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EFFORT AND CATCH STATISTICS FOR THE  
SPORT FISHERY FOR CHINOOK SALMON  
*Oncorhynchus tshawytscha* IN THE  
LOWER KANEKTOK RIVER, 1987<sup>1</sup>

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#### ABSTRACT

A roving creel survey was conducted on the lower 16 kilometers (10 miles) of the Kanektok River from 20 June to 24 July 1987 to estimate angler effort, catch (fish landed), and harvest (fish kept). An estimated 3,890 angler-hours of sport fishing effort were expended to catch 1,903 chinook salmon *Oncorhynchus tshawytscha*, 214 sockeye salmon *Oncorhynchus nerka*, 1,091 chum salmon *Oncorhynchus keta*, 149 Dolly Varden *Salvelinus malma*, and 164 rainbow trout *Salmo gairdneri*. Most of the fishing was catch and release as anglers harvested only 375 chinook salmon, 18 sockeye salmon, 112 chum salmon, 20 Dolly Varden, and 25 rainbow trout. Age 1.4 chinook salmon were the most abundant age group in the harvest (54 percent).

KEY WORDS: chinook salmon, *Oncorhynchus tshawytscha*, sport harvest, sport effort, creel survey, Kanektok River.

## INTRODUCTION

The Kanektok River, located south of Bethel in the Togiak National Wildlife Refuge (Figure 1), supports a sport fishery of world renown. Besides having an abundance of rainbow trout *Salmo gairdneri*, Arctic grayling *Thymallus arcticus*, and Dolly Varden *Salvelinus malma*, the Kanektok River also has major runs of the five species of Pacific salmon *Oncorhynchus spp.* Anglers use this resource in significant numbers each year as the popularity of this river grows.

A major component of the recreational fishery in the Kanektok River is the fishery for chinook salmon *Oncorhynchus tshawytscha* in the lower reach of the river (Figure 2). Because of concern for this expanding fishery, the Alaska Board of Fisheries reduced the bag limit for chinook salmon from 15 to five fish per day in 1985. Estimates from statewide harvest surveys (Mills 1984, 1985, 1986) and on-site creel surveys (Minard 1987) show that sport harvests have declined in recent years: 1,511 fish in 1983; 922 fish in 1984; 672 fish in 1985; and 844 fish in 1986. Sport fishing effort over this same period has also declined from the record high observed in 1984. While accurate effort estimates are lacking for the lower section of the river, estimated angler effort for the entire river climbed from 1,517 angler-days in 1983 to 6,881 angler-days in 1984, and then dropped to 4,630 angler-days in 1985 (Mills 1984, 1985, 1986), and to 3,319 angler-days in 1986 (Minard 1987). Although the sport harvest is minor in comparison to commercial (1983-1986 average of 33,318 fish annually) and subsistence (1983-1986 average of 2,668 fish annually) harvests of chinook salmon (Francisco 1987), the level of sport use and resulting conflicts with local subsistence and commercial users is a major concern.

In 1986, the Sport Fish Division of the Alaska Department of Fish and Game (ADF&G) conducted a creel survey on the sport fishery in the lower Kanektok River (Minard 1987). This study was continued in 1987 and those results are presented here. The goal of this survey is to increase our understanding of the developing sport fishery in the lower Kanektok River and to evaluate current management practices and policies related to this valuable resource. The objective of this report is to present the 1987 creel statistics for this fishery including estimates of fishing effort; catch (fish landed); harvest (fish retained); and age, sex, and size composition of the harvests.

Estimates of commercial and subsistence harvests of Pacific salmon for the Kanektok River have been annually reported by Francisco (1987). Escapement data were reported by Huttunen (1986). Sport fishery information has been previously reported by Snellgrove (1984), Alt (1986), and Minard (1987).

## METHODS

In 1987, anglers were permitted a daily harvest of five chinook salmon with no size restrictions (ADF&G 1987). The daily bag and possession limits of other salmon (sockeye, chum, pink, and coho) were 10 fish.

