

**Annual Project Report No. FIS 03-033**  
**USFWS Office of Subsistence Management**  
**Fishery Information Services Division**

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## **Stock Assessment of Sockeye and Coho Salmon from Billy's Hole, Prince William Sound, Alaska, 2003**

by

**Jan P. Bullock**  
**and**  
**Matt G. Miller**

May 2004

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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 <sup>3</sup> /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 <sub>A</sub>
base of natural logarithm	e
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	F, t, $\chi^2$ , 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 <sub>2</sub> , etc.
mideye-to-fork	MEF
minute (angular)	'
multiplied by	x
not significant	NS
null hypothesis	H <sub>0</sub>
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	$\alpha$
probability of a type II error (acceptance of the null hypothesis when false)	$\beta$
second (angular)	"
standard deviation	SD
standard error	SE
standard length	SL
total length	TL
variance	Var

**ANNUAL PROJECT REPORT NO. FIS 03-502**  
**USFWS OFFICE OF SUBSISTENCE MANAGEMENT**  
**FISHERY INFORMATION SERVICES DIVISION**

**STOCK ASSESSMENT OF SOCKEYE AND COHO SALMON FROM**  
**BILLY'S HOLE, PRINCE WILLIAM SOUND, ALASKA, 2003**

by

Jan P. Bullock  
and  
Matt G. Miller

*Division of Sport Fish, Anchorage*

May 2004

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This is an annual report to the U.S. Fish and Wildlife Service, Office of Subsistence Management, Fisheries Resource Monitoring Program and has not undergone biometric or peer review by the Division of Sport Fish, Alaska Department of Fish and Game. Thus, information contained herein should be considered preliminary and is subject to revision.

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## Annual Report Summary Page

**Title:** Stock assessment of sockeye and coho salmon from Billy's Hole, Prince William Sound, Alaska, 2003

**Study Number:** FIS 03-033

**Investigator(s)/Affiliation(s):** Jan P. Bullock and Matt G. Miller, Alaska Department of Fish and Game, Division of Sport Fish, 333 Raspberry Road, Anchorage, AK, USA.

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**Management Region:** Gulf of Alaska/Cook Inlet Region

**Information Type:** Stock Status and Trends

**Issue Addressed:** Data collected from the project will be used for management of subsistence and sport fisheries, and to assess escapements and runs of the sockeye and coho salmon stocks.

**Study Cost:** \$273,100

**Study Duration:** June 1, 2003 –October 31, 2005

**Key Words:** Age composition, Billy's Hole, Long Bay, Prince William Sound, sockeye salmon, *Oncorhynchus nerka*, coho salmon, *Oncorhynchus kisutch*, subsistence harvest, weir, steppass.

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## ABSTRACT

A weir was operated at Billy's Hole, part of Long Bay in Prince William Sound, Alaska, from June 14 – September 13, 2003. A total of 1,164 sockeye salmon *Oncorhynchus nerka* and 118 coho salmon *O. kisutch* were counted. Ninety-eight percent of the sockeye salmon in the escapement were age 1.3. Fifty percent of the coho salmon were age 1.1 and the other fifty percent were 2.1. No subsistence users and 12 recreational anglers were interviewed. Ten salmon were sampled from the recreational harvest. All were sockeye aged 1.3.

Key words: Billy's Hole, Long Bay, Prince William Sound, sockeye salmon, *O. nerka*, coho salmon, *O. kisutch*, weir, subsistence user, age composition, steppass.

## INTRODUCTION

Federally qualified subsistence users harvest sockeye *O. nerka* and coho *O. kisutch* salmon throughout Prince William Sound (PWS). Accurate data concerning escapement and harvest of these stocks by all user groups is important to manage for adequate salmon returns. The Billy's Hole weir project was designed to estimate spawning escapement, calculate total return by age and estimate harvest and effort of these fish stocks. Several sites with subsistence salmon fisheries in western Prince William Sound were identified by the Glacier Ranger District of the United States Forest Service (USFS) and local residents of Tatitlek and Chenega Bay as potential sites for creel and escapement surveys (Figure 1). This site was chosen as a priority because of its small run size and potential high utilization by rural subsistence fishers from Tatitlek and Chenega Bay and by recreational anglers from Valdez. Sockeye salmon are a valued salmon species by anglers and this fishery is one of very few in western Prince William Sound. Results from this study will help insure that sustained yield and fishing opportunities are provided, and that the health of the salmon stocks will not be negatively impacted by these recreational and subsistence fisheries.

