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**Stock Assessment of Buskin River Coho Salmon,  
1989–2004**

by

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and

**David G. Evans**

December 2011

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Alaska Department of Fish and Game

Divisions of Sport Fish and Commercial Fisheries



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<b>Weights and measures (metric)</b>		<b>General</b>		<b>Mathematics, statistics</b>	
centimeter	cm	Alaska Administrative Code	AAC	<i>all standard mathematical signs, symbols and abbreviations</i>	
deciliter	dL	all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.	alternate hypothesis	$H_A$
gram	g	all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.	base of natural logarithm	$e$
hectare	ha	at	@	catch per unit effort	CPUE
kilogram	kg	compass directions:		coefficient of variation	CV
kilometer	km	east	E	common test statistics	(F, t, $\chi^2$ , etc.)
liter	L	north	N	confidence interval	CI
meter	m	south	S	correlation coefficient	
milliliter	mL	west	W	(multiple)	R
millimeter	mm	copyright	©	correlation coefficient (simple)	r
		corporate suffixes:		covariance	cov
<b>Weights and measures (English)</b>		Company	Co.	degree (angular)	$^\circ$
cubic feet per second	ft <sup>3</sup> /s	Corporation	Corp.	degrees of freedom	df
foot	ft	Incorporated	Inc.	expected value	$E$
gallon	gal	Limited	Ltd.	greater than	>
inch	in	District of Columbia	D.C.	greater than or equal to	≥
mile	mi	et alii (and others)	et al.	harvest per unit effort	HPUE
nautical mile	nmi	et cetera (and so forth)	etc.	less than	<
ounce	oz	exempli gratia	e.g.	less than or equal to	≤
pound	lb	(for example)		logarithm (natural)	ln
quart	qt	Federal Information Code	FIC	logarithm (base 10)	log
yard	yd	id est (that is)	i.e.	logarithm (specify base)	log <sub>2</sub> , etc.
		latitude or longitude	lat. or long.	minute (angular)	'
<b>Time and temperature</b>		monetary symbols (U.S.)	\$, ¢	not significant	NS
day	d	months (tables and figures): first three letters	Jan, ..., Dec	null hypothesis	$H_0$
degrees Celsius	°C	registered trademark	®	percent	%
degrees Fahrenheit	°F	trademark	™	probability	P
degrees kelvin	K	United States (adjective)	U.S.	probability of a type I error (rejection of the null hypothesis when true)	$\alpha$
hour	h	United States of America (noun)	USA	probability of a type II error (acceptance of the null hypothesis when false)	$\beta$
minute	min	U.S.C.	United States Code	second (angular)	"
second	s	U.S. state	use two-letter abbreviations (e.g., AK, WA)	standard deviation	SD
<b>Physics and chemistry</b>				standard error	SE
all atomic symbols				variance	
alternating current	AC			population	Var
ampere	A			sample	var
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				

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## ABSTRACT

Since 1985, the Alaska Department of Fish and Game, Division of Sport Fish has assessed the annual runs of coho salmon (*Oncorhynchus kisutch*) of the Buskin River on Kodiak Island. The assessment includes monitoring the commercial, sport, and subsistence harvests, and the inriver run at a weir located in the lower Buskin River. Age-sex data have also been collected from a variety of sources, including egg-take events at Buskin Lake, the sport fish harvest, and occasionally at the weir. Between 1989 and 2004, most of the Buskin River coho salmon returns (68%) were age 2.1, followed by age 1.1 (22%) and 3.1 (8%). Average lengths of age-1.1, -2.1, and -3.1 coho salmon were 653.7 mm, 669.6 mm, and 671.3 mm, respectively. Although enumeration of adult coho salmon through the lower river weir proved problematic in some years due to flooding, spawning escapement was estimated between 5,918 and 13,028 fish, with commercial, sport, and subsistence exploitation rates averaging 0.2%, 22%, and 13%, respectively, for an average total rate of about 35%. The average return per spawner was 1.67. A spawner-recruit analysis is not presented here.

Key words: coho salmon, *Oncorhynchus kisutch*, escapement, Buskin River, age, length, sex composition, sport fish harvest, subsistence harvest, stock assessment.

## INTRODUCTION

The Buskin River drainage, located on the northeast end of Kodiak Island (Figure 1), contains one of the larger native populations of coho salmon (*Oncorhynchus kisutch*) found on the Kodiak road system. The drainage supports the largest reported subsistence salmon fishery in the Kodiak Archipelago and within the Kodiak/Aleutian Islands Federal Subsistence Region, coho salmon comprise a sizeable portion of the total subsistence salmon harvest. Harvest in this fishery is documented through subsistence permits issued by Alaska Department of Fish and Game (ADF&G), Division of Commercial Fisheries (CF).

The Buskin River is also the most popular recreational fishing stream on Kodiak Island, recently representing an average of 35% of the total freshwater recreational fishing effort in the Kodiak Management Area (Schwarz et al. 2002). Recreational fishing effort on the Buskin River is directed primarily toward coho salmon and sockeye salmon (*O. nerka*), but there is also effort directed toward steelhead and rainbow trout (*O. mykiss*), pink salmon (*O. gorbuscha*), and Dolly Varden (*Salvelinus malma*). From 1989 through 2004, estimated sport fish harvests of coho salmon from the Buskin River ranged from about 1,500 to 4,800 fish and averaged approximately 3,000 (Table 1). Sport fish harvest of coho salmon and fishing effort on the Buskin River are estimated annually by the Division of Sport Fish (SF) Statewide Harvest Survey (SWHS).

A relatively minor commercial harvest of Buskin River coho salmon periodically occurs in adjacent marine waters of Chiniak Bay. These harvests are small and may be nonexistent during some years. Fish ticket harvest receipts available from CF are used to quantify the commercial harvest and indicate that between 1989 and 2004, the average annual commercial harvest of Buskin River coho salmon was 23 fish (Table 1).

Inriver runs of Buskin River coho salmon have been monitored at a salmon counting weir operated annually by ADF&G since the mid-1980s. Counts of adult fish entering the Buskin River are obtained from early August through September, with peak coho salmon daily escapements typically occurring during the third week of September.

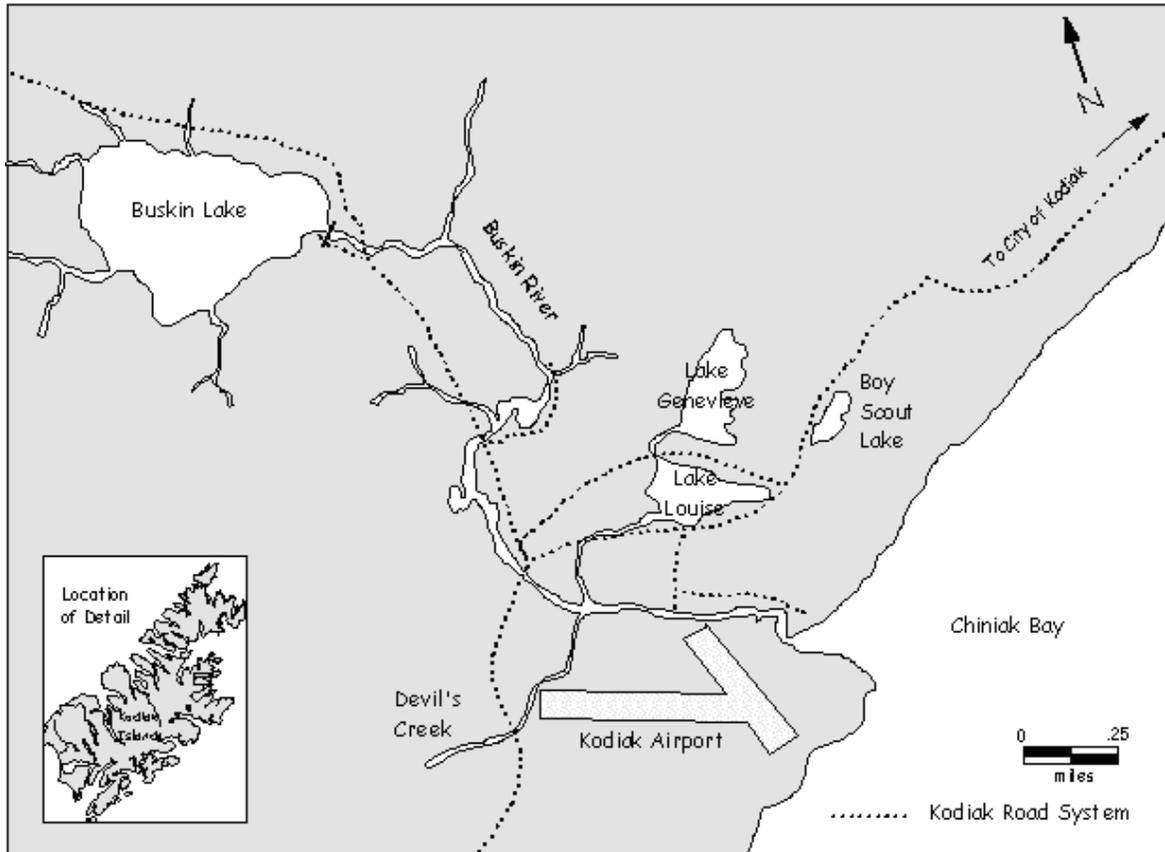


Figure 1.—Map of the Buskin River drainage

The Buskin River weir is also operated annually from early June through July to monitor inriver escapement of sockeye salmon and other anadromous species. Prior to 1990, the weir was operated at a single location throughout the season, approximately 2.0 km upstream of the river mouth, and downstream of most known coho salmon spawning. From 1990 through 2002, the weir was relocated upstream to the outlet of Buskin Lake during June and July in order to more accurately count the spawning escapement of sockeye salmon into this portion of the drainage. During these years, a weir was not in operation from 1 August through 15 August and consequently, any coho salmon entering the drainage before 16 August were not enumerated. Starting in 2004, the weir has been moved from the lake outlet to the lower location on 1 August.

Inseason management of the coho salmon subsistence, sport, and commercial fisheries is predicated on the Buskin River coho salmon escapement goal range of 5,300–8,300 fish. Even though some sport fish harvest occurs upstream of the weir, weir counts provide managers with real-time information on the likely size of eventual escapement and the basis to close fisheries if needed. The escapement estimate is calculated postseason by subtraction of assumed sport fish harvest upstream of the weir ( $0.2 \times$  SWHS estimate of harvest) from the weir count. The escapement goal is periodically refined by calculating total annual returns over time and obtaining estimates of age composition to identify brood year contributions. This report describes the collection and analysis of such information from the 1989–2004 field seasons and includes estimates of coho salmon age composition by fish size and sex, derived from sampling the inriver and spawning escapement from 1989 through 1996, and the sport fishery harvest from 1993 through 2004.

Table 1.–Buskin River coho salmon weir counts and subsistence, commercial, and sport fishery data, 1989–2004.

Year	Weir count <sup>a</sup>	Commercial harvest <sup>b</sup>	Subsistence harvest <sup>c</sup>	Sport estimate <sup>d</sup>				Escapement	Total run	SE
				Harvest	SE	Catch	Angler days			
1989	9,930	0	1,380	4,782	1,278	na	26,145	8,974	15,136	1,022
1990	6,222	1	1,810	1,521	402	3,086	19,151	5,918	9,250	540
1991	8,929	15	1,505	4,121	675	5,593	21,991	8,105	13,746	540
1992	6,535	0	1,996	1,474	308	2,097	15,482	6,240	9,710	246
1993	6,813	7	1,724	4,215	752	6,747	17,072	5,970	11,916	602
1994	8,146	15	2,193	2,429	395	3,963	16,534	7,660	12,297	316
1995	8,694	224	1,309	2,132	476	3,505	14,089	8,268	11,933	381
1996	8,439	0	1,372	2,481	465	4,258	14,159	7,943	11,796	372
1997	10,926	0	1,445	2,864	464	5,492	10,734	10,353	14,662	371
1998	9,062	9	1,555	2,669	486	4,288	14,332	8,528	12,761	389
1999	9,794	3	1,501	3,422	557	7,094	19,382	9,110	14,036	446
2000	8,048	0	2,041	2,589	628	5,541	21,002	7,530	12,160	502
2001	13,494	0	1,457	2,332	477	3,928	9,539	13,028	16,817	382
2002	10,649	0	1,582	2,497	532	4,388	18,450	10,150	14,229	426
2003	13,150	6	1,362	3,302	631	4,592	14,311	12,490	17,160	505
2004	9,599	95	1,496	4,860	822	8,562	17,549	8,627	15,078	658
Average 1989–2004	9,277	23	1,608	2,981		4,876	16,870	8,681	13,293	481

<sup>a</sup> Includes estimates for periods when weir not operating.

<sup>b</sup> Includes only stat area 259-22 (Woman's Bay).

<sup>c</sup> Includes harvest from Buskin River and Woman's Bay.

<sup>d</sup> Statewide harvest survey.

## OBJECTIVES

Published operational plans detailing annual objectives of the coho salmon project are not available for years 1989–1991, 1993, and 1996. Documented annual study objectives during other years are provided in Table 2. Overall project objectives were as follows:

- 1) Census the coho salmon immigration into Buskin River from 15 August to 1 October.
- 2) Estimate the age, sex, and length (ASL) composition of the coho salmon escapement.

Prior to 1993, estimates of coho salmon ASL composition were obtained either from fish sampled at the weir or from fish that were subsequently beach seined from the spawning escapement into Buskin Lake. From 1993 through 1997, samples were obtained from both the spawning escapement and the sport fishery harvest. Since 1998, ASL estimates have been made solely using samples from the sport fishery.

Table 2.–Study objectives as outlined in operational plans by year and sample source, 1989–2004.

