YUKON RIVER SALMON SEASON REVIEW FOR 1999 AND TECHNICAL COMMITTEE REPORT

Prepared by

THE UNITED STATES/CANADA
YUKON RIVER JOINT TECHNICAL COMMITTEE

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Whitehorse, Yukon Territory

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1.0 INTRODUCTION

The fall meeting of the Yukon River Joint Technical Committee (JTC) was held in Whitehorse on 27-29 October, 1999. The agenda for the JTC meeting was to prepare the standard season summary report, including a review of the fisheries, stocks, and projects. This agenda was cleared with the chief negotiators, and the report is intended for the information of the negotiation delegations. Participants at the meeting included the following persons:

Canadian Department of Fisheries and Oceans (DFO)
- Sandy Johnston (co-chair)
- Lana Miller
- Pat Milligan
- Al von Finster

Contractors (Canada)
- Mary Ellen Jarvis

Alaska Department of Fish and Game (ADF&G)
- Elizabeth Andrews
- Dan Bergstrom
- Jeff Bromaghin
- Larry Buklis (co-chair)
- Dan Huttunen
- Keith Schultz

National Marine Fisheries Service (NMFS)
- John Eiler
- Dick Wilmot

Bering Sea Fishermen's Association (BFSA)
- Jude Henzler

Attachment I provides the updated historical Yukon River salmon catch and escapement data set in graphic and tabular form. Note that the Alaska commercial catch information in Attachment I is in numbers of salmon. As in the past, salmon roe sales have been converted to the number of salmon estimated to have been caught to produce the reported weight of roe sold. Attachment II provides information on marine fisheries.

2.0 1999 COMMERCIAL FISHERY - ALASKA

Preliminary estimates of commercial sales totaled 120,636 salmon and 1,120 pounds of unprocessed salmon roe for the Alaskan portion of the Yukon River drainage in 1999 (Tables 1 and 2). Note that in Table 1, the Alaskan commercial harvest is expressed as the number of salmon sold in the round, pounds of salmon roe sold, and estimated harvest which includes the estimated number of salmon harvested to produce roe sold. Total sales of salmon in the round were composed of 69,275 chinook, 29,389 summer chum, 20,371 fall chum, and 1,601 coho salmon. Roe sales by species totaled 1,096 pounds for chinook and 24 pounds for summer chum salmon. The total estimated commercial harvest including the estimated harvest to produce roe sold was 120,946 salmon; 69,562 chinook, 29,412 summer chum, 20,371 fall chum, and 1,601 coho salmon. The 1999 chinook salmon harvest was the third lowest commercial harvest since statehood. The summer chum salmon harvest was the second lowest since 1968 being just 621 fish more than the record low 1998 harvest. Only limited commercial fishing was allowed during the 1999 fall chum season. The 1994 through 1998 five-year-average harvests were as follows: 97,079 chinook, 403,288 summer chum, 90,975 fall chum, and 28,553 coho salmon.

The 1999 Yukon River salmon runs continued to show a trend of very low productivity, particularly in view of good parent year escapements. Changing climate and ocean conditions appear to have impacted salmon survival.

A total of 670 permit holders participated in the fishery during 1999 (Table 1), which was 10% below the recent five-year-average and the lowest on record since 1973. A total of 632 permit holders fished in the Lower Yukon Area in 1999, which was 2% below the recent five-year-average. A total of 38 permit holders fished in the Upper Yukon Area, which was 62% below the recent five-year-average of 99 permits and the second lowest on record since 1974. Much of the decrease in commercial fishing effort in the Upper Yukon Area in 1999 can be attributed to there being no commercial fishing openings in Subdistrict 4-A.

Yukon River fishers in Alaska received an estimated $5.1 million for their catch in 1999, approximately 3% above the recent 5-year-average of $4.9 million. Five buyer-processors operated in the Lower Yukon Area, and five buyer-processors and seven catcher-sellers operated in the Upper Yukon Area.

Lower Yukon fishers received an estimated average price per pound of $3.80 for chinook, $0.10 for summer chum, $0.25 for fall chum, and $0.35 for coho salmon. The average price paid for chinook salmon in the Lower Yukon Area was well above the recent 5-year average of $2.22 per pound. Prices paid for summer chum salmon in the round continued to be low as observed since 1995. Exvessel value of the Lower Yukon Area fishery was $5.0 million, which was 14% above the recent 5-year-average of $4.3 million. The average income for Lower Yukon Area fishers that participated in the 1999 fishery was $7,918.

Upper Yukon commercial fishers received an estimated average price per pound of $1.10 for chinook salmon, $2.11 for chinook salmon roe, $0.18 for summer chum salmon, $2.25 for summer chum salmon roe, and $0.20 for fall chum salmon. The exvessel value of the Upper Yukon Area fishery was $77,065, which was 88% below the recent five-year average of $634,000 and the second lowest on record. Permit holders who participated in the 1999 fishery earned an average of $2,028 in the Upper Yukon Area.

Department and cooperative test fishing projects sold a total of 1,049 chinook, 799 summer chum, 1,149 fall chum, and 236 coho salmon in District 1 and 156 chinook, 37 summer chum, and 22 fall chum salmon in District 2 in 1999. These fish are not included in the commercial totals referenced above.

2.1 Chinook and Summer Chum Salmon

The commercial harvest of chinook salmon was near the low end of the guideline harvest range for all districts and subdistricts. The commercial fishery was managed conservatively by a general reduction in the length of fishing period duration from normal. The summer chum harvest was taken entirely incidental to fishing directed at chinook salmon. No commercial openings were allowed in Subdistrict 4-A. Historically, the Subdistrict 4-A fishery targets summer chum salmon with the dominant gear type being fish wheels and the location of the fishery resulting in a very high ratio of chum to chinook salmon.

The 1999 Yukon River chinook and summer chum salmon runs continued to exhibit the decline in productivity observed in recent years. Five and six-year-old chinook salmon abundance was much less than would be expected based on parent year escapements. Summer chum salmon abundance has been below average to poor since 1997, although parent year escapements were very good from 1994 through 1996. An extreme flood event in the Koyukuk River drainage in August 1994 and low snow cover during the winter of 1995-96 may account for some of the decline in chum salmon abundance. However, changing climate and ocean conditions appear to have also impacted salmon survival.

The 1999 preseason outlook was for a weak to below average chinook salmon run and a below average summer chum salmon run based on the reduced productivity and poor returns observed in 1998. The commercial harvest in the Alaskan portion of the drainage was anticipated to be between 25,000 and 75,000 chinook and 25,000 to 300,000 summer chum salmon.

Chinook and summer chum salmon run timing in 1999 was late, probably due to the presence of ice along the Bering Sea coast and cold water temperatures during the first half of June. The first subsistence catch of chinook salmon was reported on 8 June near Emmonak. The department's test fishing projects recorded the first chinook salmon catches on 6 June.

The chinook salmon run appeared to be below average in abundance, but better than the very weak return of 1998. Approximately 50% of the chinook salmon run had entered the lower river by 25 June; six days later than average. The cumulative test fishing CPUE was 24.4 compared to the average of 25.2 for the ten year period 1989-1998. The Pilot Station sonar preliminary cumulative passage estimate of 211,000 chinook salmon was well above the passage estimate of 122,000 fish in 1998, and near passage estimates of 240,000 in 1995 and 224,000 in 1997. Although the preliminary sonar passage target range of 140,000 to 200,000 chinook salmon identified preseason was exceeded, harvest and escapement data to date indicate below average abundance above Pilot Station. Further analysis of run assessment will be done this winter.

Age composition sampling results revealed that the chinook salmon run was dominated by 6-year olds to a higher extent than normal. The percentage of five-year-old chinook salmon was lower than average and combined with lower than average total abundance, causes concern regarding a very weak outlook for the year 2000 return.

The summer chum salmon run was assessed as being very weak in abundance. According to test fishing CPUE data, approximately 50% of the summer chum run entered the lower river by 25 June, three days later than average. The Pilot Station sonar cumulative passage estimate through 18 July was 945,000 summer chum salmon. The 1997 passage estimate was 1.4 million and the 1995 passage estimate was 3.6 million summer chum salmon. An estimated one million summer chum salmon are needed for spawning escapements. No directed summer chum commercial harvest was possible this year based on Pilot Station sonar passage estimates and escapement counts at the East Fork Andreafsky, Anvik, Clear, Gisasa, Kaltag, Nulato, Chena and Salcha Rivers. Although the 1999 sonar passage estimate was greater than the 1998 estimate of 831,000, most escapement monitoring projects indicated lower numbers in 1999 than in 1998. It will take several more seasons to evaluate the results of the Pilot Station sonar project to determine how sonar passage estimates relate to subsequent harvests and escapements on the spawning grounds.

The management strategy is to open the chinook salmon directed commercial fishery in the Lower Yukon Area when increasing subsistence and/or test net catches of chinook salmon have occurred over a seven- to ten-day period. Since chinook salmon migratory timing was late, the 1999 commercial fishing season opened on 22 June in District 1, which was the second latest opening on record. This was after approximately seven days of increasing subsistence and test fishery catches. The timing of the run was similar to 1992, which also had a late ice breakup. Based on the lower river test fishery, the chinook salmon migratory abundance increased rapidly from 19 June through 22 June and remained fairly steady through 29 June. After 29 June, abundance declined.

Based on the preseason projection, fishing periods in Districts 1 and 2 were reduced to 6 or 9-hours duration rather than the more typical 12-hour periods. Unrestricted mesh size gillnets were allowed during all fishing periods in the Lower Yukon Area to direct the harvest at chinook salmon. There were 5, 4, and 3 fishing periods allowed in Districts 1, 2, and 3 respectively between 22 June and 10 July. The last fishing period in District 1 was based on the likely dominance of lower river

chinook salmon stocks during that portion of the run. However, no additional fishing was allowed in Districts 1 and 2 after 8-9 July due to lagging escapement at the East Fork Andreafsky River weir.

No six inch maximum mesh size fishing periods were established to target summer chum salmon in the Lower Yukon Area in 1999.

The combined total harvest of 64,294 chinook salmon for Districts 1 and 2 (Table 1) was 7% above the low end of the guideline harvest range of 60,000 fish and 30% below the 1994-1998 average harvest of 91,263 fish. Thirty chinook salmon were sold during the fall season with the remainder sold during the summer season. The average weight of chinook salmon was 20.1 pounds.

The combined District 1 and 2 commercial summer chum salmon harvest of 27,883 fish was 73% below the recent 5-year-average harvest of 102,158 fish. The average weight of summer chum salmon was 7.1 pounds.

District 3 was open for three commercial fishing periods in 1999. A total of 538 chinook salmon was harvested. There was no commercial harvest of chinook salmon in District 3 from 1995 through 1998 because of a lack of markets.

Subdistrict 4-A and the Anvik River Management Area (Figure 1) were not opened to commercial fishing for the second consecutive year in 1999, because of poor runs of summer chum salmon. The Anvik River did not meet its minimum escapement goal of 500,000 summer chum salmon. The recent 5-year average harvest for Subdistrict 4-A and the Anvik River Management Area was 129,360 pounds of summer chum roe. Exvessel value from 1994 through 1998 averaged $403,000. Prior to 1997 when summer chum salmon abundance dramatically decreased, an average of 60 permit holders fished annually (1991-1996) in this subdistrict.

Commercial fishing directed at chinook salmon was open for four 48-hour periods in Subdistricts 4-B and 4-C. The harvest of 1,437 chinook salmon was 36% below the lower end of the guideline harvest range of 2,250 fish. A total of 1,267 summer chum was sold, which was 96% below the recent 5-year average of 35,353 fish. Fishing effort was low, because of the poor summer chum salmon run.

Three commercial fishing periods were allowed in Subdistricts 5-B and 5-C, after the chinook salmon run was believed to be well distributed throughout these subdistricts. The harvest of 2,189 chinook salmon was 9% below the lower end of the guideline harvest range of 2,400 fish. A total of 114 summer chum salmon were sold. Typically, the harvest of summer chum salmon is low in these subdistricts as they are located above the vast majority of summer chum salmon spawning areas. Initially, a fishing schedule of two 12-hour fishing periods was attempted this season in order to assist in maintaining fish quality. However, these two fishing periods were timed fairly close together which caused some difficulties for both buyers and fishermen.

Further discussion with buyers and fishermen is necessary for planning future management of these subdistricts.

Commercial fishing in Subdistrict 5-D was opened for three fishing periods in 1999. The Subdistrict 5-D harvest of 415 chinook salmon was near the midpoint of the guideline harvest range of 300-500 chinook salmon.

Commercial fishing in District 6 was opened for only one 18-hour period directed at the harvest of chinook salmon on 17 July. This was the least amount of commercial fishing time on record for the summer season in District 6. The total estimated commercial harvest in 1999 was 689 chinook and 147 summer chum salmon in District 6. The chinook salmon harvest was near the midpoint of the guideline harvest range of 600-800 fish. The recent 5-year average summer chum salmon harvest was 28,322 fish. Management of the District 6 fishery was primarily based on Chena and Salcha River tower counts.

2.2 Fall Chum and Coho Salmon

The 1999 Yukon River fall chum salmon run was managed by following guidelines provided by the Alaska Board of Fisheries in 5 AAC 01.249. *Yukon River Drainage Fall Chum Salmon Management Plan.* The management plan provides for escapement needs and establishes a subsistence priority use prior to considering commercial fishing activities. The management plan stipulates that directed fall chum salmon commercial fisheries be allowed only when the run size projection is greater than 675,000 fall chum salmon. Additionally, only the harvestable surplus above 625,000 fall chum salmon may be targeted in the Alaska commercial fisheries.

Since 1987, the Yukon River preseason fall chum salmon projection was presented as a point estimate. However, because of the unexpected run failures observed in 1997 and 1998, there was a high level of uncertainty associated with the Yukon River fall chum salmon preseason run projection for 1999. Consequently, the 1999 Yukon River preseason projection was presented as a range of 550,000 to 1,200,000 fall chum salmon.

As a result of the wide range in the preseason projection, the department relied more heavily on inseason run assessment tools earlier in the run than usual. The department monitored the 1999 run in the lower Yukon River by using the lower Yukon River set gillnet test fishery, Mountain Village drift gillnet test fishery (operated by Asacarsarmiut Traditional Council), Pilot Station sonar passage estimates and subsistence catch reports. Results from these projects, in combination with the preseason projection, were the basis for initial management decisions concerning the commercial fisheries. Once the commercial salmon fishing season was opened, the performance of the commercial fishery was also used as a run strength indicator.

The majority of fall chum salmon enter the Yukon River from mid-July through early September in erratic surges (pulses) usually lasting two to three days. Typically, four or five such pulses occur

each season. These pulses are often associated with on-shore wind events or high tides. This characteristic entry pattern makes it difficult to accurately assess the run strength inseason, particularly early in the season.

The 1999 fall chum salmon return had an unusually strong component early in the season. As detected by the lower Yukon River set gillnet test fishery, the first pulse of fall chum salmon entered the Yukon River on 17 July and lasted an uncharacteristically long seven days. The second pulse entered the Yukon River on 29 July and lasted until 3 August (six days). On average, approximately 30 percent of the fall chum salmon have entered the Yukon River by the end of July. The first formal inseason projection used to determine if commercial fishing could be opened was not made until late July. Based on average run timing information, it appeared that the 1999 fall chum salmon return would be large enough (more than 675,000 fish) to support commercial fishing. Consequently, the 1999 fall season commercial fishery was opened. The first commercial fishing period occurred in the Lower Yukon Area on 1 August and in the Upper Yukon Area on 8 August.

The third pulse of fall chum salmon entered the Yukon River on 11 August. However, this pulse was disappointing and not large enough to maintain the end of season run size projection above that level needed to continue commercial fishing. As determined by Pilot Station sonar, the third pulse was less than 45,000 fall chum salmon. No additional commercial fishing periods were allowed in the Lower Yukon Area after 12 August. The last commercial fishing period in the Upper Yukon Area occurred on 15 August.

The last day of operation for both the lower Yukon River set gillnet test fishery and the Pilot Station sonar project was 31 August. The total number of fall chum salmon passing the Pilot Station sonar project was estimated between 488,500 and 527,900 fish, with a midpoint of 508,200 fall chum salmon having passed the site. The Pilot Station sonar project provides an estimate of the number of salmon passing upriver only during its operational period. An estimate of the total Yukon River run size can be made by adding the combined estimates of the commercial (17,500) and subsistence harvests downstream from Pilot Station to the Pilot Station sonar passage midpoint estimate as of 31 August, along with an estimate of the number of fall chum salmon that likely passed the sonar site in after the cessation of project assessment. Based on the Pilot Station sonar historical database (four years), up to 15 percent of the fall chum salmon run has occurred in September. Since subsistence harvest estimates for 1999 are not yet available, the 1988 to 1992 five-year average subsistence harvest was used as an approximation (9,100 fall chum salmon). The resulting total run size estimate can then be applied to the fall chum salmon management plan to evaluate appropriate management actions.

Based on this method, the 1999 fall chum salmon total run size was estimated to be between 535,000 and 634,000 fall chum salmon. The Mountain Village drift gillnet test fishery operated until 12 September in 1999, twelve days later than either the lower Yukon River set gillnet test fishery or the Pilot Station sonar project. As detected by the Mountain Village drift gillnet test fishery, the 1999 fall chum salmon run appears to have had a late strong component (a sixth pulse),

indicating that the fall run would probably be in the upper end of this run size range. Run sizes within the upper end of this range should be sufficient to support normal subsistence, personal use, and sport fishing activities and also meet escapement needs.

However, the majority of the upriver projects subsequently indicated a below average return of fall chum salmon, and one much lower than expected on lower river abundance indicators. The poor return of fall chum salmon to the Tanana River prompted the closure of the Personal Use fishery within the Fairbanks Non-subsistence Area on 20 September. The Personal Use fishery was reopened on 4 October to allow additional harvest on coho salmon.

Yukon River coho salmon have a slightly later but overlapping run timing with that of the fall chum salmon run. In managing the coho salmon run, the department follows guidelines established by the Board of Fisheries in 5 AAC 05.369. *Yukon River Drainage Coho Salmon Management Plan.* The Board of Fisheries adopted this plan in November 1998. The coho salmon management plan allows a directed coho salmon commercial fishery only under special and unique situations. It is very unlikely that conditions outlined in the coho salmon management plan would occur in a given year. In most years, fall chum salmon will continue to be the primary species of management concern during the fall season. In 1999, no directed coho salmon fishing periods were allowed. Coho salmon were harvested in 1999 during commercial fishing periods established for the more numerous fall chum salmon.

A total of 20,371 fall chum and 1,601 coho salmon were sold in the Yukon Area in 1999. The Yukon Area fall chum salmon harvest in 1999 was only 11 percent of the recent 20-year average harvest of 179,395 fish. The coho salmon harvest was less than 5 percent of the recent 20-year average harvest of 37,820 fish.

The exvessel value of the Yukon Area fall chum and coho salmon sold was approximately $40,129. The value of the fishery was less than 6 percent of the recent 20-year average. An estimated 257 permit holders participated in the fall season fishery in 1999. The average income per permit holder was approximately $156. Despite the low effort, the average income per permit holder was only 12 percent of the recent 20-year average.

3.0 1999 COMMERCIAL FISHERY - CANADA

A preliminary total of only 3,140 chinook salmon, 10,402 chum salmon and 0 coho salmon was harvested in the Canadian Yukon River commercial fishery in 1999 (Table 3). The combined species catch was 54% below the previous ten-year average commercial harvest of 29,230 salmon. As in 1998, the poor catch was the result of below average run sizes of upper Yukon chinook and chum salmon in 1999.

A total of 20 commercial licenses was issued in 1999, one less than in 1998.

3.1 Chinook Salmon

The 1999 preseason expectation for Canadian-origin mainstem Yukon River chinook salmon was for a total run of 64,000 to 136,000 fish. A run size in this range would be below average to average in magnitude when compared to the previous cycle average of 134,000 fish (1993-1998). The outlook was expressed as a wide range due to the uncertainty associated with marine survival of the fish that spawned in 1992 through 1994. The potential for reduced marine survival was made apparent by the poor return of upper Yukon chinook salmon in 1998, which was significantly lower than expected.

The elements of the chinook salmon management plan for 1999 included:

i) a minimum escapement goal of 28,000 chinook salmon. This goal was the same as that agreed to by the Yukon River Panel in the spring of 1996 which was to be in effect through 2001;

ii) reasonable access to the salmon resources would be allowed within the bounds of conservation and the priority afforded to the aboriginal fishery;

iii) based on the preseason forecast and accounting for the priorities of conservation and the needs of the aboriginal fishery, it was expected that the commercial harvest would fall within a range of 0 to 9,000 chinook salmon; and

iv) an initial commercial fishery opening of 48 hours was scheduled to occur on the fifth day after the run was deemed to have commenced. The beginning date of the run was to be determined by an increasing trend in the Fisheries and Oceans Canada fishwheel catches. The first fishing period was to be followed with a 4-day closure. Additional openings would occur thereafter on a weekly basis depending upon the status of the run. The '4-2-4' season opening schedule for the commercial fishery, i.e. 4 days closed - two days open - four days closed, was the same as adopted in the 1998 plan.

The first chinook salmon was caught in the DFO fishwheels on 06 July, the third latest on record and one week later than normal. However, no chinook were caught in the wheels from 07 July through 10 July and the beginning of the run was not declared until 14 July. This was determined by an increasing trend in the 3-day moving averages of the DFO fishwheel catches.

As per the management plan, the first opening in the commercial fishery commenced on the fifth day after the run had deemed to have begun. The fishing period lasted 48 hours from noon Monday 19 July to noon 21 July during which time 622 chinook were caught by 13 fishers. The catch-per-unit-effort (CPUE) was about 42% below average (1989-1998) for this week, i.e. statistical week 30, but was about average when lagged to account for the late timing of the run. At this time, results from the ADF&G sonar project at Pilot Station indicated the run into the upper Yukon would be about average; the 1989-1998 average border escapement is approximately 45,200 chinook salmon. Extrapolations using the 1999 preliminary sonar count

and the historical relationship between the Pilot Station sonar counts and the corresponding Canadian border escapement estimates suggested a 1999 border escapement of 40,000 to 52,000 chinook salmon. Early projections using the Fisheries and Oceans mark-recapture data indicated a run size of 39,000 to 63,000 based on timing delays of 10 days to two weeks.

The second opening in the commercial fishery commenced 12:00 h Sunday, 25 July. This opening lasted 72 hours and the fishery closed 12:00 h Wednesday 28 July. A total of 9 fishers participated in the opening catching a total of 1,301 chinook, the peak weekly catch of the season. The CPUE for this opening was 46 chinook/fisher/day compared to an average of 39 chinook/fisher/day. Fisheries and Oceans fishwheel catches had improved markedly during this week reaching above average peak daily catches of 80 and 82 on 25 July and 28 July, respectively. Later than normal run timing yet above average catches and CPUE created optimism that the run would be strong. Border escapement forecasts through the end of this week, i.e. statistical week 31, ranged from 43,000 assuming a one week timing delay, to, 56,000 assuming a ten–day delay. The assumed timing delay was reduced from the previous week as a precautionary measure to take into account the sharply increasing trend in the fishwheel catches and the convergence of the cumulative fishwheel catch curve for 1999 with the average cumulative catch curve.

The fishery was open for three days in the following week, statistical week 32, from 01-04 August. Nine fishers caught a total of only 573 chinook salmon and the CPUE dropped to 25 chinook/fisher, which was below average. Fisheries and Oceans daily fishwheel catches plummeted to less than half the peak catches observed in the previous week, reaching a weekly low of 12 chinook on 03 August. The drop in run strength was unexpected. Normally the run would have peaked in week 31 and it was expected that the 1999 run would peak in week 32 or 33 due to delayed run timing. The decrease in abundance was also evident in the border escapement forecast which now ranged from 34,000 to 41,000 chinook.

