

# **Angler Effort and Catch in the 1995 Lower Fraser River Sport Fishery**

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**by**

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CONTENTS

	Page
LIST OF FIGURES.....	iv
LIST OF TABLES.....	v
LIST OF APPENDICES.....	vi
ABSTRACT.....	viii
RÉSUMÉ.....	ix
INTRODUCTION.....	1
STUDY AREA.....	1
FISHERY REGULATIONS.....	1
METHODS.....	1
STUDY DESIGN.....	1
Access Point Methods.....	3
Overflight Methods.....	3
DATA MANAGEMENT.....	3
DATA ANALYSIS.....	3
Angler Effort.....	4
Catch Per Unit Effort.....	5
Harvest and Release.....	5
Angler Characteristics.....	6
RESULTS.....	6
SURVEY EFFORT.....	6
ANGLER EFFORT.....	6
Daily Profile.....	6
Total Angler Effort.....	6
CATCH PER UNIT EFFORT.....	6
TOTAL CATCH.....	11
MARKED CATCH.....	11
ANGLER CHARACTERISTICS.....	11
DISCUSSION.....	13
ANGLER RESPONSE VERIFICATION.....	14
INCOMPLETE INTERVIEW BIAS.....	14
FISHERY CHARACTERISTICS.....	14
COMPARISON TO PREVIOUS FISHERIES.....	16
RECOMMENDATIONS.....	19
SUMMARY.....	19
ACKNOWLEDGMENTS.....	19
REFERENCES.....	20

**LIST OF FIGURES**

<b>Figure</b>		<b>Page</b>
1.	Lower Fraser River sport fishery survey study area .....	2
2a.	Hourly angler effort profiles by month and day type in the 1995 lower Fraser River sport fishery, Region 3 .....	8
2b.	Hourly angler effort profiles by month and day type in the 1995 lower Fraser River sport fishery, Region 3 .....	9
3.	CPUE by species, month and region in the 1995 lower Fraser River sport fishery .....	10
4.	Fishery performance (angler effort and CPUE) in relation to chinook abundance in the 1995 lower Fraser River sport fishery .....	15
5.	Monthly angler effort by year in the lower Fraser River sport fishery .....	18

**LIST OF TABLES**

<b>Table</b>		<b>Page</b>
1.	A summary of the 1995 lower Fraser River sport fishery regulations .....	4
2.	Harvest, release and angler effort by species and month in the 1996 lower Fraser River sport fishery .....	7
3.	Angler characteristics, catch, HPUE and HPT by month in the 1995 lower Fraser River sport fishery .....	12
4.	Angler effort and adult chinook harvest per unit effort (HPUE) by month and year in the lower Fraser River sport fishery .....	17
5.	Rod counts outside and inside the 1995 study area during the 1995 and 1986 - 1988 lower Fraser River sport fisheries .....	18

**LIST OF APPENDICES**

<b>Appendix</b>	<b>Page</b>
1a. Week-specific interview responses at Wellington bar (Region 3) during June and July in the 1995 lower Fraser River sport fishery .....	22
1b. Week-specific interview responses at Wellington bar (Region 3) during August and September in the 1995 lower Fraser River sport fishery .....	23
1c. Week-specific interview responses at Gill bar (Region 3) during June and July in the 1995 lower Fraser River sport fishery .....	24
1d. Week-specific interview responses at Gill bar (Region 4) during August and September in the 1995 lower Fraser River sport fishery .....	25
1e. Week-specific interview responses at Pegley bar during August and September in the 1995 lower Fraser River sport fishery .....	26
1f. Week-specific interview responses at Wing Dam bar during September in the 1995 lower Fraser River sport fishery .....	27
1g. Week-specific interview responses at Coquihalla bar during June in the 1995 lower Fraser River sport fishery .....	28
2. Overflight angler counts by month, day type and area in the 1995 lower Fraser River sport fishery .....	29
3a. Angler effort, harvest and release by region during June in the 1995 lower Fraser River sport fishery .....	30
3b. Angler effort, harvest and release by region during July in the 1995 lower Fraser River sport fishery .....	31
3c. Angler effort, harvest and release by region during August in the 1995 lower Fraser River sport fishery .....	32
3d. Angler effort, harvest and release by region during September in the 1995 lower Fraser River sport fishery .....	33
4. Mean hourly proportion of angler effort in the 1995 lower Fraser River sport fishery by region, month and day type .....	34
5a. Total angler effort, adult chinook harvest and HPUE by trip duration during June and July in the 1995 lower Fraser River sport fishery .....	35
5b. Total angler effort, adult chinook harvest and HPUE by trip duration during August in the 1995 lower Fraser River sport fishery .....	36
5c. Total angler effort, sockeye harvest and HPUE by trip duration during August in the 1995 lower Fraser River sport fishery .....	36

**APPENDICES (cont'd)**

5d.	Total angler effort, pink harvest and HPUE by trip duration during August in the 1995 lower Fraser River sport fishery .....	37
5e.	Total angler effort, adult chinook harvest and HPUE by trip duration during September in the 1995 lower Fraser River sport fishery .....	37
5f.	Total angler effort, sockeye harvest and HPUE by trip duration during September in the 1995 lower Fraser River sport fishery .....	38
5g.	Total angler effort, pink harvest and HPUE by trip duration during September in the 1995 lower Fraser River sport fishery .....	38
6.	Mean monthly catch (harvest and release) per angler hour by region in the 1995 lower Fraser River sport fishery .....	39

**ABSTRACT**

Bratty, J.M., R.E. Diewert, J. Irvine, V. Palermo, and A. S. Thompson. 1998. Angler effort and catch in the 1995 lower Fraser River sport fishery. *Can. Manuscr. Rep. Fish. Aquat. Sci.* 2469: 39 p.

The lower Fraser River mainstem recreational fishery was assessed annually by creel survey from 1985 to 1990. Assessment of the fishery was suspended until 1995 when, once again, an access point/overflight hybrid survey design was utilized to evaluate angler characteristics and estimate catch. The survey focused on assessing angler effort and distribution and estimating the harvest and release of chinook (*Oncorhynchus tshawytscha*), sockeye (*O. nerka*) and pink (*O. gorbuscha*) salmon in the study area. A total of 6,171 angler interviews and 32 overflights were conducted between June 3 and September 29. An estimated 374,510 angler hours were expended during the survey, resulting in the harvest of 5,501 adult chinook, 1,620 jack chinook, 6,376 sockeye and 22,888 pink salmon. Estimated releases totaled 420 adult chinook, 111 jack chinook, 3,312 sockeye and 73,160 pink salmon.

This important recreational fishery has grown since the last series of surveys, as evidenced by the increase in angler effort and harvest of chinook. The harvest and release of sockeye and pink salmon was also considerable in 1995 but no data is available for comparison from previous years. Compared to previous surveys, angler distribution in the lower Fraser River during 1995 was more concentrated between the Sumas and Coquihalla rivers.

The report concludes with recommendations for the future management and assessment of the fishery.

**Key words:** lower Fraser River, sport fisheries, chinook salmon, sockeye salmon, pink salmon, angler effort, harvest, release

## RÉSUMÉ

Bratty, J.M., R.E. Diewert, J. Irvine, V. Palermo, and A. S. Thompson. 1998. Angler effort and catch in the 1995 lower Fraser River sport fishery. *Can. Manuscr. Rep. Fish. Aquat. Sci.* 2469: 39 p.

La pêche sportive dans le bras principal du cours inférieur du Fraser a fait l'objet de 1985 à 1990 d'une évaluation annuelle par enquête sur le terrain. Les relevés ont été suspendus jusqu'en 1995, année où on a repris les relevés hybrides point d'accès/survol aérien pour évaluer les caractéristiques des pêcheurs et estimer les captures. Les relevés visaient à évaluer l'effort de pêche sportive et sa distribution, et à estimer le nombre de prélèvements et de graciations de quinnats (*Oncorhynchus tshawytscha*), de saumons rouges (*O. nerka*) et de saumons roses (*O. gorbuscha*) dans la zone d'étude. Au total, 6 171 entrevues avec des pêcheurs ont été réalisées et 32 survols effectués entre le 3 juin et le 29 septembre. Pendant la durée du relevé, on estime à 374 510 le nombre d'heures consacrées à la pêche sportive, qui ont eu pour résultat le prélèvement de 5 501 quinnats adultes, 1 620 jacks de quinnat, 6 376 saumons rouges et 22 888 saumons roses. On estime que le nombre de graciations se monte à 420 quinnats adultes, 111 jacks de quinnat, 3 312 saumons rouges et 73 160 saumons roses.

Cette importante pêche sportive a connu un essor depuis la dernière série de relevés, comme le montre l'augmentation de l'effort de pêche et des captures de quinnats. La capture avec graciación de saumons rouges et de saumons roses a été aussi considérable en 1995, mais l'absence de données empêche la comparaison avec les années précédentes. Par rapport aux relevés antérieurs, on note que la distribution des pêcheurs sportifs en 1995 dans le cours inférieur du Fraser était plus concentrée entre les rivières Sumas et Coquihalla.

Le rapport s'achève sur des recommandations pour l'avenir de la gestion et de l'évaluation de cette pêche.

**Mots clés :** cours inférieur du Fraser, pêche sportive, quinnat, saumon rouge, saumon rose, effort de pêche sportive, prélèvements, graciación.

## INTRODUCTION

The lower 150 km of the Fraser River mainstem supports a year-round recreational fishery that has been described as one of the largest river sport fisheries in British Columbia (Mosley MS 1983; DPA Group MS 1985a; Schubert 1992a). This fishery harvests all five species of Pacific salmon (*Oncorhynchus spp.*), as well as sturgeon (*Acipenser spp.*), and steelhead (*O. mykiss*), rainbow (*O. mykiss*), and cutthroat (*O. clarki*) trout.

The fishery in the lower Fraser River downstream of Hope, B.C. was evaluated by creel survey from 1985 to 1990. From 1985 to 1988, these studies focused on assessing angler effort and the harvest and release of all species; the 1989 and 1990 studies focused on chinook salmon (*O. tshawytscha*) (Schubert 1992a, 1992b; Schubert and Whyte 1992). In 1995, this fishery was again evaluated by a creel survey which assessed angler effort and estimated the harvest and release of all species. Of particular interest was a re-evaluation of the chinook fishery and an assessment of the relatively new sport fishery targeting sockeye (*O. nerka*) and pink salmon (*O. gorbuscha*). This report describes the results of the 1995 study and details total angler effort, harvest, release, and catch per unit effort (CPUE). Findings are compared to the results of previous creel surveys conducted in the region. The report concludes with an assessment of the fishery and recommendations for future research and management.

## STUDY AREA

The Fraser River watershed drains approximately one third of British Columbia and has an average daily discharge of 2,700 m<sup>3</sup>/s (Environment Canada 1994). The Fraser River mainstem flows 1,350 km from its headwaters in the province's east-central interior before entering the Strait of Georgia near Vancouver, B.C.. The lower 150 km of the river (below Hope) averages 600 m in width (5 km maximum at freshet), with mid-channel and shore gravel bars emerging at lower river levels (Fraser et al. 1982).

The 1995 study focused on the 60 km section of the Fraser River between the confluences of the Sumas and Coquihalla rivers (Fig. 1). This

area was targeted for evaluation because previous studies reported that the majority of the recreational harvest of chinook salmon occurred in this section of the river (Schubert 1992b).

The study area was divided into two regions, as described by Schubert (1992b). Region 3 was delineated by the Sumas and Harrison Rivers, and contained many mid-channel bars and treed islands. Interviews were conducted at Wellington, Pegley, and Wing Dam bars (Fig. 1). Region 4, which extended from the Harrison River to the Coquihalla River, was less braided and largely restricted to a single channel, especially above Waleach Slough. Surveyors in Region 4 were stationed at Gill and Coquihalla River bars (Fig. 1).

## FISHERY REGULATIONS

The 1995 lower Fraser River mainstem sport fishery was managed by size restrictions, area restrictions, daily and annual bag limits, and fishing time restrictions (Table 1). The daily harvest limit for all species of salmon combined was 4. The adult chinook limit was 1 fish over 50 cm (over 62 cm after September 2) per day, with an annual bag limit of 10. The limit on jack chinook (i.e., fish between 30 and 50 (62 after Sept. 2) cm) was 1 per day. Harvest of sockeye and pink salmon was limited to a combined total of 4 fish per day, including a maximum of 2 sockeye, with all fish over 30 cm. The harvest of chum salmon (*O. keta*) was limited to 1 per day over 30 cm. There were no annual bag limits on sockeye, pink or chum salmon.

The chinook and chum fisheries were open to retention from May 27 to December 31 and from September 2 to October 8, respectively. The sockeye and pink fishery was initially open to retention from July 29 to October 15. Adjustments to the sockeye opening, based on run size projections and conservation concerns, were made in season and resulted in closure of the sockeye fishery between July 29 and August 3, and August 12-16 (Table 1).

## METHODS

### STUDY DESIGN

The lower Fraser River sport fishery was

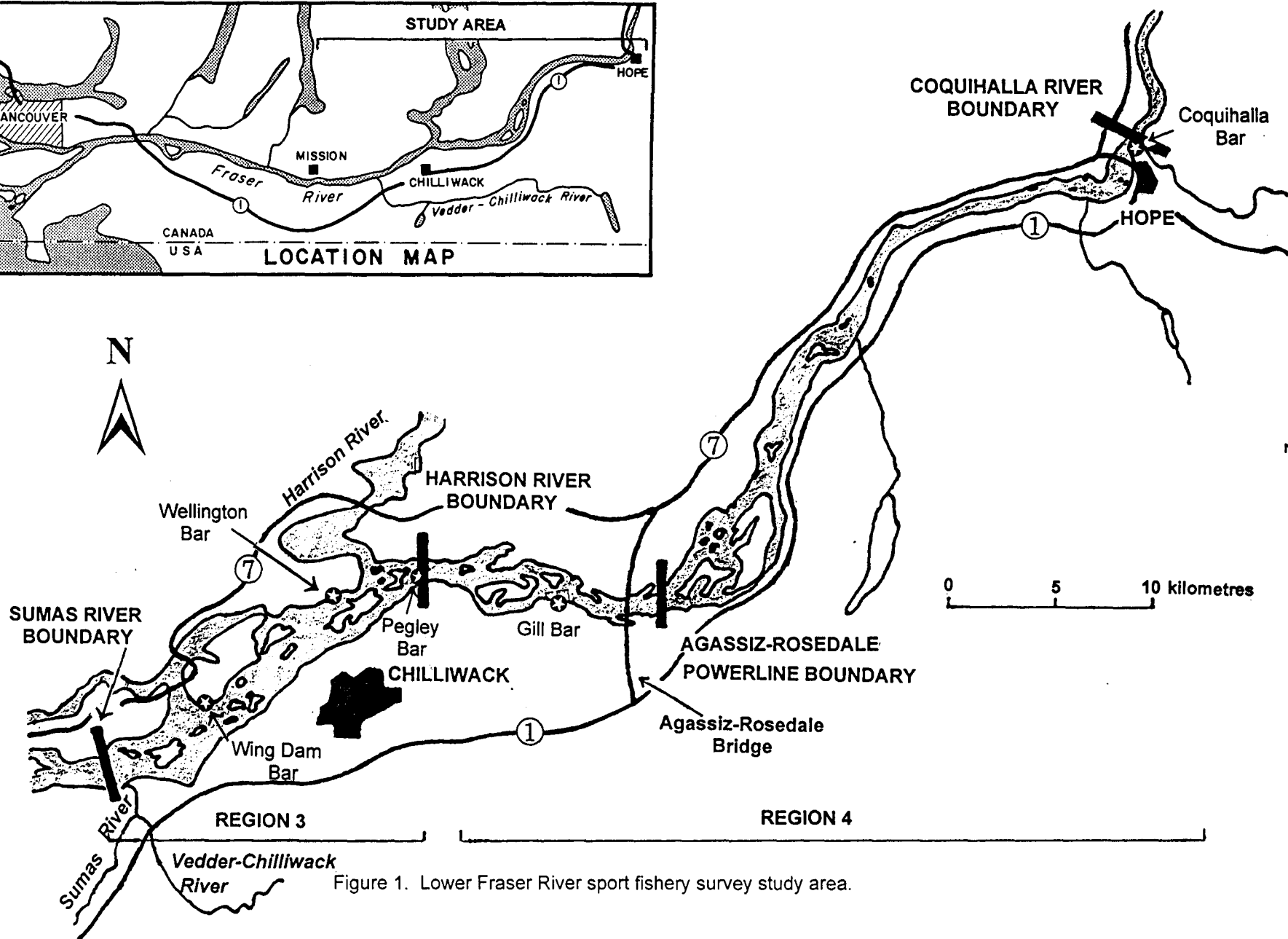
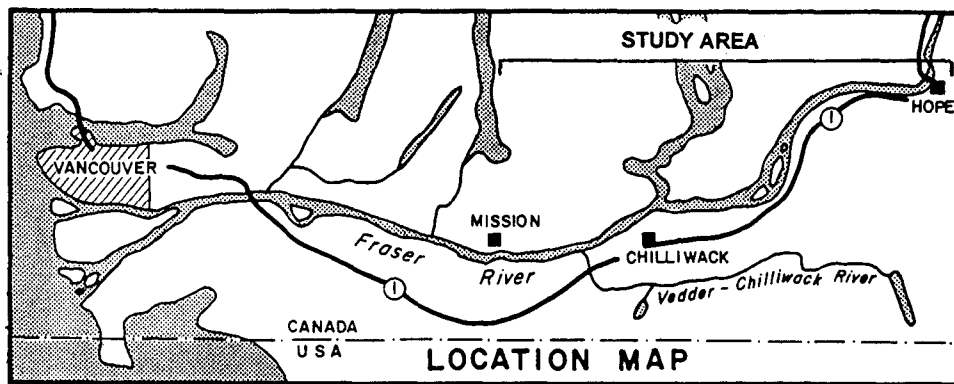


Figure 1. Lower Fraser River sport fishery survey study area.

assessed from June 3 to September 29 with a combined access point and overflight creel survey design (DPA Group MS 1985a). An evaluation of the assumptions underlying the study design is presented in the discussion. The section of Region 4 between Waleach Slough and Hope was not surveyed in September because very little effort had been observed in the area.