Year	ASL sample source <sup>a</sup>	Objective criteria
1989	Escapement	Not available
1990	No sample	Not available
1991	Escapement	Not available
1992	Escapement	Proportion by age-sex class is within $\pm 10\%$ of the true value 90% of the time.
1993	Escapement	Not available
	Sport Harvest	Not available
1994	Escapement	Proportion by age-sex class is within $\pm 10\%$ of the true value 95% of the time.
	Sport Harvest	Same as escapement
1995	Escapement	Proportion by age-sex class is within $\pm 10\%$ of the true value 95% of the time.
	Sport Harvest	Same as escapement
1996	Escapement	Not available
	Sport Harvest	Not available
1997	Escapement	Proportion by age-sex class is within $\pm 40\%$ of the true value 95% of the time for each of the 2 age classes that comprise more than 95% of the escapement.
	Sport Harvest	Proportion by age-sex class is within $\pm 45\%$ of the true value 95% of the time for each of the 2 age classes that comprise more than 90% of the sport harvest.
1998	Sport Harvest	Proportion by age-sex class is within $\pm 45\%$ of the true value 95% of the time for each of the 2 age classes that comprise more than 90% of the sport harvest.
1999	Sport Harvest	same as 1998
2000	Sport Harvest	Proportion by age-sex class is within $\pm 50\%$ of the true value 95% of the time for each of the 2 age classes that comprise more than 90% of the sport harvest.
2001	Sport Harvest	same as 2000
2002	Sport Harvest	Proportion by age-sex class is within $\pm 25\%$ of the true value 95% of the time for each of the 2 age classes that comprise more than 90% of the sport harvest.
2003	Sport Harvest	Proportion by age-sex class is within $\pm 20\%$ of the true value 95% of the time for each of the 2 age classes that comprise more than 90% of the sport harvest.
2004	Sport Harvest	same as 2003

<sup>a</sup> ASL = age, sex, and length

# METHODS

## DATA COLLECTION

### Weir Counts

The coho salmon weir spans the Buskin River across a channel approximately 40 m wide located 2 km upstream of the river mouth, where the predominately small rock substrate is suitable for holding a weir. The weir design is conventional, consisting of a framework of weighted wooden tripods covered along the leading side with aluminum cross stringers and rigid aluminum panels measuring 2.01 m in height and 0.76 m in width and made of 2.54 cm diameter schedule-40 pipe sections spaced 2.54 cm apart welded into an aluminum T-bar channel to provide structural continuity. This structure created a barrier to uncontrolled passage of fish and allowed free passage of water. Four counting gates integrated into the panel array allowed for the controlled passage of fish over a submerged white-colored background medium to visually assist in species identification and fish enumeration. A funnel entrance trap constructed of aluminum panels and attached to one of the counting gates was installed to capture upstream-migrating coho salmon.

During each year of the study, all species of immigrant and out-migrant anadromous fish passing through the weir were enumerated whenever possible. Generally, the weir was continuously operational from mid-August through the end of September, although in nearly every year, a portion of the total escapement was estimated on one or more occasions when high water levels precluded the controlled passage of fish. Estimates were calculated using a variety of methods, described in Table 3. As a result of periodic interruptions in weir counts from high water events and also variability in the annual duration of weir operations, the weir count in a given year should be considered a minimal indicator of total inriver escapement.

Table 3.—Methods used to interpolate Buskin River coho salmon weir counts during high water events, 1990–2004.

Year	Weir-tending dates	Total days weir out	Dates weir out	Number estimated	Percent estimated	Estimate per incident	Estimation methods
1989	20 Aug–10 Oct	0	na	0	0%	0	
1990	17 Jul–26 Sep	8	16–23 Sep	3,043	49%	3,043	Foot surveys, partial-day weir counts, and normal counts for the date averages
1991	20 Aug–28 Sep	9	7 Sep	2,862	32%	150	Visual
			13–18 Sep			2,272	Average before and after
			23–24 Sep			440	Average before and after
1992	25 Aug–7 Oct	0	7 Oct	83	1%	83	Stream survey following weir removal
1993	21 Aug–27 Sep	8	25–31 Aug	874	13%	529	Not available
			5–7 Sep			345	Average before

-continued-

Table 3.–Part 2 of 2.

Year	Weir-tending dates	Total days weir out	Dates weir out	Number estimated	Percent estimated	Estimated per incident	Estimation methods
1994	15 Aug–30 Sep	4	20–21 Sep	1,041	13%	679	Average before and after
			24–25 Sep			362	Average before and after
1995	15 Aug–16 Sep	9	5–9 Sep	4,047	47%	1,200	Historical run timing
			post weir			2,847	Historical run timing
1996	15 Aug–24 Sep	20	6–9 Sep	2,355	28%	1,700	Average before and after
			13–16 Sep			330	Average before and after
			16–20 Sep			150	Average before and after
			post weir			175	Historical run timing
1997	15 Aug–6 Oct	8	7–8 Sep	2,203	20%	600	Visual
			16 Sep			500	Visual
			21–25 Sep			1,092	Not available
			6 Oct			11	Stream survey following weir removal
1998	14 Aug–29 Sep	6	31 Aug	1,300	14%	0	Out for 12 hours; no estimate
			2–3 Sep			500	Visual
			10–12 Sep			800	Visual
1999	20 Aug–4 Oct	10	14–24 Sep	4,315	44%	4,315	Historical run timing
2000	20 Aug–4 Oct	0	4 Oct	300	4%	300	Visual following weir removal
2001	17 Aug–29 Sep	6	16–18 Sep	2,911	22%	900	Historical run timing
			21–25 Sep			2,011	Historical run timing
2002	12 Aug–30 Sep	0	29 Aug	81	1%	25	Visual; estimate of 25 due to hole made by bear
			22 Sep			25	Visual; estimate of 25 due to hole made by bear
			post weir			31	
2003	16 Aug–29 Sep	3	29 Aug–1 Sep	932	7%	932	Historical run timing
2004	30 Jul–30 Sep	3	23–25 Aug	233	2%	225	Historical run timing
			9–10 Sep			8	Historical run timing

*Note:* Estimates may not match immigration numbers for particular dates in Appendix A1 because the weir may not have been out the entire day.

### Fishery Harvests

Annual subsistence harvests of Buskin River coho salmon were estimated from returns of subsistence permits received by the CF Kodiak office. Every year, a percentage of permit holders fail to either report their catch or return their permit, and it is not possible to determine the

proportion of these permit holders who harvested Buskin River coho salmon. Consequently, the reported harvest for a given year is assumed to be low.

The sport fishery harvest of coho salmon was estimated by the Statewide Harvest Survey (Mills 1990-1994; Howe et al. 1995-1996; Howe et al. 2001a-d; Walker et al. 2003; Jennings et al. 2004, 2006a-b, 2007). Sport fishing effort recorded in the SWHS representing Buskin River fresh waters has been included in this report. Commercial coho salmon harvests were obtained from the CF Statewide Harvest Receipt (fish ticket) database.

### **Age, Sex, and Length (ASL) Composition Sampling**

Sampling the inriver run at the weir is likely the most non-selective way of obtaining ASL data from the escapement. Coho salmon were originally sampled for ASL data at the weir; however, sampling at this location in the past has resulted in an unacceptable level of mortality. Therefore, the ASL data in this report (1989–2004) originated predominantly from coho salmon sampled from either the spawning escapement (beach seining in Buskin Lake) or the sport fishery harvest, or a combination of both.

In 1989, coho salmon were beach seined in mid-October in Buskin Lake. No ASL sampling was conducted in 1990. In 1991, coho salmon escapement was sampled at the weir. During 1992, a combination of samples were collected, including escapement samples obtained at the weir in late August and a mix of escapement, sport-harvested fish, and weir mortalities sampled between mid-September and mid-October. Between 1993 and 1996, ASL samples were obtained both from sport-harvested coho salmon and beach seined spawning fish. From 1997 through 2004, all ASL samples were collected from the inriver sport fish harvest. Sample periods for systematically collected ASL data were variously stratified into two 3-week intervals between 20 August and 30 September. Sampling was typically conducted on 3 days during each week.

Subsistence and commercial harvests were not sampled for ASL composition; samples from the escapement and sport fish harvests were used as proxies for each of these run components.

Length from mid-eye to fork-of-tail (MEFT) was recorded to the nearest millimeter for each fish sampled. Sex was determined through external characteristics. Whenever possible, 2 to 4 scales were removed from the left side of the body, at a point on a diagonal line from the posterior insertion of the dorsal fin to the anterior insertion of the anal fin, 2 scale rows above the lateral line (Welanders 1940). Sampled scales were placed on a gummed card for subsequent analysis. Scales not available from the preferred area were taken in the same linear plane but from the third or fourth scale row above the lateral line. Scales not available in either preferred area on the left side of the fish were collected from the same region on the opposite side. Ages of sampled coho salmon were determined from scales using criteria described in Mosher (1969).

## **DATA ANALYSIS**

### **Total Run, Harvest, and Escapement**

Escapement (E), subsistence harvest (Sub), commercial harvest (CFH), and sport fish harvest (SFH) were summed to estimate the number of coho salmon in the total run (T):

$$\hat{N}_T = \hat{N}_E + N_{Sub} + N_{CFH} + \hat{N}_{SFH} \quad (1)$$

Subsistence, sport, and commercial harvests were assumed known with zero variance;  $\hat{N}_{SFH}$  and  $\text{var}(\hat{N}_{SFH})$  were provided by the SWHS. Because sport fishery harvest of coho salmon is not reported by area, and harvest occurs upriver of the weir, escapement was estimated as

$$\hat{N}_E = N_{IR} - \tilde{p}_{Ab} \hat{N}_{SFH} \quad (2)$$

where  $N_{IR}$  is the inriver run, and  $\tilde{p}_{Ab}$  is the assumed proportion of the sport fish harvest occurring above the weir; this quantity originates from a creel survey conducted in 1986 (Murray 1987) and more recent field observations. We assumed a value of 0.2 for  $\tilde{p}_{Ab}$ , with the understanding that bias may be introduced. The bias is not expected to be serious; there is only a 10% increase between escapement estimates over the last 7 years if a value for  $\tilde{p}_{Ab}$  of 0.1 versus 0.5 is used.

The variance of  $\hat{N}_E$  was estimated as

$$\text{var}(\hat{N}_E) = \tilde{p}_{Ab}^2 \text{var}(\hat{N}_{SFH}). \quad (3)$$

The variance of  $\hat{N}_T$  was estimated as

$$\text{var}(\hat{N}_T) = \text{var}(\hat{N}_{SFH})(1 - \tilde{p}_{Ab})^2. \quad (4)$$

### Exploitation Rate

The exploitation rate for fishery  $i$  was estimated as

$$\hat{U}_i = \frac{\hat{N}_i}{\hat{N}_T}. \quad (5)$$

For  $i =$  subsistence or commercial fishery, the variance of the exploitation rate was estimated as

$$\text{var}(\hat{U}_i) = N_i^2 \frac{\text{var}(\hat{N}_T)}{\hat{N}_T^4}. \quad (6)$$

For  $i =$  sport fishery, the variance of the exploitation rate was estimated as

$$\text{var}(\hat{U}_{SFH}) = \frac{[N_{IR} + N_{Subs} + N_{CFH}]^2 \text{var}(\hat{N}_{SFH})}{[N_{IR} + N_{Subs} + N_{CFH} + (1 - \tilde{p}_{Ab})\hat{N}_{SFH}]^4}. \quad (7)$$

Total exploitation rate was estimated as

$$\hat{U}_T = \frac{\sum_{i=1}^3 \hat{N}_i}{\hat{N}_T} \quad (8)$$

with variance estimated with simulation.

## Age-Sex composition

Contingency table analysis was used to test for 1) differences in age-sex composition over time (using two 3-week strata) for each of the inriver run, lake-escapement, and sport fish harvest populations and 2) differences in age-sex composition between the inriver run, lake-escapement, and sport-harvest populations. The first analysis was conducted to provide baseline information for future sampling designs; there are currently no reasonable weights available for use in a time-stratified analysis. For the sport fish harvest, there is only 1 estimate provided annually by the SWHS. For the inriver run, there are weir counts but a significant sport fish harvest occurs above the weir, which complicates any stratified estimate. (The inriver run sample is a hybrid sample of the escapement and sport fish harvest). The second analysis was conducted to provide information on potential selectivity of the different sample sources.

Proportions and variances of age or sex class  $j$  for the run were estimated from pooled data (over time and among sources) in each year, as in equations (1) and (2):

$$\hat{p}_j = \frac{n_j}{n} \quad (9)$$

$$\text{var}(\hat{p}_j) = \frac{\hat{p}_j(1 - \hat{p}_j)}{n - 1}, \quad (10)$$

where

$n_j$  = the number of coho salmon in sample that were in age or sex class  $j$

$n$  = the number of coho salmon sampled.

The number of coho salmon of age or sex class  $j$  in the population of interest  $i$  (where  $i = E, IR, SFH, Sub, CFH, \text{ or } T$ ) was estimated by

$$\hat{N}_{ij} = \hat{N}_i \hat{p}_j, \quad (11)$$

and its variance by

$$\text{var}(\hat{N}_{ij}) = \hat{N}_i^2 \text{var}(\hat{p}_j) + \hat{p}_j^2 \text{var}(\hat{N}_i) - \text{var}(\hat{p}_j) \text{var}(\hat{N}_i). \quad (12)$$

## Length

Mean lengths at age and their standard errors were estimated for each age class of the run. Density plots (Sarkar 2008) were also created for length-at-age by sex pooled over years and for length-at-age by year.

# RESULTS AND DISCUSSION

## TOTAL RUN, HARVEST, AND SPAWNING ESCAPEMENT

Total run and its components from 1989 through 2004 are presented in Table 1. Weir counts by year and date are presented in Appendix A1. The total annual run estimates fluctuated between 9,250 and 17,160, with an average relative precision (95%) of about 7%.

There are a number of sources of bias in the estimates of total run. The first source of bias results from unreturned subsistence permits. This bias, which would overestimate the total run, is not thought to be severe. However, applying the worst rate of return of subsistence permits for this period of 60% to each year's harvest shows that at least 92% of the total run is accounted for with the current methods. It is noted also that this adjustment assumes harvest associated with unreturned permits was equal to that of returned permits; it is often lower because many unreturned permit-holders do not fish, such that the real bias is probably lower still. A second source of unquantifiable bias is associated with the assumption that 20% of the sport fish harvest occurs upstream of the weir; this number originated from a creel survey by Murray (1987) and likely fluctuates annually, with a possible unknown trend over years. The third and possibly most important source of bias lies in the estimation of weir counts during periods when the weir is inoperable due to high water. The percentage of the weir count represented by interpolated counts (Table 3) ranges from 0% to 49%, with an average of 20%. Daily entry of coho salmon to the Buskin River is highly variable both within and between years (Appendix A1) and interpolation is difficult. Furthermore, there are years when the weir was likely removed before the run was complete (e.g. 2000, 2003, based on historic run timing), resulting in probable underestimation of the run. Finally, the inriver run and proportion of sport fish harvest are assumed constants in variance calculations, resulting in an underestimation of the variance of total run, spawning escapement, exploitation rates, and brood year returns.

