

Fishery Data Series No. 01-21

**Harvest Estimates for the Gastineau Hatchery
Roadside Sport Fishery near Juneau, Alaska
during 2000**

by

Michael J. Jaenicke

December 2001

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.

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	All commonly accepted professional titles.	e.g., Dr., Ph.D., R.N., etc.	base of natural logarithm	e
gram	g	and	&	catch per unit effort	CPUE
hectare	ha	at	@	coefficient of variation	CV
kilogram	kg	Compass directions:		common test statistics	F, t, χ^2 , etc.
kilometer	km	east	E	confidence interval	C.I.
liter	L	north	N	correlation coefficient	R (multiple)
meter	m	south	S	correlation coefficient	r (simple)
metric ton	mt	west	W	covariance	cov
milliliter	ml	Copyright	©	degree (angular or temperature)	°
millimeter	mm	Corporate suffixes:		degrees of freedom	df
Weights and measures (English)		Company	Co.	divided by	÷ or / (in equations)
cubic feet per second	ft ³ /s	Corporation	Corp.	equals	=
foot	ft	Incorporated	Inc.	expected value	E
gallon	gal	Limited	Ltd.	fork length	FL
inch	in	et alii (and other people)	et al.	greater than	>
mile	mi	et cetera (and so forth)	etc.	greater than or equal to	≥
ounce	oz	exempli gratia (for example)	e.g.,	harvest per unit effort	HPUE
pound	lb	id est (that is)	i.e.,	less than	<
quart	qt	latitude or longitude	lat. or long.	less than or equal to	≤
yard	yd	monetary symbols (U.S.)	\$, ¢	logarithm (natural)	ln
Time and temperature		months (tables and figures): first three letters	Jan, ..., Dec	logarithm (base 10)	log
day	d	number (before a number)	# (e.g., #10)	logarithm (specify base)	log ₂ , etc.
degrees Celsius	°C	pounds (after a number)	# (e.g., 10#)	mideye-to-fork	'
degrees Fahrenheit	°F	registered trademark	®	minute (angular)	'
hour	h	trademark	™	multiplied by	x
minute	min	United States (adjective)	U.S.	not significant	NS
second	s	United States of America (noun)	USA	null hypothesis	H ₀
Physics and chemistry		U.S. state and District of Columbia abbreviations	use two-letter abbreviations (e.g., AK, DC)	percent	%
all atomic symbols				probability	P
alternating current	AC			probability of a type I error (rejection of the null hypothesis when true)	α
ampere	A			probability of a type II error (acceptance of the null hypothesis when false)	β
calorie	cal			second (angular)	"
direct current	DC			standard deviation	SD
hertz	Hz			standard error	SE
horsepower	hp			standard length	SL
hydrogen ion activity	pH			total length	TL
parts per million	ppm			variance	Var
parts per thousand	ppt, ‰				
volts	V				
watts	W				

FISHERY DATA SERIES NO. 01-21

**HARVEST ESTIMATES FOR THE GASTINEAU HATCHERY ROADSIDE
SPORT FISHERY NEAR JUNEAU, ALASKA DURING 2000**

by

Michael J. Jaenicke

Alaska Department of Fish and Game
Division of Sport Fish, Research and Technical Services
333 Raspberry Road, Anchorage, Alaska 99518-1599

December 2001

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. 2001. Harvest estimates for the Gastineau Hatchery roadside sport fishery near Juneau, Alaska during 2000. Alaska Department of Fish and Game, Fishery Data Series No. 01-21, 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. Fairfax Drive, Suite 300 Webb, 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	4
RESULTS	5
DISCUSSION	7
CONCLUSIONS AND RECOMMENDATIONS	10
ACKNOWLEDGMENTS	12
LITERATURE CITED	12
APPENDIX A	14

LIST OF TABLES

Table	Page
1. Summary of hatchery-reared salmon smolt releases (in thousands) 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 2000.....	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 2000.....	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 2000.....	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 1993–2000.....	9
6. Comparison of Alaska statewide harvest survey (SWHS) and onsite creel survey harvest estimates for the Gastineau Hatchery roadside sport fishery during 1994–2000.....	11

LIST OF FIGURES

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

LIST OF APPENDICES

Appendix	Page
A1. Summary of sampling results by date at Gastineau Hatchery in 2000.....	16
A2. Major computer files used for data analysis of 2000 Gastineau Hatchery roadside fishery.....	19

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 12 June to 6 October 2000. An estimated 23,539 (SE = 567) angler-hours were expended to harvest a total of 155 (SE = 29) large chinook salmon at least 28 inches (71 cm) in total length, 147 (SE = 28) small chinook salmon (<28 inches in length), 10,303 (SE = 461) large coho salmon at least 16 inches (41 cm) in length, 218 (SE = 42) small coho salmon (<16 inches in length), 1,520 (SE = 190) chum salmon, and 2,386 (SE = 235) pink salmon. Effort was slightly above the 1995-1999 average while chinook harvest was well below average and coho harvest was nearly twice average. Some statistically significant differences were noted in estimated harvests from this survey when compared to those from a statewide mail survey.

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 30,711 of the 72,274 (42.5%) people in Southeast Alaska resided in the Juneau Borough in 2000, according to the U.S. Census Bureau. Also, the number of visitors to Juneau has been steadily increasing since the 1980's, with approximately 87,000 cruise ship passengers visiting in 1982, 237,000 in 1990, 381,000 in 1995, and 640,000 passengers in 2000 (J. Mazor, Juneau Convention and Visitors Bureau, Juneau, Alaska, personal communication).

The Gastineau Hatchery (renamed Macaulay Hatchery in December 2000), located about 3 miles north of downtown Juneau (Figure 1), is a popular destination for tourists and residents. The hatchery is owned and operated by Douglas Island Pink and Chum, Inc. (DIPAC), a private non-profit corporation. Approximately 120,000 people toured the facility during the 2000 season, approximately the same as in the previous year (R. Focht, Director of Research and Evaluation, DIPAC, Juneau, personal communication). In 1991, DIPAC, in cooperation with the Alaska Department of Fish and Game (ADF&G) (through the Sport Fish

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

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. 2001d). In addition, ADF&G staff since 1991 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 annual SWHS. Hatchery personnel have conducted the survey, while ADF&G has provided technical planning and analysis of the data to estimate effort and harvest.

