

Fishery Data Series No. 00-27

**Harvest Estimates for the Gastineau Hatchery
Roadside Sport Fishery in Juneau, Alaska
during 1999**

by

Michael J. Jaenicke

November 2000

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)		General		Mathematics, statistics, fisheries	
centimeter	cm	All commonly accepted abbreviations.	e.g., Mr., Mrs., a.m., p.m., etc.	alternate hypothesis	H_A
deciliter	dL			base of natural logarithm	e
gram	g	All commonly accepted professional titles.	e.g., Dr., Ph.D., R.N., etc.	catch per unit effort	CPUE
hectare	ha	and	&	coefficient of variation	CV
kilogram	kg	at	@	common test statistics	F, t, χ^2 , etc.
kilometer	km	Compass directions:		confidence interval	C.I.
liter	L			correlation coefficient	R (multiple)
meter	m		east E	correlation coefficient	r (simple)
metric ton	mt		north N	covariance	cov
milliliter	ml		south S	degree (angular or temperature)	°
millimeter	mm		west W	degrees of freedom	df
		Copyright	©	divided by	÷ or / (in equations)
		Corporate suffixes:		equals	=
		Company	Co.	expected value	E
		Corporation	Corp.	fork length	FL
		Incorporated	Inc.	greater than	>
		Limited	Ltd.	greater than or equal to	≥
		et alii (and other people)	et al.	harvest per unit effort	HPUE
		et cetera (and so forth)	etc.	less than	<
		exempli gratia (for example)	e.g.,	less than or equal to	≤
		id est (that is)	i.e.,	logarithm (natural)	ln
		latitude or longitude	lat. or long.	logarithm (base 10)	log
		monetary symbols (U.S.)	\$, ¢	logarithm (specify base)	log ₂ etc.
		months (tables and figures): first three letters	Jan.,...,Dec	mideye-to-fork	MEF
		number (before a number)	# (e.g., #10)	minute (angular)	'
		pounds (after a number)	# (e.g., 10#)	multiplied by	x
		registered trademark	®	not significant	NS
		trademark	™	null hypothesis	H_0
		United States (adjective)	U.S.	percent	%
		United States of America (noun)	USA	probability	P
		U.S. state and District of Columbia abbreviations	Use two-letter abbreviations (e.g., AK, DC)	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
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				

FISHERY DATA SERIES NO. 00-27

**HARVEST ESTIMATES FOR THE GASTINEAU HATCHERY ROADSIDE
SPORT FISHERY IN JUNEAU, ALASKA DURING 1999**

by

Michael J. Jaenicke
Division of Sport Fish, Douglas

Alaska Department of Fish and Game
Division of Sport Fish
Anchorage, Alaska

November 2000

Development of this manuscript was partially financed by the Federal Aid in Sport Fish Restoration Act
(16 U.S.C. 777-777K) under Project F-10-15, Job No. S-1-1.

The Fishery Data Series was established in 1987 for the publication of technically oriented results for a single project or group of closely related projects. Fishery Data Series reports are intended for fishery and other technical professionals. Fishery Data Series reports are available through the Alaska State Library and on the Internet: <http://www.sf.adfg.state.ak.us/statewide/divreports/html/intersearch.cfm> This publication has undergone editorial and peer review.

Michael J. Jaenicke
Alaska Department of Fish and Game, Division of Sport Fish
P. O. Box 240020, Douglas, AK 99824-0020, USA

This document should be cited as:

Jaenicke, M. J. 2000. Harvest estimates for the Gastineau Hatchery Roadside Sport Fishery in Juneau, Alaska during 1999. Alaska Department of Fish and Game, Fishery Data Series No. 00-27, Anchorage.

The Alaska Department of Fish and Game administers all programs and activities free from discrimination based on race, color, national origin, age, sex, religion, marital status, pregnancy, parenthood, or disability. The department administers all programs and activities in compliance with Title VI of the Civil Rights Act of 1964, Section 504 of the Rehabilitation Act of 1973, Title II of the Americans with Disabilities Act of 1990, the Age Discrimination Act of 1975, and Title IX of the Education Amendments of 1972.

If you believe you have been discriminated against in any program, activity, or facility, or if you desire further information please write to ADF&G, P.O. Box 25526, Juneau, AK 99802-5526; U.S. Fish and Wildlife Service, 4040 N. Fairfield Drive, Suite 300, Arlington, VA 22203 or O.E.O., U.S. Department of the Interior, Washington DC 20240.

For information on alternative formats for this and other department publications, please contact the department ADA Coordinator at (voice) 907-465-4120, (TDD) 907-465-3646, or (FAX) 907-465-2440.

TABLE OF CONTENTS

	Page
LIST OF TABLES	ii
LIST OF FIGURES	ii
LIST OF APPENDICES	ii
ABSTRACT	1
INTRODUCTION	1
OBJECTIVE	3
METHODS	3
RESULTS	5
DISCUSSION.....	7
CONCLUSIONS AND RECOMMENDATIONS.....	9
ACKNOWLEDGMENTS.....	10
LITERATURE CITED.....	10
APPENDIX A	11

LIST OF TABLES

Table	Page
1. Summary of hatchery-reared salmon smolt releases at Sheep Creek and Gastineau Hatchery since 1991	3
2. Summary of estimated weekly angler effort and harvest of large (≥ 16 in) and small (< 16 in) coho, large (≥ 28 in) and small (< 28 in) chinook, chum, and pink salmon at the Gastineau Hatchery roadside fishery in 1999	6
3. Effort and harvest estimates by angler residency of large (≥ 16 in) and small (< 16 in) coho, large (≥ 28 in) and small (< 28 in) chinook, chum, and pink salmon at the Gastineau Hatchery roadside fishery in 1999	8
4. Effort and harvest estimates by angler age class of large (≥ 16 in) and small (< 16 in) coho, large (≥ 28 in) and small (< 28 in) chinook, chum, and pink salmon at the Gastineau Hatchery roadside fishery in 1999	8
5. Summary of estimated angler effort and harvest of large (≥ 16 in) coho, large (≥ 28 in) chinook, chum, and pink salmon from onsite creel surveys at the Gastineau Hatchery roadside fishery in 1990 and 1993–1999	9

LIST OF FIGURES

Figure	Page
1. Location of the Gastineau Hatchery roadside sport fishery, northern Southeast Alaska.....	2

LIST OF APPENDICES

Appendix	Page
A1. Summary of sampling results by date at Gastineau Hatchery in 1999.....	13
A2. Major computer files used for data analysis of 1999 Gastineau Hatchery roadside fishery	16

ABSTRACT

Angler effort and sport harvests of chinook salmon *Oncorhynchus tshawytscha*, coho salmon *O. kisutch*, chum salmon *O. keta*, and pink salmon *O. gorbuscha* were estimated at Gastineau Hatchery from 7 June to 3 October 1999. An estimated 18,828 (SE = 541) angler-hours were expended to harvest a total of 109 (SE = 23) large chinook salmon at least 28 inches (71 cm) in total length, 134 (SE = 35) small chinook salmon (<28 inches in length), 7,275 (SE = 382) large coho salmon at least 16 inches (41 cm) in length, 144 (SE = 38) small coho salmon (<16 inches in length), 1,028 (SE = 173) chum salmon, and 2,986 (SE = 303) pink salmon.

Key words: Creel survey, roadside, angler effort and harvest, sport fishery, hatchery, chinook salmon, *Oncorhynchus tshawytscha*, coho salmon, *Oncorhynchus kisutch*, chum salmon, *Oncorhynchus keta*, pink salmon, *Oncorhynchus gorbuscha*, Juneau, Gastineau Hatchery, Southeast Alaska

INTRODUCTION

Roadside sport fisheries in marine waters near Juneau, Alaska offer unique fishing opportunities for both Alaskan residents and tourists visiting the area. Demand for these fishing opportunities on the Juneau roadside is heavy, as about 40% of the population of Southeast Alaska resided in the Juneau Borough in 1997, according to the 1997 State of Alaska census. Also, the number of visitors to Juneau has been steadily increasing since the 1980s: approximately 87,000 cruise ship passengers visited in 1982, 237,000 in 1990, 381,000 in 1995, and 596,000 in 1999 (J. Mazor, Juneau Convention and Visitors Bureau, Juneau, Alaska, personal communication).

