	58	1	59	H	JAD	2	I A II. Front seat replicate survey
11132275	Tseta Creek	7/27/03	-	377	-	377	H	JAD	2	Front seat replicate survey
11132275	Tseta Creek	7/27/03	-	436	-	436	H	KAP	3	325 at top end, backseat survey
11132280	Dudidontu River	7/28/03	-	614	-	614	H	JAD	2	121 in Matsatu. Replicate survey. Sunglare
11132280	Dudidontu River	7/28/03	-	644	-	644	H	KAP	2	203 above swamp
11132280	Dudidontu River	8/6/03	-	514	10	524	H	KAP	3	129 above swamp
11150069	Fish Creek-Douglas I	8/8/03	-	1	10	11	F	RLT	1	Fish still in holding pond
11532053	37 Mile Creek	8/25/03	-	7	3	10	F	RPE	1	8 SAMPLED BY RICH CHAPELL
11532054	Big Boulder Creek	8/13/03	-	106	1	107	F	RPE	1	+9 JACKS COUNTED
18230043	Takhanni River (CAN)	7/30/03	-	103	2	105	H	KAP	3	
18230045	Goat Creek	7/30/03	-	10	-	10	H	KAP	2	coyote in creek
18230050	Blanchard Ck (CAN)	7/30/03	-	126	1	127	H	KAP	3	48 above bridge
18260010	Dangerous River	8/11/03	-	3	-	3	F	MWF	0	east shore king creek
18270015	Old Situk River	8/23/03	-	14	-	14	B	MWF	0	all below road, zero coho

[a] Observer initials on file in Commercial Fisheries IFDB/ALEX database.

[b] IFDB Standard Usage Codes: 1= not useful for indexing or estimating escapement; 2= potentially useful for indexing or estimating escapement; 3= Potentially useful as the "peak" survey count for this species.

Appendix A4.–Estimated abundance and composition by age and sex of the escapement of Chinook salmon to select systems in Southeast Alaska and transboundary rivers, 2003.

PANEL A. AGE COMPOSITION OF MEDIUM AND LARGE CHINOOK SALMON IN THE KETA RIVER IN 2003

	BROOD YEAR AND AGE CLASS														
	2001	2000	1999	2000	1999	1998	1999	1998	1997	1998	1997	1996	1997	1996	
	0.1	1.1	2.1	0.2	1.2	2.2	0.3	1.3	2.3	0.4	1.4	2.4	0.5	1.5	Total
Males n	2	39		1	34		3	37		2	10				128
%	1.2	22.5		0.6	19.6		1.7	21.2		1.1	5.7				73.6
SE of %	0.8	4.6		0.6	3.1		1.0	3.5		0.8	1.8				3.9
Escapement	17	333		9	289		25	314		17	85				1,088
SE of esc.	12	80		9	46		15	67		12	29				156
Females n							2	31		3	10				46
%							1.1	17.8		1.7	5.7				26.4
SE of %							0.8	3.1		1.0	1.8				3.9
Escapement							17	263		25	85				390
SE of esc.							12	60		15	29				80
Combined n	2	39		1	34		5	68		5	20				174
%	1.2	22.5		0.6	19.6		2.9	39.0		2.9	11.5				100
SE of %	0.8	4.6		0.6	3.1		1.3	4.7		1.3	2.6				0.0
Escapement	17	333		9	289		42	576		42	169				1,478
SE of esc.	12	80		8	59		20	107		20	45				201

Abundance of medium fish Keta and Blossom rivers, from personal communication Scott McPherson, ADF&G, Douglas.

PANEL B. AGE COMPOSITION OF MEDIUM AND LARGE CHINOOK SALMON IN THE BLOSSOM RIVER IN 2003

Males n		1			4			9		1	1				16
%		3.2			12.0			26.3		2.9	2.9				47.4
SE of %		4.0			6.2			7.7		2.9	2.9				8.7
Escapement		28			104			228		25	25				411
SE of esc.		28			32			81		25	25				113
Females n								8		1	8		1		19
%								23.4		2.9	23.4		2.9		52.6
SE of %								7.4		2.9	7.4		2.9		8.7
Escapement								203		25	203		25		457
SE of esc.								76		25	76		25		123
Combined n		1			4			17		2	9		1		34
%		3.2			12.0			49.7		5.8	26.3		2.9		100.0
SE of %		4.0			6.2			0.1		0.0	0.1		2.9		0.0
Escapement		28			104			431		51	228		25		868
SE of esc.		28			53			119		36	81		25		183

PANEL C. AGE COMPOSITION OF MEDIUM AND LARGE CHINOOK SALMON IN THE CHICKAMIN RIVER IN 2003[a]

Males n		16			48			307			61			2	434
%		4.2			10.4			31.1			6.1			0.2	52.0
SE of %		1.2			2.1			1.7			0.8			0.1	2.2
Escapement		222			555			1,652			325			11	2,764
SE of esc.		64			112			224			58			8	312
Females n								323			154			2	479
%								32.4			15.4			0.2	48.0
SE of %								1.8			1.2			0.1	2.2
Escapement								1,720			820			11	2,550
SE of esc.								235			122			8	339
Combined n		16			48			630			215			4	913
%		4.2			10.4			63.4			21.5			0.4	100.0
SE of %		1.2			2.1			2.4			1.5			0.2	0.0
Escapement		222			555			3,371			1,145			21	5,314
SE of esc.		64			112			438			162			11	611

[a] From Freeman et al. 2005.