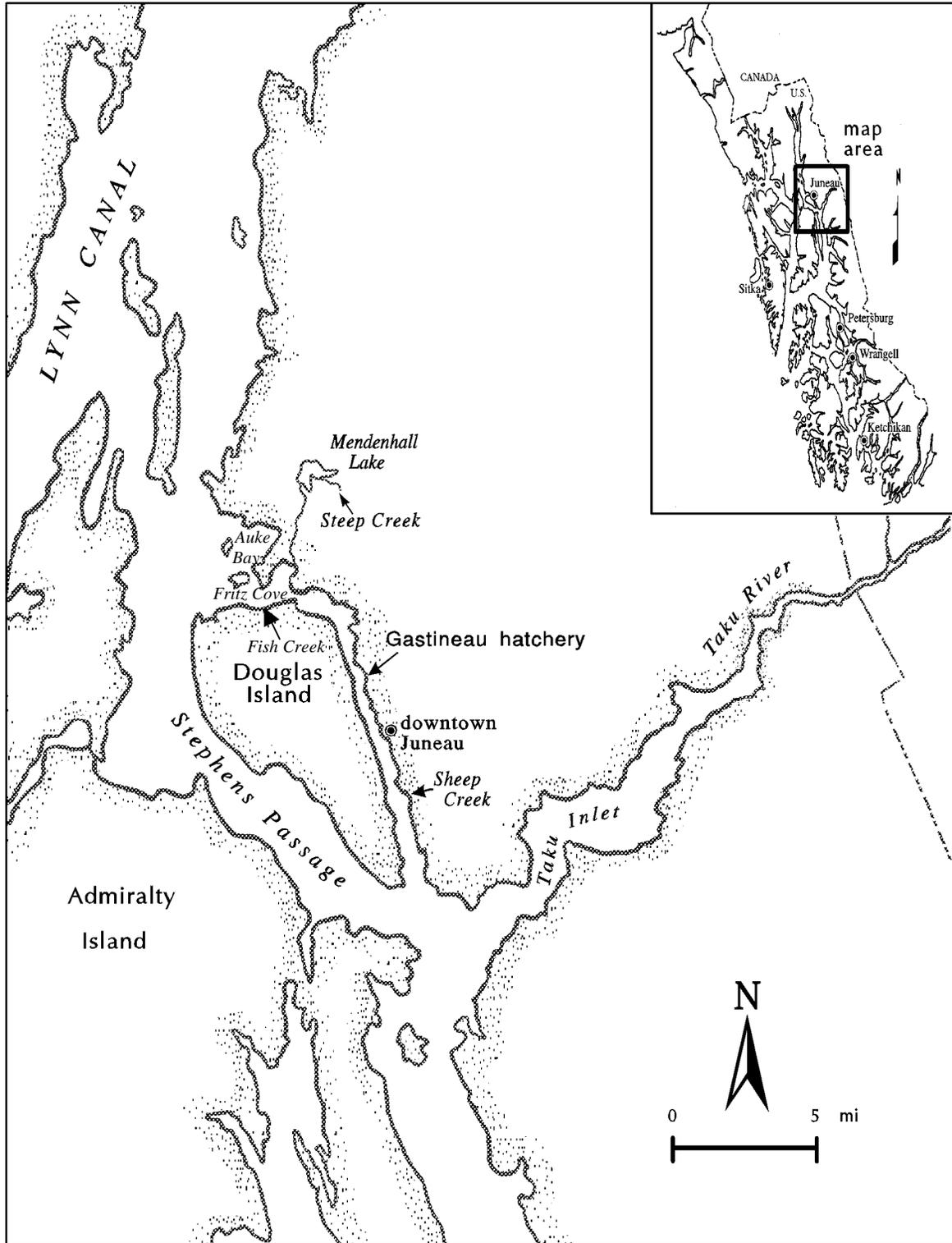


Figure 1.—Location of the Gastineau Hatchery, site of a roadside sport fishery near Juneau, northern Southeast Alaska.

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	380
1995	Sheep Creek	0	44,674	28	621
	Gastineau Hatchery	8,540	11,825	159	422
1996	Sheep Creek	0	41,175	35	511
	Gastineau Hatchery	8,744	11,474	64	348
1997	Sheep Creek	0	39,278	45	576
	Gastineau Hatchery	5,901	12,168	172	426
1998	Sheep Creek ^b	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
2000	Sheep Creek	0	0	0	91
	Gastineau Hatchery	1,682	27,879	209	806

^a Reared at Snettisham Hatchery.

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

In 1994, ADF&G entered into an agreement with DIPAC to rear chinook salmon for release at the following sites in the Juneau area (Figure 1): Gastineau Hatchery, Fish Creek (north Douglas Island), Auke Bay, and Sheep Creek (Bentz et al. 1996). This program was designed to increase sport fishing opportunities for chinook salmon in the Juneau marine boat fishery, marine shoreline fisheries at Gastineau Hatchery, Fritz Cove, and Auke Bay, and freshwater shoreline fisheries at Fish Creek. 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 at Gastineau Hatchery

provides additional information for evaluating the hatchery as a release site and terminal harvest area. In 2000, hatchery and ADF&G staff again cooperated to conduct the survey.

OBJECTIVE

The objective of the 2000 roadside creel survey at the Gastineau Hatchery was to estimate effort and harvests of pink, chum, coho, and chinook salmon from 12 June through 8 October, such that estimates were within specified values 95% of the time: $\pm 10\%$ for angler-hours of effort, $\pm 20\%$ for coho and pink salmon harvest, and $\pm 30\%$ for chinook and chum salmon harvests.

METHODS

There were two survey sites: a non-snagging zone where snagging was prohibited and a snagging zone where snagging was allowed. The non-snagging zone included a 100-ft floating dock and 150 ft of beach adjacent to the dock, while the snagging zone included the remaining 100 yd of beach extending from the non-snagging zone boundary to a private barge landing to the north. Both locations were clearly marked, and hatchery personnel enforced fishing rules. Both sites were discrete in shape and size, and easily surveyed.

The bag and possession limit for chinook salmon at the hatchery was 4 fish during 10 June to 31 August 2000, of which up to 3 could be “large” fish (≥ 28 inches or 71 cm TL). Any chinook salmon < 28 inches TL was classified as “small.” After 31 August, the chinook salmon bag limit was 1 fish ≥ 28 inches TL. The bag limit for pink, chum, and coho salmon ≥ 16 inches TL was 6 per day for each species, and an additional 10 salmon < 16 inches TL could be taken in combination. Coho salmon were classified as either “large” (≥ 16 inches or 41 cm TL) or “small” (< 16 inches TL).

A stratified, two-stage roving creel survey based on expansion of sample ratios was used to estimate fishing effort and harvest from 12 June to 6 October 2000. 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. The weekend strata (Saturday and Sunday) of the last week (2 October to 8 October 2001) was not sampled. Therefore, there were 66 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.