Billy's Hole is located 33 miles southwest of Valdez and 22 miles northwest of Tatitlek in the southwest area of Long Bay at approximately 60 degrees 58' N latitude and 147 degrees 17' W longitude. The system consists of an upper 83-acre lake, which narrows to a smaller 25-acre lake. This smaller lake has two active outlets, both containing waterfalls at tidewater, and a dry outlet that overflows during high water events. All three flow into an enclosed saltwater cove. In 1963 a steppass was constructed in a joint effort by the USFS and Alaska Department of Fish & Game (ADF&G) on the northern lake outlet to allow anadromous fish to migrate past the intertidal waterfall and into the upper lake (USFS 1981a). Previous to this construction, sockeye salmon were unable to jump the falls except at very high tides. An earthquake in 1964 caused a 2-foot uplift to the stream and steppass resulting in fish no longer being attracted to the steppass entrance. A cement dike constructed to channel upstream water into the steppass also created an impassable barrier to migration. These situations resulted in a severely diminished run and the steppass was removed in June 1981 (USFS 1981b).

Aerial surveys of Billy's Hole by ADF&G Commercial Fisheries Management Division from 1963 through 2003 have estimated salmon escapement numbers (Appendix 1). According to estimates made at peak counts of these surveys, 500-2,500 sockeye salmon would be expected to return to this system. There has been insufficient recreational effort to credibly estimate effort, harvest and catch data from postal surveys conducted through the Statewide Harvest Surveys for the years 1996-1999 (Howe et al. 2001 a-d). Therefore, this 2-year study will estimate the annual harvest and effort of subsistence users and recreational anglers on the sockeye and coho resources, use a weir to accurately measure escapement, and collect sex, age and length data. This basic information is needed for managers to make sound decisions regarding the salmon resources at this site.

## **OBJECTIVES**

1. Census the sockeye and coho salmon escapement from June 15 to September 24.
2. Estimate the age, sex and length composition of the salmon escapement into Billy's Hole Lake so that the estimates are at least 7.5 percentage points of the true value 95% of the time.
3. Estimate the age, sex and length composition of the recreational and subsistence harvest of salmon in Billy's Hole such that the estimates are at least 7.5 percentage points of the true value 95% of the time.
4. Estimate the effort and harvest of subsistence users at Billy's Hole such that the estimates of effort are within 25% of the true value 95% of the time, and the estimates of harvest are within 50% of the true value 95% of the time.
5. Estimate the effort and harvest of recreational anglers at Billy's Hole such that the estimates of effort are within 25% of the true value 95% of the time, and the estimates of harvest are within 50% of the true value 95% of the time.
6. Summarize the proportion of fishing effort by user group (recreational or subsistence); fishing trip duration; terminal tackle type (flies, bait, lures, nets); and angler type (resident/nonresident, guided/unguided).

## **METHODS**

### **ESCAPEMENT**

Sockeye and coho salmon were counted as they passed through a stationary picket weir and upstream trap at the northern outlet of Billy's Hole Lake (Figure 2) from June 24 – September 13, 2003. The distance between pickets was .5 inches, which effectively blocked all fish species but small Dolly Varden char (*Salvelinus malma*). The weir was operational a total of 85 days but was non-operational on August 14, 15, 16, 17 and 26 due to high water events. Modifications to the weir in 2004 will stabilize it in the event of high water. Species, sex, and length were recorded for 104 sockeye and 37 coho salmon. Scales were also taken from these fish. Daily counts and measurements of sockeye and coho salmon were entered on salmon weir count forms and transferred to ADF&G Standard Age Weight Length Mark Sense forms (Version 1.2). Pink and chum salmon as well as Dolly Varden char were also counted.

## **CREEL SURVEY**

A marine roving-roving creel survey (Pollock et al. 1994) was planned to estimate the daily effort by recreational and subsistence users, and to estimate the salmon harvest of these two user groups. This survey design allowed technicians to rove through the fishery counting anglers and to rove among anglers to collect effort and harvest data. The survey was temporally stratified into two intervals, June 15-August 15 and August 16-September 13. The design consisted of a two-stage survey (Cochran 1977) in which the first stage, days were sampled systematically (every other day) starting June 16. The second stage consisted of angler counts for effort estimates and angler interviews for harvest estimates. Angler counts were used to estimate fishing effort in units of angler-hours. Angler interviews, conducted during the time not used for angler counts, were conducted just prior to or just after angler counts. Interviews included collecting information on catch, harvest, user group (recreational or subsistence), trip type (guided or unguided), terminal tackle, and angler residency.

Due to low angler effort in the survey area mid-season, technicians were instructed to contact and interview all anglers. Species, sex and length data was collected from harvested salmon and scales were collected for age data.