-continued-

PANEL D. AGE COMPOSITION OF MEDIUM AND LARGE CHINOOK SALMON IN THE UNUK RIVER IN 2003[b]

	BROOD YEAR AND AGE CLASS														
	2001	2000	1999	2000	1999	1998	1999	1998	1997	1998	1997	1996	1997	1996	
	0.1	1.1	2.1	0.2	1.2	2.2	0.3	1.3	2.3	0.4	1.4	2.4	0.5	1.5	Total
Males n		31			95	1		372			78			2	579
%		3.1			9.3	0.1		34.2			7.2			0.2	54.0
SE of %		0.6			1.1	0.1		1.5			0.8			0.1	1.6
Escapement		192			580	6		2,135			447			11	3,371
SE of esc.		36			68	6		187			60			8	240
Females n					2			313		1	179			6	501
%					0.2			28.8		0.1	16.4			0.6	46.0
SE of %					0.1			1.4		0.1	1.1			0.2	1.6
Escapement					11			1,795		6	1,027			34	2,874
SE of esc.					8			163		6	106			14	241
Combined n		31			97	1		685		1	257			8	1,080
%		3.1			9.5	0.1		62.9		0.1	23.6			0.7	100.0
SE of %		0.6			1.1	0.1		1.6		0.1	1.3			0.3	0.0
Escapement		192			592	6		3,930		6	1,474			46	6,244
SE of esc.		36			68	6		316		6	139			16	440

[b] From: Weller and McPherson 2004

PANEL E. AGE COMPOSITION OF SMALL, MEDIUM AND LARGE CHINOOK SALMON IN THE STIKINE RIVER IN 2003

Males n	15	3	162	3	205	2	69	1		460
%	1.2	0.2	13.7	0.2	26.7	0.3	9.1	0.1		51.6
SE of %	0.3	0.1	1.8	0.1	1.7	0.2	1.1	0.1		2.0
Escapement	659	132	7,630	132	14,894	148	5,104	74		28,773
SE of esc	182	77	903	77	2,071	105	878	74		3,047
Females n			35		228	2	111		1	377
%			3.1		30.2	0.3	14.7		0.1	48.4
SE of %			0.6		1.8	0.2	1.3		0.1	2.0
Escapement			1,748		16,836	148	8,211		74	27,017
SE of esc			333		2,353	105	1,276		74	3,476
Combined n	15	3	197	3	433	4	180	1	1	837
%	1.2	0.2	16.8	0.2	56.9	0.5	23.9	0.1	0.1	100.0
SE of %	0.3	0.1	2.1	0.1	2.2	0.3	1.7	0.1	0.1	0.0
Escapement	659	132	9,379	132	31,730	296	13,315	74	74	55,790
SE of esc	182	77	1,054	77	4,156	151	1,919	74	74	6,178

From: DerHovanisian et al. 2005

PANEL F. AGE COMPOSITION OF MEDIUM AND LARGE CHINOOK SALMON IN ANDREW CREEK IN 2003

Males n	3		38		70		39		5	155
%	1.0		13.3		27.9		15.6		2.0	59.8
SE of %	0.7		3.8		3.0		2.4		0.9	3.5
Escapement	14		179		374		209		27	803
SE of esc.	8		47		91		56		13	155
Females n			2		51		45		3	101
%			0.7		20.3		17.9		1.2	40.2
SE of %			0.5		2.7		2.5		0.7	3.5
Escapement			10		273		241		16	541
SE of esc.			7		70		63		10	127
Combined n	3		40		121		84		8	256
%	1.0		14.1		48.2		33.5		3.2	100.0
SE of %	0.7		3.8		3.7		3.3		1.1	0.0
Escapement	14		189		648		450		43	1,344
SE of esc.	8		48		150		109		17	268

-continued-

PANEL G. AGE COMPOSITION OF MEDIUM AND LARGE CHINOOK SALMON IN THE KING SALMON RIVER IN 2003

	BROOD YEAR AND AGE CLASS														
	2001	2000	1999	2000	1999	1998	1999	1998	1997	1998	1997	1996	1997	1996	
	0.1	1.1	2.1	0.2	1.2	2.2	0.3	1.3	2.3	0.4	1.4	2.4	0.5	1.5	Total
Males n					19			6			4				29
%					36.5			11.9			7.9				56.4
SE of %					7.6			4.7			3.9				7.4
Escapement					62			20			13				96
SE of esc.					17			8			7				20
Females n								4			18				22
%								7.9			35.7				43.6
SE of %								3.9			7.1				7.4
Escapement								13			61				74
SE of esc.								7			14				16
Combined n					19			10			22				51
%					36.5			19.8			43.6				100.0
SE of %					7.6			5.8			7.4				0.0
Escapement					62			34			74				170
SE of esc.					17			11			16				26

From Personal communication Scott McPherson, ADF&G, Douglas.