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

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 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 various 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 over time.

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

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

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 \hat{E}_{hi} was estimated by (Wolter 1985)

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

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

The variance of the harvest H_{hij} in a day 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

During the 2000 fishing season at Gastineau Hatchery, 4,985 angler interviews and 934 angler counts were conducted. Fishing effort totaled 23,539 (SE = 567) angler-hours, with the highest levels of effort expended during the coho salmon fishery in late August through mid-September (Table 2). An estimated 10,303 (SE = 461) large

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 2000.

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
6/12-6/18	437	91	0	0	0	0	0	0	4	4	0	0	0	0
6/19-6/25	419	61	0	0	0	0	3	3	10	4	9	6	0	0
6/26-7/02	1,093	113	0	0	0	0	9	6	22	9	33	15	0	0
7/03-7/09	1,462	147	0	0	0	0	17	15	17	7	259	120	0	0
7/10-7/16	1,266	120	0	0	0	0	10	6	9	5	258	55	13	6
7/17-7/23	1,344	166	0	0	0	0	15	9	51	23	293	75	5	4
7/24-7/30	934	142	0	0	0	0	26	13	7	6	302	95	47	18
7/31-8/06	1,221	141	0	0	1	1	14	9	8	4	155	37	422	71
8/07-8/13	1,151	155	4	2	1	1	6	4	1	1	135	42	490	85
8/14-8/20	1,437	217	111	27	25	12	21	9	4	3	46	18	587	103
8/21-8/27	1,708	154	356	65	7	5	25	10	11	4	24	9	636	157
8/28-9/03	2,679	149	1,310	197	15	10	9	5	3	3	6	4	177	83
9/04-9/10	2,367	155	2,024	170	73	28	0	0	0	0	0	0	7	7
9/11-9/17	2,604	146	3,124	282	71	25	0	0	0	0	0	0	2	2
9/18-9/24	2,427	149	2,466	224	21	10	0	0	0	0	0	0	0	0
9/25-10/01	973	90	907	101	4	3	0	0	0	0	0	0	0	0
10/02-10/06	17	9	0	0	0	0	0	0	0	0	0	0	0	0
Total	23,539	567	10,303	461	218	42	155	29	147	28	1,520	190	2,386	235
Relative Precision	5%		9%		38%		37%		38%		24%		19%	
Goal Relative Precision	10%		20%		20%		30%		30%		30%		20%	

^a Standard error of effort or harvest estimate.

coho salmon, 1,520 (SE = 190) chum salmon, 2,386 (SE = 235) pink salmon, and 155 (SE = 29) large chinook salmon were harvested at Gastineau Hatchery from 12 June to 6 October. In addition, 147 (SE = 28) small chinook salmon and 218 (SE = 42) small coho salmon were harvested.

Anglers harvested most large chinook salmon from early July through late August, and most of the small chinook salmon were harvested in mid-June to late July. Most of the chum and pink salmon harvest occurred in July and August. A few coho salmon were taken in early August, 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 82% of the effort and 70% or more of harvests of all salmon species.

Angler age class specific estimates showed that adults accounted for about 71% of the effort, and 82% of the large chinook, 88% of the large coho, 78% of the chum, and 74% of the pink salmon harvests (Table 4). Children accounted for 22% of the effort, and 16% of the large chinook, 5% of the large coho, 12% of the chum, and 22% of the pink salmon harvests. Seniors accounted for only 7% of the effort, and less than 10% of the harvest of all salmon species.

The relative precision of effort and harvest estimates for coho, chum and pink salmon were all within goals stated in the objective (Table 2). Precision of chinook salmon harvest estimates was poorer than expected due primarily to below average returns of this species.

Detailed sampling information, including angler counts and numbers of completed interviews for overall estimates, is presented in Appendix A1. Appendix A2 lists archived files containing final data sets used for the analysis.

DISCUSSION

The 2000 sport fishing season at Gastineau Hatchery was characterized as providing above

average effort and harvest for coho salmon, while harvests of other species were below average. Effort at the site was 7% above the 5-year average, and 17% lower than the record high effort estimated for 1998 (Table 5). Although coho salmon returns to Gastineau Hatchery were about average in 2000 (R. Focht, DIPAC Director of Research & Evaluation, Juneau, personal communication), the high amount of effort resulted in a harvest of 10,303 coho salmon—the second highest for the survey. Chinook salmon returns to the hatchery were below average, and the harvest of large chinook salmon in 2000 declined by 67% from the 5-year average. Chum salmon returns were about average, but the harvest was 19% below the 5-year average. Pink salmon returns to the hatchery in 2000 were about half of the 5-year average, with harvests 25% below the 5-year average.

An angler effort increase of 25% in 2000 from 1999 may in part have been due to better weather increasing angler effort. Juneau received above average precipitation and wind during most of the summer and early fall in 1999, while in 2000 the frequency and severity of storms was lower.

Residency information collected during 1998, 1999, and 2000 indicated that the vast majority of use (74%, 79%, and 82%, respectively) of the site is by resident anglers. It appears relative use by residents may be slowly increasing.

Results of the onsite 2000 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 Fish Creek at the north end of Douglas Island, and in 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 24 April to 24 September, 2000 indicated that these anglers also benefited

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 2000.

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	19,215	485	9,546	445	217	42	112	23	126	27	1,263	165	1,661	190
Non-resident	4,292	234	756	102	0	0	43	14	21	9	255	56	726	103
Unknown	21	11	0	0	0	0	0	0	0	0	0	0	0	0
Total ^b	23,528	539	10,302	457	217	42	155	27	147	29	1,518	174	2,387	216

^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 estimate 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 2000.

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	16,652	439	9,081	455	155	37	126	27	105	23	1,194	164	1,773	178
Child	5,193	247	467	66	43	22	24	10	37	17	185	35	518	89
Senior	1,646	168	755	112	19	10	4	3	5	3	138	48	96	29
Unknown	39	27	0	0	0	0	0	0	0	0	2	2	0	0
Total ^b	23,530	532	10,303	473	217	44	154	29	147	28	1,519	174	2,387	201

^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 estimate 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 1993–2000.

Year (survey period)	Angler-hours	Large (≥ 16 in) coho salmon		Large (≥ 28 in) chinook salmon			Chum salmon		Pink salmon	
		SE ^a	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
1999 (7 Jun–3 Oct) ^j	18,828	541	7,275	382	109	23	1,028	173	2,986	303
5-year (1995-1999) Mean	22,044		5,515		473		1,866		3,195	
2000 (12 Jun-6 Oct)	23,536	567	10,303	461	155	29	1,518	190	2,387	235

^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).

