

**Fishery Data Series No. 03-10**

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**Harvest Estimates for the Macaulay (Gastineau)  
Hatchery Roadside Sport Fishery in Juneau, Alaska  
during 2001**

by

**Bruce A. White**

June 2003

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Alaska Department of Fish and Game

Division of Sport Fish





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HATCHERY ROADSIDE SPORT FISHERY IN JUNEAU, ALASKA  
DURING 2001**

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Bruce A. White  
*Division of Sport Fish, Douglas*

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

June 2003

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## 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 Macaulay Hatchery from 11 June to 7 October 2001. An estimated 19,045 (SE = 591) angler-hours were expended to harvest a total of 581 (SE = 82) large chinook salmon at least 28 inches in total length, 92 (SE = 26) small chinook salmon (<28 inches in length), 4,222 (SE = 290) large coho salmon at least 16 inches in length, 181 (SE = 38) small coho salmon (<16 inches in length), 1,176 (SE = 178) chum salmon, and 1,453 (SE = 201) pink salmon. The chinook salmon harvest was 23% above the 1996–2000 average, while the coho harvest was down 41%. Angler effort was 15% below the five-year average.

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

## INTRODUCTION

Roadside sport fisheries in marine waters around Juneau, Alaska offer unique fishing opportunities for both Alaskan residents and tourists. Demand for fishing opportunities is heavy. According to the U.S. Census Bureau during 2001, 42% of the 72,274 people living in Southeast Alaska resided within the Juneau Borough. Since the 1980s, the number of cruise ship passengers arriving in Juneau has increased from approximately 87,000 in 1982 to 660,000 in 2001. In addition, the number of independent travelers visiting Juneau in 2001 was estimated at 100,000 (M. Gladziszewski, City of Juneau Tourism Department, Juneau, Alaska, personal communication).

The Macaulay Hatchery (prior to 2001 named Gastineau Hatchery), located about 3 miles north of downtown Juneau (Figure 1), is a popular destination for residents and tourists. The hatchery is owned and operated by Douglas Island Pink and Chum, Inc. (DIPAC), a private non-profit corporation. 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.

In 2001, Wayside Park was constructed just north of the Macaulay Hatchery to accommodate the increased use by anglers. The park includes a van and wheelchair accessible dock for disabled anglers along with restrooms, benches, and off-road parking. Construction of the \$2.5 million

park (built with federal transportation money) was completed by the end of July. The original fishing dock next to the hatchery was removed in fall 2000 and was not re-installed.

Salmon enhancement at Macaulay and nearby Sheep Creek hatcheries (Figure 1) has 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.

Since 1991, ADF&G staff has assisted the Macaulay Hatchery in developing an onsite creel program to estimate sport harvest 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. Information gathered in this survey is more detailed than the information gathered through the Statewide Harvest Survey (SWHS). Along with region-wide sport harvest data, the SWHS estimates sport harvests for the site “Shoreline-Gastineau Hatchery (DIPAC)” through the use of questionnaires mailed to a random sample of sport anglers (Howe et al. 2001d).

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):

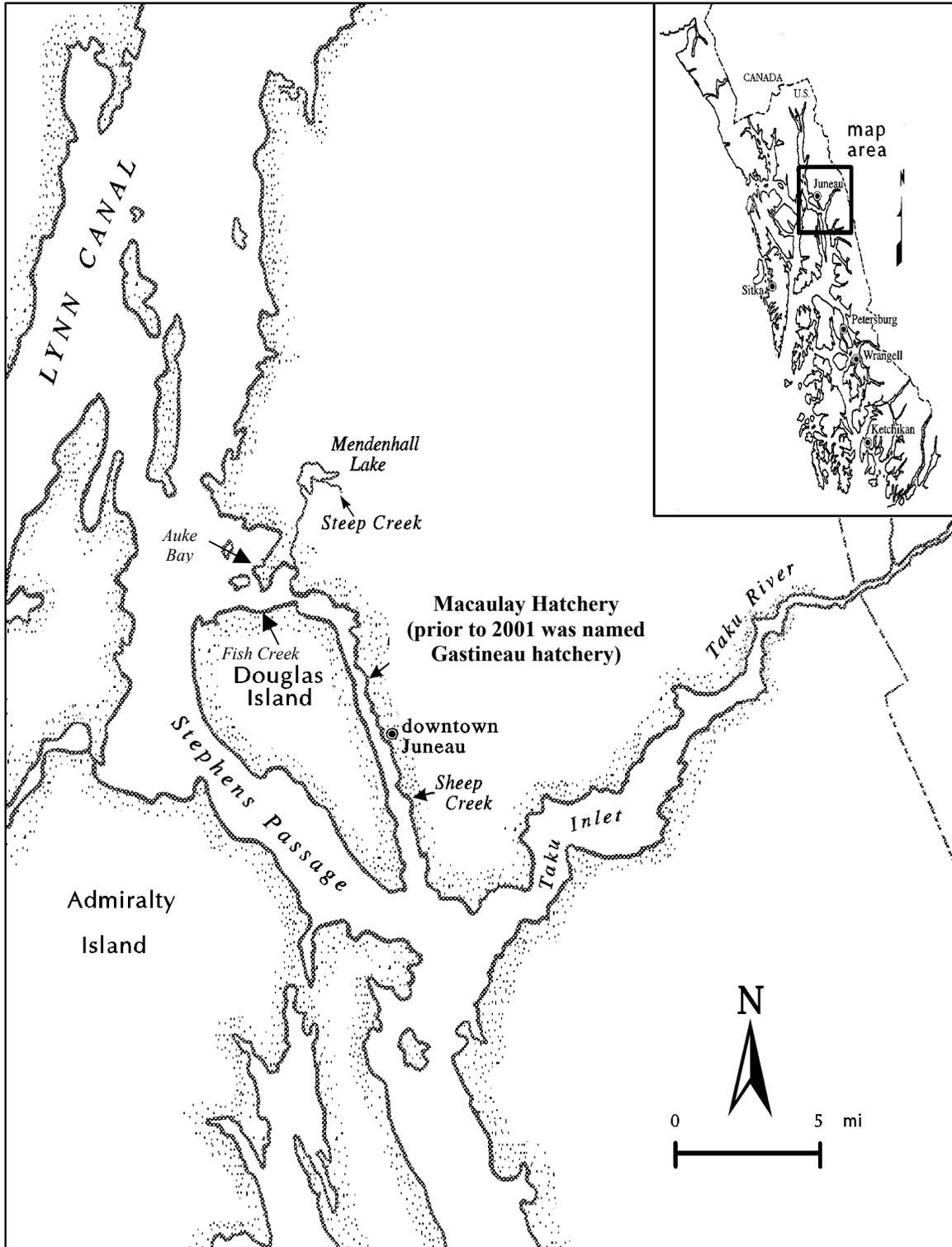


Figure 1.—Location of the Macaulay Hatchery, site of a roadside sport fishery in Juneau, northern Southeast Alaska.