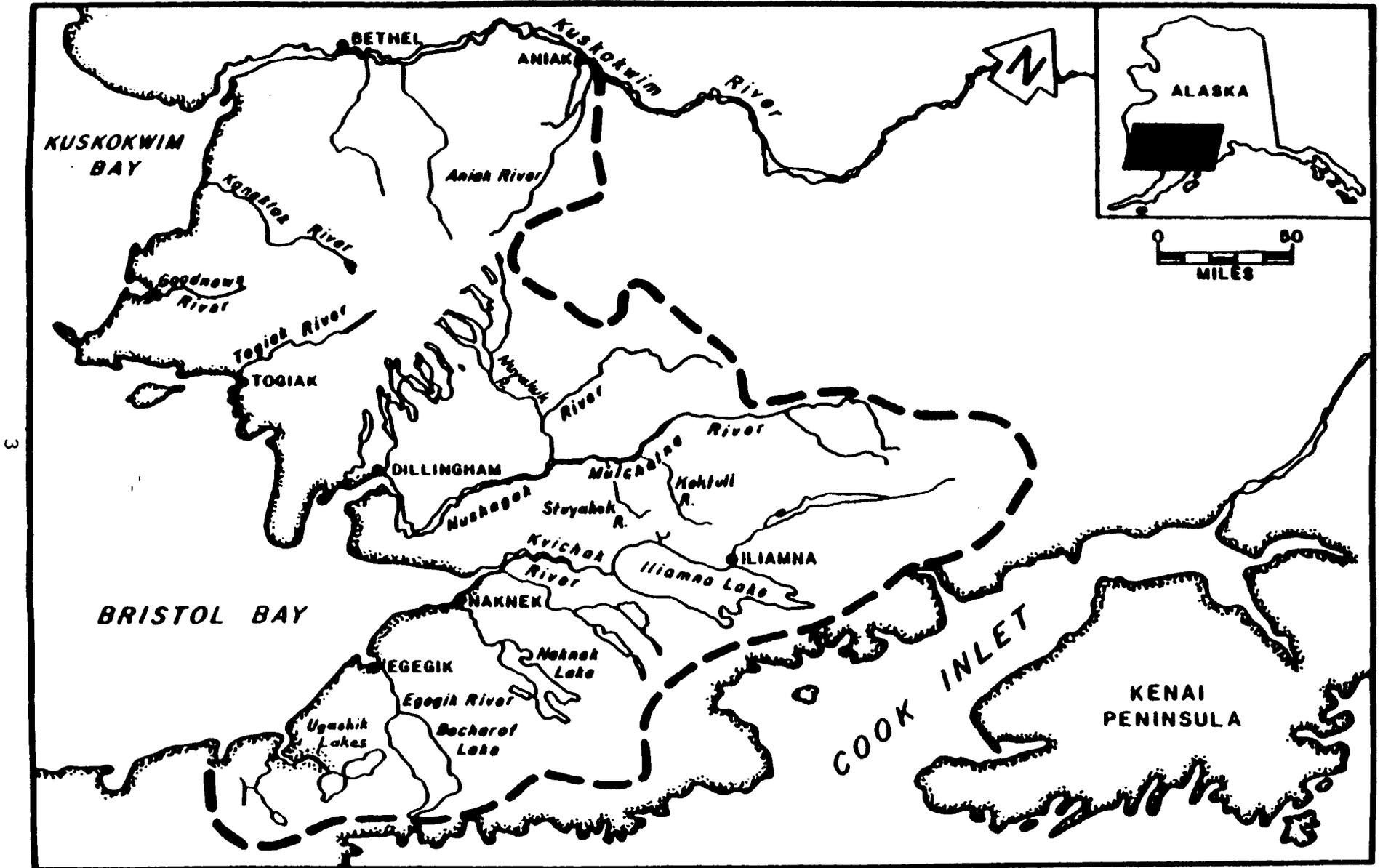


Figure 1. Bristol Bay, southwest Alaska, sport fish management area.

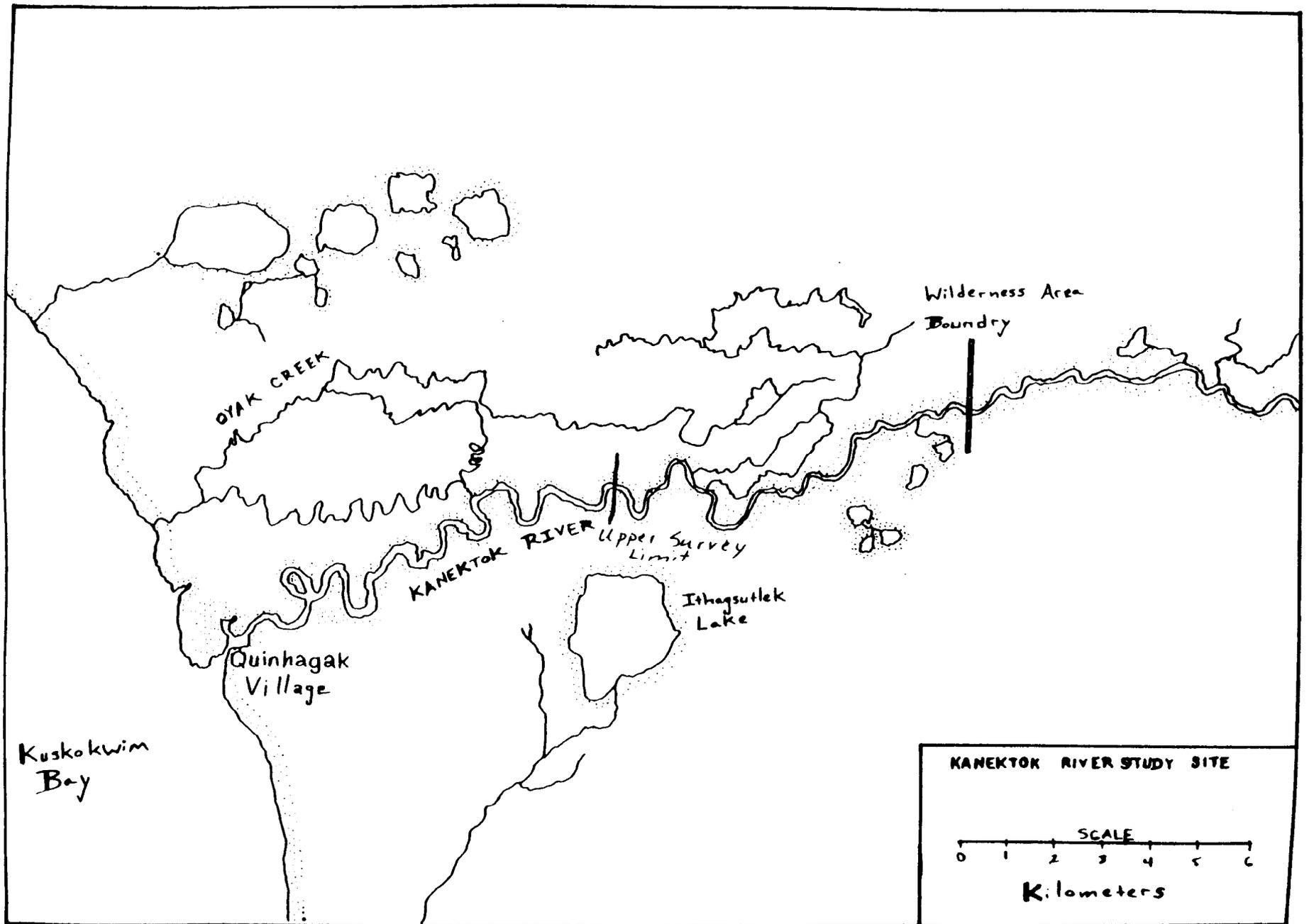


Figure 2. The Kanektok River creel survey study site.