Angler counts were recorded on Sport Fish Division Angler Count Mark Sense forms. Angler interviews were recorded on Angler Interview Mark Sense forms. Biological data was recorded on AWL Mark Sense forms.

In 2004, the creel survey design will be modified and a census will be conducted to count and interview all anglers.

## **AGE, SEX, AND LENGTH SAMPLING**

Sockeye salmon were sampled from Billy's Hole weir sampling box during each of three temporal strata: June 15-July 10, July 11-25, and July 26-August 31. Sampling was conducted daily. Every tenth fish entering the trap was sampled. Fish were passed through the trap during the early morning and late evening to allow for their expedited passage upstream. The recreational harvest was sampled for age, sex, and length. Fish were measured from mid-eye to fork-of-tail and sex determined. Two scales were taken from each sockeye 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 when necessary, although only within the area bounded dorsally by the fourth row of scales above the lateral line, ventrally by the lateral line, and between lines drawn vertically from the posterior insertion of the dorsal fin and the anterior insertion of the anal fin. If scales were not available in the preferred region on the left side of the fish, scales were collected from the preferred region on the right side. Age was interpreted from scales using the criteria of (Clutter and Whitesel 1956).

## DATA ANALYSIS

Due to the small sample size of salmon, no statistical analyses were done to determine length frequencies for the fish sampled from the fishery. Sockeye and coho salmon scales were read and age/length data of fish sampled at the weir were summarized (Tables 1 and 2). The census of angler catch, effort and harvest was also summarized (Table 3).

Estimates of the age, sex, and length compositions and their variances will be calculated in 2004 using standard estimating equations (Sokal and Rohlf 1995).

## RESULTS

Between June 14 and September 13, 2003, a total of 1,164 sockeye and 118 coho salmon were counted through the Billy's Hole weir (Figure 3 and 4, Appendix 2). The first sockeye was passed on June 15 and the last on August 29. The highest daily count of 156 sockeye occurred on July 17 (Figure 3 and 4, Appendix 2). The strongest part of this run occurred between July 5 and July 27 when 88% of the sockeye passed through the weir. The first coho salmon was counted on July 30 and the last on September 13. The highest daily count of 16 coho salmon occurred on August 20. The run was small and daily numbers were inconsistent.

The weir was operational for 86 of the 91 days it was installed. Counts of other fish species passing through the weir were kept in 2003 also. These included 276 chum salmon (*O. tshawytscha*), 3,836 pink salmon (*O. gorbuscha*) and 1,631 Dolly Varden char (*S. malma*). All three species were seen in Billy's Lake. The Dolly Varden char were most numerous just off the two stream mouths emptying into the upper lake. Pink salmon were seen spawning in both these streams and some coho salmon were observed in the narrows between the lakes.

Age, sex and length data were collected for 104 sockeye salmon and 37 coho salmon. Scales were collected from 102 sockeye and 37 coho salmon. All but one sockeye in the escapement were aged 1.3 (Table 1). One male sockeye was aged 2.3. Mean length of females in the escapement was 567mm (SE = 3.5); mean length of males was 597 mm (SE = 3.7). Fifty percent of the coho salmon were aged 1.1 and the other half was 2.1 (Table 2).

Only twelve recreational anglers were interviewed. No subsistence users were observed during the 2003 field season. These small sample sizes precluded making accurate, precise estimates of effort or harvest.

Ten sockeye salmon were sampled from the recreational harvest. All sampled fish were aged 1.3.

## DISCUSSION

The 2003 escapement of 1,164 sockeye salmon and 118 coho salmon through the Billy's Hole weir was within the range of what we would have expected for sockeye given the expected number of 500-2500 determined by peak counts during aerial surveys (Appendix 1). There was no documentation of coho salmon in this system before this study. The weir was removed before the target removal date of September 24 due to the absence of fish.

Water levels recorded throughout the field season showed a rapid increase during rain events in August. The 5 days of high water in August collapsed the weir and likely allowed fish to pass

uncounted. It is unlikely that sockeye and chum salmon escaped but coho and pink salmon may have, thus biasing our sample low for those species. Small Dolly Varden char were seen going thru the weir and, at times, were too numerous to count. After the weir was replaced, we assessed the lake but saw no large amounts of salmon that may have escaped upstream during the flood events. A steel 5/16-inch cable passed behind the weir and secured to large trees on either side of the stream in 2004 may alleviate this problem by keeping the weir intact and upright. More tripods with extra sandbags could also stabilize the weir further.

