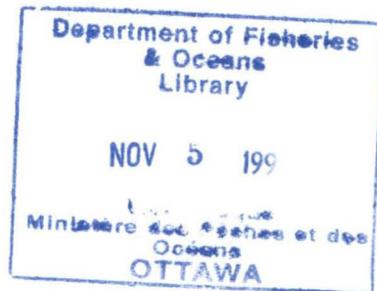


NISGA'A CATCH MONITORING PROGRAM, 1993 NISGA'A FISHERY

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**NISGA'A CATCH MONITORING PROGRAM,
1993 NISGA'A FISHERY**

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ABSTRACT

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Nisga'a harvests of salmon for food and ceremonial purposes were monitored in 1993 using a combination of shore-based and on-river surveys. Complete estimates of 30,400 sockeye and 5,586 chinook salmon, harvested by a total fishing effort of 20,942 net hours, were obtained. Minimum estimates for coho, pink, chum, and steelhead salmon were 595, 2,353, 416, and 357, respectively. Estimates for these latter species are considered minimums because the monitoring program was terminated on 11 September, prior to the end their migration through the lower Nass River.

RÉSUMÉ

Bocking, R. C. and K. K. English. 1996. Nisga'a catch monitoring program, 1993 Nisga'a fishery. Can. Manuscr. Rep. Fish. Aquat. Sci. 2377: 38 p.

En 1993, les pêches alimentaire et cérémonielle des Nisga'a ont fait l'objet d'une étude de recensement pour laquelle on a fait intervenir des dispositifs riverains et sous eau. Les résultats de cette étude révèlent que l'effort de pêche, qui totalisait 20 942 heures d'activité, a permis aux Nisga'a de capturer 30 400 saumons rouges et 5 586 saumons quinnats. Ces chiffres de capture, qui correspondent à une estimation minimale, se répartissent comme suit : 595 saumons cohos, 2 353 saumons roses, 416 saumons kétas et 357 truites arc-en-ciel anadromes. Il faut ici parler de chiffres minimum du fait que le programme de recensement s'est terminé le 11 septembre, soit avant la fin de la remonte du cours inférieur de la rivière Nass.

INTRODUCTION

In 1992, the Nisga'a Tribal Council initiated a catch monitoring program on the Nass River as part of the Interim Fisheries Program (English and Bocking 1993). The purpose of the program was to obtain, for the first time, accurate estimates of the catch and effort for Nisga'a net fisheries. These estimates are needed to assist in management of Nass River salmon stocks and the resolution of key fisheries issues associated with the ongoing Nisga'a Treaty Negotiations. Catch estimates covered in this report are for the period from 5 May to 11 September, 1993.

The Nisga'a salmon fishery is conducted out of the four Nisga'a villages along the Lower Nass River: Gingolx, Lakalzap, Gitwinksihlkw and New Aiyansh. The fishery is defined by Fisheries and Oceans (DFO) as Section 35 or a food fishery (fish only to be used for food, social and ceremonial purposes). Prior to 1991 Nisga'a food fishermen were limited to 4 d of fishing per week. This limitation ended in 1991 when the Nisga'a Tribal Council notified DFO that their fishery would operate 7 d a week, 24 h a day.

The 1993 Nisga'a fishery used a variety of gear types including: commercial drift gillnet vessels operating out of Gingolx and Lakalzap (400 m nets), still and drift gillnets fished from short and small boats throughout the lower Nass River (10-100 m nets), angling in the Kincolith River, and gillnetting in some tributaries for coho salmon. In 1992, when the escapement of sockeye salmon to the Nass River was over 650,000, the Nisga'a also harvested at Gitwinksihlkw using dipnets along the banks of the canyon.

The fishery generally starts in early May with fishermen targeting on chinook salmon. Toward the end of June the fishery shifts to smaller mesh gillnets as sockeye abundance increases. Sockeye salmon dominate the harvests throughout July and into early August. Harvests for the remainder of August include of all salmon species as gillnet fishermen target on coho salmon, pink salmon and the end of the sockeye run. Fishing effort drops off substantially in early September although coho, chum, and steelhead continue to be caught.

METHODS

SURVEY DESIGN

This catch survey covered the area of the Nass River from Grease Harbour, 5 km upstream of Gitlakdamix (Old Aiyansh) to Gingolx (Fig. 1). The river was stratified into 3 sections; upstream of Greenville bridge to Grease Harbour (Upper Stratum), downstream of Greenville bridge to Fort Pt. (Lower Stratum), and from Fort Pt. to Portland Inlet and surrounding waters (Kincolith Stratum).

Four different gear types were identified in 1993: 24-h set net, short set net, drift net and angling at Kincolith River. The survey design used a combination of shore-based interviews to determine catch per unit effort and a combination of on-river net counts and fisherman logs (compiled from interviews of fishermen) to determine total effort. Effort and

catch estimates were stratified by river location and gear type. Catch estimates were computed by multiplying our weekly effort estimates for each area and gear type by the appropriate catch per effort estimate. Interviewers recorded detailed information on fishing locations, times, net dimensions, and catch for all salmon species (Fig. 2).

ESTIMATING CATCH

The weekly catch (C) for a specific species in area t , gear type g , and week w , was estimated by multiplying the average catch per effort (CPE) by the total fishing effort (E) for each stratum.

$$C_{t g w} = CPE_{t g w} \cdot E_{t g w}$$

For example: if the average catch rate in the Upper Stratum for 24-h set nets in the third week of June was 6 chinook per fisher per day and we estimated that total fishing effort for this area-gear-week stratum was 20 net days³, the total catch estimate for this stratum would be 120 chinook (6 chinook per day times 20 d). Since all our analyses are based on hours, this would be equivalent to 0.25 chinook per hour times 480 h. The total weekly catch for a specific species was estimated by summing the weekly catch for each area and gear type. The procedures used to estimate catch per effort and total effort are described below.

ESTIMATING CATCH PER EFFORT

Mean daily catch per effort, by species of salmon, was estimated from on-water and shore-based interviews with fishers, either when they returned to the landing site with their catch or at the time they were processing the catch. In most instances, the surveyors met fishers at the point of landing where they conducted interviews and observed the catch as it was off-loaded from the boat. Occasionally, interviews were conducted in the communities, away from the fishing areas, in order to capture fishermen missed during other surveys. Catch and effort data from both types of interviews were used to compute the average catch per effort estimates.

The average catch per effort (CPE) for area t , gear type g and week w , was estimated by summing the sampled catch (sc) of a specific species for all interviews in a stratum and dividing by the total fishing effort (F) in hours recorded for these interviews (weighted mean):

³ A net day is a measure of effort which refers to the number of nets fishing for each 24-hour period; e.g., 20 net days could be 5 nets for 4 days, 10 nets fishing 2 days, or 20 nets fishing 1 day.

$$CPE_{t g w} = \frac{\sum_{i=1}^{ni} SC_{i t g w}}{\sum_{i=1}^{ni} F_{i t g w}}$$

where ni is the number of interviews i conducted in a stratum. This procedure provides a statistically unbiased estimate of mean daily catch per effort provided the catch per effort data are a representative sample of the fishing in each stratum. To ensure this, the field survey objective was to maximize the number of interviews conducted in each stratum each week.

An example of how the above formula works when three fishermen are interviewed in a specific area during a specific week and all were using gillnets set for more than 24 h is provided as follows. Fisher #1 caught 8 chinook in 30 h, fisher #2 caught 7 chinook in 25 h and fisher #3 caught 10 chinook in 45 h. Therefore, the average catch rate (catch per effort) for these three fishermen would be calculated by summing their total catch (8+7+10) and dividing by the total number of hours fished (30+25+45). Since 25 fish were caught in 100 h of fishing, the average catch per effort was 0.25 fish per hour for these fishermen. On a daily basis this would be equal to an average catch rate of 6 fish per day (0.25 fish/hour times 24 h).

ESTIMATING FISHING EFFORT

In 1992, we estimated daily fishing effort for each gear type from the maximum of: 1) the on-river boat counts of nets, and 2) the number of interviews conducted. In some cases, however, this led to errors in effort estimates for those gear types that are not visible on the river for long periods of time (i.e., drift nets and short set nets).

In 1993 we introduced fisherman logs to the study design. The purpose of the logs was to better estimate the drift and short still set fishing effort and to substantiate the on-river counts of 24-h set nets. Each surveyor kept a monthly journal of days when each fisherman was fishing, whether the fisherman was interviewed that day for catch or not. The fisherman logs allowed us to confirm whether or not fishing had indeed occurred on a given day.

Long Set Nets (>24 h)

This fishing gear represents all gillnets that are set at some fixed point in the river and fished continuously for more than 24 h. Therefore, the effort estimate for this gear type was essentially determined by the number of nets fished each day (npd):

$$npd_{t g w} = \frac{\sum_{d=1}^n N_{d t g w}}{n_{t g w}}$$

where N is the number of nets fishing on day d in area t , for gear type g , in week w ; and n is the number of days with complete effort data in that stratum (set to 7 for this study because the daily gear counts were derived from fishermen logs). The following table shows an example of actual daily fishing effort (net counts) recorded through interview, on-water survey and the resulting fisherman log net count and daily effort estimate used to compute the average number of nets fished each day (npd) for one of the fishing weeks in one area stratum.

Date	Interviews Net Count	On-Water Net Count	Fisherman Logs Net Counts	Total Daily Effort Net Count
June 27	5	7	7	7
June 28	5	7	7	7
June 29	5	6	6	6
June 30	4	10	10	10
July 1	5	11	12	12
July 2	6	12	14	14
July 3	7	8	11	11
Total	37	61	67	67
Average	5.29	8.71	9.57	9.57

Once the above value was determined, the total fishing effort for this gear type in a 7-day period was simply:

$$E_{t g w} = npd_{t g w} \cdot 24 \cdot 7$$

where all variables are as defined above. Therefore, the total fishing effort for the above example week would be 1608 h.

The assumptions associated with the catch and effort estimation procedure for long still set nets are:

- a. the fisherman logs derived from interviews and on water net counts provide a reliable estimate of the total fishing effort for 24-h set nets each week. Because of the high level of cooperation and intensive surveys, we assumed that no fishing effort was missed (i.e., a complete gear count);
- b. interview data are adequate to provide a reliable estimate of the mean number of fish caught per hour over the whole survey stratum (area, gear type, week); and
- c. interview data capture both day and night fishing activity in relatively equal proportions.