A total of 6,171 angler interviews (Appendix 1; Table 1) and 32 overflights (Appendix 2) were conducted between June 3 and September 29 in the 1995 lower Fraser River sport fishery survey.

### **Access Point Methods**

Two interviewers were stationed separately at points of maximum expected fishing effort. In June, July and August, the surveyor's shifts lasted from 7 a.m. to 3 p.m. (the a.m. shift), or from 1 p.m. to 9 p.m. (the p.m. shift). In September, the p.m. shift was from noon to 8 p.m., to accommodate changes in day length. Shifts were scheduled on all weekend days and holidays, as well as three weekdays per week. Shifts were also scheduled to meet the statistical requirements that at least two a.m. shifts and two p.m. shifts on both weekdays and weekend/holidays were performed at each site every month.

At the start of each shift, anglers were contacted by the surveyor and requested to report for an interview at the end of their fishing trip. In the case of the morning shift, they were also asked if any anglers had left the site before the arrival of the surveyor. The surveyor then remained at the site to conduct exit interviews and hourly rod counts. At the end of each shift, any anglers still fishing were interviewed in an incomplete trip interview. All interviews collected information on trip length, target species, number and species harvested or released, and gear type. An interview form was completed for each angler; however, if the angler was unresponsive or if response reliability was questionable, the form was voided.

Throughout the survey, interviewers evaluated the ability of anglers to recall trip length and to predict subsequent trip length. Individual anglers were asked how long they planned to fish at a given site and interviewers kept track of actual trip

length. Also, individual anglers were noted and tracked from arrival to departure. Upon leaving the fishing area these individuals were asked how long they had been fishing. Differences between actual and reported fishing times were noted.

### **Overflight Methods**

Two overflights of the study area were conducted each week, one on a weekday and one on a weekend or holiday. Appropriate interview sites (i.e., points of maximum effort) were determined from the previous month's overflight counts. Anglers (rods fishing) were counted from a Cessna 182, flying 30 m above the water at approximately 130 kph. Flights were conducted at the same time each day (1100h) and lasted about 1.5 h. Two observers seated on the same side of the plane made independent rod counts. The counts and times of observation were recorded on study area maps. These were later compiled to provide mean daily rod counts by bar and region, and for the entire study area. Overflights of the region downstream of the study area (i.e., between the George Massey tunnel crossing and the Sumas River confluence) were conducted on one weekday per month from July to September. Angler rod counts were used to examine the distribution of effort within and outside the study area and to compare 1995 angler distribution with patterns observed in past studies.

### **DATA MANAGEMENT**

Data management and analytic procedures are detailed in Schubert (1992a, 1992b) and Schubert and Whyte (1992). The methodology is reprinted below with relevant modifications.

Data storage and analysis were conducted on a microcomputer. A custom designed data entry program performed 31 automatic error checks, including duplication detection, code validity, and range and consistency verification (DPA Group 1985b). The entry program generated ASCII files, which were imported into a spreadsheet program to verify data entry, and into an analytic program for analysis (DPA Group 1986).

### **DATA ANALYSIS**

Prior to performing the analysis algorithms,

Table 1. A summary of the 1995 lower Fraser River sport fishery regulations.

Location	Open to retention	Species	Angler catch limits		Size limits <sup>b</sup>	Days open Total
			Daily <sup>a</sup>	Annual		
Mouth	May 27 - Sept 1	Chinook	1	10	> 50 cm	98
to Agassiz	Sept 2 - Dec 31	Chinook	1	10	> 62 cm	121
	Sept 2 - Oct 8	Chum	1	-	> 30 cm	36
Mission to Coquihalla R.	July 29 - Oct 15 <sup>c</sup>	Sockeye	2	-	> 30 cm	60
		Pink	4	-	> 30 cm	79
Agassiz to Alexander Br.	May 27 - Dec 31	Chinook	1	10	> 50 cm	219

<sup>a</sup> Daily limit for all salmon species combined was 4 adults.

<sup>b</sup> Size was measured as nose-fork length.

<sup>c</sup> Except July 29 to Aug 3 and Aug 12 to Aug 16, when the retention of sockeye was not permitted.

data were stratified according to region, site, month, day type (weekday or weekend/holiday), day, hour, and stint. Days were divided into three stints: the period of overlap between a.m. and p.m. shifts and the a.m. and p.m. shifts outside the overlap period. Stratification allowed the appropriate weighting of interview and overflight data.

### Angler Effort

Monthly angler effort profiles were generated, by region, from hourly rod counts at the survey sites, with effort outside the survey shifts reconstructed from the interview data. Hourly effort was weighted to compensate for the sampling imbalances resulting from overlapping survey shifts. Mean sample day effort for each stratum (region, month and day type) was equal to the ratio of the mean overflight rod count to the proportion of daily effort occurring during the overflight rod count time block. Total angler effort was the product of the mean daily angler effort and the number of days in the stratum. The mathematical relationships are reported below, with variance calculations detailed in Schubert and Whyte (1992).

- 1) Estimated total rods fishing by hour ( $j$ ) and day type( $h$ ) :

$$\hat{R}_{hj} = \sum_i N_h / n_{hij} \sum_k r_{hijk}$$

- 2) Estimated proportion of the daily angler

effort occurring during the instantaneous rod count time block, by day type:

$$\bar{P}_{hj} = \frac{\hat{R}_{hj}^*}{\sum_j \hat{R}_{hj}}$$

- 3) Estimated mean rod count during the instantaneous rod count time block, by day type:

$$\bar{y}_{hj} = \sum_k \frac{y_{hj^*k}}{n_{hj^*}}$$

- 4) Estimated angler effort by day type, in hours:

$$E_h = N_h \frac{\bar{y}_{hj}}{P_{hj}}$$

- 5) Estimated study period angler effort ( $E$ ), in hours:

$$E = \sum_h E_h$$

where:

- $N_h$  = total study period days of day type  $h$  (weekday or weekend);
- $n_{hij}$  = number of interview sample days on day type  $h$  at site  $i$  during hour  $j$ ;
- $r_{hijk}$  = rod count on day type  $h$  at site  $i$  at hour  $j$  on day  $k$ ;
- $\hat{R}_{hj}^*$  = estimated total effort (hours) on day type  $h$  during the instant-aneous rod count time ( $j^*$ );

$Y_{hj*k}$  = instantaneous rod count on day type  $h$  on day  $k$ ;  
 $n_{hj*}$  = number of instantaneous rod counts on day type  $h$ .

$X_{hilfqu}$  = catch to time of interview by angler  $u$  leaving in time block  $q$  on stint  $f$  of stint type  $l$  at site  $i$  on day type  $h$ ;  
 $t_{hilfqu}$  = hours fished to time of interview by angler  $u$  leaving in time block  $q$  on stint  $f$  of stint type  $l$  at site  $i$  on day type  $h$ .

**Catch Per Unit Effort**

CPUE was calculated by region and day type for each species and mark group using a total ratio estimator (Von Geldern, Jr. and Thomlinson 1973; Malvestuto 1983) i.e., the total estimated catch was divided by the total estimated effort (to time of interview). Estimates were derived from interview data weighted in two ways: 1) by the proportion of stints that were surveyed, and 2) to account for the hourly proportion of anglers leaving the site without an interview. CPUE was calculated separately for harvested (HPUE) and released (RPUE) fish; however, RPUE was not calculated by mark type because angler mark recognition was considered unreliable. The mathematical relationships are reported below, with variance calculations detailed in Schubert and Whyte (1992).

6) Estimated monthly catch to time of interview at the survey sites by region and day type:

$$\hat{X}_h = \sum_i \sum_l \frac{1}{a_{hil}} \sum_f \sum_q \sum_u \frac{X_{hilfqu}}{a_{hilfq}}$$

7) Estimated monthly angler hours to time of interview at the survey sites by region and day type:

$$\hat{T}_h = \sum_i \sum_l \frac{1}{a_{hil}} \sum_f \sum_q \sum_u \frac{t_{hilfqu}}{a_{hilfq}}$$

8) Estimated catch per angler hour at the survey sites by region and day type:

$$\bar{c}_h = \frac{\hat{X}_h}{\hat{T}_h}$$

where:

$a_{hil}$  = proportion of monthly stints of type  $l$  for site  $i$  on day type  $h$  which were surveyed;

$a_{hilfq}$  = proportion of anglers leaving in time block  $q$  on stint  $f$  of stint type  $l$  at site  $i$  on day type  $h$  who were interviewed;

However, before calculating CPUE, the raw interview data were tested for significant differences in CPUE between all interviews and complete trip interviews. The test used, from Cochran (1977), was:

9) Estimated variance of the difference between two ratios  $Var(\bar{c}_c - \bar{c}_t)$ :

$$Var(\bar{c}_c - \bar{c}_t) = Var(\bar{c}_c) + Var(\bar{c}_t)$$

where:

$Var(\bar{c}_c)$  = variance of CPUE from complete trip interviews:

$$\frac{1}{n(n-1)\bar{t}^2} (\sum x_u^2 - 2\bar{c}_c \sum x_u t_u + \bar{c}_c^2 \sum t_u^2)$$

$Var(\bar{c}_t)$  = variance of CPUE from all interviews, calculated as above.

$\bar{t}$  = mean time to interview.

If  $(\bar{c}_c - \bar{c}_t) \pm (t\text{-table, } 0.95) Var(\bar{c}_c - \bar{c}_t)$  did not include zero the difference was significant. In that case, incomplete trip interviews were excluded from the analysis for that site.

**Harvest and Release**

Monthly regional harvest and release, estimated by species and mark group, was the sum of the weekday and weekend/holiday strata estimates. For each stratum, harvest and release was the product of stratum effort and the corresponding value of HPUE or RPUE.

10) Total monthly catch (C):

$$C = \sum_h \bar{c}_h E_h$$

## Angler Characteristics

Several unweighted angler attributes were also summarised by site and week. These were: party size, mean angler day length (from complete trip, incomplete trip and all interviews), preferred species, gear type, mean angler day length and harvest on the angler's most recent trip. Study period mean angler day length was calculated from site-specific interview data.

## RESULTS

The fishery targeted Chinook, sockeye and pink salmon most heavily, but catches included coho (*O. kisutch*) and chum (*O. keta*) salmon, as well as sturgeon and steelhead, rainbow and cutthroat trout. Survey effort, total angler effort, harvest and release by species, and CPUE by species are detailed below.

### SURVEY EFFORT

The study period included 73 weekdays and 46 weekend/holiday days, of which 67% and 100% were sampled, respectively. The number of interviews conducted each month increased from June (1,305) to September (1,851), with 70% of all interviews occurring in Region 3. Ninety-four percent of the interviews were conducted at three sites: Wellington (51%), Gill (28%) and Pegleg (15%) bars.

The bars surveyed in the study accounted for 48% of the fishery's total observed effort. The proportion of the total effort taking place at the survey sites each month ranged from 37% in September to 68% in June (Table 2). The proportion of the total effort that took place at survey sites in Regions 3 and 4 was 50% and 33%, respectively (Appendix 3). Survey efficiency, or the proportion of the total estimated effort that was interviewed, ranged from 6% in September to 15% in June (Table 2). Survey efficiency averaged 9% for the study (Appendix 3).

### ANGLER EFFORT

Total angler effort by month is detailed in Table 2. Effort breakdowns by region are listed in Appendix 3.

Mean monthly rod counts ranged from 94 to 436 on weekdays, and from 173 to 630 on weekends and holidays (August and September, respectively). The single highest rod count (873) occurred on Saturday, September 23 (Appendix 2).

### Daily Profile

Anglers fished during the daylight hours, with the peaks in angler effort either occurring between 8 a.m. and 12 noon, or between 4 p.m. and 8 p.m. Daily effort profiles were rarely bimodal (Figs. 2a and 2b; Appendix 4).

Daily effort profiles were similar between months and regions, except during September, when Region 3 weekday and weekend effort peaked in the morning and evening, respectively, while Region 4 showed the opposite pattern (Fig. 2).

### Total Angler Effort

Estimated angler effort from June to September totalled 374,510 hours (69,354 days), 75% of which occurred in Region 3. Monthly effort was highest in July and September (31% and 38% of the estimated total, respectively). Fifty-two percent of the effort in the fishery took place on weekdays. Twenty-seven percent of the total effort occurred at one site (Wellington) (Appendix 1).

### CATCH PER UNIT EFFORT (CPUE)

Catch (harvest plus release) and harvest per unit effort (HPUE) estimates for all species of salmon are reported below. Peak and average CPUE are described by month, region and day type, and the average success rate (proportion of anglers harvesting at least one fish per trip) is noted for each species. In addition, HPUE by trip duration is summarised for chinook, sockeye and pink salmon in Appendix 5. The CPUE, HPUE and RPUE for other species caught in the study area between June and September are detailed in Appendix 6. The values are generally very low and will not be discussed further.

Chinook adult and jack CPUE averaged 0.0158 and 0.0046, respectively, between June and September. Most of the catch was harvested

Table 2. Harvest, release and angler effort by species and month in the 1995 lower Fraser River sport fishery, Regions 3 and 4.