Sport fish harvests fluctuated between 1989 and 2004 from 1,521 to 4,860 coho salmon and were on average about double the subsistence harvests (Table 1). Commercial harvests were very low, averaging 23 fish over the period. Total exploitation rates (Table 4) ranged from 22.5% to 49.9%, and averaged 35%. Commercial, sport, and subsistence exploitation rates averaged 0.2%, 22%, and 13%, respectively. The sport fishery represented about 63% of the total exploitation.

Table 4.—Estimated exploitation rates (percent of total run) by the subsistence, sport, and commercial fisheries of coho salmon migrating to the Buskin River, 1989–2004.

Year	Subsistence fishery	SE	Sport fishery	SE	Commercial	SE	Total	SE
1989	9.1	0.6	31.6	6.3	0.0	0.0	40.7	8.8
1990	19.6	1.1	16.4	3.8	0.0	0.0	36.0	4.5
1991	10.9	0.4	30.0	3.7	0.1	0.0	41.0	5.2
1992	20.6	0.5	15.2	2.8	0.0	0.0	35.7	3.3
1993	14.5	0.7	35.4	4.5	0.1	0.0	49.9	6.9
1994	17.8	0.5	19.8	2.7	0.1	0.0	37.7	3.3
1995	11.0	0.4	17.9	3.4	1.9	0.1	30.7	4.1
1996	11.6	0.4	21.0	3.3	0.0	0.0	32.7	4.1
1997	9.9	0.2	19.5	2.7	0.0	0.0	29.4	3.2
1998	12.2	0.4	20.9	3.2	0.1	0.0	33.2	3.9
1999	10.7	0.3	24.4	3.2	0.0	0.0	35.1	4.1
2000	16.8	0.7	21.3	4.3	0.0	0.0	38.1	5.5
2001	8.7	0.2	13.9	2.5	0.0	0.0	22.5	2.8
2002	11.1	0.3	17.5	3.2	0.0	0.0	28.7	3.8
2003	7.9	0.2	19.2	3.1	0.0	0.0	27.2	3.8
2004	9.9	0.4	32.2	4.0	0.6	0.0	42.8	5.8
average	12.6		22.3		0.2		35.1	

## AGE-SEX COMPOSITION

Annual age-sex composition and mean length-at-age estimates are presented for 1989 and 1991 through 2004 in Tables 5 through 20. Age-2.1 fish dominated the runs (averaging 68%), followed by age-1.1 (22%) and age-3.1 fish (8%). The average male to female ratio was 1.22:1, ranging from 0.86 to 2.1. Source-specific age-sex data are presented in Appendices B1–B10 and subsistence, commercial, and sport harvests by age are presented in Appendices C1 and D1. Sample sizes by source, date, sex, and age are given in Appendices E1 and F1.

The age-sex composition estimates assume that the pooled samples used within each year are representative of the total run. In many cases the age, sex, and age-sex compositions were not statistically different among time strata or between sources (Appendix G1); there were no significant differences for 1989, 1991–1992, 1995, 1998–1999, and 2002–2004 data. Occasionally, when statistical differences existed, they were small, with the statistical significance resulting from large sample sizes. Without changes in age-sex composition over time or between sources, pooled samples are representative of the combined sources sampled.

In the few instances where larger differences over time or between sources were found, use of the pooled samples assumes that samples have been taken proportionally within the source. This assumption is likely not true for samples taken from the spawning escapement during egg takes in Buskin Lake over a 2- or 3-day period. Samples taken over time within the sport fish harvest are, however, likely to have been sampled in roughly proportion to the harvest over time as a result of consistent sampling through the fishery; the sport fish harvest was sampled an average of 28 days from 1994 through 2004.

Examination of changes in the age-sex composition of the sport fish harvest over time showed that with the exception of 2000 and 2001, estimates did not change appreciably over the 2 time strata used (two 3-week intervals). If, however, 4 time strata were used (four 3-week intervals) where sufficient data existed (1994–2004), sex changed fairly consistently over time, the proportion of females increasing with the passage of the run. Age composition was not found to change substantially among the 4 time strata. A caveat to these findings is that the time strata for sampling the sport fish harvest are confounded with geographical strata; during the first part of the run, the sport fish harvest, and therefore sample, is restricted to an area downstream of the weir, while in the latter part of the run, most of the harvest, and sample, is taken throughout the entire drainage.

Density plots of length-at-age by sex are given in Appendix H1, pooled over years when there is sufficient data (1994–2004). No differences in mean lengths for age-2.1 and -3.1 fish were detected within sex (males: 676.1 and 676.6 mm; females: 663.2 and 663.8 mm, respectively), while age-1.1 fish were smaller ( $P < 0.05$ ; males: 660.8 and females: 644.8 mm). On average, males were larger than females. Length-at-age by year is depicted in Appendix H2. The 1994–2004 average lengths of age-1.1, -2.1, -3.1 fish were 653.7, 669.6, and 671.3 mm, respectively.

## BROOD TABLE

The age composition data, along with estimates of sport, subsistence, and commercial harvests and the inriver run allowed construction of a brood table for Buskin River coho salmon (Table 21). Spawning escapement ranged from 5,918 to 13,028 fish. For 1989–2000, the average return per spawner was 1.77 and the average percentages of age-1.1, -2.1 and -3.1 coho salmon at return were 22%, 69% and 8%, respectively. A full spawner-recruit analysis is not presented.

Table 5.—Estimated age and sex composition and mean length-at-age of Buskin River coho salmon, 1989.

	Coho salmon age class										Total	
	1.0	1.1	1.2	2.0	2.1	2.2	3.0	3.1	3.2	4.1		
<b><u>Females</u></b>												
Number sampled		10			85	1		3				99
Percent		4.3			36.6	0.4		1.3				40.7
SE percent		1.3			3.2	0.4		0.7				3.0
Inriver run		428			3,638	43		128				4,046
SE run		133			315	43		74				303
Mean length		652			647	645		660				645
SE mean length		9			3.0			13				3
Minimum length		590			560	645		645				560
Maximum length		680			715	645		685				715
<b><u>Males</u></b>												
Number sampled		17		6	106		1	3				144
Percent		7.3		2.6	45.7		0.4	1.3				59.3
SE percent		1.7		1.0	3.3		0.4	0.7				3.0
Inriver run		728		257	4,537		43	128				5,884
SE run		171			326			74				303
Mean length		609		323	640		320	668				622
SE mean length		16		10	5			40				7
Minimum length		490		285	450		320	600				285
Maximum length		700		345	755		320	740				755
<b><u>All</u></b>												
Number sampled		28 <sup>a</sup>		6	191	1	1	6				254
Percent		12.1		2.6	82.3	0.4	0.4	2.6				100.0
SE percent		2.1		1.0	2.5	0.4	0.4	1.0				0.0
Inriver run		1,198		257	8,175	43	43	257				9,930
SE run		213		104	250	43	43	104				0
Mean length		616		323	643	645	320	664				632
SE mean length		10		10	3			19				4
Minimum length		490		285	450	645	320	600				285
Maximum length		700		345	755	645	320	740				755

Note: Samples seined in Buskin Lake, 12–19 October.

<sup>a</sup> Includes 1 fish for which sex was not determined.

<sup>b</sup> Estimated sport fish harvest above the weir must be subtracted from inriver run for spawning escapement.

Table 6.—Estimated age and sex composition and mean length-at-age of Buskin River coho salmon, 1991.

	Coho salmon age class										Total	
	1.0	1.1	1.2	2.0	2.1	2.2	3.0	3.1	3.2	4.1		
<b><u>Females</u></b>												
Number sampled		6			41			13				82
Percent		5.0			33.9			10.7				49.1
SE percent		2.0			4.3			2.8				3.8
Inriver run		443			3,026			959				4,384
SE run		177			386			252				343
Mean length		596			613			603				612
SE mean length		22			7			15				5
Minimum length		508			492			494				492
Maximum length		677			701			686				701
<b><u>Males</u></b>												
Number sampled		14			38			9				85
Percent		11.6			31.4			7.4				50.9
SE percent		2.9			4.2			2.4				3.8
Inriver run		1,033			2,804			664				4,545
SE run		261			378			214				343
Mean length		598			623			630				619
SE mean length		12			7			17				5
Minimum length		508			535			541				508
Maximum length		667			724			708				724
<b><u>All</u></b>												
Number sampled		20			79			22				167
Percent		16.5			65.3			18.2				100.0
SE percent		3.4			4.3			3.5				0.0
Inriver run		1,476			5,830			1,623				8,929
SE run		303			388			314				0
Mean length		597			618			614				616
SE mean length		10			5			11				4
Minimum length		508			492			494				492
Maximum length		677			724			708				724

Note: Sampled at weir 28 August–20 September.

<sup>a</sup> Estimated sport fish harvest above the weir must be subtracted from inriver run for spawning escapement.

Table 7.—Estimated age and sex composition and mean length-at-age of Buskin River coho salmon, 1992.

	Coho salmon age class										Total	
	1.0	1.1	1.2	2.0	2.1	2.2	3.0	3.1	3.2	4.1		
<b><u>Females</u></b>												
Number sampled		13		1	52			6				103
Percent		9.5		0.7	38.0			4.4				53.6
SE percent		2.5		0.7	4.2			1.8				3.6
Inriver run		620		48	2,480			286				3,506
SE run		164		48	272			115				232
Mean length		597		327	644			658				631
SE mean length		13			7			11				6
Minimum length		517		327	492			614				327
Maximum length		660		327	730			688				730
<b><u>Males</u></b>												
Number sampled		19		2	39			5				89
Percent		13.9		1.5	28.5			3.6				46.4
SE percent		3.0		1.0	3.9			1.6				3.6
Inriver run		906		95	1,860			239				3,029
SE run		194		67	253			105				232
Mean length		644		359	665			649				646
SE mean length		15		3	10			20				8
Minimum length		507		356	518			586				365
Maximum length		768		362	782			684				782
<b><u>All</u></b>												
Number sampled		32		3	91			11				192
Percent		23.4		2.2	66.4			8.0				100.0
SE percent		3.6		1.3	4.0			2.3				0.0
Inriver run		1,526		143	4,341			525				6,535
SE run		237		82	264			152				0
Mean length		625		348	653			654				638
SE mean length		11		11	6			10				5
Minimum length		507		327	492			586				327
Maximum length		768		362	782			688				782

Note: Sampled at weir and sport fishery 26 August–10 October.

<sup>a</sup> Estimated sport fish harvest above the weir must be subtracted from inriver run for spawning escapement.

Table 8.—Estimated age and sex composition and mean length-at-age of Buskin River coho salmon, 1993.

	Coho salmon age class										Total	
	1.0	1.1	1.2	2.0	2.1	2.2	3.0	3.1	3.2	4.1		
<b><u>Females</u></b>												
Number sampled		15			100			17				162
Percent		5.1			33.7			5.7				43.8
SE percent		1.3			2.8			1.4				2.5
Inriver run		344			2,294			390				2,983
SE run		87			188			92				170
Mean length		627			639			660				638
SE mean length		12			4			6				3
Minimum length		505			398			597				398
Maximum length		698			727			699				727
<b><u>Males</u></b>												
Number sampled		38		1	113			13				208
Percent		12.8		0.3	38.0			4.4				56.2
SE percent		1.9		0.3	2.8			1.2				2.5
Inriver run		872		23	2,592			298				3,830
SE run		133		23	193			81				170
Mean length		637		370	658			653				651
SE mean length		7			4			9				4
Minimum length		510		370	473			616				370
Maximum length		700		370	764			721				764
<b><u>All</u></b>												
Number sampled		53		1	217 <sup>a</sup>			30				373
Percent		17.8		0.3	73.1			10.1				100.0
SE percent		2.2		0.3	2.6			1.8				0.0
Inriver run		1,216		23	4,978			688				6,813
SE run		152		23	176			120				0
Mean length		634		370	649			657				645
SE mean length		6			3			5				2
Minimum length		505		370	398			597				370
Maximum length		700		370	764			721				764

Note: Sampled from sport fishery 30 August–25 September and seined in Buskin Lake 21–28 October.

<sup>a</sup> Includes 4 fish for which sex was not determined.

<sup>b</sup> Estimated sport fish harvest above the weir must be subtracted from inriver run for spawning escapement.

Table 9.—Estimated age and sex composition and mean length-at-age of Buskin River coho salmon, 1994.

	Coho salmon age class										Total	
	1.0	1.1	1.2	2.0	2.1	2.2	3.0	3.1	3.2	4.1		
<b><u>Females</u></b>												
Number sampled		20			82			5				136
Percent		6.1			25.1			1.5				32.0
SE percent		1.3			2.4			0.7				2.2
Inriver run		498			2,043			125				2,607
SE run		109			197			56				180
Mean length		664			680			697				677
SE mean length		7			4			17				3
Minimum length		587			502			643				502
Maximum length		724			753			733				753
<b><u>Males</u></b>												
Number sampled		70	1	6	130		1	12				289
Percent		21.4	0.3	1.8	39.8		0.3	3.7				68.0
SE percent		2.3	0.3	0.7	2.7		0.3	1.0				2.2
Inriver run		1,744	25	149	3,238		25	299				5,539
SE run		186	25	61	222		25	85				180
Mean length		664	595	352	689		341	669				669
SE mean length		6		6	4			12				4
Minimum length		487	595	330	520		341	604				330
Maximum length		758	595	365	774		341	741				774
<b><u>All</u></b>												
Number sampled		90	1	6	212		1	17				425
Percent		27.5	0.3	1.8	64.8		0.3	5.2				100.0
SE percent		2.5	0.3	0.7	2.7		0.3	1.2				0.0
Inriver run		2,242		149	5,281			423				8,146
SE run		203		61	217			101				0
Mean length		664	595	352	686		341	677				672
SE mean length		5		6	3			10				3
Minimum length		487	595	330	502		341	604				330
Maximum length		758	595	365	774		341	741				774

Note: Sampled from sport fishery 19 August–21 September and seined in Buskin Lake 26–27 October.

<sup>a</sup> Estimated sport fish harvest above the weir must be subtracted from inriver run for spawning escapement.

Table 10.—Estimated age and sex composition and mean length-at-age of Buskin River coho salmon, 1995.

