TAKU RIVER COHO SALMON INVESTIGATIONS, 1988

By

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Regional Information Report[1] No. 1J89-33

Alaska Department of Fish and Game
Division of Commercial Fisheries
Douglas, Alaska

September 1989

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ACKNOWLEDGEMENTS

I wish to acknowledge the contribution of the seasonal personnel who helped collect the basic data essential to the development of this report. Kent Crabtree, Susan Jordan and Steve Schrof coded-wire tagged juvenile coho salmon at Little Tatsamenie Lake in cooperation with Ian Mathews and Mike McDonald of the Canada Department of Fisheries and Oceans (DFO). Pat Milligan (DFO) helped plan, supervise and supply that project. DFO (Ian Mathews and Mike McDonald) operated enumerated and sampled adult coho salmon at Little Tatsamenie Lake. Larry Derby and Rebecca Wilson (ADF&G) operated the Nahlin River Weir. Steve Elliott (ADF&G, Sport Fish Division) supervised the Yehring Creek Project and, with the assistance of Joe Muir and Don Ingledue (ADF&G - Commercial Fisheries), conducted escapement surveys on lower Taku River tributaries. Other DFO and ADF&G employees stationed at weir and tagging locations in the Taku River system collected much of the data referenced in this report.

PROJECT SPONSORSHIP

This investigation was partially financed with U.S./Canada Pacific Salmon Treaty funds under NOAA, National Marine Fisheries Service Cooperative Agreement NA-88-ABH-00045.

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

ABSTRACT

Tagging and escapement studies were conducted on coho salmon (*Oncorhynchus kisutch*) populations in the Taku River system in cooperation with the Canada Department of Fisheries and Oceans. A total of 10,482 juvenile coho salmon was coded-wire tagged at Little Tatsamenie Lake. Tag recovery data from fish tagged as rearing juveniles in 1986 and smolts in 1987 was analyzed. Based on a small sample of tags, the total coho salmon return to the upper Nahlin River was estimated at 3,083 of which an estimated 1,712 (55.5%) were harvested by commercial and sport fisheries (39.2% in Alaska and 16.3% in Canada). The total coho salmon return to the Tatsamenie River was estimated at 2,191 fish of which an estimated 1,521 (69.4%) were harvested by sport and commercial fisheries (66.8% in Alaska and 2.6% in Canada). The data indicated that the upper Nahlin River stock migrated through the fisheries very early in the season while the Tatsamenie River stock was more representative of the predominant fall migrating stocks in the Taku River system. The upper Nahlin River stock was heavily harvested by the Juneau marine sport and Canadian inriver fisheries which are selective for early stocks while the Tatsamenie River Stock was subjected to a higher relative harvest in the troll and marine drift gill net fisheries which target on the more typical fall stocks. The 1988 marine harvest distribution by gear type for all tagged Taku River coho salmon was estimated as follows: troll 39.5%; purse seine 0.9%; drift gill net 49.4% (44.9% in District 111 and 4.5% in District 115); sport 10.2%. Taku River coho salmon displayed a strong migratory pattern from the north with the majority of the troll and purse seine catch occurring in Icy Strait, northern Chatham Strait, Cross Sound and outside waters north of Cape Spencer. The highest concentrations of Taku River tags in the troll and purse seine fisheries (0.95-1.05 tags per 1,000 fish) were also found in these areas. Overall, the highest concentration of Taku River tags was found in the District 111 drift gill net fishery (7.50 tags per 1,000 fish) followed by the Juneau sport fishery (6.37 tags per 1,000 fish). Relatively few Taku River tags were present in catches from southern Southeast. Tagged Taku River coho salmon were available to the troll fishery throughout the entire season with apparent maximum abundance and relative contributions occurring in August and early September. Data from mainstem tagging and selected weir projects indicated that substantial differences exist in migratory timing among headwaters stocks with the Hackett River stock being intermediate in timing between the distinctively early Nahlin River stock and the late Tatsamenie River stock. Preliminary evidence of differences in timing among tagged groups from mainstem tributaries needs further verification. Helicopter surveys were conducted on two upper system tributaries (upper Nahlin and Dudidontu Rivers) and a mainstem tributary (Flannigan Slough - Wilms Creek). Surveys of the upper Nahlin River upstream of the weir on September 8 and 15 accounted for 63.0% and 47.2%, respectively, of the cumulative weir count. Surveys of the entire tributary, above and below the weir, accounted for 52.5% and 49.5%, respectively, of the total season escapement count of 1,322 fish.

KEY WORDS: Coho salmon, coded-wire tag, Taku River, Stikine River, indicator stock, harvest rates, migration patterns, transboundary rivers, Southeast Alaska.

INTRODUCTION

The Taku River supports coho salmon populations that are harvested by both the United States and Canada. In order to understand exploitation patterns and production limitations of this resource, it is necessary to determine the migratory patterns of the various stocks and to estimate escapement levels. Juvenile and smolt tagging studies have been initiated to study coho salmon harvest rates and distributions. The first tagged fish were released in 1986 while the first tag returns occurred in 1988. Methods that have been investigated to estimate escapement in the system have included aerial surveys, weirs and and mark-recapture estimation.

Ratification of the Pacific Salmon Treaty in 1985 opened the way for cooperative research on factors that determine production from stocks of mutual concern. Transboundary stocks from rivers such as the Taku are of special interest since they spawn in Canadian sections of the river, pass through and perhaps rear in U.S. sections of the river or adjacent bays and coastal waters, and are then exploited by fisheries of both countries on their journey back to spawn.

Joint coded-wire tagging investigations were initiated by the Alaska Department of Fish and Game (ADF&G) and the Canada Department of Fisheries and Oceans (DFO) in 1986 to determine the harvest rates, harvest distributions and migratory patterns of coho salmon populations in the Taku River (Shaul 1987 and 1988). These investigations were intended to complement other projects directed at assessing and monitoring escapements. Rearing juvenile coho salmon were tagged at four locations in 1986 including the Nahlin River by the ADF&G, Commercial Fisheries Division (CF), sloughs and ponds along the Sheslay River and the Canadian portion of the mainstem Taku (DFO), and Little Tatsamenie Lake (ADF&G/CF and DFO in cooperation; Figure 1). The ADF&G, Sport Fish Division (ADF&G/SF) tagged outmigrating smolts at Yehring Creek, a U.S. tributary of the Taku River in May-June 1987. Coded-wire tagging was repeated in 1987 and 1988 at Little Tatsamenie Lake, Yehring Creek and rearing areas in the lower mainstem valley of the Taku River. Juvenile coho salmon were tagged at the Dudidontu River in 1987 (ADF&G/CF) and at the Nahlin River in 1988 (ADF&G/SF). Rearing juveniles tagged during 1986 and smolts tagged during 1987 returned as adults (age .1) in 1988 when they were sampled in fisheries and escapements.

In addition to coded-wire tagging investigations, several tributaries were examined for their potential as escapement indicators. Three of those (the Dudidontu River, upper Nahlin River and Flannigan Slough - Wilms Creek) were judged to be suitable for conducting aerial surveys. Adult enumeration weirs were operated at the upper Nahlin River, Tatsamenie River, Hackett River and Yehring Creek. Mainstem escapement estimation for the portion of the system upstream of the border is under development. Mark-recapture estimates for the period through mid-September have been made in recent years (McGregor and Clark 1989). Problems remain, however, in accounting for late-season escapement because of the difficulty in operating the Canyon Island fishwheels late in the season, combined with inadequate tag recovery effort after the inriver fishery is curtailed.

The results reported here are from a program conducted jointly by the Alaska Department of Fish and Game (Commercial Fisheries and Sport Fish Divisions) and the Canada Department of Fisheries and Oceans (DFO). Each agency had individual responsibility for some components while others were undertaken in direct cooperation by personnel from different agencies. While focusing on project components undertaken by ADF&G (CF), results reported here include interrelated data collected by other agencies as part of the cooperative program. More detailed analyses of specific projects conducted by DFO and ADF&G (SF) will be published by those agencies.

LITTLE TATSAMENIE LAKE CODED-WIRE TAGGING

Methods and Procedures

Rearing juvenile coho salmon were tagged at Little Tatsamenie Lake during the period July 20 to August 9, 1988 in a cooperative field project conducted by ADF&G/CF and DFO. Wire-mesh minnow traps were used to capture juvenile salmon for tagging. Approximately 100 traps baited with salmon roe were checked and set twice daily at 4-hour intervals in suitable appearing habitat. Salmon roe was disinfected prior to use by immersion in a 5% betadyne solution for 15 minutes. Traps were moved frequently to maintain the highest possible catch rates. Juveniles were held in pens before tagging until a total of 1,000 to 4,000 was captured, but not for a period longer than 4 days. Trapping was conducted until recapture rates of tagged fish reached 50%.

Fish of 60 mm snout-fork length or larger were coded-wire tagged and released. Fish under 72 mm in length were judged to be predominantly age 0+ based on 1987 data (Shaul 1988) and were tagged with a different code than fish that were 72 mm or larger which were predominantly age 1+. A description of the coded-wire tagging technique under field conditions is found in Koerner (1977).

Results

A total of 10,482 juvenile coho salmon was captured and coded-wire tagged during the 2 1/2 week period. The overall mean length of tagged fish was 76.1 mm (N = 926; Appendix A.1). Fish under 72 mm (predominantly age 0+) comprised 4,935 (47%) of the total while 5,547 (53%) were 72 mm or larger (predominantly age 1+). Fish under 72 mm were tagged with code 4-29-20 while those 72 mm and larger were tagged with code 4-29-21. A sample of age 0+ fish that were 60 mm and larger averaged 64.5 mm (N = 38) in length while age 1+ fish averaged 81.4 mm (N = 48; Appendix A.2). The 1988 data indicated that the length that best separated individuals into the two age classes was approximately 70 mm which was close to the 72 mm division that was used to separate the groups by tag code. The difference in these lengths accounted for only about 3.9% of tagged fish.

The average catch rate of 6.5 fish per trap over a total of 1,607 trap sets was lower than past rates of 12.0 fish per trap in September 1986 and 6.9 fish per trap in July-August 1987. Total numbers tagged in 1986 and 1987 were 13,328 and 11,426, respectively, compared with 10,482 in 1988.

ADULT TAG RETURNS

Methods and Procedures

Tag Recovery from Fisheries

Marine fisheries in Southeast Alaska and northern British Columbia were sampled for coded-wire tags. Commercial catch sampling for coded-wire tagged coho salmon in Southeast Alaska was conducted by ADF&G sampling personnel stationed at fish processors and buying stations located throughout the region. The samplers watched for adipose clipped coho salmon during off-loading and sorting

operations. Skippers of fishing vessels and tenders were interviewed to determine fishing districts (Appendix B.1). The heads of all adipose fin clipped fish were sent to the ADF&G Coded-wire Tag Lab in Juneau for removal and decoding of tags. Areas used in expanding random recoveries from the troll fishery were four quadrants (Appendix B.2), while recoveries from net and trap fisheries were expanded by district. Time strata used for expanding net and trap recoveries were statistical weeks (Appendix B.3), while troll fishery samples were expanded over the total catch for open periods (between closures). Exceptions were that troll recoveries were expanded by statistical week-quadrant for analysis of migratory timing and by period-PMFC area (Appendix B.2) for analysis of harvest distribution. Randomly recovered tags were expanded by the inverse of the proportion of the catch that was sampled within area, gear type and weekly or period strata (Clark and Bernard 1987). An adjustment for lost samples was made by multiplying expansions by the inverse of the proportion of heads and tags lost.

The ADF&G Sport Fish Division conducted a creel census and survey of the Juneau and Ketchikan marine recreational fisheries. Tags recovered from random samples were expanded over biweekly strata that contained additional stratifications including weekdays vs. weekends, mornings vs. afternoons and low use vs. heavy use docks. In the Juneau fishery, 3,459 fish (28.8%) were sampled from the total estimated season catch of 12,016. The Ketchikan fishery harvested only 5,512 fish, of which 584 (10.6%) were sampled.

Sampling of British Columbia coastal fisheries and reporting of coded-wire tag recoveries was conducted by the Canada Department of Fisheries and Oceans (DFO). Tag recovery from the Taku River Canadian commercial fishery was conducted by DFO under a program in which fishermen were paid a reward for voluntary recoveries.

Harvest Estimates for Inriver Fisheries

The coded-wire tag sampling program for inriver fisheries achieved very limited success. Only four tags were recovered of which three had been implanted in juveniles in the Canadian section of the mainstem valley, while one was from the Sheslay River. Other adipose clipped fish from the inriver commercial and test gill net fisheries were reported but the heads were lost before DFO (Whitehorse) staff could recover them. Because of the limitations in coded-wire tag recovery data from these fisheries, an alternative estimation technique using adult spaghetti tag data was employed to estimate the inriver gill net harvest of specific stocks.

A mark-recapture program involving tagging at the Canyon Island fishwheels and recovery in the Canadian inriver commercial and test fisheries was used to estimate the weekly abundance of coho salmon in the inriver fishery (McGregor and Clark 1989). Weekly harvest rate estimates for the inriver fisheries were computed from these abundance estimates and weekly catches. Tags recovered at the weirs were referenced to date of tagging at the fishwheels and adjustments were applied to account for weekly fishwheel effort and the proportion of captured fish that was tagged. After these adjustments, the tags were referenced in time to the inriver fishery based on the mean interval (days) between tagging at Canyon Island and recovery in the inriver fishery for all tagged coho salmon for each period.

Harvest rate estimates by period (H_i) were computed by dividing catch (F_i) by estimated abundance (N_i).

$$H_i = \frac{F_i}{N_i}$$

The proportion of the spawning escapement that passed the fishwheels by period $P(w)_i$ was estimated as follows:

$$P(w)_i = \frac{R_i t_i e_i}{\sum(R_i t_i e_i)}$$

where: R_i = Number of weir recoveries by tagging period.

t_i = Weekly proportion of the number of coho salmon caught in the fishwheels that was tagged.

e_i = Total combined number of hours fished by both fishwheels divided twice the total number of hours in each period.

Estimated weekly proportions of the migration at the fishwheels, $P(w)_i$, were then referenced to the inriver fishery based on weekly average migration times for tagged fish to obtain an estimate of the proportion of the spawning escapement that was available in the fishery during period $P(f)_i$.

$P(f)_{i-L} = P(w)_i$, where L = lag time between the fishwheels and the fishery.

Total catch (C.) of the stock of interest was estimated as follows:

$$C. = \sum_i \left[\frac{P(f)_i H_i E}{(1-H_i)} \right]$$

where: H_i = Weekly coho salmon harvest rate estimate for the inriver fishery.

E = Total escapement count for the stock of interest.

Estimates of stock specific harvests were not made for the inriver food fishery, however, the harvest rate by the inriver food fishery on any stock was probably low given a total reported catch of only 98 fish.

The sport harvest of coho salmon in the Tatsamenie River was determined by DFO staff through interviews with anglers and lodge owners.