## Study Design

The survey area extended from the village of Quinhagak to 16 km upstream, approximately halfway to the wilderness boundary of the Togiak National Wildlife Refuge (Figure 2). Virtually all of the fishing effort for chinook salmon is concentrated in this section of the river (Snellgrove 1984, Alt 1986, and Minard 1987). Two temporal components were defined on the basis of run timing and angler activity; period 1 (20 June to 12 July) and period 2 (13 July to 24 July). Past creel surveys concluded that all the significant catches and harvests of chinook salmon occur during these periods.

A roving creel survey (Neuhold and Lu 1957) using a stratified, random sampling design was used to count anglers, conduct angler interviews, and sample the sport harvest. Angler counts were used to estimate fishing effort in units of angler-hours. Angler interviews provided estimates of catch and harvest rates (fish per angler-hour). Catch-per-unit-effort (CPUE) estimates were derived from interviews with anglers who had not completed fishing for the day (referred to as incomplete trips). It is assumed that CPUE of incomplete trips provides an unbiased estimate of CPUE of completed trips.

For the creel survey, the fishing day was divided into two time strata: one having two possible sample units and the other three. The two daily time strata and their sample units were: (1) off hour, 0600-0900 hours and 1800-2000 hours; and (2) prime hour, 0900-1200 hours, 1200-1500 hours, and 1500-1800 hours. Guided fishing accounts for the majority of the fishing effort on the Kanektok River and typically occurs between the hours of 0900 to 1800 hours (Snellgrove 1984).

## Data Collection

Approximately 20% of the sampling effort was allocated to the off-hour stratum and the rest to the prime-hour stratum. The sampling levels for the pre- and post peak periods, 20 June to 3 July, and 18 July to 24 July respectively, were nine count/interview sessions and three angler counts per 7-day week. Peak period (4 July to 17 July) sampling levels were increased to 12 angler count/ interview sessions and six angler counts per week.

Each survey started at the downstream boundary of the survey area. A coin was tossed to determine if an angler count or angler interviews were to be conducted first. For an angler count, a boat was driven through the survey area at a near constant rate of speed and all anglers actively fishing were counted. The angler count was completed within 40 to 60 minutes and was considered an instantaneous count (Neuhold and Lu 1957). It was not possible to differentiate between guided and unguided anglers during the angler count.

All interviews were of individual anglers and were not party interviews. The survey clerk attempted to sample 5% to 10% of the available anglers so that the number of anglers randomly interviewed was proportional to angler effort during the sample unit (Neuhold and Lu 1957 and DiConstanzo 1956). For each angler contacted, the following information was recorded: the number of hours fished, the number of fish in the angler's possession by species, the number of fish released by species, and whether the angler was guided or not guided.

Completed-trip angler information was collected from voluntary report forms given to interviewed anglers. The voluntary report form requested the time fishing started and ended, catch by species, and the number of fish retained. Anglers were asked to mail the postage-paid forms to the Alaska Department of Fish and Game, Dillingham office.

Harvested salmon encountered during the creel survey were measured for mid-eye to fork-of-tail length to the nearest millimeter, weighed to the nearest 10 grams, and the sex of the fish recorded. Three scales were removed from the preferred area<sup>1</sup> and mounted on an adhesive coated card. For resident fishes, the snout-to-fork length was recorded to the nearest millimeter along with weight to the nearest 10 grams. A scale smear was collected and later mounted on an adhesive coated card.

### Data Analyses

The mean number of anglers per count was calculated for each temporal component by:

$$[1] \quad \bar{X} = (1/H) \sum_{i=1}^5 H_i \bar{x}_i,$$

where;

$\bar{X}$  = the mean number of anglers per count during a component,

$\bar{x}_i$  = the mean number of anglers per count for stratum  $i$ ,

$H$  = the total number of hours in a component, and

$H_i$  = the total number of hours in stratum  $i$ .

The variance of the mean number of anglers per count was calculated as follows (Jessen 1978):

$$[2] \quad \hat{V}(\bar{X}) = (1/H^2) \sum_{i=1}^5 H_i^2 [s_i^2/n_i],$$

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<sup>1</sup> The left side of the fish approximately two rows above the lateral line and on the diagonal row downward from the posterior insertion of the dorsal fin (Clutter and Whitesel 1956).

where;

H and  $H_i$  are defined as above, and

$n_i$  = the total number of angler counts in stratum i, and

$s_i^2$  = the sample variance of  $\bar{x}_i$  for stratum i.

The total number of angler-hours ( $\hat{E}_T$ ) during temporal component 1 was estimated as follows:

$$[3] \quad \hat{E}_T = H\bar{X} = \sum_{i=1}^5 H_i \bar{x}_i.$$

The variance for the estimate of total angler-hours for component 1 was calculated as follows:

$$[4] \quad V(\hat{E}_T) = H^2 V(\bar{X}).$$

For temporal component 2, effort and its variance were estimated for each week as:

$$[5] \quad \hat{E} = \bar{x}H$$

and variance of  $\hat{E}$  by:

$$[6] \quad V(\hat{E}) = H^2 (s^2/n)$$

The total number of angler-hours for the season was estimated by summing the estimates of total angler-hours for the temporal components. Because these are independent estimates, the total variance is the sum of the individual variances.