In 1992, our estimated CPE for 24-h set nets needed to be corrected for a bias due to differences in the catch rates for fishing intervals that included nighttime hours versus those that only included daytime hours (English and Bocking 1993). While all of the nets classified as a 24-h set were fished continuously over several days, there were several weeks in 1992 when the vast majority of the samples only represented daytime fishing. This was particularly a problem in the Lower Stratum in a few weeks when catch rates were much higher for 1-12 h daytime sets than for either overnight sets or combined day-night sets. We addressed this problem in 1992 by making a conservative adjustment to the CPE estimate for 24-h set net data:

$$Adjustment\ Factor_{t,w} = 0.5 + 0.5 \frac{overnight\ sets_{t,w}}{total\ sets_{t,w}}$$

where *overnight sets* is the number of sets in a stratum (area, week) that included at least one night and *total sets* is the number of sets in a stratum. Therefore, if none of the interviews in a stratum included overnight sets, then the observed CPE would be reduced by 50%; and if all of the interviews included sets with an overnight period, then the observed CPE would not be changed (adjustment factor=1). This adjustment factor is conservative because it assumes that the nets surveyed for daytime catches would catch very few or no fish during nighttime hours.

In 1993, we tried to ensure that the interviews conducted captured day and night set fishing activity in relatively equal proportions. We then tested how well our survey performed in 1993 by comparing sockeye and chinook catch estimates using: 1) no night/day adjustment and 2) night/day adjustment.

Short Set Nets (< 12 hours)

This gear type represented all gillnets set at a fixed point, fished for several hours, up to 12 h, and removed at the end of each fishing trip. The number of nets fished per day was calculated using the formula described above. However, for short set nets, we also estimated the average number of hours of fishing time per sets in each stratum (hps):

$$hps_{t g w} = \frac{\sum_{s=1}^{ns} F_{s t g w}}{ns_{t g w}}$$

where F is the daily fishing time per set s in area t , for gear type g , in week w ; and ns is the number of sets in that stratum. For example: if four short sets were sampled in a stratum and their set times were 1.5, 2.5, 4.0 and 2.0 h, then the average hours fished per net (hpn) for these fishermen would be 2.5 h (10/4).

The total fishing effort for this gear type in a 7-day period was:

$$E_{t g w} = npd_{t g w} \cdot hps_{t g w} \cdot 7$$

where all variables are as defined above.

The shorter duration of fishing time for this gear generally results in incomplete counts during on-water surveys. Consequently, our estimates of mean nets per day were determined from the total number of nets fished on a given day recorded in the fisherman logs. The assumptions associated with this estimation procedure are:

- a. the fisherman logs account for all the short set net fishing activity;
- b. the fisherman interviewed are a representative sample of the fishery each week (i.e., no selective sampling); and
- c. sufficient numbers of interviews were conducted in each stratum to provide a reliable estimate of the mean number of fish caught per hour.

Drift Nets

This gear type represents all gillnets fished from boats by drifting downstream with the river current. A typical drift set is between 10 and 20 min long and a fisherman will usually

make several drifts each fishing trip. Total weekly drift net fishing effort was calculated using the same formula described for short set nets above.

Due to the mobility of drift fishermen and the relatively short duration of a single fishing trip, we were unable to obtain complete counts of the number of drift fishermen on the river each day from the on-river net surveys. However, like short set nets, we were able to estimate the number of nets fishing per day from the fisherman logs. This estimate was then compared with the shore-based interview data. The estimated number of nets fishing was the maximum of these two estimates. This method allowed us to include zero values for those days when no drift fishing observed or reported rather than assuming a daily mean value for the week as was done in the previous year.

For each drift fisherman interviewed, the start and end time of each fishing trip was recorded as well as the number of drifts per trip. Weekly effort was then estimated as the total number of drift-hours per week for each river stratum.

The assumptions associated with our effort estimate for drift nets are essentially the same as those listed above for short set nets.

Angling

Angling gear is used by Nisga'a fishermen to catch small numbers of chinook, coho and pink salmon in the lower reaches of the Kincolith River. Our catch estimates for this gear type were simply the sum of the catches obtained from interviewing Nisga'a anglers. We assumed that we captured 100% of the angling effort. Nisga'a fishermen also angle for salmon in other Nass tributaries, but these fisheries are considered small and were not monitored.

Commercial Fishing Bycatch

During July and August, some commercial fishermen from Gingolx retained portions of their catch for their families. Numbers of commercial bycatch reported here are the sum of those reported by fishermen and probably underestimate the total catch for this category of gear.

ESTIMATING VARIANCE FOR CPE, EFFORT AND TOTAL CATCH

Variance is a term used to describe differences between samples. For example, if each fisher fished the same number of hours and caught the same number of fish, the variance associated with our catch and effort estimates would be zero. Estimates of variance increase as the differences between individual samples or fishing activity increases. Variance estimates are typically used to describe how confident we are in our final catch and effort estimates. We are more confident that our estimates are correct when the variance estimates are small than when they are large. Variance estimates are also useful for determining how much sampling effort is

needed. If variance is zero (i.e., all fishermen are equal) then we only need to interview one fisher to get a reliable estimate of the average catch or effort. If the variance is very large we need many samples to be confident in our final estimates. In this study, our variance estimates are used to calculate a statistic called the standard error, or the standard deviation of the mean. Its name is not important, what is important is that it provides a measure of our success. Most fisheries managers would be very happy if their catch monitoring studies produced catch estimates with standard errors that were only 5% of the estimate (i.e., a standard error of 5 for a catch estimate of 100). Larger standard errors (10-15% of the estimate) indicate that the catch and effort estimates are less precise, thereby, indicating the results of the study are more uncertain.

The procedures used to estimate the variance associated with the catch and fishing effort estimates are similar to those used in other catch monitoring programs (English et al. 1986; Shardlow et al. 1989). The following equations are provided for those interested in how we estimated the variance for our catch and effort estimates.

The variance estimate for the number of nets fishing each day (npd) was:

$$Var(npd_{t g w}) = \frac{(7 - n_{t g w})}{(7 - 1)} \cdot \frac{\sum_{d=1}^n N_{d t g w}^2 - \frac{(\sum_{d=1}^n N_{d t g w})^2}{n_{t g w}}}{(n_{t g w} - 1)}$$

where N is the number of nets fished on each day d , in area t , for gear type g , in week w ; and n is the number of days monitored for fishing effort in that stratum (set to 7 for estimates based on fisherman logs). The variance estimate for the number of hours per net was:

$$Var(hps_{t g w}) = \frac{\sum_{s=1}^{ns} F_{s t g w}^2 - \frac{(\sum_{s=1}^{ns} F_{s t g w})^2}{ns_{t g w}}}{(ns_{t g w} - 1)}$$

where F is the daily fishing time per set s , in area t , for gear type g , in week w ; and ns is the number of sets in that stratum. Therefore, the total variance for fishing effort by short still sets in any stratum was:

$$Var(E_{short\ sets, drifts}) = 7^2 \cdot npd^2 \cdot Var(hps) + hps^2 \cdot Var(npd) + Var(npd) \cdot Var(hps)$$

where 7 is the number of days available for fishing each week (set to 7 to be consistent with how npd was calculated). The total variance for fishing effort by long still sets and fishwheels in any stratum was:

$$Var(E_{long\ sets}) = 7^2 \cdot 24^2 \cdot Var(npd)$$

because the number of hours per set (hps) for these gear types was fixed at 24 h.

The variance estimate for mean catch per effort was:

$$Var(CPE_{t\ g\ w}) = \frac{\sum_{i=1}^{ni} wt_{i\ t\ g\ w} \cdot cpe_{i\ t\ g\ w}^2 - \frac{(\sum_{i=1}^{ni} wt_{i\ t\ g\ w} \cdot cpe_{i\ t\ g\ w})^2}{ni_{t\ g\ w}}}{ni_{t\ g\ w} \cdot (ni_{t\ g\ w} - 1)}$$

where cpe is the catch per effort reporting in interview I , in area t , for gear type g , in week w ; ni is the number of interviews in that stratum; and wt is the weighting factor such that the sum of all weight factors for a specific area, gear type and week is equal to the number of interviews in that stratum.

The variance for the total catch in each stratum was estimated by combining the variance for fishing effort and variance for catch per effort using the significant terms of a Taylor series expansion (Cochran 1963):

$$Var(C_{t\ g\ w}) = E_{t\ g\ w}^2 \cdot Var(CPE)_{t\ g\ w} + CPE_{t\ g\ w}^2 \cdot Var(E)_{t\ g\ w} + Var(E)_{t\ g\ w} \cdot Var(CPE)_{t\ g\ w}$$

where all variables have been defined above. Therefore, the standard error (STE) associated with the catch estimate for area t , gear g and week w is:

$$STE(C_{t\ g\ w}) = \sqrt{\frac{Var(C_{t\ g\ w})}{ni_{t\ g\ w}}}$$

Similarly, the standard error associated with the total catch estimate was:

$$STE(C) = \sqrt{\frac{\sum_t \sum_g \sum_w Var(C_{t g w})}{\sum_t \sum_g \sum_w ni_{t g w}}}$$

where all variables have been defined above.

RESULTS

SURVEY AND FISHING EFFORT

Nisga'a catch monitoring crews conducted 690 interviews of Nisga'a fishermen between 5 May and 11 September 1992 (Table 1).

These numbers are the maximum of either the interview counts, net counts or fisherman logs. For most days, the maximum estimate of the number of nets fishing each day in the Upper Stratum came from the fisherman logs (Table 2 and 3). The number of drift nets fished was larger for the net count data than the fisherman logs on only 5 of 66 d when we had on-river net counts. For some weeks, there was a substantial difference in the calculated mean daily effort (using only net count and interview date (1992 Method) versus the 1993 Method which included fisherman log data, Table 3). In the case of drift and short set nets, one of the main reasons for the difference between estimates was that, in 1993, the fisherman logs allowed us to estimate the number of nets for every day and hence the mean daily effort was averaged over all 7 d in the week. In 1992, we averaged over just the number of days for which we had on-river net counts. Similar differences between methods were observed for the other two strata.

Fishing effort peaked in the first week of July at 23.2 nets per day and total effort was consistently above 10 nets per day from 30 May to 31 July (Table 4). In general, the fishing effort was evenly split between the Upper and Lower strata, while Kincolith Stratum represented only 1% of the total effort (Table 5). The observed effort (the amount of total effort captured by interviews) accounted for roughly 71% of our total effort estimate (Table 6). The percent of the total effort sampled in the Upper Stratum was generally lower for 24-set nets (44.4%) than drift nets gear (80.8%) and short set net gear (93.0%). The same pattern was true for the Lower Stratum. We sampled 84.5% of the drift set effort in Kincolith Stratum.