Due to the decreasing run strength of the chinook run that was evident from both the commercial catches and stock assessments in week 32, the commercial fishery was reduced to two days in week 33 (08-10 August). Fishing effort dropped to 5 fishers who caught a total of 247 chinook salmon during the opening. A rally in the Fisheries and Oceans fishwheel catches prior to the opening was not sustained and daily catches dropped to less than 10 chinook by week's end. As a result of the rapidly decreasing abundance and declining run forecasts, the fishery was closed for the remainder of the chinook season, i.e. through 28 August. The forecast developed in week 33 ranged from 26,000 to 28,000 chinook salmon and it remained towards the lower end of this range for the rest of the season.

The total commercial chinook catch of 3,140 fish which included 395 fish taken in the Yukon River upstream from the White River, was the second lowest catch recorded since 1978 and was 66% below the previous ten-year average. For comparison, the previous ten-year average commercial catch was 9,229 chinook (1989 to 1998); during this period the catch ranged from 390 chinook in 1998 to 12,028 chinook in 1994. The preliminary postseason estimate of the

border escapement indicated a Canadian commercial harvest rate of 13% on chinook salmon in 1999 compared to the previous ten-year average harvest rate of 20%. Fishing effort during the chinook season, i.e. through week 34, was 65% below average (85 boat-days versus an average of 246 boat-days). Run timing was abnormally compressed with an approximate two week delay in the beginning of the run but normal timing for the post-peak portion of the run.

3.2 Fall Chum Salmon

The chum salmon run to the upper Yukon was expected to be average to above average in 1999 primarily due to the escapement of 158,092 chum salmon in 1995, and 98,358 chum in 1994. The 1995 escapement was the highest on record and was well above the recent cycle average of 103,000 fish (1995-1998). The 1994 escapement which would produce the 5-year old component of the 1999 return was above the minimum escapement goal of >80,000 fish for rebuilt upper Yukon chum salmon. The total run outlook was again expressed as a range: 155,000 to 336,000 upper Yukon chum salmon. The broad range acknowledged the poor apparent marine survival in 1998 and suggested it might also be a factor in tempering expectations in 1999.

The 1999 Canadian chum salmon management plan was developed with the following components:

i) an escapement goal of >80,000 upper Yukon chum salmon for run sizes less than the mid-point of the expected range. If the run appeared to be in the upper half of the expected range, the minimum escapement goal was to be increased to >90,000 chum salmon. This latter goal was higher than what was proposed in the rebuilding plan for upper Yukon chum salmon agreed to in the IYRSA. Although the rebuilding plan stipulated a long term escapement goal for Canadian upper Yukon River chum salmon of >80,000 fish, members of the Yukon Salmon Committee recommended an increase in the goal should an above average run materialise in 1999.

ii) reasonable access to the salmon resources would be allowed within the bounds of conservation and the priority afforded to the aboriginal fishery, and;

iii) based on the preseason forecast for an average to above return and accounting for the priorities of conservation and the needs of the aboriginal fishery, it was expected that at least 13,600 chum salmon would be available for commercial harvest.

On 25 August, the Fisheries and Oceans daily fishwheel catches of chum salmon had climbed sharply to above average daily levels; however, the cumulative catch was 57% below average. Prior to this, although it was still early in the chum season, daily catches had been well below average. Information from ADF&G suggested the fall chum run was below average. These factors contributed to a decision to allow only an assessment level fishery leading into the chum season. The first chum salmon fishing period was posted for two days (29-31 August) during

which time 5 fishers harvested a total of 461 chum salmon. The CPUE for this opening was 39% below average and the weekly effort level was 69% below average.

Fishing time was increased to three days in week 37 (05-08 September) due to improved Fisheries and Oceans fishwheel catches the previous week and the relatively low effort in the commercial fishery. The catch in week 37 totaled 2,228 chum salmon taken by 6 fishers. The CPUE was 124 chum/fisher/day compared to an average of 147 chum/fisher/day. The first forecast of chum border escapement was made after this opening and ranged from 63,000 to 117,000 assuming run timing was average or one week later than average.

Concerns over declines in the Fisheries and Oceans daily fishwheel catches after 07 September in the previous week prompted a return to an assessment level opening of two days in week 38 from 12-14 September. The commercial chum CPUE increased to 227 chum/fisher/day this week which was 21% above average, and the peak weekly chum catch of the season was recorded, 3,337 fish. Although fishery performance had increased, Fisheries and Oceans fishwheel catches had not improved and daily catches during this week were approximately 25% to 35% below average daily values. The cumulative fishwheel count through the end of week 38 (12 September) was 26% below average. Forecasts of border escapement developed during week 38 ranged from 65,000 to 113,000 chum.

Fishing time continued to be restricted to two days per week through 12 October to assess the run strength and to provide limited fishing opportunity. The number of fishers steadily declined from 7 in week 38, to 4 in week 39, and 2 in week 40. Only one fisher fished the final two weeks of the season, which ended at noon, 12 October. Weekly forecasts of border escapement ranged from 72,000 to 93,000 chum salmon in week 39 and from 80,000 to 82,000 at the end of September, week 40. Weekly commercial CPUE values remained well above average from mid-September on; the CPUE peaked in week 40 (26-28 September) at 476 chum/fisher/day, a record value for this week. This corresponded with the peak catch in the Fisheries and Oceans fishwheels of 132 chum on 24 September.

The total commercial chum catch of 10,402 fish which included 89 fish taken in the Yukon River upstream from the White River, was 48% below the previous ten-year average. For comparison, the previous ten-year average commercial catch was 20,001 chum (1989 to 1998); during this period the catch ranged from 0 chum in 1998 to 39,012 chum in 1995. A significant portion of the chum salmon caught by commercial fishers in 1999 went towards meeting personal requirements and was not sold. The preliminary postseason estimate of the border escapement indicated a Canadian commercial harvest rate of 13% on chum salmon in 1999 compared to the previous ten-year average harvest rate of 20%. Fishing effort during the chum season, i.e. week 35 on, was 61% below average (56 boat-days versus an average of 143 boat-days). Overall run timing appeared to be normal, however there was a marked bimodal character to the run with one peak in early September and a later compressed peak in late September.

4.0 1999 SUBSISTENCE, PERSONAL USE, ABORIGINAL, DOMESTIC, AND SPORT FISHERIES

4.1 Alaska

4.1.1 Subsistence Fishery

Subsistence "catch calendars" were mailed in May, for use during the fishing season, to rural community households in the non-permit portions of the Yukon River drainage in Alaska. Catch calendars are collected during the personal interviews that are conducted with fishers immediately following the season in September and October. Subsistence fishers in portions of District 5 (upper Yukon River drainage) and District 6 (Tanana River drainage) are required to obtain subsistence salmon fishing permits and record harvest data on the permit. Personal use permits are required for fishers who fish in the Fairbanks Non-subsistence Area. Additionally, attempts are made to contact fishers by telephone or mail. Preliminary analysis of 1999 subsistence harvest data will not be completed until the spring of 2000. The estimated 1998 subsistence salmon harvest in the Alaska portion of the Yukon River drainage totaled approximately 54,000 chinook, 87,000 summer chum, 63,000 fall chum, and 18,000 coho salmon. These estimates do not include personal use catches in the Fairbanks Non-subsistence Area and do not include commercially-caught salmon carcasses retained for subsistence purposes.

4.1.2 Personal Use Fishery

Regulations were in effect from 1988 until July 1990 that prohibited non-rural residents from participating in subsistence fishing. In those years, non-rural residents harvested salmon under personal use fishing regulations. The Alaska Supreme Court ruled, effective July 1990, that every resident of the State of Alaska was an eligible subsistence user, making the personal use category essentially obsolete. From July 1990 through 1992 all Alaskan residents qualified as subsistence users. In 1992, during a special session of the legislature, a subsistence law was passed which allowed the Alaska Joint Boards of Fisheries and Game to designate non-subsistence areas. This law allowed the boards, acting jointly, to identify an area or community in which subsistence is not a principal characteristic of the economy, culture, and way of life. The Fairbanks Non-Subsistence Area was the only non-subsistence use area identified by the Joint Boards of Fisheries and Game. This area includes the Fairbanks North Star Borough and surrounding areas. In October 1993, a Superior Court ruled that this 1992 subsistence law was unconstitutional. The State was immediately granted a stay which allowed for status quo fishing regulations to remain in effect until April 1994. At that time, the Alaska Supreme Court vacated the State's motion for a stay. This action resulted in all Alaskan residents being eligible to fish for subsistence purposes during the 1994 fishing season.

In 1995, the Joint Board of Fisheries and Game again adopted the Fairbanks Non-Subsistence Area. Subsistence fishing is not allowed within non-subsistence areas. This new regulation primarily

affected salmon fishers within Subdistrict 6-C, which falls entirely within the Fairbanks Non-Subsistence Area. Since 1995, the Subdistrict 6-C salmon fishery has been managed under personal use regulations. Personal use salmon harvest in this subdistrict is limited to 750 chinook salmon, 5,000 summer chum salmon, and 5,200 fall chum and coho salmon combined. Preliminary data compilation for the 1999 fishing season will not be completed until the spring of 2000. In 1998, 104 fishers were issued personal use salmon fishing permits. Fishers fishing under personal use regulations harvested approximately 360 chinook and 80 summer chum salmon. During 1998, personal use salmon fishing closures were in effect from 24 July through 15 October which resulted in reducing the salmon harvests within the Fairbanks Non-Subsistence Area.

4.1.3 Sport Fishery

Approximately ninety percent of the sport fishing effort in the Alaskan portion of the Yukon River drainage occurs in the Tanana River drainage, mostly along the road system. Only a small portion of the effort is directed toward anadromous salmon, although sport fisheries targeting some of those stocks occur annually in the Chena, Salcha, Chatanika, and other Interior Alaska river systems. Sport fishing effort and harvests are monitored annually through a state-wide sport fishery survey. Some on-site fishery monitoring also takes place during some years at locations where more intense sport fishing occurs, although no on-site monitoring was conducted during 1999. Although some fall chum salmon may be taken by sport fishers, the majority of the harvest of that species is thought to come from the summer chum salmon run because: 1) that run is usually much more abundant, and; 2) the chum salmon harvest is typically incidental to effort directed at chinook salmon which overlap in timing with summer chum. For these reasons, all of the sport fishing chum salmon harvest is reported here as summer chum salmon. Yukon River drainage sport harvest estimates for recent years (1994-98) have averaged about 1,800 chinook salmon, 1,000 chum salmon, and 1,500 coho salmon. Sport harvest of salmon in the Alaskan portion of the Yukon River drainage in 1998 was estimated to total 779 chinook salmon, 488 chum salmon, and 951 coho salmon. At this time, harvest data are not yet available for 1999.

4.2 Canada

4.2.1 Aboriginal Fishery

The fourth year of a multi-year comprehensive survey of the Aboriginal fishery was conducted in 1999 as part of the implementation of the Yukon Comprehensive Land Claim Umbrella Final Agreement. The project entitled: *The Yukon River Drainage Basin Harvest Study*, is being conducted by LGL Ltd. Environmental Research Associates, and primarily involves intensive inseason surveys of catch and effort in the fishery throughout the upper Yukon drainage, excluding the Porcupine drainage. Catch estimates from the Porcupine River in the Old Crow area are determined independently from locally conducted, post season interviews.

The preliminary estimate of the 1999 total upper Yukon chinook salmon catch in the Aboriginal fishery is 8,804 fish (std = 489), 21% above the 1989-1998 ten-year average of 7,304 chinook and 88% above the final estimate of 4,550 (std = 213) chinook in 1998. The total fishing effort during the chinook season, i.e. through the end of August, was 35,311 net-hours, 17% higher than the fishing effort in 1998 (30,068 net-hours through the end of August).

The preliminary estimate of the 1999 harvest of upper Yukon chum salmon in the Aboriginal fishery is 3,172 fish (std = 390) through 28 October. Usually the fishery is virtually completed by this date. This preliminary estimate is 28% above the 1989-1998 average of 2,418 chum salmon. The preliminary estimate of total fishing effort during the chum season (September on) was 3,386 net-hours. The final chum catch estimate for 1998 was estimated to be 1,792 fish (std = 233) and the effort totaled 2,160 net-hours.

Harvest data from the Vuntut Gwitchin First Nation fishery near Old Crow on the Porcupine River are not yet available. Preliminary reports indicated the chinook catch was poor. The 1989-1998 average catch in this fishery includes 338 chinook, 3,412 chum and 333 coho salmon. Catches in 1998 included 99 chinook, 6,159 chum and 214 coho salmon.

4.2.2 Domestic Fishery

The preliminary total of 213 chinook salmon was harvested in the domestic fishery, 15% below the 1989-1998 average of 252 chinook salmon. No chum salmon were caught in 1999. Chum salmon have not been recorded in the domestic fishery catch since 1989.

4.2.3 Sport Fishery

In 1999, a mandatory Yukon Salmon Conservation Catch Card was introduced by the Yukon Salmon Committee in an attempt to improve harvest estimates and to serve as a statistical base to ascertain the importance of salmon to the Yukon sport fishery. Anglers are required to report their catch via mail by the late fall. Information requested includes: the number, sex, size, date and location of salmon caught and released. Estimates of salmon catches in the 1999 Yukon sport fishery are not yet available.

5.0 STATUS OF SPAWNING STOCKS

5.1 Chinook Salmon

5.1.1 Alaska

Yukon River chinook salmon abundance in 1999 was assessed as below average but stronger than the run strength observed in 1998 based on commercial harvest data and escapement estimates from selected tributaries. The return was dominated by 6-year old fish whose number was reasonably close to the number expected based on the return of five-year-old fish in 1998. Still, production from the 1993 parent year appears to be poor given the good escapements documented that year. Production from the 1994 parent year appears to have been especially poor given the unexpectedly weak return of 5-year old chinook salmon in 1999.

Chinook salmon escapements are assessed using data both from aerial surveys and ground-based projects. While no escapement goals have been established for chinook salmon based on project data, escapement estimates in 1999 were below recent 5-year averages throughout the drainage. Acceptable quality aerial surveys were achieved for only the Chena and Salcha Rivers in 1999. They and one 'unacceptable-quality' aerial survey observation from the Anvik River indicated that escapement goals to those three streams were achieved. Minimum aerial survey escapement goals have been established in the East and West Fork Andreafsky, Anvik, North and South Fork Nulato, Gisasa, Chena and Salcha Rivers within the Alaska portion of the Yukon River.

Chinook salmon escapement to the Andreafsky River appeared to be below desired escapement levels. No acceptable aerial surveys were conducted in either the East or West Fork Andreafsky Rivers, but the USFWS weir count of 3,347 chinook salmon for the East Fork Andreafsky River was 30% below the 5-year average weir count of 4,759. Age and sex composition samples were collected in 1999. The estimated age composition was 42% age 4, 29% age 5, and 27% age 6 fish. Males predominated the escapement samples at 71% of the total.

An aerial survey of the Anvik River on 24 July, conducted under poor conditions, resulted in a count of 950 chinook salmon within the escapement index area, which exceeded the minimum goal of 500 salmon by 90%. Age and sex composition samples were collected in 1999 by carcass survey. Six year old chinook salmon dominated the samples, comprising 48% of the total with four and five year old fish (9% and 43%) comprising the remainder. Males were more numerous than females, accounting for 62% of the samples collected.

Minimum aerial survey index escapement goals are 800 chinook salmon for the North Fork and 500 for the South Fork Nulato River. No aerial surveys were possible in 1999 due to inclement weather. An estimate of chinook salmon escapement was provided from a salmon counting-tower project operated by the Nulato Tribal Council, Bering Sea Fishermen's Association (BSFA) and

ADF&G. The tower count of 1,932 chinook salmon was 6% below the recent 5-year average of 2,053 fish. Age and sex composition samples were not collected in 1999.

The minimum aerial survey escapement goal for the Gisasa River is 600 chinook salmon. No aerial surveys were possible in 1999 due to inclement weather. The USFWS estimated a total 2,631 chinook salmon migrated through the Gisasa River weir, which was approximately 12% below the recent 5-year average of 2,997. Age and sex composition samples were collected in 1999. The estimated age composition was 17% age 4, 42% age 5, and 41% age 6 fish. Males predominated the escapement samples at 74% of the total.

A weir was not operated on the South Fork of the Koyukuk River in 1999 by the USFWS due to flood conditions. Aerial surveys were flown on selected Koyukuk River tributaries. Aerial surveys flown under poor conditions observed 31 chinook salmon in the South Fork Koyukuk River on 1 August and 70 chinook salmon in the Kateel River on 31 July. Aerial surveys flown under fair conditions observed 45 chinook salmon in the Jim River and 97 chinook salmon in Henshaw Creek on 1 August.

Historically, assessment of chinook salmon escapements to the Tanana River drainage have been assessed by aerial surveys of spawning grounds. Since 1993, inseason escapement assessment has been accomplished primarily by counts of chinook salmon passing the Chena and Salcha River tower sites, although aerial surveys have continued largely for escapement goal evaluation. In 1999, salmon escapement to the Salcha River was monitored by a private contractor with funding from BSFA. High, turbid water hampered the operations on the Chena and Salcha Rivers for short intervals during the 1999 season. The preliminary tower estimate for the Chena River was 6,485 chinook salmon, which was 30% lower than the recent five year average of 9,307 fish and the preliminary tower estimate for the Salcha River was 9,198 chinook salmon, which was 27% below the recent five year average of 12,685 fish. However, it should be noted that recent escapements represent some of the largest ever recorded for both streams, so tower-based escapement goal evaluation may not yet be appropriate. Acceptable aerial survey conditions on both rivers resulted in estimates of 2,412 chinook salmon for the Chena River index area and 3,608 chinook salmon for the Salcha River index area. The minimum aerial survey escapement goals for the Chena River and Salcha River index areas are 1,700 and 2,500 chinook salmon, respectively.

Age and sex composition samples were collected in 1999 from carcass surveys on the Salcha River and from both electro-fishing and carcass sampling activities on the Chena River. The age composition estimated from the carcass samples collected in the Salcha River was 9% age 4, 24% age 5, and 66% age 6 fish. Females were more numerous than males, accounting for 55% of the samples. The combined age composition estimated from all samples collected in the Chena River was 8% age 4, 25% age 5, and 65% age 6 fish. Females were more numerous than males, accounting for 59% of the samples.

In 1999, the U.S. Department of the Interior, Bureau of Land Management (BLM) successfully operated a weir on Beaver Creek during the majority of the chinook and summer chum salmon

migrations though a forest fire prevented operations during part of the early portion of the counting season. Final counts amounted to 128 chinook salmon. Length and sex composition samples were collected at the weir in 1999. Females comprised 9% of the samples though the timing of sample collection may have influenced the results.

5.1.2 Canada

The preliminary mark-recapture estimate of the total spawning escapement for the Canadian portion of the upper Yukon drainage is 12,003 chinook salmon, 57% below the 1993-1998 average of 28,259 chinook. Results of the DFO tagging program are discussed in greater detail in Section 6.2.2 of this report.

Aerial surveys were conducted by DFO of index areas on the Little Salmon River, Big Salmon River, Wolf River, Nisutlin River, and Tincup Creek, once per index area. The Ross River index was not flown in 1999 due to budgetary constraints. Survey results relative to the previous cycle averages are presented below. Index surveys are rated according to fish countability. Potential ratings include excellent, good, fair and poor. Surveys with ratings other than poor are considered useful for inter-annual comparisons. Historical counts are documented in Attachment I.

The Little Salmon aerial survey was flown on the 18th of August. Countability was rated as good. A high count (2 independent enumerators) of 495 chinook salmon was observed. This count is 29% below the recent cycle average (1993-1998) of 702. The Tincup Creek aerial survey was conducted on August 20th and a high count of 2 chinook was observed; 98% below the historical average. The visibility during this survey was good for the entire index area. The Big Salmon River, Nisutlin River, and Wolf River indices were flown on the 23rd of August. As in 1998, good viewing conditions were encountered due to favourable water levels and clear, calm weather. Consequently, the countability on the Big Salmon River, Nisutlin River, and the Wolf River surveys was rated as good to excellent. (The Nisutlin River index is somewhat wider than the other rivers; consequently, the countability is generally less.) A high count of 372 chinook salmon was enumerated on the Big Salmon River index, 72% below the recent cycle average of 1341. The Nisutlin River index high count of 337 chinook salmon was only 6% below the recent cycle average. On the Wolf River index, a high count of 145 chinook salmon was observed; this count was 54% below the cycle average of 313.

Timing of the aerial surveys appeared close to peak spawning for all systems other than Tincup Creek. Here, an independent ground survey was conducted, approximately, on the 24th of August and a total of 16 chinook was observed. Abandoned redds were noted on the Big Salmon River survey which indicates the survey may have been conducted somewhat late.

Note that single surveys do not capture the entire escapement since runs are usually protracted with early spawners disappearing before the late ones arrive. Weather and water conditions, spawner density, as well as observer experience and bias also affect accuracy.

The Whitehorse Rapids Fishway chinook salmon count of 1,118 fish, provided by the Yukon Fish and Game Association, was 34% below the recent cycle average. The sex composition observed at the fishway was 16.7% female and 83.3% male.

A weir was operated on Michie Creek from the 10th of August to the 11th of September. A total of 395 chinook salmon was counted through the Michie Creek weir; the sex composition was 10.9% female and 89.1% male. The Wolf Creek chinook enumeration program was not conducted in 1999 due to budgetary constraints.

The Blind Creek weir project, conducted by the Ross River Dena Council, provided a count of 892 chinook salmon between August 1st and August 22nd. Of the 872 fish sexed, 386 (44.3%) were identified as females. Counts for the two previous years of weir operation were 373 in 1998, and 957 in 1997.

For the third consecutive year, a weir was installed on Tatchun Creek by Quixote Consulting. Enumeration commenced on August 15th and terminated on September 1st, when the weir was removed from the stream due to heavy flooding. A total of 250 chinook salmon was observed; 44.4% of these were identified as female. Previous weir counts were 405 in 1998 and 1,198 in 1997.

The Yukon Commercial Fishers Association installed a weir on the Chandindu River for the second year in a row. The weir was operated from July 1 to August 31, 1999. A total of 239 chinook salmon was counted (18 tagged : 221 untagged), with peak migration taking place in late July. A total of 92 chum was counted (10 tagged: 82 untagged). The 1998 count included 132 chinook salmon (17 females) and 23 chum salmon.

Additional aerial or ground surveys for chinook salmon adult enumeration were conducted on streams which have not been subject to long term, consistent monitoring. These surveys were conducted by Yukon First Nations through the DFO Aboriginal Fisheries Strategy, or by consulting firms or private individuals funded by the Restoration and Enhancement Fund. Streams surveyed included the Nisutlin River and tributaries, Pelly River and tributaries, White River and tributaries, Flat Creek, Crooked Creek, Tincup Creek, and Nordenskiold River.

5.2 Summer Chum Salmon

Preliminary post-season analysis of comparative commercial harvest and escapement data indicates the 1999 summer chum salmon run was very weak. Spawning escapements to selected tributaries were similar to those observed in 1998 and well below most other years for each project. No escapements in monitored tributaries met minimum goals or were considered adequate; results ranged from 27% to 81% below recent year averages. Aerial surveys targeting summer chum salmon were hampered by poor weather conditions throughout the drainage. It should be noted that

severe flooding on the Koyukuk River drainage in August 1994 may have affected salmon returns there in 1999.

While a number of tower and weir projects have been established on Yukon River spawning tributaries during the past five years, most have not yet developed a database sufficient to allow escapement goal evaluation. Therefore, minimum escapement goals for summer chum salmon in the East and West Fork Andreafsky Rivers, North Fork Nulato River, Clear and Caribou Creeks of the Hogatza-Koyukuk River drainage, and the Salcha River continue to be based on aerial survey data. Because these minimum escapement goals are based on aerial survey index counts, they do not represent the total escapement to the spawning tributary. The escapement goal for summer chum salmon in the Anvik River is based on sonar passage estimates.

The preliminary Anvik River sonar-based escapement estimate of 437,631 summer chum salmon was approximately 12% below the minimum escapement goal of 500,000 and the fourth lowest since 1979. The run was weaker than expected based on parent year escapements of 1,124,689 and 1,339,418 in 1994 and 1995, respectively. Age and sex composition samples were collected from beach seine catches in 1999. The age composition of those samples was 38% age four, 61% age five, and 1% age six fish. Females comprised 58% of the sample.