PANEL H. AGE COMPOSITION OF MEDIUM AND LARGE CHINOOK SALMON IN THE TAKU RIVER IN 2003[d]

Males n	48	661	448	191	1	1,349
%	2.2	30.1	22.2	9.6	0.0	64.0
SE of %	0.4	3.6	1.3	0.9	0.0	2.5
Escapement	1,149	15,993	11,807	5,088	24	34,062
SE of esc	217	1,884	1,760	872	24	3,532
Females n		12	416	289	2	719
%		0.6	20.8	14.5	0.1	36.0
SE of %		0.2	1.6	1.2	0.1	2.5
Escapement		309	11,088	7,803	53	19,153
SE of esc.		95	1,817	1,286	38	4,187
Combined n	48	673	864	480	3	2,068
%	2.2	30.6	43.0	24.0	0.1	100.0
SE of %	0.4	3.6	2.5	1.8	0.1	0.0
Escapement	1,149	16,302	22,895	12,791	77	53,214
SE of esc.	217	1,902	3,489	2,080	45	6,175

[d] From: Boyce et al. *In Prep.*

PANEL I. AGE COMPOSITION OF MEDIUM AND LARGE CHINOOK SALMON IN THE CHILKAT RIVER IN 2003[e]

Males n	32	58	46	62	0	198
%	9.2	16.4	13.0	17.6		56.2
SE of %	1.5	2.0	1.8	2.0		2.6
Escapement	702	1,249	992	1,344		4,287
SE of esc.	168	289	203	223		450
Females n		1	39	113	2	155
%		0.2	11.0	32.0	0.5	43.8
SE of %		0.3	1.7	2.5	0.4	2.6
Escapement		18	841	2,440	41	3,340
SE of esc.		13	175	384	29	423
Combined n	32	59	85	175	2	353
%	9.2	16.6	24.0	49.6	0.5	100.0
SE of %	1.5	2.0	2.3	2.7	0.4	
Escapement	702	1,267	1,833	3,784	41	7,626
SE of esc.	168	293	312	294	19	823

[e] From: Ericksen 2004.

-continued-

PANEL J. AGE COMPOSITION OF MEDIUM AND LARGE CHINOOK SALMON IN THE ALSEK RIVER IN 2003[f]

	BROOD YEAR AND AGE CLASS														
	2001	2000	1999	2000	1999	1998	1999	1998	1997	1998	1997	1996	1997	1996	
	0.1	1.1	2.1	0.2	1.2	2.2	0.3	1.3	2.3	0.4	1.4	2.4	0.5	1.5	Total
Males n		3			98	1		154	6		58				320
%		0.5			15.4	0.2		22.3	0.9		8.4				47.5
SE of %		0.3			3.6	0.2		2.0	0.4		1.2				2.5
Escapement		31			998	10		1,446	56		542				3,083
SE of esc.		19			285	10		177	23		88				397
Females n		0			44			249	6		61				360
%		0.0			6.9			35.9	0.9		8.8				52.5
SE of %		0.0			1.7			2.9	0.4		1.2				2.5
Escapement		0			447			2,330	56		570				3,403
SE of esc.		0			134			266	23		91				361
Combined n		3			142	1		403	12		119				680
%		0.5			22.3	0.2		58.2	1.7		17.1				100.0
SE of %		0.3			5.0	0.2		4.0	0.5		1.9				0.0
Escapement		31			1,445	10		3,776	112		1,112				6,485
SE of esc.		19			402	10		402	34		148				691

[f] From: Pahlke and Waugh 2004.

PANEL K. AGE COMPOSITION OF SMALL, MEDIUM AND LARGE CHINOOK SALMON IN THE SITUK RIVER IN 2003[g]

Males n	11	5		14	8		90	8		4		140
%	4.5	2.0		5.7	3.2		36.4	3.2		1.6		56.7
SE of %	1.3	0.9		1.5	1.1		3.1	1.1		0.8		3.2
Escapement	118	53	0	150	86	0	963	86	0	43		1,497
SE of esc.												
Females n				1	0		92	8		5	1	107
%				0.4	0.0		37.2	3.2		2.0	0.4	43.3
SE of %				0.4	0.0		3.1	1.1		0.9	0.4	3.2
Escapement				11	0	0	984	86	0	53	11	1,145
SE of esc.												
Combined n	11	5		15	8		182	16		9	1	247
%	4.5	2.0		6.1	3.2		73.7	6.5		3.6	0.4	100.0
SE of %	1.3	0.9		1.5	1.1		2.8	1.6		1.2	0.4	0.0
Escapement	155	71		157	84		1,904	167		94	10	2,642
SE of esc.												

[g] From: McPherson et al. 2005b.

Summary. Percentage age composition estimated from Chinook salmon sampled in 11 Southeast Alaska rivers in 2003.[a]

	BROOD YEAR AND AGE CLASS													
	2001	2000	1999	2000	1999	1998	1999	1998	1997	1998	1997	1996	1997	1996
	0.1	1.1	2.1	0.2	1.2	2.2	0.3	1.3	2.3	0.4	1.4	2.4	0.5	1.5
1. Keta	NE	23%			20%		3%	39%		3%	12%			
2. Blossom	NE	3%			12%			50%		6%	26%		3%	
3. Chickamin	NE	4%			10%			63%			22%			
4. Unuk	NE	3%			9%			63%			24%			1%
5. Stikine	NE	1%			19%			55%	1%		23%			
6. Andrew Cr	NE	NE			14%			48%			34%			3%
7. King Salmon	NE	NE			37%			20%			44%			
8. Taku	NE	2%			28%			44%			25%			
9. Chilkat	NE	9%			17%			24%			50%			1%
10. Alsek	NE	<1%			22%			58%	2%		17%			
11. Situk	4%	2%		6%	3%		74%	6%		4%				

[a] Small fish not included (NE) in experimental design, except on Stikine and Situk Rivers, 2003.

Summary. Estimated numbers of Chinook salmon by age class in escapements to 11 key Southeast Alaska rivers in 2003.

