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Fishery Information Services Division

Stock Assessment of Sockeye Salmon from the Buskin River, Kodiak, Alaska, 2010

by

Julia Schmidt

April 2011

Alaska Department of Fish and Game **Division of Sport Fish**

Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used in Division of Sport Fish Fishery Manuscripts, Fishery Data Series Reports, Fishery Management Reports, and Special Publications without definition. All others must be defined in the text at first mention, as well as in the titles or footnotes of tables and in figures or figure captions.

Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
metric ton	mt
milliliter	ml
millimeter	mm

Weights and measures (English)

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

Spell out acre and ton.

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
hour (spell out for 24-hour clock)	h
minute	min
second	s

Spell out year, month, and week.

Physics and chemistry

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

General

All commonly accepted abbreviations.	e.g., Mr., Mrs., a.m., p.m., etc.
All commonly accepted professional titles.	e.g., Dr., Ph.D., R.N., etc.
And	&
At	@
Compass directions:	
east	E
north	N
south	S
west	W
Copyright	©
Corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
et alii (and other people)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.,
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
number (before a number)	# (e.g., #10)
pounds (after a number)	# (e.g., 10#)
registered trademark	®
Trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S. state and District of Columbia abbreviations	use two-letter abbreviations (e.g., AK, DC)

Mathematics, statistics, fisheries

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	C.I.
correlation coefficient	R (multiple)
correlation coefficient	r (simple)
covariance	cov
degree (angular or temperature)	°
degrees of freedom	df
divided by	÷ or / (in equations)
equals	=
expected value	E
fork length	FL
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.
mideye-to-fork	MEF
minute (angular)	'
multiplied by	x
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
standard length	SL
total length	TL
variance	Var

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ABSTRACT

Salmon weirs were operated on the Buskin River drainage on Kodiak Island, Alaska, from 21 May – 7 October, 2010 to enumerate sockeye salmon *Oncorhynchus nerka*. A total of 9,800 sockeye salmon were counted into Buskin Lake. A total of 421 sockeye salmon were also counted into the Catherine-Louise lakes tributary. The midpoint of the Buskin Lake run occurred on 24 June, the midpoint of the Catherine-Louise lakes tributary run occurred on 15 August. Most sockeye salmon in the Buskin Lake escapement were aged 2.3, 1.3 or 2.2 while Catherine-Louise lakes bound sockeye were aged either 1.2 or 2.2. The preliminary 2010 subsistence harvest was 1,414 sockeye salmon, most of which were aged 2.3 or 1.3.

Key words: Buskin River, Kodiak Island, sockeye salmon, *Oncorhynchus nerka*, weir, subsistence harvest, age composition.

INTRODUCTION

The Buskin River drainage (Figure 1), located approximately 2 miles from the city of Kodiak, supports a subsistence fishery occurring in marine waters near the mouth of the Buskin River, which typically harvests relatively large numbers of sockeye salmon *Oncorhynchus nerka*. Between 2001 and 2010 annual subsistence harvests have ranged as high as 13,000 fish and averaged around 7,600 (Table 1). Historically, the Buskin River is the single largest source of subsistence salmon harvests in federally managed waters within the Kodiak-Aleutians region.

Buskin River sockeye salmon are also targeted in a sport fishery which annually harvests approximately 1,594 fish (Table 2). Additionally, a small commercial fishery has recently accounted for less than 100 fish harvested per year.

Annual escapements of sockeye salmon returning to the Buskin River have been monitored since 1980. Between 1980 and 1984 escapements were indexed using aerial survey counts but since 1985 a weir has been used to enumerate total inriver returns. From 2001-2010 sockeye salmon escapements into the Buskin Lake have averaged more than 15,600 (Table 3).

Sockeye salmon harvests and escapements have been monitored historically, although age data from returns of adult fish have been collected consistently since 1993 (Schmidt and Evans 2010). In the winter of 2010, the previous sustained escapement goal (SEG) of 8,000 to 13,000 was changed to a biological escapement goal (BEG) of 5,000 to 8,000 based on Bayesian spawner-recruit analysis (Nemeth et al. 2010). There is an ongoing need to assess productivity of this salmon stock and to evaluate the current BEG.

The Buskin River is fed primarily by Buskin Lake, although the drainage also contains a major downstream tributary terminating in the Catherine-Louise lakes. Along with Buskin Lake, these lakes are utilized by sockeye salmon for spawning and juvenile rearing. Since 1990 an ADF&G weir has been operated near the outlet of Buskin Lake to avoid weir washouts resulting from frequent inriver flooding. The inriver return of sockeye salmon to Catherine-Louise lakes was not fully documented until 2002, when a second weir was installed on the outlet stream. Between 2002-2010 sockeye salmon escapements into Catherine-Louise lakes have ranged between 4,500 and 400, averaging almost 2,300 fish (Table 3). Operation of this tributary weir will continue annually for the duration of the stock assessment study.