The Gastineau Hatchery, located about 3 miles north of downtown Juneau (Figure 1), is a popular destination for tourists and residents. Approximately 120,500 paying customers toured the facility during the 1999 season, a slight increase of 0.4% over the previous year (R. Focht, Gastineau Hatchery operations manager, Juneau, personal communication). The hatchery is owned and operated by Douglas Island Pink and Chum, Inc. (DIPAC), a private non-profit corporation. In 1991, Gastineau hatchery, in cooperation with the Alaska Department of Fish and Game (ADF&G) (through the Sport Fish Partnership Program), installed a floating dock to increase access for roadside anglers.

Salmon enhancement efforts at Gastineau and nearby Sheep Creek hatcheries (Figure 1) have been extensive (Table 1), including releases of

chinook *Oncorhynchus tshawytscha* and coho salmon *O. kisutch*—the two species of salmon most preferred by anglers in Southeast Alaska (Jones & Stokes 1991). The sport fishery at the hatchery targets chinook, pink *O. gorbuscha* and chum *O. keta* salmon from mid-June through August, and coho salmon in mid-August through late September or early October.

Although sport harvests for the entire Juneau road system are estimated through use of Statewide Harvest Survey (SWHS) questionnaires mailed annually to a random sample of sport anglers (Howe et al. 1999), since 1993, ADF&G staff have assisted the Gastineau Hatchery in developing an onsite creel survey program to estimate sport harvests at the site. The onsite creel survey at the hatchery provides detailed angler demographic and fishery performance information, such as biweekly estimates of effort and harvest, which is not obtained with the mail survey. Hatchery personnel have conducted the survey, while ADF&G has provided technical planning and analysis of the data to estimate effort and harvest. In 1998, an estimated 471 (SE = 63) large (≥ 28 inches TL) chinook salmon, 11,722 (SE = 937) large (≥ 16 inches TL) coho salmon, 2,376 (SE = 280) chum salmon, and 5,653 (SE = 414) pink salmon were harvested between 8 June and 27 September (Frenette 1999).

In 1994, ADF&G entered into an agreement with DIPAC to rear chinook salmon for release at several sites in the Juneau area, including at the hatchery. This program was designed to increase

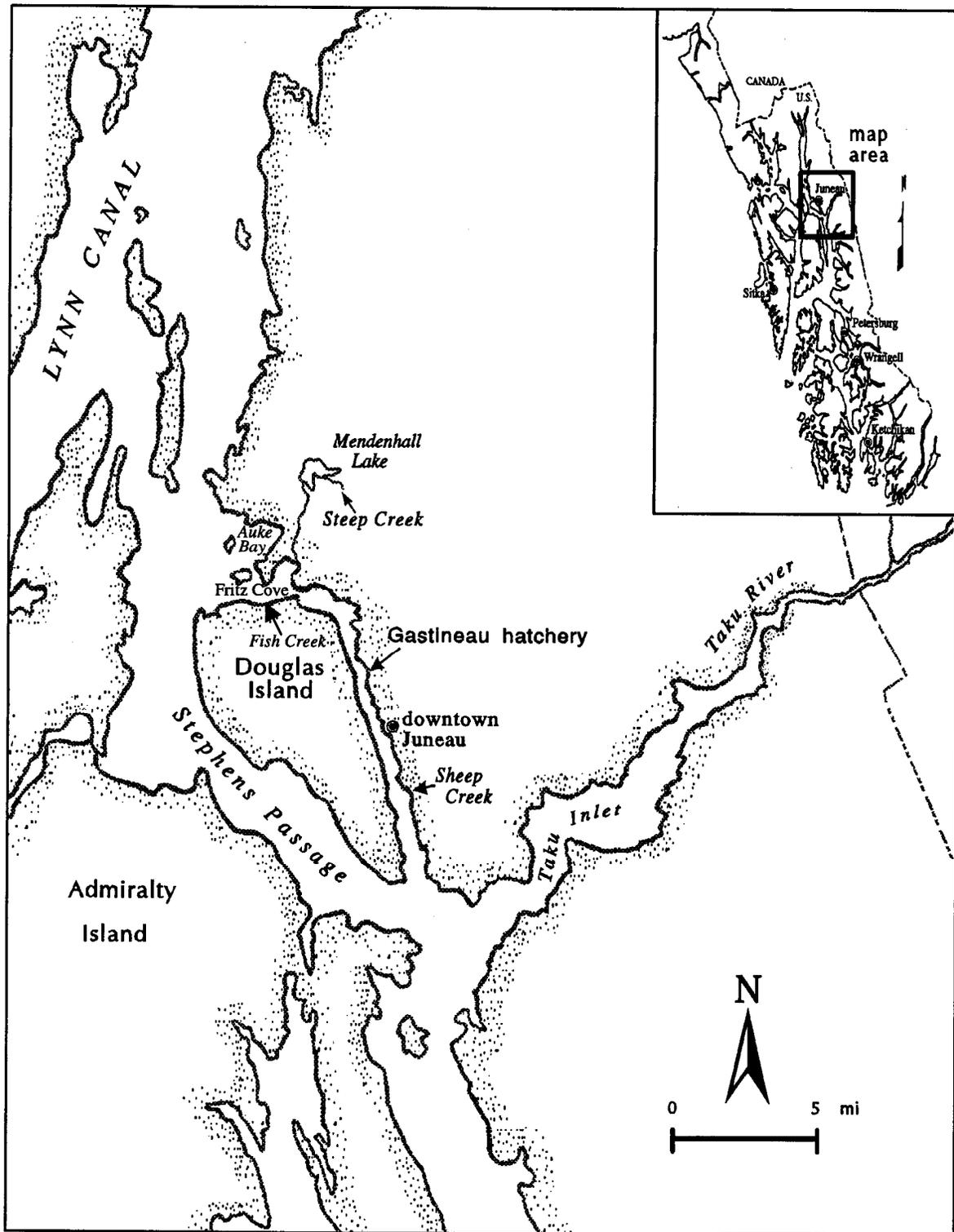


Figure 1.—Location of the Gastineau Hatchery roadside sport fishery, northern Southeast Alaska.

Table 1.—Summary of hatchery-reared salmon smolt releases (in thousands) at Sheep Creek and Gastineau Hatchery since 1991. All fish were reared at Gastineau or Sheep Creek hatcheries except as noted.

Year	Release site	Pink salmon	Chum salmon	Chinook salmon	Coho salmon
1991	Sheep Creek	16,258	37,874	101 ^a	505
	Gastineau Hatchery	14,846	11,327	44	508
1992	Sheep Creek	31,636	26,586	0	583
	Gastineau Hatchery	15,420	11,959	192	393
1993	Sheep Creek	32,660	27,002	0	562
	Gastineau Hatchery	15,769	11,891	208	478
1994	Sheep Creek	0	14,635	0	563
	Gastineau Hatchery	8,663	5,870	241 ^b	380
1995	Sheep Creek	0	44,674	28 ^b	621 ^b
	Gastineau Hatchery	8,540	11,825	159	422
1996	Sheep Creek	0	41,175 ^b	35	511
	Gastineau Hatchery	8,744 ^b	11,474	64	348
1997	Sheep Creek	0	39,278 ^b	45	576
	Gastineau Hatchery	5,901	12,168	172	426
1998	Sheep Creek ^c	0	0	0	0
	Gastineau Hatchery	8,709	24,247	212	824
1999	Sheep Creek	0	0	0	54
	Gastineau Hatchery	5,760	21,992	221	784

^a Reared at Snettisham Hatchery.

^b Some 1994-1997 release figures were revised on the basis of information provided by R. Focht, Gastineau Hatchery.

^c Sheep Creek was not used as a smolt release site in 1998.

sport fishing opportunities for chinook salmon in the Juneau area. Although sport harvests of chinook salmon in Southeast Alaska are limited by an allocation and management plan, Alaska hatchery chinook do not count toward the U.S./Canada Pacific Salmon Treaty catch totals. The onsite creel survey provides better information to evaluate the hatchery as a release site and terminal harvest area. In 1999, hatchery and ADF&G staff again cooperated to conduct the survey.