SOCKEYE SALMON HARVESTS

The total sockeye harvest to 11 September was estimated at 30,490 fish with a standard error of 2255 (7.4% of the estimate). The total number of sockeye observed by survey staff

during interviews was 20,748 (68% of the total catch estimate). The Upper Stratum accounted for 41.2% of the harvest, followed by the Lower Stratum at 37.5% and Kincolith at 21.3% (Table 7). Sockeye catches in Kincolith peaked in early July and catches in the other two strata peaked one week later (Fig. 3). Harvests by 24-h set net gear accounted for the majority of the catch in the Upper and Lower strata while most of the Kincolith Stratum harvest was taken by drift net gear.

CHINOOK SALMON HARVESTS

The total chinook harvest in 1993 was estimated at 5,586 pieces with a standard error of 459 (8.2% of the estimate). The total number of chinook observed by survey staff during interviews was 3,331 (59.6% of the total catch estimate). The Upper Stratum accounted for 54.8% of the harvest, followed by the Lower Stratum at 38.5% and Kincolith Stratum at 6.8% (Table 8). Catches of chinook bound for Nass tributaries above Kincolith Stratum peaked in the middle of June (Fig. 4). The peak of chinook catches in the Kincolith River peaked in the first week of July. Harvests by 24-h set net gear accounted for the majority of the Upper and Lower strata catch (68.5%) while most of the Kincolith Stratum harvest was taken by drift net gear and angling in the Kincolith River.

COHO, PINK AND CHUM SALMON HARVESTS

The total harvest for coho, pink and chum salmon, up to 11 September, was estimated at 595, 2,353, and 416 fish, respectively (Table 9, 10 and 11). The precision of these estimates were lower than sockeye and chinook salmon, ranging from 12-34% of the estimate, due to the much more variable catch rates for these species. There were no significant harvests of these species prior to mid-July. Some of the highest weekly harvests of coho salmon for the year were recorded just prior to the termination of the monitoring effort. (Fig. 5). Weekly pink harvests peaked in the last week of July and were quite low by 11 September. Weekly chum harvests were highest during the week of 4 September.

STEELHEAD HARVESTS

The total harvest of steelhead, up to 11 September, was estimated at 357 pieces with a standard error of 84 (23% of the estimate) and was less than 1% of the total in-river catch of salmon. Harvests of the spring run of steelhead was relatively small at roughly 73 pieces (8 May to 26 June). The remainder of the steelhead catch was assumed to be from summer runs (306 pieces). Steelhead harvests were highest during the last week of August and early September when Nisga'a fishermen were targeting on coho salmon (Table 12). The majority of steelhead were taken in the Lower Stratum (53.8%).

CATCH OBSERVED

In the Upper Stratum, interviewers observed between 43% (pink) and 69% (chinook) of the chinook catch that was captured during the interviews (Table 13). Fewer fish were seen by observers in the Lower Stratum; between 34% for chinook and 58% for pink. The highest proportion of the catch seen was in Kincolith Stratum; between 90% for steelhead and 100% for coho, pink and chum.

COMPARISON OF SOCKEYE ESTIMATES WITH AND WITHOUT FISHERMAN LOG EFFORT DATA

We compared what our estimates of the total sockeye harvest would have been for each gear type had we not used the fisherman log effort data in 1993. Had we estimated the 1993 sockeye harvest in the same manner as in 1992 (without fisherman log data) we would have determined a total harvest of 36,554 (excluding fishwheel harvests and commercial bycatch, Table 14). This is 24% higher than the estimate when fisherman log data was used. The main reason for the difference was the overestimation of the amount of drift effort in Kincolith Stratum that occurs when effort is determined on the basis of interview data alone. Since interviews are not conducted every day, and the daily mean is only the average of interview days, days when no one was fishing are not accounted for. Similarly, by not including days when we had no net counts of drift and short set effort, we overestimated the mean daily drift and short set net effort in the other two strata.

COMPARISON OF SOCKEYE ESTIMATES WITH AND WITHOUT ADJUSTING FOR DAY/NIGHT CPE

As described earlier, we attempted to ensure that our interviewers captured daytime and nighttime fishing activity for 24-h set nets in relatively equal proportions. To evaluate their performance, we calculated sockeye harvest estimates for 24-h set nets in each stratum with and without the analytical adjustment (see methods). We found that the total sockeye harvest estimates using the two methods were within 3% of each other. The estimated harvest without using the adjustment was slightly higher than when the adjustment was used. Sockeye estimates presented in this report are with the adjustment being done.

DISCUSSION

The total harvest of salmon in 1993 was lower than for 1992, although total effort was nearly identical for both years (approximately 20,000 net hours). Accordingly, CPE was lower in 1993 and can probably be attributed to a slightly smaller escapement of sockeye and lower daily abundances of salmon available for harvest. The precision associated with our catch estimates for sockeye and chinook was good (standard errors of 7.4-8.2% of the estimate) but poor for the other species. Due to budget limitations, we were not able to capture complete information on fall and winter harvests of coho, chum and steelhead.

Several improvements were made to the catch monitoring program in 1993. The most significant of these were:

1. Increased effort in obtaining representative interviews for day and night fishing times for 24-h set net fishermen; and
2. The use of fishermen logs to estimate fishing effort for days when there were no net counts and for drift and short set gear types.

Despite these improvements, several weaknesses remain in the program. First, we are still unable to obtain reliable estimates of Nisga'a "food" harvests by commercial fishermen. The addition of a marine vessel in 1994 would greatly increase our ability to monitor these fishermen. Second, our estimates of chum, coho and steelhead harvests remain incomplete. Future funding should be at a level sufficient to run this monitoring program to the end of September.

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TABLES

Table 1. Total number of interviews conducted each week, stratified by gear type and river stratum, 1993.

Week ending	Upper Stratum				Lower Stratum				Kincolith Stratum				Grand Total
	24 hour still sets	Drift sets	Short still sets	Total	24 hour still sets	Drift sets	Short still sets	Total	24 hour still sets	Drift sets	Short still sets	Total	
8-May	0	6	0	6	0	0	0	0	0	0	0	0	6
15-May	2	13	0	15	10	3	0	13	0	4	0	4	32
22-May	0	3	0	3	1	5	0	6	0	5	0	5	14
29-May	0	6	0	6	13	0	2	15	0	4	0	4	25
5-Jun	4	4	0	8	23	0	0	23	0	6	0	6	37
12-Jun	23	18	4	45	21	3	0	24	0	9	0	9	78
19-Jun	17	18	3	38	11	2	0	13	0	10	0	10	61
26-Jun	12	16	1	29	26	6	0	32	0	13	0	13	74
3-Jul	37	13	1	51	27	5	0	32	0	12	0	12	95
10-Jul	24	6	3	33	34	1	0	35	0	1	0	1	69
17-Jul	12	8	6	26	23	0	0	23	0	8	0	8	57
24-Jul	14	10	3	27	22	0	0	22	0	3	0	3	52
31-Jul	6	6	9	21	15	0	0	15	0	1	0	1	37
7-Aug	0	2	1	3	4	1	0	5	0	2	0	2	10
14-Aug	0	5	5	10	7	0	0	7	0	0	0	0	17
21-Aug	0	6	0	6	2	0	0	2	0	1	0	1	9
28-Aug	0	2	0	2	4	0	0	4	0	2	0	2	8
4-Sep	0	0	0	0	2	0	0	2	0	0	0	0	2
11-Sep	3	0	0	3	4	0	0	4	0	0	0	0	7
Total	154	142	36	332	249	26	2	277	0	81	0	81	

Table 2. Summary of fishing effort in number of nets per day by gear type, day, week and area, 1993.

Data is from combination of on-river net counts and daily fisherman logs.

Week ending	24 hour still sets								Drift sets								Short still sets							
	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Mean	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Mean	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Mean
Upper Stratum																								
8-May	0	0	0	0	0	0	0	0.00	0	1	0	1	2	1	2	1.00	0	0	0	0	0	0	0	0.00
15-May	0	1	1	2	2	0	1	1.00	0	4	3	4	3	1	0	2.14	0	0	0	0	0	0	0	0.00
22-May	0	0	0	0	0	0	0	0.00	1	0	1	1	1	0	0	0.57	0	0	0	0	0	0	0	0.00
29-May	0	0	0	0	0	0	0	0.00	1	4	1	2	1	0	0	1.29	0	0	0	0	0	0	0	0.00
5-Jun	0	3	4	3	4	2	4	2.86	0	1	0	2	1	0	1	0.71	0	0	0	0	0	0	0	0.00
12-Jun	4	4	8	9	11	8	8	7.43	1	2	4	5	4	1	5	3.14	0	1	1	1	1	0	0	0.57
19-Jun	7	6	7	7	6	2	2	5.29	5	4	3	3	4	0	2	3.00	0	1	1	1	0	0	0	0.43
26-Jun	2	3	3	5	7	9	7	5.14	4	3	2	5	3	2	2	3.00	1	0	0	0	0	0	0	0.14
3-Jul	7	7	6	10	12	14	11	9.57	4	1	4	1	0	4	3	2.43	0	0	0	1	0	0	0	0.14
10-Jul	11	8	6	7	6	4	4	6.57	0	0	3	2	1	0	1	1.00	0	0	2	2	1	0	0	0.71
17-Jul	3	5	2	2	3	6	4	3.57	3	3	1	2	1	2	1	1.86	0	3	0	0	2	2	0	1.00
24-Jul	3	3	3	4	4	4	3	3.43	2	3	2	2	2	0	0	1.57	1	0	0	2	0	0	0	0.43
31-Jul	2	3	3	2	2	2	0	2.00	2	1	0	2	3	0	0	1.14	2	3	0	1	2	0	0	1.14
7-Aug	0	0	0	0	1	1	1	0.43	0	1	0	1	0	0	0	0.29	0	0	0	0	0	0	1	0.14
14-Aug	0	0	0	0	0	0	1	0.14	1	0	1	1	1	1	2	1.00	1	0	1	4	0	0	1	1.00
21-Aug	2	2	0	0	0	0	0	0.57	1	2	1	3	1	0	0	1.14	0	0	0	0	0	0	0	0.00
28-Aug	0	0	0	0	0	0	0	0.00	1	0	0	1	0	0	0	0.29	0	0	0	0	0	0	0	0.00
4-Sep	0	0	0	0	1	0	0	0.14	0	0	0	0	0	0	0	0.00	0	0	0	0	0	0	0	0.00
11-Sep	0	1	1	1	0	0	0	0.43	0	0	0	0	0	0	0	0.00	0	0	0	0	0	0	0	0.00
Daily mean	2.16	2.42	2.32	2.74	3.11	2.74	2.42	2.56	1.37	1.58	1.37	2.00	1.47	0.63	1.00	1.35	0.26	0.42	0.26	0.63	0.32	0.11	0.11	0.30
Total nets fished				340								179								40				

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Table 2. Summary of fishing effort in number of nets per day by gear type, day, week and area, 1993.