	JUNE	JULY	AUGUST	SEPT	TOTAL	SE <sup>a</sup>
# of Interviews	1,305	1,437	1,578	1,851	6,171	-
# of Overflights	8	7	9	8	32	-
<b>ANGLER EFFORT</b>						
Estimated Effort (hours)	54,310	114,409	63,463	142,328	374,510	66,724
Estimated Effort (days) <sup>b</sup>	11,410	17,282	12,978	26,753	69,354	-
% interviewed <sup>c</sup>	14.5%	8.4%	11.6%	6.3%	9.0%	-
% at survey sites	67.6%	55.5%	41.7%	36.7%	47.6%	-
<b>ESTIMATED HARVEST</b>						
Chinook	1,732	2,993	167	609	5,501	1,338
Chinook jack	61	34	36	1,489	1,620	478
Sockeye	0	0	3,502	2,874	6,376	1,892
Pink	0	0	138	22,750	22,888	6,826
Coho	0	0	0	358	358	191
Chum	0	0	0	60	60	32
Steelhead	0	0	0	17	17	16
Cutthroat	0	0	10	30	40	33
Rainbow	0	0	0	17	17	17
<b>ESTIMATED RELEASE</b>						
Chinook	192	201	10	17	420	193
Chinook jack	0	13	16	82	111	75
Sockeye	0	44	2,816	452	3,312	1,696
Pink	0	0	55	73,105	73,160	23,797
Coho	0	0	0	24	24	18
Chum	0	0	0	64	64	38
Steelhead	4	8	53	9	74	60
Sturgeon	0	8	183	52	243	142
Salmon	4	0	0	0	4	3
Cutthroat	0	18	53	0	71	53
Rainbow	0	43	0	0	43	38

<sup>a</sup> SE = Standard Error

<sup>b</sup> Determined from mean monthly trip length

<sup>c</sup> Ratio of observed (from interviews) and estimated effort

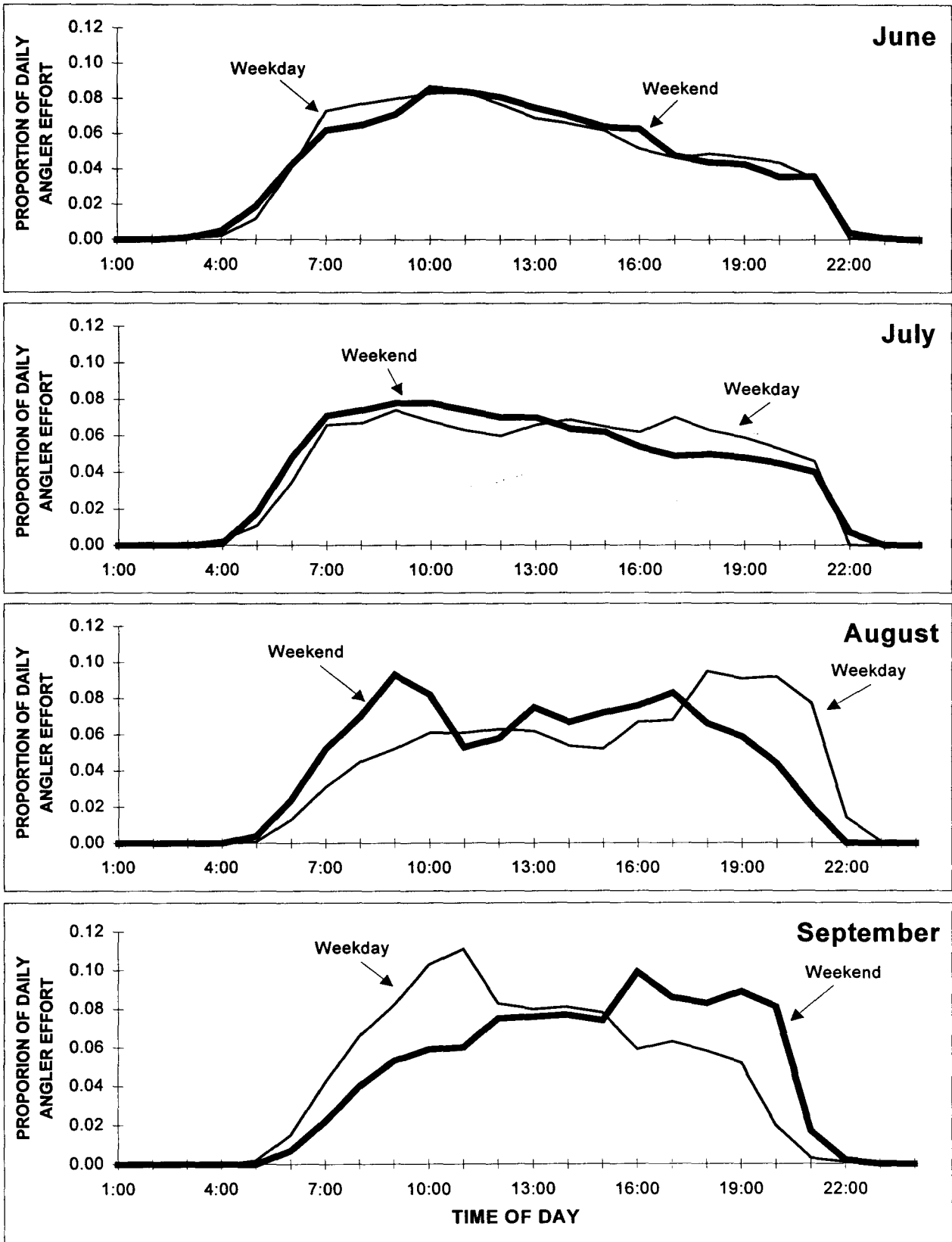


Fig. 2a. Hourly effort profiles by month and day type in the 1995 lower Fraser River sport fishery, Region 3.

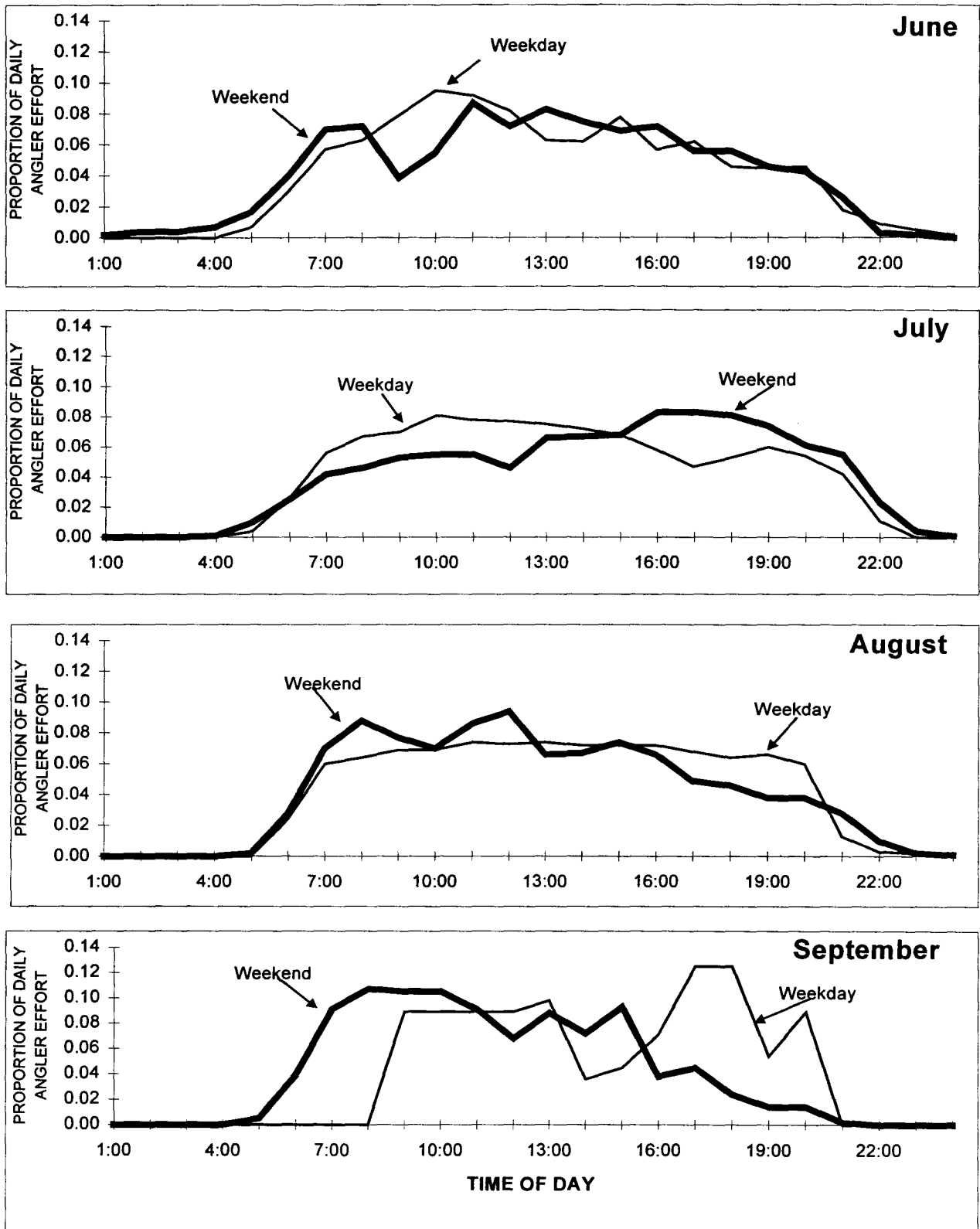


Figure 2b. Hourly effort profiles by month and day type in the 1995 lower Fraser River sport fishery, Region 4.

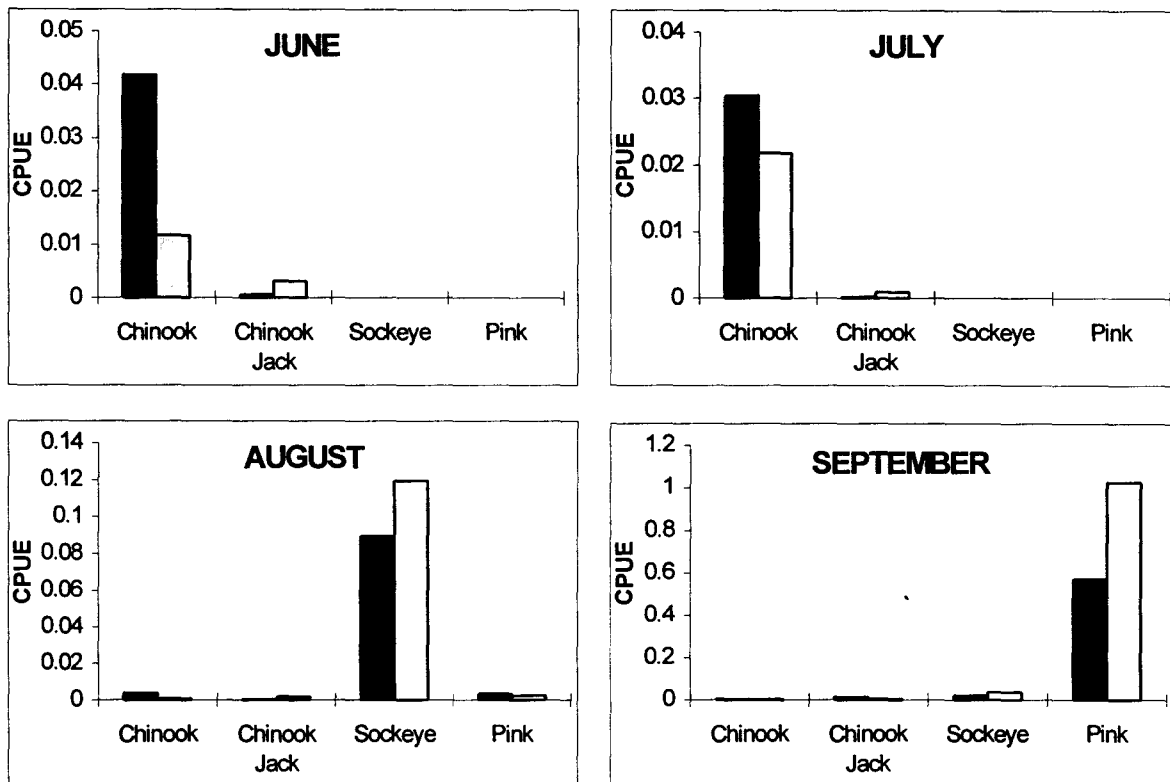


Figure 3. CPUE by species, month and region in the 1995 lower Fraser River sport fishery. Region 3 is darkly shaded; Region 4 is lightly shaded.

- adult and jack HPUE averaged 0.0147 and 0.0043, respectively. CPUE peaked in July (0.0279) for adult chinook, and in September (0.0110) for jack chinook (Fig. 3; Appendix 6).

Adult chinook CPUE was highest in Region 3 during June (0.0418), while jack chinook CPUE peaked in Region 3 during September (0.0124). Average June to September CPUE for chinook adults on weekdays and weekends were 0.0198 and 0.0115, respectively. Average June to September CPUE for chinook jacks on weekdays and weekends were 0.0048 and 0.0045, respectively.

The success rate, or average proportion of anglers harvesting at least one adult chinook per trip, ranged widely from June to September. In June and July, the success rate was approximately 15%. The highest success rate was 24%, among Region 3 anglers in June; however, in August and September this declined

dramatically to below 2%. The average proportion of anglers harvesting at least one jack chinook was less than 2% in all four months.

Sockeye monthly CPUE averaged 0.0471 in the two months that the fishery was open and being assessed (August and September only). On average, 65% of the sockeye caught were harvested (August and September average HPUE was 0.0310). Sockeye CPUE peaked at 0.1194 in Region 4 during August (Fig. 3; Appendix 6). Sockeye CPUE was slightly higher on weekdays than weekends (0.0531 and 0.0414, respectively). The average proportion of anglers harvesting at least one sockeye per trip was 18% in August and 8% in September, with the highest success rate occurring in Region 4 during August (27%).

Pink salmon monthly CPUE averaged 0.4667 during August and September. Peak CPUE occurred during September (0.6735), most notably in Region 4 (1.0262) (Fig. 3; Appendix 6). On average, only 24% of the total pink catch was

harvested. Maximum RPUE occurred during September in Region 4 (0.7743). Pink CPUE was generally much higher on weekdays than weekends (0.5705 vs. 0.3744, respectively). The average proportion of anglers harvesting at least one pink per trip was 1% in August, rising to 33% in September.

Chum salmon were only captured during September in Region 3, at which time CPUE averaged 0.0011. Approximately 50% of all chum salmon captured were harvested.

Coho salmon were not captured in the fishery until September, when CPUE were 0.0030 and 0.0017 for regions 3 and 4, respectively. Over 93% of all coho captured were harvested.

### TOTAL CATCH

A total catch of 5,921 adult chinook, 1,731 jack chinook, 9,688 sockeye, and 96,048 pink salmon represented over 99% of the total catch of all species in the study area. The spatial and temporal harvest and release patterns of these species are discussed below. Study area monthly harvest and release of all species are reported in Table 2. Regional catch patterns are summarised in Appendix 3.

Adult and jack chinook were caught throughout the study period, with peak catches occurring in July for adults (54% of total catch), and in September for jacks (91% of total catch). Over 80% of adult and jack chinook were captured in Region 3, and more than 90% of the chinook captured in the fishery were harvested.

Although a small number of sockeye were landed in July, the fishery was not open to the retention of this species until August 4. The timing of the opening was intended to ensure that weaker sockeye stocks belonging to the early segment of the run reached spawning escapement targets. Sixty-five percent of the total sockeye catch occurred in August, with 61% taken in Region 3. Notably, 55% of the sockeye captured in Region 3 during August were released. These high release rates occurred during a one-week closure to the retention of sockeye, which was implemented due to concerns about run strength.

Over 99% of the total pink catch occurred in September. Although pink CPUE was higher in Region 4, the majority of pinks were captured in Region 3 (66%), due to higher angler effort in that region. In contrast to other species, 76% of the total pink catch was released.

All of the coho and chum salmon harvested in the fishery were captured during September, with Region 3 accounting for 85% and 100% of the coho and chum catch, respectively.

### MARKED CATCH

A summary of the harvest of marked fish is presented in Appendix 7. The only mark type observed in the catch was the adipose fin clip (AFC). Adult chinook with AFCs were harvested in each month of the fishery. Jack chinook and cutthroat trout with AFCs were harvested in June and August, respectively. The AFC incidence was 0.025 for adult chinook, 0.022 for jack chinook, and 0.250 for cutthroat trout.

### ANGLER CHARACTERISTICS

Weekly and site-specific summaries of angler characteristics are presented in Appendix 1.