	BROOD YEAR AND AGE CLASS														
	2001	2000	1999	2000	1999	1998	1999	1998	1997	1998	1997	1996	1997	1996	
	0.1	1.1	2.1	0.2	1.2	2.2	0.3	1.3	2.3	0.4	1.4	2.4	0.5	1.5	Total
1. Keta	17	333	0	9	289	0	42	576	0	42	169	0	0	0	1,477
2. Blossom	0	28	0	0	104	0	0	431	0	51	228	0	25	0	867
3. Chickamin	0	222	0	0	555	0	0	3,371	0	0	1,145	0	0	21	5,314
4. Unuk	0	192	0	0	592	6	0	3,930	0	6	1,474	0	0	46	6,246
5. Stikine	0	659	132	0	9,119	132	0	27,146	253	0	11,364	63	0	63	48,931
6. Andrew Cr	0	14	0	0	189	0	0	648	0	0	450	0	0	43	1,344
7. King Salmon	0	0	0	0	62	0	0	34	0	0	74	0	0	0	170
8. Taku	0	1,201	0	0	16,573	121	0	25,888	288	0	14,529	32	0	64	58,696
9. Chilkat	0	702	0	0	1,267	0	0	1,833	0	0	3,784	0	0	41	7,627
10. Alsek	0	31	0	0	1,445	10	0	3,776	112	0	1,112	0	0	0	6,486
11. Situk	155	71	0	157	84	0	1,904	167	0	94	10	0	0	0	2,642

Summary. Percentage sex composition that were males by age class estimated from Chinook salmon sampled in 11 key Southeast Alaska rivers in 2003.

	BROOD YEAR AND AGE CLASS													
	2001	2000	1999	2000	1999	1998	1999	1998	1997	1998	1997	1996	1997	1996
	0.1	1.1	2.1	0.2	1.2	2.2	0.3	1.3	2.3	0.4	1.4	2.4	0.5	1.5
1. Keta	100%	100%		100%	100%		60%	55%		40%	50%			
2. Blossom		100%			100%			53%		49%	11%			
3. Chickamin		100%			100%			49%			28%			52%
4. Unuk		100%			98%	100%		54%			30%			24%
5. Stikine		100%	100%		82%	100%		47%	50%		38%	100%		
6. Andrew Cr					95%			58%			46%			63%
7. King Salmon					100%			59%			18%			
8. Taku		100%			96%	47%		51%	67%		40%			
9. Chilkat		100%			99%			54%			36%			
10. Alsek		100%			69%	100%		38%	50%		49%			
11. Situk	76%	75%		95%	102%		51%	51%		46%	0%			
Average	88%	97%		98%	95%		55%	52%		34%	32%			22%

Appendix A5.–Average length (MEF), by age, of Chinook salmon in selected systems in Southeast Alaska and transboundary rivers, 2003.

PANEL A. AVERAGE LENGTH OF CHINOOK SALMON IN THE KETA RIVER IN 2003														
		BROOD YEAR AND AGE CLASS												
	2001	**2000**	**1999**	**2000**	**1999**	**1998**	**1999**	**1998**	**1997**	**1998**	**1997**	**1996**	**1997**	**1996**
	0.1	**1.1**	**2.1**	**0.2**	**1.2**	**2.2**	**0.3**	**1.3**	**2.3**	**0.4**	**1.4**	**2.4**	**0.5**	**1.5**
Males n	2	41		1	34		3	37		2	10			
Average length	460	454		450	653		733	804		975	1009			
SD	28	29			51		48	74		35	58			
SE	20	5			9		27	12		25	18			
Females n							2	31		3	10			
Average length							840	804		923	936			
SD							28	74		45	55			
SE							20	13		26	17			
Combined n	2	41		1	34		5	68		5	20			
Average length	460	454		450	653		776	804		944	972			
SD	28	29			51		69	74		46	66			
SE	20	5			9		31	9		21	15			
PANEL B. AVERAGE LENGTH OF CHINOOK SALMON IN THE BLOSSOM RIVER IN 2003														
Males n		1			4			5		1	1			
Average length		475			703			797		750	785			
SD					92			41						
SE					46			18						
Females n								8		1	7		1	
Average length								841			910		910	
SD								76			51			
SE								27			19			
Combined n		1			4			13		2	8		1	
Average length		475			703			824		830	894		910	
SD					92			67		113	65			
SE					46			18		80	23			
PANEL C. AVERAGE LENGTH OF CHINOOK SALMON IN THE CHICKAMIN RIVER IN 2003														
Males n		21			48			307			61			2
Average length		438			635			829			943			1,033
SD		43			76			68			72			81
SE		9			11			4			9			57
Females n								323			154			2
Average length								850			902			890
SD								48			46			71
SE								3			4			50
Combined n		21			48			630			215			4
Average length		438			635			844			916			936
SD		43			76			54			58			88
SE		9			11			2			4			44

-continued-

PANEL D. AVERAGE LENGTH OF CHINOOK SALMON IN THE UNUK RIVER IN 2003[b].

	BROOD YEAR AND AGE CLASS													
	2001	**2000**	**1999**	**2000**	**1999**	**1998**	**1999**	**1998**	**1997**	**1998**	**1997**	**1996**	**1997**	**1996**
	0.1	**1.1**	**2.1**	**0.2**	**1.2**	**2.2**	**0.3**	**1.3**	**2.3**	**0.4**	**1.4**	**2.4**	**0.5**	**1.5**
Males n		43			95	1		372			78			2
Average length		412			589	720		804			913			870
SD		38			57			54			66			28
SE		6			6			3			76			20
Females n					2			314		1	179			6
Average length					675			816		970	884			903
SD					21			47			45			51
SE					15			3			3			21
Combined n		43			97	1		686		1	257			8
Average length		412			591	720		809		970	893			895
SD		38			58			51			54			47
SE		6			6			2			3			17

[b] From: Weller and McPherson 2004.