**Table 1.—Summary of hatchery-reared salmon smolt releases (in thousands) at Sheep Creek and Macaulay (Gastineau) Hatchery since 1991.** Fish were reared at Macaulay 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 <sup>a</sup>	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 <sup>b</sup>	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
2001	Sheep Creek	0	0	0	91
	Macaulay Hatchery <sup>c</sup>	1,724	27,859	213	771

<sup>a</sup> Reared at Snettisham Hatchery.

<sup>b</sup> Sheep Creek was not used as a smolt release site in 1998.

<sup>c</sup> Gastineau Hatchery renamed Macaulay Hatchery in 2001.

Macaulay 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 Macaulay Hatchery, Fritz Cove, and Auke Bay; and freshwater and marine 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 salmon do not count toward the U.S./Canada Pacific Salmon Treaty catch totals. The onsite creel survey at Macaulay Hatchery provides additional information for evaluating the hatchery as a release site and

terminal harvest area. In 2001, hatchery and ADF&G staff again cooperated to conduct the survey.

## OBJECTIVE

The objective of the 2001 creel survey at the Macaulay Hatchery was to estimate effort and harvests of chinook, coho, pink, and chum salmon from 11 June through 7 October, such that estimates were within the specified true values 95% of the time:  $\pm 10\%$  for angler-hours of effort,  $\pm 25\%$  for coho,  $\pm 40\%$  for chinook,  $\pm 30\%$  for pink, and  $\pm 35\%$  for chum salmon harvests. Due to a reduction in weekday samples

(a cost saving measure), these desired levels of precision were slightly lower in value than in previous surveys.

## METHODS

There were two survey sites: a non-snagging zone where snagging was prohibited and a snagging zone where snagging was allowed. Both sites lie within the newly constructed Wayside Park just north of the Macaulay Hatchery. The non-snagging zone included the public fishing dock and 300 ft of shoreline, 150 ft in either direction from the dock's access ramp. The snagging zone included the remaining 300 ft of beach extending north from the non-snagging zone boundary to the end of the park development. 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 from 9 June to 31 August 2001, of which up to 3 could be "large" fish ( $\geq 28$  inches) TL. Any chinook salmon  $< 28$  inches TL was classified as "small." After 31 August, the chinook salmon bag limit was 1 fish  $\geq 28$  inches TL. 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 in combination. Coho salmon were classified as either "large" ( $\geq 16$  inches 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 11 June to 7 October 2001. 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 maintained<sup>1</sup>. Therefore, there were 68 discrete temporal/spatial strata.

For the 2001 creel survey design, the number of weekend/holiday days sampled remained the same; i.e., all Saturdays and Sundays sampled.

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<sup>1</sup> Weekdays = Mondays–Fridays. Weekend/holidays = Saturdays, Sundays, Independence Day (observed on 4 July), and Labor Day (3 September).

The number of weekdays (Monday through Friday) sampled was reduced from 3 days to 2 days in 2001, in order to reduce survey program costs for DIPAC.

The sampling day was defined as beginning at early civil twilight or 0600 h (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 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. 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)

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

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. The standard error (SE) for each estimate is the square root of the variance. Relative precision (RP) of the estimates with a 95% confidence interval was calculated using equation (8).

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

## RESULTS

During the 2001 fishing season at Macaulay Hatchery, 2,686 angler interviews and 751 angler counts were conducted. Total estimated fishing effort was 19,045 (SE = 591) angler-hours, with the highest levels occurring during the coho

salmon fishery from late August through mid-September (Table 2). An estimated 581 (SE = 82) large chinook salmon, 4,222 (SE = 290) large coho salmon, 1,176 (SE = 178) chum salmon, and 1,453 (SE = 201) pink salmon were harvested at Macaulay Hatchery from 13 June to 7 October. In addition, 92 (SE = 26) small chinook salmon and 181 (SE = 38) small coho salmon were also harvested.

Anglers harvested most large chinook salmon from mid-June through mid-August, peaking during the week of 9-15 July, when 246 large chinook salmon were harvested. The substantial increase in the chinook salmon harvest from 9-15 July was partly the result of ADF&G temporarily lifting the snagging ban in the no snagging zone. This change coincided with a period of high chinook salmon abundance and lead to an increase in angler effort. Most of the small chinook salmon were harvested from mid-June to late July.

The majority of the pink and chum salmon harvest occurred during 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.

Alaska residents accounted for 78% of the total effort and 80% of the large chinook, 91% of the large coho, 76% of the chum, and 58% of the pink salmon harvest (Table 3).

Adults accounted for about 73% of the effort, and 71% of the large chinook, 88% of the large coho, 76% of the chum, and 83% of the pink salmon harvests (Table 4). Children accounted for 20% of the effort, and 18% of the large chinook, 6% of the large coho, 15% of the chum, and 12% of the pink salmon harvests. Seniors accounted for 7% of the effort, and 11% of the large chinook, 7% of the large coho, 9% of the chum and 6% of the pink harvest.

The relative precision of effort and harvest estimates for large chinook, large coho, chum and pink salmon were all within goals stated in the objective (Table 2). 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 2001 sport fishing season at Macaulay Hatchery was characterized as providing an above average chinook salmon harvest, whereas total effort and harvest for all other species fell below average. Angler effort at the site was 15% below the 5-year average and 33% lower than the record high effort estimated for 1998 (Table 5). Although coho salmon returns to Macaulay Hatchery were about average in 2001 (R. Focht, DIPAC Director of Research & Evaluation, Juneau, personal communication), the below average level of effort contributed to a harvest of 4,222 coho salmon, 41% below the 5-year average. Chinook salmon returns to the hatchery were above average, and the 581 large chinook salmon harvested was 23% above the 5-year average. Chum salmon returns were substantially below average, resulting in a harvest that was 33% below the 5-year average. Pink salmon returns to the hatchery were also below average, which was reflected in a harvest 51% below the 5-year average.