	Coho salmon age class										Total	
	1.0	1.1	1.2	2.0	2.1	2.2	3.0	3.1	3.2	4.1		
<b><u>Females</u></b>												
Number sampled		34			116			3				183
Percent		10.5			35.9			0.9				45.5
SE percent		1.7			2.7			0.5				2.4
Inriver run		915			3,122			81				3,958
SE run		149			233			47				211
Mean length		633			663			657				657
SE mean length		7			3			20				3
Minimum length		555			500			635				500
Maximum length		695			730			696				745
<b><u>Males</u></b>												
Number sampled	1	40		1	123	1		4				219
Percent	0.3	12.4		0.3	38.1	0.3		1.2				54.5
SE percent	0.3	1.8		0.3	2.7	0.3		0.6				2.4
Inriver run	27	1,077		27	3,311	27		108				4,736
SE run	27	160		27	235	27		54				211
Mean length	310	654		344	670	665		708				661
SE mean length		7			4			11				4
Minimum length	310	544		344	490	665		675				310
Maximum length	310	727		344	766	665		720				766
<b><u>All</u></b>												
Number sampled	1	74		1	239	1		7				402
Percent	0.3	22.9		0.3	74.0	0.3		2.2				100.0
SE percent	0.3	2.3		0.3	2.4	0.3		0.8				0.0
Inriver run	27	1,992		27	6,433	27		188				8,694
SE run	27	204		27	213	27		71				0
Mean length	310	645		344	667	665		686				659
SE mean length		5			2			14				2
Minimum length	310	544		344	490	665		635				310
Maximum length	310	727		344	766	665		720				766

Note: Sampled from sport fishery 23 August–14 September and seined in Buskin Lake on 23 October.

<sup>a</sup> Estimated sport fish harvest above the weir must be subtracted from inriver run for spawning escapement.

Table 11.—Estimated age and sex composition and mean length-at-age of Buskin River coho salmon, 1996.

	Coho salmon age class										Total	
	1.0	1.1	1.2	2.0	2.1	2.2	3.0	3.1	3.2	4.1		
<b><u>Females</u></b>												
Number sampled		24			81	1		11				139
Percent		9.1			30.6	0.4		4.2				42.8
SE percent		1.8			2.8	0.4		1.2				2.7
Inriver run		764			2,579	32		350				3,609
SE run		149			240	32		104				227
Mean length		619			666 <sup>a</sup>	691		665				656
SE mean length		11			4			13				4
Minimum length		547			595	691		594				521
Maximum length		703			742	691		744				744
<b><u>Males</u></b>												
Number sampled		34			103			11				186
Percent		12.8			38.9			4.2				57.2
SE percent		2.1			3.0			1.2				2.7
Inriver run		1,083			3,280			350				4,830
SE run		174			254			104				227
Mean length		649			673			674				667
SE mean length		8			4			13				4
Minimum length		535			482			600				482
Maximum length		727			780			752				780
<b><u>All</u></b>												
Number sampled		59 <sup>b</sup>			188 <sup>c</sup>	1		24 <sup>d</sup>				325
Percent		22.3			70.9	0.4		9.1				100.0
SE percent		2.6			2.8	0.4		1.8				0.0
Inriver run		1,879			5,987			764				8,439
SE run		216			236			149				0
Mean length		638			669 <sup>a</sup>	691		672				662
SE mean length		7			3			9				3
Minimum length		535			482	691		594				388
Maximum length		727			780	691		752				780

Note: Sampled from sport fishery 21 August–23 September and seined in Buskin Lake 23–30 October.

<sup>a</sup> Mean length based on one fish less.

<sup>b</sup> Includes 1 fish for which sex was not determined.

<sup>c</sup> Includes 4 fish for which sex was not determined.

<sup>d</sup> Includes 2 fish for which sex was not determined.

<sup>e</sup> Estimated sport fish harvest above the weir must be subtracted from inriver return for spawning escapement.

Table 12.—Estimated age and sex composition and mean length-at-age of Buskin River coho salmon, 1997.

	Coho salmon age class										Total	
	1.0	1.1	1.2	2.0	2.1	2.2	3.0	3.1	3.2	4.1		
<b><u>Females</u></b>												
Number sampled		14			63		1	10				127
Percent		6.5			29.3		0.5	4.7				43.3
SE percent		1.7			3.1		0.5	1.4				2.9
Inriver run		711			3,202		51	508				4,736
SE run		185			341		51	158				313
Mean length		661			677		360	648				664
SE mean length		9			4			30				4
Minimum length		609			557		360	388				361
Maximum length		725			780		360	723				780
<b><u>Males</u></b>												
Number sampled		28		2	84			12		1		165
Percent		13.0		0.9	39.1			5.6		0.5		56.3
SE percent		2.3		0.7	3.3			1.6		0.5		2.9
Inriver run		1,423		102	4,269			610		51		6,153
SE run		252		72	365			172		51		313
Mean length		674		388	682			651		749		676
SE mean length		9		22	6			18				5
Minimum length		556		366	565			547		749		366
Maximum length		750		410	980			711		749		980
<b><u>All</u></b>												
Number sampled		42		2	147		1	22		1		293
Percent		19.5		0.9	68.4		0.5	10.2		0.5		100.0
SE percent		2.7		0.7	3.2		0.5	2.1		0.5		0.0
Inriver run		2,134		102	7,470		51	1,118		51		10,926
SE run		297		72	348		51	227		51		0
Mean length		669		388	680		360	650		749		671
SE mean length		7		22	4			16				3
Minimum length		556		366	557		360	388		749		360
Maximum length		750		410	980		360	723		749		980

Note: Samples from sport fishery 22 August–4 October.

<sup>a</sup> Includes 1 fish for which sex was not determined.

<sup>b</sup> Estimated sport fish harvest above the weir must be subtracted from inriver run for spawning escapement.

Table 13.—Estimated age and sex composition and mean length-at-age of Buskin River coho salmon, 1998.

	Coho salmon age class										Total	
	1.0	1.1	1.2	2.0	2.1	2.2	3.0	3.1	3.2	4.1		
<b><u>Females</u></b>												
Number sampled		18			69			8				124
Percent		7.8			29.7			3.4				42.0
SE percent		1.8			3.0			1.2				2.8
Inriver run		703			2,695			312				3,809
SE run		160			273			109				257
Mean length		660			680			677				674
SE mean length		10			4			10				3
Minimum length		516			521			630				516
Maximum length		709			746			716				746
<b><u>Males</u></b>												
Number sampled		23			96	1	2	15				170
Percent		9.9			41.4	0.4	0.9	6.5				57.8
SE percent		2.0			3.2	0.4	0.6	1.6				2.8
Inriver run		898			3,750	39	78	586				5,240
SE run		179			294	39	55	147				257
Mean length		678			683	659	372	690				680
SE mean length		8			6		22	12				5
Minimum length		580			207	659	350	577				207
Maximum length		735			750	659	393	753				753
<b><u>All</u></b>												
Number sampled		42 <sup>a</sup>			165	1	2	23				295
Percent		18.1			71.1	0.4	0.9	9.9				100.0
SE percent		2.5			3.0	0.4	0.6	2.0				0.0
Inriver run		1,641			6,445	39	78	898				9,062
SE run		230			271	39	55	179				0
Mean length		671			682	659	372	685				676
SE mean length		6			4		22	8				3
Minimum length		516			207	659	350	577				207
Maximum length		735			750	659	393	753				753

Note: Sampled from sport fishery 20 August–21 September.

<sup>a</sup> Includes 1 fish for which sex was not determined.

<sup>b</sup> Estimated sport fish harvest above the weir must be subtracted from inriver run for spawning escapement.

Table 14.—Estimated age and sex composition and mean length-at-age of Buskin River coho salmon, 1999.

	Coho salmon age class										Total	
	1.0	1.1	1.2	2.0	2.1	2.2	3.0	3.1	3.2	4.1		
<b><u>Females</u></b>												
Number sampled		28		1	110	2	1	31				200
Percent		8.8		0.3	34.5	0.6	0.3	9.7				53.9
SE percent		1.6		0.3	2.7	0.4	0.3	1.7				2.5
Inriver run		860		31	3,377	61	31	952				5,280
SE run		155		31	261	43	31	162				249
Mean length		620		320	629	597	321	645				627
SE mean length		7			3	49		6				3
Minimum length		548		320	540	548	321	520				320
Maximum length		758		320	714	645	321	696				758
<b><u>Males</u></b>												
Number sampled		24			95	2		23	1	1		171
Percent		7.5			29.8	0.6		7.2	0.3	0.3		46.1
SE percent		1.5			2.6	0.4		1.4	0.3	0.3		2.5
Inriver run		737			2,917	61		706	31	31		4,514
SE run		145			251	43		142	31	31		249
Mean length		627			650	669		653	640	720		627
SE mean length		10			6	27		13				3
Minimum length		510			525	642		434	640	720		438
Maximum length		701			716	695		710	640	720		758
<b><u>All</u></b>												
Number sampled		52		1	205	4	1	54	1	1		371
Percent		16.3		0.3	64.3	1.3	0.3	16.9	0.3	0.3		100.0
SE percent		2.1		0.3	2.7	0.6	0.3	2.1	0.3	0.3		0.0
Inriver run		1,597		31	6,294	123	31	1,658	31	31		9,794
SE run		203		31	263	61	31	206	31	31		0
Mean length		623		320	639	633	321	649	640	720		637
SE mean length		6			3	31		6				2
Minimum length		510		320	525	548	321	434	640	720		320
Maximum length		758		320	716	695	321	710	640	720		758

Note: Sampled from sport fishery 30 August–23 September.

<sup>a</sup> Estimated sport fish harvest above the weir must be subtracted from inriver run for spawning escapement.

Table 15.—Estimated age and sex composition and mean length-at-age of Buskin River coho salmon, 2000.

	Coho salmon age class										Total	
	1.0	1.1	1.2	2.0	2.1	2.2	3.0	3.1	3.2	4.1		
<b><u>Females</u></b>												
Number sampled		25			110	2		7				168
Percent		8.3			36.4	0.7		2.3				47.6
SE percent		1.6			2.8	0.5		0.9				2.6
Inriver run		666			2,931	53		187				3,830
SE run		128			223	38		70				209
Mean length		652			673	568		662				665
SE mean length		10			3	17		13				3
Minimum length		525			561	551		621				525
Maximum length		712			830	583		705				830
<b><u>Males</u></b>												
Number sampled		29		1	109	2	1	16				185
Percent		9.6		0.3	36.1	0.7	0.3	5.3				52.4
SE percent		1.7		0.3	2.8	0.5	0.3	1.3				2.6
Inriver run		773		27	2,905	53	27	426				4,218
SE run		137		27	223	38	27	104				209
Mean length		63		374	684	722	325	692				678
SE mean length		9			4	17		8				4
Minimum length		535		374	546	705	325	628				325
Maximum length		730		374	814	738	325	772				814
<b><u>All</u></b>												
Number sampled		54		1	219	4	1	23				353
Percent		17.9		0.3	72.5	1.3	0.3	7.6				100.0
SE percent		2.2		0.3	2.6	0.7	0.3	1.5				0.0
Inriver run		1,439		27	5,836	107	27	613				8,048
SE run		178		27	207	53	27	123				0
Mean length		658		374	678	645	325	683				672
SE mean length		6			3	45		7				3
Minimum length		525		374	546	551	325	621				325
Maximum length		730		374	830	738	325	772				830

Note: Sampled from sport fishery 24 August–6 October.

<sup>a</sup> Estimated sport fish harvest above the weir must be subtracted from inriver run for spawning escapement.

Table 16.—Estimated age and sex composition and mean length-at-age of Buskin River coho salmon, 2001.

	Coho salmon age class										Total	
	1.0	1.1	1.2	2.0	2.1	2.2	3.0	3.1	3.2	4.1		
<b><u>Females</u></b>												
Number sampled		87			98			1				238
Percent		21.6			24.4			0.2				46.7
SE percent		2.1			2.1			0.2				2.2
Inriver run		2,920			3,290			34				6,297
SE run		278			290			34				292
Mean length		650			654			690				654
SE mean length		5			5							3
Minimum length		505			456			690				456
Maximum length		750			774			690				774
<b><u>Males</u></b>												
Number sampled		105		5	104	1	1					272
Percent		26.1		1.2	25.9	0.2	0.2	0.0				53.3
SE percent		2.2		0.6	2.2	0.2	0.2	0.0				2.2
Inriver run		3,525		168	3,491	34	34					7,251
SE run		296		75	295	34	34					294
Mean length		668		354	676	610	404					664
SE mean length		4		8	5							4
Minimum length		535		331	500	610	404					331
Maximum length		774		370	775	610	404					775
<b><u>All</u></b>												
Number sampled		193 <sup>a</sup>		5	203 <sup>a</sup>	1	1	1				512
Percent		48.0		1.2	50.5	0.2	0.2	0.2				100.0
SE percent		2.5		0.6	2.5	0.2	0.2	0.2				0.0
Inriver run		6,478		168	6,814	34	34	34				13,494
SE run		337		75	337	34	34	34				0
Mean length		660		354	665	610	404	690				659
SE mean length		3		8	3							2
Minimum length		505		331	456	610	404	690				331
Maximum length		774		370	775	610	404	690				775

Note: Sampled from sport fishery 21 August–30 September.

<sup>a</sup> Includes 1 fish for which sex was not determined.

<sup>b</sup> Estimated sport fish harvest above the weir must be subtracted from inriver run for spawning escapement.

Table 17.—Estimated age and sex composition and mean length-at-age of Buskin River coho salmon, 2002.

	Coho salmon age class										Total	
	1.0	1.1	1.2	2.0	2.1	2.2	3.0	3.1	3.2	4.1		
<b><u>Females</u></b>												
Number sampled		26			121			8				184
Percent		8.5			39.7			2.6				50.7
SE percent		1.6			2.8			0.9				2.6
Inriver run		908			4,225			279				5,412
SE run		171			299			98				276
Mean length		649			664 <sup>a</sup>			670				660
SE mean length		6			3			12				2
Minimum length		591			557			615				557
Maximum length		700			729			712				729
<b><u>Males</u></b>												
Number sampled		20		2	126			1	1			178
Percent		6.6		0.7	41.3			0.3	0.3			49.2
SE percent		1.4		0.5	2.8			0.3	0.3			2.6
Inriver run		698		70	4,399			35	35			5,237
SE run		151		49	301			35	35			275
Mean length		665 <sup>b</sup>		364	682 <sup>c</sup>			326	658			671
SE mean length		10		13	4							5
Minimum length		585		505	505			326	658			326
Maximum length		720		795	795			326	658			795
<b><u>All</u></b>												
Number sampled		46		2	248			1	9			363
Percent		15.1		0.7	81.3			0.3	3.0			100.0
SE percent		2.1		0.5	2.2			0.3	1.0			0.0
Inriver run		1,606		70	8,659			35	314			10,649
SE run		219		49	238			35	103			0
Mean length		656		364	673			326	667			665
SE mean length		5		13	3				11			3
Minimum length		585		351	505			326	615			326
Maximum length		720		376	795			326	712			795

Note: Sampled from sport fishery 20 August–29 September.

