

Fishery Data Series No. 98-16

**Harvest Estimate for the Gastineau Hatchery
Roadside Sport Fishery in Juneau, Alaska
during 1997**

by

Brian J. Frenette

August 1998

Alaska Department of Fish and Game

Division of Sport Fish



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ABSTRACT

Angler effort and harvests of chinook salmon *Oncorhynchus tshawytscha*, coho salmon *Oncorhynchus kisutch*, chum salmon *Oncorhynchus keta*, and pink salmon *Oncorhynchus gorbuscha* were estimated at Gastineau Hatchery from 16 June to 05 October 1997. An estimated 22,385 (SE = 654) angler-hours were expended to harvest a total of 931 (SE = 123) large chinook salmon at least 28 inches (71 cm) in total length, 110 (SE = 36) small chinook salmon (<28 inches in length), 3,507 (SE = 436) large coho salmon at least 16 inches (41 cm) in length, 1,601 (SE = 286) small coho salmon (<16 inches in length), 1,605 (SE = 235) chum salmon, and 2,878 (SE = 297) 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. During 1996, anglers spent an estimated 18,896 angler-days of shoreline-roadside saltwater fishing participation in the Juneau area (Howe et al. 1997). This represents 41% of total marine shoreline roadside participation (45,786 angler-days) in Southeast Alaska and 17% of the total marine participation (111,330 angler-days) in the entire Juneau area during 1996 (Hubartt et al. 1997). Demand for shoreline-roadside fishing opportunities in the Juneau area is increasing, as about 40% of the population of Southeast Alaska resided in the Juneau Borough in 1996, according to the 1996 State of Alaska census. The area is also visited each summer by more than 400,000 tourists (McDowell Group 1994).

The Gastineau Hatchery, located about 3 miles north of Juneau (Figure 1), is a popular destination for tourists and residents alike: 115,000 paying customers toured the facility during the 1997 season, a 12% increase over the previous year (Rick 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.

Although angler harvests for the entire Juneau road system are estimated through use of the

Statewide Harvest Postal Survey (SWHS) questionnaires mailed annually to a sample of sport anglers who purchased sport fishing licenses in Alaska (Howe et al. 1997), an on-site creel survey was used to obtain detailed information on the sport fishery for terminal runs of chinook, coho, chum, and pink salmon to Gastineau Hatchery. The sport fishery at the hatchery targets chinook, pink, and chum salmon from mid-June through August, and coho salmon in September to the end of the survey in early October.

In 1991, DIPAC 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 and coho salmon—the two species of salmon most preferred by anglers in Southeast Alaska (Jones & Stokes 1991).

Since 1993, ADF&G staff have assisted the Gastineau Hatchery in developing an on-site creel survey program to estimate sport harvests at the site. Hatchery personnel conducted the survey, while ADF&G provided technical planning and analyzed the data to estimate effort and harvest.

In 1996, an estimated 695 large ($\geq 28''$) chinook salmon (SE = 73), 2,860 large ($\geq 16''$) coho salmon (SE = 285), 2,274 chum salmon (SE =