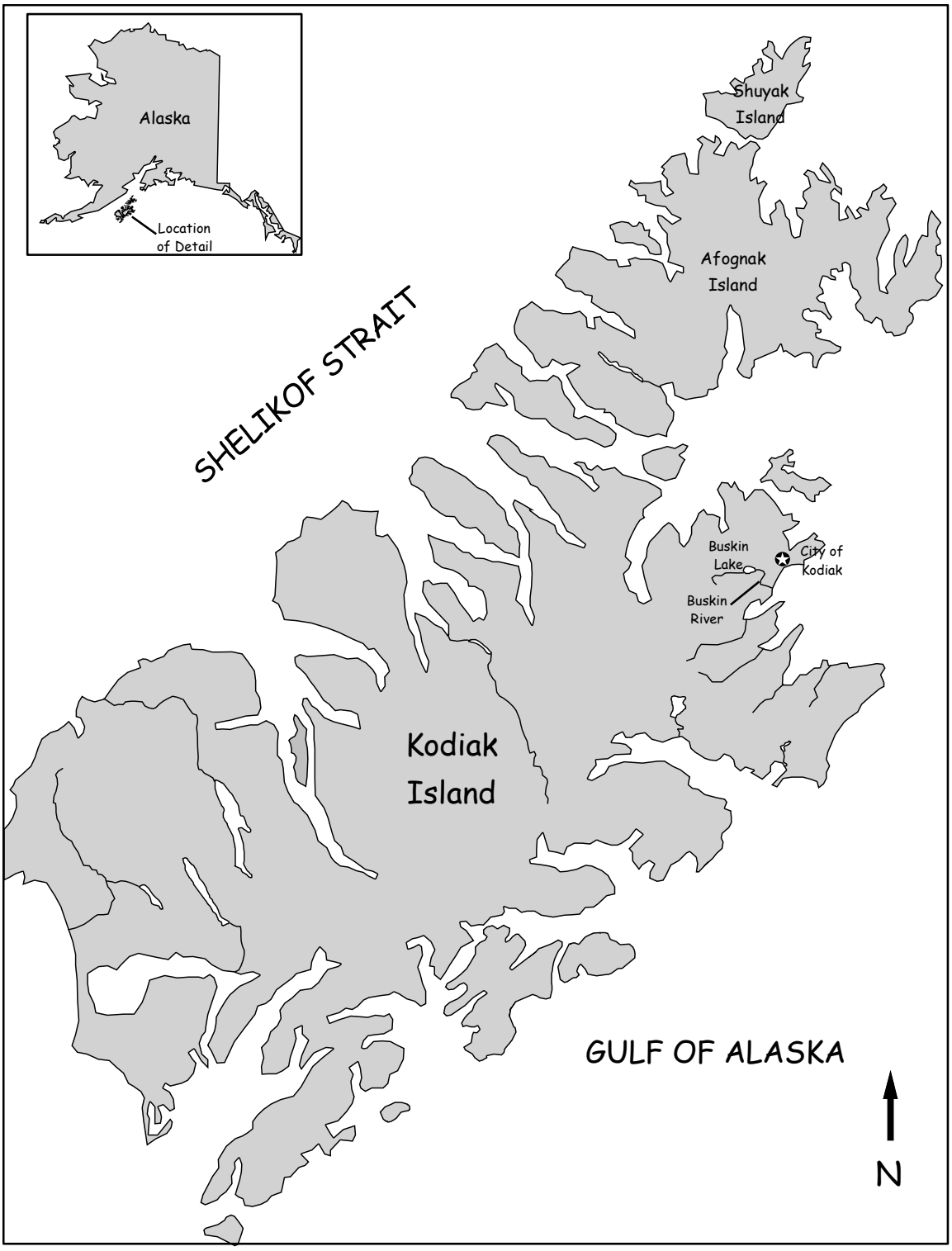

Figure 1.-Map of Kodiak Island showing Buskin River drainage.

In order to evaluate the sockeye salmon BEG, annual harvest figures from subsistence, sport and commercial fisheries plus estimated escapements and total returns by age from escapement and subsistence harvest sampling are needed to reconstruct the run and develop brood tables. Cumulative weir counts are needed not only to estimate escapements but also for comparison to historic time of entry data to ensure fisheries are managed to achieve the BEG. Results from this project will sustain productivity of the Buskin River sockeye salmon stock and provide harvestable surpluses for subsistence, recreational, or commercial fisheries.

Table 1.- Subsistence harvests of Buskin River sockeye salmon, 2001-2010.

Year	Reported Subsistence Fishery Harvest
2001	10,260
2002	13,366
2003	10,651
2004	9,421
2005	8,239
2006	7,577
2007	11,151
2008	2,664
2009	1,883
2010	1,414
Average	7,663

Source: ADF&G Commercial Fisheries Division, Kodiak; 2010 data preliminary.

Table 2.- Estimated sport fishery harvest of Buskin River sockeye salmon, 2000-2009.

Year	Estimated Sport Fishery Harvest
2000	2,041
2001	827
2002	2,204
2003	3,017
2004	1,379
2005	1,540
2006	1,577
2007	1,509
2008	1,160
2009	687
Average	1,594

Source: Tracy et al. *in prep*.

Table 3.- Escapement of sockeye salmon into Buskin Lake, 2001-2010 and Catherine-Louise lakes 2002-2010.

Year	Buskin	Lake Louise
2001	20,556	
2002	17,174	3,541
2003	23,870	4,488
2004	22,023	2,086
2005	15,468	2,028
2006	17,734	4,586
2007	16,502	1,676
2008	5,900	833
2009	7,757	992
2010	9,800	421
Average	15,678	2,295

Source: Tiernan 2011.

During 2010 the objectives of the stock assessment study were to:

1. Estimate the sockeye salmon escapement into Buskin Lake approximately from June 1 to August 1, and Louise/Catherine lakes tributary approximately from June 1 through August 31.