Escapement Enumeration and Sampling

Coho salmon escapements were enumerated and sampled for tags at adult salmon weirs at Little Tatsamenie Lake (DFO) and the Nahlin River (ADF&G/SF). As many fish as possible were examined for adipose clips at weir sites and during sampling operations on the spawning grounds. Marked fish that were counted at the Nahlin River weir were examined with a magnetic field detector to determine whether or not a tag was present. Only fish that did not register a positive signal were sacrificed and the heads sent to the ADF&G tag lab for further verification. Age-length-sex data was taken from a target sample of 600 fish from all segments of the run at the Nahlin River. Age-length-sex data is not

contained in this report but will be published in ADF&G catch and escapement reports (Technical Fishery Report Series) and DFO reports. Coded-wire tagged male coho salmon returning to the Tatsamenie River were sacrificed at the weir and the heads sent to the DFO laboratory in Vancouver for tag removal and decoding.

Analysis of Tag Recovery Data

Stock Contribution and Distribution. The estimated harvest by gear type and escapement were computed for coho salmon returns to the upper Nahlin and Tatsamenie Rivers. Alaska troll fishery tag recoveries were expanded to total catch by quadrant (Appendix B.2) and fishing period (time between fishery openings and closures). Recoveries from marine net fisheries were expanded by district (Appendix B.1) and statistical week (Appendix B.3). Sport fishery expansions and methods used to estimate Canadian commercial and test fishery harvests are described above. Fishery contribution estimates for tagged fish were divided by the proportion tagged in escapement samples to estimate total stock contributions.

Harvest Rates. Three different harvest related parameters are defined below.

1. Harvest distribution is the distribution of the catch among the fisheries by area and/or gear type expressed as a proportion of the total catch.

2. Stock distribution is the distribution of the catch and escapement expressed as a proportion of the total return (catch and escapement).

3. Harvest rate is the total harvest within a defined fishery divided by the total number of fish available within that fishery.

4. Total harvest rate is the total harvest of a stock by all fisheries divided by the total return (catch and escapement).

The total harvest rate for a stock was estimated as follows:

$$\text{Harvest Rate (H)} = \frac{F}{F + E}$$

Where F = estimated number of tagged fish harvested (expanded sum of random fishery recoveries); and

E = estimated number of tagged fish in the escapement

In sequential "gauntlet" type fisheries such as occur for Taku River coho salmon, harvest rate estimates for distinct fisheries provide a clearer understanding of management options for achieving desired escapement than do harvest or stock distribution estimates. Harvest rates are independent of removal by previous fisheries and, therefore, provide a measure of the effect of a particular fishery on a migrating population of fish. Therefore, harvest rate estimates are useful for developing management strategies to meet specific escapement and harvest sharing objectives.

For this analysis the number of fish available to a fishery is considered to be the total number of fish that migrate through the area where the fishery occurs.

The number of fish that pass through a fishing area is the estimated total return (catch and escapement) minus fish harvested in preceding fisheries. Therefore, it is necessary to assume a direction of migration. It was assumed that returning coho salmon migrated by the most direct route(s) from the open ocean toward their systems of origin. The troll and purse seine fisheries were the first fisheries encountered and were assumed to operate simultaneously on Taku River stocks. The same assumption was made for the Lynn Canal drift gill net and Juneau sport fisheries which were considered to occur subsequent to the troll and purse seine fisheries. The Taku/Snettisham (District 111) drift gill net fishery was the last fishery encountered by returning fish before they migrated into the river. The harvest by Canadian mainstem fisheries (commercial, food and test) was assumed to occur simultaneously while tributary sport fisheries were considered to be the last fishing effort encountered by returning stocks.

Harvest Distribution. Harvest distributions (percent by gear type and area) in marine fisheries were estimated for tagged stocks based on the distribution of expanded tag recoveries. The concentration of coded-wire tagged Taku River coho salmon in commercial catches in PMFC areas and in the Juneau sport fishery was estimated by dividing total expanded recoveries by the total season catch in each area or fishery.

Migratory Timing. The weekly proportion of the harvest of tagged Taku River coho salmon stocks was estimated for the Alaska troll fishery and the District 111 drift gill net fishery. In addition, migratory timing of selected stocks at Canyon Island and at weir sites in the Taku River drainage was estimated. Troll fishery estimates were based on the dates of landing of tagged fish at fishing ports. Since the average trip length for a troll vessel is 4-6 days, the average time of capture of landed fish probably occurred 2-3 days earlier. Migratory timing of Taku River coho salmon stocks in the District 111 drift gill net fishery was estimated using statistical weeks as temporal strata. The weekly proportion of the migration of three selected stocks at the border (Canyon Island) was estimated by referencing tagged fish recovered at weir sites back to their dates of tagging in the lower river with adjustments for weekly fishwheel effort, the proportion of the fishwheel catch that was tagged, and inriver fishery harvest rates.

Survival Rates. Survival rates were estimated for juvenile coho salmon tagged at the Nahlin River and Little Tatsamenie Lake in 1986. Survival from the time of tagging to the adult stage (age .1) was estimated as follows:

$$\text{Survival Rate (S)} = \frac{F + E}{T}$$

Where F = estimated number of adipose clipped fish harvested

E = number of adipose clipped fish in the escapement

T = number of juveniles tagged (uncorrected for tag loss)

The number of adipose clipped fish in the harvest was estimated by dividing the estimated total fishery contribution of tagged fish by the proportion of adipose clipped fish examined at the weir that had tags. The number of natural adipose clipped fish in the escapement was assumed to be negligible.

Results and Discussion

Escapement Enumeration and Sampling

Nahlin River Weir. A weir was operated on the upper Nahlin River Weir during July 25 - September 23. The first coho salmon passed the weir on July 29 and a total of 1,322 adults (age .1) was counted during the period of operation, including 57 fish remaining downstream when the weir was removed. A daily peak of 233 fish passed the weir on 4 September (Appendix C.1). A helicopter survey on September 15 revealed 209 fish holding in pools downstream from the weir. However, 10 or fewer fish were counted daily during September 15-20. The season peak daily count of 264 fish passed the weir on 22 September, the last full day of operation. A helicopter survey on 23 September indicated that only 57 fish remained downstream of the weir. Of the 1,265 fish that passed the weir, 31 had adipose clips. Twenty-five adipose clipped fish were sampled of which 24 had tags. The total expanded number of tagged fish in the escapement (31) accounted for 2.4% of the total.

A total of 45 orange spaghetti tags was observed in the total escapement of 1,322 fish. These tags had been applied to coho salmon captured in fishwheels operated at Canyon Island near the border. Tag numbers were recovered from 33 of the spaghetti tagged fish counted at the weir, all of which were from fish that passed Canyon Island during July 13 - August 10.

Tatsamenie Weir. The Canada Department of Fisheries and Oceans (DFO) operated a weir at the outlet of Little Tatsamenie Lake (Figure 1) during July 31 - November 8. The first adult coho salmon passed the weir on August 21 and a total of 643 fish was counted and sampled for adipose clips during the period of operation (Appendix C.2). In addition, a downstream foot survey indicated that 20 fish remained below the weir for a total escapement count of 663. Seventy-four of the 643 fish sampled had adipose clips. Thirty-nine of the adiposed clipped fish were sacrificed and the heads sent to the tag lab in Vancouver. Of those, 32 had tags while 7 did not. The total expanded number of tagged fish in the escapement (63) accounted for 9.4% of the total.

Stock Contribution and Distribution

Only 11 coded-wire tagged Nahlin River fish were recovered from marine fisheries while 24 were recovered from the escapement. In addition, 33 spaghetti tags applied at Canyon Island were recovered at the Nahlin River Weir. Based on these small recovery samples, the total return to the Nahlin River was estimated at 3,083 fish of which 1,761 (57.1%) were harvested (Table 1). An estimated 39.2% (1,209 fish) of the total return was harvested in Alaska fisheries while 16.3% (503 fish) were taken in the inriver commercial fishery and 1.6% (49 fish) were harvested in the test fishery. Of the marine fisheries, the drift gill net and sport fisheries accounted for the largest catches at 18.6% (574 fish) and 15.2% (467 fish), respectively. Smaller estimated percentages (4.2%) and (1.2%) were taken in the troll and purse seine fisheries.

A total of 50 tagged Tatsamenie River coho salmon was recovered in Alaska fisheries, while 32 were recovered from a total of 74 adiposed clipped fish observed in the escapement (Table 2). Thirty-three sphagetti tags applied at Canyon Island were recovered at the Tatsamenie Weir. The total return to the Tatsamenie River was estimated at 2,191 fish of which 1,528 (69.7%) were harvested. The Tatsamenie River stock showed different harvest patterns compared with the Nahlin River stock, with higher percentages taken in marine commercial fisheries (troll 22.0%; seine 1.4%; drift gill net 39.2%) and lower percentages

taken in the marine sport fishery (4.2%), the inriver commercial fishery (1.7%), the inriver test fishery (0.3%) and the inriver sport fishery (0.9%).

It appears that the Nahlin River stock with its earlier timing moved relatively quickly through marine commercial fisheries (see section on migratory timing). It probably peaked in abundance in the Juneau sport and inriver commercial fisheries during the period of peak effort in those fisheries in July and August. On the other hand, the Tatsamenie River stock appeared to be more typical of fall stocks which feed for weeks to months in the outside troll fishery and become highly available to the District 111 drift gill net fishery during early to mid-September when the fishery targets on coho and chum salmon with larger mesh nets. Fall stocks are less available to the Juneau sport and Canadian inriver fisheries because of curtailed effort in late August and September.

Harvest Rates

Fishery harvest rates were estimated for the upper Nahlin and Tatsamenie River stocks (Table 3). The total harvest rate estimate for the upper Nahlin River stock was 0.571. This stock was subjected to estimated harvest rates by marine and inriver fisheries of 0.392 and 0.294, respectively. Only 11 tagged Nahlin River coho salmon were recovered in the marine fisheries. Based on this small sample, the harvest rate by troll gear was estimated at only 0.042 compared with 0.160 for the Juneau sport fishery and 0.195 for the District 111 drift gill net fishery. The harvest rate for upper Nahlin River coho salmon in the Canadian inriver commercial fishery was estimated at 0.268 based on adult tagging and recovery data.

The later migrating Tatsamenie River stock underwent an estimated total harvest rate of 0.697. Estimated harvest rates of 0.220, 0.055 and 0.542, respectively, were incurred by the Tatsamenie River stock in the troll, Juneau Sport and District 111 drift gill net fisheries. The total harvest rate by inriver fisheries was estimated at 0.088. The inriver commercial fishery accounted for an estimated harvest rate of only 0.051.

The Hackett River stock was estimated to contribute 169 fish to the inriver commercial fishery and 18 fish to the test fishery for a total inriver catch of 187, based on the tagging distribution of 50 sphagetti tagged fish recovered at the Hackett River Weir. The inriver harvest rate was estimated at 0.129 (0.117 commercial and 0.012 test).

While available data is limited by small sample sizes (Tables 1 and 2), there is an indication that fall stocks such as the Tatsamenie River stock were more heavily harvested by the troll and District 111 drift gill net fisheries compared with earlier migrating stocks which were more heavily harvested by the Juneau sport fishery and the Canadian inriver commercial fishery. The inriver commercial fishery has been limited by treaty to a total harvest of 3,000 coho salmon, most of which are taken early in the season incidental to the sockeye harvest. Early stocks in the Taku River appear to be important to the Juneau sport fishery during the period of peak effort in July and early August when fall stocks are often unavailable in significant numbers.

Harvest Distribution

Harvest by Gear Type. Based on 259 tag recoveries, the marine harvest distribution by gear type for all tagged Taku River coho salmon was as follows: troll 39.5%; purse seine 0.9%; drift gill net 49.4%; and sport 10.2% (Table 4). These estimates show a somewhat lower percentage harvested in the troll fishery and a higher percentage in drift gill net fisheries compared with earlier

studies. Data from 1977-1979 (Shaul 1987; preliminary data) indicated the following marine harvest distribution based on 159 recoveries from fish tagged in mainstem valley rearing areas: troll 60.9%; purse seine 2.5%; drift gill net 29.2%; and sport 7.4%. Earlier investigations that employed fluorescent pigment marking of rearing juveniles in Yehring and Johnson Creeks (Gray et al. 1978) resulted in commercial harvest distribution estimates for 1974 returns as follows: troll 71.9%; purse seine 0.4%; and drift gill net 27.7% (no sport estimate). The 1988 percentages were affected by extensive closures in the troll fishery which reduced the troll catch and resulted in a larger harvest by inside fisheries.

In 1988, the vast majority of the troll harvest occurred in the northwest quadrant which accounted for 36.4% of the total compared with only 1.9% for the northeast quadrant and 1.2% for the southwest quadrant. Of the total estimated drift gill net share of 49.4%, 44.9% was harvested in District 111 while 4.5% was taken in District 115.

Fish tagged along the Canadian portion of the mainstem and those tagged at Yehring Creek (an Alaska mainstem tributary) displayed a somewhat different harvest distribution by gear type with an estimated 49.6% of the marine harvest of Canadian mainstem fish taken in the troll fishery (N=60) compared with only 34.5% for Yehring Creek (N=95). A greater estimated troll catch of tagged Canadian mainstem fish in the central intermediate area (Cross Sound, Icy Strait and northern Chatham Strait) appears to have accounted for the difference in the estimates (Table 5). The data also indicated that Yehring Creek fish may have demonstrated slightly earlier and more protracted timing in the troll and drift gill net fisheries (see section on migratory timing). It seems unlikely that such large differences in harvest distribution would be found between groups of fish tagged in two such relatively close locations along the mainstem of the system. Yehring Creek is a relatively clear tributary while some of the spawning areas in the vicinity of the Canadian mainstem tagging are glacial. If late timing is associated with glacial spawning areas in the Taku River as it is for the very late migrating Lynn Canal stocks, the observed differences in harvest distribution by gear type may be real, at least in part. In 1988, later migrating stocks may have been more available to the troll fishery compared with stocks exibiting early and middle timing because extensive closures and poor catch rates limited troll catches earlier in the season from July until late August. The troll fishery remained open during the last week of August and September 4-20 while catch rates improved substantially late in the season in some areas of northern Southeast. Therefore, a late migrating stock may have incurred a higher harvest rate in the troll fishery while a larger proportion of it's return could have passed through District 111 after the drift gill net season was closed (September 19). A comparision of tag returns from these two locations in 1989 and 1990 will help confirm that either a consistent difference exists in timing among mainstem stocks or that the difference observed in 1988 resulted largely from random sampling error.

Harvest by Area. The data indicated that the most important harvest areas for tagged Taku River coho salmon in outside and intermediate waters were the central intermediate area which accounted for an estimated 16.9% of the total marine harvest and the northern outside area north of Cape Spencer (15.8%; Table 5). The central outside and southern outside areas accounted for only 2.1% and 1.3% of the estimated total marine harvest, respectively. This indicates a strong migratory pattern from the northwest through Icy Strait. The southern intermediate area accounted for only 0.9% of the total. An estimated 4.9% of the harvest occurred in Lynn Canal, probably mostly in lower Lynn Canal south of Pt. Sherman which receives substantial drift gill net effort and is near the major migration route around northern Admiralty Island. An estimated 58.1% of the total marine harvest was taken in Stephens Passage (District 111).