Data is from combination of on-river net counts and daily fisherman logs.

Week ending	24 hour still sets								Drift sets								Short still sets							
	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Mean	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Mean	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Mean
Lower Stratum																								
8-May	0	0	0	0	0	0	0	0.00	0	0	0	0	0	0	0	0.00	0	0	0	0	0	0	0	0.00
15-May	0	1	3	3	3	2	0	1.71	0	1	2	0	0	0	0	0.43	0	0	0	0	0	0	0	0.00
22-May	0	0	0	1	0	0	0	0.14	1	0	1	0	2	0	1	0.71	0	0	0	1	0	0	0	0.14
29-May	1	3	3	3	3	3	3	2.71	0	0	0	0	0	0	0	0.00	0	0	0	1	1	0	1	0.43
5-Jun	4	5	6	5	6	6	9	5.86	0	1	0	0	0	0	0	0.14	0	0	0	0	0	0	0	0.00
12-Jun	8	9	7	7	5	3	4	6.14	1	0	0	1	1	0	0	0.43	0	1	2	0	0	0	0	0.43
19-Jun	4	4	4	5	5	8	7	5.29	0	0	0	2	0	0	2	0.57	0	0	0	0	0	0	0	0.00
26-Jun	6	7	8	8	9	8	8	7.71	2	0	1	1	1	0	1	0.86	0	0	0	0	0	0	0	0.00
3-Jul	8	8	9	7	8	8	9	8.14	0	1	0	1	0	1	2	0.71	0	0	0	0	0	0	0	0.00
10-Jul	8	7	7	7	8	7	6	7.14	0	0	0	0	1	0	0	0.14	0	0	0	0	0	0	0	0.00
17-Jul	6	6	6	6	8	9	8	7.00	0	0	0	0	0	0	0	0.00	1	0	0	0	0	0	0	0.14
24-Jul	8	5	6	6	6	7	7	6.43	0	0	0	0	0	0	0	0.00	0	0	0	0	0	0	0	0.00
31-Jul	6	6	6	5	4	4	3	4.86	0	0	0	0	0	0	0	0.00	0	0	0	0	0	0	0	0.00
7-Aug	2	2	2	2	2	3	3	2.29	0	0	1	0	0	0	0	0.14	0	0	0	0	0	0	0	0.00
14-Aug	2	4	2	2	2	2	2	2.29	0	0	0	0	0	0	0	0.00	0	0	0	0	0	0	0	0.00
21-Aug	2	2	2	2	0	0	0	1.14	0	0	0	0	0	0	0	0.00	0	0	0	0	0	0	0	0.00
28-Aug	1	1	1	1	1	1	2	1.14	0	0	0	0	0	0	0	0.00	0	0	0	0	0	0	0	0.00
4-Sep	1	2	3	3	2	0	0	1.57	0	0	0	0	1	0	0	0.14	0	0	0	0	0	0	0	0.00
11-Sep	2	3	3	3	0	0	0	1.57	0	0	0	0	0	0	0	0.00	0	0	0	0	0	0	0	0.00
Daily mean	3.63	3.95	4.11	4.00	3.79	3.74	3.74		0.21	0.16	0.26	0.26	0.32	0.05	0.32	0.23	0.05	0.05	0.11	0.11	0.05	0.00	0.05	0.06
Total nets fished				512								30								8				

Table 2. Summary of fishing effort in number of nets per day by gear type, day, week and area, 1993.

Data is from combination of on-river net counts and daily fisherman logs.

Week ending	24 hour still sets								Drift sets								Short still sets							
	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Mean	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Mean	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Mean
Kincolith Stratum																								
8-May	0	0	0	0	0	0	0	0.00	0	0	0	0	0	0	0	0.00	0	0	0	0	0	0	0	0.00
15-May	0	0	0	0	0	0	0	0.00	0	0	2	2	1	1	2	1.14	0	0	0	0	0	0	0	0.00
22-May	0	0	0	0	0	0	0	0.00	1	0	1	2	2	0	0	0.86	0	0	0	0	0	0	0	0.00
29-May	0	0	0	0	0	0	0	0.00	0	1	3	1	0	0	0	0.71	0	0	0	0	0	0	0	0.00
5-Jun	0	0	0	0	0	0	0	0.00	0	0	1	2	2	1	0	0.86	0	0	0	0	0	0	0	0.00
12-Jun	0	0	0	0	0	0	0	0.00	1	0	1	3	4	1	0	1.43	0	0	0	0	0	0	0	0.00
19-Jun	0	0	0	0	0	0	0	0.00	0	0	0	2	5	1	2	1.43	0	0	0	0	0	0	0	0.00
26-Jun	0	0	0	0	0	0	0	0.00	7	0	0	2	3	3	3	2.57	0	0	0	0	0	0	0	0.00
3-Jul	0	0	0	0	0	0	0	0.00	3	0	1	1	3	5	3	2.29	0	0	0	0	0	0	0	0.00
10-Jul	0	0	0	0	0	0	0	0.00	0	0	0	0	1	1	0	0.29	0	0	0	0	0	0	0	0.00
17-Jul	0	0	0	0	0	0	0	0.00	6	0	0	0	0	1	1	1.14	0	0	0	0	0	0	0	0.00
24-Jul	0	0	0	0	0	0	0	0.00	1	0	0	1	1	0	0	0.43	0	0	0	0	0	0	0	0.00
31-Jul	0	0	0	0	0	0	0	0.00	0	0	0	0	0	0	1	0.14	0	0	0	0	0	0	0	0.00
7-Aug	0	0	0	0	0	0	0	0.00	0	1	1	0	0	1	0	0.43	0	0	0	0	0	0	0	0.00
14-Aug	0	0	0	0	0	0	0	0.00	0	0	0	0	0	0	0	0.00	0	0	0	0	0	0	0	0.00
21-Aug	0	0	0	0	0	0	0	0.00	1	0	0	0	0	0	0	0.14	0	0	0	0	0	0	0	0.00
28-Aug	0	0	0	0	0	0	0	0.00	0	0	0	0	0	1	1	0.29	0	0	0	0	0	0	0	0.00
4-Sep	0	0	0	0	0	0	0	0.00	0	0	0	0	0	0	0	0.00	0	0	0	0	0	0	0	0.00
11-Sep	0	0	0	0	0	0	0	0.00	0	0	0	0	0	0	0	0.00	0	0	0	0	0	0	0	0.00
Daily mean	0	0	0	0	0	0	0		1.05	0.11	0.53	0.84	1.16	0.84	0.68	0.74	0	0	0	0	0	0	0	0.00
Total nets fished				0								99								0				

Table 3. Summary of effort estimates for the Upper Stratum from interviews, net counts and fisherman logs and mean effort estimates used in 1992 and in 1993.

Gear type	Week ending	Interviews							Net Counts							Fisherman Logs							1992 Method Daily mean	1993 Method Daily mean
		S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S		
24 hour Still	8-May	0	0	0	0	0	0	0								0	0	0	0	0	0	0	0.00	0.00
	15-May	0	0	1	1	0	0	0	1	1	2	2	0	1	0	1	1	2	2	0	1	1.17	1.00	
	22-May	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0.00	0.00	
	29-May	0	0	0	0	0	0	0	0	0	0		0		0	0	0	0	0	0	0	0.00	0.00	
	5-Jun	0	0	1	0	0	0	3	3	3	3	4	1	3	0	3	4	3	4	2	4	2.83	2.86	
	12-Jun	2	1	4	7	4	2	3	8	6	11				4	4	8	9	11	8	8	8.33	7.43	
	19-Jun	5	3	4	2	2	1	0			6	2	2		7	6	7	7	6	2	2	3.33	5.29	
	26-Jun	0	1	0	1	1	5	4	3	3	4	7	3	7	2	3	3	5	7	9	7	4.50	5.14	
	3-Jul	5	5	5	4	5	6	7	7	7	6	10	11	12	8	7	7	6	10	12	14	11	8.71	9.57
	10-Jul	6	5	4	5	3	0	1	8	6	7				11	8	6	7	6	4	4	7.00	6.57	
	17-Jul	3	1	0	1	1	5	1	1	1	2	2	3		3	5	2	2	3	6	4	1.80	3.57	
	24-Jul	2	2	2	2	2	2	2	3	3	3	4	4		3	3	3	4	4	4	3	3.40	3.43	
	31-Jul	2	2	2	0	0	0	0	3		2	2	2		2	3	3	2	2	2	0	2.25	2.00	
	7-Aug	0	0	0	0	0	0	0	0	0		1	1	1	0	0	0	0	1	1	1	0.60	0.43	
	14-Aug	0	0	0	0	0	0	0			0			1	0	0	0	0	0	0	1	0.50	0.14	
	21-Aug	0	0	0	0	0	0	0	2	2					2	2	0	0	0	0	0	2.00	0.57	
	28-Aug	0	0	0	0	0	0	0							0	0	0	0	0	0	0	0.00	0.00	
	4-Sep	0	0	0	0	0	0	0							0	0	0	0	1	0	0	0.00	0.14	
	11-Sep	0	1	1	1	0	0	0							0	1	1	1	0	0	0	0.00	0.43	
Drift	8-May	0	1	0	1	2	1	1							0	1	0	1	2	1	2	1.20	1.00	
	15-May	0	3	3	4	2	1	0	1	2	2	2	1	0	0	4	3	4	3	1	0	2.17	2.14	
	22-May	1	0	1	1	0	0	0	0	1	0	1	0		1	1	2	2	2	1	0	0.60	1.29	
	29-May	1	3	1	0	1	0	0	4	0	2		0		1	3	1	0	1	0	0	1.60	0.86	
	5-Jun	0	1	0	2	0	0	1	0	0	2	1	0	1	0	4	0	2	1	0	1	0.83	1.14	
	12-Jun	1	1	4	5	2	1	4		2	5	4			1	2	4	5	3	1	5	3.50	3.00	
	19-Jun	4	4	3	3	3	0	1			0	2	0		5	4	3	5	4	0	2	2.60	3.29	
	26-Jun	3	2	1	5	3	1	1	2	0	2	2	0	2	4	3	2	5	3	2	1	2.33	2.86	
3-Jul	3	1	3	1	0	3	2	0	1	2	0	0	0	0	4	2	4	2	2	4	3	1.86	3.00	
10-Jul	0	0	3	1	1	0	1	0	0	0				0	1	3	2	1	0	1	1.33	1.14		

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Table 3. Summary of effort estimates for the Upper Stratum from interviews, net counts and fisherman logs and mean effort estimates used in 1992 and in 1993.