PANEL E. AVERAGE LENGTH OF CHINOOK SALMON IN THE STIKINE RIVER IN 2003[c]

Males n	15	3	162	3	205	2	69	1			
Average length	419	421	588	629	786	789	885	978			
SD	24	26	69	11	78	77	64				
SE	6	15	5	6	5	55	8				
Females n			35		228	2	111				1
Average length			605		784	777	838				887
SD			80		45	44	41				
SE			13		3	31	4				
Combined n	15	3	197	3	433	4	180	1			1
Average length	419	421	591	629	785	783	856	978			887
SD	24	26	71	11	63	52	56				
SE	6	15	5	6	3	26	4				

[c] From: Little Tahltan River Samples: Der Hovanisian et al. 2005.

PANEL F. AVERAGE LENGTH OF CHINOOK SALMON IN ANDREW CREEK IN 2003

Males n	3		38		70		39				5
Average length	358		601		766		859				880
SD	15		51		57		58				104
SE	9		8		7		9				46
Females n			2		51		45				3
Average length			638		791		833				858
SD			53		34		35				28
SE			38		5		5				16
Combined n	3		40		121		84				8
Average length	358		603		777		845				872
SD	15		51		50		48				80
SE	9		8		5		5				28

-continued-

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	Brood year and age class													
	2001	**2000**	**1999**	**2000**	**1999**	**1998**	**1999**	**1998**	**1997**	**1998**	**1997**	**1996**	**1997**	**1996**
	0.1	**1.1**	**2.1**	**0.2**	**1.2**	**2.2**	**0.3**	**1.3**	**2.3**	**0.4**	**1.4**	**2.4**	**0.5**	**1.5**
Panel G. Average length of chinook salmon in the King Salmon River in 2003														
Males n					19			6			4			
Average length					627			721			922			
SD					53			69			60			
SE					12			28			30			
Females n								4			18			
Average length								801			897			
SD								86			48			
SE								43			11			
Combined n					19			10			22			
Average length					627			753			902			
SD					53			83			49			
SE					12			26			11			
Panel H. Average length of chinook salmon in the Taku River in 2003[d]														
Males n		47			609	2		423	6		177			
Average length		470			583	670		746	802		879			
SD		58			64	148		82	52		62			
SE		8			3	105		4	21		5			
Females n					20	2		399	3		273	1		2
Average length					723	783		770	753		821	795		858
SD					64	32		45	23		43			74
SE					14	23		2	13		3			53
Combined n		47			629	4		822	9		450	1		2
Average length		470			588	726		758	785		844	795		858
SD		58			68	109		68	49		59			74
SE		8			3	55		2	16		3			53
Panel I. Average length of chinook salmon in the Chilkat River in 2003[e]														
Males n		40			139			151			168			
Average length		403			582			788			928			
SD		45			57			72			69			
SE		7			5			6			5			
Females n					2			128			305			2
Average length					595			801			882			933
SD					35			50			43			11
SE					25			4			2			8
Combined n		40			141			280			474			2
Average length		403			582			794			898			933
SD		45			57			63			58			11
SE		7			5			4			3			8

[d] From: Boyce et al. *In Prep*

[e] From: Ericksen 2004.

-continued-

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PANEL J. AVERAGE LENGTH OF CHINOOK SALMON IN THE ALSEK RIVER IN 2003[f]														
	BROOD YEAR AND AGE CLASS													
	2001	**2000**	**1999**	**2000**	**1999**	**1998**	**1999**	**1998**	**1997**	**1998**	**1997**	**1996**	**1997**	**1996**
	0.1	**1.1**	**2.1**	**0.2**	**1.2**	**2.2**	**0.3**	**1.3**	**2.3**	**0.4**	**1.4**	**2.4**	**0.5**	**1.5**
Males n		6			99	1		154	6		58			
Average length		459			551	587		794	848		953			
SD		44			66			88	78		63			
SE		18			7			7	32		8			
Females n		1			44			249	6		61			
Average length		449			562			807	836		900			
SD					56			55	40		52			
SE					8			3	16		7			
Combined n		7			143	1		403	12		119			
Average length		456			554	587		802	842		926			
SD		58			63			85	65		63			
SE		22			5			4	19		56			

[f] From: Klukshu River weir: Pahlke and Waugh 2004.

PANEL K. AVERAGE LENGTH OF CHINOOK SALMON IN THE SITUK RIVER IN 2003										
Males n	11	5	14	8	89	8	4			
Average length	346	386	586	584	782	799	810			
SD	24	49	95	139	51	23	37			
SE	7	22	26	49	5	8	19			
Females n			1		92	8	5	1		
Average length			600		786	794	834	835		
SD					48	22	27			
SE					5	8	12			
Combined n	11	5	15	8	181	16	9	1		
Average length	346	386	587	584	784	797	823	835		
SD	24	49	92	139	48	42	32			
SE	7	22	24	49	4	11	11			

-continued-

Summary. Average length of male Chinook salmon sampled in Southeast Alaska in 2003