The fisheries technicians conducted some informal stream surveys above the lake in 2003. Fish counts, sampling, stream walks and lake surveys did identify sockeye spawning habitat. Lake limnology has not been documented and spawning habitat has not been evaluated to determine how many fish this system could support. Lake depth measurements, plankton trawls, stream counts and habitat suitability indices may provide insight into why fish numbers seem to be fluctuating. Also, aerial surveys of the area after the weir is out and camp is closed for the season may give an indication if anglers are returning to fish when an ADF&G presence is not there.

The small amount of data collected from the creel survey may have been due to the full time presence of the weir camp. In the past, anglers have reportedly snagged overlimits of salmon in fresh water. Once the camp was established and anglers arrived to see a full time crew presence, word passed among anglers in Valdez that this fishery was being studied (Tchaika Fishing Guide Services, Valdez, pers. comm). This may have led to an avoidance of the Billy's Hole fishery and therefore, a lack of anglers to interview. The creel census will continue to collect absolute numbers of anglers and data and all recreational and subsistence anglers that enter the study area throughout the field season will be interviewed

Chugach Regional Resources Commission (CRRC), a co-principle investigator on this project, hired field technicians from the village of Tatitlek to participate in this study. These technicians were eager to understand how to monitor escapements and assess salmon runs. These technicians were vital participants in all aspects of weir operations, data collection and information dissemination.

The baseline data collected in 2003 will be useful in determining how this fishery will be managed in the future.

## **ACKNOWLEDGMENTS**

The U.S. Forest Service funded this project through the Fisheries Resource Monitoring Program under agreement 70181-0J283.

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**Table 1.-Age and sex composition of sockeye salmon at Billy's Hole, 2003.**

		Brood Year and Age Class		Total
		1998	1997	
		1.3	2.3	
<hr/>				
Stratum dates:	06/15 - 08/29			
Sampling dates:	07/02 - 08/02			
Sample size:	64 <sup>a</sup>			
Female	Percentage of sample	42.2	0.0	42.2
	Number in escapement	491	0	491
Male	Percentage of sample	56.3	1.6	57.8
	Number in escapement	655	18	673
Total	Percentage of sample	98.4	1.6	100.0
	Number in escapement	1,146	18	1,164
	Standard error	18	18	

<sup>a</sup> Scales with resorbed edges have been taken out : strata 1 had 13 resorbed scales.

**Table 2.-Age and sex composition of coho salmon at Billy's Hole, 2003.**

		<u>Brood Year and Age Class</u>		
		<u>2000</u>	<u>1999</u>	
		1.1	2.1	Total
Stratum dates:	07/30 - 09/13			
Sampling dates:	07/30 - 09/05			
Sample size:	30			
Female	Percentage of sample	26.7	36.7	63.3
	Number in escapement	30	41	72
Male	Percentage of sample	23.3	13.3	36.7
	Number in escapement	26	15	41
Total	Percentage of sample	50.0	50.0	100.0
	Number in escapement	57	57	113
	Standard error	10	10	

**Table 3.-Summary of angler interviews at Billy's Hole, 2003.**

<b>Date</b>	<b>Fishing Period</b>	<b>No of Anglers</b>	<b>Time (Hrs) Fished</b>	<b>Species</b>	<b>Number Caught</b>	<b>Number Released</b>	<b>Size (mm)</b>
7/2/2003	3	1	3	Sockeye	4	0	F 595
				Sockeye			F 575
				Sockeye			M 605
				Sockeye			F 565
7/2/2003	3	2	3	Sockeye	4	0	F 540
				Sockeye			F 580
				Sockeye			F 582
				Sockeye			M 613
7/6/2003	2	1	2				
7/8/2003	2	1	3	D.Varden	1		
		2	3	D.Varden	1		
7/12/2003	3	1	3	Chum	3	3	
7/18/2003	3	1	2	Sockeye	1		F 510
	3	2	2	Sockeye	1		F 545
	3	3	2				
	3	4	2				
	3	5	2				
	3	6	2				