Gear type	Week ending	Interviews							Net Counts							Fisherman Logs							1992 Method Daily mean	1993 Method Daily mean	
		S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S			
	17-Jul	3	2	0	2	0	1	0		1	1	1	0	0			3	3	1	2	1	2	1	1.20	1.86
	24-Jul	2	3	2	1	2	0	0		0	0	0	2	0			2	3	2	2	2	0	0	1.60	1.57
	31-Jul	1	1	0	2	2	0	0		0		1	0	0			2	1	0	2	3	0	0	1.25	1.14
	7-Aug	0	1	0	1	0	0	0		0	0			0	0	0	0	1	0	1	0	0	0	0.20	0.29
	14-Aug	1	0	1	1	0	0	2				0		1			1	0	1	1	1	1	2	1.50	1.00
	21-Aug	1	0	1	3	1	0	0		1	2						1	1	1	3	1	0	1	1.50	1.14
	28-Aug	1	0	0	1	0	0	0									1	2	0	1	0	0	0	0.29	0.57
	4-Sep	0	0	0	0	0	0	0									0	0	0	0	0	0	0	0.00	0.00
	11-Sep	0	0	0	0	0	0	0									0	0	0	0	0	0	0	0.00	0.00
Short still	8-May	0	0	0	0	0	0	0									0	0	0	0	0	0	0	0.00	0.00
	15-May	0	0	0	0	0	0	0		0	0	0	0	0	0		0	0	0	0	0	0	0	0.00	0.00
	22-May	0	0	0	0	0	0	0		0	0	0	0	0			0	0	0	0	0	0	0	0.00	0.00
	29-May	0	0	0	0	0	0	0		0	0	0		0			0	0	0	0	0	0	0	0.00	0.00
	5-Jun	0	0	0	0	0	0	0		0	0	0	0	0	0		0	0	0	0	0	0	0	0.00	0.00
	12-Jun	0	1	1	1	1	0	0				0	0	0			0	1	1	1	1	0	0	1.00	0.57
	19-Jun	0	1	1	1	0	0	0				0	0	0			0	1	1	1	0	0	0	1.00	0.43
	26-Jun	1	0	0	0	0	0	0		0	0	0	0	0	0		1	0	0	0	0	0	0	1.00	0.14
	3-Jul	0	0	0	1	0	0	0		0	0	0	0	0	0		0	0	0	1	0	0	0	1.00	0.14
	10-Jul	0	0	1	1	1	0	0		0	0	0					0	0	2	2	1	0	0	1.00	0.71
	17-Jul	0	2	0	0	2	2	0		2	0	0	0	0			0	3	0	0	2	2	0	2.00	1.00
	24-Jul	1	0	0	2	0	0	0		0	0	0	0	0			1	0	0	2	0	0	0	1.50	0.43
	31-Jul	2	4	0	1	2	0	0		1		0	0	0			2	3	0	1	2	0	0	2.25	1.14
	7-Aug	0	0	0	0	0	0	1		0	0			0	0	0	0	0	0	0	0	0	1	0.00	0.14
	14-Aug	0	0	1	3	0	0	1				1		1			1	0	1	4	0	0	1	1.67	1.00
	21-Aug	0	0	0	0	0	0	0		0	0						0	0	0	0	0	0	0	0.00	0.00
	28-Aug	0	0	0	0	0	0	0									0	0	0	0	0	0	0	0.00	0.00
	4-Sep	0	0	0	0	0	0	0									0	0	0	0	0	0	0	0.00	0.00
	11-Sep	0	0	0	0	0	0	0									0	0	0	0	0	0	0	0.00	0.00

Table 4. Estimated number of nets per day, stratified by gear type and river stratum, 1993.

Week ending	Upper Stratum				Lower Stratum				Kincolith Stratum				Grand Total
	24 hour still sets	Drift sets	Short still sets	Total	24 hour still sets	Drift sets	Short still sets	Total	24 hour still sets	Drift sets	Short still sets	Total	
8-May	0.0	1.0	0.0	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
15-May	1.0	2.1	0.0	3.1	1.7	0.4	0.0	2.1	0.0	1.1	0.0	1.1	6.3
22-May	0.0	0.6	0.0	0.6	0.1	0.7	0.1	0.9	0.0	0.9	0.0	0.9	2.4
29-May	0.0	1.3	0.0	1.3	2.7	0.0	0.4	3.1	0.0	0.7	0.0	0.7	5.1
5-Jun	2.9	0.7	0.0	3.6	5.9	0.1	0.0	6.0	0.0	0.9	0.0	0.9	10.5
12-Jun	7.4	3.1	0.6	11.1	6.1	0.4	0.4	6.9	0.0	1.4	0.0	1.4	19.4
19-Jun	5.3	3.0	0.4	8.7	5.3	0.6	0.0	5.9	0.0	1.4	0.0	1.4	16.0
26-Jun	5.1	3.0	0.1	8.2	7.7	0.9	0.0	8.6	0.0	2.6	0.0	2.6	19.4
3-Jul	9.6	2.4	0.1	12.1	8.1	0.7	0.0	8.8	0.0	2.3	0.0	2.3	23.2
10-Jul	6.6	1.0	0.7	8.3	7.1	0.1	0.0	7.2	0.0	0.3	0.0	0.3	15.8
17-Jul	3.6	1.9	1.0	6.5	7.0	0.0	0.1	7.1	0.0	1.1	0.0	1.1	14.7
24-Jul	3.4	1.6	0.4	5.4	6.4	0.0	0.0	6.4	0.0	0.4	0.0	0.4	12.2
31-Jul	2.0	1.1	1.1	4.2	4.9	0.0	0.0	4.9	0.0	0.1	0.0	0.1	9.2
7-Aug	0.4	0.3	0.1	0.8	2.3	0.1	0.0	2.4	0.0	0.4	0.0	0.4	3.6
14-Aug	0.1	1.0	1.0	2.1	2.3	0.0	0.0	2.3	0.0	0.0	0.0	0.0	4.4
21-Aug	0.6	1.1	0.0	1.7	1.1	0.0	0.0	1.1	0.0	0.1	0.0	0.1	2.9
28-Aug	0.0	0.3	0.0	0.3	1.1	0.0	0.0	1.1	0.0	0.3	0.0	0.3	1.7
4-Sep	0.1	0.0	0.0	0.1	1.6	0.1	0.0	1.7	0.0	0.0	0.0	0.0	1.8
11-Sep	0.4	0.0	0.0	0.4	1.6	0.0	0.0	1.6	0.0	0.0	0.0	0.0	2.1
Mean	3.2	1.5	0.6	4.2	4.1	0.4	0.3	4.4	0.0	0.9	0.0	0.9	9.1

Table 5. Estimated fishing effort, in hours, for each week, stratified by gear type and river stratum, 1993

Week ending	Upper Stratum				Lower Stratum				Kincolith Stratum				Grand Total
	24 hour still sets	Drift sets	Short still sets	Total	24 hour still sets	Drift sets	Short still sets	Total	24 hour still sets	Drift sets	Short still sets	Total	
8-May	0	16	0	16	0	0	0	0	0	0	0	0	16
15-May	168	23	0	191	288	5	0	293	0	30	0	30	514
22-May	0	2	0	2	24	10	0	34	0	8	0	8	44
29-May	0	8	0	8	456	0	26	482	0	21	0	21	511
5-Jun	480	5	0	485	984	0	0	984	0	21	0	21	1490
12-Jun	1248	35	33	1316	1032	9	0	1041	0	18	0	18	2375
19-Jun	888	24	14	926	888	8	0	896	0	16	0	16	1838
26-Jun	864	24	9	897	1296	10	0	1306	0	29	0	29	2232
3-Jul	1608	26	2	1636	1368	10	0	1378	0	31	0	31	3045
10-Jul	1104	7	24	1135	1200	2	0	1202	0	2	0	2	2339
17-Jul	600	20	20	640	1176	0	0	1176	0	17	0	17	1833
24-Jul	576	18	8	602	1080	0	0	1080	0	5	0	5	1687
31-Jul	336	15	19	370	816	0	0	816	0	1	0	1	1187
7-Aug	0	1	19	20	384	2	0	386	0	3	0	3	409
14-Aug	0	7	26	33	384	0	0	384	0	0	0	0	417
21-Aug	0	16	0	16	192	0	0	192	0	2	0	2	210
28-Aug	0	1	0	1	192	0	0	192	0	2	0	2	195
4-Sep	0	0	0	0	264	0	0	264	0	0	0	0	264
11-Sep	72	0	0	72	264	0	0	264	0	0	0	0	336
Total	7944	248	174	8366	12288	56	26	12370	0	206	0	206	20942
SE	0	16	25	30	0	5	5	6	0	19	0	19	36

Table 6. Percent of effort sampled each week, stratified by gear type and river stratum, 1993.

Week ending	Upper Stratum				Lower Stratum				Kincolith Stratum				Grand Total
	24 hour still sets	Drift sets	Short still sets	Total	24 hour still sets	Drift sets	Short still sets	Total	24 hour still sets	Drift sets	Short still sets	Total	
8-May	0.0	85.7	0.0	85.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	85.7
15-May	24.8	86.7	0.0	55.7	62.1	100.0	0.0	81.1	0.0	50.0	0.0	50.0	62.3
22-May	0.0	75.0	0.0	75.0	100.0	100.0	0.0	100.0	0.0	83.3	0.0	83.3	86.1
29-May	0.0	66.7	0.0	66.7	62.8	0.0	66.7	64.7	0.0	80.0	0.0	80.0	70.5
5-Jun	8.0	80.0	0.0	44.0	54.3	0.0	0.0	54.3	0.0	100.0	0.0	100.0	66.1
12-Jun	35.7	81.8	100.0	72.5	38.2	100.0	0.0	69.1	0.0	90.0	0.0	90.0	77.2
19-Jun	44.1	85.7	100.0	76.6	28.5	50.0	0.0	39.2	0.0	100.0	0.0	100.0	71.9
26-Jun	38.0	76.2	100.0	71.4	57.7	100.0	0.0	78.8	0.0	72.2	0.0	72.2	74.2
3-Jul	49.3	76.5	100.0	75.2	67.2	100.0	0.0	83.6	0.0	75.0	0.0	75.0	77.9
10-Jul	48.2	85.7	60.0	64.6	80.0	100.0	0.0	90.0	0.0	50.0	0.0	50.0	68.2
17-Jul	61.9	61.5	85.7	69.7	54.7	0.0	0.0	54.7	0.0	100.0	0.0	100.0	74.8
24-Jul	59.9	90.9	100.0	83.6	57.8	0.0	0.0	57.8	0.0	100.0	0.0	100.0	80.5
31-Jul	42.3	75.0	112.5	76.6	54.9	0.0	0.0	54.9	0.0	100.0	0.0	100.0	77.2
7-Aug	0.0	100.0	100.0	100.0	38.5	100.0	0.0	69.3	0.0	66.7	0.0	66.7	78.6
14-Aug	0.0	71.4	71.4	71.4	57.6	0.0	0.0	57.6	0.0	0.0	0.0	0.0	64.5
21-Aug	0.0	75.0	0.0	75.0	86.6	0.0	0.0	86.6	0.0	100.0	0.0	100.0	87.2
28-Aug	0.0	100.0	0.0	100.0	27.3	0.0	0.0	27.3	0.0	100.0	0.0	100.0	75.8
4-Sep	0.0	0.0	0.0	0.0	9.1	0.0	0.0	9.1	0.0	0.0	0.0	0.0	9.1
11-Sep	76.4	0.0	0.0	76.4	54.6	0.0	0.0	54.6	0.0	0.0	0.0	0.0	65.5
Mean	44.4	80.8	93.0	74.5	55.1	93.8	66.7	62.9	0.0	84.5	0.0	84.5	71.2

Table 7. Estimated sockeye catch for each week, stratified by gear type and river stratum, 1993.