Weir projects were operated by USFWS on the East Fork Andreafsky and Gisasa Rivers. A total of 32,229 summer chum salmon were counted passing through the weir on the East Fork Andreafsky River. This count was 73% below the recent 5-year-average of 120,062 fish and 52% below the 1998 count of 67,591. The summer chum salmon minimum aerial survey escapement goals for the East and West Fork Andreafsky Rivers are 109,000 and 116,000 fish, respectively. However, aerial surveys were not conducted on the Andreafsky River for summer chum salmon in 1999 due to poor survey conditions. The weir count indicated the minimum aerial survey escapement goal for the East Fork Andreafsky River would not have been met. Age and sex composition samples were collected at the weir site in 1999. The age composition of those samples was 27% age four, 69% age five, and 3% age six fish. Females made up 56% of the total number sampled.

A total of 9,920 summer chum salmon was tallied passing through the Gisasa River weir. A summer chum salmon escapement goal has not been established for this river. However, the 1999 weir count was 87% below the 5-year average weir count of 79,124 fish, and was the lowest on record since project inception in 1994. Age and sex composition samples were collected in 1999. The age composition of those samples was 44% age four, 54% age five, and 2% age six fish. Females made up 53% of the total number sampled.

A weir was not operated on the South Fork of the Koyukuk River in 1999 by the USFWS due to flood conditions.

Aerial surveys targeting chum salmon were not flown on any spawning tributaries in 1999 due to poor survey conditions.

Counting-tower projects were operated on Kaltag Creek, Nulato River, Clear Creek, and the Chena and Salcha Rivers. The Kaltag Creek tower project was operated by the City of Kaltag and funded by the Alaska Cooperative 4-H Extension Service and BSFA. The Nulato River tower project was jointly operated by the Nulato Tribal Council and ADF&G with partial funding from BSFA. USFWS and TCC operated a counting tower on Clear Creek, a tributary of the Hogatza River within the Koyukuk River drainage. The Salcha River tower project was operated by BSFA with support from ADF&G.

The estimated summer chum salmon escapement into Kaltag Creek in 1999 was 5,300 fish, which was 89% below the recent 5-year-average escapement of 46,378 fish and 35% less than the 1998 estimate of 8,113 fish. While no escapement goal has been established for Kaltag Creek, this escapement was considered poor.

The estimated summer chum salmon escapement into the Nulato River (both forks combined) was 30,076 fish, which was 79% below the recent 5-year-average of 144,492 fish. Based on this tower estimate, the aerial escapement goal of 53,000 summer chum salmon would not have been met. An aerial survey of the Nulato River targeting summer chum salmon was not conducted due to poor weather conditions. Age and sex composition samples were collected in 1999. The age composition of those samples was 66% age four, 32% age five, and 2% age six fish. Females made up 65% of the total number sampled.

This was the fourth year the Clear Creek tower project on the Hogatza River was operated for the entire counting period, having been washed out partially through 1998. In all, 11,300 summer chum salmon were counted past the tower, which was 88% below the recent 3-year average escapement of 98,034 fish and 85% less than the previous lowest complete season estimate of 76,454 fish in 1997. No tower-based escapement goal has been established for Clear Creek, but this escapement was considered very poor. While no escapement goal exists for this project, the aerial escapement goal is a minimum of 8,000 summer chum salmon. Therefore, it is likely that the escapement goal was not met. Age and sex composition samples were not collected in 1999.

High, turbid water periodically hampered visibility in both the Chena and Salcha Rivers during the 1999 season and forced early cessation of tower counting operations for chum salmon on the Chena River. The Chena River tower count was 9,165 summer chum salmon, which was 5% above the 1993, 1994, 1996, 1997, and 1998 average count of 8,707 fish. However, counting operations on the Chena River have historically been of highly variable duration, making direct comparison of counts between years difficult. The Salcha River tower project was operated through the end of August which is three to four weeks longer duration than most previous years. The resulting count of 23,221 summer chum salmon was 41% below the recent 5-year (1994-1998) average of 39,618 fish. Aerial surveys targeting chum salmon were not conducted on either river. Chum salmon age and sex composition samples were not collected in 1999 from carcass surveys on either river due to high water conditions.

High water conditions forced an early cessation of summer chum salmon counting activities at the Beaver Creek weir in 1999. Final counts totaled 74 chum salmon. Length and sex composition samples were collected at the weir in 1999. Females comprised 20% of the samples though the timing of sample collection may have influenced the results.

5.3 Fall Chum Salmon

5.3.1 Alaska

The 1999 preseason run projection for Yukon River fall chum salmon extended from a range of 550,000 to 1,200,000 fish. The high end of the range was what would be expected given normal survival in view of the good parent year escapements realized throughout the drainage in 1994 and 1995. The low end of the range was primarily based upon the failure of the fall chum salmon run realized in 1998, should those factors that contributed to the poor 1998 return carryover to affect the return in 1999.

Although final assessment of overall run size and spawner distribution is not yet available, preliminary indications are that the 1999 Yukon River fall chum salmon run will be near the low end of the preseason projection range. In general, the fall chum salmon run could be characterized as having stronger components in the early and later portions of the run, with notable weakness in the middle. Overall run timing was judged to be approximately one week early. This was anomalous to the late run timing observed in 1999 for chinook, summer chum, and coho salmon, and is largely a function of a stronger early pulse of fall chum salmon that entered the river.

As was discussed in the review of the commercial fishery for 1999 (Section 2.2), the fall chum salmon passage estimate for the period 19 July through 31 August was 508,200 fish. Total run size, taking into account estimates for commercial and subsistence harvest downstream from the sonar site and passage after 31 August is in the range of 535,000 to 634,000 using the confidence interval bounds on the sonar project point estimate. Data from the Mountain Village test fish project, which operated until 12 September in 1999, indicated a late pulse of fall chum salmon, suggesting that the run would probably be within the upper portion of this range.

A review of upper river test fish data and escapement information suggest that both the upper Yukon River (non-Tanana) and Tanana River run components were weak and similar in size to that observed in 1998. The USFWS mark-recapture study near Rampart resulted in a preliminary upper Yukon River run size of approximately 190,000 fall chum salmon. While similar to the 1998 estimate of 198,000, it is less than half of that estimated in 1997 (393,000). Escapements in Alaskan tributary streams of the upper river were weak based upon observations made in the Chandalar and Sheenjek Rivers. The preliminary 1999 fall chum salmon escapement estimate in the Chandalar River was 81,295 fish for the 49 day period of 8 August through 25 September. While that estimate is slightly greater than the number estimated in 1998 (69,438), it is well below the 1995-1997 average of 228,000 fish. No fall chum salmon escapement goal has been established for

the Chandalar River. By comparison, the preliminary escapement estimate of fall chum salmon in the Sheenjek River was only 13,959 fish for the 46 day period of 10 August through 23 September. This is the weakest escapement observed to this river since inception of sonar counting operations in 1981, and is considered a total run failure given the major parent year escapement levels: 150,565 in 1994 and 241,855 in 1995. The 1999 estimated escapement in the Sheenjek River was 78% below the minimum escapement goal of 64,000 fall chum salmon.

The Tanana River fall chum salmon run component was also weak in 1999 based upon test fishery results from the south bank of the Yukon River near Tanana Village as well as those in the Tanana River. Although fall chum salmon spawning ground surveys are currently being conducted at selected locations throughout the Tanana River drainage, preliminary indications from ground surveys of the Toklat River spawning area indicate that the escapement was well below the minimum goal of 33,000 fall chum salmon and one of the weakest on record. For the upper Tanana River (upstream of the Kantishna River), the preliminary mark-recapture abundance estimate through 2 October was 105,000 ± 41,500 (95% C.I.) fall chum salmon. This upper Tanana River fall chum salmon passage estimate was higher than that estimated in 1998 (69,000) and 1997 (72,000), but less than estimated in 1996 (135,000) and 1995 (268,000). The preliminary estimate for the Kantishna River run component in 1999 was 27,700 ± 7,100 (95% C.I.) fall chum salmon. The Kantishna River estimate is a new aspect to the Tanana River project, and there are no historical data for direct comparison. However, the Toklat River is a tributary of the Kantishna River system, and the Kantishna River mark-recapture estimate was less than the spawning goal for the Toklat River spawning area. Further, it should be emphasized that these results are preliminary; they may change somewhat based upon the results of subsequent analyses.

Intensive ground surveillance of the Delta River spawning area was initiated in late September 1999, with surveys to continue weekly throughout November. It is not yet known whether the minimum escapement goal (11,000) will be achieved to this fall chum salmon spawning stream. Final assessment of Tanana River fall chum salmon escapements will not be available prior to early December.

5.3.2 Canada

The preliminary total fall chum salmon spawning escapement estimate based on mark-recapture data is 65,896 chum salmon. Details are presented in Section 6.2.2.

Chum salmon aerial surveys have been conducted on the Kluane and Teslin Rivers. The mainstem Yukon River index was not conducted due to budgetary constraints. The Kluane River survey was flown on the 22nd of October under what was considered to be good conditions. Judging by the proportion of dead fish to the live, the timing of the survey appeared to coincide with peak spawning. The Teslin River index survey was conducted on 8 November under what was considered to be poor conditions due to reduced visibility caused by muddy water. Historical data are presented in Attachment I.

The Kluane River index count of 4,206 chum salmon was 59.5% below the 1995-1998 average of 10,394. The 1999 Teslin River index count of 19 chum salmon is not thought to be indicative of the actual escapement for historic comparison purposes.

In the Porcupine River drainage, the Fishing Branch River weir count of 12,904 chum salmon was the lowest count on record and was well below the lower end of the interim escapement goal, which is 50,000 to 120,000 chum salmon. Female fish comprised 55.7% of the count. Details are presented in Section 6.2.7.

5.4 Coho Salmon

Assessment of coho salmon spawning escapement is very limited in the Yukon River drainage due to funding limitations and marginal survey conditions that often prevail during periods of peak spawning. Excluding the East Fork Andreafsky River in the lower Yukon River, most escapement information collected on coho salmon has historically been from the Tanana River drainage. Presently, only one escapement goal has been established for coho salmon in the Yukon River drainage. The Delta Clearwater River (DCR) in the Tanana River drainage has a minimum goal of 9,000 fish, based upon a boat survey of the river during peak coho salmon spawning activity in late October or early November. It is premature at this time to determine whether the goal will be met in 1999. Surveys of the DCR and other selected coho salmon spawning areas throughout the Tanana River drainage are on going at this time. Final assessment is not anticipated prior to the end of November.

Through a cooperative agreement between the USFWS and BSFA, 1999 marked the fifth consecutive year that East Fork Andreafsky weir operations were extended into September to collect coho salmon escapement data. A total of 2,963 coho salmon were passed through 11 September, the last day of operation in 1999. This was the lowest passage observed during the five years this project has been extended into mid-September. The preceding four-year average passage was 8,400 coho salmon, ranging from 5,417 in 1998 to 10,901 in 1995.

6.0 PROJECT SUMMARIES

6.1 Alaska

In addition to projects operated and funded by state and federal agencies, several fishery-related projects were conducted by local organizations within the Yukon River drainage, funded from a U.S. congressional appropriation through the Bureau of Indian Affairs (BIA), as well as projects supported by the US/Canada R&E Fund. A list of all projects conducted within the Alaskan portion of the Yukon River drainage, including project location, objectives, and responsible agencies or

organizations, is provided in Table 4. Available results from most projects are incorporated in the fishery and stock status portions of this report. Historic project results can be found in the attached database tables and figures. Because of the relatively large number of projects conducted within the Alaskan portion of the drainage, only new projects, or projects of particular interest, are presented in detail here. These specific projects are: (1) Yukon River chinook salmon stock identification, conducted by ADF&G; (2) Yukon River sonar, conducted by ADF&G with assistance from AVCP; (3) Tanana River fall chum salmon tagging project, conducted by ADF&G with assistance from BSFA; (4) Lower Yukon River chum salmon genetic sampling, conducted by ADF&G with assistance from BSFA; (5) Upper Yukon River chum salmon genetic sampling, conducted by USFWS; (6) Yukon River chum salmon ecology studies, conducted by USGS-BRD; (7) Toklat River fall chum salmon restoration study, conducted by ADF&G with assistance from BSFA; (8) Upper Yukon River fall chum salmon tagging study, conducted by USFWS; and (9) Restoration and Enhancement fund project.

6.1.1 Yukon River Chinook Salmon Stock Identification

A combined analysis using scale patterns, age composition estimates, and geographic distribution of catches is used by ADF&G on an annual basis to estimate the stock composition of chinook salmon caught in Yukon River fisheries. Three distinct region-of-origin run groupings of chinook salmon have been identified within the Yukon River drainage. The lower and middle run stocks spawn in the Alaska portion of the drainage, while the upper run stock group spawns in the Canadian portion of the drainage.

Scale pattern analysis (SPA) data are used to apportion the major age group(s) of the District 1, 2, 3, and 4 chinook salmon harvest to region of origin, or stock. Minor age groups in these harvests are apportioned to run of origin based on the presence of those age classes in the run-specific escapement relative to the other run-specific escapements. The harvests occurring District 5 and Canada are apportioned entirely to the upper run stock based on geographical location of the harvest. Harvests occurring in District 6 are apportioned to the middle run stock, also based on geographic location. Subsistence and sport harvests are typically apportioned using stock mixtures estimated from nearby commercial catch sample data or by geographic location as appropriate since subsistence catches are not usually sampled, and sport fish harvests are relatively minor.

A new analytical program, previously described in this section of the 1998 JTC report, has substantially reduced the amount of time required to construct and analyze the data. The control file documents data input and the output file is easily imported into a spreadsheet for summarizing. Once all historical data have been re-processed using the new methodology, detailed tabular information for the entire database will be presented in a comprehensive department report. That report will then become the reference for the historical database concerning stock identification of Yukon River chinook salmon catches using analysis of scale patterns.

To date, historical catch data back to 1987 have been reprocessed using the new methodology. Because of the different methodology used, results from years prior to 1987, which have not yet been reprocessed, are not comparable to results years 1987 and later. The proportion of the total catch of Yukon River chinook salmon attributed to lower, middle, and upper river stock groups for 1996-98 and preliminary proportions for the years 1987-95 are provided in the table below.

Year	Lower[b]	Middle[c]	Upper[d]
1987[a]	0.159	0.196	0.645
1988[a]	0.218	0.158	0.624
1989[a]	0.244	0.159	0.597
1990[a]	0.202	0.251	0.547
1991[a]	0.280	0.253	0.467
1992[a]	0.163	0.218	0.619
1993[a]	0.215	0.254	0.531
1994[a]	0.182	0.214	0.604
1995[a]	0.179	0.224	0.597
1996	0.210	0.104	0.686
1997	0.264	0.168	0.568
1998	0.328	0.174	0.498

[a] Preliminary results.

[b] The Lower River stock group includes Koyukuk River stocks downstream from and including the Gisasa River, and those stocks spawning downstream from the Koyukuk River.

[c] The Middle River stock group includes all Tanana River stocks, all Koyukuk River stocks upstream from the Gisasa River, and those stocks spawning between the Koyukuk and Tanana Rivers.

[d] The Upper River stock group includes all Yukon River stocks spawning upstream from the Tanana River confluence.

The portion of the total Alaskan catch of Yukon River chinook salmon attributed to lower, middle, and upper river stock groups from 1987 through 1998 is shown in the table that follows.

Year	Lower	Middle	Upper
1987 [a]	0.174	0.214	0.612
1988 [a]	0.249	0.181	0.570
1989 [a]	0.272	0.177	0.551
1990 [a]	0.228	0.284	0.488
1991 [a]	0.318	0.287	0.395
1992 [a]	0.180	0.242	0.578
1993 [a]	0.237	0.280	0.483
1994 [a]	0.204	0.241	0.555
1995 [a]	0.179	0.264	0.557
1996	0.240	0.118	0.642
1997	0.289	0.184	0.527
1998	0.347	0.185	0.468

[a] Preliminary results.

Similarly, the portion of the total harvest of upper river stock group origin chinook salmon caught in Alaskan and Canadian fisheries from 1987 through 1998 is shown in the table below.

Year	Alaska	Canada
1987 [a]	0.867	0.133
1988 [a]	0.798	0.202
1989 [a]	0.829	0.171
1990 [a]	0.792	0.208
1991 [a]	0.748	0.252
1992 [a]	0.845	0.155
1993 [a]	0.826	0.174
1994 [a]	0.818	0.182
1995 [a]	0.826	0.174
1996	0.819	0.181
1997	0.848	0.152
1998	0.888	0.112

[a] Preliminary results.

Data for the years 1982 – 1986 will be re-processed as time allows so that the complete historical database will represent results using the improved methodology and will be comparable to future results.

For 1999, stock standards for the lower river run of origin consisted of escapement samples of chinook salmon collected from the Andreafsky, Anvik, and Gisasa Rivers. Middle river stock standards were obtained from chinook salmon escapements to the Chena and Salcha Rivers of the Tanana River drainage. DFO contributed scale samples from fishwheels used for the Yukon border mark-recapture project. Scales from these escapement projects and commercial harvests are in the process of being aged. Scale pattern analysis for 1999 will begin once the aging of the chinook salmon scales has been completed.

6.1.2 Yukon River Sonar

The goal of the Yukon River sonar project at Pilot Station is to estimate the daily upstream passage of chinook and chum salmon. The project has been conducted most years since 1986. Sonar equipment is used to estimate total fish passage, and drift gill netting with a variety of mesh sizes is used to estimate species composition. Prior to 1992, sonar equipment was used which operated at 420 kHz. In 1993, the existing sonar equipment was modified to operate at a frequency of 120 kHz to allow greater ensonification range and to minimize signal loss. The newly configured equipment's performance was verified using standard acoustic targets in the field in 1993. Use of lower frequency equipment increased the ability to detect fish at long range.

Prior to 1994, there was an attempt to classify detected targets for direction of travel by aiming the acoustic beam at an upstream or downstream angle relative to fish travel. This technique was discontinued in 1995 to enhance target detection. Significant enhancements in 1995 included further refinements to the species apportionment process and implementing an aiming strategy designed to consistently maximize fish detection. Because of these recent changes in methodology, data from 1995, 1997, 1998 and 1999 are not directly comparable to previous project data.

Salmon passage estimates at Pilot Station are based upon a sampling design in which sonar equipment is typically operated in 3-hour intervals, three times each day. In 1999, the sonar equipment was operated 24 hours per day on five occasions. Passage estimated during these expanded operations differed from typical 9-hour passage estimates by 5% on average.

Gill nets with mesh sizes ranging from 7.0 cm to 21.6 cm (2.75 in to 8.5 in) were drifted through the sonar sampling areas twice daily between the sonar data collection periods. Drift gill netting resulted in the capture of 6,839 fish during 1,945 drifts (231 hours) including 539 chinook salmon, 2,898 summer chum salmon, 1,812 fall chum salmon, 590 coho salmon, and 1,000 fish of other species. The region behind and directly in front of the transducer was tested for target species by controlling one end of a gill net from the boat and the opposite end from shore using a 5.25" mesh during the early season and 5.75" mesh during the fall season. A total of 13 chum salmon and 23 fish of non-salmon species were captured using this method during 22 drifts totaling 80 minutes. Starting on 23 June, 5.25" and 7.5" mesh gillnets were each drifted daily for 30 minutes over a sandbar extending downstream from the river bend to search for the presence of target species. This effort was reduced to every other day after 6 July, then to 3 days/week with a 5.75" mesh after 23

July. A total of 60 chum salmon, 9 chinook salmon and 2 non-salmon were caught over the sandbar during 52 drifts (26 hours). Captured fish were distributed to nearby residents daily.

The sonar project was operational from 12 June through 31 August in 1999. Range-dependent signal loss occurred sporadically during the season which was believed to have been caused by the river's variable sediment load. Compensation for signal loss was done through a combination of changes in the echo-sounder transmit levels, gain settings, absorption compensation, and chart recorder thresholds. Occasional sonar periods were missed when large waves crested over the tops of the transducers and caused the signal to fade, or in severe cases to disappear entirely. These periods of wave action did not affect data during an entire day and rarely affected an entire sonar sampling period.

Preliminary passage estimates for 1999 and final passage estimates for 1998, 1997, and 1995 are listed below.

Species	1999 Est. Passage	1999 Lower 90% Conf. Intervals	1999 Upper 90% Conf. Intervals	1998 Est. Passage	1997 Est. Passage	1995 Est. Passage
Large Chinook*	183,094	165,109	201,079	83,175	133,691	203,282
Small Chinook	28,036	23,952	32,120	38,871	90,399	36,938
Total Chinook	211,130			122,046	224,090	240,220
Summer Chum	945,894	909,880	981,908	830,633	1,411,233	3,638,180
Fall Chum	507,598	487,959	527,237	397,157	623,367	1,247,540
Total Chum Salmon	1,453,492			1,227,790	2,034,600	4,885,720
Coho Salmon**	94,446	86,451	102,441	176,792	153,502	154,464
Other Species***	259,971			241,627	273,165	594,335
TOTAL	2,019,039			1,768,255	2,685,357	5,874,739

*Chinook Salmon >655 mm for 1999, >700mm for 1995-1998.
**This estimate may not include the entire run.
***Includes Pink Salmon, Cisco, Whitefish, Sheefish, Burbot, Suckers, Dolly Varden, Sockeye Salmon, and Northern Pike.

6.1.3 Tanana River Fall Chum Salmon Tagging

A cooperative fall chum salmon stock assessment project by ADF&G and BSFA was initiated in 1995 on the Tanana River and operated annually through 1998. The primary objective was to estimate the abundance of fall chum salmon in the upper Tanana River (upstream of the Kantishna River) using mark and recapture techniques. Secondary objectives were to estimate the migration rates of fall chum salmon within the Tanana River and determine the timing of selected stocks (e.g., the Delta River) as they passed the tagging site. As a result of the disastrous salmon runs to Western Alaska in 1997 and 1998, the Tanana River tagging study was expanded in 1999 with federal disaster studies funding to include the Kantishna River fall chum salmon run component. Expansion of the tagging study in 1999 also included tagging coho salmon in an attempt to generate abundance estimates for that species as well as to gather information on migration rates.

A single fish wheel was operated in the Tanana River approximately 8 km above the mouth of the Kantishna River to capture chum and coho salmon for tagging. A second tagging wheel was operated in the Kantishna River approximately 8 km upstream from its terminus on the Tanana River. Each tagging wheel was equipped with a live box and a four-person crew deployed tags during a 12-hour daily schedule at both wheels. Both chum and coho salmon were tagged with individually numbered spaghetti tags, and each tagged fish had its right pelvic fin clipped as a secondary mark. International orange and white spaghetti tags were used on chum and coho salmon respectively. A total of 2,159 chum and 476 coho salmon were tagged and released from the Tanana River wheel between 16 August and 3 October, while a total of 1,138 chums and 138 coho were tagged and released from the Kantishna tagging wheel during the same approximate period.

Three live-box equipped fish wheels were used to recapture tagged fish. A single recovery wheel operated approximately 60-70 km upstream of the Tanana River tagging wheel to recapture tagged fish bound for the upper Tanana River. Two recovery wheels were fished on opposite sides of the Toklat River approximately 15 km upstream from its terminus on the Kantishna River to recapture tagged fish released from the Kantishna River tagging wheel. All recovery wheels fished 24 hours per day. A total of 23 tags were recovered from 1,226 chum salmon examined in the upper Tanana River recovery wheel during the period 16 August through 5 October. Only four tags were recovered from 784 coho salmon examined. In the Toklat River recovery wheels, a total of 54 tags were recovered from 1,410 chum salmon examined, while only three tags were recovered from 139 coho salmon examined. Tag recoveries on chum and coho salmon are also being made from spawning ground surveys currently under way, to provide stock specific run timing information where possible.