Concentration of Tags. As expected, tagged Taku River coho salmon were most concentrated in the Taku/Snettisham drift gill net fishery in Stephens Passage (District 111) at an estimated 7.50 tags per 1,000 fish (Table 6). They also contributed substantially to the Juneau marine sport fishery (6.37 tags/1,000 fish). In more distant areas, tagged Taku River fish were most prevalent in catches from the Central Intermediate area (Cross Sound, Icy Strait, upper Chatham Strait) with a concentration of 1.05 tags/1,000 fish and the Northern Outside area (north of Cape Spencer) at 0.95 tags/1,000 fish. This indicates that Taku River coho salmon were approximately seven times more prevalent in catches in inside fisheries near the river mouth compared with the more mixed-stock troll and purse seine fisheries along their primary migration route through outside waters and straits. Tagged Taku River fish were found in relatively low concentrations in the Central Outside area (0.15 tags/1,000 fish), Southern Intermediate area (0.11 tags/1,000 fish) and Southern Outside area (0.04 tags/1,000 fish) indicating an overall north-south migration pattern along the coast. Tagged Taku River coho salmon were also recovered from the Lynn Canal (District 115) drift gill net fishery with an estimated concentration of 0.42 tags/1,000 fish.

Migratory Timing

The region-wide troll catch showed three distict peaks with troughs corresponding to closed periods during July 26-August 4 and August 15-24. Fish tagged at Yehring Creek appeared to be slightly earlier in timing that those tagged in Canadian mainstem rearing areas based on a small sample size of 37 and 36 tags, respectively (Figure 2 and Appendix D.1). The timing of Yehring Creek fish generally reflected the timing of the total troll catch with a peak in the second week of August. Fish tagged at the Tatsamenie and Sheslay Rivers showed the same overall timing as fish from Yehring Creek fish based on only 17 and 19 recoveries, respectively (Figures 3 and 4). Overall, tagged Taku River coho salmon were well distributed in the troll catch throughout the entire season but made a slightly higher relative contribution in August and early September compared with July and mid-September (Figure 4).

Yehring Creek and Canadian mainstem fish peaked in the District 111 drift gill net fishery in the first half of September as did the total catch of all stocks (Figure 5 and Appendix D.2). Again, Canadian mainstem fish may have been slightly later in timing although substantial doubt remains because of small sample sizes. While possibly peaking a week earlier, the Tatsamenie and Sheslay River stocks exhibited roughly similar timing to the mainstem stocks (Figures 6 and 7). Based on only 5 recoveries, the Nahlin River stock was earlier than all other tagged groups with four of the recoveries occurring around July 20 and one around August 10 (Figure 7).

The Nahlin River stock was the earliest population to migrate through the lower river based on recovery data from adult tagging (Figure 8 and Appendix D.3). The Nahlin stock was estimated to migrate during mid-July until mid-August with a peak near the end of July. Fish returning to the Hackett River (a tributary of the Sheslay River) were later than Nahlin River fish but earlier than the predominant fall stocks. Hackett River fish were available from late July until early September with an estimated peak in the middle of August. The Tatsamenie River stock was available from early August until near the end of fishwheel operations in mid-September with an estimated peak at the end of August when overall fishwheel CPUE peaked.

Nahlin River fish migrated past the weir from the end of July through the third week of September with the with approximately equal weekly peaks occuring during the period from about the end of August through the third week of September (Figure 9 and Appendix D.4). Downstream surveys indicated that few new migrants

had entered the system during the last week of operation, but that most fish passing the weir during the last week of operation had been holding in downstream pools within a few hundred meters of the weir. Weekly peak counts at the Hackett River Weir occurred around September 21 and October 5 while the overall migration took place during mid-August through mid-October. Fish migrated past the Tatsamenie Weir from late August through early November while the peak migration occured during the first half of October.

It is interesting to note that limited troll and drift gill net recoveries from fish tagged in the Sheslay River indicate that it hosts a later run, not unlike mainstem tributaries and the Tatsamenie River (Figures 2-7). In contrast, the Hackett River, a major known spawning tributary adjacent to areas where the Sheslay River fish were tagged, hosts a relatively early migrating stock based on the migratory timing of adults through the lower river and weir (Figures 8 and 9). Based on the close proximity of Hackett River spawning areas to coded-wire tagging locations on the Sheslay River, it was expected that many, if not most, tagged juveniles would be from the Hackett River spawning population. However, fishery recoveries indicated that later migrating spawning populations probably also contributed to the group of juvenile coho salmon tagged in rearing areas adjacent to the mainstem Sheslay River. It is possible that some fish move out of the Tatsamenie River system and migrate up the swift Sheslay River to these areas. However, it seems unlikely that the proportion of Tatsamenie River fish would be large given the distance involved and information from 1988 weir counts that indicated that about twice as many spawners entered the Hackett River compared with the Tatsamenie River. ADF&G staff observed approximately 80 coho salmon spawners in glacial side branches of the Sheslay River, upstream of the confluence with the Hackett River, during an inventory survey of chum salmon spawning areas on October 15-17, 1975 (Paul Kissner, ADF&G, personal communication). Based on poor visibility conditions, the observer believed that many more fish probably were present in side channels. Therefore, the relatively late timing of juveniles tagged in rearing areas along the Sheslay River could be explained by the presence of significant late migrating and spawning populations in mainstem areas of the glacial Sheslay River.

Survival Rates

Survival rates for juvenile coho salmon tagged at the upper Nahlin and Tatsamenie Rivers in 1986 were estimated at 1.5% and 1.9%, respectively. These estimates may increase somewhat if a significant proportion of the tagged fish remained in the system for an additional year to outmigrate as smolts in 1988 and return as adults in 1989. The estimated survival rate of juvenile coho salmon tagged in these two tributaries (from recoveries through 1988) falls below the range of comparable estimates from a total of 22 experiments with nine wild coho salmon stocks throughout Southeast Alaska. Survival rate estimates from these experiments ranged from 2.2-15.2% and averaged 6.5% (Shaul and Koerner 1988). Further studies will determine if these low estimates reflect generally lower survival rates for juveniles in upper Taku River tributaries compared with Southeast Alaska systems or if other factors were responsible, such as exceptionally poor survival in 1988 or a greater average freshwater residence period for upper Taku River juveniles.

ESCAPEMENT COUNTS AND ESTIMATES

Methods and Procedures

McGregor and Clark (1989) estimated the number of coho salmon that escaped past Canyon Island Island in the mainstem Taku River through September 18. Upstream migrant adults were captured in fishwheels operated at Canyon Island, tagged and released. Tag recovery was conducted using commercial and test fish catches from the Canadian portion of the mainstem. The authors applied a mark-recapture technique (Darroch 1961) to estimate gross escapement past Canyon Island. The mainstem estimation program was a joint effort between ADF&G/CF and DFO.

Adult enumeration weirs were operated throughout the majority of the coho salmon migration at the Nahlin River, Tatsamenie River, Hackett River and Yehring Creek. At the weirs, fish were enumerated as they passed through a trap, while fish remaining when the weir was removed were surveyed by foot or helicopter and their number added to the cumulative weir count.

Helicopter surveys were conducted on the Nahlin and Dudidontu Rivers and at Flannigan Slough (Wilms Creek). Surveys were conducted from an altitude of 6-15 m unless obstructions required flying higher. Airspeed varied from approximately 5-50 km per hour depending on terrain, visibility and the presence or absence of fish. Surveys were conducted from a Bell 206 B Jet Ranger helicopter. The door on the observer's side was removed and the helicopter was maneuvered so that the observer was able to look down into the stream continuously from the left side. The observer wore polarized glasses to reduce reflective glare and a billed hat to keep prop wash out of the observer's eyes. Weir counts for the upper Nahlin River were kept secret from the observer to avoid the possibility of biasing survey counts.

Results and Discussion

Mainstem Mark-Recapture Estimate

The gross coho salmon escapement past Canyon Island was estimated at 43,093 (95% C.I. 29,057-57,130). The gross escapement was reduced by Canadian commercial, food and test fishery catches to 39,450. McGregor and Clark (1989) describe the details of their estimate which included only fish migrating through September 18. Further development of the mark-recapture program is needed in the future to include estimates of fish that migrate past the tagging site later in the season through at least the first week of October.

Tributary Surveys and Weir Counts

Upper Nahlin River Surveys. The upper Nahlin River was surveyed on September 8 and 15. The first survey was conducted under excellent visibility conditions with a clear sky and calm winds. A total of 694 coho salmon was counted on September 8 of which 545 (including 26 carcasses) were upstream of the weir and 149 (no carcasses) were downstream. The count above the weir was 63.0% of the cumulative weir count of 865. In addition, a total of 16 sockeye salmon was counted (10 upstream of the weir; 6 downstream).

The September 15 survey was conducted under good visibility conditions. The sky was partly cloudy and there was a light breeze up the river. A total of 655 coho salmon was counted of which 446 (including 23 carcasses) were upstream of

the weir and 209 (no carcasses) were downstream. The count above the weir was 47.2% of the cumulative weir count of 945. Three sockeye salmon were seen.

The peak helicopter survey count of 694 coho salmon was 52.5% of the total escapement count for the system of 1,322 (1,265 weir count plus 57 counted downstream when the weir was removed). Based on information from surveys on September 8 and 15, as well as cumulative weir counts, it appeared that both surveys were conducted near the optimum date for a peak count. Approximately 140 new fish moved into the survey area between September 8-15 while about 168 fish arrived after the September 15 survey. The percentage of the total escapement count present in the survey area was 76.7% on September 8 and 87.3% on September 15. The reduced count for the second survey probably resulted from greater dispersal of spawners in headwaters areas and reduced abundance due to mortality and consumption of carcasses by scavengers. Slightly poorer visibility conditions during the September 15 survey may also have been a factor.
It appears that if surveys are conducted before September 8, there is some risk that a substantial portion of the population will not be available in the survey area, particularly if the run is late. However, a substantial portion of the population may have died and been removed from the system after September 15. Until more information is available, it appears that optimum survey timing is between these dates.

The 1988 peak count of 694 fish was higher than 1986 and 1987 survey counts of 318 and 165, respectively (Table 7; Shaul 1987 and 1988).

Dudidontu River Surveys. The Dudidontu River was surveyed on September 8 and 15. The first survey was conducted under overcast, calm conditions with good visibility. A total of 326 fish (including 8 carcasses) was counted between Ketchum Lake and Kakuchuya Creek. Only one fish (carcass) was seen downstream from Kakuchuya Creek. Three live fish were counted in Kakuchuya Creek. The total survey count included 330 coho salmon of which 9 were carcasses.

The September 15 survey was conducted under fair to good visibility conditions. The weather was calm and overcast with occasional snow showers. A total of 350 adults (335 live; 15 dead) was counted between Ketchum Lake and Kakuchuya Creek. Seventeen live fish were seen in Kakuchuya Creek but no fish were seen in the mainstem downstream from that point. The total survey count included 367 coho salmon of which 15 were carcasses.

The 1988 peak count of 367 fish was higher than the 1986 count of 276 fish but lower than the 1986 count of 798 fish (Table 7).

Flannigan Slough Surveys. Flannigan Slough (also known as Wilms Creek) was surveyed three times in 1988 (Table 8). Two of the surveys were conducted jointly by the ADF&G Commercial Fisheries and Sport Fish Divisions while the third was conducted by DFO. On October 22, counts made by two different observers during the same survey were 1,260 fish and 1,320 fish, respectively (average 1,290). DFO staff conducted two surveys on October 27 and obtained counts of 1,102 and 1,150, respectively (average 1,126). An ADF&G survey on November 3 resulted in counts for independent observers of 1,115 and 1,500, respectively (average 1,308). Overall, surveys on the three dates yielded similar counts. Flannigan slough is probably the most favorable mainstem tributary for coho salmon surveys that has been located in the Taku River system. The fish are visible throughout nearly all of the stream. However, poor visibility due to glacial influence is a problem until late fall when the stream becomes clear. In some years, total spawner abundance in the survey area probably peaks days or weeks in advance of favorable visibility conditions.

Yehring Creek Weir. The Yehring Creek weir was operated during August 12-October 23. A total of 1,423 adult coho salmon was counted. This was the first

year when the weir remained relatively fish-tight throughout the season. Adult (age .1) estimates for weir counts in 1986 and 1987 were 1,988 and 1,622, respectively (Table 8). However, an unknown number of fish passed the weir uncounted during both of those years. Daily counts for 1988 and other details of the Yehring Creek coho salmon research project were reported by Elliott and Sterritt (1989).

Hackett River Weir. DFO operated a coho salmon weir on the Hackett River during July 11-October 14. A total of 1,260 fish was counted. Counts during previous years were 1,031, 2,723 and 1,715 for 1985, 1986 and 1987, respectively. Weekly counts for 1988 are shown in Appendix D.4.

Upper Nahlin River and Tatsamenie River Weirs. Adult enumeration weirs were operated on the Tatsamenie (DFO) and upper Nahlin Rivers (ADF&G-SF). A total of 663 fish was counted at the Tatsamenie River while 1,322 were counted at the Nahlin River (Appendix D.4). The operation of these weirs is described in more detail in previous sections.

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Table 1. Estimated harvest, stock distribution and escapement of upper Nahlin River coho salmon by fishery, 1988.

Fishery	Number of Tags Recovered	Expanded Recoveries	Number of Fish	Percent
Troll	1	3.086	131	4.2
Purse Seine	1	0.864	37	1.2
Drift Gill Net (115)	1	2.811	120	3.9
(111)	5	10.689	454	14.7
Subtotal	6	13.500	574	18.6
Juneau Sport	3	11.000	467	15.2
Alaska Fisheries (Subtotal)	11	28.450	1,209	39.2
Inriver Commercial	-	-	503	16.3[1]
Inriver Test	-	-	49	1.6[1]
Inriver Food	-	-	-	-
Inriver (Subtotal)	-	-	552	17.9[1]
Total Catch (Subtotal)	-	-	1,761	57.1
Escapement	24	31.101	1,322	42.9
Total Return	35	-	3,083	100.0

[1] Harvest by Canadian inriver fisheries was estimated from spaghetti tag data (see text). No estimate was available for the inriver food fishery which harvested a total of 98 fish.

Table 2. Estimated harvest, stock distribution and escapement of Tatsamenie River coho salmon by fishery, 1988.

Fishery	Number of Tags Recovered	Expanded Recoveries	Number of Fish	Percent
Troll	17	45.452	481	22.0
Purse Seine	1	2.932	31	1.4
Drift Gill Net (111)	30	81.189	860	39.2
Juneau Sport	2	8.650	92	4.2
Alaska Fisheries (Subtotal)	50	138.223	1,464	66.8
Inriver Commercial	-	-	37	1.7[1]
Inriver Test	-	-	7	0.3[1]
Inriver Food	-	-	-	-
Inriver Sport	-	-	20	0.9
Inriver (Subtotal)	-	-	64	2.9
Total Catch (Subtotal)	-	-	1,528	69.7
Escapement	32	62.607	663	30.3
Total Return	82	-	2,191	100.0

[1] Harvest by Canadian inriver commercial and test fisheries was estimated from spaghetti tag data (see text). No estimate was available for the inriver food fishery which harvested a total of 98 fish.