<sup>a</sup> Length based on 120 fish.

<sup>b</sup> Length based on 19 fish.

<sup>c</sup> Length based on 123 fish.

<sup>d</sup> Estimated sport fish harvest above the weir must be subtracted from inriver run for spawning escapement.

Table 18.—Estimated age and sex composition and mean length-at-age of Buskin River coho salmon, 2003.

	Coho salmon age class										Total	
	1.0	1.1	1.2	2.0	2.1	2.2	3.0	3.1	3.2	4.1		
<b><u>Females</u></b>												
Number sampled		41		1	107			11				183
Percent		10.5		0.3	27.4			2.8				41.7
SE percent		1.6		0.3	2.3			0.8				2.3
Inriver run		1,382		34	3,608			371				5,482
SE run		205		34	298			111				305
Mean length		643		488	859			662				653
SE mean length		6			4			4				3
Minimum length		529		488	505			631				488
Maximum length		706		488	750			682				750
<b><u>Males</u></b>												
Number sampled		42		6	160		2	20				256
Percent		10.8		1.5	41.0		0.5	5.1				58.3
SE percent		1.6		0.6	2.5		0.4	1.1				2.3
Inriver run		1,416		202	5,395		67	674				7,668
SE run		207		82	329		48	147				305
Mean length		667		341	672		328	690				663
SE mean length		6		11	4		3	8				5
Minimum length		567		300	355		325	602				300
Maximum length		740		384	776		330	770				776
<b><u>All</u></b>												
Number sampled		83		7	267		2	31				439
Percent		21.3		1.8	68.5		0.5	7.9				100.0
SE percent		2.1		0.7	2.4		0.4	1.4				0.0
Inriver run		2,799		236	9,003		67	1,045				13,150
SE run		274		89	311		48	181				0
Mean length		655		362	667		328	680				659
SE mean length		4		23	3		3	6				3
Minimum length		529		300	355		325	602				300
Maximum length		740		488	776		330	770				776

Note: Sampled from sport fishery 20 August–27 September.

<sup>a</sup> Estimated sport fish harvest above the weir must be subtracted from inriver run for spawning escapement.

Table 19.—Estimated age and sex composition and mean length-at-age of Buskin River coho salmon, 2004.

	Coho salmon age class										Total	
	1.0	1.1	1.2	2.0	2.1	2.2	3.0	3.1	3.2	4.1		
<b><u>Females</u></b>												
Number sampled	1	46			135			16				219
Percent	0.2	11.4			33.4			4.0				48.6
SE percent	0.2	1.6			2.4			1.0				2.3
Inriver run	24	1,093			3,208			380				4,661
SE run	24	152			226			93				221
Mean length	655	648			658			673				654
SE mean length		7			3			7				3
Minimum length	655	502			560			611				502
Maximum length	655	776			722			716				776
<b><u>Males</u></b>												
Number sampled		49			117			40				232
Percent		12.1			29.0			9.9				51.4
SE percent		1.6			2.3			1.5				2.3
Inriver run		1,164			2,780			950				4,938
SE run		156			217			143				221
Mean length		647			672			674				666
SE mean length		7			3			5				2
Minimum length		497			560			591				497
Maximum length		747			733			749				749
<b><u>All</u></b>												
Number sampled	1	95			253			56				449
Percent	0.2	23.5			62.6			13.9				100.0
SE percent	0.2	2.1			2.4			1.7				0.0
Inriver run	24	2,257			6,011			1,331				9,599
SE run	24	203			231			165				0
Mean length	655	647			664			673				660
SE mean length		5			2			4				2
Minimum length	655	497			560			591				497
Maximum length	655	776			733			749				776

Note: Samples from sport fishery 18 August–26 September.

<sup>a</sup> Estimated sport fish harvest above the weir must be subtracted from inriver run for spawning escapement.

Table 20.—Estimated age composition of coho salmon in the estimated total run in the Buskin River, 1989–2004.

Year	Statistic	Age classes										Total run
		1.0	1.1	1.2	2.0	2.1	2.2	3.0	3.1	3.2	4.1	
1989	Estimate	0	1,819	0	390	12,407	65	65	390	0	0	15,136
	SE	0	323	0	157	382	65	65	157	0	0	
1990	Estimate SE	No estimation made due to no samples collected.										9,250
1991	Estimate	0	2,272	0	0	8,975	0	0	2,499	0	0	13,746
	SE	0	466	0	0	597	0	0	484	0	0	
1992	Estimate	0	2,268	0	213	6,450	0	0	780	0	0	9,710
	SE	0	352	0	33	1,002	0	0	121	0	0	
1993	Estimate	0	2,098	0	40	8,591	0	0	1,188	0	0	11,916
	SE	0	282	0	40	532	0	0	214	0	0	
1994	Estimate	0	3,385	38	226	7,972	0	38	639	0	0	12,297
	SE	0	304	38	91	325	0	38	151	0	0	
1995	Estimate	40	2,661	0	40	8,627	81	0	484	0	0	11,933
	SE	40	289	0	40	311	57	0	137	0	0	
1996	Estimate	0	2,559	0	0	8,153	43	0	1,041	0	0	11,796
	SE	0	295	0	0	331	43	0	203	0	0	
1997	Estimate	0	2,864	0	136	10,025	0	68	1,500	0	68	14,662
	SE	0	397	0	96	466	0	68	304	0	68	
1998	Estimate	0	2,300	0	0	9,037	55	110	1,260	0	0	12,761
	SE	0	322	0	0	381	55	77	250	0	0	
1999	Estimate	0	2,288	0	44	9,020	176	44	2,376	44	44	14,036
	SE	0	291	0	44	377	88	44	295	44	44	
2000	Estimate	0	2,174	0	40	8,818	161	40	926	0	0	12,160
	SE	0	269	0	40	313	80	40	186	0	0	
2001	Estimate	0	8,034	0	208	8,450	42	42	42	0	0	16,817
	SE	0	418	0	93	419	42	42	42	0	0	
2002	Estimate	0	2,139	0	93	11,532	0	46	418	0	0	14,229
	SE	0	291	0	66	319	0	46	138	0	0	
2003	Estimate	0	3,652	0	308	11,748	0	88	1,364	0	0	17,160
	SE	0	356	0	116	404	0	62	235	0	0	
2004	Estimate	37	3,537	0	0	9,419	0	0	2,085	0	0	15,078
	SE	37	353	0	0	548	0	0	274	0	0	

Note: Estimates based on age-class composition of escapements to the Buskin River.

Table 21.—Brood table for Buskin River coho salmon, 1989–2004.

Brood year	Escapement (S)	Age class										Return (R)
		1.0	1.1	1.2	2.0	2.1	2.2	3.0	3.1	3.2	4.1	
1989	8,974	0	2,268	0	213	8,591	0	0	639	0	0	11,711
Sample Year		1991	1992	1993	1992	1993	1994	1993	1994	1995	1995	
Proportion		0.00	0.19	0.00	0.02	0.73	0.00	0.00	0.05	0.00	0.00	
1990	5,918	0	2,098	38	40	7,972	37	38	259	0	0	10,481
Sample Year		1992	1993	1994	1993	1994	1995	1994	1995	1996	1996	
Proportion		0.00	0.20	0.00	0.00	0.76	0.00	0.00	0.02	0.00	0.00	
1991	8,105	0	3,385	0	226	8,829	43	0	1,041	0	68	13,592
Sample Year		1993	1994	1995	1994	1995	1996	1995	1996	1997	1997	
Proportion		0.00	0.25	0.00	0.02	0.65	0.00	0.00	0.08	0.00	0.01	
1992	6,240	0	2,734	0	37	8,153	0	0	1,500	0	0	12,424
Sample Year		1994	1995	1996	1995	1996	1997	1996	1997	1998	1998	
Proportion		0.00	0.22	0.00	0.00	0.66	0.00	0.00	0.12	0.00	0.00	
1993	5,970	37	2,559	0	0	10,025	55	68	1,260	44	44	14,091
Sample Year		1995	1996	1997	1996	1997	1998	1997	1998	1999	1999	
Proportion		0.00	0.18	0.00	0.00	0.71	0.00	0.00	0.09	0.00	0.00	
1994	7,660	0	2,864	0	136	9,037	176	110	2,376	0	0	14,699
Sample Year		1996	1997	1998	1997	1998	1999	1998	1999	2000	2000	
Proportion		0.00	0.19	0.00	0.01	0.61	0.01	0.01	0.16	0.00	0.00	
1995	8,268	0	2,300	0	0	9,020	161	44	926	0	0	12,451
Sample Year		1997	1998	1999	1998	1999	2000	1999	2000	2001	2001	
Proportion		0.00	0.18	0.00	0.00	0.72	0.01	0.00	0.07	0.00	0.00	
1996	7,943	0	2,288	0	44	8,818	42	40	42	0	0	11,274
Sample Year		1998	1999	2000	1999	2000	2001	2000	2001	2002	2002	
Proportion		0.00	0.20	0.00	0.00	0.78	0.00	0.00	0.00	0.00	0.00	
1997	10,353	0	2,174	0	40	8,450	0	42	418	0	0	11,125
Sample Year		1999	2000	2001	2000	2001	2002	2001	2002	2003	2003	
Proportion		0.00	0.20	0.00	0.00	0.76	0.00	0.00	0.04	0.00	0.00	
1998	8,528	0	8,034	0	208	11,532	0	46	1,364	0	0	21,184
Sample Year		2000	2001	2002	2001	2002	2003	2002	2003	2004	2004	
Proportion		0.00	0.38	0.00	0.01	0.54	0.00	0.00	0.06	0.00	0.00	
1999	9,110	0	2,139	0	93	11,748	0	88	2,085	0	0	16,153
Sample Year		2001	2002	2003	2002	2003	2004	2003	2004	2005	2005	
Proportion		0.00	0.13	0.00	0.01	0.73	0.00	0.01	0.13	0.00	0.00	
2000	7,530	0	3,652	0	308	9,419	0	0	1,311	0	0	14,690
Sample Year		2002	2003	2004	2003	2004	2005	2004	2005	2006	2006	
Proportion		0.00	0.25	0.00	0.02	0.64	0.00	0.00	0.09	0.00		
2001	13,028	0	3,537	0	0	14,819	0	0				18,355
Sample Year		2003	2004	2005	2004	2005	2006	2005	2006	2007	2007	
Proportion		0.00	0.19	0.00	0.00	0.81	0.00	0.00	0.00	0.00		

-continued-

Table 21.–Page 2 of 2.

Brood year	Escapement (S)	Age class										Return (R)	
		1.0	1.1	1.2	2.0	2.1	2.2	3.0	3.1	3.2	4.1		
2002	10,150	37											37
Sample Year		2004	2005	2006	2005	2006	2007	2006	2007	2008	2008		
Proportion													
2003	12,490												0
Sample Year		2005	2006	2007	2006	2007	2008	2007	2008	2009	2009		
Proportion													
2004	8,627												0
Sample Year		2006	2007	2008	2007	2008	2009	2008	2009	2010	2010		
Proportion													
Average 1989–2000	7,883	0.00	0.22	0.00	0.01	0.69	0.00	0.00	0.08	0.00	0.00		13,656

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**APPENDIX A: BUSKIN RIVER SALMON WEIR COUNTS,  
1989–2004**

Appendix A1.—Daily cumulative weir counts of Buskin River coho salmon, 1989–2004.

Date	1989		1990		1991		1992		1993		1994		1995		1996	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
15 Aug			2	0							0	0	23	0	44	1
16 Aug			18	0							0	0	27	0	130	2
17 Aug			42	1							4	0	56	1	234	3
18 Aug			56	1							12	0	95	1	273	3
19 Aug			101	2							31	0	113	1	370	4
20 Aug	133	1	161	3	0	0	0	0	134	2	48	1	135	2	425	5
21 Aug	148	1	195	3	0	0	0	0	138	2	68	1	172	2	646	8
22 Aug	159	2	231	4	0	0	0	0	224	3	77	1	208	2	811	10
23 Aug	171	2	259	4	155	2	0	0	302	4	130	2	236	3	987	12
24 Aug	185	2	280	5	173	2	0	0	333	5	144	2	269	3	1,035	12
25 Aug	310	3	340	5	198	2	25	0	400	6	153	2	308	4	1,175	14
26 Aug	370	4	356	6	236	3	132	2	467	7	176	2	341	4	1,264	15
27 Aug	381	4	380	6	261	3	219	3	534	8	185	2	370	4	1,450	17
28 Aug	393	4	402	6	310	3	261	4	635	9	191	2	503	6	1,696	20
29 Aug	429	4	428	7	373	4	299	5	736	11	193	2	561	6	1,928	23
30 Aug	478	5	436	7	437	5	459	7	837	12	198	2	656	8	2,193	26
31 Aug	519	5	444	7	475	5	618	9	938	14	203	2	1,008	12	2,555	30
1 Sep	852	9	456	7	492	6	799	12	1,030	15	214	3	1,128	13	2,767	33
2 Sep	991	10	463	7	652	7	870	13	1,123	16	229	3	1,217	14	2,943	35
3 Sep	1,041	10	556	9	807	9	897	14	1,242	18	235	3	1,270	15	3,045	36
4 Sep	1,062	11	853	14	1,320	15	920	14	1,357	20	295	4	1,819	21	3,117	37
5 Sep	1,167	12	943	15	1,562	17	942	14	1,472	22	397	5	1,919	22	3,287	39
6 Sep	1,231	12	1,000	16	1,659	19	976	15	1,587	23	421	5	2,019	23	4,925	58
7 Sep	1,298	13	1,042	17	1,861	21	1,041	16	1,702	25	470	6	2,219	26	5,525	65
8 Sep	1,365	14	1,138	18	2,461	28	1,187	18	1,822	27	530	7	2,619	30	5,875	70
9 Sep	2,240	23	1,242	20	2,511	28	1,377	21	1,928	28	640	8	3,019	35	6,225	74