OBJECTIVE

The objective of the 1999 Gastineau Hatchery roadside creel survey was to estimate effort and harvests of pink, chum, coho, and chinook

salmon from 7 June through 3 October, such that estimates were within specified values 95% of the time: $\pm 10\%$ for angler-hours of effort, and $\pm 25\%$ for coho, chinook, pink, and chum salmon harvests.

METHODS

There are two survey sites: a non-snagging zone where snagging was prohibited and a snagging zone where snagging was allowed. The non-snagging zone includes a 100-ft floating dock and 150 ft of beach adjacent to the dock, while the snagging zone is the remaining 100 yd of beach extending from the non-snagging zone boundary to a private barge landing to the north. Both locations are clearly marked, and hatchery

personnel enforce fishing rules. Both sites are discrete in shape and size, and easily surveyed.

The bag and possession limit for chinook salmon at the hatchery was 2 \geq 28 inches TL (large) and 2 $<$ 28 inches TL (small). The bag limit for pink, chum, and coho salmon \geq 16 inches TL was 6 per day for each species, and an additional 10 salmon $<$ 16 inches TL could be taken.

A stratified, two-stage roving creel survey based on expansion of sample ratios was used to estimate fishing effort and harvest from 7 June to 3 October 1999. Days were primary sampling units, and anglers within days were secondary sampling units. Two sites (snagging and non-snagging zones), 17 weekly (7-day) strata, and weekday versus weekend-holiday stratification were maintained¹. Therefore, there were 68 discrete temporal/spatial strata.

The sampling day was defined as beginning at early civil twilight or 0600 (whichever was later), and ended at late civil twilight, as computed for the midday of the sample week. Most angling at the hatchery was expected to occur between those hours. During each sampling day, anglers were counted six times within each site (snagging and non-snagging zones). The first count was randomly selected from the mid-point of the first, second, or last third of the first one-sixth of each sampling day. Subsequent counts occurred at intervals equal to one-sixth the length of each sampling day.

Effort was estimated by multiplying the average angler count for the day for each site by the hours available for sampling each day. The harvest per unit effort (HPUE) for each fish species was estimated from completed-trip interviews. The estimated harvest was obtained from the product of the effort and HPUE estimates.

When not counting anglers, survey personnel interviewed anglers completing their trip without regard to angler success (angler harvest). Interviews were conducted during one-hour periods

¹ Weekdays = Mondays–Fridays. Weekend/holidays = Saturdays, Sundays, Independence Day (observed on 5 July), and Labor Day (6 September).

that alternated between sites (non-snagging or snagging). The site to start interviews in each stratum was selected at random, and alternated each day sampled.

During each interview, anglers were asked to report their effort and harvest at the site being sampled. In addition, technicians recorded the age class (child—under 16 years of age, adult—16 to 60 years, or senior—over the age of 60) and the residency (Alaska resident or non-resident) of the angler being interviewed. As many completed-trip interviews as possible were obtained during each day selected for sampling. Since hatchery technicians had other assigned duties, interviews were not conducted at some times during the day; however, sampling of anglers exiting the survey area was thought to occur roughly in proportion to the number exiting the site at times of the day when sampling was not being conducted.

Angler effort and harvest by species along with associated variances and standard errors were calculated by the following procedures.

The harvest in each stratum (and within each specific class) was estimated by

$$\hat{H}_h = D_h * \bar{H}_h \quad (1)$$

$$\bar{H}_h = \frac{\sum_{i=1}^{d_h} \hat{H}_{hi}}{d_h} \quad (2)$$

where \hat{H}_{hi} is the estimated harvest in day i stratum h , d_h is the number of days sampled in stratum h , and D_h is the total number of days in stratum h .

The variance of the harvest in each stratum (and within each specific class) was estimated by

$$v[\hat{H}_h] = (1 - f_{hi}) D_h^2 \frac{\sum_{i=1}^{d_h} (\hat{H}_{hi} - \bar{H}_h)^2}{d_h (d_h - 1)} + f_{ih}^{-1} \sum_{i=1}^{d_h} \hat{v}[\hat{H}_{hi}] \quad (3)$$

where $f_{ih} = d_h / D_h$.

Harvest for each sampling day was estimated by

$$\hat{H}_{hi} = \hat{E}_{hi} \overline{HPUE}_{hi}^* \quad (4)$$

where \overline{HPUE}_{hi}^* is the jackknife estimate of mean HPUE during stratum h day i, and \hat{E}_{hi} is the fishing effort in angler-hours during the same time.

Angler effort in each day was estimated by

$$\hat{E}_{hi} = T_h \bar{X}_{hi} \quad (5)$$

where T_h is the number of hours in a sampling day and \bar{X}_{hi} is the average number of anglers counted in day i stratum h. If $\bar{X}_{hi} = 0$ and anglers were interviewed, then \hat{H}_{hi} in equation (4) was set equal to the observed harvest. In contrast, if $\bar{X}_{hi} > 0$ and no anglers were interviewed, then \overline{HPUE}_{hi}^* in equation (4) was set equal to the mean \overline{HPUE}_{hi}^* for the stratum.

The variance of E_{hi} was estimated by (Wolter 1985)

$$v[\hat{E}_{hi}] = T_h^2 \frac{\sum_{j=2}^{n_i} (X_{hij} - X_{hi(j-1)})^2}{2 * r_{hi} (r_{hi} - 1)} \quad (6)$$

where r_{hi} is the number of times anglers were counted in day i.

The variance of the harvest H_{hij} in a period was estimated by (Goodman 1960)

$$v[\hat{H}_{hi}] = v[\hat{E}_{hi}] \overline{HPUE}_{hi}^{*2} + v[\overline{HPUE}_{hi}^*] \hat{E}_{hi}^2 - v[\hat{E}_{hi}] v[\overline{HPUE}_{hi}^*] \quad (7)$$

The \overline{HPUE}_{hi}^* and its variance were calculated according to procedures in Efron (1982). The inherent correctable bias of m_{hi}^2 (the number of interviews in a sampling period) of jackknife estimates was removed according to the procedure in Efron (1982, p. 6).

Harvest and effort (and their variances) for the entire season were the sums of the estimates for each stratum. Relative precision (RP) of the estimates for the 95% level of precision was calculated as

$$\left[\frac{(SE * 1.96)}{\hat{N}} \right] * 100 \quad (8)$$

where SE is the square root of the sums of all the variances of each stratum estimate for $[\hat{H}_{hi}]$ and $[\hat{E}_{hi}]$ stated in equations (6) and (7), respectively, over the sampling season.

RESULTS

Detailed sampling information, including angler counts and numbers of completed interviews for overall estimates, is presented in Appendix A1. Appendix A2 contains a listing of the archived files containing final data sets used for the analysis. During the 1999 fishing season at Gastineau Hatchery, 3,490 angler interviews and 924 angler counts were conducted.

Fishing effort totaled 18,828 (SE = 541, RP = 6%) angler-hours. The highest levels of effort were expended during the coho salmon fishery in late August to mid-September (Table 2).

The relative precision of effort and harvest estimates for chinook, coho, chum and pink salmon were within or near those specified values stated in the objective (Table 2). An estimated 7,275 (SE = 382, RP = 10%) large coho ≥ 16 inches (41 cm) TL, 1,028 (SE = 173, RP = 33%) chum, 2,986 (SE = 303, RP = 20%) pink, and 109 (SE = 23, RP = 41%) large chinook salmon ≥ 28 inches (71 cm) TL were harvested at Gastineau Hatchery from 7 June to 3 October. In addition, 134 (SE = 35) small chinook salmon < 28 inches (71 cm) and 144 (SE = 38) small coho salmon < 16 inches (41 cm) TL were harvested.

Anglers harvested most large chinook salmon from mid-July through late August, and most of the small chinook salmon were harvested in mid-June to mid-July. Most of the chum and pink

Table 2.—Summary of estimated weekly angler effort and harvest of large (≥ 16 in) and small (< 16 in) coho, large (≥ 28 in) and small (< 28 in) chinook, chum, and pink salmon at the Gastineau Hatchery roadside fishery in 1999.