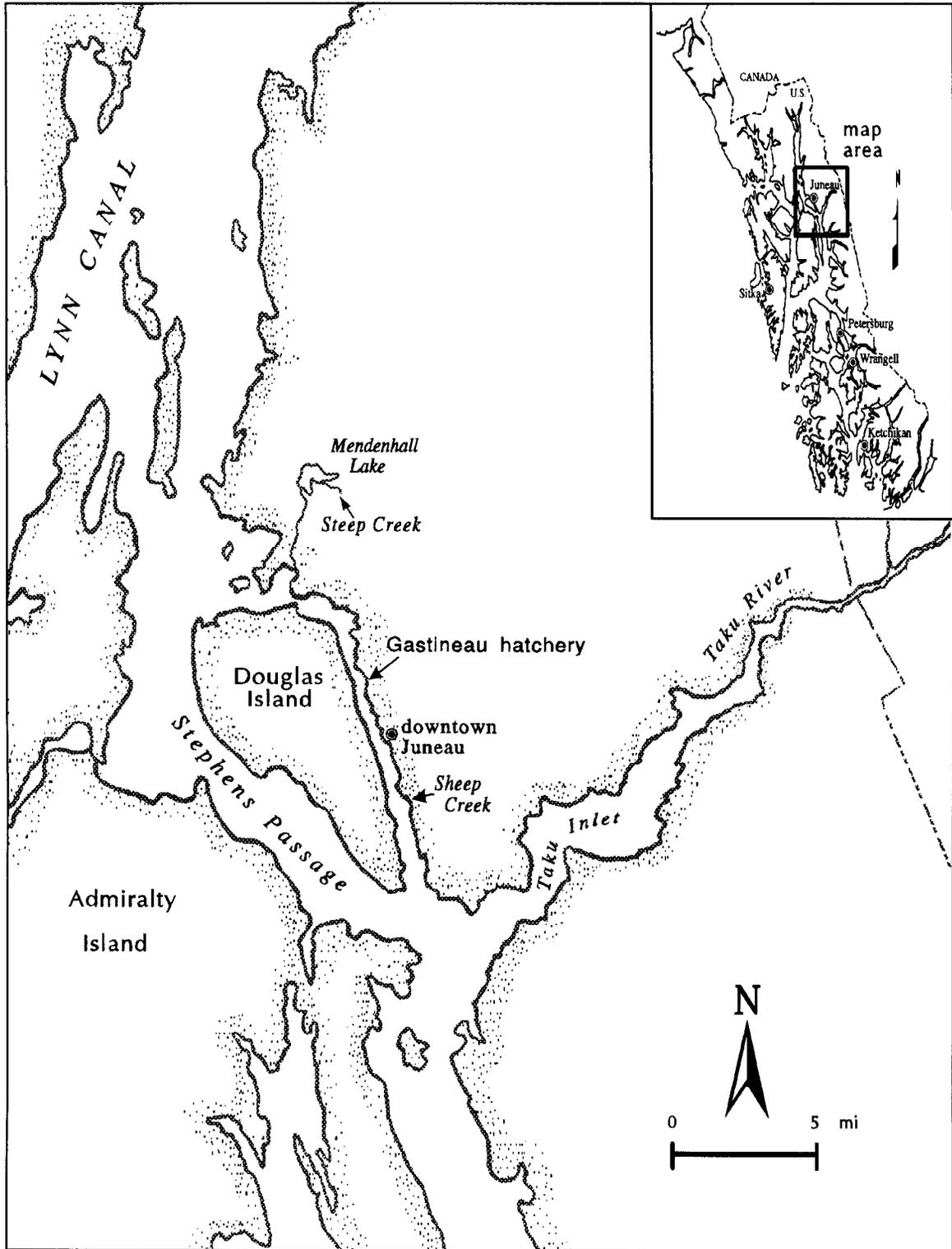


Figure 1.—Location of the Gastineau Hatchery roadside sport fishery, northern Southeast Alaska.

Table 1.—Summary of hatchery-reared salmon smolt releases (in thousands) at Sheep Creek and Gastineau Hatchery since 1991. All fish 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	257	380
1995	Sheep Creek	0	44,674	29	611
	Gastineau Hatchery	8,540	11,825	159	422
1996	Sheep Creek	0	41,240	35	511
	Gastineau Hatchery	8,750	11,474	64	348
1997	Sheep Creek	0	36,700	45	576
	Gastineau Hatchery	5,901	12,168	172	426

^a Reared at Snettisham Hatchery.

250), and 1,039 pink salmon (SE = 135) were harvested between 21 June and 29 September (Beers 1997).

Sport harvests of chinook salmon in Southeast Alaska are limited by the King Salmon Management Plan that also requires estimates of contributions from hatchery chinook salmon stocks in addition to harvests from all other sources. In 1994, ADF&G entered into an agreement with the Gastineau Hatchery to rear chinook salmon for release at several sites in the Juneau area, including waters around the hatchery. The on-site creel survey provides information to properly evaluate the hatchery as a release site and terminal harvest area. In 1997, hatchery and ADF&G staff again cooperated to conduct the survey.

OBJECTIVE

The objective of the 1997 Gastineau Hatchery roadside creel survey was to estimate effort and

harvests of pink, chum, coho, and chinook salmon from 16 June through 5 October, such that estimates were within specified values 95% of the time: angler-hours of effort $\pm 5\%$, pink salmon harvest $\pm 15\%$, chum salmon $\pm 20\%$, coho salmon harvest $\pm 25\%$, and chinook salmon harvest $\pm 35\%$.

METHODS

There are two survey sites: a non-snagging zone and a snagging zone. The non-snagging zone includes a 150-ft floating dock and 100 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.

A stratified, two-stage roving creel survey based on expansion of sample ratios was used to

estimate fishing effort and harvest from 16 June to 5 October 1997. Days were primary sampling units, and anglers within days were secondary sampling units. Two sites (snagging and non-snagging zones), 16 weekly (7-day) strata, and weekday versus weekend-holiday stratifications were maintained¹. Therefore, there were 64 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 site was expected to occur between those hours. During each sampling day, anglers were counted six times within each site (snagging and non-snagging). Angler count times were randomly selected from the mid-strata of the selected strata during each sample day.

Effort was estimated by multiplying the average angler count for the day for each location 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. 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; how-

ever, sampling of anglers exiting the survey area was thought to occur roughly in proportion to the number exiting the site at different times of the day when sampling was not being conducted.

Angler effort, estimate of total harvest, associated variances, and standard errors were calculated according to the following procedures.

The harvest in each stratum 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 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

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

¹ Weekdays = Mondays–Fridays. Weekend/holidays = Saturdays, Sundays, Independence Day (4 July), and Labor Day (1 September).

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)

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

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

The variance of the harvest H_{hij} in a 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 were 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 strata. Relative precision (RP) of the estimates for the 95% level of precision was calculated as

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

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

RESULTS

Effort for pink, chum, coho, and chinook salmon totaled 22,385 (SE = 654, RP = 6%) angler-hours, with the highest levels of effort expended during the chinook salmon fishery (Table 2).

An estimated 3,507 (SE = 436, RP = 24%) large coho at least 16 inches (41 cm) in length, 1,605 (SE = 235, RP = 29%) chum, 2,878 (SE = 297, RP = 20%) pink, and 931 (SE = 123, RP = 26%) large chinook salmon at least 28 inches (71 cm) in length were harvested at Gastineau Hatchery from 16 June to 5 October.