2. Estimate the age composition of the sockeye salmon run (combined subsistence harvest in the Chiniak Bay section and escapement) to Buskin Lake such that the estimates are within 5 percentage points of the true value 95% of the time.

3. Estimate the age composition of the sockeye salmon run (escapement) to Louise/Catherine lakes tributary such that the estimates are within 7.5 percentage points of the true value 95% of the time.

4. Estimate proportions through DNA analysis of the sockeye salmon subsistence harvest in the Buskin River Section of Chiniak Bay comprised of Buskin and Louise/Catherine lakes run components such that the estimates are within 7.5 percentage points of the true value 90% of the time.

5. Evaluate and, if necessary, refine the sockeye salmon BEG on a triennial basis concurrent with the Alaska Board of Fisheries meeting cycle for Kodiak area finfisheries.

6. Document local residency of Buskin River sockeye salmon subsistence users and user preferences for areas traditionally fished.

METHODS

WEIR OPERATIONS

In 2010 the escapement of sockeye salmon into Buskin Lake was censused from 21 May – 7 October (Table 4; Figure 2). Fish migrating upstream were enumerated as they passed through a

weir located at the lake outlet. A second weir was operated on the Catherine-Louise lakes tributary stream beginning on 27 April and ending on 15 September (Table 5; Figure 3). Daily counts of sockeye salmon were entered on salmon weir count data forms.

AGE-SEX-LENGTH SAMPLING

A simulation was used to determine Buskin Lake escapement and subsistence overall sample sizes for Objective 2 which was then combined with historical run timing to split the sample size among strata. In determining the sample size forLake Louise escapement, Sample size for estimating multinomial proportions, Thompson, 1987 was utilized.

To achieve prescribed relative precision, and allowing for a 10% scale regeneration rate, sample goal a total of 310 sockeye salmon from the weir at the Buskin Lake outlet sampling box over the four temporal strata. Ideally, sampling was conducted on two days, one week apart, during each stratum. Sampling intensity reflects historical run timing to the Buskin Lake outlet weir. A sampling goal of 140 fish was determined during the first strata (1-15 June), 100 during the second (16-30 June), a goal of 40 fish between 1-15 July, and 30 fish during the final strata (16-31 July).

All fish captured on selected days were sampled, even if the daily sample goal was exceeded. Extreme high and low water levels throughout the operation of the weir at Buskin Lake precluded use of a weir trap until July and a beach seine was used to collect approximately 70% of the sockeye sampled. On occasions when large numbers of sockeye salmon were observed behind the weir, efforts were made to sample fish during the early, middle and late portions of the time interval required for their passage upstream.

The Catherine-Louise lakes sockeye escapement was sampled during each of four temporal strata: 1 June – 15 July, 16-31 July, 1-15 August, and 16-31 August. Sampling intensity reflects historical Lake Louise run timing with sampling goals during each strata as 40, 50, 90 and 80. All fish captured on selected days were sampled, but sampling goals were not achieved for any temporal strata and, as a result, for the season.

The subsistence harvest was to be sampled for age, sex, and length during each of two temporal strata, to account for any significant changes in these attributes over the course of the fishery. The total sample size of 200, (allowing for 10% scale regeneration) was evenly divided among two strata (1-15 June and 16-30 June)., However, neither goal was achieved as the closure of the subsistence fishery made it impossible to obtain samples during the second period. Samples from the first period were used to determine age composition. Harvested fish were sampled opportunistically within the time stratum. Sampling was conducted either from a boat on the fishing grounds or dockside at local boat harbors

Fish lengths were measured from mid-eye to fork-of-tail and sex determined based on morphology. Two scales were taken from each fish and mounted on a gum card. Scales were taken 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, two rows above the lateral line (Clutter and Whitesel 1956). Scales were taken proximal to the preferred region only when necessary, and if scales were not available in the preferred region on the left side of the fish, scales were collected within or proximal to the preferred region on the right side. Age was interpreted from scales using the criteria of Clutter and Whitesel (1956).

DATA ANALYSIS

Chi-squared statistics were used to test for differences in age and sex composition among temporal strata within escapement and subsistence harvest samples as well as between sources. If differences were detected, estimates were stratified to minimize bias. If differences were not detected, age data were pooled to improve precision. The proportion of sockeye salmon from source h (escapement or subsistence harvest) during stratum i (i = 1,2,3,4) in age/sex class j was estimated as a binomial proportion by:

$$\hat{p}_{hij} = \frac{n_{hij}}{n_{hi}} \tag{1}$$

and its variance by:

$$\hat{V}(\hat{p}_{hij}) = \left[\frac{N_{hi} - n_{hi}}{N_{hi}}\right] \frac{\hat{p}_{hij}(1 - \hat{p}_{hij})}{n_{hi} - 1}, \tag{2}$$

where:

n_{hij} = the number of sockeye salmon from source h during stratum i that were in age/sex class j,

n_{hi} = the number of sockeye salmon sampled from source h during stratum i, and

N_{hi} = the total number of sockeye salmon in source h during stratum i.

Weir counts and permit returns of subsistence harvests were treated as censuses with no variance. In the event that temporal stratification was required for the subsistence harvest, N_{Si} (total number of subsistence sockeye salmon harvested during stratum i) was calculated by multiplying the total subsistence harvest by the proportion of the sockeye salmon run passing through the weir in temporal stratum i.