Weekly period	Effort		Large (≥ 16 in) coho salmon		Small (< 16 in) coho salmon		Large (≥ 28 in) chinook salmon		Small (< 28 in) chinook salmon		Chum salmon		Pink salmon	
	Angler-hours	SE ^a	Harvest	SE ^a	Harvest	SE ^a	Harvest	SE ^a	Harvest	SE ^a	Harvest	SE ^a	Harvest	SE ^a
6/07-6/13	124	38	0	0	0	0	0	0	0	0	0	0	0	0
6/14-6/20	219	45	0	0	0	0	0	0	3	3	0	0	0	0
6/21-6/27	667	81	0	0	0	0	0	0	10	7	28	18	0	0
6/28-7/04	918	135	0	0	0	0	6	4	60	27	39	17	0	0
7/05-7/11	1,193	150	0	0	0	0	5	4	14	5	83	43	52	15
7/12-7/18	1,722	172	2	2	5	4	5	3	14	12	50	26	251	51
7/19-7/25	1,372	225	4	4	0	0	8	6	0	0	200	53	350	86
7/26-8/01	1,304	153	0	0	2	2	19	11	0	0	251	133	420	145
8/02-8/08	1,384	141	0	0	2	2	5	4	0	0	163	56	525	108
8/09-8/15	930	152	10	5	0	0	7	6	0	0	113	41	547	163
8/16-8/22	744	73	58	21	2	2	27	13	8	6	66	36	538	125
8/23-8/29	1,169	112	600	110	2	2	22	9	6	6	32	18	138	57
8/30-9/05	2,322	172	2,133	253	13	6	5	4	3	3	3	3	153	56
9/06-9/12	2,191	143	2,358	195	70	32	0	0	16	16	0	0	12	6
9/13-9/19	1,222	108	998	113	35	17	0	0	0	0	0	0	0	0
9/20-9/26	705	115	597	117	0	0	0	0	0	0	0	0	0	0
9/27-10/03	642	49	515	72	13	10	0	0	0	0	0	0	0	0
Total	18,828	541	7,275	382	144	38	109	23	134	35	1,028	173	2,986	303
Relative precision	6%		10%		52%		41%		52%		33%		20%	

^a Standard error of effort or harvest estimate.

salmon harvest occurred in July and August. A few large (≥ 16 in) coho salmon were taken in mid-July, but most were harvested from late August through the end of the survey in early October.

Angler residency data collected at the time of interview by creel technicians allowed for class specific estimates of effort and harvest (Table 3). Alaska residents accounted for 79% of the effort, and 73% of the large chinook, 90% of the large coho, 88% of the small coho, 81% of the chum, and 73% of the pink salmon harvested.

Angler age class specific estimates showed that adults accounted for about 70% of the effort, and 69% of the large chinook, 87% of the large coho, 62% of the small coho, and 78% of the chum and pink salmon harvests (Table 4). Children accounted for 25% of the effort, and 31% of the large chinook, 5% of the large coho, 4% of the small coho, 16% of the chum, and 19% of the pink salmon harvests. Seniors accounted for only 5% of the effort, and none of the large chinook, 8% of the large coho, 35% of the small coho, 7% of the chum, and 4% of the pink salmon harvests.

DISCUSSION

The 1999 sport fishing season at Gastineau Hatchery was characterized as providing below average effort and harvest for most species. Effort at the site was 19% below the 5-year average, and 33% lower than the record high effort estimated for 1998 (Table 5). Even with the substantial 38% decrease in harvest of large coho salmon from 1998, coho salmon returns to Gastineau Hatchery were still very strong in 1999 (R. Focht, Gastineau Hatchery operations manager, Juneau, personal communication); resulting in a harvest of 7,275 fish—the second highest for the survey. Chinook salmon returns to the hatchery were below average, and the harvest of large chinook salmon in 1999 declined by 77% from both the 5-year average and 1998. Chum salmon returns were about average, but the harvests were 42% below the 5-year average and 57% below 1998. Pink salmon returns to the hatchery in 1999 were very strong, although the harvests were 33% below the 5-year average and 47% below 1998.

The angler effort decrease of 33% in 1999 from 1998 may in part have been due to inclement weather reducing angler effort. Juneau received above average precipitation and wind during most of the summer and early fall in 1999.

Residency information collected during 1998 and 1999 indicated that the vast majority of use (74% and 79%, respectively) of the site is by resident anglers. Since 1998 was the first year residency information was recorded, it is not known if relative use by residents has changed over the years.

Results of the onsite 1999 creel survey show that roadside anglers again benefited greatly from enhancement efforts at Gastineau Hatchery. The chinook salmon enhancement program at Gastineau Hatchery includes not only chinook salmon released onsite in Gastineau Channel at the hatchery, but also includes release sites at Sheep Creek approximately 12 km further south along the Gastineau Channel, Fish Creek at the north end of Douglas Island, and Auke Bay (Bentz et al. 1996). The latter two sites in particular provide additional chinook salmon fishing opportunities for shoreline and freshwater anglers.

Harvest estimates and coded wire tag recovery information collected in the Juneau marine boat creel survey during 26 April to 26 September, 1999 indicated that these anglers also benefited from the Gastineau enhancement activities. In 1999, Juneau marine boat anglers took 1,495 (SE = 191) chinook salmon (24% of the total harvest) and 4,562 (SE = 456) coho salmon (17% of the total harvest) originating from releases at Gastineau Hatchery (Hubartt et al. 2000). An estimated 132 (SE = 53) of the chinook salmon taken originated from releases directly at the hatchery.

Terminal area regulations in Gastineau Channel surrounding the hatchery and in nearby Auke Bay and Fritz Cove provided increased chinook bag limits (two < 28 inches and two ≥ 28 inches TL) to harvest hatchery returns. This opportunity was important as the bag limit outside the terminal area was only 1 chinook salmon ≥ 28 inches TL from 3 July through 31 December. The liberal regulations, coupled with substantial hatchery

Table 3.—Effort and harvest estimates by angler residency of large (≥ 16 in) and small (< 16 in) coho, large (≥ 28 in) and small (< 28 in) chinook, chum, and pink salmon at the Gastineau Hatchery roadside fishery in 1999.

Angler residency	Angler effort		Large (≥ 16 in) coho salmon		Small (< 16 in) coho salmon		Large (≥ 28 in) chinook salmon		Small (< 28 in) chinook salmon		Chum salmon		Pink salmon	
	Hours	SE ^a	Harvest	SE ^a	Harvest	SE ^a	Harvest	SE ^a	Harvest	SE ^a	Harvest	SE ^a	Harvest	SE ^a
Resident	14,816	478	6,579	387	127	39	80	17	79	23	833	168	2,178	233
Non-resident	3,970	252	668	153	17	13	29	16	54	29	183	48	808	149
Unknown	43	18	28	17	0	0	0	0	0	0	12	9	0	0
Total ^b	18,828	541	7,275	417	144	41	108	23	133	37	1,028	175	2,986	276

^a Standard error of the effort and harvest estimates.

^b Totals for hours and harvests may differ slightly from overall estimates due to rounding error. Totals for standard errors will not equal the overall estimated standard errors because they are not independent estimates across angler types.

∞

Table 4.—Effort and harvest estimates by angler age class of large (≥ 16 in) and small (< 16 in) coho, large (≥ 28 in) and small (< 28 in) chinook, chum, and pink salmon at the Gastineau Hatchery roadside fishery in 1999.

Angler age class	Angler effort		Large (≥ 16 in) coho salmon		Small (< 16 in) coho salmon		Large (≥ 28 in) chinook salmon		Small (< 28 in) chinook salmon		Chum salmon		Pink salmon	
	Hours	SE ^a	Harvest	SE ^a	Harvest	SE ^a	Harvest	SE ^a	Harvest	SE ^a	Harvest	SE ^a	Harvest	SE ^a
Adult	13,159	416	6,302	377	89	26	76	19	63	20	801	159	2,314	275
Child	4,730	266	344	62	5	4	33	12	35	15	160	40	562	92
Senior	901	133	564	159	50	34	0	0	34	26	67	39	110	41
Unknown	38	18	28	17	0	0	0	0	0	0	0	0	0	0
Total ^b	18,828	511	7,239	414	144	43	109	22	132	36	1,028	168	2,986	293

^a Standard error of the effort and harvest estimates.