Anglers harvested most chinook salmon in mid-June through early August, although small numbers were taken later through the first week in September. Most of the chum salmon harvest occurred in July, whereas the majority of the pink salmon harvest took place in mid-July through early August. Harvests of large coho salmon ($\geq 16''$) were weak from mid-August to mid-September (historically the peak of the harvest), but came on strong from mid-September through the end of the survey in early October. In addition, 110 (SE = 36) small chinook salmon < 28 inches (71 cm) and 1,601 (SE = 286) small coho salmon < 16 inches (41 cm) in length were harvested. Detailed sampling information, including angler counts and numbers of completed interviews, is presented in Appendix A1.

Appendix A2 contains a listing of the final data sets used for the analysis.

DISCUSSION

Effort (angler-hours) at the site was 17 percent higher in 1997 than in 1996 (Beers 1997), but angler effort of 1997 was similar in magnitude to 1994 and 1995. During 1997, a regular influx of salmon from late June to the end of the survey in early October allowed for continued fishing opportunity throughout the survey period. Harvests of large chinook salmon ($\geq 28''$) were the highest on record, and large coho salmon ($\geq 16''$) harvests were the second highest on record. Pink and chum salmon harvests were near average during the 1997 harvest season (Table 3).

Table 2.—Summary of estimated angler weekly effort and harvest of large ($\geq 16''$) coho, small ($< 16''$) coho, large ($\geq 28''$) chinook, small ($< 28''$) chinook, chum, and pink salmon at the Gastineau Hatchery roadside fishery in 1997.

Weekly period	Angler effort		Large ($\geq 16''$) coho salmon		Small ($< 16''$) coho salmon		Large ($\geq 28''$) chinook salmon		Small ($< 28''$) chinook salmon		Chum salmon		Pink salmon	
	Hours	Var ^a	Harvest	Var ^a	Harvest	Var ^a	Harvest	Var ^a	Harvest	Var ^a	Harvest	Var ^a	Harvest	Var ^a
6/16-6/22	1,887	62,184	0	0	0	0	182	2,210	3	12	20	234	0	0
6/23-6/29	1,610	24,021	0	0	0	0	173	1,338	22	232	72	661	0	0
6/30-7/06	1,755	22,141	0	0	0	0	156	942	13	191	88	630	84	888
7/07-7/13	1,756	23,232	0	0	0	0	85	956	20	442	102	1,304	211	3,110
7/14-7/20	1,826	27,131	0	0	0	0	116	2,837	0	0	394	6,373	774	24,265
7/21-7/27	1,418	27,489	0	0	0	0	9	75	0	0	124	1,869	773	28,477
7/28-8/03	1,775	36,944	52	3,797	0	0	72	3,849	3	8	425	24,243	431	16,803
8/04-8/10	1,683	36,867	19	189	8	67	102	2,685	11	58	98	5,046	280	9,600
8/11-8/17	997	59,071	9	42	2	3	2	3	0	0	0	0	154	3,336
8/18-8/24	1,250	22,225	121	697	7	29	13	98	29	251	87	1,630	102	1,065
8/25-8/31	1,877	32,222	412	11,432	661	33,866	12	75	9	73	194	13,022	48	476
9/01-9/07	1,038	6,172	244	4,003	331	6,313	10	62	0	0	0	0	21	314
9/08-9/14	1,055	7,732	208	3,322	540	39,198	0	0	0	0	0	0	0	0
9/15-9/21	883	27,449	942	105,071	0	0	0	0	0	0	0	0	0	0
9/22-9/28	725	6,963	864	52,535	52	2,305	0	0	0	0	0	0	0	0
9/29-10/5	849	6,388	637	8,622	0	0	0	0	0	0	0	0	0	0
Total	22,385	428,233	3,507	189,711	1,601	81,781	931	15,130	110	1,267	1,605	55,012	2,878	88,333

^a Variance of effort or harvest estimate.

Table 3.—Summary of estimated angler effort and harvest of large coho, large chinook, chum, and pink salmon from on-site creel surveys at the Gastineau Hatchery roadside fishery in 1990 and 1993–1997.

Year (survey period)	Angler-hours	Var ^a	Large ($\geq 16''$) coho salmon		Large ($\geq 28''$) chinook salmon		Chum salmon		Pink salmon	
			Harvest	Var ^a	Harvest	Var ^a	Harvest	Var ^a	Harvest	Var ^a
1990 (5 May–11 Nov) ^b	5,207	227,455	69	1,224	0	—	118	2,046	4,225	924,329
1993 (5 Jul–17 Oct) ^c	15,825	340,478	7,057 ^d	270,285	118 ^d	1,178	1,515	96,332	713	9,063
1994 (4 Jul–9 Oct) ^e	24,192	818,615	3,509	100,214	70	291	593	4,346	9,197	313,692
1995 (3 Jul–25 Sep) ^f	21,546	308,509	2,212	91,694	157	1,270	2,047	64,653	3,421	62,663
1996 (21 Jun–23 Sep) ^g	19,189	310,078	2,860	81,403	695	5,271	2,274	62,287	1,039	18,331
1997 (16 Jun–5 Oct)	22,385	428,233	3,507	189,711	931	15,131	1,605	55,012	2,878	88,333

^a Variance of effort and harvest.

^b Estimates from Suchanek et al. (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).

The relative precision of effort and harvest estimates for chinook and coho salmon were within or near those specified values stated in the objectives, while the relative precision of the pink and chum salmon estimates were worse than expected due to an average to below-average harvest of those species.