A preliminary Bailey estimate of the total number of fall chum salmon passing the Tanana River tagging site through 3 October 1999, bound for the upper Tanana River, was approximately 105,000 ± 41,500 fish (95% C.I.). The preliminary estimate for the Kantishna River run component through 28 September was 27,700 ± 7,100 (95% C.I.) fall chum salmon. However, post season diagnostic data analyses are still being conducted and it is likely that stratified modeling will be

required in making the final estimates due to temporal differences in the marked proportion of fish in recovery wheels. No population estimates have been made for coho salmon at this time.

6.1.4 Lower Yukon River Chum Salmon Genetic Sampling

All chum salmon entering the Yukon River after July 15 are considered fall run for purposes of in-season management. During the summer of 1999, ADF&G genetics staff began a three year study to determine the variation in entry timing of summer run and fall run chum salmon. Genetic stock identification methods developed by USFWS, USGS-BRD, and ADF&G using allozyme loci can accurately and precisely discriminate summer- and fall-run chum salmon. Use of genetic markers to estimate timing of entry and run-timing patterns will provide a better understanding of the nature and variability of these stock characteristics.

Chum salmon entering the Yukon River were sampled from 5 July to 1 August at the Pilot Station sonar project site. Fish were sampled from species apportionment sampling conducted twice daily at the sonar site. Gillnets are drifted in the morning and in the evening using a variety of mesh sizes off both the right and left bank. As chum salmon were picked from the gill nets, they were tagged using a numbered bar tag. The tag number was used to keep track of the collection location and gill net mesh size; these data as well as date, time of day (morning or evening), and fish length were recorded. After gillnet drifts were completed for a given sampling period (morning or evening), up to 30 chum salmon were randomly sampled from the total number of fish. Muscle, liver, and heart tissues were dissected from each fish, placed in labeled cryovials, frozen on liquid nitrogen, and shipped to the ADF&G-Genetics Laboratory in Anchorage.

During 1999, 1,362 chum salmon were sampled for GSI. Four stock composition estimates will be made on approximately 200 fish each for the time periods 5-11 July, 12-18 July, 19-25 July, and 26 July-1 August. The chum salmon to be used in the stock composition analysis were randomly selected from the total sampled for a given weekly time period, proportional to the daily passage rate and bank orientation.

The Genetics Laboratory will begin running these samples in October; a progress report on the first year of this study will be prepared early in the year 2000.

6.1.5 Upper Yukon River Chum Salmon Genetic Sampling

The Fish Genetics Laboratory of the USFWS concluded the laboratory processing phase of a three year project to apply new genetic markers to the discrimination of Yukon River chum salmon populations. Two classes of DNA markers were used: microsatellites and SINEs. Preliminary tests were conducted to evaluate the performance of a baseline comprising data from 8 microsatellite loci for 9 populations. Final tests, starting in the year 2000, will be used to evaluate performance of a baseline based on a suite of 12 microsatellite and 20 SINE loci.

The table below shows results of the preliminary tests to determine the effectiveness of the chum salmon baseline for identifying populations in mixtures of populations. For example, to perform a 100% simulation for the Chulinak River population, the computer program was told to first make an artificial mixture of 400 fish with genotypes found in the Chulinak River population. The computer program then used the chum salmon baseline to estimate the population composition of the artificial mixture. The process was repeated 100 times and from these results means and standard errors were calculated. The test of the Chulinak River population showed that 89% (0.8865) of the 400 fish mixture was correctly allocated to the Chulinak River stock, with most of the remainder (7% or 0.0714) being misallocated to the South Fork Koyukuk River stock. Only about 4% was misallocated among the other 7 populations. If the allocations were perfect, the Chulinak stock result would have been 100%. These simulations permit evaluation of the baseline's ability to correctly identify populations and permit assessment of patterns of allocation and misallocation.

Preliminary tests with a baseline with 8 microsatellite loci resulted in estimates for the Chandalar, Sheenjek, and Fishing Branch River stocks that were about 5% better than what was achieved with a baseline using 20 protein loci. Standard errors with the microsatellite baseline are about half the size of standard errors with the protein baseline. Estimates for some other populations were slightly lower with the microsatellite baseline than with the protein baseline. Allocations by country-of-origin with the microsatellite baseline were similar to allocations with the protein baseline. The discriminatory performance of the microsatellite baseline is expected to improve as data from additional loci are included.

Table of results of 100% simulations with a genetic baseline comprising data from 8 microsatellite loci for 9 populations of Yukon River chum salmon showing proportions of allocations and misallocations by individual population and country-of-origin. Each row in the table represents the results of a 100% simulation for a population. The mean stock composition estimates are in regular font and the standard errors for each point estimate are italicized below each estimate. Estimates for the tested populations are in bold. See the accompanying text for more explanation.

100% of this population...	allocated to these populations....										
	U.S.					Canada					
	Chulinak	SF Koyukuk	Delta	Chan-dalar	Sheen-jek	Fishing Br.	Big Cr.	Kluane	Teslin	U.S. Sum	Canada Sum
Chulinak	**0.8865**	0.0714	0.0071	0.0066	0.0050	0.0031	0.0084	0.0012	0.0108	0.9766	0.0235
	0.0549	*0.0520*	*0.0113*	*0.0116*	*0.0089*	*0.0073*	*0.0128*	*0.0036*	*0.0139*		
SF Koyukuk	0.0767	**0.8201**	0.0174	0.0245	0.0190	0.0059	0.0199	0.0014	0.0151	0.9577	0.0423
	0.0410	*0.0611*	*0.0228*	*0.0282*	*0.0222*	*0.0125*	*0.0245*	*0.0031*	*0.0166*		
Delta	0.0093	0.0363	**0.8475**	0.0129	0.0321	0.0095	0.0323	0.0086	0.0115	0.9381	0.0619
	0.0126	*0.0346*	*0.0614*	*0.0210*	*0.0347*	*0.0179*	*0.0351*	*0.0124*	*0.0193*		
Chandalar	0.0050	0.0211	0.0099	**0.6862**	0.1306	0.0273	0.0661	0.0035	0.0501	0.8528	0.1470
	0.0097	*0.0251*	*0.0138*	*0.0771*	*0.0647*	*0.0340*	*0.0522*	*0.0079*	*0.0334*		
Sheenjek	0.0026	0.0060	0.0215	0.1198	**0.7544**	0.0621	0.0251	0.0025	0.0060	0.9043	0.0957
	0.0061	*0.0151*	*0.0244*	*0.0711*	*0.0851*	*0.0560*	*0.0352*	*0.0057*	*0.0099*		
Fishing Br.	0.0027	0.0150	0.0087	0.0070	0.0543	**0.7949**	0.0716	0.0443	0.0014	0.0877	0.9122
	0.0056	*0.0157*	*0.0138*	*0.0168*	*0.0537*	*0.0846*	*0.0545*	*0.0369*	*0.0051*		
Big Cr.	0.0050	0.0159	0.0172	0.0432	0.0603	0.0698	**0.7430**	0.0099	0.0358	0.1416	0.8585
	0.0081	*0.0190*	*0.0263*	*0.0484*	*0.0441*	*0.0548*	*0.0798*	*0.0135*	*0.0321*		
Kluane	0.0003	0.0013	0.0066	0.0097	0.0076	0.0675	0.0097	**0.8959**	0.0012	0.0255	0.9743
	0.0011	*0.0037*	*0.0144*	*0.0186*	*0.0136*	*0.0510*	*0.0153*	*0.0553*	*0.0038*		
Teslin	0.0006	0.0058	0.0122	0.0337	0.0034	0.0025	0.0414	0.0004	**0.9001**	0.0557	0.9444
	0.0023	*0.0114*	*0.0162*	*0.0360*	*0.0080*	*0.0070*	*0.0440*	*0.0025*	*0.0550*		

6.1.6 Yukon River Chum Salmon Ecology Studies

The original study proposal by the USGS-BRD included four representative chum salmon stocks, two summer-run (Chena and Salcha rivers) and two fall-run (Toklat River and Bluff Cabin Slough in the Tanana River). These four chum salmon stocks were selected because 1) they were thought to be representative of other Yukon River tributary stocks, 2) they are relatively accessible, and 3) in the case of the Toklat in particular, there have been concerns about population declines. After the initial year (1996 and early 1997) of exploratory surveys, however, funding and logistics limited work to two sites (Chena River and Bluff Cabin Slough). Since the spawner/smolt relation is expected to vary among stocks, it will be important to eventually evaluate the relationship for a broader range of Yukon River chum salmon stocks. In

the meantime, studies of the ecology and limiting factors at the two selected tributaries are allowing for testing of methodologies and initial model development.

The overall study objectives include:

1) estimating spawner abundance,
2) estimating the duration and distribution of spawners in the spawning area,
3) quantifying spawning habitat,
4) estimating over-winter survival rates of eggs and fry in the gravel,
5) determining what factors influence freshwater survival.

A progress report for brood years 1996 and 1997 was released in November 1998. USGS-BRD hosted a meeting with cooperators (including: USFWS, ADF&G, TCC, and BSFA) to discuss initial results and future directions for this research. The consensus reached at that meeting was:

1) Continue research efforts to the extent that funding levels allow and expand efforts to additional study sites when possible,
2) Maintain a focus on estimates of adult spawners into study sites and the resulting out-migration of smolt,
3) Abandon intra-gravel sampling of eggs and alevins as a means to estimate over-winter survival rates,
4) Explore methods for quantifying intra-gravel environmental conditions (e.g., magnitude of up- and down-welling, dissolved oxygen, and temperature), and
5) Explore experimental methods for deploying *in situ* incubation containers as a means to determine environmental affects on survival rates of eggs and alevins.

A progress report for the inclusion of brood year 1998 and 1999 data is in progress, and should be finished during the winter of 1999/2000. One of the main focuses to date at the two study sites has been to refine and standardize methodologies. Habitat mapping using surveying equipment has allowed development of detailed computer-based maps of the study sites and spawner distributions. Adult fish are enumerated at weirs, intra-gravel survival and densities are estimated using a hydraulic pump, and smolt outmigration abundances are estimated using funnel traps and mark-recapture. A synopsis of the results for the Chena River (Hodgin's Slough) and the Tanana River (Bluff Cabin Slough) study sites for brood year 1997 follow.

In Hodgin's Slough, a total of 507 chum salmon (320 males and 187 females) were passed into the study site between 21 July and 9 September 1997. More than 90% of spawning occurred prior to 30 August. A total of 174 individual redd locations were mapped and characterized (in terms of water depth, velocity, and substrate type). Using a fecundity/length relationship, potential egg deposition (PED) was estimated at 335,600 eggs (95% CI ± 27,800). Density estimates of viable eggs within three areas of the study site resulted in survival estimates from PED to actual egg deposition (AED) ranging from 17% to 37%. However, the confidence intervals around these estimates are essentially ± the estimate. The overall average survival from AED to the eyed-egg stage was estimated at 83% and ranged from 62% to 91% within the study site. Modifications of traps and marking procedures allowed for monitoring smolt outmigrations. The initial estimate is

that 55,000 brood year 1997 smolt originated within the study site. Confidence intervals must still be calculated for this estimate. Using the preliminary smolt estimate, the survival from PED to smolt outmigration was about 15%.

In the Bluff Cabin Slough site, an estimated total of 107 female chum salmon spawned between 20 September and 21 November 1997. Spawning habitat was measured at a total of 109 individual spawning sites. Estimated PED was 275,100 (95% CI ± 22,000). Based on intra-gravel sampling, estimated average survival until the eyed-egg stage was 86% (range: 5-99%). The initial smolt estimate was low (12,468 smolt), resulting in a preliminary survival from PED to smolt outmigration of 4.5%.

Results for the 1998 and 1999 brood years are not yet available. There was an attempt to use adaptive sample design techniques to estimate intra-gravel egg densities during the winter of 1998-99. The results supported earlier results, i.e., high sampling variance resulted in extremely imprecise estimates. Furthermore, using these data it was determined that impractical sampling intensities (i.e., sampling of 30 to 40% of the total spawning area) would be necessary to improve these estimates substantially. Therefore, efforts have been directed towards the use of *in situ* incubation containers as a means to estimate both survival and the affects of environmental conditions on eggs and alevins. To this end a sub-study entitled "Quantification of upwelling as a determinant of spawning site selection and quality for Yukon River chum salmon (*Oncorhynchus keta*)," funded under the USGS quick response program, was initiated. During the 1999 spawning season, measurement of the distribution of upwelling within both Hodgin's Slough and Bluff Cabin Slough study sites was begun using piezometers (standpipes inserted into the substrate which allow for measurement of pressure differentials between surface and subsurface waters). These measurements will continue throughout the incubation period (from egg deposition until March). In addition to subgravel water flows, measurements are being made of dissolved oxygen, temperature, and conductivity via the piezometers. At both sites 40 to 44 individual incubation baskets (each with 100 fertilized eggs) have been installed in association with piezometers. The survival rates of these eggs will be estimated at three stages: eyed-egg, pre-emergent, and emergence.

Under projected funding levels it is anticipated that this project will continue at the current level at least through the 2000 brood year.

6.1.7 Toklat River Fall Chum Salmon Restoration Study

Fall chum salmon restoration activities began within the Toklat River springs spawning area in 1992. This pilot project was precipitated by the Toklat River having only reached its escapement objective of greater than 33,000 spawners once (in 1990) in the previous 12-year period of 1980 through 1991. From 1992 to 1995, eggs were collected from a small sample of Toklat River fall chum salmon and reared at Clear Hatchery. Nearly all of the surviving fry were tagged with coded wire tags and released within the Toklat River springs spawning area each following spring. In

1996, ADF&G began the evaluation phase of this pilot study. The recovery of tagged adult fish began, and a four-component recovery program was initiated. The first component was to evaluate the proportion of the Toklat River fall chum salmon return consisting of hatchery-reared fish. Components two and three were to evaluate the contribution and timing of Toklat River fall chum salmon in the proximal fisheries, and the fourth component was to evaluate the homing of Toklat River fall chum salmon within the Toklat River springs spawning ground area. The 1999 season was the fourth and final year of the four year adult recovery project.

TCC continued activities to document water quality attributes in the Toklat River spawning grounds area during 1999. This project was initiated in 1994 by BSFA and continues with BSFA funding support. Preliminary data indicate adequate to good intra-gravel water temperatures within the incubation environment for each of three habitat types being studied.

6.1.8 Upper Yukon Fall Chum Salmon Tagging Study

For the fourth year fish wheels at the Rampart Rapids were used to capture fall chum salmon for a mark and recapture population estimate. Crews tagged 12,296 fish between 4 August and 22 September 1999. The start date for tagging was similar to that of 1996 and 1998. Recovery fish wheels at Rampart sampled from 4 August to 25 September and found 1,191 individual recaptures of 18,421 fish examined for marks. The proportion of tag recoveries at the recapture site was 6.4%, excluding multiple recaptures of tagged fish which was higher than in past years. A preliminary population estimate for the eight weeks sampled was calculated as 190,612 ± 14,565 fall chum salmon. Weekly estimates were as follows:

Date	Estimate	S.E.
Aug. 4-8	8,646	1,696
Aug. 9-15	54,826	4,678
Aug. 16-22	26,324	3,345
Aug. 23-29	28,404	2,213
Aug. 30-Sept. 5	12,721	1,384
Sept. 6 - 12	25,109	1,798
Sept. 13-19	18,084	1,757
Sept. 20-22	16,317	5,316

Note that the first and last week have a reduced number of tagging days. Statistical diagnostics of sex and size indicate little evidence of selective sampling based on those factors, similar to past years. Estimates stratified by sex or size support this conclusion. Updated estimates were communicated to ADF&G on a weekly basis after the third week of tagging when an estimate first becomes possible.

The estimate from 1999 was the lowest point estimate of the four years of study, but not significantly lower than 1998. Estimates from 1996 to 1999 were as follows:

Year	Estimate	95% C.I.
1996	654,296	± 41,956
1997	369,546	± 17,364
1998	197,608	± 19,628
1999	190,612	± 14,565

Mean mid-eye to fork length of tagged fish was 57.6 cm with a range of 44-70 cm. Males made up 47% and females 53% of the tagged fish. Monitoring of recapture to capture ratios (R/C) continued through our cooperators, but tallies have yet to be completed. One fisher 40 miles above Circle, Alaska, reported a R/C ratio of 0.03 for 1,500 chum salmon harvested during September. When compared to the seasonal R/C found at Rampart at the recovery site of 0.064, this may indicate that handling mortality might still be a problem despite efforts to minimize live box holding times and crowding. The decline in R/C between the Rampart and Fort Yukon/Circle areas of approximately 50% is similar to that found in past years. In response to the potential of added mortality from fish wheel operations, biologists assisted an R&E Fund grant recipient in developing a method of measuring catch per unit effort on a fish wheel using video images. Video images captured on time lapse video tape are sorted by computer so that most images without fish are discarded. Fish identification and counts could then be obtained from the stored images. The system developed requires no live box holding or manual dipping of fish. A report on the project will be forth coming from the project leader.

6.1.9 Restoration and Enhancement Fund Projects

The Yukon River Restoration and Enhancement Fund (Fund) was established in 1995 as part of the Interim Agreement between Canada and the United States for the purposes of seeking to ensure the effective conservation and management of Yukon River salmon. In the past, the USFWS transferred an annual Fund contribution to the Yukon River Panel for administration under the terms of the Interim Agreement. However, because the Interim Agreement expired in the spring of 1998, the USFWS became responsible for Fund administration. Desiring to continue using the Fund for Yukon River salmon restoration and enhancement activities, the USFWS requested input during a U.S. Yukon River Delegation meeting in December of 1998. Attendees included U.S. members of the former Panel, staff from ADF&G, USFWS, NMFS, and representatives from the State Department. At that meeting, it was recommended to fund three 1998 R&E projects in Alaska for continuation in 1999. Those projects were the test fisheries at Mt. Village and Tanana Village (BSFA), fall chum salmon harvest and tag retention data collection in the upper Yukon (TCC), and recovery of coded wire tags from chinook salmon in the lower Yukon (Emmonak Tribal Council). Attendees also recommended funding for two other activities in 1999. They included YRDFA meeting and newsletter expenditures, and purchase of radio tags so that NMFS and USFWS could continue to conduct a fall chum salmon radio telemetry study in the Upper Yukon. The U.S. Section Panel members also recommended that the remainder of the Fund be distributed via a competitive proposal process, similar to but abbreviated from, previous years.

In January 1999, the USFWS sent over 100 letters to tribal councils, village governments, Native corporations and private individuals requesting proposals to conduct Yukon River salmon research or assist in management activities. Twenty-six proposals were received and technically reviewed by the Alaskan section of the JTC Restoration and Enhancement Subcommittee. Proposal evaluations were forwarded on 9 April 1999 to the funding selection committee. The funding selection committee met on 14 April 1999 and awarded funding to 14 project applications. This included funding for the three aforementioned continuation R & E projects, but does not include funding for the YRDFA meeting and newsletter expenses, or the NMFS radio tag purchase. The table which follows lists the projects or activities funded for 1999. The field portions of seven projects are complete as of 14 September and final reports for all projects are due at various times over the next several months.

Proposal #	Project Title	Applicant	$ Amount
RE-01-99	Stored video images as an alternative to live boxes for the collection of catch per unit effort data on fish wheels	Stan Zurray, Tanana	18,950
RE-03-99	Village of Tanana test fishwheel monitoring crew project	Bill Fliris and Lester Erhart, Tanana	11,250
RE-04-99	Abundance and run timing of adult chinook and summer chum salmon in Henshaw Creek, AK	TCC, Fairbanks	13,248
RE-06-99	Recovery of spaghetti tags from fall chum salmon, upper Yukon River subsistence fishery, 1999	TCC, Fairbanks	43,405
RE-07-99	Kaltag drift gillnet salmon test fishery	City of Kaltag, Kaltag	19,875
RE-10-99	Use of remote video and time-lapse recording technology to improve salmon escapement monitoring	Ken Harper, USFWS, Kenai	16,550
RE-12-99	Salcha River chinook and chum salmon counting tower, 1999 operations	BSFA, Anchorage	46,558
RE-14-99	Middle Yukon River chinook salmon sampling project	City of Kaltag, Kaltag	1,225
RE-17-99	Technician support to the ADF&G for drift gillnet test fishery at Pilot Station sonar project	AVCP, Bethel	6,775
RE-18-99	Marshall summer season drift gillnet test fishery	AVCP, Bethel	21,119
RE-20-99	Estimating fresh water survival and environmental influence on survival of several Yukon River chum salmon stocks	Ken Harper, USFWS, Kenai	29,600
RE-21-99	Coded wire tag recovery project, and pilot recovery project	ETC, Emmonak	19,598
RE- -99	Mt. Village fall season drift gillnet test fishery and Tanana village area fall season fishwheel test fishery	BSFA, Anchorage	33,000
RE- -99	Black River drainage aerial surveys	CATG, Ft. Yukon	10,077
RE- -99	Yukon River Drainage Fishermen's Association meeting and newsletter support	YRDFA, Anchorage	25,000
RE- -99	Upper Yukon River fall chum salmon radio tags	NMFS, Juneau	168,000

6.2 Canada

6.2.1 Upper Yukon River Salmon Tagging Program (Yukon Territory)

DFO has conducted a tagging program on salmon stocks in the Canadian section of the upper Yukon River drainage since 1982 (excluding 1984). The objectives of the program are to provide inseason estimates of the upper Yukon border escapement of chinook and chum salmon for management purposes and to provide postseason estimates of the total spawning escapements, harvest rates, migration rates and run timing. Spaghetti tags are applied to salmon live-captured in the fish wheels. Tagging events are twice daily[1], morning and evening. Subsequent tag recoveries are made in the different fisheries located upstream, and infrequently in those located downstream. Usually, population estimates are developed using spaghetti tag recoveries from the Canadian commercial fishery downstream from the Stewart River where the most intensive weekly/daily catch monitoring is conducted. In this area, commercial fishers are legally required to report catches and deposit tags and associated data in drop-off boxes at the Fortymile River or in Dawson City, within eight hours of the closure of each fishery.

Consistency in the fishwheel sites and fishing methods permits some inter-annual and in-season comparisons, although the primary purpose of the fishwheels is to live-capture salmon for the mark-recapture program. Catch data is used cautiously when assessing abundance, particularly for chinook salmon, since there is limited correlation with mark-recapture estimates of border escapement.

The two fishwheels, White Rock and Sheep Rock are situated approximately seven kilometres apart on the north bank of the river. With the exception of short periods for maintenance or repair, the fishwheels ran 24 hours per day, for a cumulative operating time of approximately 5,100 hours, from 17 June to 07 October inclusive. The White Rock fish wheel was operated until the afternoon of October 7th.

Chinook Salmon

The first chinook salmon was caught in the downstream fishwheel, White Rock, on 6 July. The average date of the first chinook capture for the 1989 to 1998 period is 26 June. The run as observed at the DFO fishwheels was approximately two weeks late. The peak of the run however, appeared to be average and the run strength declined relatively quickly thereafter. The run appeared to be somewhat compressed. A peak daily wheel catch of 83 chinook salmon was recorded on 25 July. This is similar to the average daily peak count date of July 22, although the date of peak counts for the 1989 to 1998 period have ranged from 09 July to 06 August. On average during the previous ten years, the run has peaked on 20 July.

[1] An additional tagging session was added for portions of the 1999 chinook and chum programs.

The combined total fishwheel catch of chinook salmon in 1999 was 917 fish, 42% below the recent cycle average of 1,584. The sex composition as observed in the fishwheel catches was 61.5% female.

The preliminary[2] 1999 chinook salmon border escapement estimate is 24,960 fish (95% confidence interval = 19,772 to 29,245 fish). Subtracting the harvest of 12,657 fish, approximately 12,303 chinook salmon are estimated to have reached the various spawning grounds. This falls short of the 1999 escapement goal of >28,000 chinook salmon by 56%, and is 53% below the recent cycle average of 26,067 fish.

Comparative border and spawning escapement estimates from the tagging program for 1982 through 1999 are presented in Attachment I.