^j Estimates from Jaenicke (2000).

from the DIPAC enhancement activities. In 2000, Juneau marine boat anglers took 2,194 (SE = 375) chinook salmon (48% of the total harvest) and 1,343 (SE = 346) coho salmon (11% of the total harvest) originating from DIPAC (Hubartt et al. *In prep*). An estimated 186 (SE = 77) of the chinook salmon taken in the marine boat sport fishery originated from releases directly at Gastineau Hatchery. Additional chinook salmon taken in 2000 that had in previous years been released at the hatchery site included 95 fish taken in commercial fisheries and 193 fish returning to the rack at the hatchery (R. Focht, DIPAC Director of Research & Evaluation, Juneau, personal communication). The average survival of the 1993-1994 brood year fish has been much lower for the Gastineau hatchery releases than at the Sheep Creek, Fish Creek, and Auke Creek release sites (R. Focht, DIPAC Director of Research & Evaluation, Juneau,

personal communication). This has led to low harvests at the Gastineau shoreline fishery in 1999 and 2000.

Terminal area regulations in Gastineau Channel surrounding the hatchery and in nearby Auke Bay and Fritz Cove provided increased chinook bag limits (4 fish, of which no more than 3 could be ≥ 28 inches TL) to harvest hatchery returns during 10 June to 31 August. This opportunity was important as the bag limit outside the terminal area was only 1 chinook salmon ≥ 28 inches TL. The liberal regulations, coupled with substantial hatchery returns, provided increased opportunities for a large number of anglers. Also without fishing opportunities presented by these fish, fishing regulations might have to be further restricted to adhere to sport allocations for chinook salmon.

Harvest estimates for the shoreline fishery at Gastineau Hatchery from the onsite survey and the SWHS were compared for 1994-2000 (Table 6). Chinook salmon estimates were not used in the comparison for 1994 and 1995 because starting dates for onsite surveys in these years resulted in the early portion of the chinook fishery being missed. Estimates were considered to be statistically different if 95% confidence levels did not overlap. The SWHS harvest estimates of coho salmon during 1994-2000 have twice been statistically different from onsite creel survey estimates, with the largest discrepancy occurring in 1998 (3,207 fish estimated from SWHS versus 12,909 fish estimated from onsite survey). Pink and chum salmon harvest estimates from the SWHS have been significantly lower than the onsite survey during 1994-2000 for five and three, respectively, of the seven years. In years with overlapping confidence intervals, the SWHS estimates are also generally lower than the creel estimates for these 3 species. Significantly different estimates of the harvest of large chinook salmon in 2000 (155 fish from the onsite survey versus 920 fish from the SWHS) are unique comparisons for this species (Table 6), and thus not of immediate concern as such differences are likely on occasion (say 1 in 20 years at a 5% error rate). Similarly, the total harvest of all (small plus large) chinook salmon estimated in the SWHS was similar to our on-site estimate in all previous years except for 2000, when it was higher.

It is not known why harvests of coho, pink, and chum salmon at the Gastineau Hatchery are statistically higher in our creel survey than in the SWHS in several years. It is possible that anglers harvesting large numbers of pink, chum, and coho salmon in this unique fishery exhibit a recall bias; i.e., they underestimate the total number of these species they harvest when they complete a SWHS survey questionnaire many months after fishing is concluded. Also, if children (sport fishers under 16 years of age) are the only sport fisher in a household, that household is not sampled in the SWHS (since children under 16 don't need a sport fishing license). Thus, if many children from non-surveyed households participate in the Gastineau fishery, a substantial downward bias in the SWHS

estimates might result. In our 2000 on-site survey, we estimated that 22% of the angler effort, 16% of the large chinook salmon harvest and 5% of the large coho salmon harvest was due to children under 16 years old. Even if all the effort and harvest of these children came from non-surveyed households, the bias would not explain the large discrepancies between the chinook and coho salmon estimates. Finally, mistaken species identifications (e.g., mistaking a coho salmon for a chinook salmon) could lead to relatively high chinook estimates (for example) on the SWHS and smaller estimates for coho (or chum or pink) salmon. However, this possibility (a difference of 1,003 large plus small chinook in 2000) would explain only about 35% of the difference (2,836 fish) in the two estimates for coho salmon.

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. The Gastineau Hatchery roadside fishery is unique because it represents an easily accessible area that provides concentrated angler effort and harvest near a hatchery raceway. 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 and to ground truth SWHS estimates of harvest at the Gastineau Hatchery shoreline fishery. The occasional significant differences (and generally consistent trends) in harvest estimates of pink, chum and coho salmon noted between the two surveys are not likely the

Table 6.—Comparison of Alaska statewide harvest survey (SWHS) and onsite creel survey harvest estimates for the Gastineau Hatchery roadside sport fishery during 1994–2000. Statistics in **bold** have confidence levels which do not overlap.

Year	Survey type	Large Chinook Salmon	95% CI	Small Chinook Salmon	95% CI	Coho Salmon ^a	95% CI	Pink salmon	95% CI	Chum salmon	95% CI
1994	Onsite ^b	NC ^c	NC ^c	NC ^c	NC ^c	3,520	2,899–4,141	9,197	8,099–10,295	593	464–722
	Statewide ^d	NC ^c	NC ^c	NC ^c	NC ^c	2,935	1,665–4,414	3,227	1,875–4,745	413	117–812
1995	Onsite ^e	NC ^c	NC ^c	NC ^c	NC ^c	2,634	2,007–3,261	3,421	2,931–3,911	2,047	1,549–2,545
	Statewide ^f	NC ^c	NC ^c	NC ^c	NC ^c	1,721	718–3,259	1,115	636–1,708	790	477–1,159
1996	Onsite ^g	695	552-838	88	27-149	3,625	3,010–4,240	1,039	774–1,304	2,274	1,784–2,764
	Statewide ^h	836	420-1,341	192	32-437	1,228	626–1,957	281	71–538	606	319–946
1997	Onsite ⁱ	931	690-1,172	110	39-181	5,108	4,087–6,129	2,878	2,296–3,460	1,605	1,144–2,066
	Statewide ^j	895	348-1,683	337	108-643	3,070	1,249–6,044	2,732	1,359–4,655	1,859	602-3,879
1998	Onsite ^k	471	348-594	86	47-125	12,909	11,029-14,789	5,653	4,842-6,464	2,376	1,827-2,925
	Statewide ^l	315	138-539	44	6-103	3,207	1,381-5,948	1,420	679-2,409	1,370	302-2,858
1999	Onsite ^m	109	64-154	134	65-203	7,419	6,667-8,171	2,986	2,392-3,580	1,028	689-1,367
	Statewide ⁿ	362	67-864	94	22-196	6,193	4,104-8,956	4,867	1,624 – 9,748	855	275-1,519
2000	Onsite ^o	155	98-212	147	92-202	10,521	9,614-11,428	2,386	1,925-2,847	1,520	1,148-1,892
	Statewide ^p	920	305-2,100	385	133-708	7,685	4,901-11,246	1,005	533 – 1,581	734	379-1,145

^a Combined large (≥16”) and small (<16”) coho salmon.