Harvest estimates for coho, chum, and pink salmon for the on-site creel survey were compared to the (SWHS) estimates at the site for 1994, 1995, and 1996, when Gastineau Hatchery (DIPAC) was specifically listed as a site on the questionnaire (Table 4). Chinook salmon estimates were not used in the comparison because the on-site surveys for earlier years did not begin until the first week of July, and an unknown portion of chinook harvests were taken prior to the start of the survey. Harvest estimates were considered to be different if confidence levels did not overlap.

While coho salmon estimates were well within each confidence interval in 1994 and 1995,

estimates between the two surveys in 1996 were significantly different, perhaps a result of a large number of jack coho ($< 16''$) taken but not reported on the SWHS. Pink and chum salmon estimates were substantially different again in 1996 as they were in 1995 (Table 4). On-site creel survey harvest estimates for pink salmon in fisheries with high harvest rates are sometimes much higher than SWHS estimates. It is possible that anglers harvesting large numbers of pink, or other species of salmon have poor recall when completing the postal survey and therefore underestimate the total number of fish harvested. For some anglers, the harvest of pink and chum salmon may not be significant or important compared to harvesting a large coho or chinook salmon. At any rate, it is likely that small coho (jacks), and pink and chum salmon are under-reported on the SWHS questionnaire. Another possibility is that when large numbers of jack coho, pink, and chum salmon congregate near terminal sites, they are relatively easy to catch and therefore harvested in large numbers by

Table 4.—Comparison of Alaska statewide postal survey and on-site creel survey harvest estimates for the Gastineau Hatchery roadside sport fishery during 1994–1996.

Year	Survey type	Coho salmon	95% CI	Pink salmon	95% CI	Chum salmon	95% CI
1994	On-site ^a	3,520	2,899–4,141	9,197	8,099–10,295	593	464–722
1994	Statewide ^b	2,935	1,665–4,414	3,227	1,875–4,745	413	117–812
1995	On-site ^c	2,634	2,007–3,261	3,421	2,931–3,911	2,047	1,549–2,545
1995	Statewide ^d	1,721	718–3,259	1,115	636–1,708	790	477–1,159
1996	On-site ^e	3,625	3,010–4,240	1,039	774–1,304	2,274	1,784–2,764
1996	Statewide ^f	1,272	604–2,006	272	86–518	536	286–845

^a Beers (1995).

^b Howe et al. (1995).

^c Beers (1996).

^d Howe et al. (1996).

^e Beers (1997).

^f Howe et al. (1997).

children under 16 years of age. This group of anglers is not required to purchase fishing licenses, and although anglers are asked to report harvests by all household members, some children come from households where no other members hold a fishing license, and others may fail to record harvests taken by their children.

CONCLUSIONS AND RECOMMENDATIONS

As the highest-use roadside sport fishery in the Juneau area, Gastineau Hatchery plays an important role in providing fishing opportunities for urban anglers and tourists who may not have the time or economic resources to participate in remote roadside or marine boat fisheries. Also, pressure on local wild stocks of salmon on the Juneau road system is likely lessened due to opportunities provided at the hatchery. Documentation of harvests at the site through on-site creel surveys can be used to supplement

harvest and catch information for the Juneau area provided by the SWHS.

Results of the 1997 creel survey show that roadside anglers benefited from enhancement efforts at Gastineau Hatchery. Marine boat anglers in the Juneau area also benefited from these enhancement activities: an additional 753 (SE = 178) chinook salmon and 2,113 (SE = 364) coho salmon destined for Gastineau Hatchery (Hubartt et al. *In prep.*) were taken in 1997 by marine boat anglers. 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 goals. Chinook salmon enhancement at the facility is accomplished through a cooperative agreement with ADF&G; therefore, continued monitoring of harvests at the site will help evaluate the success of both of these programs.

In recent years, harvest and catch information for chinook salmon from this fishery has had little impact on U.S./Canada treaty obligations or

inseason management decisions. However, if tighter restrictions for chinook salmon are enacted in the future, management of terminal hatchery sites could become a more important tool in the regional management plan. In recent years increased chinook returns at the site have generated higher effort levels earlier in the survey. Even though the survey was started one week earlier in 1997, it may be beneficial to begin another week earlier in 1998 (i.e., June 8) to enumerate those early harvests and effort. There may also be some benefit to extending the survey one week later into October if coho runs appear to be late locally, as was the case in 1997 (when the harvest of coho salmon was estimated at 637 during the final week of the survey). Also, in an attempt to account for the discrepancies in estimates between the SWHS and on-site creel surveys, it is recommended that each interview denote the age class of the angler (child or adult).

Most goals set forth in the operational plan were met during the 1997 sampling season. Additions to the Gastineau hatchery creel staff in 1996 and 1997 have greatly improved the quality of data recording over previous years; continued effort to employ technicians with experience and educational background in fisheries is beneficial to the success of the survey.

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APPENDIX A

Appendix A1.—Summary of sampling results by date at Gastineau Hatchery in 1997.