Angler effort in 2001 was down 19% overall, when compared to the 2000 season (Jaenicke 2001). The reduction of angler effort may have been a result of construction activity at Wayside Park. During the first seven weeks of the survey (11 June–29 July), when the park was still under construction and no onsite fishing dock was available, angler effort was down 33% from the same time the previous year. After this and when park construction was mostly complete, angler effort was down only 13% from the same time during the previous year. The chinook salmon harvest peaked during the week of 9–15 July, largely due to snagging being allowed near the raceway that week. This also suggests that activities related to construction of the new park did not significantly impair angler access or their success rate. Weather conditions should not have been a factor reducing the amount of angler effort. In 2001, Juneau experienced average temperatures and received below average precipitation.

Residency information collected from surveys conducted from 1999 to 2001 indicate that the vast majority of use (80%) of the site is by resident anglers. The relative use by residents during this period of time appears unchanged (79% in 1999, 82% in 2000, and 79% in 2001).

**Table 2.—Summary of estimated weekly angler effort and harvest of large ( $\geq 16$  in.) and small ( $< 16$  in.) coho, large ( $\geq 28$  in.) and small ( $< 28$  in.) chinook, chum, and pink salmon at the Macaulay Hatchery roadside fishery in 2001.**

Weekly period	Effort		Large ( $\geq 16$ in.) coho salmon		Small ( $< 16$ in.) coho salmon		Large ( $\geq 28$ in.) chinook salmon		Small ( $< 28$ in.) chinook salmon		Chum salmon		Pink salmon	
	Angler-hours	SE <sup>a</sup>	Harvest	SE <sup>a</sup>	Harvest	SE <sup>a</sup>	Harvest	SE <sup>a</sup>	Harvest	SE <sup>a</sup>	Harvest	SE <sup>a</sup>	Harvest	SE <sup>a</sup>
6/11-6/17	688	114	0	0	0	0	58	25	35	20	31	17	0	0
6/18-6/24	393	84	0	0	0	0	44	14	11	10	7	5	0	0
6/25-7/01	550	61	0	0	0	0	19	12	0	0	98	48	0	0
7/02-7/08	661	83	0	0	0	0	69	36	4	4	125	38	4	4
7/09-7/15	992	114	0	0	8	8	246	62	12	6	309	90	23	10
7/16-7/22	600	100	0	0	0	0	49	12	4	2	67	42	87	42
7/23-7/29	769	121	0	0	2	2	14	11	0	0	61	18	193	44
7/30-8/05	1,396	196	0	0	0	0	30	9	19	10	211	68	412	136
8/06-8/12	1,186	108	9	5	0	0	14	10	7	6	140	101	208	62
8/13-8/19	1,410	168	60	23	0	0	23	8	0	0	70	42	410	116
8/20-8/26	2,380	226	914	127	58	19	8	6	0	0	57	27	106	28
8/27-9/02	2,025	174	618	96	32	9	4	4	0	0	0	0	5	5
9/03-9/09	1,785	251	691	96	14	8	3	3	0	0	0	0	5	5
9/10-9/16	1,802	152	634	93	56	29	0	0	0	0	0	0	0	0
9/17-9/23	1,370	134	751	152	6	4	0	0	0	0	0	0	0	0
9/24-9/30	791	117	388	115	5	5	0	0	0	0	0	0	0	0
10/01-10/07	247	62	157	63	0	0	0	0	0	0	0	0	0	0
Total	19,045	591	4,222	290	181	38	581	82	92	26	1,176	178	1,453	201
Relative precision	6%		13%		41%		28%		55%		30%		27%	
Goal relative precision	10%		25%		25%		40%		40%		35%		30%	

<sup>a</sup> Standard error of effort or harvest estimate.

**Table 3.—Effort and harvest estimates by angler residency of large ( $\geq 16$  in.) and small ( $< 16$  in.) coho, large ( $\geq 28$  in.) and small ( $< 28$  in.) chinook, chum, and pink salmon at the Macaulay Hatchery roadside fishery in 2001.**

Angler residency	Angler effort		Large ( $\geq 16$ in.) coho salmon		Small ( $< 16$ in.) coho salmon		Large ( $\geq 28$ in.) chinook salmon		Small ( $< 28$ in.) chinook salmon		Chum salmon		Pink salmon	
	Hours	SE <sup>a</sup>	Harvest	SE <sup>a</sup>	Harvest	SE <sup>a</sup>	Harvest	SE <sup>a</sup>	Harvest	SE <sup>a</sup>	Harvest	SE <sup>a</sup>	Harvest	SE <sup>a</sup>
Resident	14,917	525	3,832	281	169	38	466	79	86	26	897	154	841	123
Nonresident	4,144	264	391	56	10	5	115	24	5	4	281	70	612	139
Unknown	21	17	0	0	0	0	0	0	0	0	0	0	0	0
Total <sup>b</sup>	19,082	588	4,223	287	179	39	581	82	91	26	1,178	169	1,453	186

<sup>a</sup> Standard error of the effort and harvest estimates.

<sup>b</sup> 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.

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**Table 4.—Effort and harvest estimates by angler age class of large ( $\geq 16$  in.) and small ( $< 16$  in.) coho, large ( $\geq 28$  in.) and small ( $< 28$  in.) chinook, chum, and pink salmon at the Macaulay Hatchery roadside fishery in 2001.**

Angler age class	Angler effort		Large ( $\geq 16$ in.) coho salmon		Small ( $< 16$ in.) coho salmon		Large ( $\geq 28$ in.) chinook salmon		Small ( $< 28$ in.) chinook salmon		Chum salmon		Pink salmon	
	Hours	SE <sup>a</sup>	Harvest	SE <sup>a</sup>	Harvest	SE <sup>a</sup>	Harvest	SE <sup>a</sup>	Harvest	SE <sup>a</sup>	Harvest	SE <sup>a</sup>	Harvest	SE <sup>a</sup>
Adult	13,960	519	3,693	305	133	36	410	57	72	23	895	158	1,199	173
Child	3,739	270	242	76	23	10	105	27	19	12	176	49	173	47
Senior	1,403	172	287	63	23	14	66	33	0	0	107	49	81	29
Unknown	4	4	0	0	0	0	0	0	0	0	0	0	0	0
Total <sup>b</sup>	19,106	610	4,222	321	179	39	581	71	91	26	1,178	172	1,453	181

<sup>a</sup> Standard error of the effort and harvest estimates.