Table 3. Estimated harvest rate by fishery for coho salmon returns to the Taku River, 1988.

Fishery	Harvest Rate (Proportion)	
	Nahlin River	Tatsamenie River
Troll	0.042	0.220
Purse Seine	0.012	0.014
Lynn Canal Gill Net	0.041	0.000
Juneau Sport	0.160	0.055
District 111 Gill Net	0.195	0.542
Marine (Subtotal)	0.392	0.668
Inriver Commercial	0.268	0.051
Inriver Test	0.026	0.010
Inriver Food	-	-
Inriver Sport	0.000	0.029
Inriver (Subtotal)	0.294	0.088
Total	0.571	0.697

Table 4. Estimated harvest distribution of Taku River coho salmon in marine fisheries by gear type, 1988. The troll percentage is listed by quadrant while the drift gillnet percentage is listed by district. Stratification is by quadrant (troll), district (seine and gillnet) and port (sport).

Gear Type	Area	Tagging Location (Percent) Yehring Creek	Canadian Mainstem	Yehring Creek & Mainstem	Tatsamenie River	Sheslay River	Nahlin River	All Taku Tags
Troll	Northwest	33.7	45.2	38.2	29.3	54.3	10.8	36.4
	Northeast	0.8	3.2	1.8	1.5	4.9	0.0	1.9
	Southwest	0.0	1.2	0.5	2.1	0.0	0.0	1.2
	Southeast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total	34.5	49.6	40.5	32.9	59.2	10.8	39.5
Seine	Total	0.0	0.0	0.0	2.1	0.0	3.0	0.9
Gill Net	Dist. 115	5.6	6.5	5.9	0.0	3.6	9.9	4.5
	Dist. 111	52.3	31.0	43.9	58.7	34.8	37.6	44.9
	Total	57.9	37.5	49.8	58.7	38.4	47.5	49.4
Sport	Total	7.6	12.9	9.7	6.3	2.4	38.7	10.2
Grand Total		100.0	100.0	100.0	100.0	100.0	100.0	100.0
Sample Size		95	60	155	50	34	11	259

Table 5. Estimated harvest distribution of Taku River coho salmon in marine fisheries by area, 1988. Stratification is by PMFC area (troll), district (seine and gillnet) and port (sport).

		Tagging Location (Percent)						
Area	Gear Type	Yehring Creek	Canadian Mainstem	Yehring Creek & Mainstem	Tatsamenie River	Sheslay River	Nahlin River	All Taku Tags
N. Outside	Troll	15.6	16.3	15.9	8.6	33.6	0.0	15.8
C. Outside	Troll	4.2	2.1	3.3	0.0	0.0	0.0	2.1
S. Outside	Troll	0.0	3.3	1.4	2.3	0.0	0.0	1.3
C. Intermed.	Troll	7.8	27.4	16.0	13.0	17.6	0.0	14.7
	Seine	0.0	0.0	0.0	2.4	0.0	0.0	0.9
	Sport	0.0	0.0	0.0	0.0	0.0	35.5	1.3
	Total	7.8	27.4	16.0	15.4	17.6	35.5	16.9
S. Intermed.	Troll	0.9	0.0	0.5	1.4	2.3	0.0	0.8
	Seine	0.0	0.0	0.0	0.0	0.0	3.4	0.1
	Total	0.9	0.0	0.5	1.4	2.3	3.4	0.9
Lynn Canal	Gill Net	6.1	6.5	6.2	0.0	4.1	11.1	4.9
Steph. Pass	Gill Net	57.1	31.4	46.4	65.3	39.7	42.1	48.4
	Sport	8.3	13.0	10.3	7.0	2.7	7.9	9.7
	Total	65.4	44.4	56.7	72.3	42.4	50.0	58.1
Grand Total		100.0	100.0	100.0	100.0	100.0	100.0	100.0
Sample Size		86	60	146	45	30	10	238

Table 6. Estimated concentration (tags per 1,000 fish) of coded-wire tagged Taku River coho salmon in Southeast Alaska commercial fisheries by PMFC area and in the Juneau sport fishery, 1988.

Area	Gear Type(s)	Expanded Recoveries	Total Catch	Concentration (tags/1,000 fish)
Northern Outside	Troll	109.947	116,528	0.95
Central Outside	Troll & Seine	14.859	96,621	0.15
Southern Outside	Troll & Seine	9.037	222,527	0.04
Central Intermediate	Troll & Seine	108.743	103,720	1.05
Southern Intermediate	Troll & Seine	6.682	60,871	0.11
Lynn Canal	Gill Net	33.955	81,397	0.42
Stephens Passage	Gill Net	338.079	45,094	7.50
Juneau	Sport	76.500	12,016	6.37

Table 7. Escapement counts for three upper Taku River coho salmon stocks, 1985-1988.

Location	Year	Type	Date(s)	Agency	No. of Fish
Upper Nahlin River	1986	Helicopter	09/18-19	ADF&G	318
	1987	Helicopter	09/15	ADF&G	165
	1988	Helicopter	09/08	ADF&G	694
	1988	Helicopter	09/15	ADF&G	655
	1988	Weir	07/25-09/23	ADF&G	1,322
Dudidontu River	1986	Helicopter	09/18	ADF&G	798
	1987	Helicopter	09/15	ADF&G	276
	1988	Helicopter	09/08	ADF&G	330
	1988	Helicopter	09/15	ADF&G	367
Hackett River[1]	1985	Weir	08/06-10/20	DFO	1,031
	1986	Weir	08/03-10/10	DFO	2,723
	1987	Weir	08/08-10/13	DFO	1,715
	1988	Weir	07/11-10/14	DFO	1,260
Tatsamenie River	1988	Weir	07/31-11/08	DFO	663

[1] Canada Department of Fisheries and Oceans data.

Table 8. Coho salmon escapement weir counts and peak and near-peak survey counts for two lower Taku River tributaries, 1984-1988.

Location	Year	Type	Date(s)	Agency	No. of Fish
Flannigan Slough	1984	Helicopter	10/21	ADF&G-SF	1,480
	1985	Helicopter	10/21	ADF&G-SF	2,320
	1986	Helicopter	10/31	ADF&G-SF	860-1,330[1]
	1987	Helicopter	11/04	ADF&G-SF/CF	1,950-2,250[1]
	1988	Helicopter	10/22	ADF&G-SF/CF	1,260-1,320[1]
	1988	Helicopter	10/27	DFO	1,102-1,150[2]
	1988	Helicopter	11/03	ADF&G-SF/CF	1,115-1,500[1]
Yehring Creek	1986	Weir	08/23-10/03	ADF&G-SF	1,988[3]
	1987	Weir	08/16-09/30	ADF&G-SF	1,622[3]
	1988	Weir	08/12-10/23	ADF&G-SF	1,423

[1] Counts by two independent observers.

[2] Counts from two surveys by the same observer.

[3] It is probable that some fish escaped uncounted during high water periods when the weir was inoperative in 1986 and 1987. The counts for Yehring Creek represent age .1 fish only. In addition, there were estimated to be 128 age .0 jacks in the escapement count in 1986 and 5 in 1987. No jacks were counted in 1988 when the weir pickets were more widely spaced.

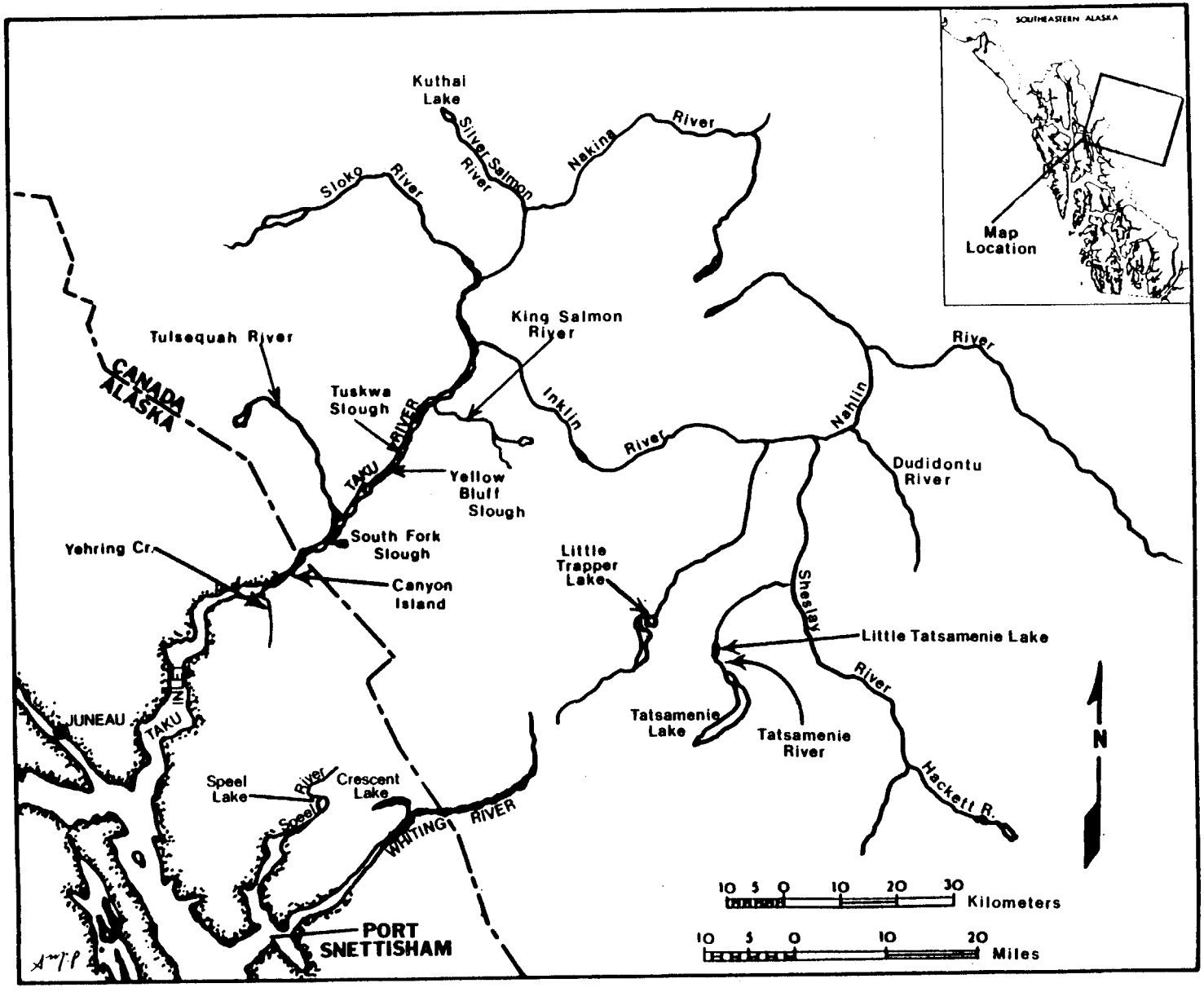
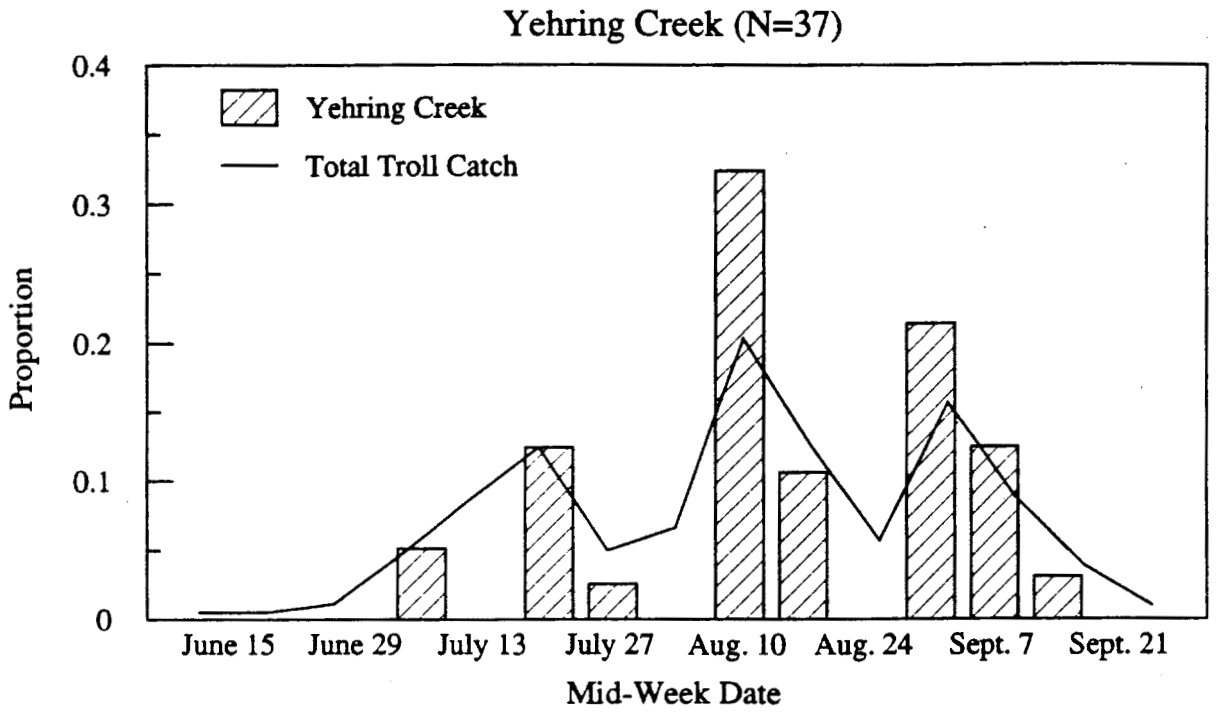


Figure 1. Taku River and Port Snettisham drainages.