Week	Stratum ^a	Date	Site	ANGLER COUNTS			INTERVIEW SAMPLING INFORMATION							
				No.	Mean	SD	No.	Effort	Large chinook harvest	Small chinook harvest	Large coho harvest	Small coho harvest	Pink harvest	Chum harvest
6/16-6/22	WD	17Jun	NONSNAG	6	5.00	4.00	8	11.00	0	0	0	0	0	0
6/16-6/22	WD	17Jun	SNAGGING	6	5.67	3.72	10	14.00	4	0	0	0	0	0
6/16-6/22	WD	18Jun	NONSNAG	6	6.33	6.12	9	13.50	2	0	0	0	0	1
6/16-6/22	WD	18Jun	SNAGGING	6	4.50	4.85	11	26.75	2	0	0	0	0	0
6/16-6/22	WD	19Jun	NONSNAG	6	12.67	10.37	14	39.45	2	0	0	0	0	0
6/16-6/22	WD	19Jun	SNAGGING	6	13.67	10.61	10	21.50	3	0	0	0	0	0
6/16-6/22	WE/H	21Jun	NONSNAG	6	7.33	7.47	13	25.00	1	0	0	0	0	0
6/16-6/22	WE/H	21Jun	SNAGGING	6	6.00	6.51	11	30.75	0	1	0	0	0	1
6/16-6/22	WE/H	22Jun	NONSNAG	5	8.00	9.43	17	31.50	1	0	0	0	0	0
6/16-6/22	WE/H	22Jun	SNAGGING	5	7.40	8.99	14	40.00	4	0	0	0	0	0
6/23-6/29	WD	25Jun	NONSNAG	6	8.50	7.66	8	21.75	1	0	0	0	0	0
6/23-6/29	WD	25Jun	SNAGGING	6	5.50	6.77	8	19.25	1	0	0	0	0	1
6/23-6/29	WD	26Jun	NONSNAG	6	7.00	3.16	15	40.75	8	0	0	0	0	2
6/23-6/29	WD	26Jun	SNAGGING	6	1.33	1.51	4	5.75	1	0	0	0	0	0
6/23-6/29	WD	27Jun	NONSNAG	5	11.40	4.62	17	45.50	5	2	0	0	0	0
6/23-6/29	WD	27Jun	SNAGGING	5	4.40	3.36	8	16.50	1	0	0	0	0	2
6/23-6/29	WE/H	28Jun	NONSNAG	6	6.33	1.75	9	34.25	3	0	0	0	0	1
6/23-6/29	WE/H	28Jun	SNAGGING	6	6.50	4.85	14	27.50	5	0	0	0	0	3
6/23-6/29	WE/H	29Jun	NONSNAG	5	9.40	3.51	24	58.00	5	3	0	0	0	0
6/23-6/29	WE/H	29Jun	SNAGGING	5	7.40	5.86	8	10.00	1	0	0	0	0	2
6/30-7/06	WD	01Jul	NONSNAG	6	8.83	6.43	15	33.50	2	0	0	0	0	2
6/30-7/06	WD	01Jul	SNAGGING	6	4.83	4.40	11	23.00	4	2	0	0	1	1
6/30-7/06	WD	02Jul	NONSNAG	6	10.83	7.52	14	36.50	2	0	0	0	1	1
6/30-7/06	WD	02Jul	SNAGGING	6	6.50	4.68	13	29.00	4	0	0	0	4	1
6/30-7/06	WE/H	04Jul	NONSNAG	6	5.67	4.55	19	41.50	0	0	0	0	1	1
6/30-7/06	WE/H	04Jul	SNAGGING	6	8.17	6.11	17	38.25	5	0	0	0	1	2
6/30-7/06	WE/H	05Jul	NONSNAG	5	10.20	9.96	22	48.00	4	0	0	0	2	4
6/30-7/06	WE/H	05Jul	SNAGGING	5	6.20	5.97	18	36.25	6	0	0	0	7	6
6/30-7/06	WE/H	06Jul	NONSNAG	6	5.00	6.78	8	10.00	0	0	0	0	1	0
6/30-7/06	WE/H	06Jul	SNAGGING	6	5.50	5.05	10	30.00	4	0	0	0	0	2
7/07-7/13	WD	07Jul	NONSNAG	6	8.50	7.56	23	60.00	0	0	0	0	2	3
7/07-7/13	WD	07Jul	SNAGGING	6	8.00	8.51	14	35.50	1	0	0	0	3	3
7/07-7/13	WD	08Jul	NONSNAG	6	8.67	6.59	22	54.25	2	0	0	0	12	0
7/07-7/13	WD	08Jul	SNAGGING	6	6.50	6.75	11	18.25	1	2	0	0	5	1
7/07-7/13	WD	10Jul	NONSNAG	6	10.50	5.82	16	30.50	2	0	0	0	1	0
7/07-7/13	WD	10Jul	SNAGGING	6	5.83	5.04	11	24.50	3	0	0	0	3	0
7/07-7/13	WE/H	12Jul	NONSNAG	6	5.17	4.88	15	21.50	0	0	0	0	3	10
7/07-7/13	WE/H	12Jul	SNAGGING	6	4.67	5.50	16	27.25	1	0	0	0	9	4
7/07-7/13	WE/H	13Jul	NONSNAG	6	6.67	4.80	17	18.00	2	0	0	0	0	0
7/07-7/13	WE/H	13Jul	SNAGGING	6	2.00	1.67	19	34.50	0	0	0	0	0	3
7/14-7/20	WD	14Jul	NONSNAG	6	6.67	4.97	26	35.00	0	0	0	0	3	4
7/14-7/20	WD	14Jul	SNAGGING	6	2.50	1.87	16	29.50	4	0	0	0	2	32
7/14-7/20	WD	16Jul	NONSNAG	6	9.83	5.27	28	49.75	0	0	0	0	10	8
7/14-7/20	WD	16Jul	SNAGGING	6	6.50	4.23	20	31.00	0	0	0	0	5	21
7/14-7/20	WD	18Jul	NONSNAG	6	6.83	7.22	17	32.50	7	0	0	0	19	4
7/14-7/20	WD	18Jul	SNAGGING	6	5.17	3.25	12	16.50	3	0	0	0	9	3
7/14-7/20	WE/H	19Jul	NONSNAG	6	8.50	6.22	19	33.75	0	0	0	0	23	7
7/14-7/20	WE/H	19Jul	SNAGGING	6	7.67	8.78	11	17.50	2	0	0	0	16	5
7/14-7/20	WE/H	20Jul	NONSNAG	6	19.00	13.62	16	33.50	1	0	0	0	19	0
7/14-7/20	WE/H	20Jul	SNAGGING	6	10.83	10.67	16	39.50	3	0	0	0	14	2
7/21-7/27	WD	22Jul	NONSNAG	6	8.83	7.73	20	54.25	0	0	0	0	27	2
7/21-7/27	WD	22Jul	SNAGGING	6	3.33	4.13	9	16.25	0	0	0	0	5	4
7/21-7/27	WD	23Jul	NONSNAG	4	8.00	5.29	16	25.50	1	0	0	0	23	0
7/21-7/27	WD	23Jul	SNAGGING	4	4.50	2.65	8	11.50	0	0	0	0	2	4
7/21-7/27	WD	24Jul	NONSNAG	5	3.60	2.51	9	10.00	0	0	0	0	6	0
7/21-7/27	WD	24Jul	SNAGGING	5	1.20	1.64	2	1.50	0	0	0	0	2	0
7/21-7/27	WE/H	26Jul	NONSNAG	6	11.50	5.24	21	43.75	0	0	0	0	23	6
7/21-7/27	WE/H	26Jul	SNAGGING	6	7.17	5.12	17	27.00	0	0	0	0	12	6
7/21-7/27	WE/H	27Jul	NONSNAG	6	10.00	6.32	34	69.00	0	0	0	0	18	0
7/21-7/27	WE/H	27Jul	SNAGGING	6	8.00	6.20	6	7.50	0	0	0	0	7	0
7/28-8/03	WD	28Jul	NONSNAG	6	10.17	6.77	21	44.25	0	0	0	0	12	17
7/28-8/03	WD	28Jul	SNAGGING	6	7.17	10.55	7	8.00	0	0	0	0	0	3
7/28-8/03	WD	29Jul	NONSNAG	6	8.00	6.29	22	33.11	0	0	0	0	6	2
7/28-8/03	WD	29Jul	SNAGGING	6	2.83	3.43	12	6.06	0	0	0	0	1	15
7/28-8/03	WD	01Aug	NONSNAG	6	4.50	1.87	18	22.50	0	0	0	0	3	4
7/28-8/03	WD	01Aug	SNAGGING	6	4.17	4.07	10	14.50	0	0	0	0	6	0
7/28-8/03	WE/H	02Aug	NONSNAG	5	19.20	9.31	26	47.50	1	0	0	0	8	4
7/28-8/03	WE/H	02Aug	SNAGGING	5	12.20	7.05	9	20.00	7	0	6	0	12	0
7/28-8/03	WE/H	03Aug	NONSNAG	6	9.17	8.35	23	54.00	0	1	0	0	3	0