The majority of anglers in the lower Fraser River mainstem sport fishery fished from shore or from mid-channel gravel bars. Some angling from boats was concentrated at the mouths of the Sumas and Harrison rivers. Anglers generally fished only one area per trip. Anglers fishing for chinook usually used rods set in rod holders driven into the gravel, while anglers intending to harvest sockeye or pink salmon fished with hand-held spinning, casting or fly rods.

Over the course of the study, 94.5% of anglers used lures, and the remainder preferred bait, bait/lure combinations or flies. The proportion of anglers using lures decreased each month, reaching a minimum of 85.9% in September. This trend corresponded with an increase in the proportion of anglers using flies, which peaked at 4.5% in September (Table 3).

Eighty-three percent of anglers interviewed in the survey fished for adult or jack chinook, sockeye or pink salmon. Overall, 51.3% targeted

Table 3. Angler characteristics, catch, HPUE and HPT by month in the 1995 lower Fraser River sport fishery.

		June	July	August	September	Total
	Angler Effort	54,310	114,409	63,463	142,328	374,510
	Gear					
	% using lures	97.2%	99.4%	97.8%	85.9%	94.5%
	% using flies	0.0%	0.0%	0.7%	4.6%	1.6%
Chinook	Harvest	1,732	2,993	167	609	5,501
Adult	% targeting	99.2%	99.7%	20.9%	5.4%	51.3%
	HPUE	0.0319	0.0262	0.0026	0.0043	0.0147
	HPT	0.1518	0.1732	0.0129	0.0228	0.0793
Chinook	Harvest	61	34	36	1,489	1,620
Jack	% targeting	0.0%	0.0%	0.0%	1.6%	0.5%
	HPUE	0.0011	0.0003	0.0006	0.0105	0.0043
	HPT	0.0053	0.002	0.0028	0.0557	0.0234
Sockeye	Harvest	0	0	3,502	2,874	6,376
	% targeting	0.0%	0.0%	76.6%	18.6%	25.0%
	HPUE	0	0	0.0552	0.0202	0.0170
	HPT	0	0	0.2698	0.1074	0.0919
Pink	Harvest	0	0	138	22,750	22,888
	% targeting	0.0%	0.0%	0.0%	23.5%	7.1%
	HPUE	0	0	0.0022	0.1598	0.0611
	HPT	0	0	0.0106	0.8504	0.3300
Coho	Harvest	0	0	0	358	358
	% targeting	0.0%	0.0%	0.0%	0.0%	0.0%
	HPUE	0	0	0	0.0025	0.0010
	HPT	0	0	0	0.0134	0.0051
Chum	Harvest	0	0	0	60	60
	% targeting	0.0%	0.0%	0.0%	0.0%	0.0%
	HPUE	0	0	0	0.0004	0.0002
	HPT	0	0	0	0.0022	0.0009

adult chinook; however, the proportion of anglers trying to catch chinook decreased each month, reaching a minimum of 5.4% in September. The proportion of anglers fishing for sockeye peaked in August at 76.6% and declined to 18.6% in September. Anglers fished for pink salmon in September only, when 23.5% of all anglers interviewed were targeting pinks. Anglers did not

actively fish for chum or coho salmon during the survey (Table 3).

Mean angler trip length was 5.4 hours over the period of study. Trips were longest in July (6.6 hours) and shortest in June (4.8 hours). Average trip lengths were always shorter in Region 4.

The ability of anglers to recall trip length and to predict subsequent trip length was evaluated throughout the study period. The average and maximum deviation between estimated and actual trip length was +0.5 and +1.5 hours, respectively. The average and maximum deviation between estimated and actual subsequent fishing time was +1.0 and +3.5 hours, respectively.

## DISCUSSION

The combined access point/overflight survey design used in this study incorporated the main advantages of both access point surveys (i.e., high proportion of complete trip interviews) and overflight surveys (i.e., able to effectively survey a large area). It avoided the problems of biased catch rate estimates, which are sometimes associated with roving surveys (Robson and Jones 1989).

A major assumption underlying the access point/overflight survey methodology is that either the interview sites are representative of the entire study area, or the proportion of effort occurring at the interview sites is sufficient to make HPUE estimates insensitive to effort occurring at non-survey sites. It was anticipated that this assumption would not be violated in 1995, because anglers were not highly mobile within the study region and effort was generally concentrated at relatively few fishing sites, ensuring that a high proportion of anglers would be interviewed. Previous studies of the lower Fraser River sport fishery have concluded that this assumption in the study methodology was probably not violated (Schubert 1992a; Schubert and Whyte 1992).

To further ensure that the above assumption was satisfied, survey sites were modified in-season in response to changes in monthly and regional catch, effort and CPUE estimates. On average, 48% of the total effort in the study area occurred at the survey sites (Table 2). This compared favourably to creel surveys conducted in the region between 1985 and 1988, when 35% to 43% of the total effort occurred at the survey sites (Schubert 1992b); however, whether the proportion observed in 1995 was sufficient to produce reliable effort and catch estimates for the fishery still needs to be addressed. Schubert (1995) has suggested that if the survey sites

account for a large proportion (>50%) of the total angler effort, the difference between the surveyed sites and the remainder of the fishery would have to be large to appreciably affect effort estimates. Although our 48% result represented a large proportion of the total effort in the study area, future studies should endeavour to improve survey coverage, especially during months when angler effort becomes more widely distributed in the study region. For example, in 1995, the proportion of effort that occurred at the survey sites was relatively high for the first half of the study (68% and 56% in June and July, respectively); however, with increased angler dispersion in August and September, the proportion of the total effort at the survey sites decreased to 42% and 37%, respectively (Table 2). Schubert (1992a) noted a similar increase in effort dispersion in the 1989 lower Fraser River sport fishery and suggested that a violation of survey site representativeness may have occurred. We tested for such a violation by comparing HPUEs among sites. No significant differences existed in HPUE estimates at the survey sites, except for one instance in September, when pink HPUE differed between Wing Dam and Wellington bars. Schubert also found a difference between these sites in 1989 and noted that, because the effort at Wing Dam was much lower than at other locations, its potential influence on the fishery's total catch and effort estimates was considered negligible (Schubert 1992a). We concluded similarly, as effort at Wing Dam bar in 1995 remained low. In general, the 1995 results suggest that, although survey coverage was comparable to previous studies in the area, more error may be associated with the August and September estimates of catch and effort in the study area.

Survey efficiency also compared favourably to results from previous creel surveys in the region. From June to September, efficiency averaged 9%, and ranged between 6% and 15% (Table 2). Schubert (1992b) reported a survey efficiency of 11% and remarked that it was generally good, especially in comparison to the 4.6% result observed in the 1983 to 1988 Strait of Georgia salmon and groundfish creel survey (Shardlow and Collicutt 1989), and the 1984 to 1988 Barkley Sound/Alberni Inlet creel survey result of 5.8% (J.O. Thomas and Associate MS 1988).

## ANGLER RESPONSE VERIFICATION

It was found that anglers were able to recall trip length accurately. Similar observations were noted by Schubert (1992a), during the 1985 to 1988 lower Fraser River creel surveys, and by McEachron *et al.* (1986) and Phippen and Bergersen (1991). The average and maximum deviation between predicted and actual subsequent trip length was slightly greater than for predictions of trip length to the time of interview. While these values are much lower than those reported by previous surveys in the region, when biases of up to +15 hours were observed (Schubert 1992a), and are well within the range observed during creel surveys conducted on the Shuswap River (Schubert 1992a), they do indicate that angler predictions of subsequent trip length are positively biased. Consequently, caution should be used when incomplete trip interview data is used in the calculation of angler day length. This survey included both complete and incomplete trip data; however, the vast majority of the data came from complete trip interviews and therefore the effect on the day length calculation is likely small.

## INCOMPLETE TRIP INTERVIEW BIAS

An important assumption underlying the design of creel surveys which include incomplete interview data is that catch rate estimates based on these interviews will be unbiased (Schubert 1995; Von Geldern and Tomlinson 1973; Malvestuto *et al.* 1978). The survey design used in this study included the collection of both complete and incomplete interview data. We used the test outlined by Schubert (1995) to test for differences in catch rate calculated using complete trip interviews only versus all interviews.

Schubert noted that although the test may not be as sensitive to biases as alternate analyses, it addresses whether the potential differences caused by the inclusion of incomplete trips are statistically significant. When significant differences were detected, the incomplete trip interviews were excluded from the catch estimate algorithm. No biases were detected in the 1995 analyses and therefore all interviews were included in the analyses.

## FISHERY CHARACTERISTICS

Monthly and regional patterns of catch and CPUE were associated with river discharge and salmon migration timing and abundance in the study area. For example, over 95% of the total catch during June and July was comprised of adult and jack chinook salmon (Table 2). These peak catches occurred when upper Fraser River chinook stocks were migrating through the lower river (Fig. 4). Jack chinook catches were also relatively high in September when the Harrison River stock began its spawning migration. Similarly, 90% of the fish captured in August were sockeye, while pinks comprised 94% of the catch in September. These peaks coincided with the bulk of the sockeye and pink spawning migrations, respectively.

Fluctuations in fish abundance in the lower Fraser River affected angler effort, species targeted and gear preference, while also influencing anglers' effectiveness at harvesting fish. Total angler effort increased from June to July. During this period, over 99% of all anglers were targeting chinook salmon. In August, total effort declined and the target species shifted to sockeye (Table 3). RPUE estimates for sockeye were relatively high, with RPUE actually exceeding HPUE in Region 3. This is largely explained by the closures to the retention of sockeye implemented during the first and third weeks of August - 87% of the August sockeye releases at Gill and Wellington bars occurred during these 2 periods (Appendix 1). The closure of the fishery to sockeye retention also partially explained the decrease in angler effort. Overflight rod counts during the closure were less than one half of those observed when the fishery was open to sockeye retention (Appendix 2). Schubert (1992a) noted a similar relationship between allowable fish retention and an angler's decision to participate in a fishery. Future regulation of the lower Fraser River fishery should anticipate such responses.

In September, the increasing abundance of pink salmon in the river was accompanied by an overall increase in angler effort; however, only 23% of anglers were specifically targeting pinks and many more (50%) were participating to catch 'anything'. The higher proportion of non-directed fishing effort may have been due to the presence of a wider range of potential target species.

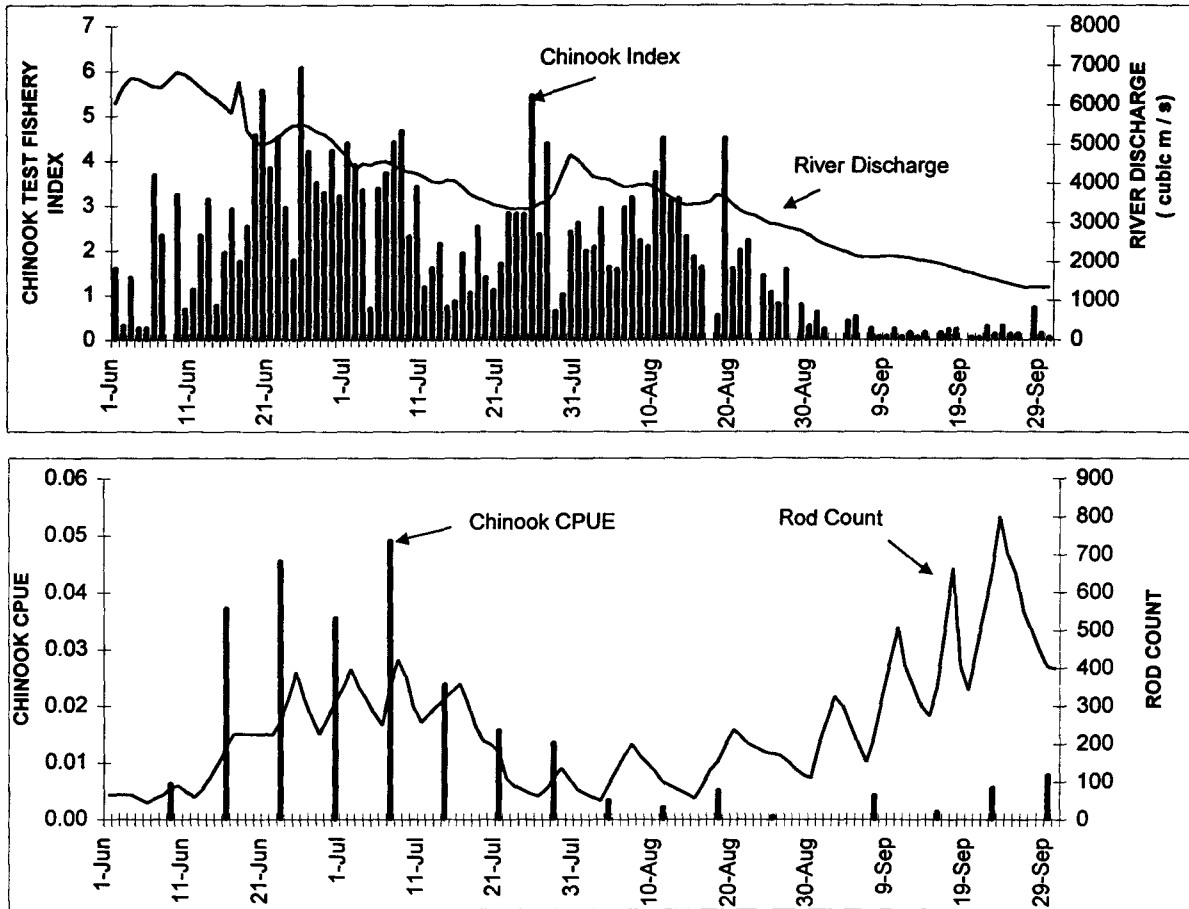


Figure 4. Fishery performance (angler effort and CPUE) in relation to chinook abundance and river level in the 1995 lower Fraser River sport fishery.

It may also have been partially because high pink CPUE levels (0.646) encouraged more 'casual' fishers to participate in the fishery. Schubert (1992b) noted that September effort increases reflected the traditional start of the coho fishery on the lower Fraser River. Our survey indicated that 0% of anglers interviewed during September were targeting coho (Table 3). This discrepancy is likely due, in part, to differences in the two surveys' study areas. Schubert's study included a section of the river downstream of our survey area, where anglers traditionally target coho in the fall.

The capture of chum salmon in the study area was entirely incidental. While this species was harvested during September, 0% of the anglers interviewed were targeting chum (Table 3). This result may indicate a low preference by anglers for this species, a slow response by anglers to

the opening of this new fishery, or low abundance and/or catchability of chum salmon.

The proportion of anglers fly-fishing reached a maximum in September (Table 3). This increase coincided with peak CPUE levels for pinks. Survey responses indicated that all fly fishers interviewed were targeting pink salmon, which suggests that fly fishing opportunities in the lower Fraser River may have been expanded with the opening of the pink salmon sport fishery.

Seasonal patterns in fish abundance also appeared to influence angler effectiveness. In 1995, the average harvest per trip (HPT) of chinook adults and jacks was 0.079 and 0.023, respectively. June and July HPT estimates were substantially higher, likely because fish abundance was greater (i.e. July adult chinook HPT = 0.173). Predictably, sockeye and pink salmon HPT estimates were high in August and

September, averaging 0.158 and 0.568, respectively. These values suggest that anglers were quite effective at harvesting fish throughout the study period.

Analysis of the proportion of anglers harvesting at least one fish per trip indicated that high success rates were enjoyed by anglers targeting sockeye and pinks during August and September (peaked at 27% and 42%, respectively). HPUE by trip duration in the 1995 lower Fraser River sport fishery indicated that in some months HPUE for certain species was greatest for anglers who fished for shorter periods (Appendix 5). This was most notable for the adult chinook fishery during June and July, and likely reflects the fact that anglers who were successful in attaining their daily bag limit at the start of their trip were more inclined to leave quickly. Schubert (1995) noted this situation in other fisheries and suggested that it may result in biased catch estimates, if incomplete trip interview data are used to calculate catch rates.