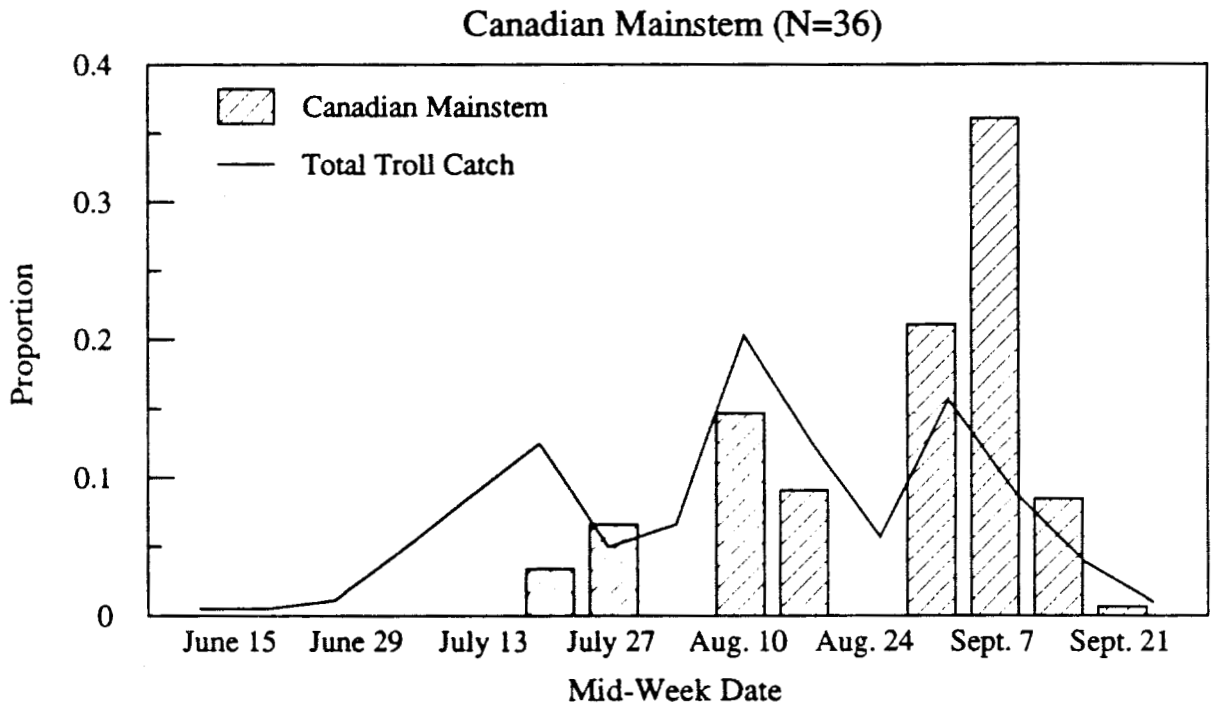
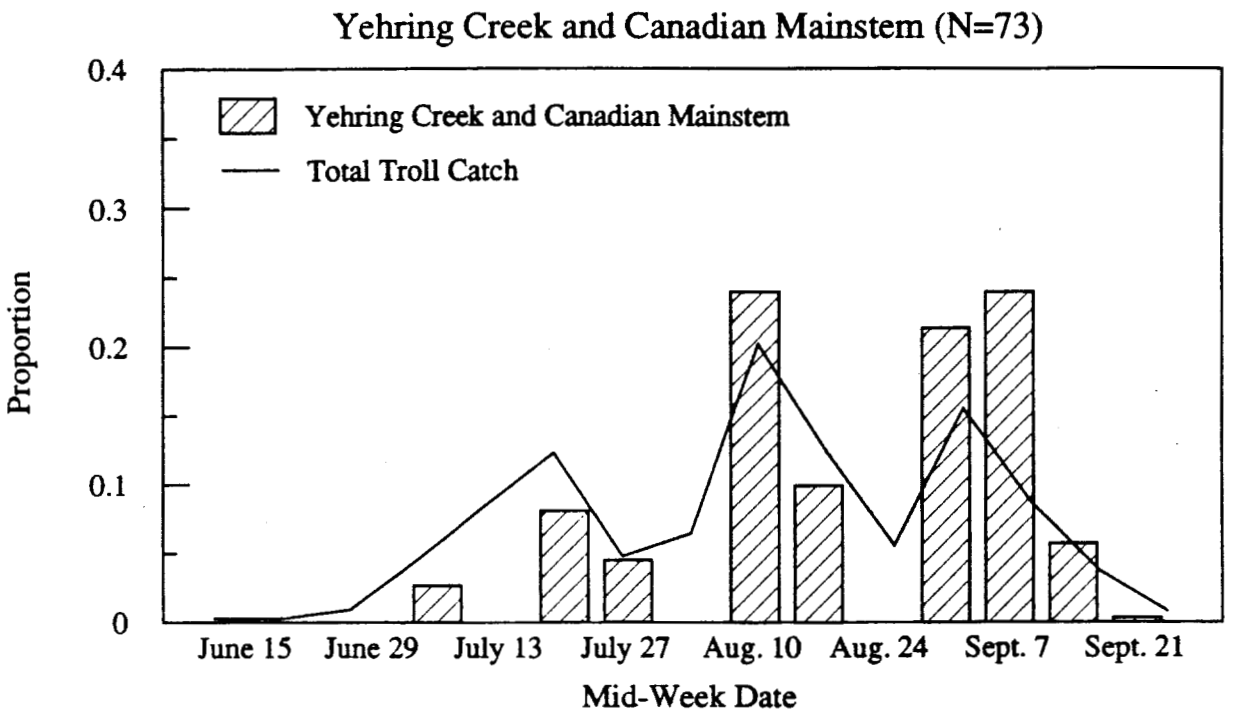


Figure 2. Average weekly proportion of the total coho salmon troll catch (line graph) and estimated troll catch of coded-wire tagged coho salmon from Yehring Creek and rearing areas along the Canadian mainstem (bar graph), 1988.



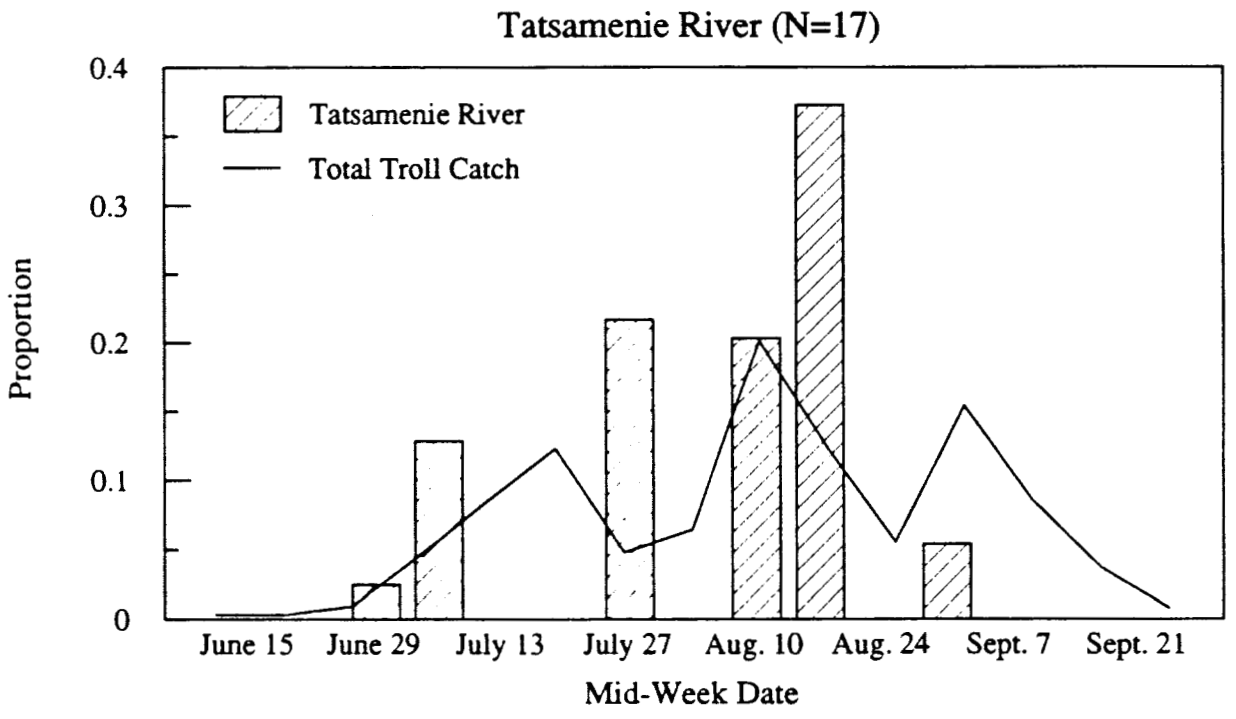


Figure 3. Average weekly proportion of the total coho salmon troll catch (line graph) and estimated troll catch of coded-wire tagged coho salmon from the Taku River mainstem valley (Yehring Creek and Canadian mainstem) and the Tatsamenie River (bar graph), 1988.

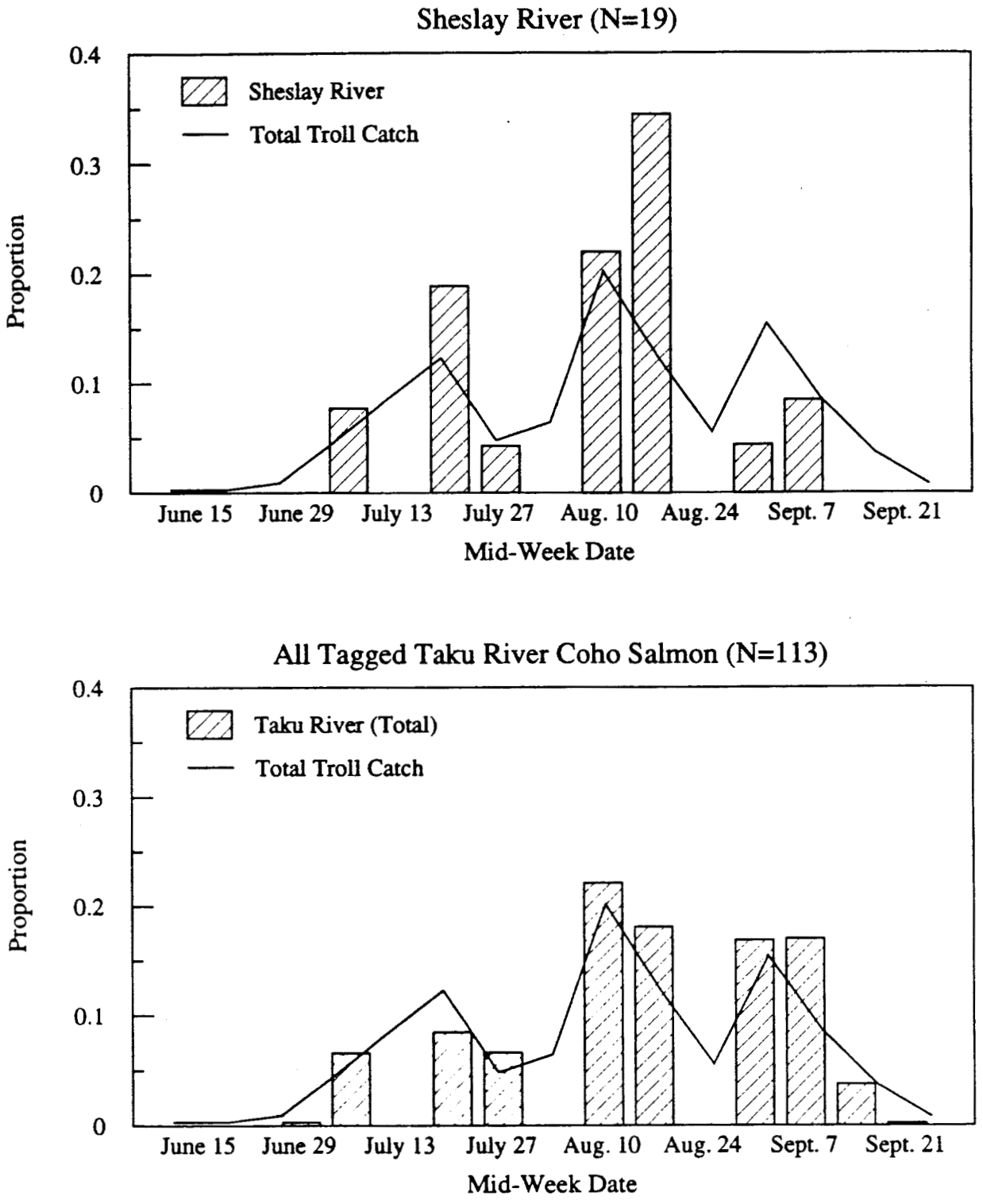


Figure 4. Average weekly proportion of the total coho salmon troll catch (line graph) and estimated troll catch of coded-wire tagged coho salmon from the Sheslay River and all tagging locations in the Taku River drainage (bar graph), 1988.