Chum Salmon

The first chum salmon was captured in the DFO fishwheels on 27 July. On average over the previous ten years, the first chum salmon has been captured July 21. The run mid-point occurred on 09 September. The mid-point dates over the previous ten years average at 14 September, however the mid-point dates have been quite variable, ranging from 5 September to 23 September. The peak catch date, September 24, was quite late. On average the daily catch peaks on September 16, although, as with run-mid point dates, peak count dates have been quite variable, and the dates for the 1989 to 1998 period range from 05 September to 27 September. The total catch was 2,021 chum salmon. This is 57% below the 1995 to 1998 average of 4,721 chum salmon.

A large number or green spaghetti tags applied at Rampart, Alaska were observed on chum salmon captured by the fish wheels and large numbers of these tags were recovered by commercial and aboriginal fishers. Information from the U.S. tags will be included in the mark-recapture estimate when tag application and recovery information is finalized.

A total of 1,971 chum salmon was tagged using the DFO fishwheels in 1999. The catch and tag recapture component of the mark-recapture study for chum salmon was limited to the commercial fishery near Dawson City. This fishery occurred from statistical week 36 (August 31) to statistical week 42 (ending 10 October), and captured 10,402 chum salmon. Pooling the tags applied, catch and tag and applying the Petersen formula generates a preliminary estimate of 79,470 for border escapement. The 95% confidence interval surrounding this point estimate is 69,996 to 83,374 chum salmon. Subtracting the total chum harvest of 13,574 fish indicates a spawning escapement of 65,896 chum salmon.

The rebuilding goal for 1999 of > 80,000 chum salmon was not achieved. The preliminary escapement estimate is 18% below the rebuilding goal and 2 % below the 10 year average of

[2] The chinook and fall chum escapement estimates are preliminary. It is anticipated that the final estimates will be lower when adjustments are made for tag loss.

66,963. Comparative border and spawning escapement estimates from 1982 through 1999 are presented in Attachment I.

6.2.2 Harvest Sampling

The Canadian commercial fishery was sampled in 1999 for age, length, sex, coded-wire tag (CWT) data, and spaghetti tag loss data. Preliminary results for chinook salmon indicate an unweighted sex composition of 49.5% female. One hundred and ninety five (195) chinook salmon harvested approximately 20 kilometres upstream of the tagging area were examined for spaghetti tag loss. No tag loss was detected in this sample, i.e. no fish lacking tags exhibited tagging needle marks. This sample was much lower than anticipated. One adipose-clipped fish was observed in the commercial fishery sample. The head from the adipose-clipped fish was retained for CWT retrieval.

Harvest sampling was also conducted in the commercial chum salmon fishery, however results are not yet available. Age, length, and sex and CWT samples were also obtained from the aboriginal harvest. This harvest, as well as a portion of the test fishery harvest, was sampled by LGL Ltd. Environmental Research Associates, as a corollary to the aboriginal harvest study. Results are not yet available.

6.2.3 Whitehorse Rapids Fishway Chinook Enumeration

A total of 1,118 chinook salmon ascended the Whitehorse Rapids Fishway between 05 August and 07 September 1999. This was 21% below the 1989-1998 average count of 1,415 fish. The percentage of females was 17% (187 fish), which was also below the recent 10 year average (39%). There were 113 mortalities in the fishway, constituting a 20% mortality rate for females and 8% mortality rate for males. The 1997 through 1999 and seasons have demonstrated what are believed to be record numbers of mortalities in the fishway. In 1997, 114 mortalities were observed, 90% of which were female. Similarly, 150 mortalities were recorded in 1998, 25% of which were females. The reason for the high mortality rates observed this year and last year has not been determined with certainty; however, many fish have appeared to be reluctant or unable to move past the upper end of the fishway. It is possible that there has been some impediment to fish movement in the fishway itself, or that the fish simply lacked the energy to ascend the upper end of the fishway, which has a significant gradient.

Adipose-clipped fish accounted for 72% of the count, and numbered 751 males and 54 females. The hatchery contribution to the fishway return is expected to be much higher when the contribution of unmarked hatchery fish is accounted for. The run mid-point was observed on 19 August, and the peak daily count was observed on 15 August. During the previous six years, the run mid-point and peak counts have both occurred on 14 August.

In 1999, no fish were removed from the fishway for coded-wire tag sampling. Samples were not collected because of a re-evaluation of sampling goals, an inseason expectation of a poor return, and the potential for collecting similar data at the Michie Creek weir. Collection of coded-wire tag samples from upper lakes chinook salmon assists in evaluation of the effect of release strategy on return rates, as well as estimation of run composition (in terms of age structure and hatchery component).

6.2.4 Whitehorse Hatchery Operations

All of the 240,040 chinook salmon fry on hand at the Whitehorse Rapids Fish Hatchery in May 1999 were marked with adipose fin-clips, then released into the Yukon River system upstream of Whitehorse. Unlike recent years, no coded wire tags were applied due to budgetary constraints. The fry releases into the Yukon River system were as follows: 31,048 into Wolf Creek; 80,393 into Michie Creek; 64,169 into the McClintock River above the confluence of Michie Creek. In addition to the Michie Creek release, 64,430 were released into Byng Creek. A summary of Whitehorse Rapids Fish Hatchery fry releases from 1985 through 1999 is presented in Table 6.

In 1999, broodstock collection began after 102 salmon had migrated up the Whitehorse fishway. All attempts were made to collect two males for every female during broodstock collection to allow matrix spawning in order to increase the potential genetic diversity of offspring. The number of females taken from the run was 59 fish, comprising 31% of the female population. All of these chinook salmon females were successfully spawned with the exception of 6 fish, 4 which died during holding and 2 which were partially spawned. As noted in Section 6.2.4, a large number of fish in the upper section of the fishway appeared unable to complete the final leg of the ascent into Schwatka Lake. Fishway staff assisted hatchery staff in attempting to capture some of these pre-spawned adults before they perished. In total, 19 females were captured and spawned successfully. The females were in very poor condition resulting in poor egg quality. Fertilization rate of eggs taken from the above mentioned females was 30%. Ten females used for brood stock lacked adipose fins, and therefore, were known to be of hatchery origin. A total of 167 males was used in the brood stock program, of which 97 were known to be of hatchery origin.

All males and females selected for broodstock were transported to the hatchery in a live-tank and held in Capilano troughs under tarpaulins until they were ripe enough for spawning. An estimated 250,000 green eggs was taken between August 25 and September 7, 1999. The fertilization rate was estimated to be 90%. Shocking and second inventory of eyed eggs began on October 15 and will be completed on December 8, 1999 after the eggs have become fully eyed. Total mortality from the green egg stage to the eyed stage is unavailable at this time. The average fecundity for the females taken for brood stock was 5,100 eggs.

6.2.5 Fishing Branch River Chum Salmon Weir

A weir to enumerate chum salmon escapement to the Fishing Branch River has operated annually since 1985, except for 1990. Prior to 1985, the weir operated during the 1972-1975 period. Since 1991, the weir program has been conducted cooperatively by the Vuntut Gwitchin First Nation (VGFN), of Old Crow, and DFO. Escapement estimates, including aerial count expansions, have ranged from approximately 16,000 chum salmon in 1973 to 353,000 chum salmon in 1975 (Attachment Table 12).

In 1999, the weir was operational from August 30 to October 11. A total of 12,904 fall chum salmon was counted. The peak count (862 chum salmon) occurred on 12 September and the run mid-point was observed on 16 September. The 1999 count was 68% below the recent 10 year average of 40,249 and 74% below the lower end of the interim escapement goal range of 50,000 - 120,000 chum salmon. The 1999 count was the lowest recorded, although it was very similar to the count of 13,248 recorded in 1998.

Generally, coho salmon are observed at the weir each year. However, the weir is not in place late enough to obtain quantitative information on the escapement.

DNA samples were collected from 200 juvenile coho salmon captured near the weir site. The samples will be forwarded to the USFWS laboratory in Anchorage for processing. The data collection will contribute to a drainage wide stock identification study on coho salmon.

6.2.6 Restoration and Enhancement Fund Projects

A number of enumeration, beaver management and beaver dam removal projects were undertaken in Canada in 1999 using some of the remaining Interim Yukon River Salmon Agreement Restoration and Enhancement funds.

All of the enumeration programs focused on counting and sampling chinook salmon returns to spawning tributaries. The Mica Creek beaver management program involved the removal of beavers while all other programs involved the removal or breaching of beaver dams which impeded access to spawning areas. More detailed information on the enumeration programs is contained in the escapement section. A list of the projects funded is as follows:

Chandindu River Chinook Salmon Enumeration Weir
Tatchun Creek Chinook Salmon Enumeration Weir
Michie Creek Chinook Salmon Enumeration Weir
Kluane River Beaver Dam Removal
Tatchun Creek Beaver Dam Removal
Mica Creek Beaver Management

6.2.7 Habitat Restoration And Salmon Enhancement Program (HRSEP) and Community Development and Education Program (CDEP)

Program Introduction

The Habitat Restoration and Salmon Enhancement Program (HRSEP) was established in January 1997 to complement the Pacific Salmon Revitalisation Strategy. The main objective of the three year, $15 million program is: to increase the quality and quantity of salmon habitat in conjunction with conserving and rebuilding of weak salmon stocks in British Columbia and the Yukon. Program objectives encompass three major categories in the on-going effort to ensure healthy salmon stocks - Resource and Watershed Stewardship, Habitat Restoration and Stock Rebuilding. Activities in each category are designed to encourage community-based stewardship, increase the quality or quantity of in-stream and riparian habitat and rebuild stocks through intensive assessment and enhancement techniques. In June of 1998, the Pacific Salmon Fisheries Restructuring Program was announced, extending the HRSEP for an additional $20 million over 3 years.

In 1999, HRSEP funded a number of CDEP projects. CDEP projects have developed over the years using funds from a variety of sources including the R&E Fund, economic development initiatives, community groups etc.

Salmon Emergence Monitoring

The primary objective of this HRSEP-funded CDEP project is to develop a database on the incubation and emergence characteristics of Yukon salmon in a number of local rivers. Partners involved in this project include: Streamkeepers North Society, Whitehorse Correctional Centre, Wood St. School, Fisheries and Oceans Canada (Habitat and Enhancement Branch and Stock Assessment Division).

Temperature data has been collected in the past at Takhini River, Wolf Creek, McIntyre Creek and the McIntyre Incubation Box. Data loggers are out at all these sites again, as well as in the Morley River, Tatchun Creek, Flat Creek, the Yukon River and the Ibex River. Some data and equipment has been lost due to freezing (year one at Flat Creek) and vandalism (fall 1999 at Wolf Creek).

Emergence monitoring was not pursued at Wolf Creek, Flat Creek and McIntyre Creek this spring, due to lack of spawning stocks. Emergence timing was identified at the Takhini River using fine mesh Gee minnow traps in the vicinity of known redds. Other sites will be monitored in the spring of 2000.

School Fry Release Field Trips

The primary objective of this CDEP project is to enable schools involved with the Salmon in the Classroom program to participate in fry release field trips. Partners involved in this project include: various Yukon schools, Streamkeepers North Society, Whitehorse Correctional Centre, Fisheries and Oceans Canada (Habitat and Enhancement Branch).

Schools monitor water temperatures, incubate chinook or chum salmon eggs and rear emergent fry in classroom aquariums. The field trips enable students, teachers and parents to learn more about salmon in their natural environments and often include various habitat studies such as invertebrate sampling and water quality testing.
School releases in 1999 were as follows:
4 classes released approximately 185 chinook fry into Tatchun Creek;
3 classes released 450 chinook fry into the Morley River;
3 classes released 700 chum fry into Kluane River; and
12 classes released 615 fry into Flat Creek or into the McIntyre site for subsequent release into Flat Creek in the spring of 1999.

The Salmon in the Classroom program is again underway in Yukon Schools. Chinook eggs were taken from the Morley River, Takhini River and Tatchun Creek for schools from Teslin to Dawson.. Schools are preparing to receive these eggs at the "eyed" stage. Students from Kluane Lake school spent an exciting day in late October helping take and fertilise chum salmon eggs from the Kluane River for their school.

McIntyre Creek Salmon Incubation Project

The primary objective of this CDEP project is to develop, monitor and evaluate low-technology ground water fed incubation facilities and techniques under northern interior climatic conditions. The project was initiated in 1989. A wide range of partners have participated in the project, including the YR R&E Fund. This project is currently operated by the Whitehorse Correctional Centre and Streamkeepers North Society. Other partners involved in the project include the Whitehorse Correctional Centre Inmates Society, Wood Street School, and Fisheries and Oceans Canada (Habitat and Enhancement Branch and Stock Assessment Division).

A total of 25,431Takhini River chinook salmon fry was tagged and released in 1999: 11,502 into Flat Creek on 14 July, and 13, 929 into the Takhini River on 15 July. The incubation box also produced 15,245 Tatchun Creek chinook salmon fry which were released into Tatchun Creek on 08 July. Survival of Takhini River chinook eggs was excellent, although numbers were low. Approximately 30% of the Tatchun Creek chinook eggs were lost at the egg stage, and some fry were lost due to predation.

In August 1999, approximately 60,000 chinook eggs were taken at the Takhini River and about 46,000 chinook eggs were taken at Tatchun Creek.

The Whitehorse Correctional Centre is monitoring and maintaining the site and has completed plumbing and installation of the heath tray shelter that was constructed by the Wood Street School. This will be tested over the winter of 1999-2000 using 200 eggs from Tatchun Creek.

The McIntyre incubation facility is also providing a small number of eggs (hundreds) to pilot incubation projects near Mayo and Dawson. The Na Cho Nyak Dun First Nation has assessed various groundwater sites in the Mayo area and the Yukon River Commercial Fishing Association and Tr'on dek Hwech'in First Nation have monitored temperature and water quality in the Dawson tailings ponds. Water quality results indicate that there are promising sites for possible future incubation of salmon.

Ibex River Watershed Stewardship and Stock Enhancement

The primary objectives of this CDEP project were as follows: to inventory and map habitat characteristics in a portion of the Ibex River; to develop incubation facilities for fry production and release back into the Ibex river; to educate youth, generate awareness and foster stewardship of aquatic resources. Partners include: Wood Street Centre Experiential Programs, Streamkeepers North Society, Yukon College, various Yukon schools, Fisheries and Oceans Canada (Habitat and Enhancement Branch).

The Wood Street School has been mapping obstructions in the Ibex River using GPS, and has conducted a spawner/carcass float survey on the Ibex at the end of spawning season. The program constructed an insulated shelter to house a stack of heath trays for the McIntyre Creek project. This will be tested in the winter of 1999-2000.

Chandindu River Salmon Enumeration Weir

This project is part of a larger program designed to restore salmon stocks in selected watercourses in the Dawson area. It involves the following partners: the Yukon River Commercial Fishing Association, the Tr'on dek Hwech'in First Nation, and Fisheries and Oceans Canada (Habitat and Enhancement Branch and Stock Assessment Division). The purpose of this project was to enumerate chinook salmon (and early chum) on the Chandindu River, a tributary of the Yukon River in the Dawson Area. This enumeration, over a period of several years, will provide the means to determine the availability and characteristics of potential chinook broodstock and to collect vital mark-recapture data for stock management purposes. Juvenile sampling was also conducted at the weir site to determine natural fry sizes. This information will be used in the future to help determine optimal sizes for outplanted fry in this system.

The weir was operated from 17 July to 31 August, 1999. A large forest fire in the area delayed the start date, originally planned for 01 July, 1999. A total of 239 chinook salmon was counted (18

tagged, 221 untagged), with peak migration taking place in late July. A total of 78 female chinook was counted migrating through the weir. If assumed fecundity rates of 6000-8000 eggs per female are applied to 30% of the female population (consistent with Department broodstock protocols), then 138,000 to 184,000 eggs could potentially have been available for broodstock collection. A total of 92 chum was counted (10 tagged, 82 untagged).

This project fostered watershed stewardship and partnership building through the employment and training of local fishers and First Nations people.

1999 Klondike River Chinook Sampling and Redd Mapping

The project was undertaken by a partnership including the Yukon River Commercial Fishing Association, the Tr'on dek Hwech'in First Nation, and Fisheries and Oceans Canada (Habitat and Enhancement Branch and Stock Assessment Division). The primary objective of this project was to enumerate chinook salmon returning to the Klondike River and to sample those adults for adipose clips through snorkel/driftnet surveys. This provided an estimate of fry-to-adult survival for returning North Klondike incubation box fry releases. Redd mapping and weekly juvenile chinook sampling were also conducted throughout the duration of this project.

Snorkel surveys were carried out on eleven days between 19 July and 10 August, 1999. Survey efforts were negated by poor visibility due to heavy rainfalls, mechanical difficulties with the project's volunteer plane for aerial surveys and low numbers of salmon utilizing the survey area.

Despite these difficulties, valuable data was collected and the project fostered watershed stewardship and partnership building through the employment and training of local Fishers and First Nations.

Croucher Creek Juvenile Chinook Salmon Migration Study / Yukon River Juvenile Chinook Ecology

In 1998, a research project on the ecology of juvenile chinook salmon in small non-natal streams of the upper Yukon watershed was initiated by DFO Science Branch. The 1998-1999 studies focused on Croucher Creek, which drains into the Yukon River near Whitehorse. These studies were conducted by Fisheries and Oceans Canada (Habitat and Enhancement Branch and Science Branch/ Freshwater Habitat Research) in partnership with the Yukon Conservation Society (YCS) and Kwanlin Dun First Nation. YCS and Kwanlin Dun operated a smolt fence on the creek. Extensive sampling and marking of juveniles in this creek has revealed the followed preliminary results:
Juvenile chinook salmon entered the creek from the Yukon River beginning in June, and distributed themselves throughout the accessible parts of the stream. Once in the stream, mark-recapture studies indicated that their movements were relatively limited throughout the summer and fall.
Over all habitats, the summer densities averaged 0.5 fish· m^{-2}. Preferred habitats were small pools with cover, and densities reached 10 fish· m^{-2} in pools greater than 50 cm deep.

Beginning in late August, juveniles became increasingly nocturnal, and many hid in the substrate during daytime. Over wintering of juvenile chinook was confirmed by the recovery of fish in December and January that were tagged in July and August. By May 1999, the density of juveniles was about half that observed in the previous summer. Extensive icings (aufeis) were observed in winter, and catches of juveniles were very low in areas where ice deposits had developed. Smolt outmigration peaked in mid-June. Extensive spring growth was observed, and juvenile nearly doubled in weight in the spring before emigrating from the creek.

The results indicate that small streams (<3m wide) can provide important year-round rearing habitats for juvenile chinook salmon. Studies in 1999 and 2000 will focus on small streams in the Dawson area, and will consider the relative importance of non-natal tributaries to the mainstem Yukon as rearing habitat.

Mayo Groundwater Surveys

The Na Cho Nyak Dun First Nation has assessed various groundwater sites in the Mayo area. Water quality results indicate that they have several promising sites for possible future incubation of salmon. Trial tests will be conducted at those sites with a few chinook eggs in the upcoming year.

6.3 Upper Yukon River Fall Chum Salmon Radio Telemetry Project

A large-scale radio telemetry program was conducted in 1999 to provide information on stock composition and timing, nation of origin, and movement patterns of fall chum salmon returns in the upper Yukon River basin. Chum salmon were captured with fish wheels located 60 river km upriver from the Tanana River confluence -- an area known locally as the Rapids. The fish wheels were operated from early August to late September.

About 1050 fish were tagged with pulse-coded radio transmitters. The transmitters were inserted through the mouth of the fish and into the stomach. The fish were also tagged externally with yellow spaghetti tags used as a secondary mark. Information on sex, body length, and general condition was recorded. A tissue sample (a small fin clip) was collected from each fish for genetic stock identification analysis by the U.S. Fish and Wildlife Service. A minimum of 100 fish was tagged during each weekly period during the run, except for the first and last week of tagging when approximately 50 fish were tagged per week due to low catch rates.

About 950 fish were tagged and released immediately after capture. An additional 100 fish, captured over a two-week period, were held in a fish wheel live box prior to being tagged and released. These fish were separated into two treatment groups: 50 fish (10 fish per day for five days) were held for four to five hours under crowded conditions, and 50 fish were held for the same period of time under uncrowded conditions.

Radio-tagged fish moving upriver were recorded by remote tracking stations located at sites throughout the upper basin. Sixteen stations were operated during 1999. Information collected by the stations was transmitted via satellite to a receiving station, accessed daily by modem, and downloaded into a database for analysis. Aerial surveys were also conducted in sections of the drainage to locate radio-tagged fish and identify potential spawning areas. Additional survey flights are scheduled for later this fall and winter.

Data analysis is continuing, and the information presented in this summary should be considered preliminary. Chum salmon responded well to tagging with 865 (91%) of the fish released immediately after capture resuming upriver movement. Radio-tagged fish were tracked to areas throughout the upper Yukon River basin. Of the 816 fish that moved upriver and were not caught in fisheries, 611 (75%) travelled to areas in the Yukon River main stem, while 205 (25%) were located in the Porcupine River drainage . Fish returning to the Chandalar River comprised the largest proportion of the sample tracked to terminal spawning areas, with 229 (28%) fish tracked to this area. Eighty-four (10%) fish travelled to the Canadian section of the Yukon River main stem. The percentage of fish remaining in the U.S. section of the main stem was substantially greater than observed the previous year, with 36% in 1999 versus 8% in 1998. Since the U.S. main stem is not a terminal area, this component of the sample may include fish caught in the fishery but not reported, mortalities due to predation or handling, and fish spawning in main stem and off-channel areas.

Sheenjek River fish were the primary component of the Porcupine River return, with 115 (14%) fish travelling to this area. This observation is substantially less than in 1998 when 27% of the sample returned to this tributary. Twenty-three (3%) fish were tracked to the Black River, eight fish to the U.S. section of the Porcupine River, and 59 (7%) fish to the Canadian section, including 17 fish that travelled to the Fishing Branch River.

In addition to being preliminary data, the numbers and associated proportions reported represent only the distribution of fish in the radio-tagged sample. Stock composition and timing estimates for the fall chum return will be developed by weighting telemetry data with abundance estimates developed from the mark-recapture study conducted by the U.S. Fish and Wildlife Service.

Movement rates were determined for fish moving to different sections of the drainage. Average movements ranged from 31 km/day to 38 km/day, compared to average rates of 36 km/day to 44 km/day in 1998. The fastest movement rate observed was 47 km/day for a fish travelling to the Canadian section of the Yukon River main stem; the fastest rate observed in 1998 was 54 km/day for fish tracked to the upper Porcupine River. Further analysis will examine stock-specific movements within different sections of the drainage.

Most (89%) of the radio-tagged fish held in fish wheel live boxes prior to release resumed upriver movements. Of the 72 fish that moved upriver and were not caught in fisheries, 44 (61%) remained in the U.S. section of the Yukon River main stem, 22 (31%) travelled to the Chandalar and

Sheenjek Rivers, and 6 (8%) were tracked to the Canadian section of the drainage. Further analysis will detail difference between fish held under crowded and uncrowded conditions.