Catch per unit effort for species j during a component was estimated by:

$$[7] \quad \overline{CPUE}_j = \frac{\sum_{k=1}^m c_{jk}}{\sum_{k=1}^m f_k}$$

where;

- $m$  = the number of anglers interviewed during the component,
- $c_{jk}$  = the catch (either number harvested or total number caught) of species  $j$  by angler  $k$ , and
- $f_k$  = the effort (number of hours) expended by angler  $k$ .

The variance of mean effort per angler was estimated using a two-stage sample design with days representing the first-stage sample units and anglers the second-stage sample units (Von Geldern and Tomlinson 1973). On a given sample day, the number of second-stage units available was unknown. The variance of mean effort was estimated as follows (Sukhatme et al. 1984):

$$[8] \quad V(\bar{f}) = [1 - (d/D)] s_B^2/d + (\sum_{k=1}^D s_{Wk}^2/m)/dD,$$

where;

- $d$  = the number of days sampled during the component,
- $D$  = the number of days in the component,
- $s_{Wk}^2$  = the sample variance of effort for anglers interviewed during day  $k$ , and
- $s_B^2$  = the between-day variance of mean angler effort.

The between-day variance,  $s_B^2$ , was estimated as follows:

$$[9] \quad s_B^2 = [ \sum_{k=1}^D (\bar{f}_k - \bar{f})^2 ] / (d-1),$$

where  $\bar{f}_k$  = the mean effort by anglers interviewed during day  $k$ .

The mean and variances of harvest or catch of a species were estimated identically to effort by substituting the corresponding harvest or catch quantities for effort ( $f$ ).

The variance of the catch rate of species  $j$  ( $CPUE_j$ ) was estimated using the approximation for the variance of the quotient of two random variables (Jessen 1978):

$$[10] \quad \hat{V}(CPUE_j) = (\bar{c}_j/\bar{f})^2 (s_c^2/\bar{c}_j^2 + s_f^2/\bar{f}^2 - 2rs_c s_f/\bar{c}_j \bar{f})$$

where;

$\bar{c}_j$  = the mean catch of species  $j$  by anglers interviewed during  
a component,

$\bar{f}$  = the mean number of hours fished by anglers interviewed  
during a component,

$s_c^2$  = the two-stage variance estimate for  $\bar{c}_j$ ,

$s_f^2$  = the two-stage variance estimate for  $\bar{f}$ , and

$r$  = the correlation between the  $c_{jk}$  and  $f_k$ .

The catch (or harvest) of species  $j$  was estimated by:

$$[11] \quad \hat{C}_j = E_T \hat{CPUE}_j.$$

The variance of the catch was estimated using Goodman's (1960) formula for the variance of the product of two independent random variables, which is:

$$[12] \quad V(\hat{C}_j) = [E_T^2 V(\hat{CPUE}_j)] + [\hat{CPUE}_j^2 V(E_T)] - [V(E_T) V(\hat{CPUE}_j)].$$

Total catch and its variance were estimated for each component and summed to estimate the total season catch. The same procedures were followed in estimating total harvest of each species.

The assumptions necessary for these analyses were:

1. Incomplete-trip angler interviews provided an unbiased estimate of completed-trip angler CPUE.
2. Interviewed anglers were representative of the total angler population and anglers were interviewed in proportion to their abundance on the day of the interview.
3. No significant fishing effort occurred between 2000 hours and 0600 hours.
4. Catch and effort by individual anglers are normally distributed random variables.
5. Catch rate and duration of fishing trip are independent (DiConstanzo 1956).

Age composition of all species harvested by the sport fishery was calculated from legible scales collected during the creel survey. The proportional age composition of the harvest was estimated when sample sizes were sufficient. Letting  $p_h$  equal the estimated proportion of age group  $h$ , the variance of  $p_h$  was estimated using the normal approximation to the binomial (Schaeffer et al. 1979):

$$[13] \quad V(\hat{p}_h) = \hat{p}_h(1-\hat{p}_h)/(n_T-1),$$

where  $n_T$  is the number of scales read.

Mean length at age by sex and its variance were estimated using standard normal procedures. Mean length (millimeters) and weight (kilograms) were calculated by age class for all species sampled.

## RESULTS

The creel survey was conducted on the lower Kanektok River from 20 June to 24 July, 1987. Angler counts by day and daily time period are presented in Appendix Table 1. Daily catch and harvest rates for chinook, sockeye, and chum salmon, rainbow trout, and Dolly Varden are presented in Appendix Tables 2 and 3.

### Effort

The mean number of anglers per count were 11.0 and 3.3 during temporal components 1 and 2, respectively (Table 1). Total effort was estimated to be 3,890 angler-hours. Effort during the first component (3,405 angler-hours) was 88% of the total effort. Interviewed anglers who had completed their fishing day ( $n = 14$ ) averaged 5.36 hours per angler day. Variability in this estimate, however, was high (standard error = 1.3).

### Catch Rate

Chinook salmon catch and harvest rates during component 1 (20 June-12 July) were 0.53 and 0.09 fish per hour, respectively (Table 2). Component 2 (13 July-24 July) catch and harvest rates of chinook salmon were 0.22 and 0.14 fish per hour, respectively. Chum salmon catch rates (0.84 fish per hour) were greatest during component 2, however, harvest rates for this species were low during both sampling periods. Catch and harvest rates of other species were very small.