<sup>b</sup> 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 ( $\geq 16$  in.) coho, large ( $\geq 28$  in.) chinook, chum, and pink salmon from onsite creel surveys at the Macaulay Hatchery roadside fishery in 1990 and 1993–2001.**

Year (survey period)	Angler-hours	SE <sup>a</sup>	Large ( $\geq 16$ in.) coho salmon		Large ( $\geq 28$ in.) chinook salmon		Chum salmon		Pink salmon	
			Harvest	SE <sup>a</sup>	Harvest	SE <sup>a</sup>	Harvest	SE <sup>a</sup>	Harvest	SE <sup>a</sup>
1990 (5 May–11 Nov) <sup>b</sup>	5,207	477	69	35	0	—	118	45	4,225	961
1993 (5 Jul–17 Oct) <sup>c</sup>	15,825	584	7,057 <sup>d</sup>	520	118 <sup>d</sup>	34	1,515	310	713	95
1994 (4 Jul–9 Oct) <sup>e</sup>	24,192	905	3,509	317	70	17	593	66	9,197	560
1995 (3 Jul–25 Sep) <sup>f</sup>	21,546	555	2,212	303	157	36	2,047	254	3,421	250
1996 (21 Jun–23 Sep) <sup>g</sup>	19,189	555	2,860	285	695	73	2,274	250	1,039	135
1997 (16 Jun–5 Oct) <sup>h</sup>	22,385	654	3,507	436	931	123	1,605	235	2,878	297
1998 (8 Jun–27 Sep) <sup>i</sup>	28,273	701	11,722	937	471	63	2,376	280	5,653	414
1999 (7 Jun–3 Oct) <sup>j</sup>	18,828	541	7,275	382	109	23	1,028	173	2,986	303
2000 (12 Jun–6 Oct) <sup>k</sup>	23,536	567	10,303	461	155	29	1,518	190	2,387	235
5-year (1996–2000) Mean	22,442		7,133		472		1,760		2,989	
2001 (13 Jun–7 Oct)	19,045	591	4,222	290	581	82	1,176	178	1,453	201

<sup>a</sup> Standard error (SE) of effort or harvest.

<sup>b</sup> Estimates from Suchanek and Bingham (1991).

<sup>c</sup> Estimates from Beers and Marshall (1994).

<sup>d</sup> Includes both large and small fish.

<sup>e</sup> Estimates from Beers (1995).

<sup>f</sup> Estimates from Beers (1996).

<sup>g</sup> Estimates from Beers (1997).

<sup>h</sup> Estimates from Frenette (1998).

<sup>i</sup> Estimates from Frenette (1999).

<sup>j</sup> Estimates from Jaenicke (2000).

<sup>k</sup> Estimates from Jaenicke (2001).

Chinook salmon smolts reared at Macaulay Hatchery are released onsite in Gastineau Channel, at Fish Creek at the north end of Douglas Island, and in Auke Bay (Bentz et al. 1996). The latter two sites provide additional chinook salmon fishing opportunities for marine boat, shoreline, and freshwater anglers.

Harvest estimates and coded wire tag recovery information generated during the Juneau marine boat creel survey from 23 April to 23 September, 2001 indicated that these anglers also benefited from DIPAC enhancement activities. In 2001, Juneau marine boat anglers took 2,069 (SE = 270) chinook salmon (46% of the total harvest) and 2,262 (SE = 300) coho salmon (14% of the total harvest) originating from DIPAC (Hubartt et al. 2002). An estimated 199 (SE = 100) of the chinook salmon taken in the marine boat sport fishery originated from releases directly at Macaulay Hatchery.

Additional chinook salmon harvested outside the Juneau area in 2001 that had in previous years been released from the Macaulay hatchery, Auke Bay and Fish Creek rearing sites include 2,372 fish harvested by commercial fishers. Chinook salmon from the Auke Bay release site accounted for 62.7% of the DIPAC chinook salmon harvested in the commercial fishery. The Fish Creek and Macaulay hatchery release sites contributed 25.7% and 11.6% respectively. Finally, a total of 2,138 adult chinook salmon returned to the hatchery rack (R. Focht, DIPAC Director of Research & Evaluation, Juneau, personal communication).

Beginning with the 1997 brood year, the Andrew Creek stock was released from all three release sites in Juneau. Returns of the Andrew Creek stock have been better than the returns of the King Salmon river stock which was previously used (R. Focht, DIPAC Director of Research and

Evaluation, Juneau, personal communication). Other factors that also affected this year's return were the relatively better ocean survival of the 1997 brood year and a significant component of the Auke Creek released fish returning to the hatchery's terminal area. Terminal area regulations in Gastineau Channel surrounding the hatchery and in nearby Auke Bay and Fritz Cove provided increased chinook salmon bag limits (4 fish, of which no more than 3 could be  $\geq 28$  inches TL) to harvest hatchery returns during the period from 9 June to 31 August. This opportunity was important, because the bag limit outside the terminal area was only 1 chinook salmon  $\geq 28$  inches TL. The liberal regulations, coupled with substantial hatchery returns, provided increased opportunities for a large number of anglers. Even with these increased bag limits, the exploitation rate of the chinook salmon returning to the hatchery terminal area was only 31%.

Harvest estimates for the onsite survey at Gastineau Hatchery were compared to the "parallel" estimates from the SWHS (i.e., for "Shoreline-Gastineau Hatchery-DIPAC" in 2000, Walker et al., 2003) from 1994 through 2000. Ninety-five percent (95%) confidence intervals for several of the paired estimates do not overlap (Table 6), suggesting the two procedures yield dissimilar estimates. Also, the SWHS estimates for coho, pink, and chum are less than creel estimates in many years when confidence intervals do overlap.

A two-tailed test of the hypotheses ( $H_0$ ) that both survey procedures yield similar estimates was tested (Table 7) using the Wilcoxon Signed Ranks test (Conover 1980). Chinook salmon estimates for 1994 and 1995 were excluded because the onsite surveys did not sample the early portion of the fishery in those years. Also, small and large chinook salmon were combined for the analysis, to avoid the possibility that people responding to the SWHS could not accurately recall the size of the chinook they harvested. Similarly, a category "all salmon" was added in the event people responding to the SWHS could not accurately recall the species of fish they harvested.