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Date	1989		1990		1991		1992		1993		1994		1995		1996	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
10 Sep	2,295	23	1,249	20	2,820	32	1,406	22	2,065	30	1,017	12	3,421	39	6,519	77
11 Sep	2,783	28	1,301	21	3,169	35	1,442	22	2,161	32	1,635	20	3,895	45	6,980	83
12 Sep	3,133	32	1,743	28	3,776	42	1,493	23	2,459	36	1,796	22	4,270	49	7,254	86
13 Sep	3,684	37	1,886	30	4,689	53	1,532	23	2,777	41	1,933	24	4,822	55	7,631	90
14 Sep	4,034	41	2,222	36	5,147	58	1,638	25	3,062	45	3,526	43	5,198	60	7,831	93
15 Sep	4,814	48	2,565	41	5,605	63	1,713	26	3,179	47	4,464	55	5,665	65	7,931	94
16 Sep	5,144	52	3,565	57	6,063	68	1,773	27	3,952	58	4,804	59	5,847	67	7,976	95
17 Sep	5,965	60	4,065	65	6,521	73	3,085	47	4,506	66	5,737	70	8,694	100	8,026	95
18 Sep	6,645	67	4,565	73	6,847	77	3,268	50	4,555	67	6,090	75			8,076	96
19 Sep	7,645	77	4,965	80	7,131	80	3,314	51	4,687	69	6,381	78			8,126	96
20 Sep	8,177	82	5,165	83	7,399	83	3,345	51	4,942	73	6,683	82			8,135	96
21 Sep	8,617	87	5,365	86	7,867	88	3,378	52	5,157	76	6,985	86			8,211	97
22 Sep	9,074	91	5,515	89	7,934	89	3,383	52	5,241	77	7,330	90			8,247	98
23 Sep	9,153	92	5,608	90	8,154	91	3,385	52	5,291	78	7,550	93			8,264	98
24 Sep	9,359	94	5,830	94	8,374	94	3,390	52	5,413	79	7,731	95			8,439	100
25 Sep	9,516	96	5,959	96	8,541	96	3,410	52	5,696	84	7,912	97				
26 Sep	9,601	97	6,222	100	8,722	98	3,425	52	6,022	88	7,966	98				
27 Sep	9,651	97			8,868	99	5,193	79	6,297	92	8,070	99				
28 Sep	9,701	98			8,929	100	5,513	84	6,469	95	8,088	99				
29 Sep	9,752	98					5,649	86	6,641	97	8,146	100				
30 Sep	9,805	99					5,820	89	6,813	100						
Season total <sup>a</sup>	9,930		6,222		8,929		6,535		6,813		8,146		8,694		8,439	
Number estimated	0		2,800		3,727		83		874		1,041		4,047		2,355	
Lower weir in	20 Aug		17 Jul		20 Aug		25 Aug		21 Aug		15 Aug		15 Aug		15 Aug	
Lower weir out	2 Oct		26 Sep		28 Sep		7 Oct		27 Sep		16 Sep		16 Sep		24 Sep	

-continued-

Date	1997		1998		1999		2000		2001		2002		2003		2004	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
15 Aug	23	0	77	1							81	1			344	4
16 Aug	60	1	113	1							84	1	52	0	406	4
17 Aug	124	1	151	2					14	0	119	1	86	1	467	5
18 Aug	176	2	237	3					68	1	126	1	133	1	630	7
19 Aug	197	2	269	3					110	1	178	2	156	1	891	9
20 Aug	238	2	385	4	0	0	17	0	131	1	216	2	408	3	1,112	12
21 Aug	357	3	463	5	46	0	60	1	366	3	306	3	493	4	1,274	13
22 Aug	671	6	508	6	67	1	96	1	509	4	358	3	599	5	1,333	14
23 Aug	862	8	633	7	125	1	168	2	627	5	429	4	670	5	1,458	15
24 Aug	1,006	9	748	8	176	2	208	3	667	5	602	6	768	6	1,683	18
25 Aug	1,160	11	761	8	320	3	311	4	892	7	688	6	825	6	1,875	20
26 Aug	1,228	11	780	9	398	4	432	5	935	7	753	7	1,153	9	2,257	24
27 Aug	1,376	13	797	9	522	5	665	8	1,292	10	905	8	1,476	11	2,749	29
28 Aug	1,445	13	801	9	590	6	935	12	1,593	12	1,022	10	1,859	14	3,377	35
29 Aug	1,495	14	807	9	722	7	1,298	16	1,934	14	1,361	13	2,180	17	3,999	42
30 Aug	1,569	14	822	9	985	10	1,505	19	2,144	16	1,466	14	2,452	19	4,496	47
31 Aug	1,757	16	1,017	11	1,053	11	1,606	20	2,311	17	1,579	15	2,791	21	5,248	55
1 Sep	1,932	18	1,565	17	1,228	13	1,719	21	2,413	18	1,612	15	3,006	23	5,830	61
2 Sep	2,019	18	2,294	25	1,412	14	1,767	22	2,563	19	1,637	15	3,148	24	6,081	63
3 Sep	2,118	19	2,949	33	1,581	16	1,796	22	2,651	20	1,651	16	3,243	25	6,545	68
4 Sep	2,246	21	3,117	34	1,668	17	1,814	23	2,798	21	1,711	16	3,300	25	6,672	70
5 Sep	2,363	22	3,194	35	1,825	19	1,842	23	2,975	22	1,786	17	3,351	25	6,722	70
6 Sep	2,557	23	3,401	38	1,872	19	1,863	23	3,065	23	1,853	17	3,408	26	6,793	71
7 Sep	2,957	27	3,536	39	1,937	20	1,877	23	3,112	23	2,000	19	3,482	26	6,808	71
8 Sep	3,949	36	3,663	40	2,005	20	1,888	23	3,135	23	2,080	20	3,591	27	6,824	71
9 Sep	4,399	40	3,893	43	2,132	22	1,892	24	3,162	23	2,221	21	4,681	36	6,828	71

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Date	1997		1998		1999		2000		2001		2002		2003		2004	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
10 Sep	4,678	43	4,293	47	3,422	35	1,917	24	3,404	25	2,344	22	5,427	41	6,864	72
11 Sep	4,895	45	4,693	52	3,925	40	1,961	24	4,313	32	2,382	22	5,770	44	6,891	72
12 Sep	5,047	46	5,051	56	4,396	45	1,972	25	5,507	41	2,441	23	6,067	46	6,927	72
13 Sep	5,171	47	5,192	57	4,889	50	2,190	27	6,285	47	2,547	24	6,332	48	6,962	73
14 Sep	5,274	48	5,233	58	5,281	54	2,459	31	6,714	50	3,565	33	6,559	50	6,972	73
15 Sep	5,799	53	5,255	58	5,673	58	2,603	32	7,126	53	3,653	34	6,881	52	6,985	73
16 Sep	6,299	58	5,284	58	6,065	62	2,855	35	7,390	55	3,792	36	7,216	55	7,003	73
17 Sep	6,814	62	5,366	59	6,457	66	3,126	39	7,918	59	3,909	37	7,650	58	7,056	74
18 Sep	7,550	69	5,468	60	6,849	70	3,262	41	8,554	63	3,985	37	7,877	60	7,086	74
19 Sep	8,389	77	6,647	73	7,241	74	3,440	43	9,487	70	4,091	38	8,373	64	7,815	81
20 Sep	8,894	81	7,325	81	7,633	78	3,554	44	10,124	75	4,153	39	8,496	65	7,921	83
21 Sep	9,544	87	7,854	87	8,025	82	3,949	49	10,830	80	4,323	41	8,604	65	8,101	84
22 Sep	9,869	90	8,086	89	8,417	86	4,044	50	11,313	84	5,912	56	8,689	66	8,253	86
23 Sep	9,908	91	8,377	92	8,809	90	4,350	54	11,808	88	6,640	62	8,794	67	8,421	88
24 Sep	9,947	91	8,581	95	9,201	94	4,591	57	12,308	91	7,528	71	9,941	76	8,544	89
25 Sep	9,986	91	8,690	96	9,259	95	4,993	62	12,854	95	8,859	83	10,836	82	8,775	91
26 Sep	10,051	92	8,871	98	9,349	95	5,499	68	13,156	97	9,834	92	11,512	88	9,292	97
27 Sep	10,077	92	8,929	99	9,419	96	5,904	73	13,308	99	10,293	97	11,878	90	9,361	98
28 Sep	10,104	92	8,977	99	9,529	97	5,983	74	13,392	99	10,516	99	12,440	95	9,494	99
29 Sep	10,141	93	9,062	100	9,606	98	6,038	75	13,494	100	10,616	100	13,150	100	9,557	100
30 Sep	10,342	95			9,626	98	6,079	76			10,649	100			9,599	100
Season Total <sup>a</sup>	10,926		9,062		9,794		8,048		13,494		10,649		13,150		9,599	
Number Estimated	2,203		1,300		4,312		300		2,911		81		932		233	
Lower weir in	15 Aug		14 Aug		20 Aug		20 Aug		17 Aug		12 Aug		16 Aug		30 Jul	
Lower weir out	6 Oct		29 Sep		4 Oct		4 Oct		29 Sep		30 Sep		29 Sep		30 Sep	

<sup>a</sup> Season totals counted from date lower weir was put in until lower weir was removed for the season.



**APPENDIX B: AGE, SEX, AND MEAN LENGTH-AT-AGE  
COMPOSITION ESTIMATES OF BUSKIN RIVER COHO  
SALMON IN RIVER ESCAPEMENT, 1992–1996.**

Appendix B1.—Age, sex, and mean length-at-age composition of Buskin River coho salmon from escapement sample at weir, 26–27 August 1992.

	Coho salmon ages									Total	
	1.0	1.1	1.2	2.0	2.1	2.2	3.0	3.1	3.2		4.1
<b><u>Females</u></b>											
Number sampled		8			30			2			59
Percent		11.8			44.1			2.9			59.0
SE percent		3.9			6.1			2.1			4.9
Mean length		589			623			660			612
SE mean length		17			10			14			7
Minimum length		517			492			646			475
Maximum length		652			690			674			690
<b><u>Males</u></b>											
Number sampled		7			17			4			41
Percent		10.3			25.0			5.9			41.0
SE percent		3.7			5.3			2.9			4.9
Mean length		619			617			642			622
SE mean length		22			12			24			7
Minimum length		521			518			568			518
Maximum length		676			706			684			706
<b><u>All</u></b>											
Number sampled		15			47			6			100
Percent		22.1			69.1			8.8			
SE percent		5.1			5.6			3.5			
Mean length		603			620			648			616
SE mean length		14			8			16			5
Minimum length		517			492			586			475
Maximum length		676			706			684			706

Appendix B2.—Age, sex, and mean length-at-age compositions of Buskin River coho salmon from mixed samples from weir and sport fish harvest, 10 September–10 October 1992.

	Coho salmon ages										Total	
	1.0	1.1	1.2	2.0	2.1	2.2	3.0	3.1	3.2	4.1		
<b><u>Females</u></b>												
Number sampled		5		1	22			4				44
Percent		7.2		1.4	31.9			5.8				47.8
SE percent		3.1		1.4	5.7			2.8				5.2
Mean length		610		327	673			658				656
SE mean length		22			6			16				9
Minimum length		548		327	612			614				327
Maximum length		660		227	730			688				730
<b><u>Males</u></b>												
Number sampled		12		2	22			1				48
Percent		17.4		2.9	31.9			1.4				52.2
SE percent		4.6		2.0	5.7			1.4				5.2
Mean length		658		359	702			674				667
SE mean length		17		3	10							12
Minimum length		507		356	595			674				356
Maximum length		768		362	782			674				782
<b><u>All</u></b>												
Number sampled		17		3	44			5				92
Percent		24.6		4.3	63.8			7.2				
SE percent		5.2		2.5	5.8			3.1				
Mean length		644		348	687			661				661
SE mean length		15		11	6			13				8
Minimum length		507		327	595			614				327
Maximum length		768		362	782			688				782

Appendix B3.—Age, sex, and mean length-at-age composition of Buskin River coho salmon from the sport fish harvest, 30 August–25 September 1993.

	Coho salmon ages										Total	
	1.0	1.1	1.2	2.0	2.1	2.2	3.0	3.1	3.2	4.1		
<b><u>Females</u></b>												
Number sampled		12			57			12				101
Percent		6.3			30.2			6.3				43.9
SE percent		1.8			3.3			1.8				3.3
Mean length		622			634			658				633
SE mean length		14			7.0			8				4
Minimum length		505			398			597				398
Maximum length		664			699			699				699
<b><u>Males</u></b>												
Number sampled		27		1	68			12				129
Percent		14.3		0.5	36.0			6.3				56.1
SE percent		2.6		0.5	3.5			1.8				3.3
Mean length		640		370	653			657				649
SE mean length		8		0	6			9				5
Minimum length		510		370	473			616				370
Maximum length		700		370	750			721				750
<b><u>All</u></b>												
Number sampled		39		1	128 <sup>a</sup>			24				233
Percent		20.3			66.7			12.5				
SE percent		2.9			3.4			2.4				
Mean length		634		370	644			657				642
SE mean length		7		0	4			6				3
Minimum length		505		370	398			597				370
Maximum length		700		370	750			721				750

<sup>a</sup> Includes 3 fish for which sex was not determined.

Appendix B4.—Age, sex, and mean length-at-age composition of Buskin River coho salmon from Buskin Lake, 21–28 October 1993.

	Coho salmon ages										Total	
	1.0	1.1	1.2	2.0	2.1	2.2	3.0	3.1	3.2	4.1		
<b><u>Females</u></b>												
Number sampled		3			43			5				61
Percent		2.8			39.8			4.6				43.3
SE percent		1.6			4.7			2.0				4.2
Mean length		649			646			666				646
SE mean length		24			5.0			9				4
Minimum length		623			581			642				573
Maximum length		698			727			690				727
<b><u>Males</u></b>												
Number sampled		11			45			1				80
Percent		10.2			41.7			0.9				56.7
SE percent		2.9			4.8			0.9				4.2
Mean length		632			666			616				654
SE mean length		14			6			0				5
Minimum length		527			541			616				525
Maximum length		687			764			616				764
<b><u>All</u></b>												
Number sampled		14			89 <sup>a</sup>			6				141
Percent		12.8			81.7			5.5				
SE percent		3.2			3.7			2.2				
Mean length		635			656			658				650
SE mean length		12			4			11				4
Minimum length		527			541			616				525
Maximum length		698			764			690				764

<sup>a</sup> Includes 3 fish for which sex was not determined.

Appendix B5.—Age, sex, and mean length-at-age composition of Buskin River coho salmon from the sport fish harvest, 19 August–21 September 1994.