### Catch and Harvest

An estimated total of 1,903 chinook salmon were caught by anglers during the study period (Table 3). Of the chinook salmon caught, 375 (20%) were harvested. The majority of the chinook salmon catch and harvest occurred during

Table 1. Estimated effort (angler-hours) by sampling period for the sport fishery in the lower Kanektok River, 1987.

Sampling Period	Number of Interviews	Number of Days Possible	Number of Days Sampled	Anglers Per Count	Estimated Effort			
					Ang-Hrs	SE <sup>1</sup>	95% CI <sup>2</sup>	Rel Pre <sup>3</sup>
6/20-7/12	223	23	21	11.0	3,405.0	329.3	2,760.0 - 4,050.0	19.0%
7/13-7/24	38	12	7	3.3	485.0	101.7	285.0 - 684.0	41.1%
Total	261	35	28		3,890.0	344.6	3,214.5 - 4,565.5	17.4%

<sup>1</sup> Standard Error.

<sup>2</sup> Confidence interval.

<sup>3</sup> Relative Precision of 95% confidence interval.

Table 2. Catch per angler-hour and harvest per angler-hour by species and time period for the sport fishery in the lower Kanektok River, 1987.

Species	Sampling Period <sup>1</sup>	Catch Rate		Harvest Rate	
		Fish/Hr	SE <sup>2</sup>	Fish/Hr	SE <sup>2</sup>
Chinook Salmon	1	0.5280	0.0522	0.0901	0.0125
	2	0.2172	0.0976	0.1412	0.0559
Sockeye Salmon	1	0.0567	0.0302	0.0037	0.0018
	2	0.0434	0.0143	0.0109	0.0045
Chum Salmon	1	0.2011	0.0334	0.0160	0.0046
	2	0.8362	0.2062	0.1195	0.0609
Grayling	1	0.0037	0.0030	0.0000	0.0000
	2	0.0326	0.0297	0.0000	0.0000
Dolly Varden	1	0.0284	0.0095	0.0012	0.0022
	2	0.1086	0.0042	0.0326	0.0226
Rainbow Trout	1	0.0419	0.0141	0.0074	0.0041
	2	0.0434	0.0230	0.0000	0.0000

<sup>1</sup> Period 1 6/20-7/12; Period 2 7/13-7/24.

<sup>2</sup> Standard Error.

Table 3. Estimated catch and harvest by species for the sport fishery in the lower Kanektok River, 1987.

Species	Sampling Period <sup>1</sup>	Catch				Harvest			
		Number	SE <sup>2</sup>	95 % CI <sup>3</sup>	Rel Pre <sup>4</sup>	Number	SE <sup>2</sup>	95 % CI <sup>3</sup>	Rel Pre <sup>4</sup>
Chinook	1	1,798	248	1,312 - 2,284	27.0%	307	52	206 - 408	33.1%
	2	105	51	5 - 205	95.2%	68	30	9 - 127	86.5%
	Total	1,903	253	1,407 - 2,399	26.1%	375	60	257 - 493	31.4%
Sockeye	1	193	104	0 - 397	105.6%	13	6	1 - 25	94.1%
	2	21	8	5 - 37	74.7%	5	2	1 - 9	78.4%
	Total	214	104	10 - 418	95.3%	18	7	5 - 31	72.2%
Chum	1	685	131	428 - 942	37.5%	54	17	22 - 86	60.1%
	2	406	130	151 - 661	62.8%	58	31	0 - 118	103.6%
	Total	1,091	184	730 - 1,452	33.1%	112	35	44 - 180	61.0%
Grayling	1	13	10	0 - 33	153.0%	0	0	0 - 0	
	2	16	14	0 - 44	176.6%	0	0	0 - 0	
	Total	29	18	0 - 64	119.2%	0	0	0 - 0	
Dolly Varden	1	97	33	32 - 162	67.0%	4	7	0 - 19	363.6%
	2	52	23	7 - 97	86.7%	16	11	0 - 38	134.8%
	Total	149	40	71 - 227	52.6%	20	13	0 - 45	127.4%
Rainbow Trout	1	143	50	45 - 241	68.4%	25	14	0 - 53	111.4%
	2	21	12	0 - 44	107.6%	0	0	0 - 0	
	Total	164	51	64 - 264	61.2%	25	14	0 - 53	111.4%

<sup>1</sup> Sample Period 1 = 6/20-7/12; Sample Period 2 = 7/13-7/24.

<sup>2</sup> Standard error.

<sup>3</sup> Confidence interval.

<sup>4</sup> Relative precision at  $\alpha = 0.05$ .

the first temporal component. Sockeye catch and harvest were 214 fish and 18 fish, respectively. A total of 1,091 chum salmon were caught of which 112 (10%) were harvested. Rainbow trout catches and harvests were 164 fish and 25 fish, respectively.

#### Size, Sex, and Age Sampling

Males comprised 54% of the chinook salmon (n = 160) harvested by anglers (Table 4). Age 1.4 fish were the most abundant age group in the harvest (54%). Mean length and weight of sport caught chinook salmon was 740 mm and 8.09 kg, respectively. The largest chinook salmon sampled during the survey was 1,100 mm long and weighed 21.0 kg (46.2 lb). Size, sex, and age composition for chum salmon and rainbow trout are presented in Tables 5 and 6.

### DISCUSSION

#### The 1987 Season

The sport harvest of 375 chinook salmon from the lower Kanektok River in 1987 is the smallest observed since 1983 and accounted for approximately 1% of the total return (Table 7). Sport effort during 1987 was 23% below the 1986 levels. Angler effort for the entire lower river sport fishery for chinook salmon (20 June through 24 July) totalled 3,890 angler-hours (Table 1). During 1986, a total of 5,076 angler-hours were expended in the lower river fishery during the period 20 June to 17 July.