The Wilcoxon test suggests the two survey methods yield different ( $\alpha \leq 0.1$ ) results for coho, pink, chum, and all salmon. It is not known why estimates for these species at Gastineau Hatchery are higher in our creel survey. 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 numbers harvested when they complete a SWHS survey questionnaire many months after fishing is concluded. Also, other factors may contribute to the observed difference: a) if children (sport fishers <16 years of age) are the only sport fisher in a household, that household could not be sampled in the SWHS (children <16 don't need a sport fishing license); b) anglers responding to the SWHS may ascribe fish they caught in the onsite survey area to some other survey area; c) anglers responding to the SWHS may inaccurately identify/report the species of fish they catch (note that sockeye salmon are reported as harvested by households responding to the SWHS even though no sockeye salmon are observed during the on-site surveys); d) there may be an unidentified upward bias in the onsite survey estimates for these species.

The possibility that a significant recall bias exists in this fishery is quite plausible given the long (several month) delay between fishing and the arrival of a statewide harvest survey questionnaire. In the 2000 on-site survey, we estimate that children under 16 years old took 7% of the coho salmon harvest, 12% of the pink salmon harvest and 20% of the chum salmon harvest, and some of these harvests may not be included in the SWHS. Species identification (e.g., mistaking a coho salmon for a chinook salmon) is frequently a problem among tourists (Table 3), and residents who are not avid fishers. However, the observed difference of 1,003 large plus small chinook salmon in 2000 would explain only about 35% of the difference (2,836 fish) in the two estimates for coho salmon.

A bias may exist in regards to SWHS estimates due to either poor recollection or reporting by respondents in regards to where they were fishing. During most years approximately half of the respondents to the SWHS are responding to the "supplemental" survey questionnaire. This form

**Table 6.—Comparison of Alaska statewide harvest survey (SWHS) and onsite creel survey harvest estimates for the Macaulay Hatchery roadside sport fishery during 1994–2001.** Statistics in **bold** have 95% confidence levels which do not overlap.

Year	Survey type	Large chinook salmon	95% CI	Small chinook salmon	95% CI	Coho salmon <sup>a</sup>	95% CI	Pink salmon	95% CI	Chum salmon	95% CI
1994	Onsite <sup>b</sup>	NC <sup>c</sup>	NC <sup>c</sup>	NC <sup>c</sup>	NC <sup>c</sup>	3,520	2,899–4,141	<b>9,197</b>	8,099–10,295	593	464–722
	Statewide <sup>c</sup>	NC <sup>c</sup>	NC <sup>c</sup>	NC <sup>c</sup>	NC <sup>c</sup>	2,935	1,665–4,414	<b>3,227</b>	1,875–4,745	413	117–812
1995	Onsite <sup>d</sup>	NC <sup>c</sup>	NC <sup>c</sup>	NC <sup>c</sup>	NC <sup>c</sup>	2,634	2,007–3,261	<b>3,421</b>	2,931–3,911	<b>2,047</b>	1,549–2,545
	Statewide <sup>e</sup>	NC <sup>c</sup>	NC <sup>c</sup>	NC <sup>c</sup>	NC <sup>c</sup>	1,721	718–3,259	<b>1,115</b>	636–1,708	<b>790</b>	477–1,159
1996	Onsite <sup>f</sup>	695	552–838	88	27–149	<b>3,625</b>	3,010–4,240	<b>1,039</b>	774–1,304	<b>2,274</b>	1,784–2,764
	Statewide <sup>g</sup>	836	420–1,341	192	32–437	<b>1,228</b>	626–1,957	<b>281</b>	71–538	<b>606</b>	319–946
1997	Onsite <sup>h</sup>	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 <sup>i</sup>	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 <sup>j</sup>	471	348–594	86	47–125	<b>12,909</b>	11,029–14,789	<b>5,653</b>	4,842–6,464	2,376	1,827–2,925
	Statewide <sup>k</sup>	315	138–539	44	6–103	<b>3,207</b>	1,381–5,948	<b>1,420</b>	679–2,409	1,370	302–2,858
1999	Onsite <sup>l</sup>	109	64–154	134	65–203	7,419	6,667–8,171	2,986	2,392–3,580	1,028	689–1,367
	Statewide <sup>m</sup>	362	67–864	94	22–196	6,193	4,104–8,956	4,867	1,624–9,748	855	275–1,519
2000	Onsite <sup>n</sup>	<b>155</b>	98–212	147	92–202	10,521	9,614–11,428	<b>2,386</b>	1,925–2,847	<b>1,520</b>	1,148–1,892
	Statewide <sup>o</sup>	<b>920</b>	305–2,100	385	133–708	7,685	4,901–11,246	<b>1,005</b>	533–1,581	<b>734</b>	379–1,145
2001	Onsite <sup>p</sup>	581	420–742	92	41–143	4,403	3,760–5,046	1,453	1059–1,847	1,176	827–1,525
	Statewide	n/a <sup>q</sup>		n/a		n/a		n/a		n/a	

<sup>a</sup> Combined large (≥16 in.) and small (<16 in.) coho salmon.

<sup>b</sup> Beers (1995).

<sup>c</sup> NC = chinook salmon estimates are not comparable (NC) because onsite creel survey started late.

<sup>d</sup> Howe et al. (1995).

<sup>e</sup> Beers (1996)

<sup>f</sup> Howe et al. (1996)

<sup>g</sup> Beers (1997).

<sup>h</sup> Howe et al. (2001a).

<sup>i</sup> Frenette (1998).

<sup>j</sup> Howe et al. (2001b)

<sup>k</sup> Frenette (1999)

<sup>l</sup> Howe et al. (2001c).

<sup>m</sup> Jaenicke (2000)

<sup>n</sup> Howe et al. (2001d).

<sup>o</sup> Jaenicke (2001).

<sup>p</sup> Walker et al. (In prep)

<sup>q</sup> Not available.

**Table 7.—Results (2-sided probabilities) of Wilcoxon Signed Ranks tests comparing Alaska statewide survey estimates and onsite survey estimates of harvest for the Macaulay Hatchery.**

SPECIES/CATEGORY	PROBABILITY H <sub>0</sub> IS TRUE
Small chinook	0.225
Large chinook	0.345
All chinook	0.138
All coho	0.018
Pink	0.091
Chum	0.063
All salmon	0.028

of the SWHS requires the respondents to fill-in-the-blank in regards to site(s) fished (whereas the ‘standard’ questionnaire has specific sites listed). Respondents that only supply generalized location information (e.g., Juneau roadside) who may have fished at the Gastineau Hatchery would have their trip information reported under a generalized site coding rather than at the specific site.

Finally, we have no reason to suspect the observed differences are due to biases in the onsite survey estimates, but the possibility of some bias in these estimates cannot be absolutely ruled out. It is also possible that all these factors play some role.