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Week	Stratum ^a	Date	Site	ANGLER COUNTS			INTERVIEW SAMPLING INFORMATION							
				No.	Mean	SD	No.	Effort	Large chinook harvest	Small chinook harvest	Large coho harvest	Small coho harvest	Pink harvest	Chum harvest
7/28-8/03	WE/H	03Aug	SNAGGING	6	7.50	8.02	4	6.75	0	0	0	0	4	1
8/04-8/10	WD	04Aug	NONSNAG	5	9.60	6.95	22	51.00	0	0	0	0	21	1
8/04-8/10	WD	04Aug	SNAGGING	5	5.40	3.85	10	13.00	0	0	0	0	1	8
8/04-8/10	WD	06Aug	NONSNAG	6	3.67	4.03	8	18.50	0	0	0	0	3	0
8/04-8/10	WD	06Aug	SNAGGING	6	5.33	5.54	6	7.50	0	0	0	0	2	0
8/04-8/10	WD	07Aug	NONSNAG	5	9.40	7.89	12	22.50	4	0	1	0	0	0
8/04-8/10	WD	07Aug	SNAGGING	5	6.60	4.51	3	3.00	0	0	0	0	0	0
8/04-8/10	WE/H	09Aug	NONSNAG	6	9.83	6.43	23	30.50	0	1	0	0	5	0
8/04-8/10	WE/H	09Aug	SNAGGING	6	11.00	13.86	12	22.00	5	0	1	1	0	1
8/04-8/10	WE/H	10Aug	NONSNAG	6	12.33	12.88	17	35.00	1	1	0	0	4	0
8/04-8/10	WE/H	10Aug	SNAGGING	6	6.17	9.83	12	19.50	3	0	0	0	12	0
8/11-8/17	WD	13Aug	NONSNAG	5	2.00	1.41	18	21.00	0	0	0	0	2	0
8/11-8/17	WD	13Aug	SNAGGING	5	1.00	1.41	0	0.00	0	0	0	0	0	0
8/11-8/17	WD	15Aug	NONSNAG	6	9.00	8.07	8	13.75	0	0	0	0	0	0
8/11-8/17	WD	15Aug	SNAGGING	6	2.67	2.66	8	13.75	0	0	0	0	0	0
8/11-8/17	WE/H	16Aug	NONSNAG	6	8.33	6.71	22	42.00	0	0	0	0	5	0
8/11-8/17	WE/H	16Aug	SNAGGING	6	6.33	5.85	7	23.00	0	0	0	0	13	0
8/11-8/17	WE/H	17Aug	NONSNAG	6	9.33	8.91	24	82.25	1	0	5	1	17	0
8/11-8/17	WE/H	17Aug	SNAGGING	6	3.50	3.83	8	11.00	0	0	0	0	11	0
8/18-8/24	WD	18Aug	NONSNAG	6	7.67	7.71	19	29.00	0	0	1	0	2	5
8/18-8/24	WD	18Aug	SNAGGING	6	3.33	2.73	6	13.50	0	0	0	0	3	1
8/18-8/24	WD	19Aug	NONSNAG	5	4.80	5.36	8	30.50	0	2	4	0	0	0
8/18-8/24	WD	19Aug	SNAGGING	5	1.60	3.05	5	13.00	0	0	0	0	0	0
8/18-8/24	WD	20Aug	NONSNAG	5	9.60	8.44	38	84.00	1	6	6	0	9	0
8/18-8/24	WD	20Aug	SNAGGING	5	0.80	1.30	0	0.00	0	0	0	0	0	0
8/18-8/24	WE/H	23Aug	NONSNAG	6	6.83	6.71	11	22.25	2	1	2	1	0	0
8/18-8/24	WE/H	23Aug	SNAGGING	6	3.33	3.78	7	12.50	0	0	0	0	3	9
8/18-8/24	WE/H	24Aug	NONSNAG	6	17.83	10.38	46	104.50	0	0	27	1	0	4
8/18-8/24	WE/H	24Aug	SNAGGING	6	8.00	9.82	6	10.50	0	0	0	0	2	0
8/25-8/31	WD	25Aug	NONSNAG	6	14.50	6.12	29	84.50	1	2	12	14	2	1
8/25-8/31	WD	25Aug	SNAGGING	6	10.17	12.8	1	3.00	0	0	2	0	0	2
8/25-8/31	WD	27Aug	NONSNAG	5	10.00	4.69	12	30.50	0	0	2	21	2	2