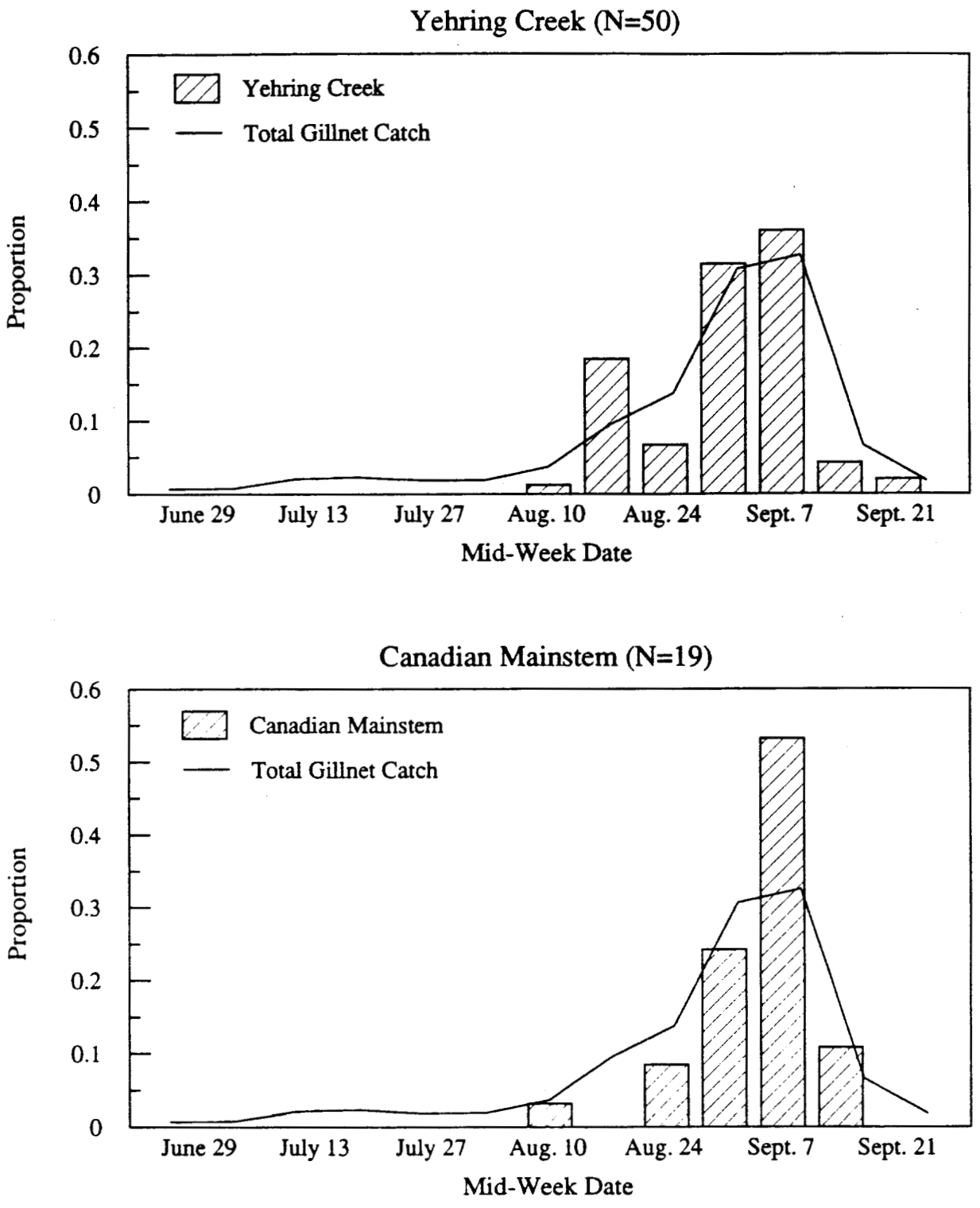
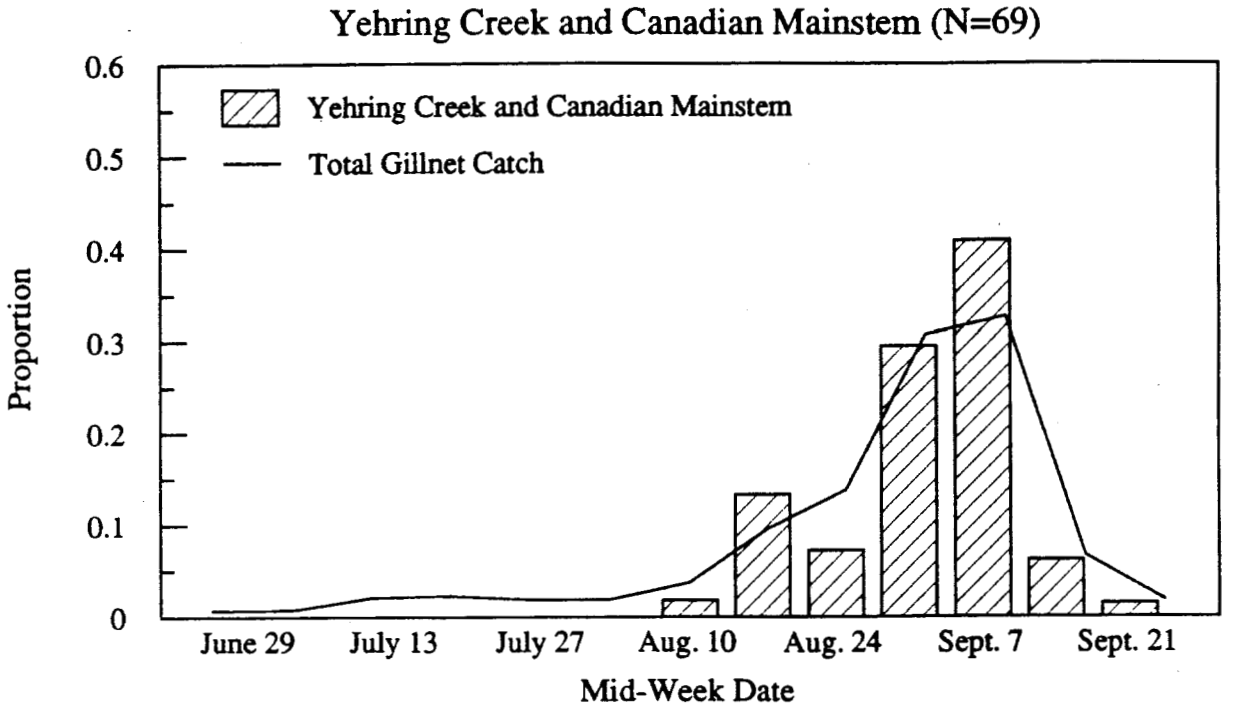


Figure 5. Average weekly proportion of the total District 111 drift gill net coho salmon catch (line graph) and estimated catch of coded-wire tagged coho salmon from Yehring Creek and rearing areas along the Canadian mainstem (bar graph), 1988.



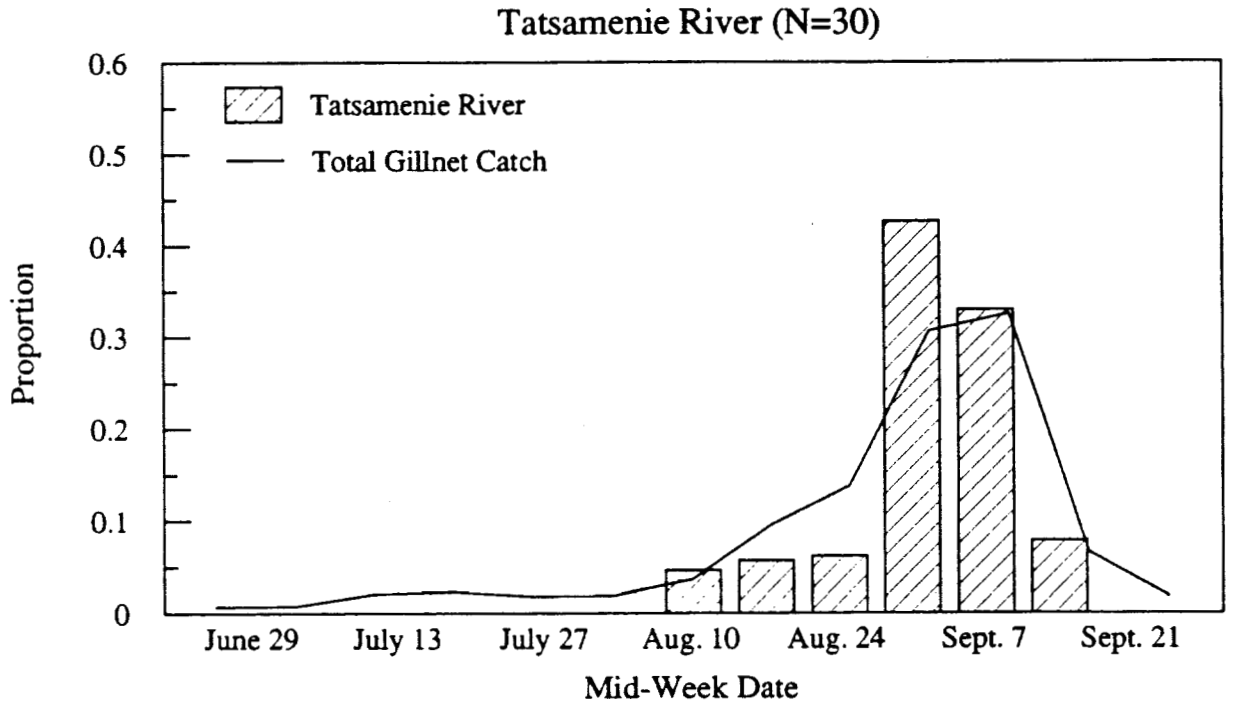


Figure 6. Average weekly proportion of the total District 111 drift gill net coho salmon catch (line graph) and estimated catch of coded-wire tagged coho salmon from the Taku River mainstem valley (Yehring Creek and Canadian mainstem) and the Tatsamenie River (bar graph), 1988.

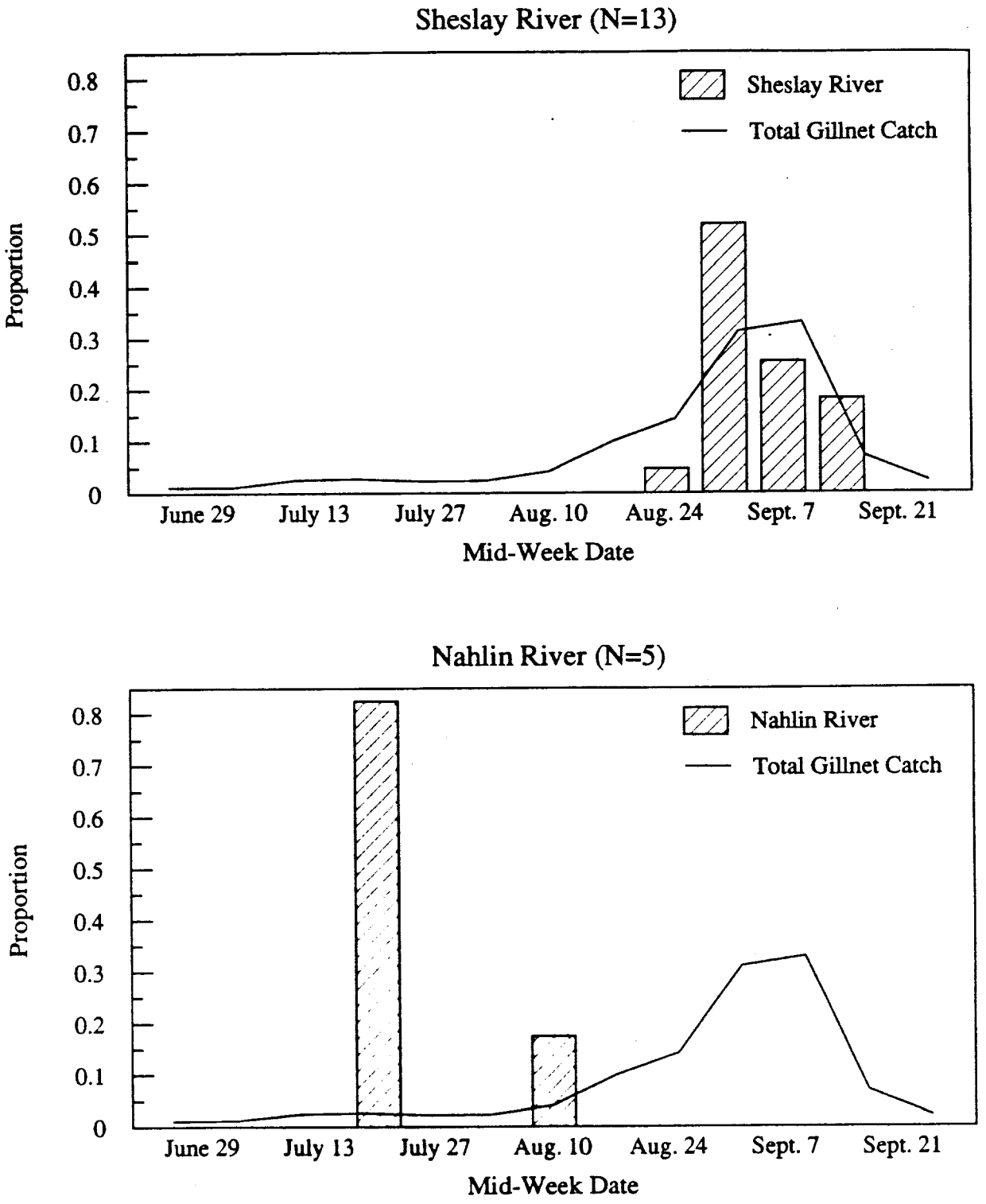


Figure 7. Average weekly proportion of the total District 111 drift gill net coho salmon catch (line graph) and estimated catch of coded-wire tagged coho salmon from the Sheslay and Nahlin Rivers (bar graph), 1988.

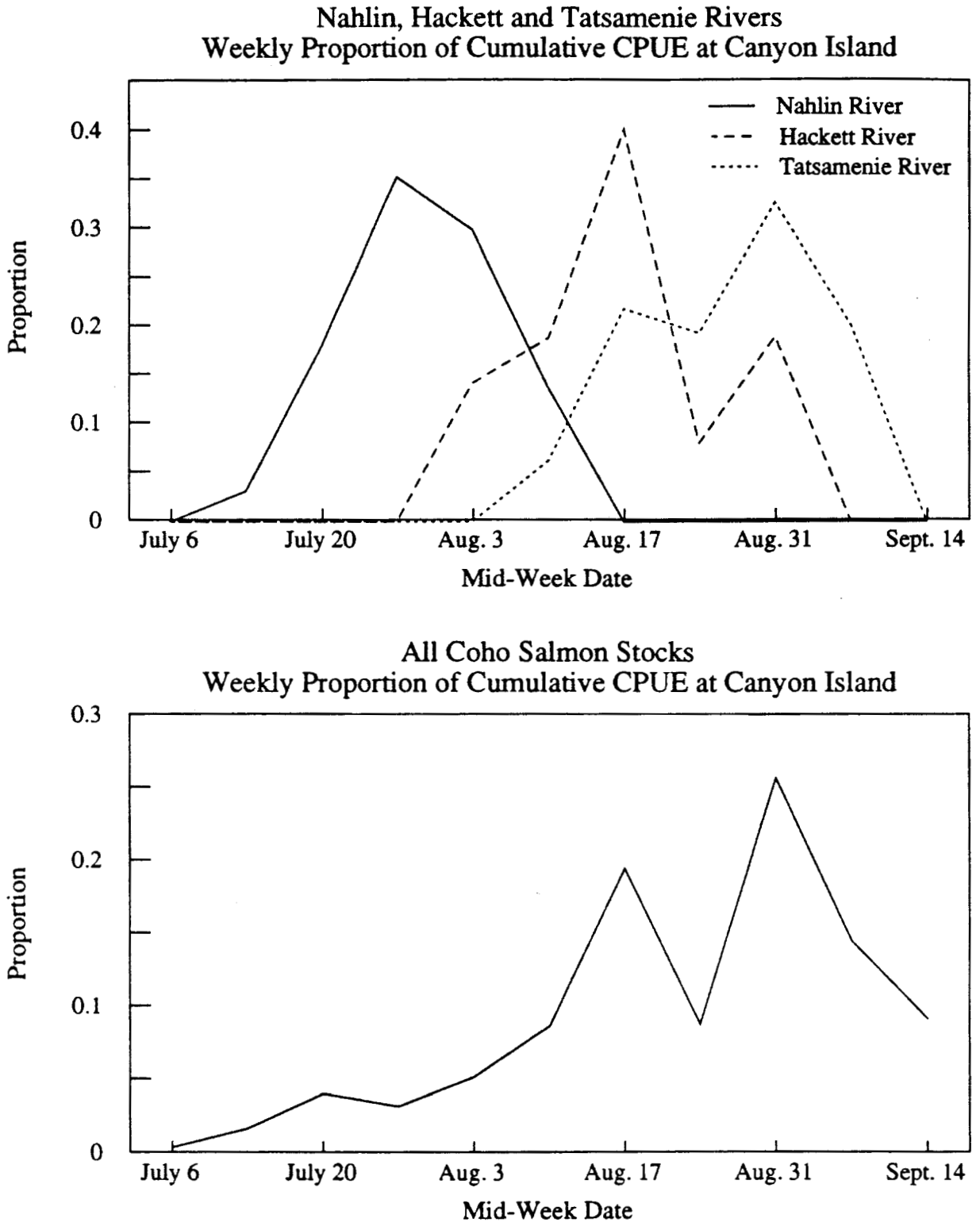


Figure 8. Estimated weekly proportion of cumulative CPUE at Canyon Island for coho salmon stocks in the Nahlin, Hackett and Tatsamenie Rivers based on weir recoveries of spaghetti tags, 1988.