^b Totals for hours and harvests may differ slightly from overall estimates due to rounding error. Totals for standard errors will not equal the overall estimated standard errors because they are not independent estimates across angler types.

Table 5.—Summary of estimated angler effort and harvest of large (≥ 16 in) coho, large (≥ 28 in) chinook, chum, and pink salmon from onsite creel surveys at the Gastineau Hatchery roadside fishery in 1990 and 1993–1999.

Year (survey period)	Angler-hours	SE ^a	Large (≥ 16 in) coho salmon		Large (≥ 28 in) chinook salmon		Chum salmon		Pink salmon	
			Harvest	SE ^a	Harvest	SE ^a	Harvest	SE ^a	Harvest	SE ^a
1990 (5 May–11 Nov) ^b	5,207	477	69	35	0	—	118	45	4,225	961
1993 (5 Jul–17 Oct) ^c	15,825	584	7,057 ^d	520	118 ^d	34	1,515	310	713	95
1994 (4 Jul–9 Oct) ^e	24,192	905	3,509	317	70	17	593	66	9,197	560
1995 (3 Jul–25 Sep) ^f	21,546	555	2,212	303	157	36	2,047	254	3,421	250
1996 (21 Jun–23 Sep) ^g	19,189	555	2,860	285	695	73	2,274	250	1,039	135
1997 (16 Jun–5 Oct) ^h	22,385	654	3,507	436	931	123	1,605	235	2,878	297
1998 (8 Jun–27 Sep) ⁱ	28,273	701	11,722	937	471	63	2,376	280	5,653	414
5-year (1994–1998) mean	23,117		4,762		465		1,779		4,438	
1999 (7 Jun–3 Oct)	18,828	541	7,275	382	109	23	1,028	173	2,986	303

^a Standard error (SE) of effort or harvest.

^b Estimates from Suchanek and Bingham (1991).

^c Estimates from Beers and Marshall (1994).

^d Includes both large and small fish.

^e Estimates from Beers (1995).

^f Estimates from Beers (1996).

^g Estimates from Beers (1997).

^h Estimates from Frenette (1998).

ⁱ Estimates from Frenette (1999).

returns, provided increased opportunities for a large number of anglers. In particular, charter vessels fished these terminal areas extensively with a clientele composed of about 96% non-resident anglers (ADF&G unpublished Saltwater Charter Vessel Logbook program data).

CONCLUSIONS AND RECOMMENDATIONS

As the highest-use roadside sport fishery in the Juneau area, Gastineau Hatchery plays an important role in providing fishing opportunities to urban anglers and tourists who may not have the time or economic resources to participate in remote roadside or marine boat fisheries. Increased fishing opportunities are also provided by hatchery returns to marine boat anglers on both private and charter vessels. Also, pressure on local wild stocks of salmon on the Juneau road system by roadside anglers is likely lessened due to opportunities provided at the hatchery. Documentation of class specific

harvests at the site through onsite creel surveys can be used to supplement harvest and effort information for the Juneau area provided by the SWHS and marine boat surveys.

The success and continuation of the Gastineau Hatchery coho, pink, and chum salmon fisheries is directly tied to the hatchery's ability to meet production and return goals. Chinook salmon enhancement at the facility is accomplished through a cooperative agreement with ADF&G; therefore, continued monitoring of angling effort and harvests at the site will help to evaluate the success of both these programs.

Gastineau Hatchery creel survey staff proved to be effective in collecting as many completed trip interviews as possible. However, relative precision goals were not met for chinook, small coho, and chum salmon. This was primarily because harvests of these species were relatively small or below average. Given an increase in harvest back to average levels, I expect that the current sampling design should provide estimates generally achieving goal precision levels in 2000.

In recent years, coho returns at the site have generated higher levels of effort late in the survey. Although sampling was scheduled to continue until 10 October, it was discontinued after 3 October due to a drop in observed fishing effort and poor weather. Harvests did appear to be dropping off, but not to a point that would have indicated the coho run was at an end. Therefore, it is suggested that 2000 sampling have a startup date of mid June (e.g., June 12) and continue until the first or second week in October of 2000 (contingent upon funding, returns of coho salmon, and observed participation at the site).

ACKNOWLEDGMENTS

I wish to thank the Gastineau Hatchery creel survey staff of Dan DeSloover, Stephanie Ogden, Rhys Smoker, Eric Reiter, Elizabeth Boyle, Jim Griswold, and Todd Ogden for their valuable data collection efforts, and Diana Tersteeg for data editing, entry, and reduction. Operations manager Rick Focht supervised the Gastineau Hatchery data collection and provided updated information on hatchery releases for Sheep Creek and Gastineau Hatchery. Paul Suchanek and Brian Frenette provided additional editorial comment.

LITERATURE CITED

- Beers, D. E. 1995. Harvest estimate for the Gastineau Hatchery roadside sport fishery in Juneau, Alaska during 1994. Alaska Department of Fish and Game, Fishery Data Series No. 95-25.
- Beers, D. E. 1996. Harvest estimate for the Gastineau Hatchery roadside sport fishery in Juneau, Alaska during 1995. Alaska Department of Fish and Game, Fishery Data Series No. 96-27.
- Beers, D. E. 1997. Harvest estimate for the Gastineau Hatchery roadside sport fishery in Juneau, Alaska during 1996. Alaska Department of Fish and Game, Fishery Data Series No. 97-32.
- Beers, D. E., and R. P. Marshall. 1994. Harvest estimate for the Picnic Cove and Gastineau Hatchery roadside sport fisheries in Juneau, Alaska during 1993. Alaska Department of Fish and Game, Fishery Data Series No. 94-31.
- Bentz, R., P. Suchanek, M. Bethers, S. Hoffman, A. Schmidt, M. Dean, and R. Johnson. 1996. Area management report for the sport fisheries of Southeast Alaska, 1994. Alaska Department of Fish and Game, Fishery Management Report No. 96-1.
- Efron, B. 1982. The jackknife, the bootstrap and other resampling plans. Society for Industrial and Applied Mathematics, CBMS-NSF Monograph 38, Philadelphia, Pennsylvania.
- Frenette, B. J. 1998. Harvest estimate for the Gastineau Hatchery roadside fishery in Juneau, Alaska during 1997. Alaska Department of Fish and Game, Fishery Data Series No. 98-16, Anchorage.
- Frenette, B. J. 1999. Harvest estimate for the Gastineau Hatchery roadside fishery in Juneau, Alaska during 1998. Alaska Department of Fish and Game, Fishery Data Series No. 99-16, Anchorage.
- Goodman, L. A. 1960. On the exact variance of products. *Journal of the American Statistical Association* 55:708-713.
- Howe, A. L., R. J. Walker, C. Olness, G. Heineman, and A. E. Bingham. 1999. Harvest and catch in Alaska sport fisheries during 1998. Alaska Department of Fish and Game, Fishery Data Series No. 99-41, Anchorage.
- Hubartt, D. J., A. E. Bingham, and P. M. Suchanek. 1998. Harvest estimates for selected marine sport fisheries in Southeast Alaska during 1997. Alaska Department of Fish and Game, Fishery Data Series No. 98-20, Anchorage.
- Hubartt, D. J., A. E. Bingham, and B. J. Frenette. 2000. Harvest estimates for selected marine sport fisheries in Southeast Alaska during 1999. Alaska Department of Fish and Game, Fishery Data Series No. 00-17, Anchorage.
- Jones & Stokes Associates, Inc. 1991. Southeast Alaska sport fishing economic study. Final Research Report. December 1991. (JSA 88-028.) Sacramento, California. Prepared for Alaska Department of Fish and Game, Sport Fish Division, Research and Technical Services Section, Anchorage.
- Pollock, K. H., C. M. Jones, and T. L. Brown. 1994. Angler survey methods and their applications in fisheries management. American Fisheries Society, Special Publication 25, Bethesda, MA.
- Suchanek, P. M., and A. E. Bingham. 1991. Harvest estimates for selected roadside fisheries near Juneau, Alaska during 1990. Alaska Department of Fish and Game, Fishery Data Series No. 91-29, Anchorage.
- Wolter, K. M. 1985. Introduction to variance estimation. Springer-Verlag, New York.