In our survey, only 12% of the interviews in June and July were from incomplete trips and our tests for catch rate differences using complete trip interviews only versus all interviews did not detect any biases. Consequently, we included all interviews and are confident that our results are unbiased. It is evident, however, that the fishery could not be assessed using a roving survey design, because the resulting high proportion of incomplete interviews would probably result in biased catch rate estimates.

#### **COMPARISON TO PREVIOUS FISHERIES**

It is difficult to compare all aspects of past fisheries, due to variations in fishing regulations and survey coverage. For example, while the fishery was surveyed from 1985 to 1990, the retention of sockeye, pink and chum was not permitted during these years. In addition, the retention of chinook was limited to certain months. Despite these inconsistencies, some interesting observations can be made.

Characteristics of the 1985-90 fisheries are summarised in Table 4. The total harvest of adult chinook salmon was higher in 1995 than in any other year. In fact, the second highest total harvest, which occurred in 1988, is only 35% of

the 1995 harvest. Monthly patterns are similar except during August when the 1995 adult chinook harvest is lower than in 1988 and 1990. This may be due to a lower adult chinook abundance during August in 1995 or may be a result of anglers targeting sockeye in 1995.

A comparison of HPUE between years indicated that 1995 anglers were more effective at harvesting adult chinook; however, this pattern is not consistent across months. For example, while the 1995 had the highest HPUE during June, it ranked second during July, third during August and fourth during September. This result is once again likely due in part to the opening of the fishery in 1995 to the retention of sockeye, pink and chum; however, this does not explain the July result. In this case, the difference is likely due to differences in chinook abundance.

A comparison of angler effort between years indicates that total and monthly effort was greatest during 1995 (Table 4; Fig. 5). While growth in the fishery during August and September was anticipated due to the openings for sockeye, pink and chum salmon it is clear that effort also increased substantially in June and July (Fig. 5). This somewhat surprising result indicates that while the new fisheries may be drawing more anglers to the fishery during August and September, the traditional chinook fishery occurring earlier in the season has also grown dramatically.

The observed increase in effort may either be explained by more anglers participating in the fishery, or the redistribution of effort into the study area. While examining changes in effort distribution outside the study area was not a primary objective of the 1995 survey angler distribution in the entire lower Fraser River was determined from overflights conducted one weekday per month in July, August and September. Angler effort inside and outside the study area contrasted markedly to overflight data averaged from comparable days in 1986, 1987 and 1988 (Table 5). Results suggest a redistribution of effort into the 1995 study area (Regions 3 and 4) from the portion of the Fraser River downstream of the Sumas River confluence (Regions 1 and 2; Schubert 1992a); however, higher total rod counts suggests that the increase

Table 4. Angler effort and adult chinook harvest and harvest per unit effort (HPUE) by month and year in the lower Fraser River sport fishery.

Year	Month	Angler Effort (hours)	Adult Chinook Harvest	HPUE
1985 <sup>a</sup>	September	127,906	161	0.0013
	Total	127,906	161	0.0013
1986 <sup>a</sup>	June	1,063	-	0.0000
	July	9,415	-	0.0000
	August	38,987	10	0.0003
	September	79,626	383	0.0048
	Total	129,091	393	0.0030
1987 <sup>b</sup>	June	4,497	66	0.0147
	July	29,601	1,128	0.0381
	August	30,394	55	0.0018
	September	71,135	311	0.0044
	Total	135,627	1,560	0.0115
1988 <sup>b</sup>	June	1,301	-	0.0000
	July	54,429	991	0.0182
	August	38,461	665	0.0173
	September	61,021	286	0.0047
	Total	155,212	1,942	0.0125
1989 <sup>c</sup>	June	26,212	599	0.0229
	July	64,466	683	0.0106
	Total	90,678	1,282	0.0141
1990 <sup>d</sup>	July	27,482	187	0.0068
	August	32,670	271	0.0083
	Total	60,152	458	0.0076
1995	June	54,310	1,732	0.0319
	July	114,409	2,993	0.0262
	August	63,463	167	0.0026
	September	142,328	609	0.0043
	Total	374,510	5,501	0.0147

<sup>a</sup> Fishery open to the retention of adult chinook from Sept. 1 to Dec. 31. Data from Schubert 1992b.

<sup>b</sup> Fishery open to the retention of adult chinook from July 1 to Dec. 31. Data from Schubert 1992b.

<sup>c</sup> Fishery open to the retention of adult chinook from June 1 to Sept. 22. Data from Schubert 1992a.

<sup>d</sup> Fishery open to the retention of adult chinook from June 1 to June 24 and July 6 to Sept. 3. Data from Schubert and Whyte 1992.

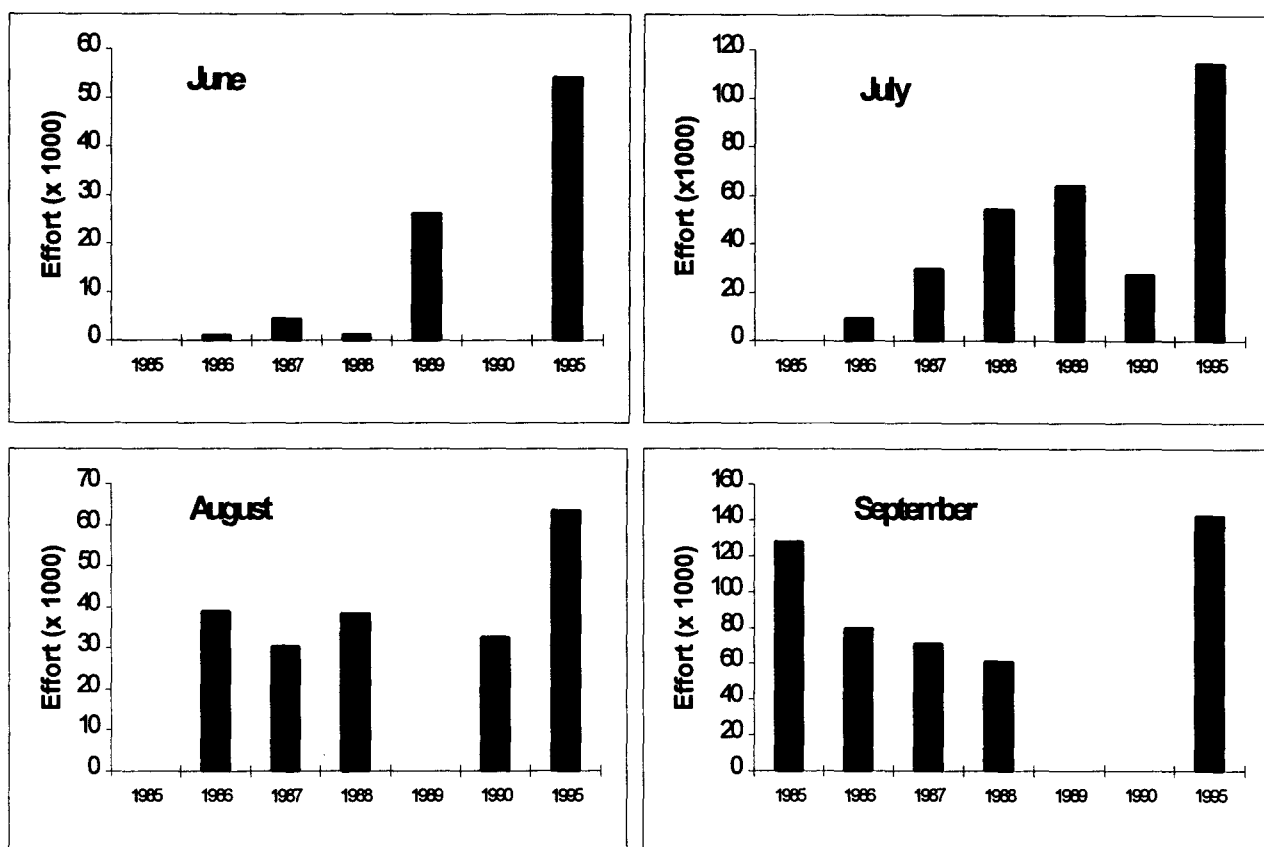


Figure 5. Monthly angler effort by year in the lower Fraser River sport fishery.

Table 5. Rod counts outside and inside the 1995 study area during the 1995 and 1986-1988 lower Fraser River sport fisheries.

Month	Outside study area		Inside study area		Total	
	1986 - 1988 <sup>a</sup>	1995	1986 - 1988 <sup>a</sup>	1995	1986 - 1988 <sup>a</sup>	1995
July	122	39	81	194	203	233
August	154	125	70	240	224	365
September	185	181	178	341	363	522

<sup>a</sup>Average for all years, Schubert 1992b

in effort observed in the 1995 study is not solely a result of effort redistribution but reflects growth of the fishery. A survey in the United States during the early 1980's indicated that the number of anglers was growing five times faster than the population of the country (Everhart and Youngs 1981). Our results suggest that angler participation in the lower Fraser River recreational fishery has increased since the 1986 to 1988 period.

Interannual variation in environmental condit-

ions and salmonid population structure can impact the effectiveness of fisheries. It has been shown that both angler effort and success are influenced by river level (Schubert and Whyte 1992). At high river levels, the most effective fishing sites are flooded and not accessible to anglers. Also, because river discharge partially determines the timing of river entry by returning salmon, the proportion of a run that is vulnerable to the fishery is affected by flow. In 1995, river discharge began to decline in early June, exposing prime fishing locations early in the season. Chinook test fishing

at Mission indicated that peak chinook abundance occurred in the middle of June with only 10% of the migration passing through the lower Fraser River prior to the opening of the sport fishery; therefore, a relatively high proportion of the 1995 run was exposed to harvest during June.

Escapement of chinook to the upper and middle Fraser River and to the Thompson River suggests that chinook abundance in 1995 was relatively (Appendix 8). The combination of ideal river conditions, relatively high chinook abundance (14% above the 1989-95 average) and increased angler effort resulted in the highest chinook catches on record for this fishery. This result compels managers to re-evaluate their understanding of the lower Fraser River sport fishery and its impact on Fraser River salmon.

### RECOMMENDATIONS

1. Assessment of the lower Fraser River sport fishery should continue. The effectiveness of the fishery has increased substantially and its rapid growth and apparent changes in angler distribution warrant further evaluation. The surveys should cover all days that the recreational fishery is open.
2. The harvest and release of species recently included in the Fraser River mainstem sport fishery (i.e. sockeye and pink salmon) needs to be more fully evaluated.
3. Given the marked changes observed in the 1995 study area, other recreational fisheries such as the Fraser River mainstem bar fishery downstream of Sumas River should be re-evaluated.
4. Expanded monitoring programs should endeavour to reassess those lower Fraser River fisheries also targeting coho salmon. The programs should cover all days that the recreational fishery is open.
5. All new fisheries must be assessed in their first year and until effort and catch rates stabilise. Creel surveys should then be conducted every three to five years to document fishery changes.

6. Although estimation precision is at or near acceptable levels, additional improvements may be possible by modifying sampling effort allocation and stratification. Simulation studies are recommended to determine the most appropriate strategy for the fishery.

### SUMMARY

1. The early season (June and July) catch of chinook salmon has increased dramatically since the last creel survey of the lower Fraser River sport fishery. In July 1989, 683 adult chinook were harvested in the study region, and in July 1990, 187 adult chinook were harvested. In July 1995, 2,993 adult chinook were harvested in the study area.
2. New regulations have resulted in a considerable sport harvest and release of sockeye and pink salmon in the lower Fraser River. A total of 9,688 sockeye and 96,048 pinks were captured in the study area from June 3 to September 29, 1995.
3. Angler effort has increased substantially since the last creel survey. Effort in the study area in August 1990 was 32,670 angler hours. In 1995, effort in August almost doubled totalling 63,463 angler hours.
4. Angler distribution in the lower Fraser River has changed since the last survey. More effort was concentrated inside the 1995 study area (Regions 3 and 4), and fewer anglers fished outside the study area (Regions 1 and 2).

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#### REFERENCES

- Cochran, W.G. 1977. Sampling techniques, third edition. John Wiley & Sons, New York.
- DPA Group Inc. MS 1985a. The Fraser River bar sport fishery design study. Prepared for the Dept. of Fisheries and Oceans, New Westminster, 63 p.
- DPA Group Inc. 1985b. Fraser River bar sport fishing survey data entry system. Prepared for the Dept. of Fisheries and Oceans, New Westminster, 25 p.
- DPA Group Inc. 1986. Fraser River bar sport fishing survey analysis module. Prepared for the Dept. of Fisheries and Oceans, New Westminster, 39 p.
- Environment Canada. 1994. Historic stream flow summary, British Columbia, to 1994. Inland Waters Directorate, Water Survey of Canada, Ottawa.
- Everhart, W.H., and W.D. Youngs. 1981. Principles of Fishery Science. Cornell University Press. New York.
- Fraser, F.J., P.J. Starr, and A.Y. Federenko. 1982. A review of the chinook and coho salmon of the Fraser River. Can. Tech. Rep. Fish. Aquat. Sci. 1126: 130p.
- Malvestuto, S.P. 1983. Sampling the recreational fishery. Pages 397 - 419 In: Fisheries Techniques. Neilsen, L. H. And D. L. Johnson (eds.). American Fisheries Society, Bethesda, Maryland.
- McEachron, L.W., G.E. Saul, and S.J. Gutreuter. 1986. Accuracy of trip durations reported by marine sport-boat fishermen. N. Amer. J. Fish. Man. 6: 59-62.
- Mosley, T. MS 1983. Creel survey of the Fraser River bar fishery, 1982. Prepared for the Dept. of Fisheries and Oceans, New Westminster. 97 p.
- Phippen, K.W., and E.P. Bergersen. 1991. Accuracy of a roving creel survey's harvest estimate and evaluation of possible sources of bias. American Fisheries Society Symposium 12: 51-60.
- Robson, D.S., and C.M. Jones. 1989. The theoretical basis of an access site angler survey design. Biometrics 45: 83-98.
- Schubert, N.D. 1992a. Angler effort and catch in five Fraser River chinook salmon sport fisheries, 1989. Can. Manuscr. Rep. Fish. Aquat. Sci. 2128: 69 p.
- Schubert, N.D. 1992b. Angler effort and catch in the 1985 - 1988 lower Fraser River sport fishery. Can. Manuscr. Rep. Fish. Aquat. Sci. 2170: 140 p.
- Schubert, N.D., and I.W. Whyte. 1992. Angler effort and catch in five Fraser River chinook salmon sport fisheries, 1990. Can. Manuscr. Rep. Fish. Aquat. Sci. 2142: 58 p.
- Schubert, N.D. 1995. Angler effort and catch in four Fraser chinook salmon sport fisheries, 1994, and a retrospective on nine years of upper Fraser River sport fishery management and assessment. Can. Manuscr. Rep. Fish. Aquat. Sci. 2275: 93 p.
- Shardlow, T.F., and L.D. Collicutt. 1989. Strait of Georgia sport fishery creel survey statistics for salmon and groundfish, 1988. Can. Manuscr. Rep. Fish. Aquat. Sci. 2036. 63 p.
- Thomas, J.O., and Associates. MS 1988. 1988 Barkley Sound/Alberni Inlet sport fishing creel survey. Prepared for the Department of Fisheries and Oceans, Nanaimo. 51 p.
- Von Geldern, Jr., C.E., and P.K. Tomlinson. 1973. On the analysis of angler catch rate data from warmwater reservoirs. Calif. Fish and Game 59(4): 281-292.

**APPENDICES**

Appendix 1a. Week-specific interview responses at Wellington bar (Region 3) during June and July in the 1995 lower Fraser River sport fishery.