Week ending	Upper Stratum					Lower Stratum				Kincolith Stratum					Grand Total
	24 hour still sets	Drift sets	Short still sets	Fishwheel No. 3	Total	24 hour still sets	Drift sets	Short still sets	Total	24 hour still sets	Drift sets	Short still sets	Commercial bycatch ^a	Total	
8-May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15-May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22-May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29-May	0	0	0	0	0	0	0	2	2	0	3	0	0	3	5
5-Jun	31	3	0	0	34	2	0	0	2	0	49	0	0	49	85
12-Jun	60	78	15	0	153	88	3	0	91	0	284	0	0	284	528
19-Jun	360	361	80	0	801	91	30	0	121	0	622	0	0	622	1544
26-Jun	364	362	5	0	731	333	125	0	458	0	942	0	0	942	2131
3-Jul	712	441	2	0	1155	1085	183	0	1268	0	2297	0	0	2297	4720
10-Jul	1977	616	413	239	3245	3212	13	0	3225	0	100	0	0	100	6570
17-Jul	735	764	347	488	2334	3168	0	0	3168	0	1374	0	0	1374	6876
24-Jul	700	558	140	123	1521	577	0	0	577	0	289	0	0	289	2387
31-Jul	348	401	292	0	1041	1122	0	0	1122	0	55	0	4	59	2222
7-Aug	0	39	52	0	91	597	20	0	617	0	324	0	0	324	1032
14-Aug	0	524	346	229	1099	639	0	0	639	0	0	0	0	0	1738
21-Aug	0	343	0	0	343	51	0	0	51	0	90	0	0	90	484
28-Aug	0	20	0	0	20	27	0	0	27	0	26	0	40	66	113
4-Sep	0	0	0	0	0	25	0	0	25	0	0	0	0	0	25
11-Sep	4	0	0	0	4	26	0	0	26	0	0	0	0	0	30
Total	5291	4510	1692	1079	12572	11043	374	2	11419	0	6455	0	44	6499	30490
SE	997	635	1112	0	1623	1240	131	1	1247	0	946	0	0	946	2255

^a Commercial bycatch for Kincolith Stratum was recorded for each month, not weekly.

Table 8. Estimated chinook catch for each week, stratified by gear type and river stratum, 1993.

Week ending	Upper Stratum					Lower Stratum				Kincolith Stratum					Grand Total	
	24 hour still sets	Drift sets	Short still sets	Fishwheel No. 3	Total	24 hour still sets	Drift sets	Short still sets	Total	24 hour still sets	Drift sets	Short still sets	Commercial bycatch ^a	Kincolith R. angling		Total
8-May	0	20	0	0	20	0	0	0	0	0	0	0	0	0	0	20
15-May	0	33	0	0	33	18	2	0	20	0	0	0	0	0	0	53
22-May	0	0	0	0	0	0	10	0	10	0	10	0	0	0	10	20
29-May	0	6	0	0	6	69	0	32	101	0	35	0	0	0	35	142
5-Jun	220	10	0	0	230	281	0	0	281	0	33	0	0	0	33	544
12-Jun	381	163	29	0	573	511	52	0	563	0	47	0	0	4	51	1187
19-Jun	513	427	21	0	961	345	22	0	367	0	28	0	0	7	35	1363
26-Jun	99	400	44	0	543	341	30	0	371	0	51	0	0	11	62	976
3-Jul	259	203	2	0	464	220	25	0	245	0	36	0	0	46	82	791
10-Jul	74	15	0	0	89	87	0	0	87	0	0	0	0	20	20	196
17-Jul	18	29	7	0	54	19	0	0	19	0	0	0	0	22	22	95
24-Jul	25	14	3	0	42	24	0	0	24	0	0	0	0	6	6	72
31-Jul	5	11	2	0	18	40	0	0	40	0	0	0	2	9	11	69
7-Aug	0	2	1	0	3	13	0	0	13	0	0	0	0	10	10	26
14-Aug	0	15	1	0	16	7	0	0	7	0	0	0	0	1	1	24
21-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28-Aug	0	8	0	0	8	0	0	0	0	0	0	0	1	0	1	9
4-Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11-Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1594	1356	110	0	3060	1975	141	32	2148	0	239	0	3	136	378	5586
SE	367	182	26	0	410	200	28	13	202	0	33	0	0	0	33	459

^a Commercial bycatch for Kincolith Stratum was recorded for each month, not weekly.

Table 9. Estimated coho catch for each week, stratified by gear type and river stratum, 1993.

Week ending	Upper Stratum					Lower Stratum				Kincolith Stratum					Grand Total	
	24 hour still sets	Drift sets	Short still sets	Fishwheel No. 3	Total	24 hour still sets	Drift sets	Short still sets	Total	24 hour still sets	Drift sets	Short still sets	Commercial bycatch ^a	Kincolith R. angling		Total
8-May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15-May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22-May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29-May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17-Jul	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2
24-Jul	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1
31-Jul	0	0	1	0	1	19	0	0	19	0	0	0	6	0	6	26
7-Aug	0	0	2	0	2	60	0	0	60	0	8	0	0	0	8	70
14-Aug	0	13	7	0	20	0	0	0	0	0	0	0	0	0	0	20
21-Aug	0	27	0	0	27	21	0	0	21	0	0	0	0	0	0	48
28-Aug	0	2	0	0	2	25	0	0	25	0	1	0	0	0	1	28
4-Sep	0	0	0	0	0	223	0	0	223	0	0	0	0	0	0	223
11-Sep	5	0	0	0	5	172	0	0	172	0	0	0	0	0	0	177
Total	7	42	10	1	60	520	0	0	520	0	9	0	6	0	15	595
SE	5	21	6	0	22	174	0	0	174	0	2	0	0	0	2	175

^a Commercial bycatch for Kincolith Stratum was recorded for each month, not weekly.

Table 10. Estimated pink catch for each week, stratified by gear type and river stratum, 1993.

Week ending	Upper Stratum					Lower Stratum				Kincolith Stratum					Grand Total	
	24 hour still sets	Drift sets	Short still sets	Fishwheel No. 3	Total	24 hour still sets	Drift sets	Short still sets	Total	24 hour still sets	Drift sets	Short still sets	Commercial bycatch ^a	Kincolith R. angling		Total
8-May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15-May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22-May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29-May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26-Jun	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
3-Jul	5	0	0	0	5	0	0	0	0	0	5	0	0	0	5	10
10-Jul	0	0	0	0	0	35	8	0	43	0	0	0	0	233	233	276
17-Jul	2	2	8	1	13	43	0	0	43	0	130	0	0	57	187	243
24-Jul	37	18	11	3	69	107	0	0	107	0	55	0	0	43	98	274
31-Jul	5	16	30	0	51	296	0	0	296	0	20	0	57	52	129	476
7-Aug	0	3	3	0	6	39	0	0	39	0	83	0	0	25	108	153
14-Aug	0	15	6	0	21	12	0	0	12	0	0	0	0	336	336	369
21-Aug	0	3	0	0	3	23	0	0	23	0	30	0	0	39	69	95
28-Aug	0	0	0	0	0	38	0	0	38	0	3	0	0	1	4	42
4-Sep	0	0	0	0	0	231	0	0	231	0	0	0	0	45	45	276
11-Sep	1	0	0	0	1	31	0	0	31	0	0	0	0	0	0	32
Total	50	57	58	4	169	961	8	0	969	0	327	0	57	831	1215	2353
SE	18	27	23	0	40	271	0	0	271	0	68	0	0	0	68	282

^a Commercial bycatch for Kincolith Stratum was recorded for each month, not weekly.

Table 11. Estimated chum catch for each week, stratified by gear type and river stratum, 1993.

Week ending	Upper Stratum					Lower Stratum				Kincolith Stratum					Grand Total
	24 hour still sets	Drift sets	Short still sets	Fishwheel No. 3	Total	24 hour still sets	Drift sets	Short still sets	Total	24 hour still sets	Drift sets	Short still sets	Commercial bycatch ^a	Kincolith R. angling	
8-May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15-May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22-May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29-May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19-Jun	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2
26-Jun	0	0	0	0	0	0	0	0	0	0	10	0	0	0	10
3-Jul	0	0	0	0	0	0	0	0	0	0	3	0	0	0	3
10-Jul	0	0	0	0	0	2	1	0	3	0	0	0	0	0	0
17-Jul	0	0	0	0	0	2	0	0	2	0	10	0	0	0	10
24-Jul	6	3	0	0	9	6	0	0	6	0	2	0	0	0	2
31-Jul	0	0	2	0	2	8	0	0	8	0	0	0	0	0	0
7-Aug	0	0	0	0	0	0	0	0	0	0	56	0	0	0	56
14-Aug	0	4	1	0	5	0	0	0	0	0	0	0	0	0	0
21-Aug	0	1	0	0	1	7	0	0	7	0	0	0	0	0	0
28-Aug	0	4	0	0	4	11	0	0	11	0	65	0	0	0	65
4-Sep	0	0	0	0	0	173	0	0	173	0	0	0	0	0	0
11-Sep	3	0	0	0	3	35	0	0	35	0	0	0	0	0	0
Total	9	12	3	0	24	244	1	0	245	0	147	0	0	0	147
SE	7	8	4	0	11	134	0	0	134	0	36	0	0	0	36

^a Commercial bycatch for Kincolith Stratum was recorded for each month, not weekly.