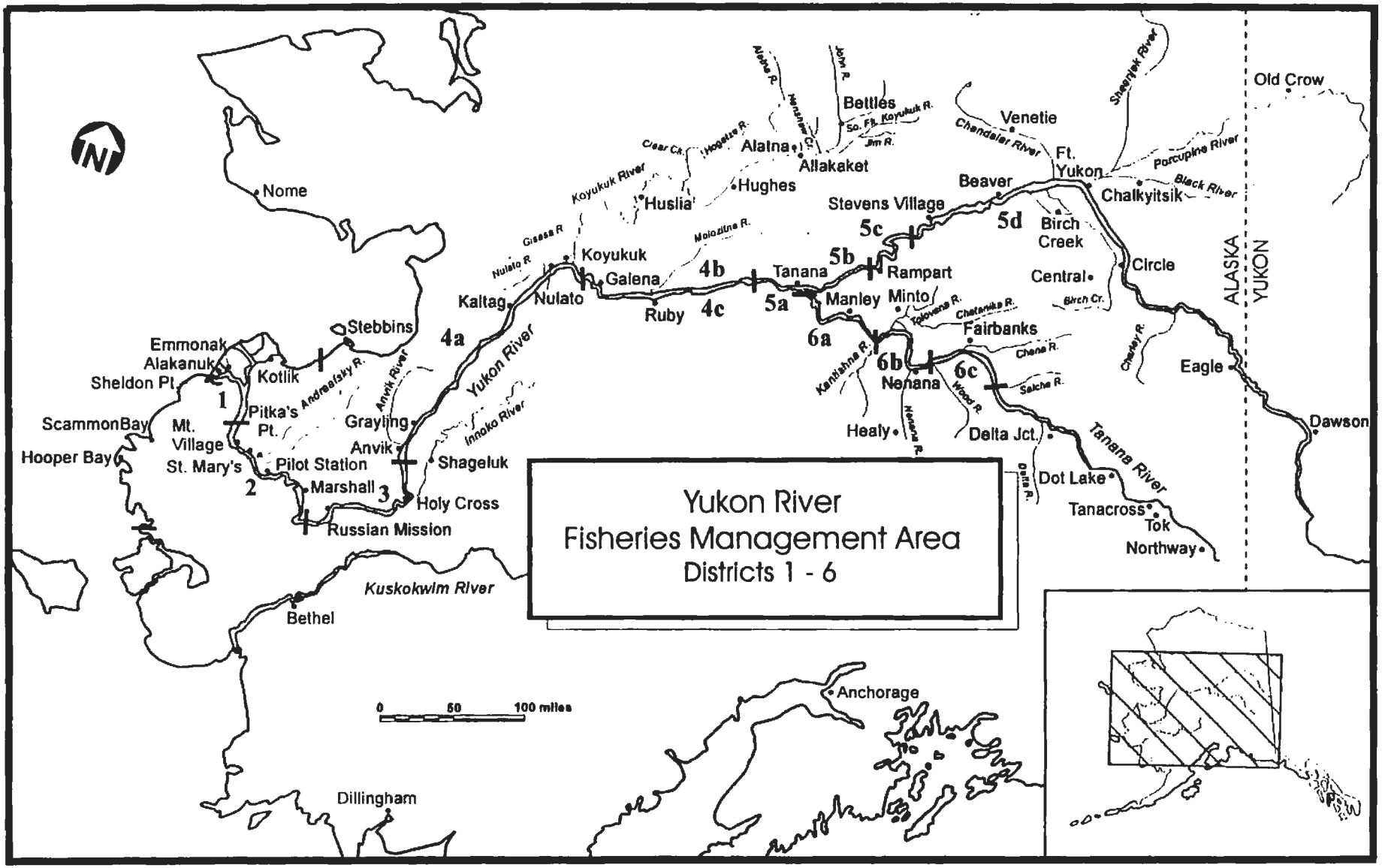


Figure 1. Map of the Alaska portion of the Yukon River Drainage.

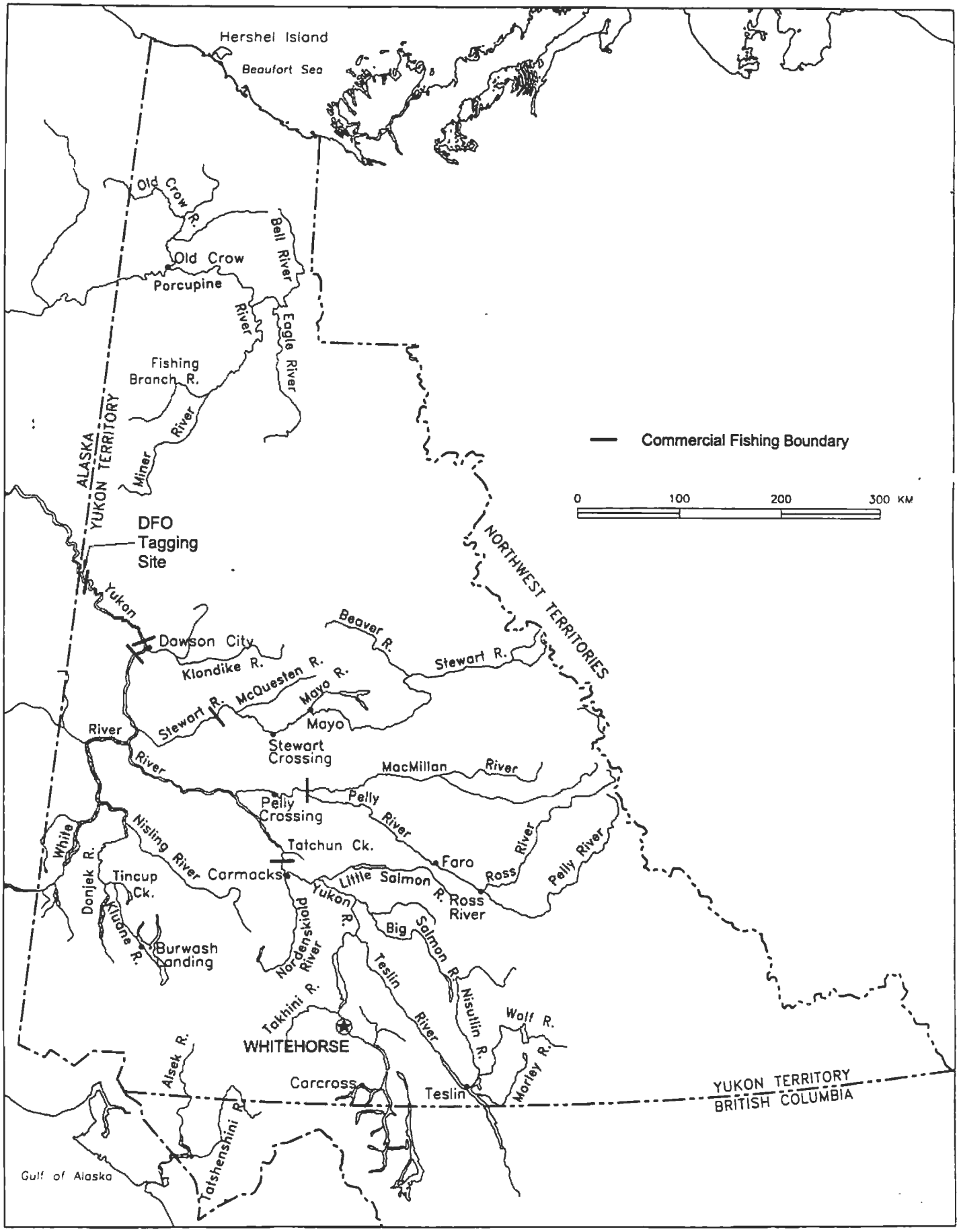


Figure 2. Map of the Canadian portion of the Yukon River showing commercial fishing boundaries

Table 1. Preliminary estimates of commercial salmon sales and estimated harvests in the Alaska portion of the Yukon River drainage, 1999.[a,b]

District	No. of	Chinook			Summer Chum			Fall Chum			Coho			Total		
Subdist.	Fishermen[c]	Numbers	Roe	Harvest	Numbers	Roe	Harvest	Numbers	Roe	Harvest	Numbers	Roe	Harvest	Numbers	Roe	Harvest
1	422	37,161	0	37,161	16,181	0	16,181	9,987	0	9,987	855	0	855	64,184	0	64,184
2	238	27,133	0	27,133	11,702	0	11,702	9,703	0	9,703	746	0	746	49,284	0	49,284
Subtotal	628	64,294	0	64,294	27,883	0	27,883	19,690	0	19,690	1,601	0	1,601	113,468	0	113,468
3	5	538	0	538	0	0	0	-	-	-	-	-	-	538	0	538
Total Lower Yukon	632	64,832	0	64,832	27,883	0	27,883	19,690	0	19,690	1,601	0	1,601	114,006	0	114,006
Anvik Rive	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4-A	-	-	-	-	-	-	- [d]	-	-	-	-	-	-	-	-	-
4-B,C	6	1,437	0	1,437	1,267	0	1,267 [d]	681	0	681	0	0	0	3,385	-	3,385
Subtotal District 4	*6*	*1,437*	*0*	*1,437*	*1,267*	*0*	*1,267*	*681*	*0*	*681*	*0*	*0*	*0*	*3,385*	*0*	*3,385*
5-A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5-B,C	23	2,189	0	2,189	114	0	114	-	-	-	-	-	-	2,303	0	2,303
5-D	3	415	0	415	1	0	1	-	-	-	-	-	-	416	0	416
Subtotal District 5	*26*	*2,604*	*0*	*2,604*	*115*	*0*	*115*	*0*	*0*	*0*	*0*	*0*	*0*	2,719	0	2,719
District 6	6	402	1,096	689	124	24	147	0	0	0	0	0	0	526	1,120	836
Total Upper Yukon	38	4,443	1,096	4,730	1,506	24	1,529	681	0	681	0	0	0	6,630	1,120	6,940
Total Yukon Area	670	69,275	1,096	69,562	29,389	24	29,412	20,371	0	20,371	1,601	0	1,601	120,636	1,120	120,946

a Commercial sales reported in numbers of fish sold in the round and pounds of unprocessed roe sold by fishermen. Unless otherwise noted, estimated harvest is the number of fish sold in the round plus the estimated number of females harvested to produce the roe sold.

b Does not include Department test fish sales.

c Number of unique permits fished by district, subdistrict, or area. Area totals may not add up due to transfers between districts or subdistricts.

d Estmated number of male and female salmon harvested to produce roe sold.

Table 2. Commercial sales of salmon and salmon roe in the Alaska portion of the Yukon River drainage, 1961-1998. [a]

Year	Chinook		Summer Chum		Fall Chum		Coho	
	Numbers	Roe (lbs.)	Numbers	Roe (lbs.)	Numbers	Roe (lbs.)	Numbers	Roe (lbs.)
1961	119,664	-	0	-	42,461	-	2,855	-
1962	94,734	-	0	-	53,116	-	22,926	-
1963	117,048	-	0	-	0	-	5,572	-
1964	93,587	-	0	-	8,347	-	2,446	-
1965	118,098	-	0	-	23,317	-	731	-
1966	93,315	-	0	-	71,045	-	19,254	-
1967	129,656	-	10,935	-	38,274	-	11,047	-
1968	106,526	-	14,470	-	52,925	-	13,303	-
1969	91,027	-	61,966	-	131,310	-	15,720	-
1970	79,145	-	137,006	-	209,595	-	13,778	-
1971	110,507	-	100,090	-	189,594	-	13,226	-
1972	92,840	-	135,668	-	152,176	-	23,465	-
1973	75,353	-	285,509	-	232,090	-	49,644	-
1974	98,089	-	589,892	-	289,776	-	16,777	-
1975	63,838	-	710,295	-	275,009	-	2,546	-
1976	87,776	-	600,894	-	156,390	-	5,184	-
1977	96,757	-	534,875	-	257,986	-	38,863	-
1978	99,168	-	1,052,226	25,761	236,383	10,628	26,152	-
1979	127,673	-	779,316	40,217	359,946	18,466	17,165	-
1980	153,985	-	928,609	139,106	293,430	5,020	8,745	-
1981	156,706	-	1,003,556	189,068	466,451	11,285	23,651	-
1982	123,174	-	460,167	152,819	224,187	805	36,895	-
1983	146,904	-	742,463	149,999	302,598	5,064	13,157	-
1984	118,815	-	586,375	167,224	207,938	2,328	81,826	-
1985	145,476	-	514,900	248,625	267,302	2,525	57,521	-
1986	99,268	-	719,234	271,691	138,688	577	47,162	-
1987	133,558	-	439,854	121,968	0	0	0	-
1988	100,364	-	1,148,650	256,535	133,320	3,227	86,187	-
1989	104,198	-	955,806	288,549	266,206	14,749	81,548	-
1990	95,247	1,731	303,858	109,376	122,010	10,944	41,032	4,042
1991	104,878	3,829	349,113	141,976	230,852	19,395	103,180	4,299
1992	120,245	3,164	332,313	112,996	15,721	2,806	6,556	1,680
1993	93,550	2,014	96,522	22,962	0	0	0	0
1994	113,137	2,394	80,284	97,757	3,631	3,276	120	5,588
1995	122,728	5,357	259,774	290,737	250,733	32,502	45,939	2,229
1996	89,671	1,470	145,593	314,759	88,342	14,671	52,643	4,829
1997	112,841	3,225	95,242	83,267	56,713	1,194	35,320	0
1998	43,618	260	28,611	153	0	0	1	0
1999	69,275	1,096	29,389	24	20,371	0	1,601	0
1993-97 Avg.	96,399	2,541	121,901	157,335	79,884	10,329	26,805	2,529

a Commercial sales reported in numbers of fish sold in the round and pounds of unprocessed roe sold by fishermen.

Table 3. Canadian weekly commercial catches of chinook and chum salmon in the Yukon River in 1999.

Statistical Week	Week Ending	Start Date	Finish Date	Days Fished	Number Fishing	Boat Days	Chinook Salmon	Chum Salmon	Coho Salmon
27	03-Jul			closed	0	0.0	0	0	0
28	10-Jul			closed	0	0.0	0	0	0
29	17-Jul	12-Jul	12-Jul	closed	0	0.0	0	0	0
30	24-Jul	19-Jul	21-Jul	2	12.5	25.0	622	0	0
31	31-Jul	25-Jul	28-Jul	3	9.3	28.0	1301	0	0
32	07-Aug	01-Aug	04-Aug	3	7.7	23.0	573	6	0
33	14-Aug	08-Aug	10-Aug	2	4.5	9.0	247	7	0
34	21-Aug			closed	0	0.0	0	0	0
35	28-Aug			closed	0	0.0	0	0	0
36	04-Sep	29-Aug	31-Aug	2	4.5	9.0	2	461	0
37	11-Sep	05-Sep	08-Sep	3	6.0	18.0	0	2228	0
38	18-Sep	12-Sep	14-Sep	2	7.3	14.7	0	3337	0
39	25-Sep	19-Sep	21-Sep	2	4.0	8.0	0	2026	0
40	02-Oct	26-Sep	28-Sep	2	2.0	4.0	0	1905	0
41	09-Oct	03-Oct	05-Oct	2	1.0	2.0	0	343	0
42	16-Oct	10-Oct	12-Oct	2	0.0	0.0	0	0	0
Dawson area subtotal				23		140.7	2745	10313	0
Upriver commercial subtotal							395	89	0
Total Commercial Harvest							3140	10402	0
Domestic Harvest							213	0	0
Estimated Recreational Harvest							500	0	0
Aboriginal Harvest catch reported by LGL on Oct 28							8804	3172	0
							0	0	0
TOTAL UPPER YUKON HARVEST							12657	13574	0
Old Crow AF								6000	0

note: the Old Crow chum catch is preliminary

Table 4. Salmon fishery projects conducted in the Alaskan portion of the Yukon River drainage in 1999.

Project Name	Location	Primary Objective(s)	Duration	Agency	Responsibility
Commercial Catch and Effort Assessment	Alaskan portion of the Yukon River drainage	document and estimate the catch and associated effort of the Alaskan Yukon River commercial salmon fishery via receipts (fish tickets) of commercial sales of salmon or salmon roe.	June - Sept.	ADF&G	all aspects
Commercial Catch Sampling and Monitoring	Alaskan portion of the Yukon River drainage	determine age, sex, and size of salmon harvested in Alaskan Yukon River commercial fisheries; monitor Alaskan commercial fishery openings and closures.	June - Sept.	ADF&G ADPS	all aspects enforcement
Subsistence and Personal Use Catch and Effort Assessment	Alaskan portion of the Yukon River drainage	document and estimate the catch and associated effort of the Alaskan Yukon River subsistence salmon fishery via interviews, catch calendars, mail-out questionnaires, telephone interviews, and subsistence fishing permits, and of the personal use fishery personal use fishery permits.	post-season	ADF&G	all aspects
Sport Catch, Harvest and Effort Assessment	Alaskan portion of the Yukon River drainage	document and estimate the catch, harvest, and associated effort of the Alaskan Yukon River sport fishery via post-season mail-out questionnaires.	post-season	ADF&G	all aspects
Yukon River Salmon Stock Identification	Yukon River drainage	estimate chinook salmon stock composition of the various Yukon River drainage harvests through analyses of scale patterns, age compositions, and geographical distribution of catches and escapements;	ongoing	ADF&G DFO & USFWS	all aspects provide scale samples
		investigate the utility of nuclear genes, microsatellites, and SINE's in identifying U.S./Canada fall chum salmon stocks.	ongoing	USGS-BRD USFWS & ADF&G	lead agency
Coded Wire Tag Recovery	Emmonak	estimate chinook salmon catch stock composition from coded wire tags recovered in lower Yukon River commercial catch samples	June - July	Emmonak Tribal Council	all aspects implementation with R & E
Yukon River Salmon Escapement Surveys and Sampling	Alaskan portion of the Yukon River drainage Nenana River drainage	estimate population size, or index the relative abundance, of chinook, chum, and coho salmon spawning escapements by aerial, foot, and boat surveys; estimate age, sex and size of selected tributary chinook, chum, and coho salmon spawning populations.	July - Nov. Sept.-Oct.	ADF&G TCC/BSFA	all aspects conduct surveys
Lower Yukon River Set Gillnet Test Fishing	South, Middle, and North mouths of the Yukon River delta, RM 20	index chinook, summer and fall chum, and coho salmon run timing and abundance using set gillnets. sample captured salmon for age, sex, size composition information.	June - Aug.	ADF&G	all aspects
Lower Yukon River Drift Gillnet Test Fishing	Middle mouth of the Yukon River delta, RM 20	index summer chum salmon run timing and abundance using drift gillnets sample captured salmon for age, sex, size composition information	June - July	ADF&G Emmonak Tribal Council	all aspects implementation with R & E
Mountain Village Drift Gillnet Test Fishing	mainstem Yukon River, RM 87	determine feasibility of using drift gillnets to index timing and relative abundance of fall chum and coho salmon runs.	July - Sept.	Asa'carsarmiut Trad. Council	all aspects implementation with R & E
Marshall Drift Gillnet Test Fishing	mainstem Yukon River, RM 161	determine feasibility of using drift gillnets to index timing and relative abundance of chinook salmon run.	June - July	AVCP Marshall Traditional Council	all aspects implementation with R & E
East Fork Weir, Andreafsky River	mile 20 East Fork RM 124	estimate daily escapement, with age, sex and size composition, of chinook, summer chum, and coho salmon into the East Fork of the Andreafsky River.	June - Sept.	USFWS Yupiit of Andreafsky Algaaciq Tribal Council	all aspects partial funding from BSFA Aug.-Sept.
		determine feasibility of using video and time-lapse photography to improve escapement monitoring	July - Sept.	USFWS	partial funding from R & E
Yukon River Sonar	Pilot Station, RM 123	estimate chinook, summer and fall chum salmon passage in the mainstem Yukon . River.	June - Sept.	ADF&G AVCP BSFA	all aspects partial funding

continued

Tabl. ,page 2 of 3).

Project Name	Location	Primary Objective(s)	Duration	Agency	Responsibility
Anvik River Sonar	mile 40 Anvik River, RM 358	estimate daily escapement of summer chum salmon to the Anvik River; estimate age, sex, and size composition of the summer chum salmon escapement.	June - July	ADF&G	all aspects
Kaltag Creek Tower	mile 1 Kaltag Creek, RM 451	estimate daily escapement of chinook and summer chum salmon into Kaltag Creek; estimate age, sex, and size composition of the summer chum salmon escapement.	June - July	City of Kaltag ACES BSFA	all aspects provided funding provided funding
Nulato River Tower	mile 3 Nulato River, RM 486	estimate daily escapement of summer chum and chinook salmon into the Nulato River; estimate age, sex, and size composition of the summer chum salmon escapement.	June - July	NTC ADF&G BSFA	all aspects provided funding provide funding
Gisasa River Weir	mile 3 Gisasa River, Koyukuk River drainage, RM 567	estimate daily escapement of chinook and summer chum salmon into the Gisasa River; estimate age, sex, and size composition of the chinook and summer chum salmon escapements.	June - July.	USFWS	all aspects
Clear Creek Tower	mile 0 Clear Creek, Hogotza River drainage, Koyukuk River drainage, RM ~ 780	estimate daily escapement of chinook and summer chum salmon into Clear Creek; estimate age, sex, and size composition of the summer chum salmon escapement.	June - Aug	TCC BSFA	all aspects
South Fork Koyukuk River Tower	South Fork Koyukuk River near mouth of Fish Creek RM > 1,117	estimate daily escapement of chinook, summer chum and fall chum salmon to the South Fork Koyukuk River estimate age, sex, and size composition of the salmon escapement.	July - Sept.	USFWS	all aspects
Henshaw Creek Tower	mile 0 Henshaw Creek, RM 970	estimate daily escapement of chinook and summer chum salmon into Henshaw Creek; estimate age, sex, and size composition of the salmon escapement.	June - July	TCC BSFA	all aspects implementation with R & E
Upper Yukon-Porcupine River Radio Telemetry and mark-recapture	mainstem Yukon River, near Rampart, RM 763	evaluate feasibility of using radio-telemetry and mark-recapture in a combined approach to estimate stock composition and timing of fall chum salmon in upper Yukon-Porcupine River drainages.	Aug - Sept.	SFWS, USGS-BRD ADFG, NMFS, TCC, DFO co-op. project	all aspects
Chandalar River Sonar	mile 14 Chandalar River, RM 996	investigate feasibility of using split-beam sonar equipment to estimate fall chum salmon escapement.	Aug. - Sept.	USFWS	all aspects
Sheenjek River Sonar	mile 6 Sheenjek River, Porcupine River drainage, RM 1,060	estimate daily escapement of fall chum salmon into the Sheenjek River; estimate age, sex, and size composition of the fall chum salmon escapement.	Aug. - Sept.	ADF&G	all aspects
Kaltag Village Drift Gill Net Test Fishing	Mainstem Yukon River Kaltag, RM 451	determine feasibility of using drift gillnets to index timing and relative abundance of fall chum and coho salmon runs.	July - Sept.	City of Kaltag	all aspects implementation with R & E
Middle Yukon River Chinook Sampling Project	Mainstem Yukon River Kaltag, RM 451	estimate age, sex, and size composition of chinook salmon harvested in middle Yukon River subsistence fisheries	June - July	City of Kaltag	all aspects implementation with R & E
Nenana River Escapement Surveys	Nenana River drainage, above RM 860	aerial and ground surveys for numbers and distrubution of coho and chum salmon in ten tributaries of the Nenana below Healy Creek.	Sept. - Oct.	TCC BSFA	all aspects funding
Tanana Village North and South banks Yukon River Fish Wheels, Test Fishing	Mainstem Yukon River Tanana, RM 695	index the timing of fall chum salmon on the north bank of the Yukon River; and index the timing of chum and coho salmon on the south bank of the Yukon River bound for the Tanana River drainage, using test fish wheels. South bank test fish wheel also used for Toklat CWT recovery.	Aug. - Sept.	ADF&G BSFA	all aspects partial funding R & E partial funding
		determine feasibility of using stored video images as an alternative to live boxes to estimate catch per unit effort on fishwheels	July - Sept.	USFWS	implementation with R & E

continued

Table 4. (page 3 of 3).