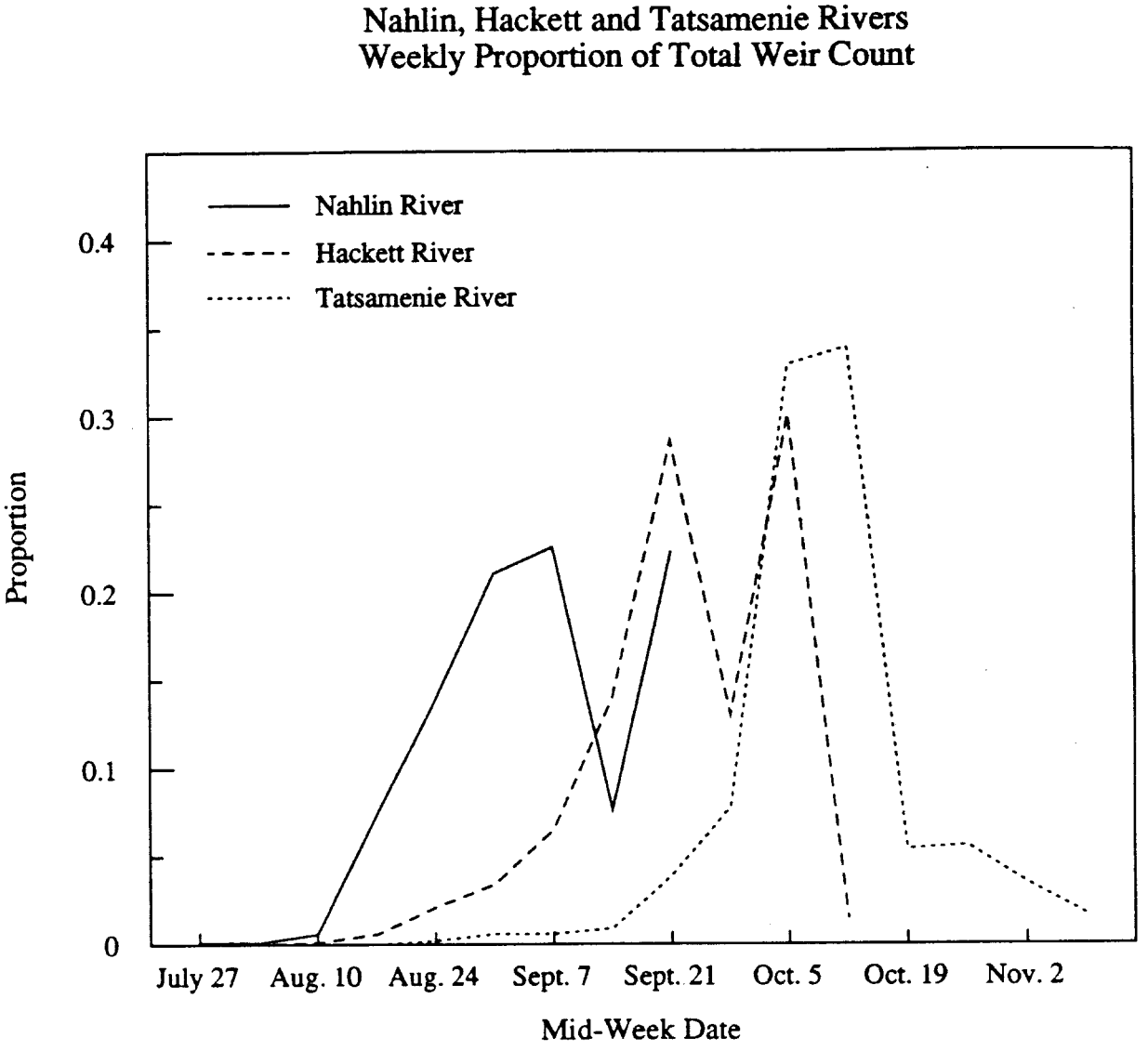


Figure 9. Weekly proportion of the total coho salmon count at weirs on the Nahlin, Hackett and Tatsamenie Rivers, 1988.

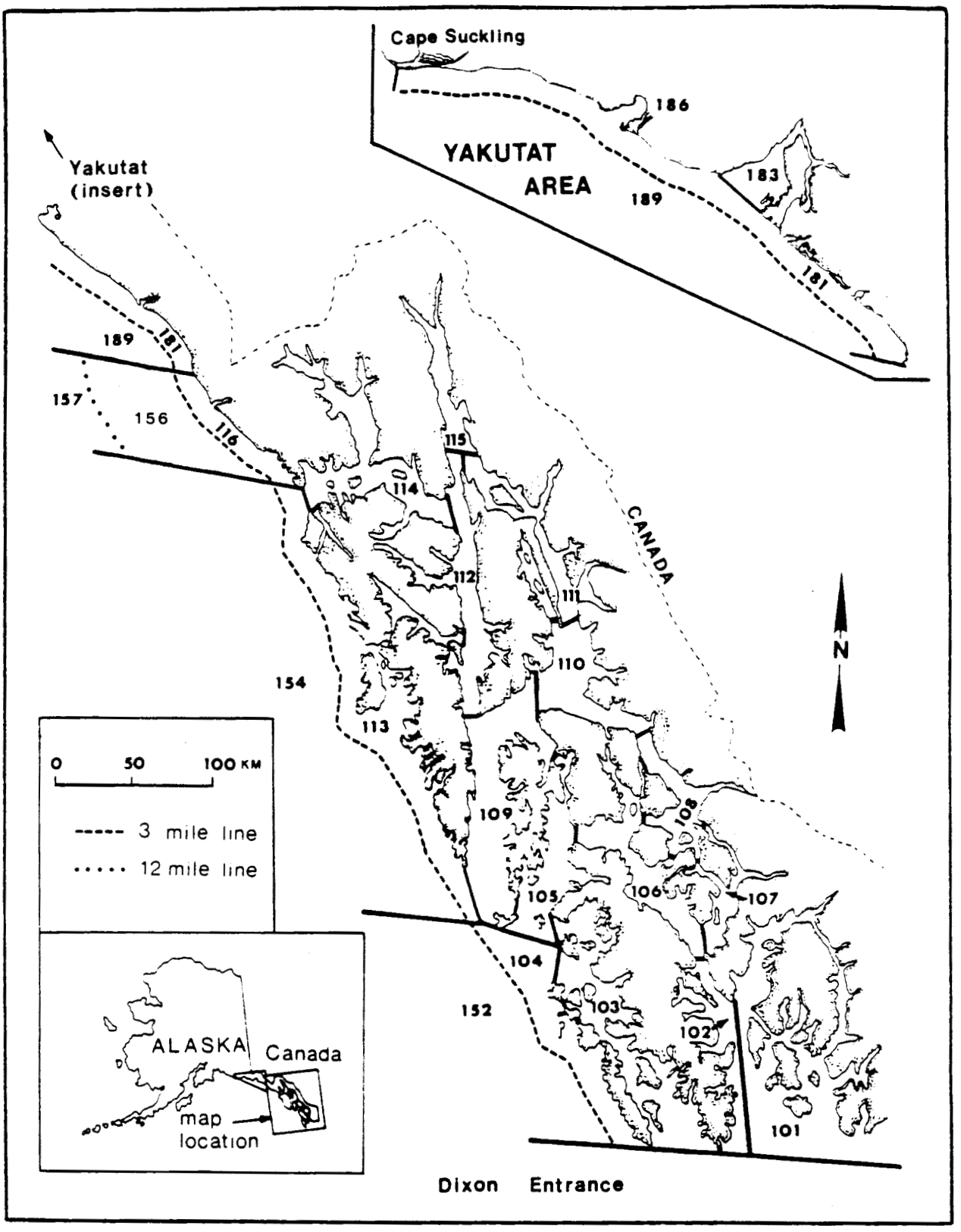
APPENDICES

Appendix A.1. Length-frequency distribution of juvenile coho salmon tagged at Little Tatsamenie Lake, July 20 - August 9, 1988.

Length (mm)	Number of Fish	Length (mm)	Number of Fish	Length (mm)	Number of Fish
60	47	89	21	118	1
61	41	90	17	119	0
62	45	91	11	120	0
63	35	92	10	121	0
64	29	93	7	122	0
65	41	94	7	123	0
66	27	95	8	124	0
67	21	96	8	125	0
68	25	97	7	126	0
69	21	98	6	127	0
70	21	99	6	128	0
71	15	100	3	129	0
72	16	101	6	130	0
73	29	102	1	131	0
74	27	103	5	132	0
75	31	104	4	133	0
76	35	105	2		
77	14	106	3		
78	27	107	1	Total	926
79	34	108	1		
80	20	109	2	Mean	76.1
81	24	110	1		
82	26	111	0	Median	74
83	21	112	3		
84	23	113	0	Range	60-118
85	29	114	0		
86	22	115	1	90%	62-92
87	16	116	1		
88	21	117	0	50%	65-85

Appendix A.2. Age-length sample from juvenile coho salmon tagged at Little Tatsamenie Lake, 20 July - 9 August 1988.

Length (mm)	Number of Fish			Length (mm)	Number of Fish		
	Age 0+	Age 1+	Total		Age 0+	Age 1+	Total
60	6	0	6	100	0	0	0
61	4	0	4	101	0	0	0
62	4	0	4	102	0	0	0
63	2	0	2	103	0	0	0
64	7	1	8	104	0	0	0
65	4	0	4	105	0	0	0
66	0	0	0	106	0	0	0
67	4	2	6	107	0	0	0
68	1	0	1	108	0	0	0
69	1	0	1	109	0	0	0
70	2	0	2	110	0	0	0
71	1	1	2	111	0	0	0
72	0	2	2	112	0	0	0
73	0	1	1	113	0	0	0
74	2	4	6	114	0	1	1
75	0	1	1	115	0	0	0
76	0	3	3	116	0	0	0
77	0	1	1	117	0	0	0
78	0	1	1	118	0	0	0
79	0	1	1	119	0	0	0
80	0	4	4	120	0	0	0
81	0	1	1	121	0	0	0
82	0	1	1	122	0	0	0
83	0	3	3	123	0	0	0
84	0	3	3	124	0	0	0
85	0	7	7	125	0	0	0
86	0	3	3				
87	0	0	0				
88	0	2	2				
89	0	1	1	Total	38	48	86
90	0	1	1				
91	0	0	0	Mean	64.4	81.4	73.9
92	0	1	1				
93	0	0	0	Median	64	82.5	73.5
94	0	0	0				
95	0	1	1	Range	60-74	64-114	60-114
96	0	0	0				
97	0	1	1	90%	60-70	72-90	61-86
98	0	0	0				
99	0	0	0	50%	61-67	75.5-85	64-83



Appendix B.1. Map of Southeast Alaska statistical fishing districts.

Appendix B.2. Statistical areas of Southeast Alaska belonging to Pacific Marine Fisheries Commission (PMFC) areas and quadrants.

PMFC Area	Abbreviation	Statistical Areas (Districts)
Northern Outside	NOUT	116, 156, 157, 181, 183, 186, 189, 191
Central Outside	COUT	113, 154
Southern Outside	SOUT	103, 104, 152
Southern Inside	SIN	101, 102, 150
Southern Intermediate	SNTR	105, 109, 110
Central Inside	CIN	106, 107, 108
Stephens Passage	STEP	111
Central Intermediate	CNTR	112, 114
Lynn Canal	LYNN	115

Quadrant	Abbreviation	Statistical Areas (Districts)
Northwest	NW	113, 114, 116, 154, 156, 157, 181, 183, 186, 189, 191
Northeast	NE	109, 110, 111, 112, 115
Southwest	SW	103, 104, 150, 152
Southeast	SE	101, 102, 105, 106, 107, 108

Appendix B.3. Statistical weeks used in recording and compiling Southeast Alaska commercial fisheries catch data.

STAT WEEK	YEAR/DATE 1982	YEAR/DATE 1983	YEAR/DATE 1984	YEAR/DATE 1985	YEAR/DATE 1986	YEAR/DATE 1987	YEAR/DATE 1988	YEAR/DATE 1989
1	0101 - 0102	0101 - 0101	0101 - 0107	0101 - 0105	0101 - 0104	0101 - 0103	0101 - 0102	0101 - 0107
2	0103 - 0109	0102 - 0108	0108 - 0114	0106 - 0112	0105 - 0111	0104 - 0110	0103 - 0109	0108 - 0114
3	0110 - 0116	0109 - 0115	0115 - 0121	0113 - 0119	0112 - 0118	0111 - 0117	0110 - 0116	0115 - 0121
4	0117 - 0123	0116 - 0122	0122 - 0128	0120 - 0126	0119 - 0125	0118 - 0124	0117 - 0123	0122 - 0128
5	0124 - 0130	0123 - 0129	0129 - 0204	0127 - 0202	0126 - 0201	0125 - 0131	0124 - 0130	0129 - 0204
6	0131 - 0206	0130 - 0205	0205 - 0211	0203 - 0209	0202 - 0208	0201 - 0207	0131 - 0206	0205 - 0211
7	0207 - 0213	0206 - 0212	0212 - 0218	0210 - 0216	0209 - 0215	0208 - 0214	0207 - 0213	0212 - 0218
8	0214 - 0220	0213 - 0219	0219 - 0225	0217 - 0223	0216 - 0222	0215 - 0221	0214 - 0220	0219 - 0225
9	0221 - 0227	0220 - 0226	0226 - 0303	0224 - 0302	0223 - 0301	0222 - 0228	0221 - 0227	0226 - 0304
10	0228 - 0306	0227 - 0305	0304 - 0310	0303 - 0309	0302 - 0308	0301 - 0307	0228 - 0305	0305 - 0311
11	0307 - 0313	0306 - 0312	0311 - 0317	0310 - 0316	0309 - 0315	0308 - 0314	0306 - 0312	0312 - 0318
12	0314 - 0320	0313 - 0319	0318 - 0324	0317 - 0323	0316 - 0322	0315 - 0321	0313 - 0319	0319 - 0325
13	0321 - 0327	0320 - 0326	0325 - 0331	0324 - 0330	0323 - 0329	0322 - 0328	0320 - 0326	0326 - 0401
14	0328 - 0403	0327 - 0402	0401 - 0407	0331 - 0406	0330 - 0405	0329 - 0404	0327 - 0402	0402 - 0408
15	0404 - 0410	0403 - 0409	0408 - 0414	0407 - 0413	0406 - 0412	0405 - 0411	0403 - 0409	0409 - 0415
16	0411 - 0417	0410 - 0416	0415 - 0421	0414 - 0420	0413 - 0419	0412 - 0418	0410 - 0416	0416 - 0422
17	0418 - 0424	0417 - 0423	0422 - 0428	0421 - 0427	0420 - 0426	0419 - 0425	0417 - 0423	0423 - 0429
18	0425 - 0501	0424 - 0430	0429 - 0505	0428 - 0504	0427 - 0503	0426 - 0502	0424 - 0430	0430 - 0506
19	0502 - 0508	0501 - 0507	0506 - 0512	0505 - 0511	0504 - 0510	0503 - 0509	0501 - 0507	0507 - 0513
20	0509 - 0515	0508 - 0514	0513 - 0519	0512 - 0518	0511 - 0517	0510 - 0516	0508 - 0514	0514 - 0520
21	0516 - 0522	0515 - 0521	0520 - 0526	0519 - 0525	0518 - 0524	0517 - 0523	0515 - 0521	0521 - 0527
22	0523 - 0529	0522 - 0528	0527 - 0602	0526 - 0601	0525 - 0531	0524 - 0530	0522 - 0528	0528 - 0603
23	0530 - 0605	0529 - 0604	0603 - 0609	0602 - 0608	0601 - 0607	0531 - 0606	0529 - 0604	0604 - 0610
24	0606 - 0612	0605 - 0611	0610 - 0616	0609 - 0615	0608 - 0614	0607 - 0613	0605 - 0611	0611 - 0617
25	0613 - 0619	0612 - 0618	0617 - 0623	0616 - 0622	0615 - 0621	0614 - 0620	0612 - 0618	0618 - 0624
26	0620 - 0626	0619 - 0625	0624 - 0630	0623 - 0629	0622 - 0628	0621 - 0627	0619 - 0625	0625 - 0701
27	0627 - 0703	0626 - 0702	0701 - 0707	0630 - 0706	0629 - 0705	0628 - 0704	0626 - 0702	0702 - 0708
28	0704 - 0710	0703 - 0709	0708 - 0714	0707 - 0713	0706 - 0712	0705 - 0711	0703 - 0709	0709 - 0715
29	0711 - 0717	0710 - 0716	0715 - 0721	0714 - 0720	0713 - 0719	0712 - 0718	0710 - 0716	0716 - 0722
30	0718 - 0724	0717 - 0723	0722 - 0728	0721 - 0727	0720 - 0726	0719 - 0725	0717 - 0723	0723 - 0729
31	0725 - 0731	0724 - 0730	0729 - 0804	0728 - 0803	0727 - 0802	0726 - 0801	0724 - 0730	0730 - 0805
32	0801 - 0807	0731 - 0806	0805 - 0811	0804 - 0810	0803 - 0809	0802 - 0808	0731 - 0806	0806 - 0812
33	0808 - 0814	0807 - 0813	0812 - 0818	0811 - 0817	0810 - 0816	0809 - 0815	0807 - 0813	0813 - 0819
34	0815 - 0821	0814 - 0820	0819 - 0825	0818 - 0824	0817 - 0823	0816 - 0822	0814 - 0820	0820 - 0826
35	0822 - 0828	0821 - 0827	0826 - 0901	0825 - 0831	0824 - 0830	0823 - 0829	0821 - 0827	0827 - 0902
36	0829 - 0904	0828 - 0903	0902 - 0908	0901 - 0907	0831 - 0906	0830 - 0905	0828 - 0903	0903 - 0909
37	0905 - 0911	0904 - 0910	0909 - 0915	0908 - 0914	0907 - 0913	0906 - 0912	0904 - 0910	0910 - 0916
38	0912 - 0918	0911 - 0917	0916 - 0922	0915 - 0921	0914 - 0920	0913 - 0919	0911 - 0917	0917 - 0923
39	0919 - 0925	0918 - 0924	0923 - 0929	0922 - 0928	0921 - 0927	0920 - 0926	0918 - 0924	0924 - 0930
40	0926 - 1002	0925 - 1001	0930 - 1006	0929 - 1005	0928 - 1004	0927 - 1003	0925 - 1001	1001 - 1007
41	1003 - 1009	1002 - 1008	1007 - 1013	1006 - 1012	1005 - 1011	1004 - 1010	1002 - 1008	1008 - 1014
42	1010 - 1016	1009 - 1015	1014 - 1020	1013 - 1019	1012 - 1018	1011 - 1017	1009 - 1015	1015 - 1021
43	1017 - 1023	1016 - 1022	1021 - 1027	1020 - 1026	1019 - 1025	1018 - 1024	1016 - 1022	1022 - 1028