The number of fish from source h during stratum i of age/sex class j was estimated by:

$$\hat{N}_{hij} = N_{hi}\hat{p}_{hij}, \tag{3}$$

where N_{hi} = the total number of sockeye salmon from source h during stratum i;

and its variance by:

$$\hat{V}(\hat{N}_{hij}) = N_{hi}^2 \hat{V}(\hat{p}_{hij}). \tag{4}$$

The total number of fish from source h of age/sex class j was estimated as:

$$\hat{N}_{hj} = \sum_{i=1}^{t} \hat{N}_{hij} \tag{5}$$

where t = the number of strata; and the variance was estimated as the sum of the variances as:

$$V(\hat{N}_{hj}) = \sum V(\hat{N}_{hij}). \tag{6}$$

The proportion of sockeye salmon age age/sex class j for the total of source h was estimated as:

$$\hat{p}_{hj} = \frac{\hat{N}_{hj}}{N_h}, \quad (7)$$

where N_h = the total for source h.

The variance of the proportion was estimated by:

$$V(\hat{p}_{hj}) = \frac{V(\hat{N}_{hj})}{N_h^2}. \quad (8)$$

Genetic Sampling and Analysis

Tissue samples for genetic analysis were collected from the mixed-stock sockeye salmon subsistence fishery with the objective (Objective 4) of apportioning Lake Louise and Buskin Lake components of the harvest. During the subsistence fishery, technicians opportunistically collected tissues (consisting of Axillary process fin clips) from harvested sockeye salmon also sampled for ASL, either on the fishing grounds or dockside at the local boat harbor.

It is assumed that only Buskin and Lake Louise fish are in the subsistence harvest and that they are highly genetically distinctive with respect to origin. Genetic analyses, conducted in 2008, of samples collected from the 2005 Buskin and Louise/Catherine escapements identified distinct differences among these two components. Allele frequencies are very different and 100% simulations show that at least 99.8% of the mixtures allocate to the correct populations (Chris Habicht, personal communication).

Fish collected were analyzed by the ADF&G Gene Conservation Laboratory in Anchorage. Single nucleotide polymorphisms (SNPs) were used to estimate the stock composition of mixture samples using laboratory methods described by Habicht et al. (2008). The stock composition along with 90% credibility intervals were estimated using BAYES with a relative escapement prior as described by Dann et al. (2009).

Refinement of Sockeye Salmon Escapement Goal

Staff conducted a Bayesian spawner-recruit analysis (Schmidt and Evans 2010) which yielded a 90% credibility interval of S_{msy} of 4,950 - 8,700 fish and a probability of sustained yield being greater than 90% of S_{msy} occurring for an escapement range of 5,000 - 8,000 fish. The past decade has included record high and low returns of Buskin River sockeye salmon, with the low returns possibly related to over escapement in parent years.

Subsistence User Survey

Technicians opportunistically contacted sockeye salmon subsistence fishers on the fishing grounds in front of the Buskin River during good weather, and alternatively dockside at the local boat harbor while concurrently sampling the harvest for ASL. The user survey is an objective and has not been designed with bias and precision of the estimates in mind. The survey sample is, however, conducted over the duration of the subsistence fishery, providing a representative sample to a degree. The survey provides residency and effort data not currently available from the permit returns. Following a set of brief introductory remarks by the technician, all fishers who agree to be interviewed were then asked a short series of questions to determine their

residency (Kodiak Island Borough or other Alaskan) and traditional subsistence fishing location(s) (Buskin River or elsewhere).

RESULTS

By 15 August a total of 9,709 adult fish were counted through the weir located at the outlet of Buskin Lake (Table 4). The entire 2010 weir count eventually totaled 9,800 (Table 3). The highest daily count of 608 sockeye salmon occurred on 9 July and the midpoint of the run occurred on approximately 24 June (Table 4; Figure 3). Total sample goal was 310 fish and allowing for 10% scale regeneration, a total of 279 sampled fish were required. Age, length and sex data were collected from 280 sampled fish, and sex and length only data from an additional 83. Age composition estimates were not significantly different among temporal strata ($\chi^2 = 2.96$, df = 6, P = 0.813), so all samples were pooled. A combined 90% proportion of the total sample consisted of fish aged 1.3, 2.2 or 2.3 (Appendix A1). Mean length of sampled females was 51 mm (SE = 2.5); mean length of males was 520 mm (SE = 4.9).

A cumulative total of 421 sockeye salmon were counted through the weir located on the Catherine-Louise lakes tributary stream (Table 3). The single highest daily count of 85 sockeye salmon occurred on 15 August, with nearly 64% of the run complete (Table 5; Figure 4). Due to the small run, the goal of obtaining 260 age samples was not met. Age, length and sex data were collected from 65 sampled fish and sex and length only data from an additional 34 fish. Since an insufficient number of samples were obtained from the total escapement to meet the stated accuracy and precision goals for the age composition estimate, Chi-square testing among temporal strata was not conducted. Most fish bound for Catherine-Louise lakes were aged 2.2 (40%) and followed by age 1.3 (34%) (Appendix A2). Mean length of Catherine-Louise lakes females was 485mm (SD = 41), while mean length of males was 492 mm (SD = 58).

At the time of this report, a preliminary tally of more than 1,414 sockeye salmon reported taken in the 2010 subsistence harvest likely reflects an incomplete accounting of the total harvest. Estimates of abundance by age were pooled because sample sizes were too small to justify stratification. Nearly 90% of the subsistence harvest was comprised of age 2.3 (46.6%) or 1.3 (39.7%) fish (Appendix A3). Mean length of females was 521 mm (SE = 4.3), and 537 mm (SE = 7.8) for males.