	Brood Year and Age Class													
	2001	2000	1999	2000	1999	1998	1999	1998	1997	1998	1997	1996	1997	1996
	0.1	1.1	2.1	0.2	1.2	2.2	0.3	1.3	2.3	0.4	1.4	2.4	0.5	1.5
1. Keta		454			653			804			1,009			
2. Blossom					703			797						
3. Chickamin		438			635			829			943			
4. Unuk		412			589			804			913			
5. Stikine		419	421		588	629		786			885			
6. Andrew Cr		358			601			766			859			880
7. King Salmon					627			721			922			
8. Taku		470			583			746	802		879			
9. Chilkat		403			582			788			928			
10. Alsek		459			551			794	848		953			
11. Situk	346	386			584		782	799		810				

Summary. Average length of female Chinook salmon sampled in Southeast Alaska in 2003

	Brood Year and Age Class													
	2001	2000	1999	2000	1999	1998	1999	1998	1997	1998	1997	1996	1997	1996
	0.1	1.1	2.1	0.2	1.2	2.2	0.3	1.3	2.3	0.4	1.4	2.4	0.5	1.5
1. Keta								804			936			
2. Blossom								841			910			
3. Chickamin								850			902			
4. Unuk								816			884			903
5. Stikine					605			784			838			
6. Andrew Cr								791			833			858
7. King Salmon								801			897			
8. Taku					723			770	753		821			
9. Chilkat								801			882			933
10. Alsek		449			562			807	836		900			
11. Situk							786	794		834				

Summary. Average length of Chinook salmon sampled in Southeast Alaska in 2003 sexes combined

	Brood Year and Age Class													
	2001	2000	1999	2000	1999	1998	1999	1998	1997	1998	1997	1996	1997	1996
	0.1	1.1	2.1	0.2	1.2	2.2	0.3	1.3	2.3	0.4	1.4	2.4	0.5	1.5
1. Keta		454			653		776	804		944	972			
2. Blossom					703			824			894			
3. Chickamin		438			635			844			916			936
4. Unuk		412			591			809			893			895
5. Stikine		419	421		591	629		785	783		856			
6. Andrew Cr		358			603			777			845			872
7. King Salmon					627			753			902			
8. Taku		470			588	726		758	785		844			
9. Chilkat		403			582			794			898			
10. Alsek		456			554			802	842		926			
11. Situk	346	386		587	584		784	797		823				
Averages	403	427		519	610		780	795	803	892	889			901

Note: age classes with fewer than four fish sampled were not reported in summary panels.

Appendix A6.–Differences in mean lengths (Panel A) and test results (Z, Panel B) for statistical differences in mean lengths between age-1.2 Chinook salmon (sexes combined) sampled in 11 rivers in Southeast Alaska in 2003.

Bold numbers indicate probability of <0.01 that they are the same.

PANEL A. DIFFERENCES IN MEAN LENGTHS FOR AGE-1.2 FISH, SEXES COMBINED

System	Age class	Average length	SE	Difference in mean length										
				Keta	Blossom	Chickamin	Unuk	Stikine	Andrew Cr	King Salmon	Taku	Chilkat	Alsek	Situk
1. Keta	1.2	653	9	0	50	-18	-62	-62	-50	-26	-65	-71	-99	
2. Blossom	1.2	703	46	-50	0	-68	-112	-112	-100	-76	-115	-121	-149	
3. Chickamin	1.2	635	11	18	68	0	-44	-44	-32	-8	-47	-53	-81	
4. Unuk	1.2	591	6	62	112	44	0	0	12	36	-3	-9	-37	
5. Stikine	1.2	591	5	62	112	44	0	0	12	36	-3	-9	-37	
6. Andrew Cr	1.2	603	8	50	100	32	-12	-12	0	24	-15	-21	-49	
7. King Salmon	1.2	627	12	26	76	8	-36	-36	-24	0	-39	-45	-73	
8. Taku	1.2	588	3	65	115	47	3	3	15	39	0	-6	-34	
9. Chilkat	1.2	582	5	71	121	53	9	9	21	45	6	0	-28	
10. Alsek	1.2	554	5	99	149	81	37	37	49	73	34	28	0	
11. Situk	1.2													

PANEL B. TEST VALUES FOR DIFFERENCES IN MEAN LENGTHS FOR AGE-1.2 FISH, SEXES COMBINED

System	Age class	Average length	SE	Test statistics for differences in mean length										
				Keta	Blossom	Chickamin	Unuk	Stikine	Andrew Cr	King Sal.	Taku	Chilkat	Alsek	Situk
1. Keta	1.2	653	9	0.00	1.07	-1.27	**-5.73**	**-6.02**	**-4.15**	-1.73	**-6.85**	**-6.90**	**-9.62**	
2. Blossom	1.2	703	46	-1.07	0.00	-1.44	-2.41	-2.42	-2.14	-1.60	-2.49	**-2.62**	**-3.22**	
3. Chickamin	1.2	635	11	1.27	1.44	0.00	**-3.51**	**-3.64**	-2.35	-0.49	**-4.12**	**-4.38**	**-6.70**	
4. Unuk	1.2	591	6	**5.73**	2.41	**3.51**	0.00	0.00	1.20	**2.68**	-0.45	-1.15	**-4.74**	
5. Stikine	1.2	591	5	**6.02**	2.42	**3.64**	0.00	0.00	1.27	**2.77**	-0.51	-1.27	**-5.23**	
6. Andrew Cr	1.2	603	8	**4.15**	2.14	2.35	-1.20	-1.27	0.00	1.66	-1.76	-2.23	**-5.19**	
7. King Salmon	1.2	627	12	1.73	1.60	0.49	**-2.68**	**-2.77**	-1.66	0.00	**-3.15**	**-3.46**	**-5.62**	
8. Taku	1.2	588	3	**6.85**	2.49	**4.12**	0.45	0.51	1.76	**3.15**	0.00	-1.03	**-5.83**	
9. Chilkat	1.2	582	5	**6.90**	**2.62**	**4.38**	1.15	1.27	2.23	**3.46**	1.03	0.00	**-3.96**	
10. Alsek	1.2	554	5	**9.62**	**3.22**	**6.70**	**4.74**	**5.23**	**5.19**	**5.62**	**5.83**	**3.96**	0.00	
11. Situk	1.2													

Appendix A7.–Differences in mean lengths (Panel A) and test results (Z, Panel B) for statistical differences in mean lengths between age-1.3 Chinook salmon (sexes combined) sampled in 11 rivers in Southeast Alaska in 2003.