Appendix C.1. Daily count of age .1 coho salmon at the Nahlin River Weir, 1988.

Date	Daily Count	Cum. Count	Number of Ad Clips	Number of Tags	Comments
July 25	0	0	0	0	Weir installed (fish-tight)
July 26	0	0	0	0	Trap not operating
July 27	0	0	0	0	Fish allowed to pass
July 28	0	0	0	0	
July 29	1	1	0	0	
July 30	0	1	0	0	
July 31	0	1	0	0	
Aug. 1	0	1	0	0	
Aug. 2	0	1	0	0	
Aug. 3	0	1	0	0	
Aug. 4	0	1	0	0	
Aug. 5	0	1	0	0	
Aug. 6	1	2	0	0	
Aug. 7	0	2	0	0	
Aug. 8	0	2	0	0	
Aug. 9	4	6	0	0	
Aug. 10	1	7	0	0	
Aug. 11	3	10	1	1	
Aug. 12	0	10	0	0	
Aug. 13	0	10	0	0	
Aug. 14	10	20	1	1	
Aug. 15	0	20	0	0	
Aug. 16	9	29	0	0	
Aug. 17	17	46	0	0	
Aug. 18	16	62	0	0	
Aug. 19	26	88	0	0	
Aug. 20	20	108	0	0	
Aug. 21	7	115	0	0	
Aug. 22	6	121	0	0	
Aug. 23	37	158	0	0	
Aug. 24	3	161	0	0	
Aug. 25	52	213	1	1	
Aug. 26	16	229	0	0	
Aug. 27	63	292	1	1	
Aug. 28	41	333	2	2	
Aug. 29	28	361	0	0	
Aug. 30	15	376	1	1	
Aug. 31	8	384	0	0	

-Continued-

Appendix C.1. (page 2 of 2)

Date	Daily Count	Cum. Count	Number of Ad Clips	Number of Tags	Comments
Sept. 1	84	468	0	0	
Sept. 2	54	522	1	1	
Sept. 3	49	571	1	0	
Sept. 4	233	804	5	5	
Sept. 5	43	847	3	3	
Sept. 6	15	862	0	0	
Sept. 7	3	865	1	1	
Sept. 8	2	867	0	0	Survey: 545 above, 149 below[1]
Sept. 9	1	868	0	0	
Sept. 10	2	870	0	0	
Sept. 11	4	874	0	0	
Sept. 12	24	898	2	2	
Sept. 13	37	935	0	0	
Sept. 14	10	945	1	1	
Sept. 15	6	951	1	1	Survey: 446 above, 209 below[1]
Sept. 16	10	961	2	2	
Sept. 17	9	970	0	0	
Sept. 18	5	975	0	0	
Sept. 19	4	979	0	0	
Sept. 20	3	982	0	0	
Sept. 21	19	1,001	1	1	
Sept. 22	264	1,265	6		Last daily weir count[2]
Sept. 23	57	1,322			Helicopter count below weir
Total count		1,322	31	24	

Est. total number of ad clips = 32.397

Est. total number of tags = 31.101

Est. Proportion tagged = 0.02353

[1] Helicopter surveys. Above and below figures indicate survey counts upstream and downstream from the weir, respectively.

[2] Ad clipped fish were enumerated on September 22, but were not sampled for tag retention.

Appendix C.2. Daily count of adult coho salmon at the Tatsamenie Weir, 1988.

Date	Daily Count	Cum. Count	Sampled For Ad Clips	Ad Clips Observed	Comments
July 31	0	0	0	0	Weir installed
Aug. 21	1	1	1	0	First coho salmon
Aug. 22	0	1	0	0	
Aug. 23	0	1	0	0	
Aug. 24	0	1	0	0	
Aug. 25	0	1	0	0	
Aug. 26	0	1	0	0	
Aug. 27	0	1	0	0	
Aug. 28	0	1	0	0	
Aug. 29	0	1	0	0	
Aug. 30	0	1	0	0	
Aug. 31	0	1	0	0	
Sept. 1	2	3	2	1	
Sept. 2	2	5	2	0	
Sept. 3	0	5	0	0	
Sept. 4	0	5	0	0	
Sept. 5	2	7	2	0	
Sept. 6	0	7	0	0	
Sept. 7	0	7	0	0	
Sept. 8	0	7	0	0	
Sept. 9	0	7	0	0	
Sept. 10	2	9	2	0	
Sept. 11	0	9	0	0	
Sept. 12	2	11	2	0	
Sept. 13	4	15	4	0	
Sept. 14	0	15	0	0	
Sept. 15	0	15	0	0	
Sept. 16	0	15	0	0	
Sept. 17	0	15	0	0	
Sept. 18	2	17	2	1	
Sept. 19	3	20	3	1	
Sept. 20	2	22	2	0	
Sept. 21	4	26	4	0	
Sept. 22	1	27	1	0	
Sept. 23	10	37	10	3	
Sept. 24	4	41	4	1	
Sept. 25	1	42	1	0	
Sept. 26	1	43	1	0	
Sept. 27	1	44	1	0	
Sept. 28	7	51	7	0	
Sept. 29	28	79	28	3	
Sept. 30	2	81	2	0	
Oct. 1	12	93	12	0	
Oct. 2	2	95	2	0	
Oct. 3	0	95	0	0	
Oct. 4	35	130	35	8	
Oct. 5	21	151	21	2	
Oct. 6	48	199	48	4	

-Continued-

Appendix C.2. (page 2 of 2)

Date	Daily Count	Cum. Count	Sampled For Ad Clips	Ad Clips Observed	Comments
Oct. 7	3	202	3	1	
Oct. 8	109	311	109	13	
Oct. 9	62	373	62	6	
Oct. 10	88	461	88	12	
Oct. 11	33	494	33	3	
Oct. 12	19	513	19	1	
Oct. 13	11	524	11	1	
Oct. 14	5	529	5	0	
Oct. 15	7	536	7	0	
Oct. 16	3	539	3	3	
Oct. 17	0	539	0	0	
Oct. 18	3	542	3	0	
Oct. 19	7	549	7	0	
Oct. 20	13	562	13	2	
Oct. 21	7	569	7	1	
Oct. 22	3	572	3	0	
Oct. 23	4	576	4	0	
Oct. 24	1	577	1	0	
Oct. 25	6	583	6	1	
Oct. 26	7	590	7	0	
Oct. 27	6	596	6	0	
Oct. 28	8	604	8	0	
Oct. 29	5	609	5	0	
Oct. 30	6	615	6	0	
Oct. 31	12	627	12	1	
Nov. 1	0	627	0	0	
Nov. 2	3	630	3	1	
Nov. 3	2	632	2	0	
Nov. 4	0	632	0	0	
Nov. 5	0	632	0	0	
Nov. 6	3	635	3	0	
Nov. 7	7	642	7	3	
Nov. 8	1	643	1	1	Weir removed
Below Weir	20	663	0	0	Foot count
Total		663	643	74	

Number of ad clips sampled for tags = 39

Number of tags in sample = 32

Est. total number of ad clips = 76.302

Est. total number of tags = 62.607

Est. Proportion tagged = 0.09443

Appendix D.1. Estimated weekly proportion of the total troll catch of coded-wire tagged Taku River coho salmon, 1988.

	Tagging Location					
Mid-Week Date	Yehring Creek	Canadian Mainstem	Yehring Creek & Mainstem	Tatsamenie River	Sheslay River	All Taku R. Tags
June 15	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
June 22	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
June 29	0.0000	0.0000	0.0000	0.0246	0.0000	0.0033
July 6	0.0513	0.0000	0.0267	0.1285	0.0772	0.0656
July 13	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
July 20	0.1244	0.0337	0.0809	0.0000	0.1887	0.0848
July 27	0.0257	0.0660	0.0450	0.2166	0.0428	0.0662
Aug. 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Aug. 10	0.3236	0.1467	0.2387	0.2032	0.2190	0.2211
Aug. 17	0.1064	0.0906	0.0988	0.3729	0.3444	0.1809
Aug. 24	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Aug. 31	0.2131	0.2111	0.2121	0.0541	0.0438	0.1686
Sept. 7	0.1248	0.3607	0.2379	0.0000	0.0841	0.1702
Sept. 14	0.0307	0.0846	0.0566	0.0000	0.0000	0.0371
Sept. 21	0.0000	0.0068	0.0032	0.0000	0.0000	0.0021
Total	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Sample Size	37	36	73	17	19	113

Appendix D.2. Estimated weekly proportion of the total drift gill net catch of coded-wire tagged Taku River coho salmon in District 111, 1988.

	Tagging Location						
Mid-Week Date	Yehring Creek	Canadian Mainstem	Yehring Creek & Mainstem	Tatsamenie River	Sheslay River	Nahlin River	All Taku R. Tags
June 15	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
June 22	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
June 29	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
July 6	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
July 13	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
July 20	0.0000	0.0000	0.0000	0.0000	0.0000	0.8248	0.0261
July 27	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Aug. 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Aug. 10	0.0125	0.0318	0.0180	0.0461	0.0000	0.1752	0.0277
Aug. 17	0.1849	0.0000	0.1327	0.0567	0.0000	0.0000	0.1089
Aug. 24	0.0669	0.0850	0.0720	0.0616	0.0471	0.0000	0.0641
Aug. 31	0.3136	0.2425	0.2935	0.4265	0.5188	0.0000	0.3374
Sept. 7	0.3589	0.5318	0.4078	0.3302	0.2529	0.0000	0.3700
Sept. 14	0.0429	0.1089	0.0615	0.0789	0.1812	0.0000	0.0568
Sept. 21	0.0202	0.0000	0.0145	0.0000	0.0000	0.0000	0.0089
Total	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Sample Size	50	19	69	30	13	5	118

Appendix D.3. Estimated weekly proportion of the total migration of Nahlin River, Hackett River and Tatsamenie River coho salmon at Canyon Island based on spaghetti tag recoveries compared with the weekly proportion of total total fishwheel CPUE of coho salmon, 1988.

Mid-Week Date	Recovery Location (Proportion) Nahlin River	Hackett River	Tatsamenie River	Total Fishwheel CPUE
July 6	0.000	0.000	0.000	0.003
July 13	0.031	0.000	0.000	0.016
July 20	0.180	0.000	0.000	0.040
July 27	0.353	0.000	0.000	0.031
Aug. 3	0.299	0.142	0.000	0.051
Aug. 10	0.137	0.188	0.062	0.086
Aug. 17	0.000	0.401	0.218	0.194
Aug. 24	0.000	0.080	0.193	0.087
Aug. 31	0.000	0.189	0.326	0.256
Sept. 7	0.000	0.000	0.201	0.144
Sept. 14	0.000	0.000	0.000	0.091
Total	1.000	1.000	1.000	1.000
Sample Size	33	50	33	2,158

Appendix D.4. Weekly coho salmon escapement count at weirs on three tributaries of the Taku River, 1988.

Mid-Week Date	Location (Weekly Weir Count) Nahlin River	Hackett River	Tatsamenie River
July 27	1	0	
Aug. 3	1	0	0
Aug. 10	8	1	0
Aug. 17	98	8	0
Aug. 24	184	27	1
Aug. 31	279	43	4
Sept. 7	299	82	4
Sept. 14	100	177	6
Sept. 21	295	360	26
Sept. 28		164	52
Oct. 5		379	218
Oct.12		19	225
Oct. 19			36
Oct. 26			37
Nov. 2			23
Nov. 9			11
Number remaining downstream from the weir	57	0	20
Total Escapement	1,322	1,260	663
Dates of Operation	July 25-Sept. 23	July 11-Oct. 14	July 31-Nov. 8