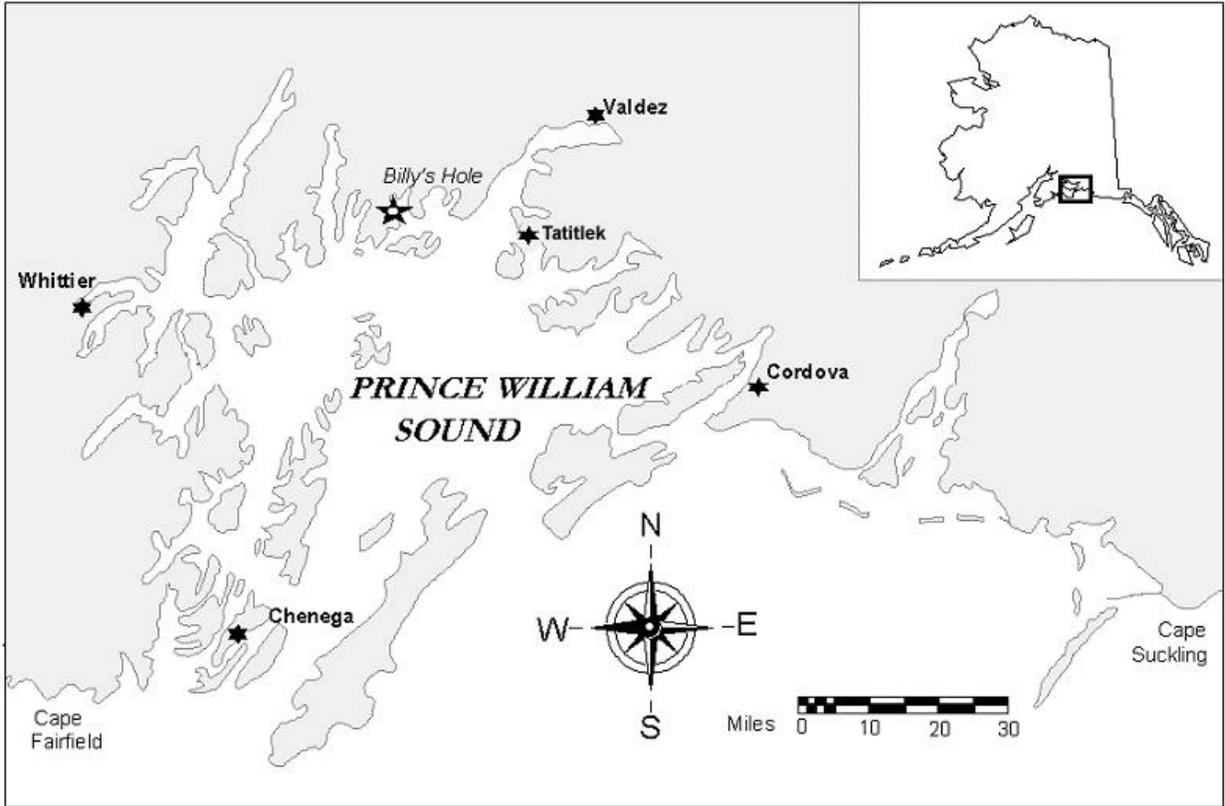
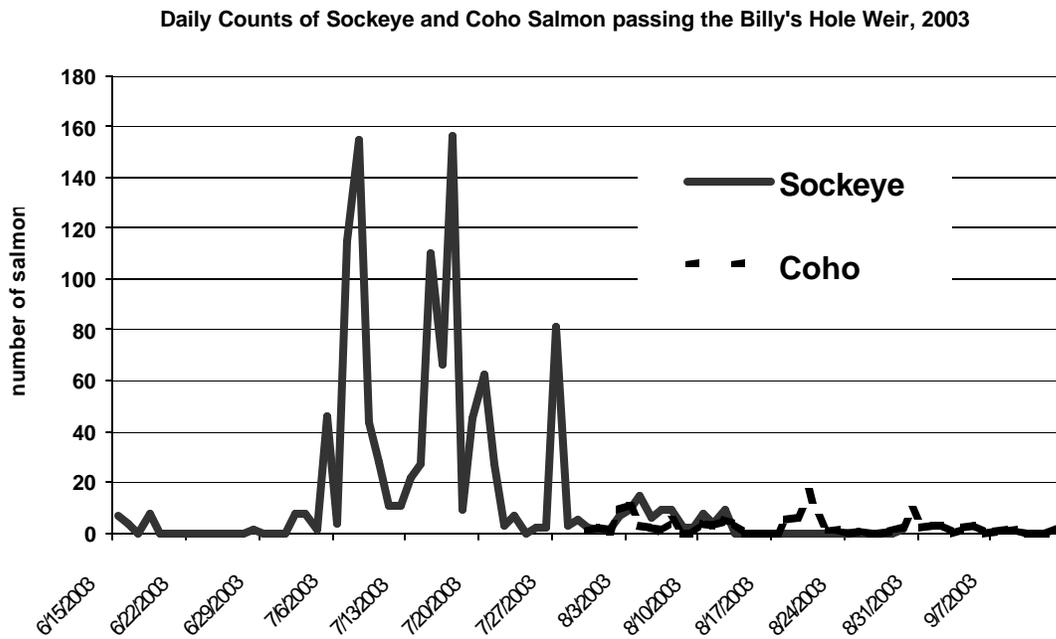