Age composition of the Buskin Lake escapement was significantly different from the subsistence harvest ($\chi^2 = 23.59$; df = 3; P = 3.04E-05). Age composition of Buskin Lake escapement was also significantly from Lake Louise escapement ($\chi^2 = 34.73$; df = 3; P = 1.39-E07). As expected the age composition of the subsistence harvest was significantly different from that of Lake Louise escapement ($\chi^2 = 28.51$; df = 2; P = 6.44E-07).

During 2010, genetic samples were collected from total of 79 sockeye salmon (sample objective: 200) harvested in the Buskin River Section of the Chiniak Bay federal subsistence fishery between 30 May and 10 June. Additional samples were unavailable after this date due to emergency closure of the subsistence fishery resulting from low escapement. Samples have been sent to the ADF&G Gene Conservation Laboratory in Anchorage and are currently waiting to be analyzed. Analysis of these and the 2009 subsistence samples are scheduled after the collection of the 2011 samples have been obtained.

In order to further verify the genetic difference between the Buskin Lake and Louise/Catherine components, in 2010, during the peak of each run, an additional 100 genetic samples were

collected at the respective weirs. These samples were analyzed by the genetics lab and proof tests indicated that the two Buskin River reporting groups were highly identifiable, with mean correct allocation of 0.99 (personal communication, Tyler Dann).

During the January 2011 Alaska Board of Fisheries Kodiak area finfish meeting, the escapement goal review team recommended the current Buskin River sockeye salmon SEG of 8,000 - 13,000 fish should be changed to a BEG of 5,000 - 8,000 fish. Staff conducted a Bayesian spawner-recruit analysis (Schmidt and Evans 2010) which yielded a 90% credibility interval of S_{msy} of 4,950 - 8,700 fish and a probability of sustained yield being greater than 90% of S_{msy} occurring for an escapement range of 5,000 - 8,000 fish. The past decade has included record high and low returns of Buskin River sockeye salmon, with the low returns possibly related to over escapement in parent years.

In-person interviews were conducted on the fishing grounds with Buskin River subsistence users to determine user residency and patterns of historic fishing effort. Due to relatively low effort levels and the brief duration of the 2010 fishery, twenty individual interviews were obtained between 30 May and 10 June (Table 6). Very little subsistence effort occurred at the Buskin once the closure was lifted, thus no interviews were collected after 10 June.

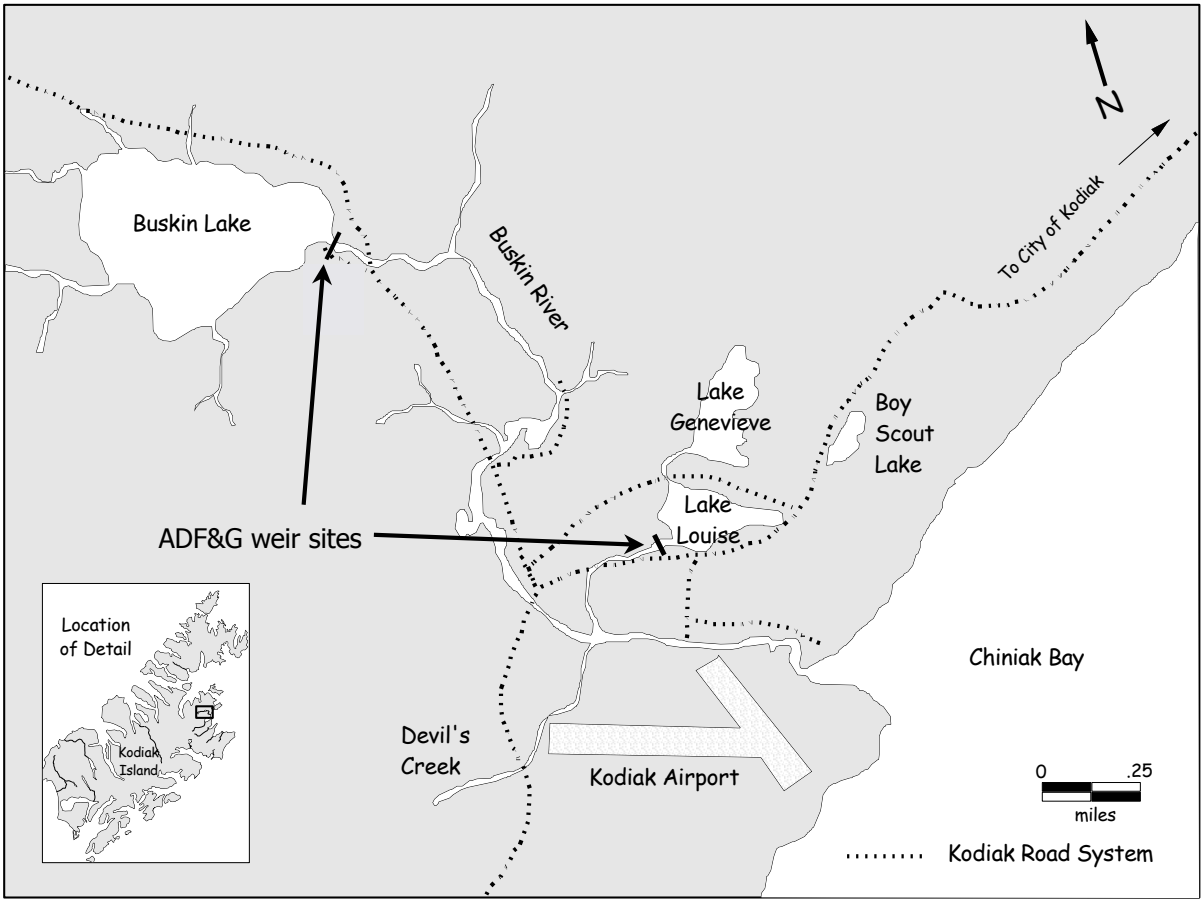

Figure 2.-Location of the Buskin River drainage weirs, 2010.