		Week Ending					Week Ending				
		9-Jun	16-Jun	23-Jun	30-Jun	Total	7-Jul	14-Jul	21-Jul	28-Jul	Total
<b>Number of Interviews</b>		188	241	255	391	1,075	314	307	280	152	1,053
<b>Mean Angler Day Length (h)</b>											
All anglers		6.0	6.2	6.6	6.7	6.4	6.0	7.0	8.0	6.0	6.8
Complete trip interviews	Number	186	237	248	364	1,035	300	307	271	151	1,029
	Hours	6.1	6.2	6.6	6.8	6.4	6.0	7.0	8.0	6.0	6.8
Incomplete trip interviews	Number	2	4	7	27	40	14	0	9	1	24
	Hours	4.0	6.1	6.0	5.6	5.4	6.0	0.0	9.0	6.0	5.3
<b>Target Species</b>											
	Chinook	184	241	255	391	1,071	313	306	280	148	1,047
	Chinook jack	0	0	0	0	0	0	0	0	0	0
	Sockeye	0	0	0	0	0	0	0	0	0	0
	Pink	0	0	0	0	0	0	0	0	0	0
	Sturgeon	1	0	0	0	1	0	0	0	3	3
	Rainbow trout	0	0	0	0	0	1	0	0	0	1
	Cutthroat trout	0	0	0	0	0	0	1	0	0	1
	Salmon	3	0	0	0	3	0	0	0	0	0
<b>Harvested Catch</b>											
	Chinook	8	62	87	102	259	97	60	37	14	208
	Chinook jack	0	1	0	0	1	0	0	0	1	1
	Sockeye	0	0	0	0	0	0	0	0	0	0
	Pink	0	0	0	0	0	0	0	0	0	0
	Coho	0	0	0	0	0	0	0	0	0	0
	Chum	0	0	0	0	0	0	0	0	0	0
	Rainbow trout	0	0	0	0	0	0	0	0	0	0
	Cutthroat trout	0	0	0	0	0	0	0	0	0	0
<b>Released Catch</b>											
	Chinook	0	7	4	16	27	9	2	1	2	14
	Chinook jack	0	0	0	0	0	1	0	0	0	1
	Sockeye	0	0	0	0	0	0	0	2	1	3
	Pink	0	0	0	0	0	0	0	0	0	0
	Coho	0	0	0	0	0	0	0	0	0	0
	Chum	0	0	0	0	0	0	0	0	0	0
	Steelhead	0	0	0	0	0	0	0	1	0	1
	Sturgeon	0	0	0	0	0	0	0	0	1	1
	Rainbow trout	0	0	0	0	0	0	0	0	2	2
	Cutthroat trout	0	0	0	0	0	0	0	0	1	1
<b>Gear</b>											
	Bait	1	0	0	0	1	0	0	0	3	3
	Lure	186	240	255	384	1,065	313	306	277	149	1,045
	Bait and Lure	1	1	0	7	9	0	1	0	0	1
	Fly	0	0	0	0	0	1	0	2	0	3
<b>Inspection of catch</b>											
	Number	7	56	78	58	199	46	18	14	6	84
	Correct Id	7	56	78	58	199	46	18	14	6	84
<b>Previous lower Fraser angling <sup>a</sup></b>											
	Number	102	206	206	280	794	255	229	218	135	837
	Mean angler day length (h)	8.0	7.0	7.0	7.0	7.3	8.0	8.0	8.0	7.0	7.8

<sup>a</sup>. Within 2 weeks of the interview, data are specific to the most recent trip.

Appendix 1b. Week-specific interview responses at Wellington bar (Region 3) during August and September in the 1995 lower Fraser River sport fishery.

		Week Ending				Week Ending					
		4-Aug	11-Aug	18-Aug	25-Aug	Total	8-Sep	15-Sep	22-Sep	29-Sep	Total
<b>Number of Interviews</b>		135	184	162	0	481	0	91	234	213	538
<b>Mean Angler Day Length (h)</b>											
-All anglers		7.0	6.0	5.0	0	6.0	0	5.0	5.0	5.0	15.0
-Complete trip interviews	Number	135	177	161	0	473	0	76	211	200	487
	Hours	7.0	6.0	5.0	0	6.0	0	5.0	5.0	5.0	15.0
-Incomplete trip interview	Number	0	7	1	0	8	0	15	23	13	51
	Hours	0	5.0	4.0	0	4.5	0	2.0	4.0	3.0	9.0
<b>Target Species</b>	Chinook	123	34	47	0	204	0	8	49	21	78
	Chinook jack	0	0	0	0	0	0	4	3	0	7
	Sockeye	2	141	104	0	247	0	7	24	15	46
	Pink	0	0	0	0	0	0	39	64	81	184
	Sturgeon	2	0	0	0	2	0	0	0	4	4
	Rainbow trout	0	0	0	0	0	0	0	0	0	0
	Cutthroat trout	3	0	1	0	4	0	0	2	0	2
	Salmon	5	9	10	0	24	0	31	90	90	211
<b>Harvested Catch</b>	Chinook	4	2	8	0	14	0	1	13	5	19
	Chinook jack	0	0	0	0	0	0	13	26	5	44
	Sockeye	1	69	32	0	102	0	2	43	22	67
	Pink	0	0	1	0	1	0	91	191	196	478
	Coho	0	0	0	0	0	0	5	6	2	13
	Chum	0	0	0	0	0	0	0	1	2	3
	Rainbow trout						0	0	1	0	1
	Cutthroat trout	1	0	0	0	1	0	0	3	0	3
<b>Released Catch</b>	Chinook	0	0	1	0	1	0	0	1	0	1
	Chinook jack	0	0	2	0	2	0	2	3	0	5
	Sockeye	7	5	156	0	168	0	0	5	6	11
	Pink	0	0	0	0	0	0	98	419	1,075	1,592
	Coho	0	0	0	0	0	0	0	0	1	1
	Chum	0	0	0	0	0	0	0	2	2	4
	Steelhead	0	0	16	0	16	0	0	0	0	0
	Sturgeon	7	0	0	0	7	0	0	0	3	3
	Rainbow trout	0	0	0	0	0	0	0	0	0	0
Cutthroat trout	1	0	4	0	5	0	0	0	0	0	
<b>Gear</b>	Bait	3	0	4	0	7	0	0	0	0	0
	Lure	125	182	155	0	462	0	83	211	180	474
	Bait and Lure	7	0	3	0	10	0	4	9	24	37
	Fly	0	2	0	0	2	0	4	10	7	21
<b>Inspection of catch</b>	Number	4	20	22	0	46	0	37	87	89	213
	Number correct	4	20	22	0	46	0	35	86	86	207
<b>Previous lower Fraser angling <sup>a</sup></b>											
	Number	105	124	90		319	0	58	166	156	380
	Mean angler day (h)	7.0	6.0	5.0		6.0	0	4.0	5.0	5.0	14.0

<sup>a</sup>. Within 2 weeks of the interview, data are specific to the most recent trip.

Appendix 1c. Week-specific interview responses at Gill bar (Region 4) during June and July in the 1995 lower Fraser River sport fishery.

		Week ending					Week ending				
		9-Jun	16-Jun	23-Jun	30-Jun	Total	7-Jul	14-Jul	21-Jul	28-Jul	Total
<b>Number of interviews</b>		27	20	25	62	134	102	138	65	79	384
<b>Mean Angler Day Length (h)</b>											
All anglers		4.0	6.0	5.0	6.0	5.3	5.0	8.0	8.0	6.0	6.8
Complete trip interviews	Number	15	13	15	31	74	58	84	21	48	211
	Hours	4.0	7.0	5.0	5.0	5.3	5.0	7.0	7.0	6.0	6.3
Incomplete trip interviews	Number	12	7	10	31	60	44	54	44	31	173
	Hours	4.0	4.0	5.0	7.0	5.0	5.0	9.0	8.0	5.0	6.8
<b>Target Species</b>	Chinook	24	19	25	59	127	102	138	65	79	384
	Chinook jack	0	0	0	0	0	0	0	0	0	0
	Sockeye	0	0	0	0	0	0	0	0	0	0
	Pink	0	0	0	0	0	0	0	0	0	0
	Sturgeon	0	0	0	0	0	0	0	0	0	0
	Rainbow trout	0	0	0	0	0	0	0	0	0	0
	Cutthroat trout	0	1	0	0	1	0	0	0	0	0
	Salmon	3	0	0	3	6	0	0	0	0	0
<b>Harvested Catch</b>	Chinook	0	0	0	6	6	21	18	7	5	51
	Chinook jack	0	0	0	0	0	0	1	1	0	2
	Sockeye	0	0	0	0	0	0	0	0	0	0
	Pink	0	0	0	0	0	0	0	0	0	0
	Coho	0	0	0	0	0	0	0	0	0	0
	Chum	0	0	0	0	0	0	0	0	0	0
	Rainbow trout	0	0	0	0	0	0	0	0	0	0
	Cutthroat trout	0	0	0	0	0	0	0	0	0	0
<b>Released Catch</b>	Chinook	0	0	0	2	2	3	0	0	0	3
	Chinook jack	0	0	0	0	0	0	0	1	0	1
	Sockeye	0	0	0	0	0	0	0	0	0	0
	Pink	0	0	0	0	0	0	0	0	0	0
	Coho	0	0	0	0	0	0	0	0	0	0
	Chum	0	0	0	0	0	0	0	0	0	0
	Steelhead	0	0	0	0	0	0	0	0	0	0
	Sturgeon	0	0	0	0	0	0	0	0	0	0
	Rainbow trout	0	0	0	0	0	0	0	0	0	0
	Cutthroat trout	0	0	0	0	0	0	0	0	0	0
<b>Gear</b>	Bait	0	0	0	0	0	0	0	0	0	0
	Lure	25	20	22	60	127	100	138	65	79	382
	Bait and Lure	2	0	3	2	7	2	0	0	0	2
	Fly	0	0	0	0	0	0	0	0	0	0
<b>Inspection of catch</b>	Number	0	0	0	2	2	15	11	6	6	38
	Number correct	0	0	0	2	2	15	11	6	6	38
<b>Previous lower Fraser angling <sup>a</sup></b>	Number	17	12	20	47	96	76	113	57	72	318
	Mean angler day length (h)	8.0	7.0	6.0	7.0	7.0	8.0	9.0	9.0	8.0	8.5

<sup>a</sup> Within 2 weeks of the interview; data are specific to the most recent trip.

Appendix 1d. Week-specific interview responses at Gill bar (Region 4) during August and September in the 1995 lower Fraser River sport fishery.

		Week ending					Week ending					
		4-Aug	11-Aug	18-Aug	25-Aug	1-Sep	Total	8-Sep	15-Sep	22-Sep	29-Sep	Total
<b>Number of Interviews</b>		66	197	178	170	125	751	116	0	147	222	485
<b>Mean Angler Day Length (h)</b>												
-All anglers		7.0	5.0	4.0	4.0	4.0	4.8	15.0	0.0	4.0	4.0	5.8
-Complete trip interviews	Number	37	116	119	142	107	521	69	0	143	202	414
	Hours	7.0	5.0	4.0	4.0	4.0	4.8	5.0	0.0	4.0	4.0	3.3
-Incomplete trip interviews	Number	29	80	59	28	34	230	47	0	4	20	71
	Hours	7.0	5.0	4.0	3.0	4.0	4.6	5.0	0.0	1.0	2.0	2.0
<b>Target Species</b>	Chinook	66	33	13	3	2	117	2	0	0	1	3
	Chinook jack	0	0	0	0	0	0	14	0	1	0	15
	Sockeye	0	164	162	167	123	616	70	0	37	33	140
	Pink	0	0	0	0	0	0	1	0	50	39	90
	Sturgeon	0	0	0	0	0	0	0	0	0	0	0
	Rainbow trout	0	0	1	0	0	1	0	0	0	0	0
	Cutthroat trout	0	0	0	0	0	0	0	0	0	1	1
	Salmon	0	0	2	0	0	2	29	0	59	148	236
<b>Harvested Catch</b>	Chinook	1	3	0	0	0	4	2	0	0	0	2
	Chinook jack	0	0	0	0	5	5	17	0	1	0	18
	Sockeye	0	143	69	37	26	275	14	0	27	32	73
	Pink	0	0	0	1	2	3	13	0	179	262	454
	Coho	0	0	0	0	0	0	0	0	2	1	3
	Chum	0	0	0	0	0	0	0	0	0	0	0
	Rainbow trout	0	0	0	0	0	0	0	0	0	0	0
	Cutthroat trout											
<b>Released Catch</b>	Chinook	0	0	0	0	0	0	0	0	0	0	0
	Chinook jack	0	0	0	0	0	0	1	0	0	0	1
	Sockeye	4	30	90	0	2	126	0	0	2	2	4
	Pink	0	0	0	1	2	3	6	0	591	2,237	2,834
	Coho	0	0	0	0	0	0	0	0	0	0	0
	Chum	0	0	0	0	0	0	0	0	0	0	0
	Steelhead	0	1	0	0	0	0	0	0	0	0	0
	Sturgeon	0	0	0	0	0	0	0	0	0	0	0
	Rainbow trout	0	0	0	0	0	0	0	0	0	0	0
	Cutthroat trout	0	0	0	0	0	0	0	0	0	0	0
<b>Gear</b>	Bait	0	0	1	0	0	1	0	0	0	0	0
	Lure	61	190	173	170	138	732	108	0	144	221	473
	Bait and Lure	0	0	0	0	3	3	7	0	0	0	7
	Fly	0	0	0	0	0	0	1	0	3	1	5
<b>Inspection of catch</b>	Number	4	93	55	31	23	206	35	0	53	41	129
	Number correct	4	92	48	31	23	198	34	0	53	39	126
<b>Previous lower Fraser angling <sup>a</sup></b>												
	Number	59	125	146	150	123	603	100	0	114	155	369
	Mean angler day length (h)	7.0	5.0	5.0	5.0	4.0	5.2	5.0	0.0	4.0	4.0	3.3

<sup>a</sup> Within 2 weeks of the interview, data are specific to the most recent trip.

Appendix 1e. Week-specific interview responses at Peg Leg bar during August and September in the 1995 lower Fraser

		Week ending					Week ending					
		4-Aug	11-Aug	18-Aug	25-Aug	1-Sep	Total	8-Sep	15-Sep	22-Sep	29-Sep	Total
<b>Number of Interviews</b>		0	0	0	188	157	345	189	325	0	82	596
<b>Mean Angler Day Length (h)</b>												
All anglers		0	0	0	4.0	3.0	3.5	4.0	4.0	0	5.0	4.3
Complete trip interviews	Number	0	0	0	148	112	260	101	213	0	74	388
	Hours	0	0	0	3.0	3.0	3.0	4.0	5.0	0	5.0	4.7
Incomplete trip interviews	Number	0	0	0	40	45	85	88	112	0	8	208
	Hours	0	0	0	4.0	2.0	3.0	3.0	4.0	0	6.0	4.3
<b>Target Species</b>												
	Chinook	0	0	0	2	4	6	9	0	0	0	9
	Chinook jack	0	0	0	0	0	0	2	0	0	0	2
	Sockeye	0	0	0	186	147	333	87	29	0	39	155
	Pink	0	0	0	0	2	2	17	136	0	7	160
	Sturgeon	0	0	0	0	0	0	0	0	0	0	0
	Rainbow trout	0	0	0	0	0	0	0	0	0	0	0
	Cutthroat trout	0	0	0	0	0	0	0	0	0	0	0
	Salmon	0	0	0	0	4	4	73	159	0	36	268
<b>Harvested Catch</b>												
	Chinook	0	0	0	1	0	1	0	3	0	14	17
	Chinook jack	0	0	0	0	0	0	2	2	0	0	4
	Sockeye	0	0	0	34	16	50	5	29	0	42	76
	Pink	0	0	0	0	7	7	40	311	0	56	407
	Coho	0	0	0	0	0	0	1	0	0	4	5
	Chum	0	0	0	0	0	0	0	0	0	2	2
	Rainbow trout	0	0	0	0	0	0	0	0	0	0	0
	Cutthroat trout	0	0	0	0	0	0	0	0	0	0	1
<b>Released Catch</b>												
	Chinook	0	0	0	0	0	0	0	1	0	0	1
	Chinook jack	0	0	0	0	0	0	0	0	0	0	0
	Sockeye	0	0	0	1	0	1	0	1	0	8	9
	Pink	0	0	0	0	3	3	18	427	0	846	1,291
	Coho	0	0	0	0	0	0	0	1	0	0	1
	Chum	0	0	0	0	0	0	0	0	0	1	1
	Steelhead	0	0	0	0	0	0	0	0	0	0	0
	Sturgeon	0	0	0	0	0	0	0	0	0	0	0
	Rainbow trout	0	0	0	0	0	0	0	0	0	0	0
	Cutthroat trout	0	0	0	0	0	0	0	0	0	0	0
<b>Gear</b>												
	Bait	0	0	0	2	0	2	0	0	0	0	0
	Lure	0	0	0	187	147	334	158	288	0	79	525
	Bait and Lure	0	0	0	0	0	0	10	0	0	0	10
	Fly	0	0	0	0	9	9	21	35	0	3	59
<b>Inspection of catch</b>												
	Number	0	0	0	19	10	29	26	141	0	50	217
	Number correct	0	0	0	19	10	29	21	139	0	48	208
<b>Previous lower Fraser angling<sup>a</sup></b>												
	Number	0	0	0	126	124	250	148	237	0	68	453
	Mean angler day length (h)	0	0	0	3.0	4.0	3.5	4.0	4.0	0	5.0	4.3

<sup>a</sup>. Within 2 weeks of the interview; data are specific to the most recent trip.