## CONCLUSIONS AND RECOMMENDATIONS

Macaulay Hatchery plays an important role in providing fishing opportunities to residents and tourists, who may be limited by time or other resources to participate in remote roadside or marine boat fisheries. The Macaulay Hatchery roadside fishery is unique because it represents a centrally located, easily accessible area that provides concentrated angler effort and harvest near a hatchery raceway. Increased fishing opportunities are also provided by hatchery returns for marine boat anglers on both charter and non-charter vessels. Also, pressure on the wild stocks of salmon in the Juneau area is likely reduced because of opportunities provided at the hatchery.

Documentation of class specific harvests at the hatchery’s terminal harvest area 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. This survey can also be helpful in ground truthing SWHS estimates of harvest at the Macaulay Hatchery shoreline fishery.

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## **APPENDIX A**



**Appendix A1.–Summary of sampling results by date at Macaulay Hatchery in 2001.**

Week	Stratum <sup>a</sup>	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	
6/11-6/17	WD	13Jun	NON	6	2.33	2.73	21	55.50	3	0	0	0	0	0	0
6/11-6/18	WD	14Jun	NON	6	2.33	3.34	4	3.00	1	1	0	0	0	0	0
6/11-6/19	WD	15Jun	NON	6	2.33	2.32	12	17.50	0	0	0	0	0	0	2
6/11-6/20	WD	16Jun	NON	6	2.33	5.32	13	38.00	3	3	0	0	0	0	1
6/11-6/21	WE/H	16Jun	NON	5	4.40	3.51	12	23.50	3	0	0	0	0	0	0
6/11-6/22	WE/H	16Jun	SNAG	5	3.00	2.92	20	29.50	0	0	0	0	0	0	1
6/11-6/23	WE/H	17Jun	NON	5	3.20	2.95	20	34.25	0	0	0	0	0	0	2
6/11-6/24	WE/H	17Jun	SNAG	5	1.40	1.52	10	16.25	1	0	0	0	0	0	1
6/18-6/24	WD	21Jun	NON	5	3.40	1.52	9	16.00	1	1	0	0	0	0	0
6/18-6/24	WD	21Jun	SNAG	5	0.00	0	3	4.25	0	0	0	0	0	0	0
6/18-6/24	WD	22Jun	NON	5	1.40	2.19	14	24.50	6	0	0	0	0	0	1
6/18-6/24	WD	22Jun	SNAG	5	0.20	0.45	4	3.50	1	0	0	0	0	0	2
6/18-6/24	WE/H	23Jun	NON	6	2.50	3.33	6	8.50	0	0	0	0	0	0	0
6/18-6/24	WE/H	23Jun	SNAG	6	0.67	1.03	4	7.50	2	0	0	0	0	0	0
6/18-6/24	WE/H	24Jun	NON	6	3.50	2.88	4	14.50	4	0	0	0	0	0	0
6/18-6/24	WE/H	24Jun	SNAG	6	2.67	3.08	5	5.75	0	0	0	0	0	0	0
6/27-7/01	WD	27Jun	NON	6	2.67	0.82	15	21.50	2	0	0	0	0	0	2
6/27-7/01	WD	27Jun	SNAG	6	2.17	2.4	2	2.50	0	0	0	0	0	0	1
6/27-7/01	WD	28Jun	NON	5	2.20	2.17	14	18.75	0	0	0	0	0	0	3
6/27-7/01	WD	28Jun	SNAG	5	1.60	1.67	10	13.00	1	0	0	0	0	0	0
6/27-7/01	WE/H	30Jun	NON	5	2.00	1.87	4	10.50	0	0	0	0	0	0	0
6/27-7/01	WE/H	30Jun	SNAG	5	0.80	1.3	5	9.50	0	0	0	0	0	0	0
6/27-7/01	WE/H	01Jul	NON	5	3.60	1.95	12	24.75	1	0	0	0	0	0	9
6/27-7/01	WE/H	01Jul	SNAG	5	3.60	4.56	.	.	.	.	.	.	.	.	.
7/02-7/08	WD	03Jul	NON	4	4.00	3.83	23	38.00	13	1	0	0	0	0	10
7/02-7/08	WD	03Jul	SNAG	4	1.75	2.87	9	16.00	2	0	0	0	0	0	1
7/02-7/08	WD	05Jul	NON	6	3.50	2.51	27	54.00	2	0	0	0	0	2	15
7/02-7/08	WD	05Jul	SNAG	6	2.50	2.17	8	9.75	0	0	0	0	0	0	3
7/02-7/08	WE/H	04Jul	NON	5	3.00	2.35	3	2.00	0	0	0	0	0	0	0
7/02-7/08	WE/H	04Jul	SNAG	5	1.80	2.95	1	2.00	0	0	0	0	0	0	0
7/02-7/08	WE/H	08Jul	NON	5	3.60	4.16	16	23.75	2	0	0	0	0	0	8
7/02-7/08	WE/H	08Jul	SNAG	5	1.40	2.07	1	1.00	0	0	0	0	0	0	0
7/09-7/15	WD	10Jul	NON	5	4.60	2.7	33	80.75	14	0	0	0	0	2	5
7/09-7/15	WD	10Jul	SNAG	5	1.00	1.22	14	19.25	3	0	0	0	0	0	10
7/09-7/15	WD	11Jul	NON	6	5.67	2.58	23	51.05	20	1	0	0	0	0	13
7/09-7/15	WD	11Jul	SNAG	6	3.17	3.6	10	15.50	4	0	0	1	0	0	11
7/09-7/15	WE/H	14Jul	NON	6	5.33	2.5	15	25.75	9	2	0	0	0	2	5
7/09-7/15	WE/H	14Jul	SNAG	6	8.33	8.09	12	17.00	2	0	0	0	0	0	7
7/09-7/15	WE/H	15Jul	NON	5	5.40	3.78	17	37.25	9	0	0	0	0	4	12
7/09-7/15	WE/H	15Jul	SNAG	5	3.20	3.42	.	.	.	.	.	.	.	.	.
7/16-7/22	WD	16Jul	NON	6	4.17	1.94	40	86.75	11	1	0	0	0	2	6
7/16-7/22	WD	16Jul	SNAG	6	3.17	2.32	12	27.00	0	0	0	0	0	0	7
7/16-7/22	WD	20Jul	NON	6	2.00	1.41	4	5.50	1	0	0	0	0	0	0
7/16-7/22	WD	20Jul	SNAG	6	1.67	2.07	15	23.00	0	0	0	0	0	12	0
7/16-7/22	WE/H	21Jul	NON	6	3.67	1.86	25	41.50	2	1	0	0	0	1	9
7/16-7/22	WE/H	21Jul	SNAG	6	2.33	3.2	2	5.50	0	0	0	0	0	3	3
7/16-7/22	WE/H	22Jul	NON	5	2.20	2.95	9	15.50	1	0	0	0	0	7	0
7/16-7/22	WE/H	22Jul	SNAG	5	0.00	0	.	.	.	.	.	.	.	.	.
7/23-7/29	WD	23Jul	NON	6	3.00	3.22	12	18.00	0	0	0	0	0	3	1
7/23-7/29	WD	23Jul	SNAG	6	0.50	1.22	11	12.75	0	0	0	1	0	0	0
7/23-7/29	WD	26Jul	NON	6	5.83	3.43	34	51.00	2	0	0	0	0	6	1
7/23-7/29	WD	26Jul	SNAG	6	1.83	1.6	4	4.00	0	0	0	0	0	0	0