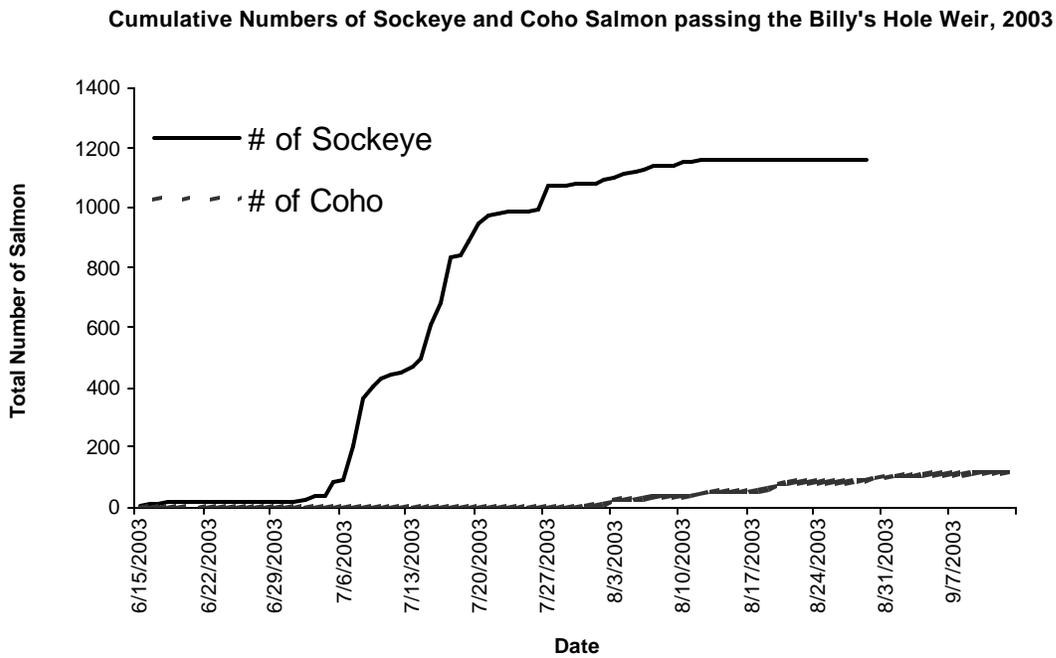
Figure 1.-Map of Prince William Sound and location of Billy's Hole.



**Figure 2.-Photo of Billy's Hole and study area.**



**Figure 3.-Daily counts of sockeye and coho salmon by day through the weir at Billy's Hole, 2003**



**Figure 4.-Cumulative counts of sockeye and coho salmon by day through the weir at Billy's Hole, 2003.**





**Appendix 1. - Historical aerial survey estimates of salmon at Billy's Hole**

DATE	# FISH	YEAR
7/27/1963	200	1963
8/12/1963	700	
8/14/1964	2400	1964
7/8/1965	1000	1965
7/13/1966	1500	1966
7/24/1967	500	1967
7/26/1968	400	1968
8/2/1968	300	
7/8/1969	200	1969
7/29/1971	0	1971
8/11/1971	0	
7/8/1972	200	1972
7/17/1973	50	
9/12/1973	0	1973
8/4/1975	200	1975
8/11/1975	200	
7/15/1976	2600	1976
7/23/1976	2000	
8/2/1976	3600	
6/28/1977	0	1977
7/11/1977	100	
7/7/1978	0	1978
7/17/1978	700	
8/7/1978	800	
8/15/1978	500	
7/23/1979	100	1979
7/31/1979	600	
8/22/1979	90	
7/2/1980	0	1980
7/21/1980	0	
8/5/1980	0	
8/12/1980	0	
6/23/1981	0	1981
7/2/1981	0	
7/20/1981	0	
7/29/1981	0	
7/7/1982	600	1982
7/14/1982	1500	
7/21/1982	1500	
7/28/1982	3200	
8/3/1982	2500	
8/11/1982	1200	
8/20/1982	1000	
6/30/1983	5000	1983
7/12/1983	800	
7/20/1983	2500	
7/26/1983	4000	
8/2/1983	1500	