Commercial and subsistence catches in 1987 were close to average harvests observed in recent years. The escapement index for chinook salmon totalled 4,223 fish and was considerably below the desired index of 5,800 fish (Francisco 1987).

#### Recommendations

At the 1987 December Board of Fisheries meeting the Department recommended several regulatory changes that would affect the Kanektok River sport fishery. Specific regulation proposals included: (1) reduction of the chinook salmon daily bag and possession limit from five fish to three fish, of which only two may be greater than 711 mm (28 in); and (2) reduction of the other salmon (coho, chum, sockeye, and pink) daily bag and possession limits from 10 to five fish.

Data from this and past creel surveys were used to support these proposals. Department staff considered the existing bag and possession limits too liberal given the current harvest potential of the Kanektok River sport fishery. These proposals were adopted to reduce the potential for future harvests exceeding sustained yield, and to bring salmon bag and possession limits more in line with other fisheries of comparable size.

Table 4. Sex, age, length (mm), and weight (kg) composition of chinook salmon sampled from the sport harvest in the lower Kanektok River, 1987.<sup>1</sup>

	Age Class					Total
	1.1	1.2	1.3	1.4	1.5	
<b>Male</b>						
Percent	5.63%	23.13%	8.13%	15.63%	1.88%	54.37%
Av Length	450	504	699	823	970	635
Std Error	26.53	11.82	17.45	17.18	22.91	18.93
Sample Size	9	37	13	25	3	87
Av Weight	1.8	2.5	5.8	10.0	16.4	5.5
Std Error	0.25	0.13	0.47	0.87	1.02	0.51
Sample Size	9	34	13	23	3	82
<b>Female</b>						
Percent	0.00%	0.63%	2.50%	38.13%	4.38%	45.63%
Av Length		543	833	871	876	865
Std Error			35.18	7.62	14.27	8.12
Sample Size		1	4	61	7	73
Av Weight		2.8	9.9	11.3	11.4	11.1
Std Error			1.22	0.38	0.74	0.35
Sample Size		1	4	57	7	69
<b>Both Sexes</b>						
Percent	5.63%	23.75%	10.63%	53.75%	6.25%	100.00%
Av Length	450	505	731	857	904	740
Std Error	26.53	11.55	20.77	7.68	18.32	14.18
Sample Size	9	38	17	86	10	160
Av Weight	1.8	2.48	6.76	10.94	12.88	8.09
Std Error	0.25	0.12	0.62	0.37	0.96	0.39
Sample Size	9	35	17	80	10	151

<sup>1</sup> Sample Period: 6/20 - 7/24.

Table 5. Sex, age, length (mm), and weight (kg) composition of chum salmon sampled from the sport harvest in the lower Kanektok River, 1987.<sup>1</sup>

	Age Class			Total
	0.3	0.4	0.5	
<b>Male</b>				
Percent	10.00%	42.50%	5.00%	57.50%
Av Length	590	612	652	612
Std Error	12.41	17.12	24.50	13.19
Sample Size	4	17	2	23
Av Weight	3.6	3.8	4.6	3.8
Std Error	0.24	0.29	0.38	0.21
Sample Size	4	13	2	19
<b>Female</b>				
Percent	17.50%	17.50%	7.50%	42.50%
Av Length	554	593	629	583
Std Error	10.21	10.69	17.46	9.43
Sample Size	7	7	3	17
Av Weight	2.8	3.3	4.1	3.2
Std Error	0.11	0.28	0.36	0.18
Sample Size	7	7	3	17
<b>Both Sexes</b>				
Percent	27.50%	60.00%	12.50%	100.00%
Av Length	567	607	639	600
Std Error	9.35	12.5	13.55	8.78
Sample Size	11	24	5	40
Av Weight	3.1	3.6	4.3	3.5
Std Error	0.17	0.21	0.27	0.15
Sample Size	11	20	5	36

<sup>1</sup> Sample Period - 6/20-7/24.

Table 6. Age, length (mm), and weight (kg) composition of rainbow trout sampled from the sport harvest in the lower Kanektok River, 1987.<sup>1</sup>

	Age Class			Total
	4	5	6	
Percent	14.29%	71.43%	14.29%	100.00%
Av Length	539	485	482	492
Std Error		16.36		13.73
Sample Size	1	5	1	7
Av Weight		1.3	1.2	1.3
Std Error		0.19		0.15
Sample Size		4	1	5

<sup>1</sup> Sample Period - 6/20-7/24.

Table 7. Harvest and escapement of chinook salmon returns on the Kanektok River, 1983-1987.

Year	Commercial Harvest <sup>1</sup>	Subsistence Harvest <sup>1</sup>	Sport Harvest <sup>3</sup>	Esc. Index <sup>2</sup>	Total Run <sup>4</sup>	% Sport Harvest
1983	46,385	2,542	1,511	8,890	59,328	2.5%
1984	33,652	3,109	922	11,282	48,965	1.9%
1985	30,401	2,341	672	13,465	46,879	1.4%
1986	22,835	2,682	844	3,642	30,003	2.8%
1987	26,022	3,670	375	4,223	34,290	1.1%
Average	31,859	2,869	865	8,300	43,893	2.0%

<sup>1</sup> (Francisco, 1987).

<sup>2</sup> Escapement index is considered a minimum level of escapement based upon unexpanded aerial survey count of spawners (Francisco, 1987).

<sup>3</sup> Sport harvests of chinook salmon are based upon Statewide harvest surveys (Mills 1984 - 1986) and on combined creel survey activities conducted by ADF&G and USF&WS in 1986.