Bold numbers indicate probability of <0.01 that they are the same.

PANEL A. DIFFERENCES IN MEAN LENGTHS FOR AGE-1.3 FISH, SEXES COMBINED

	Age	Average		Difference in mean length									
System	class	length	SE	Keta	Blossom	Chickamin	Unuk	Stikine	Andrew Cr	King Sal.	Taku	Chilkat	Alsek	Situk
1. Keta	1.3	804	9	0	20	36	5	-19	-27	-51	-46	-10	-2	-9
2. Blossom	1.3	824	18	-20	0	16	-15	-39	-47	-71	-66	-30	-22	-18
3. Chickamin	1.3	840	2	-36	-16	0	-31	-55	-63	-87	-82	-46	-38	-2
4. Unuk	1.3	809	2	-5	15	31	0	-24	-32	-56	-51	-15	-7	-2
5. Stikine	1.3	785	3	19	39	55	24	0	-8	-32	-27	9	17	-3
6. Andrew Cr	1.3	777	5	27	47	63	32	8	0	-24	-19	17	25	-5
7. King Sal.	1.3	753	26	51	71	87	56	32	24	0	5	41	49	-26
8. Taku	1.3	758	2	46	66	82	51	27	19	-5	0	36	44	-2
9. Chilkat	1.3	794	4	10	30	46	15	-9	-17	-41	-36	0	8	-4
10. Alsek	1.3	802	4	2	22	38	7	-17	-25	-49	-44	-8	0	-4
11. Situk	1.3													

PANEL B. TEST VALUES FOR DIFFERENCES IN MEAN LENGTHS FOR AGE-1.3 FISH, SEXES COMBINED

	Age	Average		Test statistics for differences in mean length									
System	class	length	SE	Keta	Blossom	Chickamin	Unuk	Stikine	Andrew Cr	King Sal.	Taku	Chilkat	Alsek	Situk
1. Keta	1.3	804	9	0.00	0.99	**3.87**	0.54	-2.00	**-2.62**	-1.85	**-4.94**	-1.02	-0.20	
2. Blossom	1.3	824	18	-0.99	0.00	0.88	-0.83	-2.14	-2.52	-2.25	**-3.63**	-1.63	-1.19	
3. Chickamin	1.3	840	2	**-3.87**	-0.88	0.00	**-9.98**	**-14.37**	**-11.38**	**-3.33**	**-24.28**	**-9.89**	**-8.17**	
4. Unuk	1.3	809	2	-0.54	0.83	**9.98**	0.00	**-6.66**	**-5.94**	-2.15	**-16.32**	**-3.35**	-1.57	
5. Stikine	1.3	785	3	2.00	2.14	**14.37**	**6.66**	0.00	-1.37	-1.22	**-7.03**	1.80	3.40	
6. Andrew Cr	1.3	777	5	**2.62**	**2.52**	**11.38**	**5.94**	1.37	0.00	-0.91	**-3.43**	**2.65**	**3.90**	
7. King Sal.	1.3	753	26	1.85	**2.25**	**3.33**	2.15	1.22	0.91	0.00	0.19	1.56	1.86	
8. Taku	1.3	758	2	**4.94**	**3.63**	**24.28**	**16.32**	**7.03**	3.43	-0.19	0.00	**7.72**	**9.43**	
9. Chilkat	1.3	794	4	1.02	1.63	**9.89**	**3.35**	-1.80	**-2.65**	-1.56	**-7.72**	0.00	1.41	
10. Alsek	1.3	802	4	0.20	1.19	**8.17**	1.57	**-3.40**	**-3.90**	-1.86	**-9.43**	-1.41	0.00	
11. Situk	1.3													

Appendix A8.– Differences in mean lengths (Panel A) and test results (Z, Panel B) for statistical differences in mean lengths between age-1.4 Chinook salmon (sexes combined) sampled in 11 rivers in Southeast Alaska in 2003.

Bold numbers indicate probability of <0.01 that they are the same.

PANEL A. DIFFERENCES IN MEAN LENGTHS FOR AGE-1.4 FISH, SEXES COMBINED

	Age	Average		Difference in mean length										
System	class	length	SE	Keta	Blossom	Chickamin	Unuk	Stikine	Andrew Cr	King Sal.	Taku	Chilkat	Alsek	Situk
1. Keta	1.4	972	15	0	-78	-58	-79	-116	-127	-70	-128	-74	-46	
2. Blossom	1.4	894	23	78	0	20	-1	-38	-49	8	-50	4	32	
3. Chickamin	1.4	914	4	58	-20	0	-21	-58	-69	-12	-70	-16	12	
4. Unuk	1.4	893	3	79	1	21	0	-37	-48	9	-49	5	33	
5. Stikine	1.4	856	4	116	38	58	37	0	-11	46	-12	42	70	
6. Andrew Cr	1.4	845	5	127	49	69	48	11	0	57	-1	53	81	
7. King Sal.	1.4	902	11	70	-8	12	-9	-46	-57	0	-58	-4	24	
8. Taku	1.4	844	3	128	50	70	49	12	1	58	0	54	82	
9. Chilkat	1.4	898	3	74	-4	16	-5	-42	-53	4	-54	0	28	
10. Alsek	1.4	926	6	46	-32	-12	-33	-70	-81	-24	-82	-28	0	
11. Situk	1.4													