Project Name	Location	Primary Objective(s)	Duration	Agency	Responsibility
Tanana River Fish Wheel Test Fishing	mainstem Tanana River Nenana, RM 860	index the timing of chinook, summer chum, fall chum, and coho salmon runs using test fish wheels.	June - Sept.	ADF&G BSFA	all aspects partial funding
Tanana River Tagging	mainstem Tanana River between RM 793 and 860.	estimate the population size of the Tanana River fall chum salmon run above the confluence of the Kantishna River using mark-recapture methodology;	Aug. - Sept.	ADF&G BSFA	all aspects provided partial funding
Beaver Creek Weir	mile 200 Beaver Creek Yukon River, RM 932	estimate daily escapement of chinook and chum salmon into the upper portion of Beaver Creek.	July - Sept.	BLM	all aspects
Toklat River Ground Survey	Toklat River, between RM 848 and 853	estimate fall chum spawning escapement in Tolkat Springs and vicinity.	mid-Oct.	ADF&G	all aspects
Toklat River Fall Chum Salmon Restoration Feasibility Study	5-A Test Fish Wheel RM 690 Toklat River Recovery RM 848 Toklat Spawning Ground RM 878	Estimate proportion of Toklat River fall chum salmon return consisting of hatchery reared fish. Estimate the proportion and timing of Toklat River fall chum salmon migrating through and/or harvested in Sudistricts 5-A and 6-A. Estimate the precision of tagged fish homing within the Toklat River springs area.	Aug - Oct	ADF&G BSFA	all aspects provided funding for Subdistrict 5-A recovery wheel assistance
Chena River Tower	mile 1 Chena River, Tanana River drainage, RM 921	estimate daily escapement of chinook and summer chum salmon into the Chena River.	July - Aug.	ADF&G	all aspects
Salcha River Tower	mile 2 Salcha River, Tanana River drainage, RM 967	estimate daily escapement of chinook and summer chum salmon into the Salcha River.	July - Aug.	BSFA	all aspects implementation with R & E
Yukon River Chum Salmon Ecology Study	Chena River and Bluff Cabin Slough	study spawning habitat and factors influencing freshwater survival	ongoing	USGS-BRD	all aspects
Ichthyophonus hoferi Feasibility Study	Emmonak, RM 20, Tanana Village, RM 695	determine feasibility of collecting samples to estimate infection rate of *Icthyophonus hoferi* fungus, and its effects on Yukon River chinook salmon.	June - July.	BSFA	all aspects

Agency Acronyms:

ACES	= Alaska Cooperative Extension Service
ADF&G	= Alaska Department of Fish and Game
ADPS	= Alaska Department of Public Safety
AVCP	= Association of Village Council Presidents, Inc.
BSFA	= Bering Sea Fishermen's Association
BLM	= Borough of Land Management
CATG	= Council of Athabascan Tribal Governments
DFO	= Department of Fisheries and Oceans (Canada)
NMFS	= National Marine Fisheries Service
NTC	= Nulato Tribal Council
TCC	= Tanana Chiefs Conference, Inc.
USFWS	= United States Fish and Wildlife Service
USGS - BRD	= United States Geological Survey - Biological Resource Division
YRDFA	= Yukon River Drainage Fisheries Association

Table 5. List of harvest/escapement monitoring and incubation/rearing projects involving salmon in the Canadian portion of the Yukon River drainage in 1999.

Project Name	Location	Primary Objective(s)	Duration	Agency	Responsibility
Yukon Mark-Recapture	downstream of the Stewart River	- to obtain population, escapement and harvest rate estimates of chinook and chum salmon in the Canadian section of the mainstem Yukon River; - to collect stock ID, age, size, sex composition data; - to contribute to inseason run forecasting.	June - Oct	DFO	all aspects
Commercial Catch Monitoring	near Dawson City	- to determine weekly catches and effort in the Canadian commercial fishery; recovery of tags.	July - Oct	DFO	all aspects
Aboriginal Catch Monitoring	Yukon communities	- to determine weekly catches and effort in the aboriginal fishery; recovery of tags; - to implement components of the UFA.	July - Oct	LGL, Yukon First Nations, DFO	joint project
Harvest Sampling	downstream of the Stewart River; Yukon communities	- to obtain age, size, sex composition of commercial, aboriginal, and test fish catches; - to sample for coded wire tags.	July - Oct	DFO, LGL	joint project
DFO Escapement Index Surveys	chinook and chum index streams	- to obtain escapement counts in index spawning areas.	August - Nov	DFO	all aspects
Escapement Surveys	throughout upper Yukon R. drainage	- to conduct mobile surveys (on foot or by helicopter) - to enumerate chinook returns to Flat Creek, Nordenskiold River, Nisutlin River and tribs., Crooked Creek, Tincup Creek, Pelly River tribs., and White River tribs.	July - August	various R&E Fund recipients including Yukon First Nations, consultants, and individuals	all aspects
Fishing Branch Weir	Fishing Branch River	- to enumerate chum salmon returning to the Fishing Branch River and obtain age, size, tag and sex composition data.	August - Oct	VGFN, DF0	
Whitehorse Rapids Fishway	Whitehorse	- to enumerate wild and hatchery reared chinook returns to the Whitehorse area and obtain age, size, sex and tag composition data.	July - Sept.	YFGA, DFO	all aspects
Chandindu River Weir	near Dawson City	- enumerate chinook returns to Chandindu River and obtain age, size, sex and tag composition data.	July - August	YRCFA	all aspects
Tatchun Creek Weir	near Carmacks	- enumerate chinook returns to Tatchun Creek and obtain age, size, sex and tag composition data.	July - August	QC	all aspects
Blind Creek Weir	near Faro	- enumerate chinook returns to Blind Creek and obtain sex and tag composition data.	July - August	RRDC	all aspects
Michie Creek Weir	near Whitehorse	- enumerate chinook returns to Michie Creek and obtain age, size, sex and tag composition data.	August - Sept.	W/Y	all aspects
Wolf Creek Weir	near Whitehorse	- enumerate chinook returns to Wolf Creek and obtain age, size, sex and tag composition data.	July - August	YFGA	all aspects
Tatchun Creek Catch & Release Study	near Carmacks	- to determine short-term mortality rates by sex and gear typ for chinook salmon angled near the Yukon R. /Tachun Ck. confluence	July - August	QC	all aspects

Table 5. (Page 2 of 2)

Upper Yukon R. and Porcupine R. Radio Tag Tracking	- upper Yukon River: mstm Yukon R. near Minto and Kluane R. - Porcupine R. drainage	- to track chum tagged with transmitters at Ramparts, AK. using fixed tracking stations installed at chum index areas on the upper Yukon R., and aerial surveys in the Porcupine R. drainage in order to assess spawning distribution.	May - October	DFO, NMFS, USFWS	joint project
Whitehorse Rapids Fish Hatchery and Coded-wire Tag /Adipose Fin Marking Project	Whitehorse	- to incubate up to 320K chinook eggs obtained at the Whitehorse Fishway; - to rear fry until spring, then mark and/or tag, and release fish upstream of Whitehorse hydroelectric facility.	ongoing	YFGA	all aspects
				DFO	coded-wire tagging or adipose only mark
MacIntyre Incubation Box and Coded-wire Tag Project	Whitehorse	- to incubate up to 120K chinook fry obtained from the Takhini River or, alternatively, Tatchun Creek; - to rear fry to taggable size, then mark, tag, and release at natal site.	ongoing	DFO	technical support
				WCC	field work, project monitoring

Acronyms:

DFO	= Department of Fisheries and Oceans Canada
NMFS	= National Marine Fisheries Service
QC	= Quixote Consulting
RRDC	= Ross River Dena Council
THFN	= Tr'ondek Hwech'in First Nation
UFA	= Umbrella Final Agreement
USFWS	= U.S. Fish and Wildlife Service
VGFN	= Vuntut Gwitchin First Nation
WCC	= Whitehorse Correctional Centre
YFGA	= Yukon Fish and Game Association
YRCFA	= Yukon River Commercial Fishers Association
YSC	= Yukon Salmon Committee
W/Y	= Waugh/Young (Contractors)

Table 6. Summary of releases and recoveries of Coded-wire Tagged Chinook Salmon from Whitehorse Hatchery, 1985 - 1999

Release Location	Release Date*	Code	# Tagged & Clipped(c)	Adipose Clipped Only	%Tag-Loss*	Days a	updated: Total Clipped	Weight (grams	17-Nov-98 Total Unclipped	Total Released
Michie	25-May-85	023248	26670	518			27188		0	
Michie	25-May-85	023226	28269	518			28787		0	
Michie	25-May-85	023247	43325	518			43843		0	
Wolf	1985	no-clip	0	0			0		10520	10520
SUM	[illegible]		[illegible]	[illegible]			[illegible]		[illegible]	[illegible]
Michie	1986	023731	77170				77170		1000	78170
Wolf	1986						0		5720	5720
SUM	[illegible]		[illegible]				[illegible]		[illegible]	[illegible]
Michie	05-Jun-87	024812	47644	1361	0.028	b	49005	2.50	9598	58603
Michie	05-Jun-87	024813	49344	808	0.016	b	50152	2.50	9141	59293
Michie	05-Jun-87	024814	51888	559	0.011	b	52447	2.50	9422	61869
Michie	05-Jun-87	024815	43367	2066	0.045	b	45433	2.50	7868	53301
Michie	05-Jun-87	024258	25945	245	0.009	b	26190	2.50	4171	30361
Wolf	30-May-87	024259	26752	123	0.005	b	26875	2.50	422	27297
SUM	[illegible]		[illegible]	[illegible]			[illegible]		[illegible]	[illegible]
Michie	10-Jun-88	025549	77670	1991		15	79661	2.80	84903	164564
Michie	10-Jun-88	025550	78013	1592		11	79605	2.70	85288	164893
Wolf	05-Jun-88	no-clip	0	0			0		25986	25986
SUM	[illegible]		[illegible]	[illegible]			[illegible]		[illegible]	[illegible]
Wolf	1989	no-clip	0	0			0		22388	22388
Michie	06-Jun-89	026004	26161	326	0.015		26487	2.30	0	26487
Michie	06-Jun-89	026005	24951	128	0.004		25079	2.30	0	25079
Michie	06-Jun-89	026006	25098	291	0.018		25389	2.40	0	25389
Michie	06-Jun-89	026007	25233	156	0.0008		25389	2.20	95724	121113
Fishway	06-Jun-89	026008	25194	357	0.013		25551	2.70	0	25551
Fishway	06-Jun-89	026009	25190	351	0.0125		25541	2.70	0	25541
SUM	[illegible]		[illegible]	[illegible]			[illegible]		[illegible]	[illegible]
Wolf	06-Jun-90	no-clip	0	0			0		11969	11969
Michie	02-Jun-90	020238	24555	501	0.02		25056	2.30	0	25056
Michie	02-Jun-90	020239	24345	753	0.03		25098	2.30	0	25098
Fishway	02-Jun-90	020260	24508	501	0.0200		25009	2.20	0	25009
Fishway	02-Jun-90	020263	25113	254	0.01		25367	2.20	0	25367
SUM	[illegible]		[illegible]	[illegible]			[illegible]		[illegible]	[illegible]
Wolf	08-Jun-91	180322	49477	793	0.015		50270	2.30	0	50270
Fishway	06-Jun-91	180323	52948	193	0.0025		53141	2.30	0	53141
Michie	06-Jun-91	180324	50020	176	0.0025		50196	2.30	87348	137544
SUM	[illegible]		[illegible]	[illegible]			[illegible]		[illegible]	[illegible]
Wolf	04-Jun-92	180829	48239	0	0		48239	2.40	0	48239
Fishway	04-Jun-92	180828	49356	99	0.002		49455	2.30	0	49455
Michie	04-Jun-92	180830	52946	643	0.012		53589	2.20	249166	302755
SUM	[illegible]		[illegible]	[illegible]			[illegible]		[illegible]	[illegible]
Wolf	06-Jun-93	181215	50248	0	0		50248	2.30	0	50248
Fishway	06-Jun-93	181216	49957	434	0.009		50391	2.30	0	50391
Michie	06-Jun-93	181217	50169	0	0		50169	2.30	290647	340816
SUM	[illegible]		[illegible]	[illegible]			[illegible]		[illegible]	[illegible]
Wolf	02-Jun-94	181427	50155	270	0.0053		50425	2.30	0	50425
Michie	02-Jun-94	181428	50210	127	0.0002		50337	2.30	158780	209117
Fishway	02-Jun-94	181429	50415	125	0.0002		50540	2.30	0	50540
SUM	[illegible]		[illegible]	[illegible]			[illegible]		[illegible]	[illegible]
Wolf	06-Jun-95	181246	10067	164	0.0163	3	10231	1.67	0	10231
Wolf	06-Jun-95	181247	9122	0	0	3	9122	1.53	0	9122
Michie	06-Jun-95	181826	25231	337	0.0134	3	25568	2.47	4552	30120
Michie	06-Jun-95	181827	25187	141	0.0056	3	25328	2.33	0	25328
SUM	[illegible]		[illegible]	[illegible]			[illegible]		[illegible]	[illegible]
Wolf	26-May-96	18748	10131	102	0.001	5	10233	2.30	0	10233
Fox	4-Jun-96	182823	35452	0	0	5	35452	2.43	0	35452
Byng	4-Jun-96	181041	25263	516	0.002	5	25779	2.37	0	25779
Michie	5-Jun-96	183345	50082	1022	0.002	5	51104	2.51	0	51104
Michie	5-Jun-96	183346	50260	508	0.001	5	50768	2.43	0	50768
Michie	5-Jun-96	183347	49985	505	0.001	5	50490	2.32	0	50490
Judas	4-Jun-96	183348	49798	1016	0.002	5	50814	2.43	0	50814
McClintock	4-Jun-96	183349	49991	302	0.001	5	50293	2.27	0	50293
SUM	[illegible]		[illegible]	[illegible]			[illegible]		[illegible]	[illegible]

Table 6. (page 2 of 2).

Release Location	Release Date*	Code	# Tagged & Clipped(c)	Adipose Clipped Only	%Tag-Loss*	Days a	updated: Total Clipped	Weight (grams	17-Nov-98 Total Unclipped	Total Released
Wolf	1-Jun-97	182325	14850	150		2	15000	2.30	0	15000
Wolf	1-Jun-97	182326	20334	0		4	20334		0	20334
Wolf	8-Jun-97	182906	10158	0		8	10158		0	10158
Fox	11-Jun-97	182554	25242	0		3	25242	2.43	0	25242
Fox	11-Jun-97	182555	24995	253		3	25248		0	25248
Byng	11-Jun-97	182907	10029	0		1	10029	2.37	0	10029
Byng	11-Jun-97	182905	10155	0		1	10155		0	10155
Michie	11-Jun-97	182859	49657	502		3	50159	2.51	0	50159
Michie	11-Jun-97	182860	50130	0		3	50130	2.43	0	50130
Judas	7-Jun-97	182327	19951	202		3/7	20153	2.43	0	20153
Judas	11-Jun-97	182553	25146	0		11	25146	2.43	0	25146
McClintock	11-Jun-97	182551	25399	0		3	25399	2.27	0	25399
McClintock	11-Jun-97	182552	24792	251		3	25043		0	25043
[illegible]										
Michie	12-Jun-98	184122	49243	1004	0.02	5	50247	2.84	0	50247
Michie	12-Jun-98	184121	49197	1004	0.02	5	50201	2.81	0	50201
Byng	12-Jun-98	183160	24518	1022	0.04	5	25540	3.00	0	25540
McClintock	12-Jun-98	184043	49810	503	0.01	5	50313	2.76	0	50313
Judas	13-Jun-98	025417	19018	1432	0.07	5	20450	2.55	0	20450
Judas	12-Jun-98	183159	25331	256	0.01	5	25587	2.60	0	25587
Wolf	6-Jun-98	021958	10104	421	0.04	5	10525	1.95	0	10525
Wolf	4-Jun-98	024606	34813	710	0.02	5	35523	2.63	0	35523
[illegible]										
Michie	1999			80393					0	80393
Byng	1999			64430					0	64430
McClintock	1999			64169					0	64169
Wolf	1999			31048					0	31048
[illegible]										

a: Tag loss measured over 5 days unless indicated otherwise.
b: unknown period.
c: usually corresponds to "tagged" category on MRP release forms
Non-CWT groups not recorded, 1985-1986.
CWT Data recorded from CWT release sheets 1989-94.
CWT Data prior to 1987 not verified against SEP records.
* release year = brood year + 1

Table 7. Summary of Releases of Chinook Salmon from Yukon Territory In-stream Incubation/Rearing Sites 1991-1999

PROJECT	SPECIES	BROOD YEAR	STOCK	MARK	STAGE	RELEASE SITE	START DATE	END DATE	# TAGGED	# AD ONLY	# UN-MARKED	TOTAL REL.	WT. (GM)
Klondike R, Nor	Chinook	1990	Tatchun R	0201010212	Spring Fry	Tatchun R	91/06/28	91/06/28	13593	21	650	14264	0 74
Klondike R, Nor	Chinook	1990	Tatchun R	0201010209	Spring Fry	Tatchun R	91/06/28	91/06/28	15247	173	750	16170	0 74
ndike R, Nor	Chinook	1991	Tatchun R	180645	Spring Fry	Tatchun R	/ /	92/08/31	11734	0	817	12551	2 47
ndike R, Nor	Chinook	1991	Tatchun R	023356	Spring Fry	Tatchun R	/ /	92/08/31	6453	0	852	7305	2 47
Klondike R, Nor	Chinook	1991	Tatchun R	180644	Spring Fry	Tatchun R	/ /	92/08/31	11585	0	320	11905	2 47
Klondike R, Nor	Chinook	1991	Yukon R	NOCN9148	Spring Fry	Pothole Lk	92/06/	92/06/	0	0	1500	1500	0
Klondike R, Nor	Chinook	1993	Klondike R Nor	0201010503	Spring Fry	Klondike R Nor	94/06/30	94/06/30	6174	10	54	6238	0 88
Klondike R, Nor	Chinook	1993	Tatchun R	0201010407	Spring Fry	Tatchun R	94/06/30	94/06/30	12077	246	71	12394	0 99
Klondike R, Nor	Chinook	1993	Tatchun R	0201010505	Spring Fry	Tatchun R	94/06/30	94/06/30	9982	0	61	10043	0.99
Klondike R, Nor	Chinook	1994	Klondike R Nor	0201010603	Spring Fry	Klondike R Nor	95/07/04	95/07/04	2159	11	190	2360	0 75
Klondike R, Nor	Chinook	1994	Klondike R Nor	0201010602	Spring Fry	Klondike R Nor	95/07/04	95/07/04	1809	16	56	1881	0 75
Klondike R, Nor	Chinook	1994	Tatchun R	0201010511	Spring Fry	Tatchun R	95/07/04	95/07/04	12431	100	686	13217	0.81
Klondike R, Nor	Chinook	1994	Tatchun R	0201010515	Spring Fry	Tatchun R	95/07/04	95/07/04	2490	33	177	2700	0.81
Klondike R, Nor	Chinook	1994	Tatchun R	0201010601	Spring Fry	Tatchun R	95/07/04	95/07/04	1476	19	155	1650	0 81
Klondike R, Nor	Chinook	1994	Tatchun R	0201010513	Spring Fry	Tatchun R	95/07/04	95/07/04	11649	238	413	12300	0 81
Klondike R, Nor	Chinook	1995	Klondike R Nor	0201010408	Spring Fry	Klondike R Nor	96/06/22	96/06/22	11423	1707	0	13130	0 76
Mayo River	Chinook	1991	Mayo R	NOCN9147	Spring Fry	Mayo R	92/06/	92/06/	0	0	13000	13000	0
Mayo River	Chinook	1992	Mayo R	NOCN9292	Spring Fry	Mayo R	93/07/	93/07/	0	0	500	500	0
McIntyre Cr	Chinook	1990	Takhini R	023355	Fall Fry 5-8 gm	Takhini R	91/09/13	91/09/13	7967	80	39	8086	3.2
McIntyre Cr	Chinook	1990	Takhini R	023354	Fall Fry 5-8 gm	Takhini R	91/09/13	91/09/13	10789	109	101	10999	3.2
McIntyre Cr	Chinook	1991	Takhini R	0201010308	Spring Fry	Flat Cr	/ /	92/07/04	12141	143	3425	15709	0.98
McIntyre Cr	Chinook	1991	Takhini R	0201010309	Spring Fry	Flat Cr	/ /	92/07/04	13102	466	1398	14966	0.98
McIntyre Cr	Chinook	1991	Takhini R	0201010310	Spring Fry	Flat Cr	/ /	92/07/04	4955	261	601	5817	0.98
McIntyre Cr	Chinook	1992	Klondike R Nor	0201010404	Spring Fry	Klondike R Nor	93/07/01	93/07/01	12832	240	144	13216	1.14
McIntyre Cr	Chinook	1992	Klondike R Nor	0201010405	Spring Fry	Klondike R Nor	93/07/01	93/07/01	7546	256	167	7969	1 14
McIntyre Cr	Chinook	1992	Takhini R	023424	Spring Fry	Flat Cr	93/08/17	93/08/17	9532	823	95	10450	2.71
McIntyre Cr	Chinook	1992	Takhini R	023423	Spring Fry	Flat Cr	93/08/17	93/08/17	9822	850	218	10890	2.71
McIntyre Cr	Chinook	1992	Takhini R	181454	Spring Fry	Flat Cr	93/08/17	93/08/17	10925	567	227	11719	2 71
McIntyre Cr	Chinook	1992	Takhini R	181453	Spring Fry	Flat Cr	93/08/17	93/08/17	10658	865	226	11749	2 71
McIntyre Cr	Chinook	1992	Takhini R	020217	Spring Fry	Flat Cr	93/08/17	93/08/17	2291	114	37	2442	2 71
McIntyre Cr	Chinook	1992	Takhini R	023422	Spring Fry	Flat Cr	93/08/17	93/08/17	10355	314	40	10709	2 71
Intyre Cr	Chinook	1992	Tatchun R	0201010402	Spring Fry	Tatchun R	93/06/17	93/06/17	4654	633	335	5622	0 76
Intyre Cr	Chinook	1993	Takhini R	181751	Spring Fry	Flat Cr	94/08/26	94/08/31	7410	46	222	7678	2 6
McIntyre Cr	Chinook	1993	Takhini R	181750	Spring Fry	Flat Cr	94/08/26	94/08/31	11227	40	87	11354	2 6
McIntyre Cr	Chinook	1993	Takhini R	181749	Spring Fry	Flat Cr	94/08/26	94/08/31	11071	159	142	11372	2 6
McIntyre Cr	Chinook	1993	Takhini R	181748	Spring Fry	Flat Cr	94/08/26	94/08/31	11375	0	104	11479	2 6
McIntyre Cr	Chinook	1993	Takhini R	181752	Spring Fry	Flat Cr	94/08/26	94/08/31	10668	21	198	10887	2 6
McIntyre Cr	Chinook	1993	Takhini R	020216	Spring Fry	Takhini R	94/08/30	94/08/30	9343	271	36	9650	2 8
McIntyre Cr	Chinook	1993	Takhini R	020163	Spring Fry	Takhini R	94/08/30	94/08/30	10899	222	62	11183	2 8
McIntyre Cr	Chinook	1994	Takhini R	0201010415	Spring Fry	Takhini R	95/08/14	95/08/14	9887	0	410	10297	2 2
McIntyre Cr	Chinook	1994	Takhini R	0201010413	Spring Fry	Takhini R	95/08/14	95/08/14	14452	0	365	14817	2 2
McIntyre Cr	Chinook	1994	Takhini R	0201010412	Spring Fry	Flat Cr	95/08/14	95/08/14	14193	59	281	14533	2 2
McIntyre Cr	Chinook	1994	Takhini R	0201010414	Spring Fry	Flat Cr	95/08/14	95/08/14	13586	130	295	14011	2 2
McIntyre Cr	Chinook	1995	Takhini R	0201010508	Spring Fry	Takhini R	96/08/12	96/08/12	15731	251	496	16478	2 1
McIntyre Cr	Chinook	1995	Takhini R	0201010509	Spring Fry	Takhini R	96/08/12	96/08/12	8085	41	293	8419	2.1
McIntyre Cr	Chinook	1995	Takhini R	0201010510	Spring Fry	Flat Cr	96/08/07	96/08/07	10727	65	170	10962	2.01
McIntyre Cr	Chinook	1995	Tatchun R	0201010210	Spring Fry	Tatchun R	96/06/27	96/06/27	14530	49	62	14641	0.81
McIntyre Cr	Chinook	1995	Tatchun R	0201010211	Spring Fry	Tatchun R	96/06/27	96/06/27	13526	91	294	13911	0.81
McIntyre Cr	Chinook	1996	Takhini R	0201010614	Spring Fry	Flat Cr	97/07/02	97/07/04	15622	158	382	16162	0 8
McIntyre Cr	Chinook	1996	Takhini R	0201010406	Spring Fry	Flat Cr	97/07/02	97/07/04	14845	37	280	15162	0 8
McIntyre Cr	Chinook	1996	Tatchun R	0201010703	Spring Fry	Tatchun R	97/06/27	97/06/27	1521	15	148	1684	1
McIntyre Cr	Chinook	1997	Tatchun R	0201010608	Spring Fry	Tatchun R	98/06/19	98/06/19	9284	150	74	9508	1 1
McIntyre Cr	Chinook	1997	Tatchun R	0201010609	Spring Fry	Tatchun R	98/06/19	98/06/19	10318	211	188	10717	1 1
McIntyre Cr	Chinook	1997	Tatchun R	0201010702	Spring Fry	Tatchun R	98/06/19	98/06/19	2536	52	0	2588	1 1
McIntyre Cr	Chinook	1997	Takhini R	0201010709	Spring Fry	Flat Cr	98/06/22	98/06/22	11374	115	115	11604	1.1
McIntyre Cr	Chinook	1997	Takhini R	0201010611	Spring Fry	Takhini R	98/06/23	98/06/23	12933	334	118	13385	1 1
McIntyre Cr	Chinook	1997	Takhini R	0201010610	Spring Fry	Takhini R	98/06/23	98/06/23	12186	37	115	12338	1 1
McIntyre Cr	Chinook	1997	Takhini R	0201010708	Spring Fry	Takhini R	98/06/23	98/06/23	12341	253	148	12742	1 1
TOTAL 1991-1998									547521	11102	32390	591013	
TOTAL 1998									70972	1152	758	72882	

ATTACHMENT I

HISTORICAL YUKON RIVER SALMON CATCH AND ESCAPEMENT DATABASE

Attachment Table 1. Alaskan and Canadian total utilization of Yukon River chinook, chum, and coho salmon, 1903-1999.