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INTERVIEW SAMPLING INFORMATION														
Week	Stratum <sup>a</sup>	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								
7/23-7/29	WE/H	28Jul	NON	6	6.00	4.15	16	20.75	1	0	0	0	9	2
7/23-7/29	WE/H	28Jul	SNAG	6	2.83	2.64	5	10.50	0	0	0	0	0	7
7/23-7/29	WE/H	29Jul	NON	6	7.67	3.93	22	36.00	0	0	0	0	25	3
7/23-7/29	WE/H	29Jul	SNAG	6	2.17	4.4	5	8.50	0	0	0	0	3	0
7/30-8/05	WD	01Aug	NON	5	11.20	4.21	38	76.05	1	1	0	0	20	0
7/30-8/05	WD	01Aug	SNAG	5	2.80	2.77	16	26.00	0	0	0	0	33	27
7/30-8/05	WD	03Aug	NON	6	5.83	4.36	33	51.25	1	0	0	0	4	3
7/30-8/05	WD	03Aug	SNAG	6	3.33	3.78	28	41.00	0	0	0	0	9	17
7/30-8/05	WE/H	04Aug	NON	5	6.40	6.11	34	56.25	5	0	0	0	10	1
7/30-8/05	WE/H	04Aug	SNAG	5	1.80	2.17	16	19.25	1	0	0	0	15	3
7/30-8/05	WE/H	05Aug	NON	5	14.40	6.19	60	110.25	4	2	0	0	21	1
7/30-8/05	WE/H	05Aug	SNAG	5	6.20	2.68	17	25.25	0	2	0	0	4	4
8/06-8/12	WD	07Aug	NON	6	7.83	6.34	35	55.75	2	1	0	0	0	1
8/06-8/12	WD	07Aug	SNAG	6	1.00	0.89	24	34.75	1	1	0	0	29	2
8/06-8/12	WD	10Aug	NON	6	8.17	5.95	40	59.25	0	0	0	0	9	2
8/06-8/12	WD	10Aug	SNAG	6	2.67	4.08	2	1.25	0	0	0	0	0	1
8/06-8/12	WE/H	11Aug	NON	5	6.20	6.61	18	35.25	0	0	0	0	15	0
8/06-8/12	WE/H	11Aug	SNAG	5	3.20	3.27	5	7.25	0	0	0	0	5	0
8/06-8/12	WE/H	12Aug	NON	6	12.83	9.06	48	69.75	0	0	0	0	16	2
8/06-8/12	WE/H	12Aug	SNAG	6	3.67	3.83	20	39.00	1	0	6	0	3	0
8/13-8/19	WD	13Aug	NON	6	8.83	6.71	22	43.75	0	0	0	0	21	6
8/13-8/19	WD	13Aug	SNAG	6	4.83	3.31	20	41.00	0	0	1	0	19	1
8/13-8/19	WD	14Aug	NON	6	8.50	4.59	24	29.00	0	0	0	0	4	0
8/13-8/19	WD	14Aug	SNAG	6	2.00	2.61	7	8.00	0	0	0	0	7	0
8/13-8/19	WE/H	18Aug	NON	6	9.17	4.75	34	72.25	5	0	11	0	13	0
8/13-8/19	WE/H	18Aug	SNAG	6	4.00	3.69	13	26.50	4	0	0	0	11	2
8/13-8/19	WE/H	19Aug	NON	5	10.00	10.07	35	90.00	2	0	11	0	2	0
8/13-8/19	WE/H	19Aug	SNAG	5	8.00	12.63	9	13.25	0	0	2	0	0	0
8/20-8/26	WD	22Aug	NON	6	16.33	5.79	62	115.75	1	0	49	2	10	3
8/20-8/26	WD	22Aug	SNAG	6	9.00	9.3	29	40.25	0	0	9	0	1	3
8/20-8/26	WD	24Aug	NON	6	15.33	7.99	47	108.25	0	0	69	0	5	3
8/20-8/26	WD	24Aug	SNAG	6	3.50	3.39	16	19.75	0	0	5	0	1	0
8/20-8/26	WE/H	25Aug	NON	6	10.67	5.35	46	92.25	0	0	21	6	0	0
8/20-8/26	WE/H	25Aug	SNAG	6	7.50	5.54	18	39.00	1	0	8	6	0	0
8/20-8/26	WE/H	26Aug	NON	5	19.80	9.78	43	83.00	0	0	22	4	1	0
8/20-8/26	WE/H	26Aug	SNAG	5	9.20	10.83	38	72.25	0	0	16	2	4	0
8/27-9/02	WD	28Aug	NON	6	9.67	6.92	39	78.75	0	0	3	0	0	0
8/27-9/02	WD	28Aug	SNAG	6	8.17	6.34	48	70.50	1	0	37	2	0	0
8/27-9/02	WD	30Aug	NON	6	9.50	6.16	33	54.25	0	0	13	0	0	0
8/27-9/02	WD	30Aug	SNAG	6	12.17	11.34	50	95.25	0	0	43	2	1	0
8/27-9/02	WE/H	01Sep	NON	5	5.80	2.95	31	63.50	0	0	17	3	0	0
8/27-9/02	WE/H	01Sep	SNAG	5	8.00	5.15	24	57.75	0	0	23	2	0	0
8/27-9/02	WE/H	02Sep	NON	5	14.20	6.46	61	132.75	0	0	22	1	0	0
8/27-9/02	WE/H	02Sep	SNAG	5	11.00	10.79	21	36.00	0	0	13	1	0	0
9/03-9/09	WD	05Sep	NON	5	3.60	2.97	18	25.50	0	0	27	0	0	0
9/03-9/09	WD	05Sep	SNAG	5	2.60	1.52	12	17.50	0	0	16	0	0	0
9/03-9/09	WD	06Sep	NON	5	10.80	5.59	31	60.50	0	0	13	1	1	0
9/03-9/09	WD	06Sep	SNAG	5	10.60	7.02	37	65.50	0	0	20	1	0	0