Appendix 1f. Week-specific interview responses at Wing Dam bar during September in the 1995 lower Fraser River sport fishery.

		Week ending				Total
		8-Sep	15-Sep	22-Sep	29-Sep	
<b>Number of Interviews</b>		29	103	78	23	233
<b>Mean Angler Day Length (h)</b>						
All anglers		7.1	8.0	6.0	7.0	7.0
Complete trip interviews	Number	22	54	10	2	88
	Hours	7.5	8.0	6.0	8.0	7.4
Incomplete trip interviews	Number	7	49	68	21	145
	Hours	5.7	8.0	5.0	7.0	6.4
<b>Target Species</b>	Chinook	0	3	6	0	9
	Chinook jack	3	2	0	0	5
	Sockeye	0	0	1	0	1
	Pink	0	0	0	0	0
	Sturgeon	0	0	0	0	0
	Rainbow trout	0	0	0	0	0
	Cutthroat trout	0	0	0	0	0
	Salmon	26	98	70	23	217
<b>Harvested Catch</b>	Chinook	7	0	0	0	7
	Chinook jack	0	11	19	0	30
	Sockeye	0	0	2	0	2
	Pink	0	10	24	12	46
	Coho	0	0	0	0	0
	Chum	0	0	0	0	0
	Rainbow trout	0	0	0	0	0
	Cutthroat trout	0	0	0	0	0
<b>Released Catch</b>	Chinook	0	0	0	0	0
	Chinook jack	0	0	0	0	0
	Sockeye	0	0	0	0	0
	Pink	0	4	35	15	54
	Coho	0	0	0	0	0
	Chum	0	0	0	0	0
	Steelhead	0	0	1	0	1
	Sturgeon	0	0	0	0	0
	Rainbow trout	0	0	0	0	0
Cutthroat trout	0	0	0	0	0	
<b>Gear</b>	Bait	0	0	0	0	0
	Lure	5	49	36	21	111
	Bait and Lure	24	54	41	2	121
	Fly	0	0	0	0	0
<b>Inspection of catch</b>	Number	1	11	23	7	42
	Number correct	1	11	22	6	40
<b>Previous lower Fraser angling <sup>a</sup></b>						
	Number	20	86	64	23	193
	Mean angler day length (h)	8.0	9.0	8.0	9.0	8.5

<sup>a</sup> Within 2 weeks of the interview; data are specific to the most recent trip.

Appendix 1g. Week-specific interview responses at Coquihalla bar during June in the 1995 lower Fraser River sport fishery.

		Week ending				
		9-Jun	16-Jun	23-Jun	30-Jun	Total
<b>Number of Interviews</b>		0	21	58	17	96
<b>Mean Angler Day Length (h)</b>						
All anglers		0	2.0	2.0	2.0	2.0
Complete trip interviews	Number	0	9	25	10	44
	Hours	0	2.0	3.0	2.0	2.3
Incomplete trip interviews	Number	0	12	33	7	52
	Hours	0	2.0	1.0	2.0	1.7
<b>Target Species</b>						
	Chinook	0	21	58	17	96
	Chinook jack	0	0	0	0	0
	Sockeye	0	0	0	0	0
	Pink	0	0	0	0	0
	Sturgeon	0	0	0	0	0
	Rainbow trout	0	0	0	0	0
	Cutthroat trout	0	0	0	0	0
	Salmon	0	0	0	0	0
<b>Harvested Catch</b>						
	Chinook	0	0	1	0	1
	Chinook jack	0	0	1	0	1
	Sockeye	0	0	0	0	0
	Pink	0	0	0	0	0
	Coho	0	0	0	0	0
	Chum	0	0	0	0	0
	Rainbow trout	0	0	0	0	0
	Cutthroat trout	0	0	0	0	0
<b>Released Catch</b>						
	Chinook	0	0	0	0	0
	Chinook jack	0	0	0	0	0
	Sockeye	0	0	0	0	0
	Pink	0	0	0	0	0
	Coho	0	0	0	0	0
	Chum	0	0	0	0	0
	Steelhead	0	0	0	0	0
	Sturgeon	0	0	0	0	0
	Rainbow trout	0	0	0	0	0
	Cutthroat trout	0	0	0	0	0
<b>Gear</b>						
	Bait	0	0	0	0	0
	Lure	0	20	40	16	76
	Bait and Lure	0	1	18	1	20
	Fly	0	0	0	0	0
<b>Inspection of catch</b>						
	Number	0	0	2	2	4
	Number correct	0	0	1	2	3
<b>Previous lower Fraser angling <sup>a</sup></b>						
	Number	0	17	53	13	83
	Mean angler day length (h)	0	5.0	4.0	4.0	4.3

<sup>a</sup>. Within 2 weeks of the interview; data are specific to the most recent trip.

Appendix 2. Overflight angler counts by month, day type and area in the 1995 lower Fraser River sport fishery.

Month	Date	Day of week	Weather	Mean Angler Count			Total
				Sumas R. to Harrison R.	Harrison R. to Rosedale powerline	Agassiz-Rosedale powerline to Coquihalla R.	
June	4-Jun	Sun	Overcast	52	6	8	66
	6-Jun	Tue	Overcast	37	0	9	46
	10-Jun	Sat	Overcast	64	14	13	91
	12-Jun	Mon	Overcast	49	3	7	59
	17-Jun	Sat	Overcast	173	29	24	226
	22-Jun	Thur	Overcast	188	20	17	225
	25-Jun	Sun	Clear	265	78	48	391
	28-Jun	Wed	Clear	182	19	25	226
	Weekday	Mean		114	11	15	139
		%		82.0%	7.9%	10.8%	
Weekend	Mean		139	32	23	194	
	%		71.6%	16.5%	11.9%		
July	2-Jul	Sun	Overcast	305	64	30	399
	6-Jul	Thur	Clear	206	45	18 <sup>a</sup>	269
	8-Jul	Sat	Clear	322	102	49 <sup>a</sup>	473
	11-Jul	Tue	Overcast	192	66	13 <sup>a</sup>	271
	16-Jul	Sun	Clear	292	67	33 <sup>a</sup>	392
	21-Jul	Fri	Overcast	136	44	14 <sup>a</sup>	194
	26-Jul	Wed	Overcast	48	16	8 <sup>a</sup>	72
	Weekday	Mean		146	43	13	202
		%		77.7%	22.9%	6.9%	
	Weekend	Mean		306	78	37	421
	%		77.7%	19.8%	7.6%		
August	29-Jul	Sat	Rain	123	13	7 <sup>a</sup>	143
	03-Aug <sup>c</sup>	Thur	Clear	31	20	3 <sup>a</sup>	54
	7-Aug	Mon <sup>b</sup>	Rain	124	76	15 <sup>a</sup>	215
	12-Aug <sup>c</sup>	Sat	Overcast	59	30	7 <sup>a</sup>	96
	15-Aug <sup>c</sup>	Tue	Overcast	41	15	2	58
	18-Aug	Fri	Overcast	54	79	21	154
	20-Aug	Sun	Clear	162	47	31	240
	26-Aug	Sat	Overcast	114	28	28	170
	30-Aug	Wed	Clear	72	14	24	110
	Weekday	Mean		50	32	13	94
	%		52.6%	33.7%	13.7%		
Weekend	Mean		116	39	18	173	
	%		69.5%	23.3%	10.8%		
September	2-Sep	Sat	Clear	234	59	34	327
	6-Sep	Wed	Overcast	130	23	16 <sup>a</sup>	169
	10-Sep	Sun	Clear	404	105	62 <sup>a</sup>	571
	14-Sep	Thur	Clear	233	42	21 <sup>a</sup>	296
	17-Sep	Sun	Overcast	561	105	83 <sup>a</sup>	749
	19-Sep	Tue	Overcast	273	36	33	342
	23-Sep	Sat	Clear	682	119	72 <sup>a</sup>	873
	29-Sep	Fri	Overcast	335	55	14	404
	Weekday	Mean		243	39	21	303
		%		82.7%	13.3%	7.1%	
Weekend	Mean		470	97	63	630	
	%		81.6%	16.8%	10.9%		

<sup>a</sup> Count from Agassiz-Rosedale powerline to top of Waleach Slough only.

<sup>b</sup> BC Day holiday: considered a weekend day

<sup>c</sup> Denotes days when fishery closed to the retention of sockeye.

Appendix 3a. Angler effort and harvest and release by region during June in the 1995 lower Fraser River sport fishery

	June					
	Region 3	SE <sup>a</sup>	Region 4	SE <sup>a</sup>	TOTAL	SE <sup>a</sup>
# of Interviews	1,075	-	230	-	1,305	-
# of Overflights	8	-	8	-	8	-
<b>ANGLER EFFORT</b>						
		-				
Estimated Effort (hours)	42,752	10,667	11,558	3,925	54,310	14,592
Estimated Effort (days) <sup>b</sup>	6,680	-	3,042	-	11,410	-
% interviewed <sup>c</sup>	16.3	-	7.9	-	14.5	-
% at survey sites	77.1	-	37.9	-	67.6	-
<b>ESTIMATED HARVEST</b>						
Chinook	1,619	469	113	55	1,732	524
Chinook jack	25	12	36	46	61	58
Sockeye	0	0	0	0	0	0
Pink	0	0	0	0	0	0
Coho	0	0	0	0	0	0
Chum	0	0	0	0	0	0
Steelhead	0	0	0	0	0	0
Cutthroat	0	0	0	0	0	0
Rainbow	0	0	0	0	0	0
<b>ESTIMATED RELEASE</b>						
Chinook	170	65	22	14	192	79
Chinook jack	0	0	0	0	0	0
Sockeye	0	0	0	0	0	0
Pink	0	0	0	0	0	0
Coho	0	0	0	0	0	0
Chum	0	0	0	0	0	0
Steelhead	4	3	0	0	4	3
Sturgeon	0	0	0	0	0	0
Salmon	4	3	0	0	4	3
Cutthroat	0	0	0	0	0	0
Rainbow	0	0	0	0	0	0

<sup>a</sup> SE = Standard Error

<sup>b</sup> Determined from mean monthly day length

<sup>c</sup> Ratio of observed (from interviews) and estimated effort

Appendix 3b. Angler effort and harvest and release by region during July in the 1995 lower Fraser River sport fishery

	July					
	Region 3	SE <sup>a</sup>	Region 4	SE <sup>a</sup>	TOTAL	SE <sup>a</sup>
# of Interviews	1,053	-	384	-	1,437	-
# of Overflights	7	-	7	-	7	-
<b>ANGLER EFFORT</b>						
Estimated Effort (hours)	81,570	12,072	32,839	4,245	114,409	16,317
Estimated Effort (days) <sup>b</sup>	12,359	-	4,976	-	17,282	-
% interviewed <sup>c</sup>	8.6%	-	7.8%	-	8.4%	-
% at survey sites	60.8%	-	28.3%	-	55.5%	-
<b>ESTIMATED HARVEST</b>						
Chinook	2,327	423	666	123	2,993	546
Chinook jack	11	8	23	12	34	20
Sockeye	0	0	0	0	0	0
Pink	0	0	0	0	0	0
Coho	0	0	0	0	0	0
Chum	0	0	0	0	0	0
Steelhead	0	0	0	0	0	0
Cutthroat	0	0	0	0	0	0
Rainbow	0	0	0	0	0	0
<b>ESTIMATED RELEASE</b>						
Chinook	152	50	49	39	201	89
Chinook jack	6	1	7	5	13	6
Sockeye	37	18	7	5	44	23
Pink	0	0	0	0	0	0
Coho	0	0	0	0	0	0
Chum	0	0	0	0	0	0
Steelhead	8	6	0	0	8	6
Sturgeon	8	6	0	0	8	6
Salmon	0	0	0	0	0	0
Cutthroat	18	17	0	0	18	17
Rainbow	36	33	7	5	43	38

<sup>a</sup> SE = Standard Error

<sup>b</sup> Determined from mean monthly day length

<sup>c</sup> Ratio of observed (from interviews) and estimated effort

Appendix 4. Mean hourly proportion of angler effort in the 1995 lower Fraser River sport fishery by region, month and day type

Region 3	June		July		August		September	
	Weekday	Weekend	Weekday	Weekend	Weekday	Weekend	Weekday	Weekend
1:00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2:00	0.0000	0.0000	0.0010	0.0000	0.0000	0.0000	0.0000	0.0000
3:00	0.0010	0.0010	0.0010	0.0000	0.0000	0.0000	0.0000	0.0000
4:00	0.0020	0.0050	0.0030	0.0010	0.0000	0.0000	0.0000	0.0000
5:00	0.0120	0.0190	0.0110	0.0180	0.0010	0.0040	0.0020	0.0000
6:00	0.0400	0.0420	0.0350	0.0480	0.0130	0.0240	0.0150	0.0070
7:00	0.0730	0.0620	0.0660	0.0710	0.0310	0.0520	0.0420	0.0220
8:00	0.0770	0.0650	0.0670	0.0740	0.0450	0.0700	0.0660	0.0400
9:00	0.0800	0.0710	0.0740	0.0780	0.0520	0.0930	0.0820	0.0530
10:00	0.0830	0.0860	0.0680	0.0780	0.0610	0.0820	0.1030	0.0590
11:00	0.0840	0.0840	0.0630	0.0740	0.0610	0.0530	0.1110	0.0600
12:00	0.0770	0.0810	0.0600	0.0700	0.0630	0.0580	0.0830	0.0750
13:00	0.0690	0.0750	0.0660	0.0700	0.0620	0.0750	0.0800	0.0760
14:00	0.0660	0.0700	0.0690	0.0640	0.0540	0.0670	0.0810	0.0770
15:00	0.0620	0.0640	0.0650	0.0620	0.0520	0.0720	0.0780	0.0740
16:00	0.0520	0.0630	0.0620	0.0540	0.0670	0.0760	0.0590	0.0990
17:00	0.0470	0.0480	0.0700	0.0490	0.0680	0.0830	0.0630	0.0860
18:00	0.0490	0.0440	0.0630	0.0500	0.0950	0.0660	0.0580	0.0830
19:00	0.0470	0.0430	0.0590	0.0480	0.0910	0.0590	0.0520	0.0890
20:00	0.0440	0.0360	0.0530	0.0450	0.0920	0.0440	0.0200	0.0810
21:00	0.0350	0.0360	0.0460	0.0400	0.0770	0.0200	0.0030	0.0170
22:00	0.0010	0.0040	0.0000	0.0070	0.0140	0.0000	0.0010	0.0020
23:00	0.0000	0.0010	0.0000	0.0000	0.0010	0.0000	0.0010	0.0000
24:00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Region 4	June		July		August		September	
	Weekday	Weekend	Weekday	Weekend	Weekday	Weekend	Weekday	Weekend
1:00	0.0000	0.0020	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2:00	0.0000	0.0040	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3:00	0.0000	0.0040	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4:00	0.0000	0.0070	0.0000	0.0010	0.0000	0.0000	0.0000	0.0000
5:00	0.0070	0.0170	0.0040	0.0100	0.0000	0.0020	0.0000	0.0050
6:00	0.0300	0.0400	0.0260	0.0250	0.0240	0.0280	0.0000	0.0390
7:00	0.0570	0.0700	0.0560	0.0420	0.0600	0.0700	0.0000	0.0910
8:00	0.0630	0.0720	0.0670	0.0460	0.0640	0.0880	0.0000	0.1070
9:00	0.0790	0.0390	0.0700	0.0530	0.0690	0.0770	0.0890	0.1050
10:00	0.0950	0.0550	0.0810	0.0550	0.0690	0.0700	0.0890	0.1050
11:00	0.0920	0.0870	0.0780	0.0550	0.0740	0.0860	0.0890	0.0910
12:00	0.0820	0.0720	0.0770	0.0460	0.0730	0.0940	0.0890	0.0680
13:00	0.0630	0.0830	0.0750	0.0660	0.0740	0.0660	0.0980	0.0880
14:00	0.0620	0.0750	0.0720	0.0670	0.0720	0.0670	0.0360	0.0720
15:00	0.0780	0.0690	0.0680	0.0680	0.0720	0.0740	0.0450	0.0930
16:00	0.0570	0.0720	0.0580	0.0830	0.0720	0.0660	0.0710	0.0380
17:00	0.0620	0.0560	0.0470	0.0830	0.0680	0.0490	0.1250	0.0450
18:00	0.0460	0.0560	0.0530	0.0810	0.0640	0.0460	0.1250	0.0240
19:00	0.0450	0.0460	0.0600	0.0740	0.0660	0.0380	0.0540	0.0140
20:00	0.0460	0.0430	0.0540	0.0610	0.0600	0.0380	0.0890	0.0140
21:00	0.0180	0.0260	0.0420	0.0550	0.0130	0.0280	0.0000	0.0020
22:00	0.0090	0.0030	0.0110	0.0230	0.0030	0.0100	0.0000	0.0000
23:00	0.0050	0.0020	0.0000	0.0040	0.0020	0.0020	0.0000	0.0000
24:00	0.0020	0.0000	0.0000	0.0010	0.0010	0.0010	0.0000	0.0000

Appendix 5a. Total angler effort, chinook adult harvest, and HPUE by trip duration during June and July in the 1995 lower Fraser River sport fishery.