^b Beers (1995).

^c NC – Chinook estimates are not comparable (NC) due to late start of onsite creel survey.

^d Howe et al. (1995).

^e Beers (1996)

^f Howe et al. (1996)

^g Beers (1997).

^h Howe et al. (2001a).

ⁱ Frenette (1998).

^j Howe et al. (2001b)

^k Frenette (1999)

^l Howe et al. (2001c).

^m Jaenicke (2000)

ⁿ Howe et al. (2001d).

^o This report.

^p Walker et al. (*In prep.*).

result of random chance. One possible explanation for these differences is recall bias, where anglers do not accurately remember their harvest of these “less desirable” species after a protracted absence from the fishery. Additional study is needed to determine why these estimates differ.

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, the relative precision goal was not met for chinook salmon. This was primarily because harvests of this species were considerably below average (Table 5). Given average or better returns, I expect that the current sampling design should provide estimates generally achieving goal precision levels in 2001.

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 8 October, it was discontinued after 6 October due to poor weather, a drop in observed fishing effort and no coho salmon being harvested. Therefore, it is suggested that 2001 sampling have a startup date of mid June (e.g., 11 June) and continue until the first or second week in October of 2001 (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 Robbie Bishop and Phil Gray for their valuable data collection efforts, Ruth Reiter for data collection and entry, and Diana Tersteeg for data editing and reduction. Rick Focht, DIPAC Director of Research & Evaluation,

supervised the Gastineau Hatchery data collection and provided updated information on releases for 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, Anchorage.
- 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, Anchorage.
- 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, Anchorage.
- 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, Anchorage.
- 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, Anchorage.
- 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., G. Fidler, and M. J. Mills. 1995. Harvest, catch, and participation in Alaska sport fisheries during 1994. Alaska Department of Fish and Game, Fishery Data Series No. 95-24, Anchorage.
- Howe, A. L., G. Fidler, A. E. Bingham, and M. J. Mills. 1996. Harvest, catch, and participation in Alaska sport fisheries during 1995. Alaska Department of Fish and Game, Fishery Data Series No. 96-32, Anchorage.
- Howe, A. L., R. J. Walker, C. Olnes, K. Sundet, and A. E. Bingham. 2001a. Revised Edition: Harvest, catch, and participation in Alaska sport fisheries during 1996. Alaska Department of Fish and Game, Fishery Data Series No. 97-29 (Revised), Anchorage.
- Howe, A. L., R. J. Walker, C. Olnes, K. Sundet, and A. E. Bingham. 2001b. Revised Edition: Harvest, catch, and participation in Alaska sport fisheries during 1997. Alaska Department of Fish and Game, Fishery Data Series No. 98-25 (Revised), Anchorage.
- Howe, A. L., R. J. Walker, C. Olnes, K. Sundet, and A. E. Bingham. 2001c. Revised Edition: Participation, catch, and harvest in Alaska sport fisheries during 1998. Alaska Department of Fish and Game, Fishery Data Series No. 99-41 (Revised), Anchorage.
- Howe, A. L., R. J. Walker, C. Olnes, K. Sundet, and A. E. Bingham. 2001d. Participation, catch, and harvest in Alaska sport fisheries during 1999. Alaska Department of Fish and Game, Fishery Data Series No. 01-08, Anchorage.
- Hubartt, D. J., A. E. Bingham, and B. J. Frenette. *In prep.* Harvest estimates for selected marine sport fisheries in Southeast Alaska during 2000. Alaska Department of Fish and Game, Fishery Data Series, Anchorage.
- Jaenicke, M. J. 2000. Harvest estimate for the Gastineau Hatchery roadside fishery in Juneau, Alaska during 1999. Alaska Department of Fish and Game, Fishery Data Series No. 00-27, 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.
- 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.
- Walker, R. J., C. Olnes, K. Sundet, A. L. Howe, and A. E. Bingham. *In prep.* Participation, catch, and harvest in Alaska sport fisheries during 2000. Alaska Department of Fish and Game, Fishery Data Series, 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 2000.