	Coho salmon ages										Total	
	1.0	1.1	1.2	2.0	2.1	2.2	3.0	3.1	3.2	4.1		
<b><u>Females</u></b>												
Number sampled		17			44			4				88
Percent		8.0			20.7			1.9				31.0
SE percent		1.9			2.8			0.9				2.7
Mean length		661			667			688				666
SE mean length		8			6.0			18				4
Minimum length		587			502			643				502
Maximum length		724			730			718				730
<b><u>Males</u></b>												
Number sampled		54		2	79		1	12				196
Percent		25.4			37.1			5.6				69.0
SE percent		3.0			3.3			1.6				2.7
Mean length		662		347 <sup>a</sup>	675 <sup>a</sup>		341	669				662
SE mean length		7		17	6		0	12				5
Minimum length		487		330	520		341	604				330
Maximum length		744		364	760		341	741				760
<b><u>All</u></b>												
Number sampled		71		2	123		1	16				284
Percent		33.3		0.9	57.7		0.5	7.5				
SE percent		3.2		0.7	3.4		0.5	1.8				
Mean length		662		347	672		341	674				663
SE mean length		6		17	4		0	10				3
Minimum length		487		330	502		341	604				330
Maximum length		744		364	760		341	741				760

<sup>a</sup> Length based on 78 fish.

Appendix B6.—Age, sex, and length-at-age composition of Buskin River coho salmon from Buskin Lake, 26–27 October 1994.

	Coho salmon ages										Total	
	1.0	1.1	1.2	2.0	2.1	2.2	3.0	3.1	3.2	4.1		
<b><u>Females</u></b>												
Number sampled		3			38			1				48
Percent		2.6			33.3			0.9				34.0
SE percent		1.5			4.4			0.9				4.0
Mean length		661			696			733				697
SE mean length		6			4			0				4
Minimum length		669			620			733				620
Maximum length		691			753			733				753
<b><u>Males</u></b>												
Number sampled		16	1	4	51							93
Percent		14.0	0.9	3.5	44.7							66.0
SE percent		3.3	0.9	1.7	4.7							4.0
Mean length		670	595	355	710							684
SE mean length		12	0	6	5							9
Minimum length		592	595	344	598							344
Maximum length		758	595	365	774							774
<b><u>All</u></b>												
Number sampled		19	1	4	89			1				141
Percent		16.7	0.9	3.5	78.1			0.9				
SE percent		3.5	0.9	1.7	3.9			0.9				
Mean length		672	595	355	704			733				689
SE mean length		10	0	6	4			0				6
Minimum length		592	595	344	598			733				344
Maximum length		758	595	365	774			733				774

Appendix B7.—Age, sex, and mean length-at-age composition estimates of Buskin River coho salmon from the sport fish harvest, 23 August–14 September 1995.

	Coho salmon ages										Total	
	1.0	1.1	1.2	2.0	2.1	2.2	3.0	3.1	3.2	4.1		
<b><u>Females</u></b>												
Number sampled		22			78			2				122
Percent		9.7			34.4			0.9				43.0
SE percent		2.0			3.2			0.6				2.9
Mean length		619			659			668				652
SE mean length		7			4			28				3
Minimum length		555			570			640				555
Maximum length		675			710			696				725
<b><u>Males</u></b>												
Number sampled	1	34		1	86	1		2				162
Percent	0.4	15.0		0.4	37.9	0.4		0.9				57.0
SE percent	0.4	2.4		0.4	3.2	0.4		0.6				2.9
Mean length	310	657		344	667	665		698				657
SE mean length	0	8		0	4	0		23				4
Minimum length	310	544		344	549	665		675				310
Maximum length	310	727		344	766	665		720				766
<b><u>All</u></b>												
Number sampled	1	56		1	164	1		4				284
Percent	0.4	24.7		0.4	72.2	0.4		1.8				
SE percent	0.4	2.9		0.4	3.0	0.4		0.9				
Mean length	310	642		344	663	665		683				655
SE mean length	0	6		0	3	0		17				3
Minimum length	310	544		344	549	665		640				310
Maximum length	310	727		344	766	665		720				766

Appendix B8.—Age, sex, and mean length-at-age composition of Buskin River coho salmon from Buskin lake, 23 October 1995.

	Coho salmon ages								Total		
	1.0	1.1	1.2	2.0	2.1	2.2	3.0	3.1		3.2	4.1
<b><u>Females</u></b>											
Number sampled		12			38			1			61
Percent		12.5			39.6			1.0			51.7
SE percent		3.4			5.0			1.0			4.6
Mean length		660			671			636			668
SE mean length		10			6			0			5
Minimum length		595			500			635			500
Maximum length		695			730			635			745
<b><u>Males</u></b>											
Number sampled		6			37			2			57
Percent		6.3			38.5			2.1			48.3
SE percent		2.5			5.0			1.5			4.6
Mean length		639			677			719			671
SE mean length		11			8			1			6
Minimum length		592			490			718			490
Maximum length		665			760			720			760
<b><u>All</u></b>											
Number sampled		18			75			3			118
Percent		18.8			78.1			3.1			
SE percent		4.0			4.2			1.8			
Mean length		653			674			691			669
SE mean length		8			5			28			4
Minimum length		592			490			635			490
Maximum length		695			760			720			760

Appendix B9.—Age, sex, and mean length-at-age composition of Buskin River coho salmon from the sport fish harvest, 21 August–23 September 1996.

	Coho salmon ages										Total
	1.0	1.1	1.2	2.0	2.1	2.2	3.0	3.1	3.2	4.1	
<b><u>Females</u></b>											
Number sampled		20			51			6			94
Percent		10.2			26.0			3.1			38.7
SE percent		2.2			3.1			1.2			3.1
Mean length		605			654 <sup>a</sup>			639			640
SE mean length		10			4			13			4
Minimum length		547			595			594			521
Maximum length		702			710			685			710
<b><u>Males</u></b>											
Number sampled		28			83			8			149
Percent		14.3			42.3			4.1			61.3
SE percent		2.5			3.5			1.4			3.1
Mean length		642			667			656			660
SE mean length		8			5			11			4
Minimum length		535			482			600			482
Maximum length		712			780			712			780
<b><u>All</u></b>											
Number sampled		49 <sup>b</sup>			138 <sup>c</sup>			16 <sup>d</sup>			243
Percent		24.1			68.0			7.9			
SE percent		3.0			3.3			1.9			
Mean length		628			661			655			652
SE mean length		7			3			10			3
Minimum length		535			482			594			388
Maximum length		712			780			749			780

<sup>a</sup> Length based on 50 fish.

<sup>b</sup> Includes 1 fish for which sex was not determined.

<sup>c</sup> Includes 4 fish for which sex was not determined.

<sup>d</sup> Includes 2 fish for which sex was not determined.

Appendix B10.—Age, sex, and mean length-at-age composition of Buskin River coho salmon from Buskin Lake, 23–30 October 1996.

	Coho salmon ages										Total	
	1.0	1.1	1.2	2.0	2.1	2.2	3.0	3.1	3.2	4.1		
<b><u>Females</u></b>												
Number sampled		4			30	1		5				45
Percent		5.8			43.5	1.4		7.2				55.6
SE percent		2.8			6.0	1.4		3.1				5.6
Mean length		691			687	691		696				688
SE mean length		5			5			16				4
Minimum length		680			638	691		647				628
Maximum length		703			742	691		744				744
<b><u>Males</u></b>												
Number sampled		6			20			3				36
Percent		8.7			29.0			4.3				44.4
SE percent		3.4			5.5			2.5				5.6
Mean length		684			678			721				700
SE mean length		13			10			21				8
Minimum length		651			598			681				598
Maximum length		727			773			752				777
<b><u>All</u></b>												
Number sampled		10			50	1		8				81
Percent		14.5			72.5	1.4		11.6				
SE percent		4.3			5.4	1.4		3.9				
Mean length		687			692	691		705				693
SE mean length		8			5			12				4
Minimum length		651			598	691		647				598
Maximum length		727			773	691		752				777



**APPENDIX C: ESTIMATED AGE COMPOSITION OF  
BUSKIN RIVER COHO SALMON SUBSISTENCE AND  
COMMERICAL HARVESTS, 1989–2004.**

Appendix C1.—Estimated harvest by age of coho salmon in the Buskin River subsistence and commercial fisheries, 1989–2004.

Year		Coho salmon ages										Total
		1.0	1.1	1.2	2.0	2.1	2.2	3.0	3.1	3.2	4.1	
1989	Estimate	0	167	0	36	1,136	6	6	36	0	0	1,380
	SE	0	30	0	14	35	6	6	14	0	0	
1990	Estimate	No estimation made due to no samples collected.										1,811
	SE											
1991	Estimate	0	251	0	0	992	0	0	276	0	0	1,520
	SE	0	52	0	0	66	0	0	54	0	0	
1992	Estimate	0	466	0	44	1,326	0	0	160	0	0	1,996
	SE	0	72	0	25	81	0	0	46	0	0	
1993	Estimate	0	309	0	6	1,265	0	0	175	0	0	1,731
	SE	0	39	0	6	45	0	0	30	0	0	
1994	Estimate	0	608	7	41	1,431	0	7	115	0	0	2,208
	SE	0	55	7	17	59	0	7	27	0	0	
1995	Estimate	5	351	0	5	1,134	5	0	33	0	0	1,533
	SE	5	36	0	5	38	5	0	12	0	0	
1996	Estimate	0	305	0	0	973	5	0	124	0	0	1,372
	SE	0	35	0	0	38	5	0	24	0	0	
1997	Estimate	0	282	0	13	988	0	7	148	0	7	1,445
	SE	0	39	0	9	46	0	7	30	0	7	
1998	Estimate	0	283	0	0	1,112	7	13	155	0	0	1,564
	SE	0	40	0	0	47	7	10	31	0	0	
1999	Estimate	0	245	0	5	967	19	5	255	5	5	1,504
	SE	0	31	0	5	40	9	5	32	5	5	
2000	Estimate	0	365	0	7	1,480	27	7	155	0	0	2,041
	SE	0	45	0	7	53	13	7	31	0	0	
2001	Estimate	0	700	0	18	736	4	4	4	0	0	1,457
	SE	0	36	0	8	36	4	4	4	0	0	
2002	Estimate	0	239	0	0	10	0	0	5	47	0	1,582
	SE	0	32	0	0	7	0	0	5	15	0	
2003	Estimate	0	291	0	25	937	0	7	109	0	0	1,368
	SE	0	28	0	9	32	0	5	19	0	0	
2004	Estimate	4	374	0	0	996	0	0	221	0	0	1,591
	SE	4	34	0	0	38	0	0	27	0	0	

Note: Estimates based on age-class composition of Buskin River inriver escapements.

**APPENDIX D: ESTIMATED AGE COMPOSITION OF  
BUSKIN RIVER COHO SALMON SPORT FISHERY, 1989–  
2004**

Appendix D1.—Estimated harvest by age of coho salmon in the Buskin River sport fishery, 1989–2004.

Year		Coho salmon ages										Total
		1.0	1.1	1.2	2.0	2.1	2.2	3.0	3.1	3.2	4.1	
1989	Estimate	0	577	0	124	3,937	21	21	124	0	0	4,782
	SE	0	103	0	50	120	21	21	50	0	0	
1990	Estimate	No estimation made due to no samples collected.										1,521
	SE											
1991	Estimate	0	681	0	0	2,691	0	0	749	0	0	4,121
	SE	0	140	0	0	179	0	0	145	0	0	
1992	Estimate	0	344	0	32	979	0	0	118	0	0	1,474
	SE	0	53	0	18	60	0	0	34	0	0	
1993	Estimate	0	752	0	14	3,080	0	0	426	0	0	4,215
	SE	0	94	0	14	109	0	0	74	0	0	
1994	Estimate	0	669	7	45	1,575	0	7	126	0	0	2,429
	SE	0	61	7	18	65	0	7	30	0	0	
1995	Estimate	7	488	0	7	1,578	7	0	46	0	0	2,132
	SE	7	50	0	7	52	7	0	17	0	0	
1996	Estimate	0	552	0	0	1,760	9	0	225	0	0	2,481
	SE	0	64	0	0	69	9	0	44	0	0	
1997	Estimate	0	559	0	27	1,958	0	13	293	0	13	2,864
	SE	0	78	0	19	91	0	13	59	0	13	
1998	Estimate	0	483	0	0	1,898	12	23	265	0	0	2,669
	SE	0	68	0	0	80	12	16	53	0	0	
1999	Estimate	0	558	0	11	2,199	43	11	579	11	11	3,422
	SE	0	71	0	11	92	21	11	72	11	11	
2000	Estimate	0	463	0	9	1,877	34	9	197	0	0	2,589
	SE	0	57	0	9	67	17	9	40	0	0	
2001	Estimate	0	1,120	0	29	1,178	6	6	6	0	0	2,332
	SE	0	58	0	13	58	6	6	6	0	0	
2002	Estimate	0	377	0	0	16	0	0	8	74	0	2,497
	SE	0	51	0	0	12	0	0	8	24	0	
2003	Estimate	0	703	0	59	2,261	0	17	262	0	0	3,302
	SE	0	69	0	22	78	0	12	45	0	0	
2004	Estimate	12	1,143	0	0	3,044	0	0	674	0	0	4,860
	SE	12	103	0	0	117	0	0	84	0	0	

Note: Estimates based on age-class composition of Buskin River inriver escapements.

**APPENDIX E: SAMPLE SIZES BY SOURCE, DATE, AND  
AGE OF COHO SALMON FROM THE BUSKIN RIVER,  
1989–2004.**

Appendix E1.—Sample sizes by source, date, and age of coho salmon from the Buskin River, 1989–2004.