APPENDIX A

Appendix A1.—Summary of sampling results by date at Gastineau Hatchery in 1999.

INTERVIEW SAMPLING INFORMATION														
Week	Stratum ^a	Date	Site	ANGLER COUNTS			No.	Effort	Large chinook harvest	Small chinook harvest	Large coho harvest	Small coho harvest	Pink harvest	Chum harvest
				No.	Mean	SD								
6/07-6/13	WD	07Jun	Nonsnagging	5	0.80	1.79	1	2.50	0	0	0	0	0	0
6/07-6/13	WD	07Jun	Snagging	5	0.20	0.45	.	.	.	.	.	.	.	.
6/07-6/13	WD	08Jun	Nonsnagging	6	0.33	0.82	3	2.75	0	0	0	0	0	0
6/07-6/13	WD	08Jun	Snagging	6	0.33	0.82	2	4.50	0	0	0	0	0	0
6/07-6/13	WD	09Jun	Nonsnagging	6	1.17	1.60	10	10.00	0	0	0	0	0	0
6/07-6/13	WD	09Jun	Snagging	6	0.33	0.82	.	.	.	.	.	.	.	.
6/07-6/13	WE/H	12Jun	Nonsnagging	6	0.33	0.82	8	9.75	0	0	0	0	0	0
6/07-6/13	WE/H	12Jun	Snagging	6	0.00	0.00	.	.	.	.	.	.	.	.
6/07-6/13	WE/H	13Jun	Nonsnagging	6	1.33	3.27	11	15.75	0	0	0	0	0	0
6/07-6/13	WE/H	13Jun	Snagging	6	0.00	0.00	1	4.50	0	0	0	0	0	0
6/14-6/20	WD	14Jun	Nonsnagging	6	1.83	1.60	6	9.25	0	0	0	0	0	0
6/14-6/20	WD	14Jun	Snagging	6	0.33	0.82	.	.	.	.	.	.	.	.
6/14-6/20	WD	16Jun	Nonsnagging	6	0.67	1.21	1	0.50	0	0	0	0	0	0
6/14-6/20	WD	16Jun	Snagging	6	0.00	0.00	.	.	.	.	.	.	.	.
6/14-6/20	WD	18Jun	Nonsnagging	6	1.67	2.25	13	22.75	0	0	0	0	0	0
6/14-6/20	WD	18Jun	Snagging	6	0.67	1.63	2	7.50	0	0	0	0	0	0
6/14-6/20	WE/H	19Jun	Nonsnagging	5	1.80	2.17	12	12.25	0	1	0	0	0	0
6/14-6/20	WE/H	19Jun	Snagging	5	0.00	0.00	.	.	.	.	.	.	.	.
6/14-6/20	WE/H	20Jun	Nonsnagging	6	2.17	2.32	21	24.00	0	0	0	0	0	0
6/14-6/20	WE/H	20Jun	Snagging	6	0.00	0.00	1	0.25	0	0	0	0	0	0
6/21-6/29	WD	22Jun	Nonsnagging	5	2.20	2.17	22	20.75	0	0	0	0	0	0
6/21-6/29	WD	22Jun	Snagging	5	0.20	0.45	.	.	.	.	.	.	.	.
6/21-6/29	WD	23Jun	Nonsnagging	6	3.83	2.04	24	34.25	0	0	0	0	0	0
6/21-6/29	WD	23Jun	Snagging	6	1.00	2.00	2	1.01	0	0	0	0	0	0
6/21-6/29	WD	24Jun	Nonsnagging	6	4.33	3.88	18	22.00	0	1	0	0	0	0
6/21-6/29	WD	24Jun	Snagging	6	2.00	2.53	9	14.50	0	0	0	0	0	0
6/21-6/29	WD	25Jun	Nonsnagging	5	5.20	3.63	18	22.00	0	1	0	0	0	0
6/21-6/29	WD	25Jun	Snagging	5	2.40	2.61	9	14.50	0	0	0	0	0	0
6/21-6/29	WE/H	26Jun	Nonsnagging	6	2.83	2.48	17	27.75	0	0	0	0	0	1
6/21-6/29	WE/H	26Jun	Snagging	6	0.83	0.98	1	2.50	0	0	0	0	0	1
6/21-6/29	WE/H	27Jun	Nonsnagging	5	5.40	4.22	33	53.55	0	0	0	0	0	0
6/21-6/29	WE/H	27Jun	Snagging	5	2.80	2.68	5	10.50	0	0	0	0	0	4
6/28-7/04	WD	28Jun	Nonsnagging	6	3.83	3.71	19	45.75	1	1	0	0	0	6
6/28-7/04	WD	28Jun	Snagging	6	1.83	2.14	10	10.75	0	1	0	0	0	2
6/28-7/04	WD	30Jun	Nonsnagging	6	8.83	9.06	40	99.25	0	1	0	0	0	3
6/28-7/04	WD	30Jun	Snagging	6	3.33	5.05	6	4.00	0	1	0	0	0	0
6/28-7/04	WD	02Jul	Nonsnagging	6	5.50	5.28	41	66.75	0	1	0	0	0	0
6/28-7/04	WD	02Jul	Snagging	6	1.00	1.55	11	18.25	0	2	0	0	0	0
6/28-7/04	WE/H	03Jul	Nonsnagging	6	3.83	4.36	18	23.00	1	1	0	0	0	1
6/28-7/04	WE/H	03Jul	Snagging	6	0.50	0.84	5	4.00	0	0	0	0	0	0
6/28-7/04	WE/H	04Jul	Nonsnagging	5	5.60	3.65	29	45.25	0	6	0	0	0	0
6/28-7/04	WE/H	04Jul	Snagging	5	2.60	3.78	14	13.75	0	0	0	0	0	1
7/05-7/11	WD	06Jul	Nonsnagging	6	4.00	1.55	27	51.06	0	0	0	0	2	1
7/05-7/11	WD	06Jul	Snagging	6	2.83	2.23	9	6.00	0	0	0	0	0	0
7/05-7/11	WD	08Jul	Nonsnagging	6	8.67	3.61	25	62.25	0	0	0	0	1	0
7/05-7/11	WD	08Jul	Snagging	6	5.33	3.88	25	41.75	1	0	0	0	3	12
7/05-7/11	WE/H	05Jul	Nonsnagging	6	6.67	4.63	37	55.00	0	1	0	0	0	0
7/05-7/11	WE/H	05Jul	Snagging	6	2.50	2.51	11	19.50	0	1	0	0	0	7
7/05-7/11	WE/H	10Jul	Nonsnagging	5	6.60	3.44	27	39.50	0	1	0	0	4	0
7/05-7/11	WE/H	10Jul	Snagging	5	2.80	1.64	17	27.75	0	2	0	0	2	1
7/05-7/11	WE/H	11Jul	Nonsnagging	6	8.33	7.79	44	79.25	0	0	0	0	7	2
7/05-7/11	WE/H	11Jul	Snagging	6	0.83	1.33	12	27.25	1	5	0	0	3	16
7/12-7/18	WD	13Jul	Nonsnagging	5	10.40	7.40	16	24.75	0	1	0	0	1	0
7/12-7/18	WD	13Jul	Snagging	5	5.40	5.41	14	16.75	0	0	0	0	0	0
7/12-7/18	WD	14Jul	Nonsnagging	6	9.00	7.69	35	83.75	1	0	0	0	15	8
7/12-7/18	WD	14Jul	Snagging	6	5.33	8.04	24	33.25	0	0	0	0	0	2
7/12-7/18	WD	15Jul	Nonsnagging	4	7.00	5.60	38	60.50	0	1	0	0	15	0
7/12-7/18	WD	15Jul	Snagging	4	5.25	4.27	12	29.00	0	0	0	0	5	0
7/12-7/18	WE/H	17Jul	Nonsnagging	5	10.40	7.92	42	97.00	0	0	1	0	23	0
7/12-7/18	WE/H	17Jul	Snagging	5	4.00	4.06	7	12.00	0	0	0	0	8	0
7/12-7/18	WE/H	18Jul	Nonsnagging	6	13.50	10.93	69	152.25	1	0	0	0	22	3
7/12-7/18	WE/H	18Jul	Snagging	6	3.33	2.88	17	23.00	0	0	0	2	1	6
7/19-7/25	WD	19Jul	Nonsnagging	6	4.17	4.54	32	56.50	0	0	0	0	13	5
7/19-7/25	WD	19Jul	Snagging	6	3.50	4.46	21	23.00	0	0	0	0	14	15
7/19-7/25	WD	20Jul	Nonsnagging	5	12.60	8.17	65	87.50	0	0	1	0	5	8
7/19-7/25	WD	20Jul	Snagging	5	4.60	4.39	8	8.75	0	0	0	0	5	2