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								
6/12-6/18	WD	12Jun	NON	5	4.20	3.19	17	21.50	0	0	0	0	0	0
6/12-6/18	WD	12Jun	SNAG	5	0.00	0.00	.	.	.	.	.	.	.	.
6/12-6/18	WD	14Jun	NON	6	3.83	3.49	14	13.75	0	0	0	0	0	0
6/12-6/18	WD	14Jun	SNAG	6	0.50	0.84	4	3.50	0	0	0	0	0	0
6/12-6/18	WD	16Jun	NON	6	0.67	1.21	6	5.75	0	0	0	0	0	0
6/12-6/18	WD	16Jun	SNAG	6	0.33	0.82	.	.	.	.	.	.	.	.
6/12-6/18	WE/H	17Jun	NON	6	1.83	3.13	16	16.00	0	0	0	0	0	0
6/12-6/18	WE/H	17Jun	SNAG	6	0.83	2.04	6	4.25	0	0	0	0	0	0
6/12-6/18	WE/H	18Jun	NON	6	5.17	5.60	32	47.25	0	2	0	0	0	0
6/12-6/18	WE/H	18Jun	SNAG	6	1.67	2.66	15	13.00	0	0	0	0	0	0
6/19-6/25	WD	19Jun	NON	6	1.00	1.26	13	16.00	0	0	0	0	0	0
6/19-6/25	WD	19Jun	SNAG	6	0.33	0.82	4	5.75	0	1	0	0	0	2
6/19-6/25	WD	20Jun	NON	6	1.00	1.26	12	16.25	0	0	0	0	0	0
6/19-6/25	WD	20Jun	SNAG	6	0.67	0.82	6	5.25	0	0	0	0	0	0
6/19-6/25	WD	23Jun	NON	3	3.00	1.00	23	60.00	2	0	0	0	0	0
6/19-6/25	WD	23Jun	SNAG	3	1.33	2.31	10	6.50	0	0	0	0	0	0
6/19-6/25	WE/H	24Jun	NON	5	5.60	5.77	22	41.00	0	0	0	0	0	0
6/19-6/25	WE/H	24Jun	SNAG	5	0.40	0.89	20	31.00	0	0	0	0	0	0
6/19-6/25	WE/H	25Jun	NON	6	3.67	1.63	23	31.25	0	0	0	0	0	0
6/19-6/25	WE/H	25Jun	SNAG	6	2.33	2.07	13	16.00	0	3	0	0	0	2
6/26-7/02	WD	26Jun	NON	6	4.17	3.06	17	52.75	0	1	0	0	0	0
6/26-7/02	WD	26Jun	SNAG	6	3.17	2.71	20	19.25	1	0	0	0	0	0
6/26-7/02	WD	27Jun	NON	6	4.83	4.40	29	48.75	0	2	0	0	0	0
6/26-7/02	WD	27Jun	SNAG	6	4.67	3.01	18	33.00	1	2	0	0	0	3
6/26-7/02	WD	28Jun	NON	6	4.83	4.71	39	59.00	0	0	0	0	0	0
6/26-7/02	WD	28Jun	SNAG	6	1.67	1.97	19	14.50	0	0	0	0	0	0
6/26-7/02	WE/H	01Jul	NON	6	7.67	6.09	32	59.00	0	1	0	0	0	0
6/26-7/02	WE/H	01Jul	SNAG	6	3.83	3.76	26	44.00	0	0	0	0	0	4
6/26-7/02	WE/H	02Jul	NON	6	7.50	4.32	34	58.50	0	2	0	0	0	0
6/26-7/02	WE/H	02Jul	SNAG	6	5.67	4.03	35	46.50	0	0	0	0	0	7
7/03-7/09	WD	05Jul	NON	6	5.50	4.37	29	45.75	0	2	0	0	0	0
7/03-7/09	WD	05Jul	SNAG	6	3.00	3.46	9	22.00	4	0	0	0	0	8
7/03-7/09	WD	06Jul	NON	6	7.00	5.37	40	63.50	0	1	0	0	0	0
7/03-7/09	WD	06Jul	SNAG	6	6.83	7.41	29	35.50	0	0	0	0	0	26
7/03-7/09	WE/H	04Jul	NON	6	8.17	4.79	40	62.00	0	0	0	0	0	0
7/03-7/09	WE/H	04Jul	SNAG	6	3.33	3.78	36	67.00	0	0	0	0	0	15
7/03-7/09	WE/H	08Jul	NON	6	8.83	4.49	66	85.50	0	2	0	0	0	0
7/03-7/09	WE/H	08Jul	SNAG	6	5.50	2.51	28	40.50	0	0	0	0	0	10
7/03-7/09	WE/H	09Jul	NON	6	10.83	8.98	63	133.75	0	1	0	0	0	8
7/03-7/09	WE/H	09Jul	SNAG	6	4.17	4.07	14	26.90	0	0	0	0	0	4
7/10-7/16	WD	11Jul	NON	6	5.50	3.99	42	68.75	0	1	0	0	0	7
7/10-7/16	WD	11Jul	SNAG	6	3.00	3.52	17	21.50	0	0	0	0	0	0
7/10-7/16	WD	12Jul	NON	6	7.67	5.54	29	49.00	1	0	0	0	0	7
7/10-7/16	WD	12Jul	SNAG	6	3.00	2.53	20	30.75	1	0	0	0	0	5
7/10-7/16	WD	14Jul	NON	6	6.50	4.18	30	39.50	0	1	0	0	0	6
7/10-7/16	WD	14Jul	SNAG	6	2.83	3.31	27	41.25	1	0	0	0	3	25
7/10-7/16	WE/H	15Jul	NON	6	9.50	9.83	43	114.25	1	1	0	0	0	22
7/10-7/16	WE/H	15Jul	SNAG	6	4.33	4.59	29	39.00	0	0	0	0	2	23
7/10-7/16	WE/H	16Jul	NON	6	9.50	8.62	58	113.50	0	0	0	0	3	4
7/10-7/16	WE/H	16Jul	SNAG	6	4.50	6.63	30	52.25	0	0	0	0	0	29
7/17-7/23	WD	18Jul	NON	6	8.50	10.77	45	88.50	0	0	0	0	0	4
7/17-7/23	WD	18Jul	SNAG	6	2.50	3.21	22	26.25	0	0	0	0	0	11
7/17-7/23	WD	20Jul	NON	6	7.17	7.57	31	50.25	1	5	0	0	0	6
7/17-7/23	WD	20Jul	SNAG	6	6.17	7.19	23	41.25	0	0	0	0	0	8
7/17-7/23	WD	21Jul	NON	6	9.00	9.63	43	75.00	0	2	0	0	0	7
7/17-7/23	WD	21Jul	SNAG	6	1.83	2.23	22	31.50	0	0	0	0	1	30
7/17-7/23	WE/H	22Jul	NON	6	5.50	4.85	22	24.75	0	4	0	0	1	1
7/17-7/23	WE/H	22Jul	SNAG	6	2.83	4.17	20	13.75	0	0	0	0	0	26
7/17-7/23	WE/H	23Jul	NON	5	11.20	8.87	40	89.50	5	4	0	0	0	10
7/17-7/23	WE/H	23Jul	SNAG	5	3.80	1.64	11	7.50	0	0	0	0	0	2
7/24-7/30	WD	24Jul	NON	6	9.33	8.94	45	59.25	3	0	0	0	2	3
7/24-7/30	WD	24Jul	SNAG	6	2.67	3.08	12	9.25	0	0	0	0	0	6
7/24-7/30	WD	27Jul	NON	6	5.33	3.93	43	75.00	0	0	0	0	0	2
7/24-7/30	WD	27Jul	SNAG	6	2.33	2.58	17	13.25	1	0	0	0	0	3
7/24-7/30	WD	28Jul	NON	6	1.67	1.37	10	8.75	0	1	0	0	0	1
7/24-7/30	WD	28Jul	SNAG	6	1.83	1.60	8	6.00	0	0	0	0	0	16