DATE	# FISH	YEAR
8/11/1983	600	
8/16/1983	500	
7/3/1984	4000	1984
7/17/1984	1500	
7/24/1984	900	
7/31/1984	900	
8/29/1984	200	
7/16/1985	300	1985
7/22/1985	100	
8/1/1985	1200	
8/5/1985	150	
6/26/1986	300	1986
7/3/1986	2000	
7/7/1986	2000	
7/14/1986	2450	
7/28/1986	4000	
8/5/1986	800	
8/4/1987	10	1987
7/27/1988	800	1988
8/1/1988	700	
8/8/1988	500	
8/15/1988	300	
8/23/1988	100	
7/10/1989	200	1989
7/17/1989	400	
7/25/1989	2500	
8/7/1989	600	
8/16/1989	80	
8/21/1989	50	
7/7/1990	450	1990
7/23/1990	1900	
7/26/1990	800	
7/31/1990	1900	
8/3/1990	825	
8/6/1990	1400	
8/13/1990	630	
8/15/1990	14	
8/21/1990	900	
8/30/1990	110	
9/4/1990	210	
9/11/1990	10	
7/12/1993	400	1993
7/2/1996	0	1996
7/10/1996	0	
7/18/1996	1200	
7/31/1996	600	
8/15/1996	100	
8/21/1996	0	

DATE	# FISH	YEAR
9/4/1996	200	
9/20/1996	200	
6/24/1997	25	1997
7/1/1997	0	
7/3/1997	600	
7/15/1997	20	
7/19/1997	500	
8/6/1997	50	
8/15/1997	0	
8/21/1997	0	
9/2/1997	50	
9/16/1997	30	
7/2/1998	150	1998
7/8/1998	0	
7/14/1998	0	
7/20/1998	50	
7/27/1998	600	
8/3/1998	450	
8/12/1998	200	
8/21/1998	0	
9/5/1998	20	
6/30/1998	0	
7/6/1999	30	1999
7/13/1999	500	
7/22/1999	1500	
7/29/1999	1800	
8/5/1999	2000	
8/13/1999	2100	
8/19/1999	600	
8/26/1999	220	
9/6/1999	0	
6/21/2000	0	2000
6/26/2000	0	
7/3/2000	0	
7/11/2000	50	
7/18/2000	50	
7/24/2000	60	
7/30/2000	700	
8/6/2000	450	
8/12/2000	450	
8/25/2000	200	
9/5/2000	0	
9/14/2000	8	
7/6/2003	75	2003
7/25/2003	400	
7/8/2003	550	
8/18/2003	200	
8/25/2003	300	

**Appendix 2. - Daily counts of passage through the weir at Billy's Hole, 2003**

Date	Sockeye daily	Sockeye Total	Chum Daily	Chum Total	Pink Daily	Pink Total	DV Daily	DV Total	SH	Coho Daily	Coho Total	H2O Level
6/15/2003	7	7		0				0			0	
6/16/2003	4	11		0				0			0	
6/17/2003	0	11		0				0			0	
6/18/2003	8	19		0				0			0	
6/19/2003	0	19		0			31	31			0	1.3 FT
	1	20		0			0	31			0	1.5
6/21/2003	0	20		0			5	36			0	1.5
6/22/2003	0	20		0			3	39			0	1.38
6/23/2003	0	20		0			21	60			0	1.25
6/24/2003	0	20		0			0	60			0	1.2
6/25/2003	0	20		0			0	60			0	2.2
6/26/2003	0	20		0			0	60			0	1.7
6/27/2003	0	20		0			0	60			0	2.4
6/28/2003	1	21		0			0	60			0	1.5
6/29/2003	0	21		0			0	60			0	1.2
6/30/2003	0	21		0			16	76			0	1.14
7/1/2003	0	21		0			136	212			0	1.1
7/2/2003	8	29	1	1			100	312			0	1.62
7/3/2003	8	37	1	2			26	338			0	2.3
7/4/2003	1	38	0	2			0	338			0	1.5
7/5/2003	46	84	0	2			150	488			0	1.2
7/6/2003	4	88	0	2			36	524			0	1.16
7/7/2003	115	203	6	8			120	644			0	1.06
7/8/2003	155	358	3	11			26	670			0	1.06
7/9/2003	44	402	12	23			300	970			0	1
7/10/2003	28	430	33	56			284	1254			0	0.96
7/11/2003	11	441	75	131			9	1263			0	0.9
7/12/2003	11	452	13	144			9	1272			0	0.88
7/13/2003	22	474	13	157			5	1277			0	0.86
7/14/2003	27	501	35	192			6	1283			0	0.86
7/15/2003	110	611	10	202	1	1	21	1304			0	0.9
7/16/2003	66	677	13	215	7	8	22	1326	1		0	0.94
7/17/2003	156	833	35	250	61	69	89	1415			0	2.15 - 1.75