8/25-8/31	WD	27Aug	SNAGGING	5	3.80	3.11	7	11.50	0	0	7	7	0	0
8/25-8/31	WD	28Aug	NONSNAG	5	9.60	7.70	12	29.75	0	0	6	12	0	0
8/25-8/31	WD	28Aug	SNAGGING	5	5.00	4.80	6	7.00	0	0	1	7	0	0
8/25-8/31	WE/H	30Aug	NONSNAG	5	12.60	4.34	13	22.50	0	0	1	5	2	0
8/25-8/31	WE/H	30Aug	SNAGGING	5	8.20	9.23	8	13.00	0	0	1	9	0	0
8/25-8/31	WE/H	31Aug	NONSNAG	6	12.33	6.98	15	36.50	0	0	3	6	1	1
8/25-8/31	WE/H	31Aug	SNAGGING	6	5.00	5.76	6	10.00	1	0	3	0	0	0
9/01-9/07	WE/H	01Sep	NONSNAG	6	12.17	6.52	12	31.75	0	0	3	0	3	0
9/01-9/07	WE/H	01Sep	SNAGGING	6	6.83	4.67	4	12.00	1	0	1	0	0	0
9/01-9/07	WD	02Sep	NONSNAG	6	5.00	3.46	12	39.50	0	0	8	26	0	0
9/01-9/07	WD	02Sep	SNAGGING	6	1.50	1.38	7	9.00	0	0	3	0	1	0
9/01-9/07	WD	04Sep	NONSNAG	6	5.67	4.68	18	43.50	0	0	8	12	0	0
9/01-9/07	WD	04Sep	SNAGGING	6	1.50	1.64	3	8.00	0	0	0	1	0	0
9/01-9/07	WE/H	06Sep	NONSNAG	6	11.67	7.50	21	39.79	0	0	26	26	0	0
9/01-9/07	WE/H	06Sep	SNAGGING	6	2.00	2.10	8	9.00	0	0	5	10	0	0
9/01-9/07	WE/H	07Sep	NONSNAG	6	7.33	3.08	22	41.00	0	0	8	13	0	0
9/01-9/07	WE/H	07Sep	SNAGGING	6	4.33	3.44	14	48.25	0	0	0	6	0	0
9/08-9/14	WD	09Sep	NONSNAG	6	5.50	3.73	14	31.50	0	0	5	1	0	0
9/08-9/14	WD	09Sep	SNAGGING	6	3.17	3.97	7	9.50	0	0	3	0	0	0
9/08-9/14	WD	11Sep	NONSNAG	6	5.33	3.93	6	7.00	0	0	0	0	0	0
9/08-9/14	WD	11Sep	SNAGGING	6	2.67	2.66	2	5.50	0	0	0	0	0	0
9/08-9/14	WD	12Sep	NONSNAG	6	4.17	0.75	10	18.25	0	0	1	12	0	0
9/08-9/14	WD	12Sep	SNAGGING	6	3.17	3.54	3	6.00	0	0	0	0	0	0
9/08-9/14	WE/H	13Sep	NONSNAG	6	11.00	5.73	7	12.50	0	0	1	23	0	0
9/08-9/14	WE/H	13Sep	SNAGGING	6	8.00	4.38	8	15.00	0	0	4	23	0	0
9/08-9/14	WE/H	14Sep	NONSNAG	3	13.00	8.00	4	10.50	0	0	6	0	0	0
9/08-9/14	WE/H	14Sep	SNAGGING	3	2.67	2.08	3	6.00	0	0	2	0	0	0
9/15-9/21	WD	16Sep	NONSNAG	6	5.83	4.31	4	5.50	0	0	9	0	0	0
9/15-9/21	WD	16Sep	SNAGGING	6	12.67	10.48	3	8.00	0	0	12	0	0	0
9/15-9/21	WD	17Sep	NONSNAG	6	5.00	2.00	5	11.00	0	0	10	0	0	0
9/15-9/21	WD	17Sep	SNAGGING	6	3.33	2.50	6	9.00	0	0	7	0	0	0
9/15-9/21	WD	19Sep	NONSNAG	5	2.60	2.88	8	9.00	0	0	1	0	0	0
9/15-9/21	WD	19Sep	SNAGGING	5	2.00	2.35	6	14.00	0	0	16	0	0	0
9/15-9/21	WE/H	20Sep	NONSNAG	5	4.00	2.55	4	9.00	0	0	1	0	0	0
9/15-9/21	WE/H	20Sep	SNAGGING	5	5.20	2.77	6	18.00	0	0	6	0	0	0
9/15-9/21	WE/H	21Sep	NONSNAG	6	2.00	2.28	2	5.00	0	0	3	0	0	0
9/15-9/21	WE/H	21Sep	SNAGGING	6	0.50	1.22	0	0.00	0	0	0	0	0	0