PANEL B. TEST VALUES FOR DIFFERENCES IN MEAN LENGTHS FOR AGE-1.4 FISH, SEXES COMBINED

	Age	Average		Test statistics for differences in mean length										
System	class	length	SE	Keta	Blossom	Chickamin	Unuk	Stikine	Andrew Cr	King Sal.	Taku	Chilkat	Alsek	Situk
1. Keta	1.4	972	15	0.00	**-2.84**	**-3.74**	**-5.16**	**-7.47**	**-8.03**	**-3.76**	**-8.37**	**-4.84**	**-2.85**	
2. Blossom	1.4	894	23	**2.84**	0.00	0.86	-0.04	-1.63	-2.08	0.31	-2.16	0.17	1.35	
3. Chickamin	1.4	914	4	**3.74**	-0.86	0.00	**-4.28**	**-10.41**	**-10.90**	-1.03	**-14.27**	**-3.26**	1.68	
4. Unuk	1.4	893	3	**5.16**	0.04	4.28	0.00	**-7.40**	**-8.23**	0.79	**-11.55**	1.18	**4.92**	
5. Stikine	1.4	856	4	**7.47**	1.63	**10.41**	**7.40**	0.00	-1.72	**3.93**	-2.40	**8.40**	**9.71**	
6. Andrew Cr	1.4	845	5	**8.03**	**2.08**	**10.90**	**8.23**	1.72	0.00	**4.72**	-0.17	**9.09**	**10.37**	
7. King Sal.	1.4	902	11	**3.76**	-0.31	1.03	-0.79	**-3.93**	**-4.72**	0.00	**-5.09**	-0.35	1.92	
8. Taku	1.4	844	3	**8.37**	**2.16**	**14.27**	**11.55**	2.40	0.17	**5.09**	0.00	**12.73**	**12.22**	
9. Chilkat	1.4	898	3	**4.84**	-0.17	**3.26**	-1.18	**-8.40**	**-9.09**	0.35	**-12.73**	0.00	**4.17**	
10. Alsek	1.4	926	6	**2.85**	-1.35	-1.68	**-4.92**	**-9.71**	**-10.37**	-1.92	**-12.22**	**-4.17**	0.00	
11. Situk	1.4													

Appendix A9.–Numbers of Chinook salmon examined for coded-wire tags and numbers of tags recovered in rivers in Southeast Alaska and transboundary rivers, 2002-2003. Hatchery CWTs expanded by tag ratio reported in Tag Lab database.

	2003					2002				
	Chinook Sampled	Hatchery CWTs	Expanded Hatchery CWTs	Non Natal Wild CWTs	Natal Wild CWTs	Chinook Sampled	Hatchery CWTs	Expanded Hatchery CWTs	Non Natal Wild CWTs	Natal Wild CWTs
Situk River	663	0	0	0	0	574	0	0	0	0
Alsek River	2,350	0	0	0	0	1,458	0	0	0	0
Chilkat River	1,019	0	0	0	1944	678	0	0	0	2
Taku River	3,727	0	0	0	63	5,254	0	0	0	64
						6 no tags 1 lost head test fish, 2 no tagsCYI, 3 lost Nakina heads				
King Salmon River	69	0	0	0	0	74	0	0	0	0
Stikine River	4,804	0	0	1	9	5,805	0	0	0	1
				1 Taku River wild						
Andrew Creek	300	4	54	0	0	210	0	0	0	0
	7 clips, 4 heads; 2 Earl West, 1 Hidden Falls, 1 Anita Bay									
Unuk River	1,850	0	0	0	32	1,637	1	7	0	45
						149 clips, 46 sacrificed, 1 Dipac fish(7.3:1 expansion)				
Chickamin River	1,370	0	0	1	0	1,062	3	25	1	0
				1 Unuk River wild		*4 clips, 4 tags, 1 Unuk W, 1 Tamgas (20X), 1Neets bay(3.4), 1 Kincolith(2X)*				
Blossom River	37	1	10	0	0	101	0	0	0	0
			1 Neets Bay							
Keta River	231	1	24	0	0	298	0	0	0	0
			Tamgass Creek							
Totals	16,420	6	88	2	123	17,151	4	32	1	112

Notes:

1) Expanded hatchery numbers are from listed Tag Ratios in ADF&G Tag Lab database

2) Non-natal wild CWTs are recoveries in a stream from Chinook smolt that were tagged in another wild river, i.e. Chickamin River had one Chinook tag from Unuk in 2002.

3) Natal CWTs are recoveries of wild Chinook tagged as smolt in that river.

Appendix A10.–Computer files used to complete this report

File name	Description
TOTALCHTS.XLS	Excel workbook with tables and charts with annual counts for each index area.
SUMVER03XLS	Appendix table A2, with expanded escapement totals for Southeast Alaska
ESCAP03.XLS	Table 1. Estimated Chinook escapement in 2003
AGELENGTHSEAK2003.XLS	Appendix Table A4-A7. Length and age summaries for 2003
CWTrecovs.xls	coded-wire tag recoveries