Table 4.-Immigration of sockeye salmon through the Buskin Lake outlet weir by date through August 15, 2010.

Date	Daily Count	Cumulative Count	% of Total	Date	Daily Count	Cumulative Count	% of Total
21-May	0	0	0%	4-Jul	0	7,131	73%
22-May	0	0	0%	5-Jul	9	7,140	73%
23-May	0	0	0%	6-Jul	170	7,310	75%
24-May	0	0	0%	7-Jul	77	7,387	75%
25-May	0	0	0%	8-Jul	375	7,762	79%
26-May	0	0	0%	9-Jul	608	8,370	85%
27-May	0	0	0%	10-Jul	67	8,437	86%
28-May	0	0	0%	11-Jul	66	8,503	87%
29-May	288	288	3%	12-Jul	80	8,583	88%
30-May	21	309	3%	13-Jul	42	8,625	88%
31-May	23	332	3%	14-Jul	18	8,643	88%
1-Jun	51	383	4%	15-Jul	553	9,196	94%
2-Jun	267	650	7%	16-Jul	1	9,197	94%
3-Jun	12	662	7%	17-Jul	0	9,197	94%
4-Jun	284	946	10%	18-Jul	64	9,261	95%
5-Jun	28	974	10%	19-Jul	66	9,327	95%
6-Jun	2	976	10%	20-Jul	69	9,396	96%
7-Jun	57	1,033	11%	21-Jul	13	9,409	96%
8-Jun	304	1,337	14%	22-Jul	7	9,416	96%
9-Jun	194	1,531	16%	23-Jul	12	9,428	96%
10-Jun	278	1,809	18%	24-Jul	0	9,428	96%
11-Jun	189	1,998	20%	25-Jul	2	9,430	96%
12-Jun	131	2,129	22%	26-Jul	178	9,608	98%
13-Jun	386	2,515	26%	27-Jul	9	9,617	98%
14-Jun	254	2,769	28%	28-Jul	0	9,617	98%
15-Jun	285	3,054	31%	29-Jul	0	9,617	98%
16-Jun	29	3,083	31%	30-Jul	21	9,638	98%
17-Jun	127	3,210	33%	31-Jul	12	9,650	98%
18-Jun	596	3,806	39%	1-Aug	2	9,652	98%
19-Jun	145	3,951	40%	2-Aug	1	9,653	99%
20-Jun	305	4,256	43%	3-Aug	3	9,656	99%
21-Jun	260	4,516	46%	4-Aug	0	9,656	99%
22-Jun	41	4,557	47%	5-Aug	5	9,661	99%
23-Jun	164	4,721	48%	6-Aug	4	9,665	99%
24-Jun	78	4,799	49%	7-Aug	1	9,666	99%
25-Jun	465	5,264	54%	8-Aug	14	9,680	99%
26-Jun	533	5,797	59%	9-Aug	0	9,680	99%
27-Jun	209	6,006	61%	10-Aug	2	9,682	99%
28-Jun	68	6,074	62%	11-Aug	0	9,682	99%
29-Jun	52	6,126	63%	12-Aug	0	9,682	99%
30-Jun	48	6,174	63%	13-Aug	1	9,683	99%
1-Jul	27	6,201	63%	14-Aug	15	9,698	99%
2-Jul	381	6,582	67%	15-Aug	11	9,709	99%
3-Jul	549	7,131	73%	**End of season count:**		**9,800**	

Table 5.-Immigration of sockeye salmon through the Catherine-Louise lakes weir by date through August 31, 2010