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Week	Stratum ^a	Date	Site	ANGLER COUNTS			INTERVIEW SAMPLING INFORMATION							
				No.	Mean	SD	No.	Effort	Large chinook harvest	Small chinook harvest	Large coho harvest	Small coho harvest	Pink harvest	Chum harvest
9/22-9/28	WD	22Sep	NONSNAG	4	2.00	1.63	2	6.00	0	0	2	2	0	0
9/22-9/28	WD	22Sep	SNAGGING	4	2.50	1.29	7	8.00	0	0	2	0	0	0
9/22-9/28	WD	24Sep	NONSNAG	6	2.00	1.41	10	19.00	0	0	24	0	0	0
9/22-9/28	WD	24Sep	SNAGGING	6	6.67	4.37	12	16.00	0	0	38	0	0	0
9/22-9/28	WD	26Sep	NONSNAG	6	2.00	1.26	7	10.00	0	0	12	0	0	0
9/22-9/28	WD	26Sep	SNAGGING	6	5.17	4.75	6	9.00	0	0	11	0	0	0
9/22-9/28	WE/H	27Sep	NONSNAG	6	3.83	2.32	10	17.00	0	0	17	0	0	0
9/22-9/28	WE/H	27Sep	SNAGGING	6	6.67	2.66	6	6.00	0	0	0	3	0	0
9/22-9/28	WE/H	28Sep	NONSNAG	5	5.00	3.16	7	10.00	0	0	14	0	0	0
9/22-9/28	WE/H	28Sep	SNAGGING	5	4.60	4.67	7	10.00	0	0	12	0	0	0
9/29-10/05	WD	29Sep	NONSNAG	6	5.50	3.27	10	15.00	0	0	7	0	0	0
9/29-10/05	WD	29Sep	SNAGGING	6	6.67	4.68	6	11.00	0	0	5	0	0	0
9/29-10/05	WD	01Oct	NONSNAG	6	4.00	2.53	6	14.50	0	0	6	0	0	0
9/29-10/05	WD	01Oct	SNAGGING	6	6.00	3.95	12	16.75	0	0	12	0	0	0
9/29-10/05	WD	02Oct	NONSNAG	6	2.83	1.33	12	13.50	0	0	8	0	0	0
9/29-10/05	WD	02Oct	SNAGGING	6	5.00	4.60	10	17.75	0	0	25	0	0	0
9/29-10/05	WE/H	04Oct	NONSNAG	6	4.67	4.97	17	23.50	0	0	14	0	0	0
9/29-10/05	WE/H	04Oct	SNAGGING	6	3.00	1.67	7	13.25	0	0	19	0	0	0
9/29-10/05	WE/H	05Oct	NONSNAG	6	4.67	4.93	14	22.25	0	0	12	0	0	0
9/29-10/05	WE/H	05Oct	SNAGGING	6	2.50	2.88	4	6.50	0	0	10	0	0	0

^a WD = weekdays (Mondays–Fridays, except 4 July and 1 Sept.); WE/H = weekend/holidays (Saturdays, Sundays, 4 July, and 1 Sept.).

Appendix A2.—Major computer files used for data analysis of Gastineau Hatchery roadside fishery in 1997.
 Custodian of data files listed below are the author and the Alaska Department of Fish and Game, Division of Research and Technical Services, Anchorage, Alaska. File archive name is “dipac_97.zip.”

File name	File type	File Description
CREEL	TXT	Raw ASCII data file of interviews and angler counts
DIPAC97	DTA	Final edited ASCII data set
DIPAC97A	SAS	SAS program to reformat ASCII file
DIPAC97	SSD	Summary subset SAS data file: count and interview data
BOWDEN7A	SAS	SAS program to estimate effort, harvests, and variances