Table 12. Estimated steelhead catch for each week, stratified by gear type and river stratum, 1993.

Week ending	Upper Stratum					Lower Stratum				Kincolith Stratum					Grand Total	
	24 hour still sets	Drift sets	Short still sets	Fishwheel No. 3	Total	24 hour still sets	Drift sets	Short still sets	Total	24 hour still sets	Drift sets	Short still sets	Commercial bycatch ^a	Kincolith R. angling		Total
8-May	0	12	0	0	12	0	0	0	0	0	0	0	0	0	0	12
15-May	4	17	0	0	21	1	0	0	1	0	2	0	0	2	4	26
22-May	0	0	0	0	0	0	1	0	1	0	1	0	0	2	3	4
29-May	0	0	0	0	0	7	0	2	9	0	6	0	0	1	7	16
5-Jun	0	4	0	0	4	2	0	0	2	0	0	0	0	0	0	6
12-Jun	2	0	0	0	2	0	0	0	0	0	0	0	0	1	1	3
19-Jun	0	0	0	0	0	0	0	0	0	0	2	0	0	3	5	5
26-Jun	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
3-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
10-Jul	0	0	0	0	0	6	0	0	6	0	0	0	0	0	0	6
17-Jul	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	2
24-Jul	3	2	1	0	6	5	0	0	5	0	0	0	0	0	0	11
31-Jul	2	3	2	0	7	21	0	0	21	0	0	0	7	0	7	35
7-Aug	0	0	1	0	1	16	0	0	16	0	0	0	0	0	0	17
14-Aug	0	24	4	0	28	2	0	0	2	0	0	0	0	0	0	30
21-Aug	0	4	0	0	4	1	0	0	1	0	0	0	0	0	0	5
28-Aug	0	6	0	0	6	14	0	0	14	0	0	0	32	0	32	52
4-Sep	0	0	0	0	0	83	0	0	83	0	0	0	0	0	0	83
11-Sep	1	0	0	0	1	31	0	0	31	0	0	0	0	0	0	32
Mean	12	74	8	0	94	189	1	2	192	0	12	0	49	10	71	357
SE	33	22	6	0	40	73	1	2	73	0	7	0	0	0	7	84

^a Commercial bycatch for Kincolith Stratum was recorded for each month, not weekly.

Table 13. Amount of catch observed during interviews with fishermen.

Stratum	Species	Catch seen	Catch not seen	Unknown	Total N
Upper	Sockeye	54%	35%	11%	7769
	Chinook	69%	21%	11%	1901
	Coho	58%	42%	0%	45
	Chum	57%	38%	5%	21
	Pink	43%	47%	10%	135
	Steelhead	61%	35%	4%	72
Lower	Sockeye	50%	35%	16%	7547
	Chinook	34%	30%	35%	1227
	Coho	39%	49%	12%	181
	Chum	55%	32%	13%	62
	Pink	58%	38%	4%	387
	Steelhead	43%	44%	13%	68
Kincolith	Sockeye	94%	6%	0%	5432
	Chinook	98%	2%	0%	203
	Coho	100%	0%	0%	6
	Chum	100%	0%	0%	125
	Pink	100%	0%	0%	298
	Steelhead	90%	10%	0%	10

Table 14. Comparison of sockeye harvests in 1993 with and without fishermen log effort data (not including fishwheel harvests and commercial bycatch).

	Without fishermen log data				With fishermen log data			
	24 hour still	Drift	Short still	Total	24 hour still	Drift	Short still	Total
Upper Stratum	4905	5446	3538	13889	5291	4508	1691	11490
Lower Stratum	10827	838	4	11669	11042	374	2	11418
Kincolith Stratu	0	10996	0	10996	0	6455	0	6455
Total	15732	17280	3542	36554	16333	11337	1693	29363

FIGURES

Lower Nass River

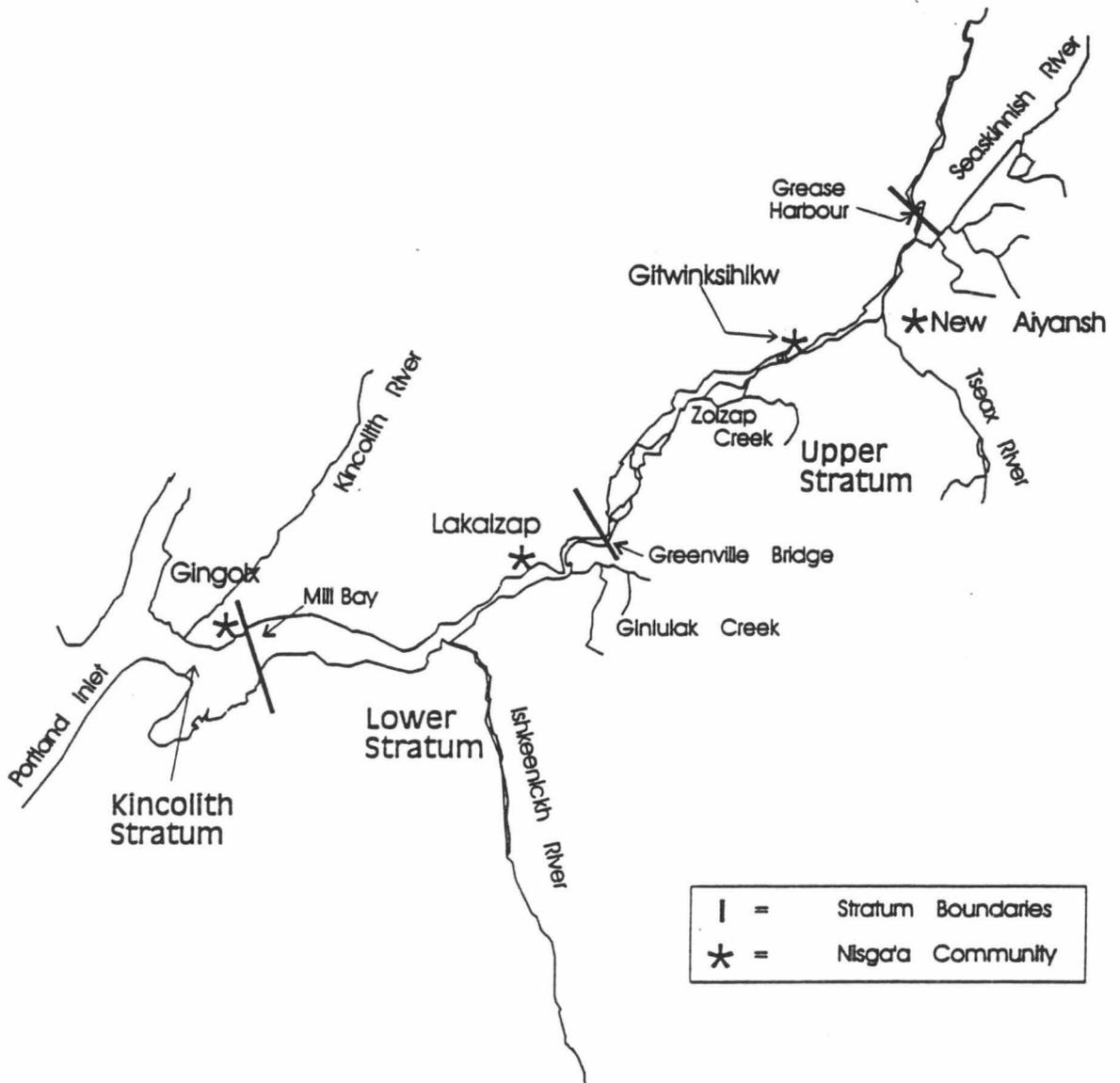


Figure 1. River strata for 1993 Nisga'a catch monitoring program.

Nisga'a In-River Net Fishery Catch Monitoring Program, 1993

Surveyor Information

Location: _____	Date: _____
Interviewer: _____	Time: _____

Fishermen Information

	Site 1	Site 2	Site 3
Location			
Net Size			
Length			
Depth			
Mesh			
No. of Nets			
Trip/Set			
Type			
Start Date			
Start Time			
End Date			
End Time			
No. of Picks			
Complete (Y/N)			
Catch			
Sockeye			
Chinook			
Coho			
Pink			
Chum			
Steelhead			
Observed (Y/N)			

Days fished in previous 7 days:

Comments: _____

Figure 2. Interview data form used in 1993 Nisga'a catch monitoring program.

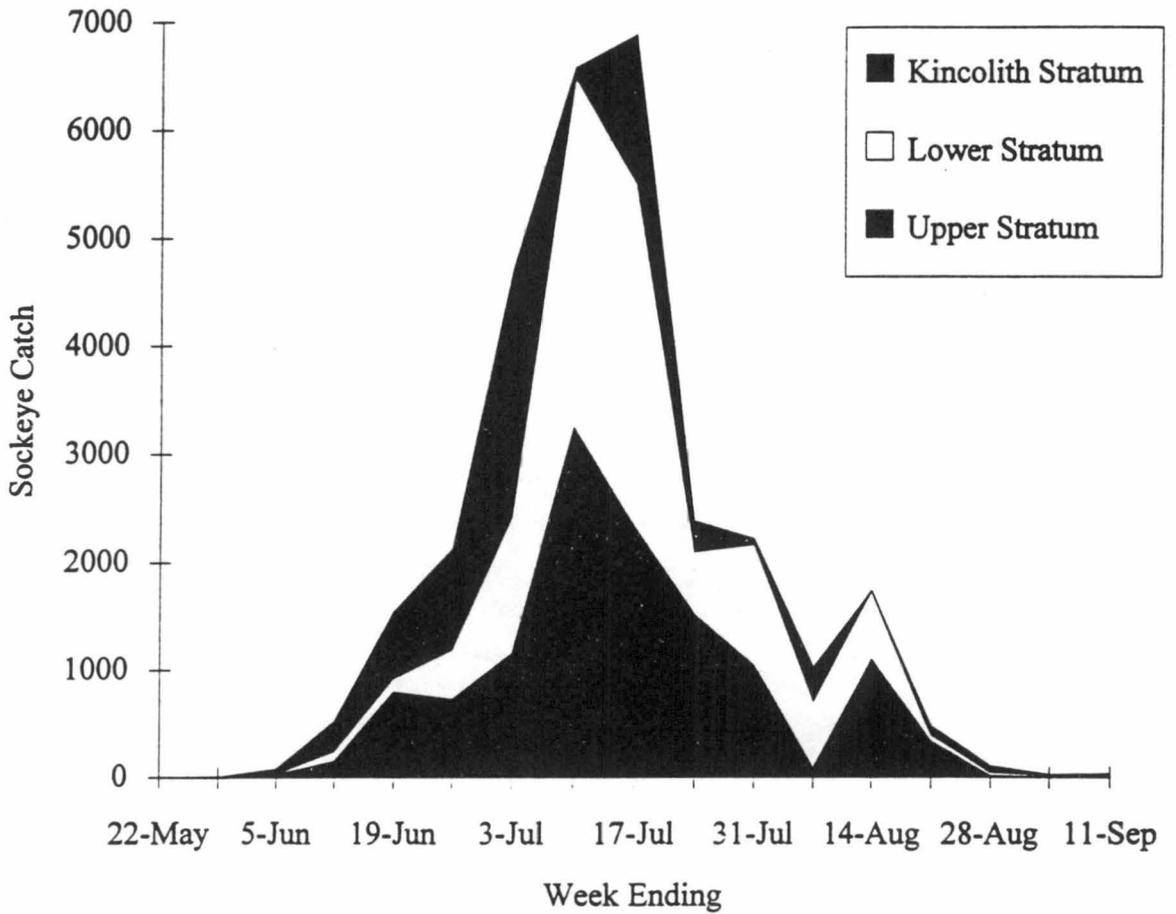


Figure 3. Nisga'a harvests of sockeye salmon for food and ceremonial needs, 1993.