Source	Year	Date	No age	Coho salmon ages									
				1.0	1.1	1.2	2.0	2.1	2.2	3.0	3.1	3.2	4.1
Egg Take	1989	12–19 Oct	22	0	28	0	6	191	1	1	6	0	0
Escapement	1991	20 Aug–9 Sept.	27	0	12	0	0	48	0	0	13	0	0
		10–30 Sept.	19	0	8	0	0	31	0	0	9	0	0
Escapement	1992	20 Aug–9 Sept.	32	0	15	0	0	47	0	0	6	0	0
		Mixed 10 Sept–10 Oct	23	0	17	0	3	44	0	0	5	0	0
Egg Take	1993	21–28 Oct.	33	0	14	0	0	89	0	0	6	0	0
Sport	1993	20 Aug–9 Sept.	16	0	16	0	0	52	0	0	10	0	0
		10–30 Sept.	25	0	23	0	1	76	0	0	14	0	0
Egg Take	1994	26–27 Oct.	27	0	19	1	4	89	0	0	1	0	0
Sport	1994	20 Aug–9 Sept.	36	0	40	0	0	59	0	1	4	0	0
		10–30 Sept.	35	0	31	0	2	64	0	0	12	0	0
Egg Take	1995	23 Oct.	22	0	18	0	0	75	0	0	3	0	0
Sport	1995	20 Aug–9 Sept.	32	0	27	0	1	81	1	0	1	0	0
		10–30 Sept.	25	1	29	0	0	83	0	0	3	0	0
Egg Take	1996	23–30 Oct.	12	0	10	0	0	50	1	0	8	0	0
Sport	1996	20 Aug–9 Sept.	30	0	32	0	0	97	0	0	9	0	0
		10–30 Sept.	19	0	17	0	0	41	0	0	7	0	0
Sport	1997	20 Aug–9 Sept.	27	0	18	0	0	60	0	0	12	0	0
		10–30 Sept.	51	0	24	0	2	87	0	1	10	0	1
Sport	1998	20 Aug–9 Sept.	33	0	19	0	0	56	0	0	12	0	0
		10–30 Sept.	29	0	23	0	0	109	1	2	11	0	0
Sport	1999	20 Aug–9 Sept.	2	0	3	0	1	11	0	0	5	0	0
		10–30 Sept.	50	0	49	0	0	194	4	1	49	1	1
Sport	2000	20 Aug–9 Sept.	18	0	7	0	0	48	0	0	12	0	0
		10–30 Sept.	33	0	47	0	1	171	4	1	11	0	0
Sport	2001	20 Aug–9 Sept.	51	0	65	0	0	111	1	0	1	0	0
		10–30 Sept.	57	0	128	0	5	92	0	1	0	0	0
Sport	2002	20 Aug–9 Sept.	32	0	15	0	1	99	0	1	4	0	0
		10–30 Sept.	25	0	31	0	1	149	0	0	5	0	0
Sport	2003	20 Aug–9 Sept.	17	0	34	0	4	109	0	2	10	0	0
		10–30 Sept.	32	0	49	0	3	158	0	0	21	0	0
Sport	2004	20 Aug–9 Sept.	27	1	54	0	0	138	0	0	38	0	0
		10–30 Sept.	17	0	41	0	0	115	0	0	18	0	0

**APPENDIX F: SAMPLE SIZES BY SOURCE, SEX, AND AGE  
OF BUSKIN RIVER COHO SALMON, 1989–2004.**

Appendix F1.—Sample sizes by source, sex, and age of Buskin River coho salmon, 1989–2004.

Year	Source	Sex	No age	Coho salmon ages										Total
				1.0	1.1	1.2	2.0	2.1	2.2	3.0	3.1	3.2	4.1	
1989	Egg take	Female	10	0	10	0	0	85	1	0	3	0	0	109
		Male	11	0	18	0	6	106	0	1	3	0	0	145
		Unknown			1									1
1990		Female	No samples collected.											
		Male												
		Unknown												
1991	Escapement	Female	22	0	6	0	0	41	0	0	13	0	0	82
		Male	24	0	14	0	0	38	0	0	9	0	0	85
		Unknown												0
1992	Escapement	Female	19		8			30			2			59
		Male	13		7			17			4			41
		Unknown												0
1993	Sport	Female	20		12		0	57			12			101
		Male	21		27		1	68			12			129
		Unknown						3						3
	Egg take	Female	10		3			43			5			61
		Male	23		11			45			1			80
		Unknown						1						1
1994	Sport	Female	23		17		0	44		0	4			88
		Male	48		54		2	79		1	12			196
		Unknown												0
	Egg take	Female	6		3	0		38			1			48
		Male	21		16	1	4	51			0			93
		Unknown												0
1995	Sport	Female	20		22			78			2			122
		Male	37	1	34		1	86	1		2			162
		Unknown												0
	Egg take	Female	10		12			38			1			61
		Male	12		6			37			2			57
		Unknown												0
1996	Sport	Female	17		20			51			6			94
		Male	31		28			83			8			150
		Unknown	1		1			4			2			8
	Egg take	Female	5		4			30	1		5			45
		Male	7		6			20			3			36
		Unknown												0
1997	Sport	Female	40		14			63		1	10			128
		Male	38		28		2	84		0	12		1	165
		Unknown												0

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Year	Source	Sex	No Age	Coho salmon ages										Total
				1.0	1.1	1.2	2.0	2.1	2.2	3.0	3.1	3.2	4.1	
1998	Sport	Female	29	18		69	0	0	8					124
		Male	33	23		96	1	2	15					170
		Unknown		1										1
1999	Sport	Female	27	28	1	110	2	1	31	0	0			200
		Male	25	24		95	2	0	23	1	1			171
		Unknown												0
2000	Sport	Female	24	25	0	110	2	0	7					168
		Male	27	29	1	109	2	1	16					185
		Unknown												0
2001	Sport	Female	52	87		98			1					238
		Male	56	105	5	104	1	1	0					272
		Unknown		1		1								2
2002	Sport	Female	29	26		121			8					184
		Male	28	20	2	126		1	1					178
		Unknown				1								1
2003	Sport	Female	23	41	1	107			11					183
		Male	26	42	6	160		2	20					256
		Unknown												0
2004	Sport	Female	18	1	46		135		16					216
		Male	26		49		117		40					232
		Unknown					1							1



## **APPENDIX G: CONTINGENCY TABLE ANALYSES**

Appendix G1.–Contingency table analyses, 1989–2004.

Year	Sample source	Test <sup>a</sup>	Number of fish in test	Date of stratification	P-value	$\chi^2$	df <sup>b</sup>			
1989	Spawning escapment (Egg take)	Time*Sex	254	12-Oct	0.15	2.10	1			
		Time*Age	225		0.52	1.31	2			
		Time*Sex*Age	225		0.68	3.10	5			
1991	Weir	Time*Sex	167	9-Sep	0.22	1.50	1			
		Time*Age	121		0.99	0.02	2			
		Time*Sex*Age	121		0.57	3.84	5			
1992	Weir	Time*Sex	100	9-Sep	0.92	0.01	1			
		Time*Age	68		0.39	1.87	2			
		Time*Sex*Age	68		0.64	3.40	5			
1993	Spawning escapment (Egg take)	Time*Sex	141	21-Oct	0.03	4.98	1			
		Time*Age	109		0.01	10.00	2			
		Time*Sex*Age	108		0.01	16.90	5			
	Sport harvest	Time*Sex	230	9-Sep	0.18	1.83	1			
		Time*Age	191		1.00	0.01	2			
		Time*Sex*Age	188		0.62	3.56	5			
		Source*Sex	371		0.90	0.02	1			
		Source*Age	300		0.02	8.19	2			
		Source*Sex*Age	296		0.04	11.46	5			
1994	Spawning escapment (Egg take)	Time*Sex	141	26-Oct	0.02	5.20	1			
		Time*Age	109		0.29	2.46	2			
		Time*Sex*Age	109		0.27	6.36	5			
	Sport harvest	Time*Sex	284	9-Sep	0.17	1.92	1			
		Time*Age	210		0.07	5.46	2			
		Time*Sex*Age	210		0.02	13.80	5			
		Source*Sex	425		0.53	0.40	1			
		Source*Age	319		0.00	20.89	2			
		Source*Sex*Age	319		0.00	25.15	5			
1995	Spawning escapment (Egg take)	Time*Sex	NA	9-Sep	0.12	2.38	1			
		Time*Age	NA							
		Time*Sex*Age	NA							
	Sport harvest	Time*Sex	284							
		Time*Age	224					0.61	0.98	2
		Time*Sex*Age	224					0.42	4.99	5
		Source*Sex	402					0.11	2.56	1
		Source*Age	320					0.38	1.91	2
		Source*Sex*Age	320					0.27	6.45	5

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Year	Sample source	Test <sup>a</sup>	Number of fish in test	Date of stratification	P-value	$\chi^2$	df <sup>b</sup>
1996	Spawning Escapment (Egg take)	Time*Sex	81	23-Oct	0.74	0.11	1
		Time*Age	68		0.39	1.89	2
		Time*Sex*Age	68		0.66	3.26	5
	Sport Harvest	Time*Sex	244	9-Sep	0.10	2.78	1
		Time*Age	203		0.43	1.69	2
		Time*Sex*Age	196		0.48	4.53	5
		Source*Sex	325		0.01	7.15	1
		Source*Age	271		0.19	3.30	2
		Source*Sex*Age	264		0.04	11.68	5
1997	Sport Harvest	Time*Sex	292	9-Sep	0.00	9.14	1
		Time*Age	211		0.48	1.46	2
		Time*Sex*Age	210		0.01	14.30	5
1998	Sport Harvest	Time*Sex	294	9-Sep	0.31	1.02	1
		Time*Age	230		0.14	3.98	2
		Time*Sex*Age	229		0.17	7.76	5
1999	Sport Harvest	Time*Sex	371	9-Sep	0.21	1.59	1
		Time*Age	311		0.60	1.03	2
		Time*Sex*Age	311		0.77	2.56	5
2000	Sport Harvest	Time*Sex	353	9-Sep	0.00	13.30	1
		Time*Age	296		0.00	12.80	2
		Time*Sex*Age	296		0.00	22.60	5
2001	Sport Harvest	Time*Sex	510	9-Sep	0.04	4.15	1
		Time*Age	396		0.00	17.80	1
		Time*Sex*Age	394		0.00	28.80	3
2002	Sport Harvest	Time*Sex	362	9-Sep	0.36	0.82	1
		Time*Age	303		0.61	1.00	2
		Time*Sex*Age	302		0.61	3.60	5
2003	Sport Harvest	Time*Sex	439	9-Sep	0.10	2.75	1
		Time*Age	381		0.64	0.90	2
		Time*Sex*Age	381		0.26	6.54	5
2004	Sport Harvest	Time*Sex	448	9-Sep	0.91	0.01	1
		Time*Age	404		0.18	3.39	2
		Time*Sex*Age	403		0.59	3.76	5

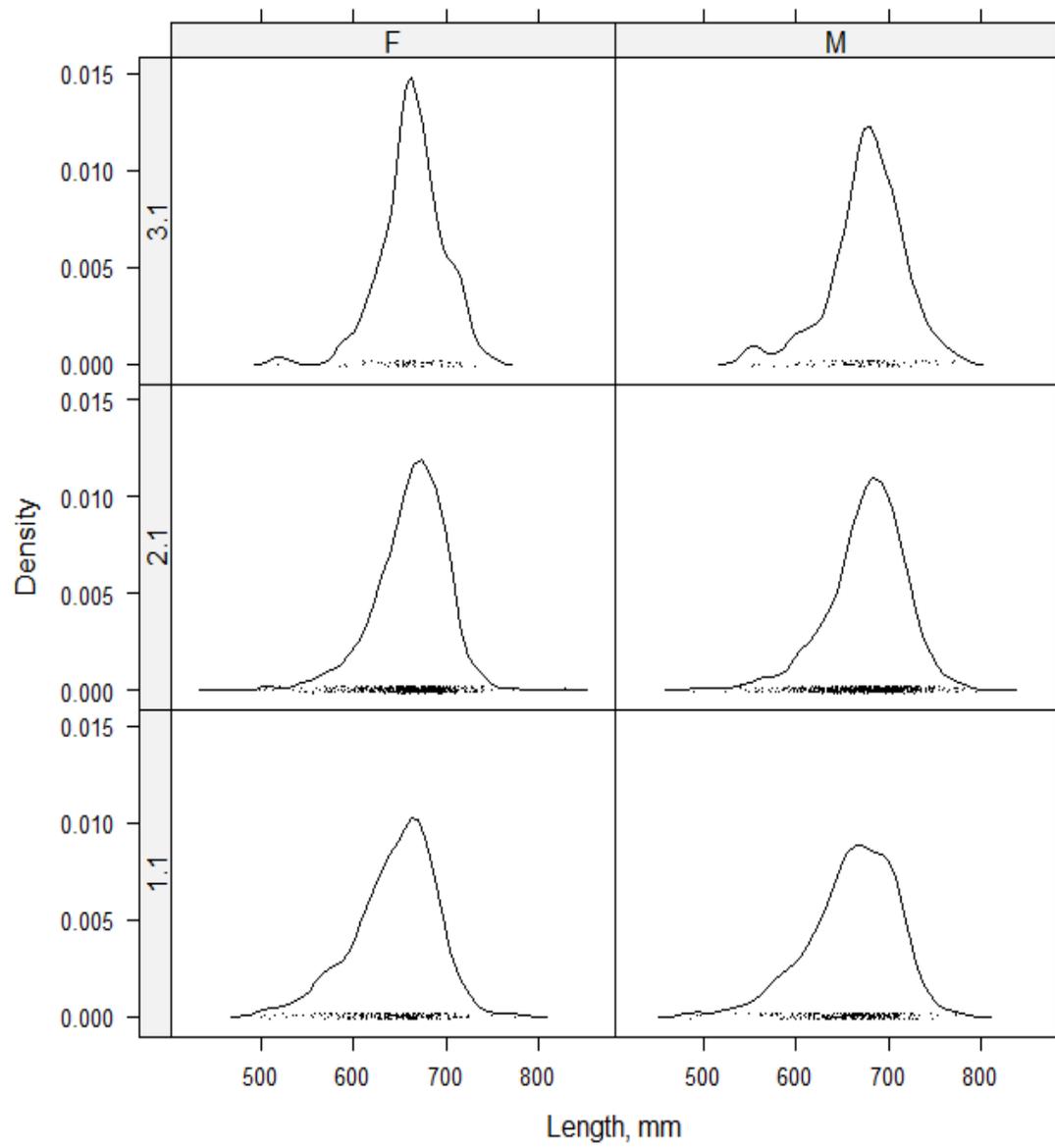
<sup>a</sup> Time\*Factor indicates a test of  $H_0$ : factor does not change over time. Source\*Factor indicates a test of  $H_0$ : factor does not change over source.

<sup>b</sup> Three age (1.2, 2.1, and 3.1) and 2 time strata (two 3-week strata) were used.



**APPENDIX H: DENSITY PLOTS OF LENGTH-AT-AGE,  
1994–2004.**

Appendix H1.—Density plots for length-at-age by sex (pooled over 1994–2004).



Appendix H2.–Density plots of length-at-age by year, 1994–2004.