-continued-

INTERVIEW SAMPLING INFORMATION

Week	Stratum ^a	Date	Site	ANGLER COUNTS			No.	Effort	Large chinook harvest	Small chinook harvest	Large coho harvest	Small coho harvest	Pink harvest	Chum harvest
				No.	Mean	SD								
7/19-7/25	WD	21Jul	Nonsnagging	6	1.83	1.17	32	36.25	0	0	0	0	6	1
7/19-7/25	WD	21Jul	Snagging	6	4.50	5.89	4	11.50	0	0	0	0	0	2
7/19-7/25	WE/H	24Jul	Nonsnagging	6	8.17	6.74	24	33.75	2	0	0	0	19	2
7/19-7/25	WE/H	24Jul	Snagging	6	7.17	4.96	22	27.00	0	0	0	0	11	4
7/19-7/25	WE/H	25Jul	Nonsnagging	6	8.33	8.12	26	78.25	0	0	0	0	15	2
7/19-7/25	WE/H	25Jul	Snagging	6	6.50	5.79	28	59.00	0	0	0	0	4	10
7/26-8/01	WD	26Jul	Nonsnagging	5	6.40	4.34	22	39.75	3	0	0	0	0	5
7/26-8/01	WD	26Jul	Snagging	5	2.60	3.29	3	4.00	0	0	0	0	6	6
7/26-8/01	WD	27Jul	Nonsnagging	6	5.33	7.31	21	37.00	1	0	0	0	15	1
7/26-8/01	WD	27Jul	Snagging	6	1.00	2.00	1	0.25	0	0	0	0	0	0
7/26-8/01	WD	29Jul	Nonsnagging	6	8.17	5.91	30	59.00	0	0	0	0	7	0
7/26-8/01	WD	29Jul	Snagging	6	6.00	4.56	16	22.75	0	0	0	0	3	2
7/26-8/01	WE/H	31Jul	Nonsnagging	6	8.33	7.69	48	90.75	2	0	0	0	27	1
7/26-8/01	WE/H	31Jul	Snagging	6	8.33	8.82	22	34.15	0	0	0	0	19	9
7/26-8/01	WE/H	01Aug	Nonsnagging	6	8.17	8.47	30	66.50	0	0	0	1	15	2
7/26-8/01	WE/H	01Aug	Snagging	6	6.00	6.84	41	75.50	0	0	0	0	9	11
8/02-8/08	WD	02Aug	Nonsnagging	5	8.20	5.67	33	82.00	0	0	0	0	17	2
8/02-8/08	WD	02Aug	Snagging	5	5.60	4.88	16	17.00	0	0	0	0	1	0
8/02-8/08	WD	03Aug	Nonsnagging	5	6.80	7.01	46	82.25	0	0	0	1	32	12
8/02-8/08	WD	03Aug	Snagging	5	7.00	6.44	46	81.00	1	0	0	0	42	19
8/02-8/08	WD	05Aug	Nonsnagging	6	8.67	5.54	33	60.25	0	0	0	0	34	0
8/02-8/08	WD	05Aug	Snagging	6	3.00	2.68	5	8.00	0	0	0	0	3	1
8/02-8/08	WE/H	07Aug	Nonsnagging	6	5.33	4.18	32	38.50	0	0	0	0	8	1
8/02-8/08	WE/H	07Aug	Snagging	6	4.33	3.01	34	66.75	0	0	0	0	25	6
8/02-8/08	WE/H	08Aug	Nonsnagging	5	6.80	5.93	16	28.50	0	0	0	0	15	7
8/02-8/08	WE/H	08Aug	Snagging	5	4.60	5.98	17	25.50	1	0	0	0	15	15
8/09-8/15	WD	09Aug	Nonsnagging	6	5.33	7.28	44	82.00	0	0	0	0	16	8
8/09-8/15	WD	09Aug	Snagging	6	4.67	2.73	21	23.00	0	0	0	0	39	8
8/09-8/15	WD	10Aug	Nonsnagging	6	7.50	8.07	41	49.00	0	0	0	0	19	0
8/09-8/15	WD	10Aug	Snagging	6	3.67	3.27	23	39.00	0	0	0	0	9	14
8/09-8/15	WD	13Aug	Nonsnagging	6	1.00	2.45	6	14.00	0	0	0	0	0	0
8/09-8/15	WD	13Aug	Snagging	6	1.50	1.38	3	6.00	0	0	0	0	5	0
8/09-8/15	WE/H	14Aug	Nonsnagging	5	6.80	7.69	25	59.75	0	0	3	0	18	6
8/09-8/15	WE/H	14Aug	Snagging	5	8.20	8.79	20	23.50	1	0	0	0	20	2
8/09-8/15	WE/H	15Aug	Nonsnagging	6	3.17	3.49	39	55.75	1	0	5	0	7	2
8/09-8/15	WE/H	15Aug	Snagging	6	1.67	1.51	6	8.50	0	0	0	0	15	0
8/16-8/22	WD	17Aug	Nonsnagging	6	5.17	2.93	30	55.50	0	0	0	1	35	0
8/16-8/22	WD	17Aug	Snagging	6	1.00	1.67	10	10.50	0	0	0	0	12	5
8/16-8/22	WD	18Aug	Nonsnagging	4	6.50	4.65	20	58.25	4	2	4	0	26	15
8/16-8/22	WD	18Aug	Snagging	4	2.50	3.11	17	18.50	0	0	5	0	40	0
8/16-8/22	WD	19Aug	Nonsnagging	5	6.40	3.65	36	52.00	1	0	3	0	43	0
8/16-8/22	WD	19Aug	Snagging	5	1.00	1.00	8	10.25	0	0	0	0	1	0
8/16-8/22	WE/H	21Aug	Nonsnagging	6	3.33	2.25	17	36.75	4	2	1	0	15	1
8/16-8/22	WE/H	21Aug	Snagging	6	1.17	1.83	2	2.50	0	0	0	0	0	0
8/16-8/22	WE/H	22Aug	Nonsnagging	6	3.33	2.34	15	33.75	1	0	7	0	12	0
8/16-8/22	WE/H	22Aug	Snagging	6	3.17	3.13	22	23.50	3	0	4	0	19	4
8/23-8/29	WD	23Aug	Nonsnagging	5	5.60	3.29	44	76.17	2	0	12	0	6	8
8/23-8/29	WD	23Aug	Snagging	5	2.00	1.58	7	10.00	1	0	0	0	6	0
8/23-8/29	WD	25Aug	Nonsnagging	5	3.60	2.88	22	32.25	0	0	13	0	9	0
8/23-8/29	WD	25Aug	Snagging	5	3.20	3.42	8	14.75	0	0	0	0	1	2
8/23-8/29	WD	26Aug	Nonsnagging	6	7.33	3.33	25	55.00	1	0	31	0	0	0
8/23-8/29	WD	26Aug	Snagging	6	3.83	2.71	10	11.00	0	0	6	0	0	0
8/23-8/29	WE/H	28Aug	Nonsnagging	6	7.50	4.18	31	78.25	1	0	75	0	7	1
8/23-8/29	WE/H	28Aug	Snagging	6	4.00	5.18	4	9.50	1	0	18	0	7	0
8/23-8/29	WE/H	29Aug	Nonsnagging	5	18.00	16.81	64	144.25	1	3	65	1	5	0
8/23-8/29	WE/H	29Aug	Snagging	5	5.80	5.26	20	36.00	0	0	18	0	2	3
8/30-9/05	WD	30Aug	Nonsnagging	6	9.17	4.22	39	77.14	1	1	96	0	4	0
8/30-9/05	WD	30Aug	Snagging	6	3.33	3.27	14	23.75	0	0	33	0	2	1
8/30-9/05	WD	31Aug	Nonsnagging	6	14.17	12.51	56	117.75	0	0	109	0	4	0
8/30-9/05	WD	31Aug	Snagging	6	8.33	9.99	23	32.67	0	0	36	0	13	0
8/30-9/05	WD	02Sep	Nonsnagging	5	16.20	6.53	55	103.25	0	0	91	0	2	0
8/30-9/05	WD	02Sep	Snagging	5	9.40	3.97	45	61.25	0	0	129	1	4	0
8/30-9/05	WE/H	04Sep	Nonsnagging	6	15.67	9.20	61	121.00	0	0	28	2	7	0
8/30-9/05	WE/H	04Sep	Snagging	6	15.17	4.58	51	93.75	1	0	61	1	1	0
8/30-9/05	WE/H	05Sep	Nonsnagging	6	15.33	7.15	52	121.25	0	0	52	2	4	0
8/30-9/05	WE/H	05Sep	Snagging	6	11.83	6.18	33	71.75	0	0	33	0	0	0
9/06-9/12	WD	07Sep	Nonsnagging	5	6.80	3.96	31	64.75	0	0	90	7	0	0
9/06-9/12	WD	07Sep	Snagging	5	8.40	4.98	28	51.75	0	0	104	0	1	0