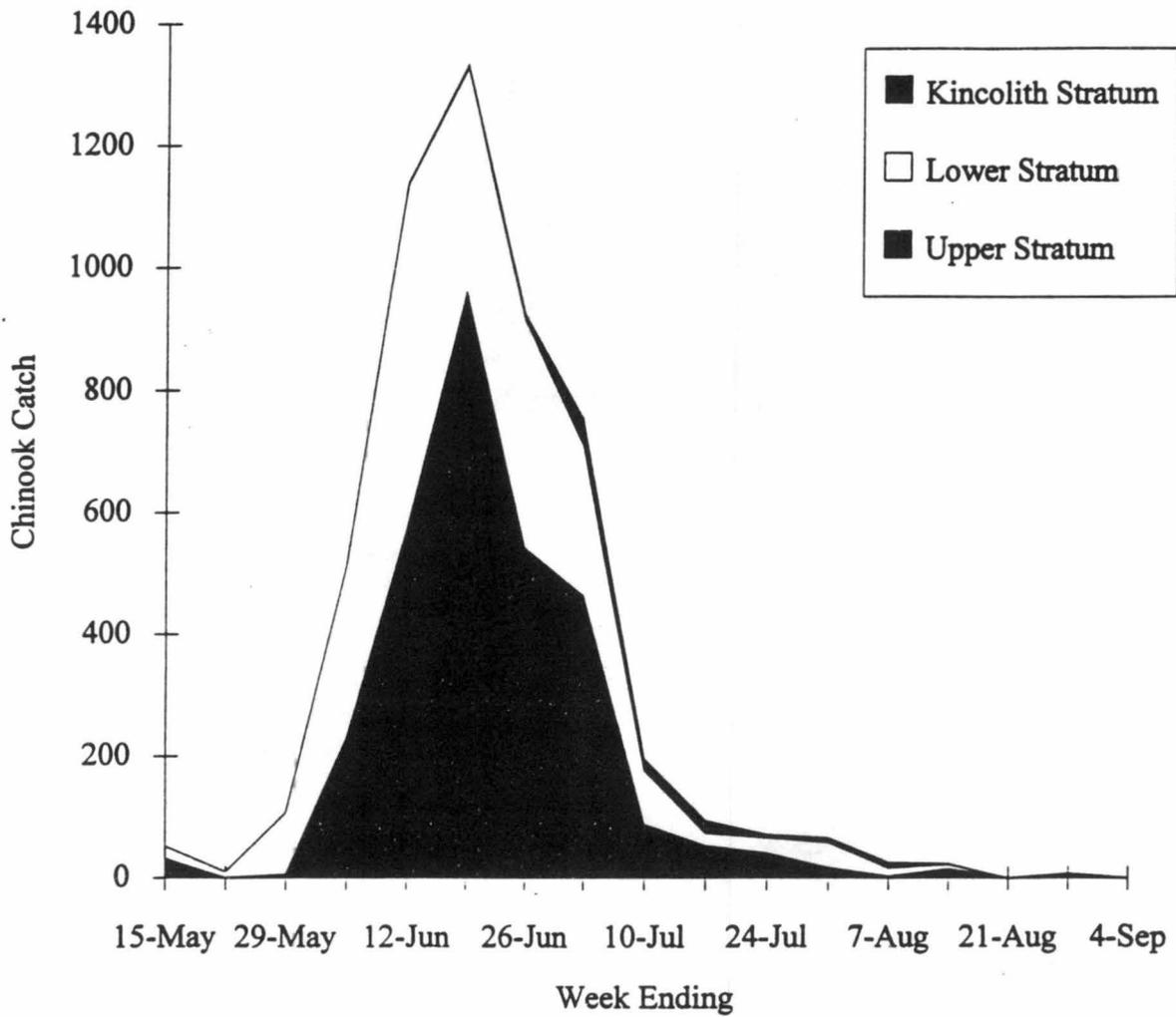


Figure 4. Nisga'a harvests of chinook salmon for food and ceremonial needs, 1993.

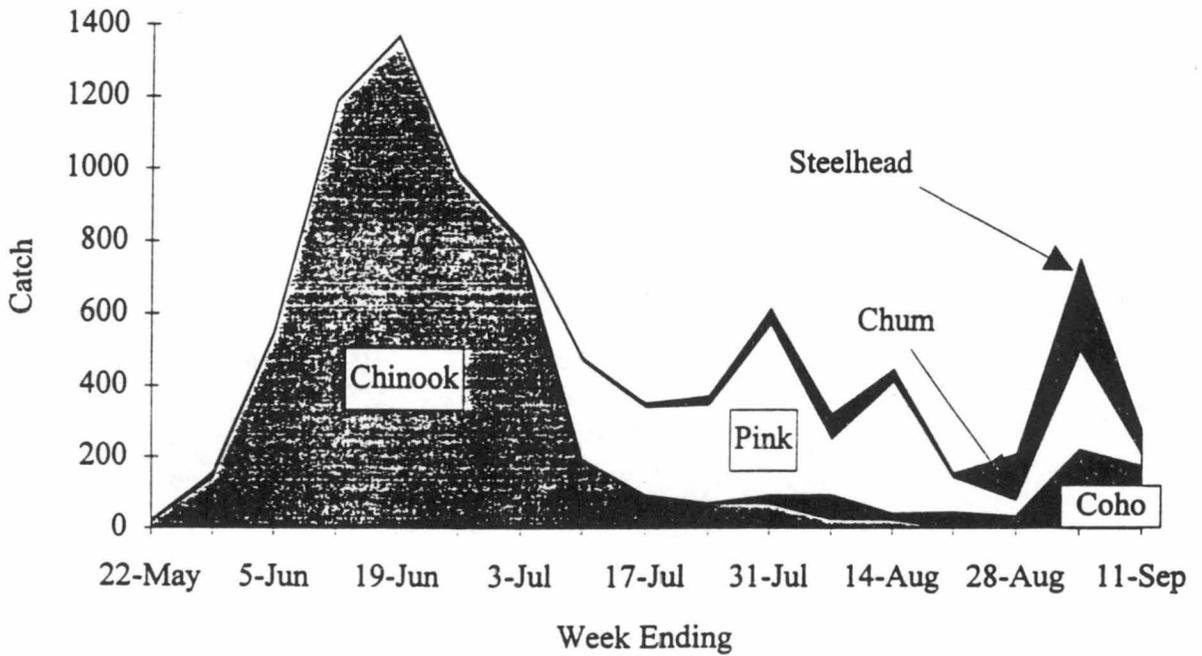
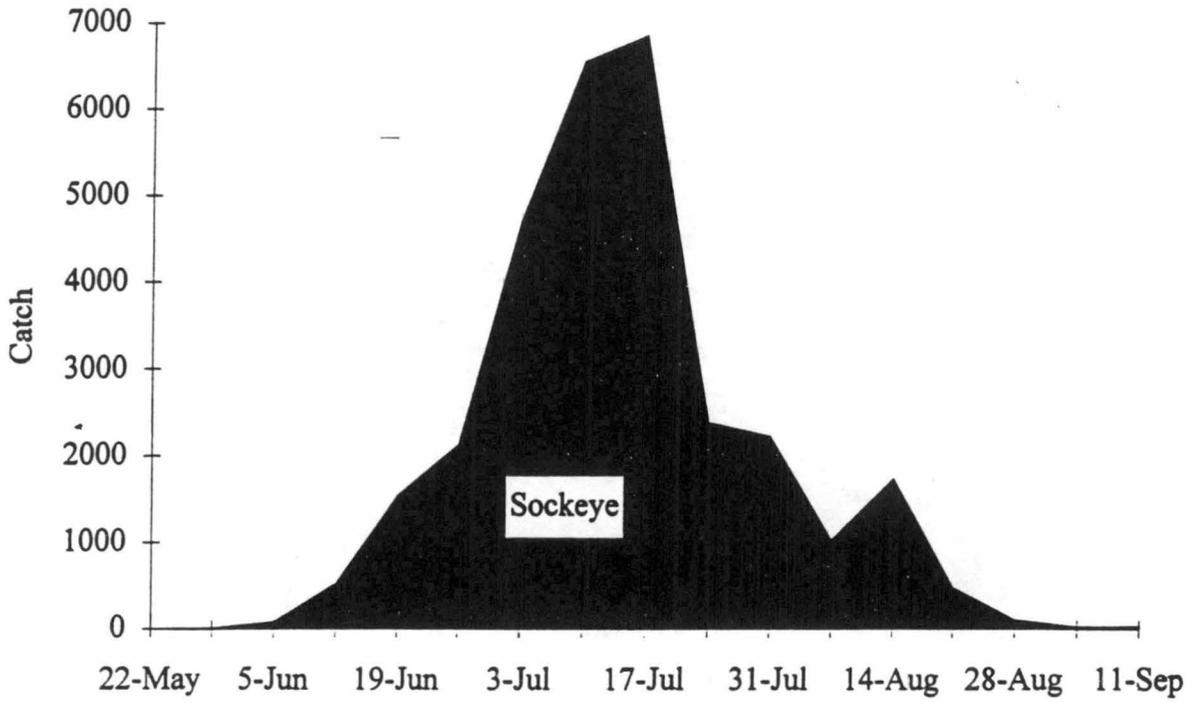


Figure 5. Nisga'a harvests of all species of salmon for food and ceremonial needs, 1993.