<sup>4</sup> Total run estimates are conservative due to methods of estimating escapement described in footnote 2 (Francisco, 1987).

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APPENDIX TABLES

Appendix Table 1. Angler counts for the sport fishery on the lower Kanektok River, 1987.

Date	Wd/We <sup>2</sup>	Period <sup>1</sup>				
		A	B	C	D	E
20-Jun	We			16	18	
21-Jun	We	3				26
22-Jun	Wd		25	20		
23-Jun	Wd	0			17	
24-Jun	Wd		20			
25-Jun	Wd		27			
26-Jun	Wd		4		12	
27-Jun	We				19	
28-Jun	We			10		
29-Jun	Wd	0	21			5
30-Jun	Wd		7			
01-Jul	Wd			8	10	
02-Jul	Wd				15	10
03-Jul	Wd		9	29		
04-Jul	We			7	4	
05-Jul	We		5		9	1
06-Jul	Wd	0	8	15		
07-Jul	Wd		7	11		6
08-Jul	Wd	0			12	
09-Jul	Wd		12	18		
10-Jul	Wd		11		16	1
11-Jul	We	0			17	
12-Jul	We		11		5	9
13-Jul	Wd		2			
14-Jul	Wd					
15-Jul	Wd					
16-Jul	Wd					
17-Jul	Wd		3	2		
18-Jul	We	1				
19-Jul	We		0			
20-Jul	Wd				7	2
21-Jul	Wd		0	7		
22-Jul	Wd	0	1			
23-Jul	Wd		5	8		
24-Jul	Wd				8	

<sup>1</sup> Period A (0600-0859), Period B (0900-1159), Period C (1200-1459), Period D (1500-1759), Period E (1800-2100).

<sup>2</sup> Wd = Weekday; We = Weekend/Holiday.

Appendix Table 2. Summary of daily angler effort and catch rates (CPUE) for chinook, sockeye, and chum salmon, rainbow trout, and Dolly Varden from angler interviews on the lower Kanektok River, 1987.

Date	We/ Wd <sup>1</sup>	Sample Size	Effort		Catch														
			Mean	SE <sup>2</sup>	Chinook			Sockeye			Chum			Rainbow Trout			Dolly Varden		
					Mean	SE <sup>2</sup>	CPUE	Mean	SE <sup>2</sup>	CPUE	Mean	SE <sup>2</sup>	CPUE	Mean	SE <sup>2</sup>	CPUE	Mean	SE <sup>2</sup>	CPUE
6/20	We	9	2.000	0.350	0.890	0.261	0.445	0.000	0.000	0.000	0.000	0.000	0.000	0.110	0.111	0.056	0.000	0.000	0.000
6/21	We	6	5.800	1.050	2.170	1.046	0.373	0.000	0.000	0.000	0.000	0.000	0.170	0.167	0.029	0.000	0.000	0.000	
6/22	Wd	13	2.200	0.510	1.690	0.472	0.763	0.000	0.000	0.000	0.620	0.432	0.277	0.000	0.000	0.000	0.150	0.154	0.069
6/23	Wd	9	5.600	0.800	4.670	1.818	0.840	0.000	0.000	0.000	0.330	0.236	0.060	0.000	0.000	0.000	0.000	0.000	0.000
6/24	Wd	6	1.400	0.290	0.830	0.477	0.611	0.000	0.000	0.000	0.170	0.167	0.122	0.000	0.000	0.000	0.000	0.000	0.000
6/25	Wd	9	0.700	0.250	1.000	0.373	1.424	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6/26	We	13	6.200	0.310	4.080	0.763	0.659	0.000	0.000	0.000	0.230	0.166	0.037	0.000	0.000	0.000	0.000	0.000	0.000
6/27	We	13	3.400	0.710	1.080	0.309	0.321	0.000	0.000	0.000	0.380	0.311	0.115	0.920	0.923	0.275	0.620	0.615	0.184
6/30	Wd	5	1.000	0.430	1.600	0.678	1.550	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7/01	Wd	17	4.400	0.470	2.650	0.477	0.601	0.000	0.000	0.000	0.180	0.095	0.040	0.060	0.059	0.013	0.060	0.059	0.013
7/02	Wd	16	6.600	0.770	2.560	0.598	0.390	0.190	0.101	0.029	0.630	0.239	0.095	0.380	0.180	0.057	0.060	0.063	0.010
7/03	We	17	1.800	0.390	2.000	1.061	1.117	0.290	0.206	0.164	0.880	0.461	0.493	0.060	0.059	0.033	0.060	0.059	0.033
7/04	We	6	4.800	0.960	6.330	2.390	1.326	0.000	0.000	0.000	2.500	1.384	0.523	0.000	0.000	0.000	0.000	0.000	0.000
7/05	We	16	1.500	0.520	0.440	0.128	0.284	0.130	0.125	0.081	0.630	0.407	0.406	0.000	0.000	0.000	0.250	0.194	0.162
7/06	Wd	5	0.800	0.060	1.000	0.316	1.176	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7/07	Wd	6	3.300	0.500	1.170	0.167	0.359	0.000	0.000	0.000	0.170	0.167	0.051	0.000	0.000	0.000	0.000	0.000	0.000
7/08	Wd	10	7.400	0.350	2.500	1.213	0.340	3.200	2.215	0.435	2.300	0.907	0.313	0.200	0.200	0.027	0.000	0.000	0.000
7/09	Wd	17	2.300	0.350	1.120	0.283	0.476	0.120	0.081	0.050	1.350	0.562	0.576	0.120	0.081	0.050	0.060	0.059	0.025
7/10	Wd	5	4.300	2.010	2.600	1.249	0.609	0.000	0.000	0.000	0.400	0.400	0.094	0.000	0.000	0.000	0.000	0.000	0.000
7/11	We	12	5.700	0.860	1.170	0.441	0.204	0.170	0.167	0.029	3.250	1.366	0.567	0.000	0.000	0.000	0.080	0.083	0.015
7/12	We	13	3.400	0.570	0.460	0.215	0.136	0.000	0.000	0.000	0.150	0.154	0.045	0.620	0.432	0.181	0.000	0.000	0.000
7/13	Wd	3	1.600	0.080	1.330	1.333	0.842	0.000	0.000	0.000	0.330	0.333	0.211	0.330	0.333	0.211	0.000	0.000	0.000
7/17	Wd	3	0.800	0.000	0.330	0.333	0.444	0.000	0.000	0.000	1.330	0.667	1.778	0.000	0.000	0.000	0.000	0.000	0.000
7/18	We	3	0.800	0.250	0.670	0.667	0.889	0.000	0.000	0.000	1.330	0.882	1.778	0.000	0.000	0.000	0.330	0.333	0.444
7/20	Wd	9	1.900	0.650	0.670	0.236	0.360	0.000	0.000	0.000	0.440	0.242	0.240	0.000	0.000	0.000	0.110	0.111	0.060
7/21	Wd	2	2.400	0.476	0.000	0.204	0.000	0.000	0.000	0.000	5.500	0.206	2.273	0.000	0.000	0.000	0.000	0.000	0.000
7/22	Wd	3	6.300	0.476	0.000	0.000	0.000	0.000	0.000	0.000	4.670	0.541	0.737	0.000	0.000	0.000	1.000	0.118	0.158
7/23	Wd	15	2.800	0.476	0.470	0.204	0.165	0.270	0.035	0.094	2.600	0.541	0.921	0.200	0.051	0.071	0.000	0.000	0.000