-continued-

INTERVIEW SAMPLING INFORMATION															
Week	Stratum ^a	Date	Site	ANGLER COUNTS			No.	Effort	Large chinook harvest	Small chinook harvest	Large coho harvest	Small coho harvest	Pink harvest	Chum harvest	
				No.	Mean	SD									
9/06-9/12	WD	10Sep	Nonsnagging	6	10.67	1.03	53	102.00	0	0	116	6	0	0	
9/06-9/12	WD	10Sep	Snagging	6	10.33	9.83	30	47.75	0	0	65	0	0	0	
9/06-9/12	WE/H	06Sep	Nonsnagging	5	11.00	3.39	66	135.00	0	0	56	0	4	0	
9/06-9/12	WE/H	06Sep	Snagging	5	13.00	7.42	44	75.50	0	0	65	0	1	0	
9/06-9/12	WE/H	11Sep	Nonsnagging	6	13.17	2.04	38	72.50	0	6	30	11	0	0	
9/06-9/12	WE/H	11Sep	Snagging	6	12.67	8.07	36	65.75	0	0	82	0	0	0	
9/06-9/12	WE/H	12Sep	Nonsnagging	6	16.17	6.74	48	84.50	0	0	52	1	0	0	
9/06-9/12	WE/H	12Sep	Snagging	6	14.83	10.87	29	71.75	0	0	66	0	0	0	
9/13-9/19	WD	13Sep	Nonsnagging	3	10.33	0.58	6	15.50	0	0	3	1	0	0	
9/13-9/19	WD	13Sep	Snagging	3	6.00	3.46	3	8.50	0	0	17	0	0	0	
9/13-9/19	WD	15Sep	Nonsnagging	4	7.00	5.72	.	.	.	.	.	.	.	.
9/13-9/19	WD	15Sep	Snagging	4	4.00	2.83	1	1.00	0	0	2	0	0	0	
9/13-9/19	WD	16Sep	Nonsnagging	2	6.00	2.83	.	.	.	.	.	.	.	.
9/13-9/19	WD	16Sep	Snagging	2	6.00	5.66	.	.	.	.	.	.	.	.
9/13-9/19	WE/H	18Sep	Nonsnagging	4	4.00	2.94	17	57.25	0	0	20	0	0	0	
9/13-9/19	WE/H	18Sep	Snagging	4	3.75	3.50	9	26.75	0	0	11	0	0	0	
9/13-9/19	WE/H	19Sep	Nonsnagging	3	8.00	4.58	19	40.50	0	0	8	0	0	0	
9/13-9/19	WE/H	19Sep	Snagging	3	6.67	3.51	7	22.00	0	0	22	0	0	0	
9/20-9/26	WD	20Sep	Nonsnagging	6	1.67	1.51	9	28.25	0	0	14	0	0	0	
9/20-9/26	WD	20Sep	Snagging	6	3.00	1.26	10	19.50	0	0	23	0	0	0	
9/20-9/26	WD	21Sep	Nonsnagging	6	5.00	2.19	23	34.75	0	0	16	0	0	0	
9/20-9/26	WD	21Sep	Snagging	6	5.17	3.19	16	50.75	0	0	68	0	0	0	
9/20-9/26	WD	22Sep	Nonsnagging	0	.	.	.	.	.	.	.	.	.	.
9/20-9/26	WD	22Sep	Snagging	0	.	.	.	.	.	.	.	.	.	.
9/20-9/26	WE/H	25Sep	Nonsnagging	6	2.17	0.98	22	40.25	0	0	20	0	0	0	
9/20-9/26	WE/H	25Sep	Snagging	6	4.17	3.82	12	16.75	0	0	18	0	0	0	
9/20-9/26	WE/H	26Sep	Nonsnagging	6	7.33	3.67	22	42.25	0	0	22	0	0	0	
9/20-9/26	WE/H	26Sep	Snagging	6	1.50	1.38	9	16.75	0	0	15	0	0	0	
9/27-10/03	WD	28Sep	Nonsnagging	6	6.00	3.74	19	40.50	0	0	21	3	0	0	
9/27-10/03	WD	28Sep	Snagging	6	3.00	2.37	6	12.25	0	0	6	0	0	0	
9/27-10/03	WD	29Sep	Nonsnagging	5	4.20	2.39	15	39.00	0	0	37	0	0	0	
9/27-10/03	WD	29Sep	Snagging	5	1.60	0.89	4	6.75	0	0	7	0	0	0	
9/27-10/03	WD	30Sep	Nonsnagging	3	5.33	2.31	19	28.50	0	0	30	0	0	0	
9/27-10/03	WD	30Sep	Snagging	3	2.00	1.00	3	6.00	0	0	14	0	0	0	
9/27-10/03	WE/H	02Oct	Nonsnagging	3	5.00	2.65	14	23.25	0	0	7	1	0	0	
9/27-10/03	WE/H	02Oct	Snagging	3	1.67	0.58	6	17.25	0	0	21	0	0	0	
9/27-10/03	WE/H	03Oct	Nonsnagging	5	4.00	2.92	12	15.00	0	0	4	0	0	0	
9/27-10/03	WE/H	03Oct	Snagging	5	2.20	1.30	10	22.00	0	0	11	0	0	0	
				924				3,490	6,318	40	43	2,103	42	938	308

^a WD = weekdays (Mondays–Fridays, except 5 July and 6 Sept.); WE/H = weekend/holidays [Saturdays, Sundays, Independence Day (observed on 5 July) and Labor Day (6 Sept.)]

Appendix A2.—Major computer files used for data analysis of 1999 Gastineau Hatchery roadside fishery. Custodian of data files listed below include the author and the Alaska Department of Fish and Game, Division of Research and Technical Services, Anchorage, Alaska. File archive name is “dipac_99.zip.”

File name	File type	File description
DIPAC99	XLS	Final edited ASCII data set worksheet [sheet1] in an EXCEL spreadsheet.
DIPAC99A	SAS	SAS program to reformat data file in DIPAC99.XLS
DIPAC99	SSD	Summary subset SAS data file: count and interview data
BOWDEN9A	SAS	SAS program to estimate overall effort, harvests, and associated variances
DIPAC99Age_eff	SAS	SAS program to estimate effort, harvest, and associated variances by age class (A, C, S, U)
DIPAC99Resid_eff	SAS	SAS program to estimate effort, harvest, and associated variances by residency (R, N, and U)
DIPC99SA	SAS	SAS program to summarize daily estimate of effort and harvest.
DIPAC9899	XLS	Summary of 1999 data analysis and comparison with historical data in an EXCEL spreadsheet