Date	Daily Count	Cumulative Count	% of Total	Date	Daily Count	Cumulative Count	% of Total
8-Jun				21-Jul	0	78	19%
9-Jun				22-Jul	0	78	19%
10-Jun				23-Jul	0	78	19%
11-Jun				24-Jul	0	78	19%
12-Jun				25-Jul	0	78	19%
13-Jun				26-Jul	0	78	19%
14-Jun				27-Jul	0	78	19%
15-Jun				28-Jul	0	78	19%
16-Jun				29-Jul	0	78	19%
17-Jun				30-Jul	50	128	30%
18-Jun				31-Jul	11	139	33%
19-Jun	0	0	0%	1-Aug	0	139	33%
20-Jun	0	0	0%	2-Aug	0	139	33%
21-Jun	0	0	0%	3-Aug	0	139	33%
22-Jun	0	0	0%	4-Aug	0	139	33%
23-Jun	0	0	0%	5-Aug	0	139	33%
24-Jun	0	0	0%	6-Aug	0	139	33%
25-Jun	0	0	0%	7-Aug	0	139	33%
26-Jun	0	0	0%	8-Aug	0	139	33%
27-Jun	0	0	0%	9-Aug	1	140	33%
28-Jun	0	0	0%	10-Aug	0	140	33%
29-Jun	0	0	0%	11-Aug	0	140	33%
30-Jun	0	0	0%	12-Aug	0	140	33%
1-Jul	0	0	0%	13-Aug	0	140	33%
2-Jul	0	0	0%	14-Aug	44	184	44%
3-Jul	0	0	0%	15-Aug	85	269	64%
4-Jul	0	0	0%	16-Aug	0	269	64%
5-Jul	0	0	0%	17-Aug	4	273	65%
6-Jul	0	0	0%	18-Aug	0	273	65%
7-Jul	0	0	0%	19-Aug	0	273	65%
8-Jul	0	0	0%	20-Aug	0	273	65%
9-Jul	75	75	18%	21-Aug	2	275	65%
10-Jul	1	76	18%	22-Aug	9	284	67%
11-Jul	0	76	18%	23-Aug	1	285	68%
12-Jul	2	78	19%	24-Aug	0	285	68%
13-Jul	0	78	19%	25-Aug	1	286	68%
14-Jul	0	78	19%	26-Aug	0	286	68%
15-Jul	0	78	19%	27-Aug	0	286	68%
16-Jul	0	78	19%	28-Aug	0	286	68%
17-Jul	0	78	19%	29-Aug	2	288	68%
18-Jul	0	78	19%	30-Aug	0	288	68%
19-Jul	0	78	19%	31-Aug	1	289	69%
20-Jul	0	78	19%	**End of season count:**		**421**	

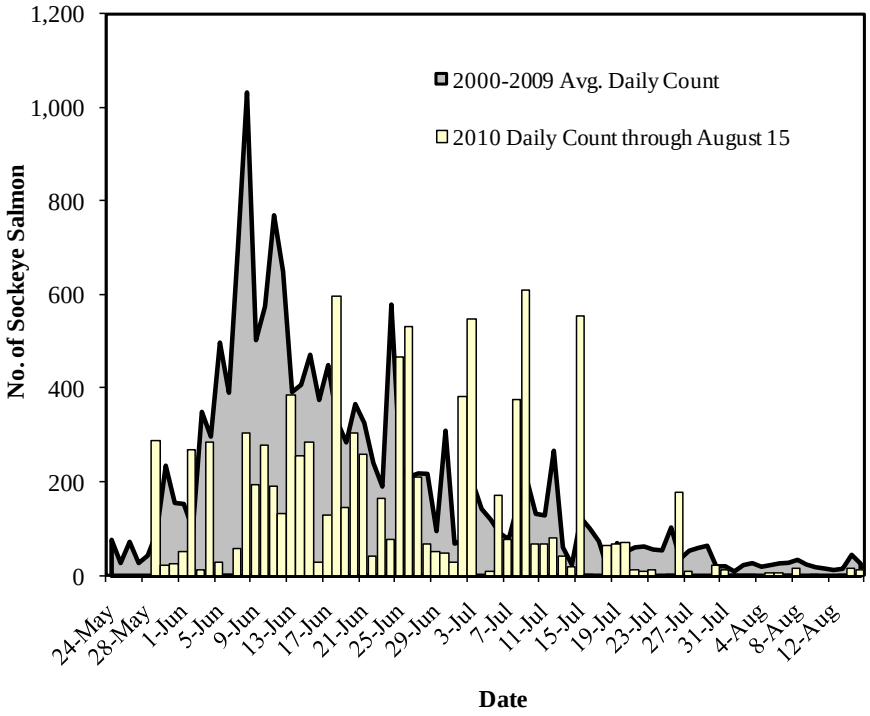

Figure 3.-Buskin River average daily sockeye salmon weir count, 2000-2009 and daily weir count through August 15, 2010

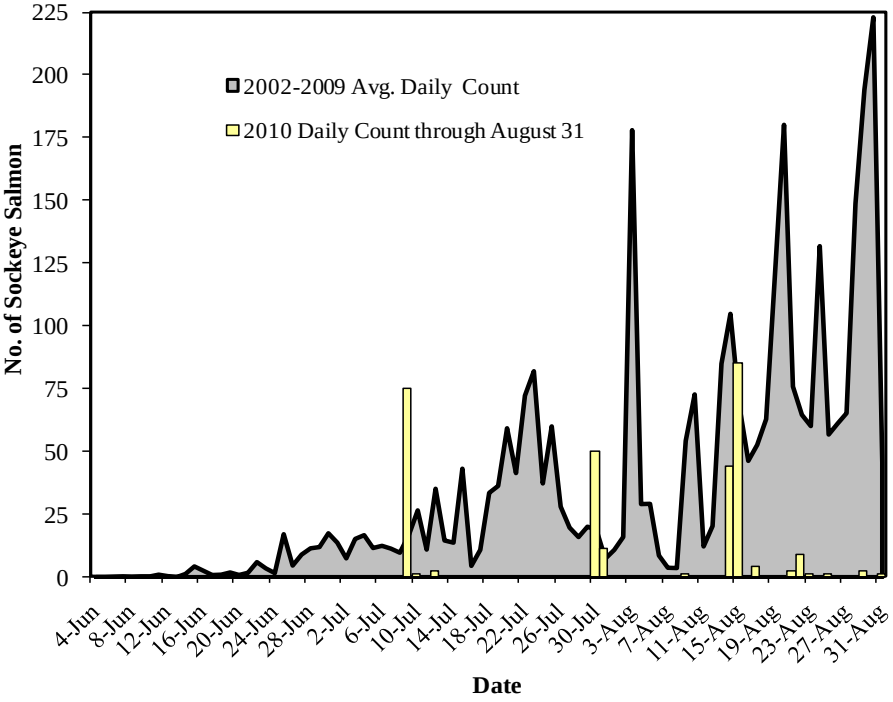

Figure 4.-Catherine-Louise lakes daily and cumulative sockeye salmon escapement through August 31, 2010.