-continued-

INTERVIEW SAMPLING INFORMATION														
Week	Stratum ^a	Date	Site	ANGLER COUNTS			No.	Effort	Large	Small	Large	Small	Pink	Chum
				No.	Mean	SD			chinook	chinook	coho	coho		
								harvest	harvest	harvest	harvest	harvest	harvest	
7/24-7/30	WE/H	29Jul	NON	6	6.17	6.24	24	63.50	0	1	0	0	5	12
7/24-7/30	WE/H	29Jul	SNAG	6	1.83	1.17	29	39.50	0	0	0	0	1	18
7/24-7/30	WE/H	30Jul	NON	6	9.00	8.53	38	71.00	4	0	0	0	14	16
7/24-7/30	WE/H	30Jul	SNAG	6	2.00	2.53	23	20.50	0	0	0	0	1	15
7/31-8/06	WD	02Aug	NON	6	7.50	10.23	56	99.50	5	2	0	0	20	2
7/31-8/06	WD	02Aug	SNAG	6	3.83	4.62	20	27.25	0	0	0	0	19	9
7/31-8/06	WD	03Aug	NON	6	7.17	6.49	34	66.75	0	1	0	0	21	0
7/31-8/06	WD	03Aug	SNAG	6	2.33	4.08	20	20.25	0	0	0	0	3	9
7/31-8/06	WD	04Aug	NON	6	9.00	8.27	44	77.75	0	0	0	0	16	6
7/31-8/06	WD	04Aug	SNAG	6	1.67	1.97	25	22.50	0	0	0	0	15	11
7/31-8/06	WE/H	05Aug	NON	6	6.67	5.20	36	79.75	0	0	0	0	27	0
7/31-8/06	WE/H	05Aug	SNAG	6	2.00	2.45	16	26.75	0	0	0	1	11	15
7/31-8/06	WE/H	06Aug	NON	6	8.50	11.18	47	95.25	0	1	0	0	37	3
7/31-8/06	WE/H	06Aug	SNAG	6	7.67	8.64	40	61.50	2	0	0	0	34	15
8/07-8/13	WD	07Aug	NON	5	8.40	6.27	44	58.00	1	0	0	0	27	2
8/07-8/13	WD	07Aug	SNAG	5	5.60	3.36	32	35.75	0	0	0	0	12	8
8/07-8/13	WD	08Aug	NON	6	2.83	3.60	23	32.50	0	0	0	0	8	2
8/07-8/13	WD	08Aug	SNAG	6	1.83	2.40	10	18.25	0	0	0	0	9	4
8/07-8/13	WD	10Aug	NON	6	6.83	5.42	36	84.25	0	0	0	0	34	0
8/07-8/13	WD	10Aug	SNAG	6	5.17	7.99	38	43.00	0	0	0	0	16	13
8/07-8/13	WE/H	12Aug	NON	6	6.33	4.68	35	76.75	2	0	0	1	27	7
8/07-8/13	WE/H	12Aug	SNAG	6	4.50	3.27	22	20.00	0	0	0	0	11	8
8/07-8/13	WE/H	13Aug	NON	6	7.67	8.21	54	100.50	0	1	2	0	55	4
8/07-8/13	WE/H	13Aug	SNAG	6	5.17	8.35	23	49.75	0	0	1	0	27	1
8/14-8/20	WD	14Aug	NON	6	3.67	2.07	16	15.75	0	0	2	0	9	0
8/14-8/20	WD	14Aug	SNAG	6	2.17	3.92	12	8.50	0	0	1	0	5	0
8/14-8/20	WD	15Aug	NON	6	9.33	11.06	37	81.50	0	0	0	4	26	6
8/14-8/20	WD	15Aug	SNAG	6	1.33	2.42	13	12.50	0	0	0	1	2	0
8/14-8/20	WD	16Aug	NON	6	14.33	9.54	57	145.00	4	0	1	0	46	5
8/14-8/20	WD	16Aug	SNAG	6	6.17	5.88	21	30.50	0	0	1	1	17	2
8/14-8/20	WE/H	19Aug	NON	6	7.33	5.43	32	63.50	2	1	12	0	23	0
8/14-8/20	WE/H	19Aug	SNAG	6	6.17	7.44	26	45.25	1	1	15	3	56	2
8/14-8/20	WE/H	20Aug	NON	6	13.67	9.35	61	120.00	3	0	16	0	21	0
8/14-8/20	WE/H	20Aug	SNAG	6	5.67	8.50	19	28.75	0	0	2	0	8	1
8/21-8/27	WD	22Aug	NON	6	11.17	6.24	53	123.25	1	2	9	1	16	0
8/21-8/27	WD	22Aug	SNAG	6	3.00	3.90	15	21.25	0	0	2	0	12	0
8/21-8/27	WD	23Aug	NON	6	13.50	5.24	39	90.25	1	1	0	0	20	1
8/21-8/27	WD	23Aug	SNAG	6	4.67	4.08	42	52.25	0	0	1	0	111	1
8/21-8/27	WD	25Aug	NON	6	5.83	2.48	31	59.00	5	1	4	0	9	2
8/21-8/27	WD	25Aug	SNAG	6	5.50	3.62	23	38.75	0	0	19	0	11	0
8/21-8/27	WE/H	26Aug	NON	6	14.67	10.41	40	88.00	2	0	26	0	15	1
8/21-8/27	WE/H	26Aug	SNAG	6	9.33	6.77	30	58.00	0	0	28	2	31	0
8/21-8/27	WE/H	27Aug	NON	6	6.83	4.49	38	79.00	0	0	18	0	10	0
8/21-8/27	WE/H	27Aug	SNAG	6	11.00	7.64	34	87.50	1	0	51	0	31	6
8/28-9/03	WD	28Aug	NON	6	13.17	7.78	57	97.00	1	1	18	3	7	0
8/28-9/03	WD	28Aug	SNAG	6	10.00	6.81	28	58.50	1	0	21	0	28	0
8/28-9/03	WD	29Aug	NON	6	13.50	11.48	42	107.00	0	0	38	0	2	0
8/28-9/03	WD	29Aug	SNAG	6	9.17	9.11	25	48.25	0	0	23	1	1	0
8/28-9/03	WD	01Sep	NON	5	16.40	9.56	59	109.75	0	0	49	0	6	0
8/28-9/03	WD	01Sep	SNAG	5	13.20	10.76	27	69.50	0	0	74	0	0	0
8/28-9/03	WE/H	02Sep	NON	6	17.67	8.09	62	115.50	0	0	52	0	3	1
8/28-9/03	WE/H	02Sep	SNAG	6	15.83	6.40	41	92.25	0	0	73	0	1	0
8/28-9/03	WE/H	03Sep	NON	6	14.50	3.62	62	124.50	1	0	55	0	0	0
8/28-9/03	WE/H	03Sep	SNAG	6	12.33	7.00	27	48.75	0	0	13	0	1	1
9/04-9/10	WD	05Sep	NON	6	10.00	3.58	54	97.50	0	0	60	0	0	0
9/04-9/10	WD	05Sep	SNAG	6	9.33	6.28	29	40.00	0	0	24	0	0	0
9/04-9/10	WD	07Sep	NON	5	11.40	5.86	45	74.75	0	0	20	5	0	0
9/04-9/10	WD	07Sep	SNAG	5	14.00	7.84	39	55.00	0	0	24	0	1	0