June Angler trip duration (h)	Complete trip interviews		Angler Effort		Chinook adult harvest		Chinook adult HPUE
	No.	%	No.	%	No.	%	
0 - 1	16	1.4%	16	0.2%	6	2.4%	0.375
1.1 - 2	68	5.9%	132	1.8%	9	3.7%	0.068
2.1 - 3	89	7.7%	263	3.6%	16	6.5%	0.061
3.1 - 4	156	13.5%	622	8.6%	28	11.4%	0.045
4.1 - 5	159	13.7%	792	10.9%	31	12.6%	0.039
5.1 - 6	170	14.7%	1,017	14.0%	29	11.8%	0.029
6.1 - 7	147	12.7%	1,027	14.2%	29	11.8%	0.028
7.1 - 8	112	9.7%	894	12.3%	23	9.3%	0.026
8.1 - 9	81	7.0%	727	10.0%	27	11.0%	0.037
9.1 - 10	68	5.9%	659	9.1%	19	7.7%	0.029
10.1 - 11	41	3.5%	450	6.2%	13	5.3%	0.029
11.1 - 12	28	2.4%	336	4.6%	10	4.1%	0.030
12.1 - 13	17	1.5%	220	3.0%	4	1.6%	0.018
13.1 - 14	6	0.5%	84	1.2%	2	0.8%	0.024
14.1 - 15	0	0.0%	0	0.0%	0	0.0%	0.000
15.1 - 16	0	0.0%	0	0.0%	0	0.0%	0.000
16.1 - 17	0	0.0%	0	0.0%	0	0.0%	0.000

July Angler trip duration (h)	Complete trip interviews		Angler Effort		Chinook adult harvest		Chinook adult HPUE
	No.	%	No.	%	No.	%	
0 - 1	21	1.7%	19	0.2%	5	2.1%	0.263
1.1 - 2	55	4.4%	101	1.2%	11	4.6%	0.109
2.1 - 3	70	5.6%	201	2.4%	16	6.7%	0.080
3.1 - 4	147	11.9%	558	6.8%	29	12.1%	0.052
4.1 - 5	155	12.5%	747	9.1%	18	7.5%	0.024
5.1 - 6	179	14.4%	1,053	12.8%	19	7.9%	0.018
6.1 - 7	123	9.9%	834	10.1%	20	8.3%	0.024
7.1 - 8	191	15.4%	1,484	18.1%	40	16.7%	0.027
8.1 - 9	86	6.9%	745	9.1%	25	10.4%	0.034
9.1 - 10	43	3.5%	417	5.1%	5	2.1%	0.012
10.1 - 11	66	5.3%	709	8.6%	15	6.3%	0.021
11.1 - 12	49	4.0%	572	7.0%	14	5.8%	0.024
12.1 - 13	10	0.8%	129	1.6%	4	1.7%	0.031
13.1 - 14	30	2.4%	413	5.0%	14	5.8%	0.034
14.1 - 15	6	0.5%	88	1.1%	1	0.4%	0.011
15.1 - 16	7	0.6%	112	1.4%	4	1.7%	0.036
16.1 - 17	2	0.2%	36	0.4%	0	0.0%	0.000

Appendix 5b. Total angler effort and adult chinook harvest, and HPUE by trip duration during August in the 1995 lower Fraser River sport fishery.

Angler trip duration (h)	Complete trip interviews		Angler Effort		Chinook adult harvest		Chinook adult HPUE
	No.	%	No.	%	No.	%	
0 - 1	72	5.8%	66	0.8%	0	0.0%	0.000
1.1 - 2	150	12.0%	276	4.5%	1	5.6%	0.004
2.1 - 3	180	14.4%	511	8.4%	1	5.6%	0.002
3.1 - 4	198	15.8%	759	12.4%	1	5.6%	0.001
4.1 - 5	164	13.1%	799	13.1%	2	11.1%	0.003
5.1 - 6	137	10.9%	807	13.2%	1	5.6%	0.001
6.1 - 7	135	10.8%	911	14.9%	2	11.1%	0.002
7.1 - 8	101	8.1%	787	12.9%	5	27.8%	0.006
8.1 - 9	49	3.9%	430	7.0%	2	11.1%	0.005
9.1 - 10	33	2.6%	327	5.4%	0	0.0%	0.000
10.1 - 11	8	0.6%	87	1.4%	1	5.6%	0.011
11.1 - 12	13	1.0%	156	2.6%	0	0.0%	0.000
12.1 - 13	7	0.6%	91	1.5%	2	11.1%	0.022
13.1 - 14	7	0.6%	95	1.6%	0	0.0%	0.000

Appendix 5c. Total angler effort, sockeye harvest, and HPUE by trip duration during August in the 1995 lower Fraser River sport fishery.

Angler trip duration (h)	Complete trip interviews		Angler Effort		Sockeye harvest		Sockeye HPUE
	No.	%	No.	%	No.	%	
0 - 1	72	5.7%	66	1.1%	5	1.4%	0.076
1.1 - 2	150	12.0%	276	4.5%	28	7.6%	0.101
2.1 - 3	180	14.4%	511	8.4%	31	8.4%	0.061
3.1 - 4	198	15.8%	759	12.4%	63	17.1%	0.083
4.1 - 5	164	13.1%	799	13.1%	67	18.2%	0.084
5.1 - 6	137	10.9%	807	13.2%	55	14.9%	0.068
6.1 - 7	135	10.8%	911	14.9%	45	12.2%	0.049
7.1 - 8	101	8.1%	787	12.9%	21	5.7%	0.027
8.1 - 9	49	3.9%	430	7.0%	18	4.9%	0.042
9.1 - 10	33	2.6%	327	5.4%	19	5.2%	0.058
10.1 - 11	8	0.6%	87	1.4%	7	1.9%	0.080
11.1 - 12	13	1.0%	156	2.6%	6	1.6%	0.038
12.1 - 13	7	0.6%	91	1.5%	0	0.0%	0.000
13.1 - 14	7	0.6%	95	1.6%	3	0.8%	0.032

Appendix 5d. Total angler effort, pink harvest, and HPUE by trip duration during August in the 1995 lower Fraser River sport fishery.

Angler trip duration (h)	Complete trip interviews		Angler Effort		Pink harvest		Pink HPUE
	No.	%	No.	%	No.	%	
0 - 1	72	5.7%	66	1.1%	0	0.0%	0.000
1.1 - 2	150	12.0%	276	4.5%	2	18.2%	0.007
2.1 - 3	180	14.4%	511	8.4%	1	9.1%	0.002
3.1 - 4	198	15.8%	759	12.4%	3	27.3%	0.004
4.1 - 5	164	13.1%	799	13.1%	1	9.1%	0.001
5.1 - 6	137	10.9%	807	13.2%	0	0.0%	0.000
6.1 - 7	135	10.8%	911	14.9%	2	18.2%	0.002
7.1 - 8	101	8.1%	787	12.9%	2	18.2%	0.003
8.1 - 9	49	3.9%	430	7.0%	0	0.0%	0.000
9.1 - 10	33	2.6%	327	5.4%	0	0.0%	0.000
10.1 - 11	8	0.6%	87	1.4%	0	0.0%	0.000
11.1 - 12	13	1.0%	156	2.6%	0	0.0%	0.000
12.1 - 13	7	0.6%	91	1.5%	0	0.0%	0.000
13.1 - 14	7	0.6%	95	1.6%	0	0.0%	0.000

Appendix 5e: Total angler effort, adult chinook harvest, and HPUE by trip duration during September in the 1995 lower Fraser River sport fishery.

Angler trip duration (h)	Complete trip interviews		Angler Effort		Chinook adult harvest		Chinook adult HPUE
	No.	%	No.	%	No.	%	
0 - 1	62	4.6%	50	0.7%	0	0.0%	0.000
1.1 - 2	168	12.6%	307	4.6%	2	5.0%	0.007
2.1 - 3	169	12.6%	474	7.0%	2	5.0%	0.004
3.1 - 4	234	17.5%	894	13.3%	0	0.0%	0.000
4.1 - 5	186	13.9%	893	13.3%	3	7.5%	0.003
5.1 - 6	190	14.2%	1109	16.5%	8	20.0%	0.007
6.1 - 7	156	11.7%	1061	15.7%	9	22.5%	0.008
7.1 - 8	88	6.6%	690	10.2%	8	20.0%	0.012
8.1 - 9	51	3.8%	447	6.6%	4	10.0%	0.009
9.1 - 10	30	2.2%	294	4.4%	1	2.5%	0.003
10.1 - 11	10	0.7%	109	1.6%	0	0.0%	0.000
11.1 - 12	22	1.6%	264	3.9%	2	5.0%	0.008
12.1 - 13	8	0.6%	104	1.5%	1	2.5%	0.010
13.1 - 14	3	0.2%	41	0.6%	0	0.0%	0.000

Appendix 5f. Total angler effort, sockeye harvest, and HPUE by trip duration during September in the 1995 lower Fraser River sport fishery.

Angler day length (h)	Complete trip interviews		Angler Effort		Sockeye harvest		Sockeye HPUE
	No.	%	No.	%	No.	%	
0 - 1	62	4.6%	50	0.7%	1	0.5%	0.020
1.1 - 2	168	12.6%	307	4.6%	6	3.2%	0.020
2.1 - 3	169	12.6%	474	7.0%	14	7.5%	0.030
3.1 - 4	234	17.5%	894	13.3%	29	15.6%	0.032
4.1 - 5	186	13.9%	893	13.3%	22	11.8%	0.025
5.1 - 6	190	14.2%	1,109	16.5%	22	11.8%	0.020
6.1 - 7	156	11.7%	1,061	15.7%	43	23.1%	0.041
7.1 - 8	88	6.6%	690	10.2%	33	17.7%	0.048
8.1 - 9	51	3.8%	447	6.6%	11	5.9%	0.025
9.1 - 10	30	2.2%	294	4.4%	2	1.1%	0.007
10.1 - 11	10	0.7%	109	1.6%	0	0.0%	0.000
11.1 - 12	22	1.6%	264	3.9%	3	1.6%	0.011
12.1 - 13	8	0.6%	104	1.5%	0	0.0%	0.000
13.1 - 14	3	0.2%	41	0.6%	0	0.0%	0.000

Appendix 5g. Total angler effort, pink harvest, and HPUE by trip duration during September in the 1995 lower Fraser River sport fishery.

Angler day length (h)	Complete trip interviews		Angler Effort		Pink harvest		Pink HPUE
	No.	%	No.	%	No.	%	
0 - 1	62	4.6%	50	0.7%	15	1.2%	0.300
1.1 - 2	168	12.6%	307	4.6%	108	8.7%	0.352
2.1 - 3	169	12.6%	474	7.0%	120	9.7%	0.253
3.1 - 4	234	17.5%	894	13.3%	227	18.4%	0.254
4.1 - 5	186	13.9%	893	13.3%	212	17.1%	0.237
5.1 - 6	190	14.2%	1,109	16.5%	209	16.9%	0.188
6.1 - 7	156	11.7%	1,061	15.7%	166	13.4%	0.156
7.1 - 8	88	6.6%	690	10.2%	88	7.1%	0.128
8.1 - 9	51	3.8%	447	6.6%	60	4.9%	0.134
9.1 - 10	30	2.2%	294	4.4%	13	1.1%	0.044
10.1 - 11	10	0.7%	109	1.6%	3	0.2%	0.028
11.1 - 12	22	1.6%	264	3.9%	15	1.2%	0.057
12.1 - 13	8	0.6%	104	1.5%	1	0.1%	0.010
13.1 - 14	3	0.2%	41	0.6%	0	0.0%	0.000

Appendix 6. Mean monthly catch (harvest and release) per angler hour by region and species in the 1995 lower Fraser River sport fishery.

		Region 3									
		Chinook		Sockeye	Pink	Coho	Chum	Steelhead	Sturgeon	Cutthroat	Rainbow
Month	Adult	Jack									
Harvest	June	0.0379	0.0006	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	July	0.0285	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	August	0.0036	0.0000	0.0404	0.0025	0.0000	0.0000	0.0000	0.0000	0.0002	0.0000
	September	0.0047	0.0117	0.0162	0.1335	0.0028	0.0005	0.0002	0.0000	0.0003	0.0002
Release	June	0.0040	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	July	0.0019	0.0001	0.0004	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002	0.0004
	August	0.0002	0.0004	0.0491	0.0008	0.0000	0.0000	0.0012	0.0044	0.0013	0.0000
	September	0.0002	0.0007	0.0033	0.4391	0.0002	0.0006	0.0001	0.0005	0.0000	0.0000
Total	June	0.0419	0.0006	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	July	0.0304	0.0002	0.0004	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002	0.0004
	August	0.0038	0.0004	0.0895	0.0033	0.0000	0.0000	0.0012	0.0044	0.0015	0.0000
	September	0.0049	0.0124	0.0195	0.5726	0.0030	0.0011	0.0003	0.0005	0.0003	0.0002

		Region 4									
		Chinook		Sockeye	Pink	Coho	Chum	Steelhead	Sturgeon	Cutthroat	Rainbow
Month	Adult	Jack									
Harvest	June	0.0098	0.0031	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	July	0.0203	0.0007	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	August	0.0008	0.0017	0.0843	0.0014	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	September	0.0027	0.0061	0.0340	0.2518	0.0017	0.0000	0.0000	0.0000	0.0000	0.0000
Release	June	0.0019	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	July	0.0015	0.0002	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0002
	August	0.0000	0.0000	0.0352	0.0009	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000
	September	0.0000	0.0003	0.0029	0.7743	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	June	0.0117	0.0031	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	July	0.0218	0.0009	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0002
	August	0.0008	0.0017	0.1195	0.0023	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000
	September	0.0027	0.0064	0.0369	1.0261	0.0017	0.0000	0.0000	0.0000	0.0000	0.0000