7/18/2003	9	842	2	252	1	70	7	1422			0	1.45
7/19/2003	45	887	10	262	9	79	19	1441			0	1.15
7/20/2003	62	949	4	266	4	83	29	1470			0	1.06-.96
7/21/2003	27	976	1	267	32	115	16	1486			0	.9-1.76
7/22/2003	3	979	0	267	0	115	0	1486			0	1.85-1.66
7/23/2003	7	986	1	268	5	120	8	1494			0	1.4-1.35
7/24/2003	0	986	0	268	0	120	2	1496			0	1.08
7/25/2003	2	988	0	268	5	125	4	1500			0	1.45-1.55
7/26/2003	2	990	0	268	2	127	0	1500			0	N/A
7/27/2003	81	1071	1	269	95	222	2	1502			0	2.72-2.82
7/28/2003	3	1074	0	269	12	234	0	1502			0	2.45-2.55
7/29/2003	5	1079	0	269	16	250	0	1502			0	2.58-2.26
7/30/2003	2	1081	1	270	11	261	1	1503		1	1	2.08-2
7/31/2003	1	1082	0	270	3	264	5	1508		2	3	1.6-1.4
8/1/2003	1	1083	0	270	2	266	4	1512		1	4	1.26-1.18
8/2/2003	7	1090	3	273	10	276	0	1512		9	13	1.08
8/3/2003	9	1099	0	273	29	305	0	1512		11	24	0.98
8/4/2003	15	1114	0	273	209	514	6	1518		3	27	.96-.94
8/5/2003	6	1120	0	273	89	603	6	1524		2	29	.9-.88
8/6/2003	9	1129	0	273	103	706	14	1538		1	30	0.85
8/7/2003	9	1138	0	273	113	819	18	1556		5	35	0.8
8/8/2003	2	1140	0	273	25	844	0	1556		0	35	0.78
8/9/2003	2	1142	0	273	31	875	0	1556		0	35	0.76
8/10/2003	8	1150	0	273	62	937	0	1556		4	39	0.75
8/11/2003	4	1154	0	273	115	1052	0	1556		3	42	0.72
8/12/2003	9	1163	0	273	174	1226	0	1556		5	47	.72-2.8
8/13/2003	0	1163	0	273	41	1267	0	1556		4	51	.97cm-3.9
8/14/2003 <sup>a</sup>		1163		273		1267		1556			51	
8/15/2003 <sup>a</sup>		1163		273		1267		1556			51	
8/16/2003 <sup>a</sup>		1163		273		1267		1556			51	
8/17/2003 <sup>a</sup>		1163		273		1267		1556			51	
8/18/2003	0	1163	2	275	250	1517	27	1583		5	56	1.4(44cm)
8/19/2003	0	1163	0	275	154	1671	18	1601		6	62	1.35(40cm)
8/20/2003	0	1163	1	276	146	1817	5	1606		16	78	
8/21/2003	0	1163			39	1856	12	1618		6	84	

8/22/2003	0	1163		67	1923	3	1621		1	85	34-32cm
8/23/2003	0	1163		59	1982	2	1623		1	86	29cm
8/24/2003	0	1163		79	2061	3	1626		0	86	27cm
8/25/2003	0	1163		363	2424	1	1627		1	87	.9-1.9
8/26/2003 <sup>a</sup>		1163			2424		1627			87	3.3-3.55
8/27/2003	0	1163		0	2424	0	1627		0	87	N/A
8/28/2003	0	1163		68	2492	0	1627		1	88	2.15
8/29/2003	1	1164		303	2795	1	1628		2	90	1.5
8/30/2003				420	3215	0	1628		9	99	1.55-1.47
8/31/2003				92	3307	0	1628		2	101	2.1
9/1/2003				236	3543	0	1628		3	104	1.5-1.4
9/2/2003				161	3704	0	1628		3	107	1.2-1.16
9/3/2003				62	3766	0	1628		0	107	1.1-1.7
9/4/2003				34	3800	0	1628		2	109	1.8-1.6
9/5/2003				15	3815	0	1628		3	112	1.25
9/6/2003				16	3831	0	1628		0	112	1.1-.98
9/7/2003				0	3831	0	1628		1	113	0.96
9/8/2003				4	3835	3	1631		1	114	0.94
9/9/2003				1	3836				1	115	1.1-1.2
9/10/2003									0	115	1.1
9/11/2003									0	115	0.98
9/12/2003									0	115	0.92
9/13/2003									3	118	
TOTALS		1164	276		3836		1631			118	

<sup>a</sup> Weir was washed out due to high water event and not fish-tight.