<sup>1</sup> Wd = Weekday; We = Weekend/Holiday.

<sup>2</sup> Standard error.

Appendix Table 3. Summary of daily angler effort and harvest rates (CPUE) for chinook, sockeye, and chum salmon, rainbow trout, and Dolly Varden from angler interviews on the lower Kanektok River, 1987.

Date	We/Wd <sup>1</sup>	Sample Size	Effort		Catch															
			Mean	SE <sup>2</sup>	Chinook			Sockeye			Chum			Rainbow Trout			Dolly Varden			
					Mean	SE <sup>2</sup>	CPUE	Mean	SE <sup>2</sup>	CPUE	Mean	SE <sup>2</sup>	CPUE	Mean	SE <sup>2</sup>	CPUE	Mean	SE <sup>2</sup>	CPUE	
6/20	We	9	2.000	0.350	0.220	0.147	0.111	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.110	0.111	0.056	0.000	0.000	0.000
6/21	We	6	5.800	1.050	0.330	0.211	0.057	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.170	0.167	0.029	0.000	0.000	0.000
6/22	Wd	13	2.200	0.510	0.310	0.175	0.139	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6/23	Wd	9	5.600	0.800	0.220	0.147	0.040	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6/24	Wd	6	1.400	0.290	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6/25	Wd	9	0.700	0.250	0.110	0.111	0.158	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6/26	Wd	13	6.200	0.310	0.690	0.286	0.112	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6/27	We	13	3.400	0.710	0.460	0.183	0.138	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6/30	Wd	5	1.000	0.430	0.400	0.245	0.388	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7/01	Wd	17	4.400	0.470	0.410	0.258	0.093	0.060	0.059	0.013	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7/02	Wd	16	6.600	0.770	0.250	0.194	0.038	0.060	0.063	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7/03	We	17	1.800	0.390	0.180	0.095	0.099	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7/04	We	6	4.800	0.960	0.830	0.401	0.174	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7/05	We	16	1.500	0.520	0.190	0.101	0.122	0.000	0.000	0.000	0.130	0.125	0.081	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7/06	Wd	5	0.800	0.060	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7/07	Wd	6	3.300	0.500	0.330	0.211	0.103	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7/08	Wd	10	7.400	0.350	0.500	0.269	0.068	0.100	0.100	0.014	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7/09 <sup>a</sup>	Wd	17	2.300	0.350	0.290	0.143	0.125	0.000	0.000	0.000	0.060	0.059	0.025	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7/10	Wd	5	4.300	2.010	0.400	0.245	0.094	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7/11	We	12	5.700	0.860	0.330	0.188	0.058	0.670	0.225	0.116	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7/12	We	13	3.400	0.570	0.380	0.180	0.113	0.150	0.154	0.045	0.000	0.000	0.000	0.310	0.237	0.090	0.000	0.000	0.000	0.000
7/13	Wd	3	1.600	0.080	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7/17	Wd	3	0.800	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7/18	We	3	0.800	0.250	0.670	0.667	0.889	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.330	0.333	0.444	0.000
7/20	Wd	9	1.900	0.650	0.670	0.236	0.360	0.440	0.242	0.240	0.000	0.000	0.000	0.000	0.000	0.000	0.110	0.111	0.060	0.000
7/21	Wd	2	2.400	0.000	0.000	0.000	0.000	1.500	0.148	0.620	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7/22	Wd	3	6.300	0.470	0.000	0.000	0.000	0.000	0.148	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7/23	Wd	15	2.800	0.470	0.330	0.113	0.118	0.270	0.148	0.940	0.070	0.011	0.024	0.000	0.000	0.000	0.000	0.000	0.000	0.000

<sup>1</sup> Wd = Weekday; We = Weekend/Holiday.

<sup>2</sup> Standard error.