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Week	Stratum <sup>a</sup>	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	
9/03-9/09	WE/H	03Sep	NON	5	13.60	7.5	44	79.75	0	0	16	0	0	0	
9/03-9/09	WE/H	03Sep	SNAG	5	7.40	5.03	27	55.25	1	0	37	0	0	0	
9/03-9/09	WE/H	09Sep	NON	6	16.33	12.13	42	92.00	0	0	32	1	0	0	
9/03-9/09	WE/H	09Sep	SNAG	6	8.50	3.39	19	27.75	0	0	10	0	0	0	
9/10-9/16	WD	11Sep	NON	4	9.75	3.5	19	47.00	0	0	0	0	0	0	
9/10-9/16	WD	11Sep	SNAG	4	9.25	4.03	8	14.00	0	0	9	0	0	0	
9/10-9/16	WD	14Sep	NON	6	5.67	2.73	16	32.25	0	0	8	0	0	0	
9/10-9/16	WD	14Sep	SNAG	6	8.50	4.93	12	22.50	0	0	11	2	0	0	
9/10-9/16	WE/H	15Sep	NON	5	13.60	2.51	47	91.00	0	0	16	2	0	0	
9/10-9/16	WE/H	15Sep	SNAG	5	13.60	7.5	39	101.50	0	0	53	6	0	0	
9/10-9/16	WE/H	16Sep	NON	5	9.20	8.04	39	81.00	0	0	14	3	0	0	
9/10-9/16	WE/H	16Sep	SNAG	5	9.40	3.58	38	76.00	0	0	37	6	0	0	
9/17-9/23	WD	20Sep	NON	6	4.67	4.18	10	17.00	0	0	14	0	0	0	
9/17-9/23	WD	20Sep	SNAG	6	9.00	6.6	18	50.75	0	0	35	0	0	0	
9/17-9/23	WD	21Sep	NON	6	4.17	4.83	15	31.50	0	0	10	0	0	0	
9/17-9/23	WD	21Sep	SNAG	6	5.83	4.96	13	26.75	0	0	10	0	0	0	
9/17-9/23	WE/H	22Sep	NON	5	13.40	7.47	46	98.65	0	0	54	2	0	0	
9/17-9/23	WE/H	22Sep	SNAG	5	7.00	2.92	27	52.50	0	0	16	1	0	0	
9/17-9/23	WE/H	23Sep	NON	5	12.20	6.3	58	88.50	0	0	62	0	0	0	
9/17-9/23	WE/H	23Sep	SNAG	5	8.20	7.53	14	20.25	0	0	6	0	0	0	
9/24-9/30	WD	26Sep	NON	6	5.83	2.48	21	40.00	0	0	17	1	0	0	
9/24-9/30	WD	26Sep	SNAG	6	5.00	3.58	7	12.75	0	0	10	0	0	0	
9/24-9/30	WD	27Sep	NON	5	2.00	2.55	12	21.00	0	0	8	0	0	0	
9/24-9/30	WD	27Sep	SNAG	5	3.80	2.68	6	8.00	0	0	1	0	0	0	
9/24-9/30	WE/H	29Sep	NON	6	6.33	3.61	23	44.50	0	0	21	0	0	0	
9/24-9/30	WE/H	29Sep	SNAG	6	8.17	8.16	33	64.50	0	0	36	0	0	0	
9/24-9/30	WE/H	30Sep	NON	6	1.67	1.51	15	29.75	0	0	4	0	0	0	
9/24-9/30	WE/H	30Sep	SNAG	6	2.67	3.44	10	18.25	0	0	17	0	0	0	
10/01-10/07	WD	01Oct	NON	6	1.67	1.21	10	17.75	0	0	13	0	0	0	
10/01-10/07	WD	01Oct	SNAG	6	3.83	2.23	11	27.75	0	0	22	0	0	0	
10/01-10/07	WD	05Oct	NON	5	0.60	0.55	6	6.00	0	0	1	0	0	0	
10/01-10/07	WD	05Oct	SNAG	5	1.80	2.49	3	3.00	0	0	1	0	0	0	
10/01-10/07	WE/H	06Oct	NON	6	1.83	1.6	8	11.00	0	0	3	0	0	0	
10/01-10/07	WE/H	06Oct	SNAG	6	1.33	1.51	5	4.75	0	0	3	0	0	0	
10/01-10/07	WE/H	07Oct	NON	6	0.33	0.52	4	2.00	0	0	0	0	0	0	
10/01-10/07	WE/H	07Oct	SNAG	6	1.00	1.55	8	5.25	0	0	1	0	0	0	
Totals				751			2,686	4,944	158	18	1,085	59	375	248	

<sup>a</sup> WD = weekdays (Mondays–Fridays, except 4 July and 3 September); WE/H = weekend/holidays [Saturdays, Sundays, Independence Day (observed on 4 July) and Labor Day (3 September)]

**Appendix A2.—Major computer files used for data analysis of 2001 Macaulay 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\_01.zip.”

<b>File name</b>	<b>File type</b>	<b>File Description</b>
2001_DIPAC	XLS	Final edited ASCII data set worksheet [sheet1] in an EXCEL spreadsheet.
DIPAC01A	SAS	SAS program to reformat data file in 2001_DIPAC.XLS
DIPAC01	SAS7BDAT	Summary subset SAS data file: count and interview data
BOWEN01A	SAS	SAS program to estimate overall effort, harvests, and associated variances
DIPAC_01_Age_eff	SAS	SAS program to estimate effort, harvest, and associated variances by age class (A, C, S, U)
DIPAC_01_RESID_eff	SAS	SAS program to estimate effort, harvest, and associated variances by residency (R, N, and U)
DIPAC_01_SA	SAS	SAS program to summarize daily estimate of effort and harvest.
DIPAC_2001_analysis	XLS	Summary of 2001 data analysis and comparison with historical data in an EXCEL spreadsheet