Table 6.- Results from verbal interviews conducted with Buskin River subsistence users between 30 May and 10 June 2010.

User Statistics:	
Total Users Interviewed:	20
Interview dates:	30 May - 10 June

User Demographics

	Kodiak	Unknown	
Residency	20	0	
	Buskin	**Pasagshak**	**Unknown**
Location of Traditional Subsistence Use	18	1	0
	Yes	**No**	
Have Occasionally Fished Other Areas* Besides Traditional Location(s)	12	8	

*Other areas occsionally fished: Pasagshak (6); Litnik (6)

DISCUSSION

The 2010 Buskin Lake sockeye salmon run is continuing to recover from the 2008 record low adult return, while the Lake Louise run was the least abundant since counting began in 2002. As a result of the poor daily and cumulative weir counts, the sport and subsistence fisheries were both closed on15 June. Additionally, no commercial fishery openings targeting Buskin drainage sockeye salmon were allowed. While the Buskin subsistence fishery was re-opened 30 June, typically the majority of the Buskin subsistence effort is completed by the first week of July. On 13 July, the Buskin River sockeye salmon sport fishery was re-opened. The poor run and resultant early closure of the subsistence fishery were undoubtedly responsible for the preliminary 2010 subsistence harvest of just 1,414 fish. With the exception of the 2008-2010 runs, the Buskin River sockeye run has remained relatively stable, and is fully utilized by harvesters. A combination of projected increasing Buskin Lake sockeye salmon runs and a new lower BEG of 5,000-8,000, should result in uninterrupted subsistence, sport and commercial fisheries in the near future.

Escapements, subsistence harvests and corresponding age composition estimates from 2010 will be used along with sport and commercial harvest data to continue to refine the triennial evaluation of the sockeye BEG evaluation through expanded development of a sockeye salmon brood table.

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APPENDIX A. SUPPORTING DATA

Appendix A 1.-Estimated age composition of Buskin River sockeye salmon escapement, 2010.

Buskin Lake Escapement

	Age						
Run Component	1.2	1.3	2.1	2.2	2.3	3.3	Total
Females							
Sample Proportion	2.9	11.9	0.0	10.8	23.1	0.0	48.7
SE	0.2	0.3	0.0	0.3	0.4	0.0	0.5
Estimated Escapement	283	1,168	0	1,061	2,264	0	4,776
SE	17	32	0	31	42	0	49
Males							
Sample Proportion	4.0	12.3	2.9	10.1	22.0	0.0	51.3
SE	0.2	0.3	0.2	0.3	0.4	0.0	0.5
Estimated Escapement	389	1,203	283	991	2,158	0	5,024
SE	19	32	17	30	41	0	49
Total							
Sample Proportion	6.9	24.2	2.9	20.9	45.1	0.0	100.0
SE	0.3	0.4	0.2	0.4	0.5	0.0	0.0
Estimated Escapement	672	2,370	283	2,052	4,422	0	9,800
SE	25	42	17	40	49	0	0

Appendix A 2.-Estimated age composition of Catherine-Louise lakes sockeye salmon escapement, 2010.

	Age						
Run Component	1.2	1.3	2.1	2.2	2.3	3.3	Total
Females							
Sample Proportion	4.5	16.7	0.0	18.2	7.6	1.5	48.5
SE	1.0	1.8	0.0	1.9	1.3	0.6	2.4
Estimated Escapement	19	70	0	77	32	6	204
SE	4	8	0	8	5	3	10
Males							
Sample Proportion	9.1	15.2	0.0	21.2	4.5	1.5	51.5
SE	1.4	1.7	0.0	2.0	1.0	0.6	2.4
Estimated Escapement	38	64	0	89	19	6	217
SE	6	7	0	8	4	3	10
Total							
Sample Proportion	13.6	31.8	0.0	39.4	12.1	3.0	100.0
SE	1.7	2.3	0.0	2.4	1.6	0.8	0.0
Estimated Escapement	57	134	0	166	51	13	421
SE	7	10	0	10	7	4	0

Appendix A 3.-Estimated age composition of Buskin River sockeye salmon subsistence harvest, 2010.

	Age						
Run Component	1.2	1.3	2.1	2.2	2.3	3.3	Total
Females							
Sample Proportion	1.4	29.0	0.0	0.0	30.4	0.0	60.9
SE	0.3	1.2	0.0	0.0	1.2	0.0	1.3
Estimated Harvest	20	410	0	0	430	0	861
SE	4	17	0	0	17	0	18
Males							
Sample Proportion	2.9	10.1	0.0	7.2	18.8	0.0	39.1
SE	0.4	0.8	0.0	0.7	1.0	0.0	1.3
Estimated Harvest	41	143	0	102	266	0	553
SE	6	11	0	10	15	0	18
Total							
Sample Proportion	4.3	39.1	0.0	7.2	49.3	0.0	100.0
SE	0.5	1.3	0.0	0.7	1.3	0.0	0.0
Estimated Harvest	61	553	0	102	697	0	1,414
SE	8	18	0	10	19	0	0