9/04-9/10	WE/H	04Sep	NON	5	10.60	2.79	47	84.75	0	0	111	2	0	0
9/04-9/10	WE/H	04Sep	SNAG	5	9.40	4.83	39	58.25	0	0	156	0	0	0
9/04-9/10	WE/H	09Sep	NON	6	14.67	5.28	58	103.75	0	0	44	2	0	0
9/04-9/10	WE/H	09Sep	SNAG	6	14.00	9.76	33	65.75	0	0	84	0	0	0
9/04-9/10	WE/H	10Sep	NON	6	17.33	4.37	82	169.00	0	0	147	20	0	0
9/04-9/10	WE/H	10Sep	SNAG	6	11.17	7.14	49	83.00	0	0	170	8	0	0
9/11-9/17	WD	11Sep	NON	5	13.20	9.42	40	86.00	0	0	91	4	0	0
9/11-9/17	WD	11Sep	SNAG	5	12.40	10.21	49	98.00	0	0	235	0	0	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									
9/11-9/17	WD	12Sep	NON	5	14.20	3.11	54	115.25	0	0	101	10	0	0	
9/11-9/17	WD	12Sep	SNAG	5	14.00	7.65	38	71.25	0	0	95	0	0	0	
9/11-9/17	WD	15Sep	NON	5	11.60	5.13	45	91.00	0	0	73	7	0	0	
9/11-9/17	WD	15Sep	SNAG	5	12.60	9.32	58	105.25	0	0	141	0	0	0	
9/11-9/17	WE/H	16Sep	NON	6	13.33	4.80	59	111.50	0	0	67	2	0	0	
9/11-9/17	WE/H	16Sep	SNAG	6	10.83	7.03	32	68.00	0	0	101	0	0	0	
9/11-9/17	WE/H	17Sep	NON	6	14.17	9.56	55	96.50	0	0	46	0	0	0	
9/11-9/17	WE/H	17Sep	SNAG	6	20.33	13.40	60	122.75	0	0	171	2	1	0	
9/18-9/24	WD	19Sep	NON	6	9.33	5.92	27	54.00	0	0	34	0	0	0	
9/18-9/24	WD	19Sep	SNAG	6	8.00	4.60	27	43.00	0	0	101	0	0	0	
9/18-9/24	WD	20Sep	NON	6	12.33	7.45	37	64.50	0	0	73	1	0	0	
9/18-9/24	WD	20Sep	SNAG	6	13.50	6.89	23	46.50	0	0	65	0	0	0	
9/18-9/24	WD	21Sep	NON	6	13.67	5.50	43	75.75	0	0	47	0	0	0	
9/18-9/24	WD	21Sep	SNAG	6	14.33	12.86	17	25.25	0	0	20	0	0	0	
9/18-9/24	WE/H	23Sep	NON	6	16.33	9.89	45	136.00	0	0	67	1	0	0	
9/18-9/24	WE/H	23Sep	SNAG	6	15.67	11.52	41	79.00	0	0	110	0	0	0	
9/18-9/24	WE/H	24Sep	NON	6	17.17	5.34	47	108.75	0	0	65	7	0	0	
9/18-9/24	WE/H	24Sep	SNAG	6	13.33	8.85	35	54.50	0	0	68	0	0	0	
9/25-10/01	WD	26Sep	NON	6	7.83	4.67	27	56.25	0	0	29	0	0	0	
9/25-10/01	WD	26Sep	SNAG	6	6.33	4.13	20	45.25	0	0	57	0	0	0	
9/25-10/01	WD	27Sep	NON	6	5.00	3.03	10	27.00	0	0	26	0	0	0	
9/25-10/01	WD	27Sep	SNAG	6	5.33	5.16	23	38.00	0	0	67	0	0	0	
9/25-10/01	WD	28Sep	NON	6	4.50	2.74	22	44.25	0	0	51	1	0	0	
9/25-10/01	WD	28Sep	SNAG	6	2.50	2.59	21	27.00	0	0	70	0	0	0	
9/25-10/01	WE/H	30Sep	NON	6	7.00	4.24	26	38.75	0	0	8	0	0	0	
9/25-10/01	WE/H	30Sep	SNAG	6	6.00	4.29	16	18.50	0	0	11	0	0	0	
9/25-10/01	WE/H	01Oct	NON	6	6.83	2.79	33	45.50	0	0	18	1	0	0	
9/25-10/01	WE/H	01Oct	SNAG	6	3.67	3.72	19	19.75	0	0	2	0	0	0	
10/02-10/06	WD	04Oct	NON	6	0.00	0.00	.	.	.	.	.	.	.	.
10/02-10/06	WD	04Oct	SNAG	6	0.00	0.00	4	1.75	0	0	0	0	0	0	
10/02-10/06	WD	05Oct	NON	5	0.00	0.00	.	.	.	.	.	.	.	.
10/02-10/06	WD	05Oct	SNAG	5	0.00	0.00	.	.	.	.	.	.	.	.
10/02-10/06	WD	06Oct	NON	6	0.00	0.00	.	.	.	.	.	.	.	.
10/02-10/06	WD	06Oct	SNAG	6	0.67	0.82	.	.	.	.	.	.	.	.
				968				4,984	8,817.7	59	52	3,577	91	992	562

^a WD = weekdays (Mondays–Fridays, except 4 July and 4 September); WE/H = weekend/holidays [Saturdays, Sundays, Independence Day (observed on 4 July) and Labor Day (4 September)]

Appendix A2.–Major computer files used for data analysis of 2000 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_00.zip.”

File name	File type	File Description
2000_DIPAC	XLS	Final edited ASCII data set worksheet [sheet1] in an EXCEL spreadsheet.
DIPAC00A	SAS	SAS program to reformat data file in 2000_DIPAC.XLS
DIPAC00	SD2	Summary subset SAS data file: count and interview data
BOWDEN00A	SAS	SAS program to estimate overall effort, harvests, and associated variances
DIPAC_00_Age_eff	SAS	SAS program to estimate effort, harvest, and associated variances by age class (A, C, S, U)
DIPAC_00_RESID_eff	SAS	SAS program to estimate effort, harvest, and associated variances by residency (R, N, and U)
DIPAC_00_SA	SAS	SAS program to summarize daily estimate of effort and harvest.
DIPAC_2000_analysis	XLS	Summary of 2000 data analysis and comparison with historical data in an EXCEL spreadsheet