	Alaska [a,b]			Canada [c]			Total		
Year	Chinook	Other Salmon	Total	Chinook	Other Salmon	Total	Chinook	Other Salmon	Total
1903				4,666		4,666	4,666		4,666
1904									
1905									
1906									
1907									
1908				7,000		7,000	7,000		7,000
1909				9,238		9,238	9,238		9,238
1910									
1911									
1912									
1913				12,133		12,133	12,133		12,133
1914				12,573		12,573	12,573		12,573
1915				10,466		10,466	10,466		10,466
1916				9,566		9,566	9,566		9,566
1917									
1918	12,239	1,500,065	1,512,304	7,066		7,066	19,305	1,500,065	1,519,370
1919	104,822	738,790	843,612	1,800		1,800	106,622	738,790	845,412
1920	78,467	1,015,655	1,094,122	12,000		12,000	90,467	1,015,655	1,106,122
1921	69,646	112,098	181,744	10,840		10,840	80,486	112,098	192,584
1922	31,825	330,000	361,825	2,420		2,420	34,245	330,000	364,245
1923	30,893	435,000	465,893	1,833		1,833	32,726	435,000	467,726
1924	27,375	1,130,000	1,157,375	4,560		4,560	31,935	1,130,000	1,161,935
1925	15,000	259,000	274,000	3,900		3,900	18,900	259,000	277,900
1926	20,500	555,000	575,500	4,373		4,373	24,873	555,000	579,873
1927		520,000	520,000	5,366		5,366	5,366	520,000	525,366
1928		670,000	670,000	5,733		5,733	5,733	670,000	675,733
1929		537,000	537,000	5,226		5,226	5,226	537,000	542,226
1930		633,000	633,000	3,660		3,660	3,660	633,000	636,660
1931	26,693	565,000	591,693	3,473		3,473	30,166	565,000	595,166
1932	27,899	1,092,000	1,119,899	4,200		4,200	32,099	1,092,000	1,124,099
1933	28,779	603,000	631,779	3,333		3,333	32,112	603,000	635,112
1934	23,365	474,000	497,365	2,000		2,000	25,365	474,000	499,365
1935	27,665	537,000	564,665	3,466		3,466	31,131	537,000	568,131
1936	43,713	560,000	603,713	3,400		3,400	47,113	560,000	607,113
1937	12,154	346,000	358,154	3,746		3,746	15,900	346,000	361,900
1938	32,971	340,450	373,421	860		860	33,831	340,450	374,281
1939	28,037	327,650	355,687	720		720	28,757	327,650	356,407
1940	32,453	1,029,000	1,061,453	1,153		1,153	33,606	1,029,000	1,062,606
1941	47,608	438,000	485,608	2,806		2,806	50,414	438,000	488,414
1942	22,487	197,000	219,487	713		713	23,200	197,000	220,200
1943	27,650	200,000	227,650	609		609	28,259	200,000	228,259
1944	14,232		14,232	986		986	15,218		15,218
1945	19,727		19,727	1,333		1,333	21,060		21,060
1946	22,782		22,782	353		353	23,135		23,135
1947	54,026		54,026	120		120	54,146		54,146
1948	33,842		33,842				33,842		33,842
1949	36,379		36,379				36,379		36,379
1950	41,808		41,808				41,808		41,808
1951	56,278		56,278				56,278		56,278
1952	38,637	10,868	49,505				38,637	10,868	49,505
1953	58,859	385,977	444,836				58,859	385,977	444,836
1954	64,545	14,375	78,920				64,545	14,375	78,920
1955	55,925		55,925				55,925		55,925
1956	62,208	10,743	72,951				62,208	10,743	72,951
1957	63,623		63,623				63,623		63,623
1958	75,625	337,500	413,125	11,000	1,500	12,500	86,625	339,000	425,625
1959	78,370		78,370	8,434	3,098	11,532	86,804	3,098	89,902
1960	67,597		67,597	9,653	15,608	25,261	77,250	15,608	92,858

continued

Attachment Table 1. (page 2 of 2).

Year	Alaska [a,b]			Canada [c]			Total		
	Chinook	Other Salmon	Total	Chinook	Other Salmon	Total	Chinook	Other Salmon	Total
1961	141,152	461,597	602,749	13,246	9,076	22,322	154,398	470,673	625,071
1962	105,844	434,663	540,507	13,937	9,436	23,373	119,781	444,099	563,880
1963	141,910	429,396	571,306	10,077	27,696	37,773	151,987	457,092	609,079
1964	109,818	504,420	614,238	7,408	12,187	19,595	117,226	516,607	633,833
1965	134,706	484,587	619,293	5,380	11,789	17,169	140,086	496,376	636,462
1966	104,887	309,502	414,389	4,452	13,192	17,644	109,339	322,694	432,033
1967	146,104	352,397	498,501	5,150	16,961	22,111	151,254	369,358	520,612
1968	118,632	270,818	389,450	5,042	11,633	16,675	123,674	282,451	406,125
1969	105,027	424,399	529,426	2,624	7,776	10,400	107,651	432,175	539,826
1970	93,019	585,760	678,779	4,663	3,711	8,374	97,682	589,471	687,153
1971	136,191	547,448	683,639	6,447	16,911	23,358	142,638	564,359	706,997
1972	113,098	461,617	574,715	5,729	7,532	13,261	118,827	469,149	587,976
1973	99,670	779,158	878,828	4,522	10,135	14,657	104,192	789,293	893,485
1974	118,053	1,229,678	1,347,731	5,631	11,646	17,277	123,684	1,241,324	1,365,008
1975	76,883	1,307,037	1,383,920	6,000	20,600	26,600	82,883	1,327,637	1,410,520
1976	105,582	1,026,908	1,132,490	5,025	5,200	10,225	110,607	1,032,108	1,142,715
1977	114,494	1,090,758	1,205,252	7,527	12,479	20,006	122,021	1,103,237	1,225,258
1978	129,988	1,615,312	1,745,300	5,881	9,566	15,447	135,869	1,624,878	1,760,747
1979	159,232	1,596,133	1,755,365	10,375	22,084	32,459	169,607	1,618,217	1,787,824
1980	197,665	1,730,960	1,928,625	22,846	23,718 [d]	46,564	220,511	1,754,678	1,975,189
1981	188,477	2,097,871	2,286,348	18,109	22,781 [d]	40,890	206,586	2,120,652	2,327,238
1982	152,808	1,265,457	1,418,265	17,208	16,091 [d]	33,299	170,016	1,281,548	1,451,564
1983	198,436	1,678,597	1,877,033	18,952	29,490 [d]	48,442	217,388	1,708,087	1,925,475
1984	162,683	1,548,101	1,710,784	16,795	29,767 [d]	46,562	179,478	1,577,868	1,757,346
1985	187,327	1,657,984	1,845,311	19,301	41,515 [d]	60,816	206,628	1,699,499	1,906,127
1986	146,004	1,758,825	1,904,829	20,364	14,843 [d]	35,207	166,368	1,773,668	1,940,036
1987	188,386	1,246,176	1,434,562	17,614	44,786 [d]	62,400	206,000	1,290,962	1,496,962
1988	148,421	2,311,196	2,459,617	21,427	33,915 [d]	55,342	169,848	2,345,111	2,514,959
1989	157,606	2,281,566	2,439,172	17,944	23,490 [d]	41,434	175,550	2,305,056	2,480,606
1990	149,433	1,053,351	1,202,784	19,227	34,302 [d]	53,529	168,660	1,087,653	1,256,313
1991	154,651	1,335,111	1,489,762	20,607	35,653 [d]	56,260	175,258	1,370,764	1,546,022
1992	168,191	863,575	1,031,766	17,903	21,310 [d]	39,213	186,094	884,885	1,070,979
1993	163,078	342,871	505,949	16,611	14,150 [d]	30,761	179,689	357,021	536,710
1994	172,315	577,250	749,565	21,218	38,340	59,558	193,533	615,590	809,123
1995	177,663	1,437,837	1,615,500	20,887	46,109	66,996	198,550	1,483,946	1,682,496
1996	138,562	1,117,481	1,256,043	19,612	24,395	44,007	158,174	1,141,876	1,300,050
1997	174,625	543,484	718,109	16,528	15,878	32,406	191,153	559,362	750,515
1998	98,568	196,976	295,544	5,918 [h]	8,115	14,033	104,486	205,091	309,577
1999 [f]	69,562 [g]	51,384 [g]	120,946	12,657	19,574	32,231	82,219	70,958	153,177
Average									
1903-88	81,212	764,592	712,002	7,331	16,668	14,930	76,150	747,994	661,120
1989-98	155,469	974,950	1,130,419	17,646	26,174	43,820	173,115	1,001,124	1,174,239
1994-98	152,347	774,606	926,952	16,833	26,567	43,400	169,179	801,173	970,352

a Catch in number of salmon. Includes estimated number of salmon harvested for the commercial production of salmon roe.
b Commercial, subsistence, personal-use, and sport catches combined.
c Catch in number of salmon. Commercial, Aboriginal, domestic and sport catches combined.
d Includes the Old Crow Aboriginal fishery harvest of coho salmon.
f Data are preliminary.
g Does not include Alaskan subsistence, personal use and sport fish harvests as these harvest numbers are unavailable at this time.
h Catch includes 737 chinook salmon taken in the test fishery.

Attachment Table 2. Alaskan and Canadian total utilization of Yukon River chinook and fall chum salmon, 1961-1999.

Year	Chinook			Fall Chum		
	Canada [a]	Alaska [b,c]	Total	Canada [a]	Alaska [b,c]	Total
1961	13,246	141,152	154,398	9,076	144,233	153,309
1962	13,937	105,844	119,781	9,436	140,401	149,837
1963	10,077	141,910	151,987	27,696	99,031 [d]	126,727
1964	7,408	109,818	117,226	12,187	128,707	140,894
1965	5,380	134,706	140,086	11,789	135,600	147,389
1966	4,452	104,887	109,339	13,192	122,548	135,740
1967	5,150	146,104	151,254	16,961	107,018	123,979
1968	5,042	118,632	123,674	11,633	97,552	109,185
1969	2,624	105,027	107,651	7,776	183,373	191,149
1970	4,663	93,019	97,682	3,711	265,096	268,807
1971	6,447	136,191	142,638	16,911	246,756	263,667
1972	5,729	113,098	118,827	7,532	188,178	195,710
1973	4,522	99,670	104,192	10,135	285,760	295,895
1974	5,631	118,053	123,684	11,646	383,552	395,198
1975	6,000	76,883	82,883	20,600	361,600	382,200
1976	5,025	105,582	110,607	5,200	228,717	233,917
1977	7,527	114,494	122,021	12,479	340,757	353,236
1978	5,881	129,988	135,869	9,566	331,250	340,816
1979	10,375	159,232	169,607	22,084	593,293	615,377
1980	22,846	197,665	220,511	22,218	466,087	488,305
1981	18,109	188,477	206,586	22,281	654,976	677,257
1982	17,208	152,808	170,016	16,091	357,084	373,175
1983	18,952	198,436	217,388	29,490	495,526	525,016
1984	16,795	162,683	179,478	29,267	383,055	412,322
1985	19,301	187,327	206,628	41,265	474,216	515,481
1986	20,364	146,004	166,368	14,543	303,485	318,028
1987	17,614	188,386	206,000	44,480	361,663 [d]	406,143
1988	21,427	148,421	169,848	33,565	319,677	353,242
1989	17,944	157,606	175,550	23,020	518,157	541,177
1990	19,227	149,433	168,660	33,622	316,478	350,100
1991	20,607	154,651	175,258	35,418	403,678	439,096
1992	17,903	168,191	186,094	20,815	128,031 [g]	148,846
1993	16,611	163,078	179,689	14,090	76,925 [d]	91,015
1994	21,218	172,315	193,533	38,008	131,217	169,225
1995	20,887	177,663	198,550	45,600	415,547	461,147
1996	19,612	138,562	158,174	24,354	238,686	263,040
1997	16,528	174,625	191,153	15,580	153,612	169,192
1998	5,918 [i]	98,568	104,486	7,901	62,869	70,770
1999 [f]	12,657	69,562 [h]	82,219	19,574	20,371 [h]	39,945
Average						
1961-88	10,776	136,589	147,365	17,600	292,828	310,429
1989-98	17,646	155,469	173,115	25,841	244,520	270,361
1994-98	16,833	152,347	169,179	26,289	200,386	226,675

[a] Catches in number of salmon. Includes commercial, Aboriginal, domestic, and sport catches combined.
[b] Catch in number of salmon. Includes estimated number of salmon harvested for the commercial production of salmon roe (see Bergstrom et al. 1992: 1990 Yukon Area AMR).
[c] Commercial, subsistence, personal-use, and sport catches combined.
[d] Commercial fishery did not operate within the Alaskan portion of the drainage.
[f] Data are preliminary.
[g] Commercial fishery operated only in District 6, the Tanana River.
[h] Does not include Alaskan subsistence, personal use and sport fish harvests as these harvest numbers are unavailable at this time.
[i] Catch includes 737 chinook salmon taken in the test fishery.

Attachment Table 3. Alaskan catch of Yukon River chinook salmon, 1961-1999

Year	Estimated Subsistence Use [a]	Harvest			
		Subsistence [b]	Commercial [c]	Sport [d]	Total
1961	21,488	21,488	119,664		141,152
1962	11,110	11,110	94,734		105,844
1963	24,862	24,862	117,048		141,910
1964	16,231	16,231	93,587		109,818
1965	16,608	16,608	118,098		134,706
1966	11,572	11,572	93,315		104,887
1967	16,448	16,448	129,656		146,104
1968	12,106	12,106	106,526		118,632
1969	14,000	14,000	91,027		105,027
1970	13,874	13,874	79,145		93,019
1971	25,684	25,684	110,507		136,191
1972	20,258	20,258	92,840		113,098
1973	24,317	24,317	75,353		99,670
1974	19,964	19,964	98,089		118,053
1975	13,045	13,045	63,838		76,883
1976	17,806	17,806	87,776		105,582
1977	17,581	17,581	96,757	156	114,494
1978	30,297	30,297	99,168	523	129,988
1979	31,005	31,005	127,673	554	159,232
1980	42,724	42,724	153,985	956	197,665
1981	29,690	29,690	158,018	769	188,477
1982	28,158	28,158	123,644	1,006	152,808
1983	49,478	49,478	147,910	1,048	198,436
1984	42,428	42,428	119,904	351	162,683
1985	39,771	39,771	146,188	1,368	187,327
1986	45,238	45,238	99,970	796	146,004
1987	53,124	53,124	134,760 [f]	502	188,386
1988	46,032	46,032	101,445	944	148,421
1989	51,062	51,062	105,491	1,053	157,606
1990	51,594	51,181	97,708	544	149,433
1991	48,311	46,773	107,105	773	154,651
1992	46,553	45,626	122,134	431	168,191
1993	66,261	65,701	95,682	1,695	163,078
1994	55,266	54,563	115,471	2,281	172,315
1995	50,258	48,934	126,204	2,525	177,663
1996	43,827	43,521	91,890	3,151	138,562
1997	57,060	56,291	116,421	1,913	174,625
1998	54,171	54,090	43,699	779	98,568
1999 [g]	[h]	[h]	69,562	[h]	69,562
Average					
1961-88	26,246	26,246	110,022	748	136,589
1989-98	52,436	51,774	102,181	1,515	155,469
1994-98	52,116	51,480	98,737	2,130	152,347

[a] Includes salmon harvested for subsistence purposes, and an estimate of the number of salmon carcasses harvested for the commercial production of salmon roe and used for subsistence. These data are only available since 1990.

[b] Includes salmon harvested for subsistence and personal use.

[c] Includes ADF&G test fish sales, fish sold in the round, and estimated numbers of female salmon commercially harvested for the production of salmon roe (see Bergstrom et al. 1992: 1990 Yukon Area AMR).

[d] Sport fish harvest for the Alaskan portion of the Yukon River drainage. The majority of this harvest is believed to have been taken within the Tanana River drainage (see Schultz et al. 1993: 1992 Yukon Area AMR).

[f] Includes 653 and 2,136 chinook salmon illegally sold in District 5 and 6 (Tanana River), respectively.

[g] Data are preliminary.

[h] Data are unavailable at this time.

Attachment Table 4. Canadian catch of Yukon River chinook salmon, 1961-1999.

Year	Mainstem Yukon River Harvest							Porcupine River Aboriginal Fishery Harvest	Total Canadian Harvest
	Commercial	Domestic	Aboriginal Fishery	Sport [a]	Test Fishery	Combined Non-Commercial	Total		
1961	3,446		9,300			9,300	12,746	500	13,246
1962	4,037		9,300			9,300	13,337	600	13,937
1963	2,283		7,750			7,750	10,033	44	10,077
1964	3,208		4,124			4,124	7,332	76	7,408
1965	2,265		3,021			3,021	5,286	94	5,380
1966	1,942		2,445			2,445	4,387	65	4,452
1967	2,187		2,920			2,920	5,107	43	5,150
1968	2,212		2,800			2,800	5,012	30	5,042
1969	1,640		957			957	2,597	27	2,624
1970	2,611		2,044			2,044	4,655	8	4,663
1971	3,178		3,260			3,260	6,438	9	6,447
1972	1,769		3,960			3,960	5,729		5,729
1973	2,199		2,319			2,319	4,518	4	4,522
1974	1,808	406	3,342			3,748	5,556	75	5,631
1975	3,000	400	2,500			2,900	5,900	100	6,000
1976	3,500	500	1,000			1,500	5,000	25	5,025
1977	4,720	531	2,247			2,778	7,498	29	7,527
1978	2,975	421	2,485			2,906	5,881		5,881
1979	6,175	1,200	3,000			4,200	10,375		10,375
1980	9,500	3,500	7,546	300		11,346	20,846	2000	22,846
1981	8,593	237	8,879	300		9,416	18,009	100	18,109
1982	8,640	435	7,433	300		8,168	16,808	400	17,208
1983	13,027	400	5,025	300		5,725	18,752	200	18,952
1984	9,885	260	5,850	300		6,410	16,295	500	16,795
1985	12,573	478	5,800	300		6,578	19,151	150	19,301
1986	10,797	342	8,625	300		9,267	20,064	300	20,364
1987	10,864	330	6,069	300		6,699	17,563	51	17,614
1988	13,217	282	7,178	650		8,110	21,327	100	21,427
1989	9,789	400	6,930	300		7,630	17,419	525	17,944
1990	11,324	247	7,109	300		7,656	18,980	247	19,227
1991	10,906	227	9,011	300		9,538	20,444	163	20,607
1992	10,877	277	6,349	300		6,926	17,803	100	17,903
1993	10,350	243	5,576	300		6,119	16,469	142	16,611
1994	12,028	373	8,089	300		8,762	20,790	428	21,218
1995	11,146	300	7,945	700		8,945	20,091	796	20,887
1996	10,164	141	8,451	790		9,382	19,546	66	19,612
1997	5,311	288	8,888	1,230		10,406	15,717	811	16,528
1998	390	24	4,668	0	737	5,429	5,819	99	5,918
1999 [b]	3,140	213	8,804	500		9,517	12,657		12,657
1961-88	5,438	648	4,685	339		5,141	10,579	221	10,776
1989-98	9,229	252	7,302	452		8,079	17,308	338	17,646
1994-98	7,808	225	7,608	604		8,585	16,393	440	16,833

[a] Sport fish harvest unknown prior to 1980.

[b] Data are preliminary.

Attachment Table 5. Alaskan catch of Yukon River summer chum salmon, 1961-1999

Year	Estimated Subsistence Use [a]	Harvest			
		Subsistence [b]	Commercial [c]	Sport [d]	Total
1961	305,317 [f]	305,317 [f]	0		305,317
1962	261,856 [f]	261,856 [f]	0		261,856
1963	297,094 [f]	297,094 [f]	0		297,094
1964	361,080 [f]	361,080 [f]	0		361,080
1965	336,848 [f]	336,848 [f]	0		336,848
1966	154,508 [f]	154,508 [f]	0		154,508
1967	206,233 [f]	206,233 [f]	10,935		217,168
1968	133,880 [f]	133,880 [f]	14,470		148,350
1969	156,191 [f]	156,191 [f]	61,966		218,157
1970	166,504 [f]	166,504 [f]	137,006		303,510
1971	171,487 [f]	171,487 [f]	100,090		271,577
1972	108,006 [f]	108,006 [f]	135,668		243,674
1973	161,012 [f]	161,012 [f]	285,509		446,521
1974	227,811 [f]	227,811 [f]	589,892		817,703
1975	211,888 [f]	211,888 [f]	710,295		922,183
1976	186,872 [f]	186,872 [f]	600,894		787,766
1977	159,502	159,502	534,875	316	694,693
1978	197,144	171,383	1,077,987	451	1,249,821
1979	196,187	155,970	819,533	328	975,831
1980	272,398	167,705	1,067,715	483	1,235,903
1981	208,284	117,629	1,279,701	612	1,397,942
1982	260,969	117,413	717,013	780	835,206
1983	240,386	149,180	995,469	998	1,145,647
1984	230,747	166,630	866,040	585	1,033,255
1985	264,828	157,744	934,013	1,267	1,093,024
1986	290,825	182,337	1,188,850	895	1,372,082
1987	275,914	174,940	622,541	846	798,327
1988	311,724	198,806	1,620,269	1,037	1,820,112
1989	249,582	169,046	1,463,345	2,131	1,634,522
1990	201,839 [g]	117,436	525,440	472	643,348
1991	275,673 [g]	118,540	662,036	1,037	781,613
1992	261,448 [g]	125,497	545,544	1,308	672,349
1993	139,541 [g]	106,728	141,985	564	249,277
1994	245,973 [g]	132,510	261,953	350	394,813
1995	221,308 [g]	119,503	824,487	1,174	945,164
1996	248,856 [g]	103,408	684,083	1,854	789,345
1997	177,506	97,500	230,842	475	328,817
1998	86,275	86,088	28,798	488	115,374
1999 [h]	[j]	[j]	29,412	[j]	29,412
Average					
1961-88	226,982	191,637	513,240	717	705,184
1989-98	210,800	117,626	536,851	985	655,462
1994-98	195,984	107,802	406,033	868	514,703

a Includes salmon harvested for subsistence purposes, and an estimate of the number of salmon carcasses harvested for the commercial production of salmon roe and used for subsistence. These data are only available since 1990.

b Includes salmon harvested for subsistence and personal use.

c Includes ADF&G test fish sales, fish sold in the round, and estimated numbers of female salmon commercially harvested for the production of salmon roe (see Bergstrom et al. 1992: 1990 Yukon Area AMR).

d Includes both summer and fall chum salmon sport fish harvest within the Alaskan portion of the Yukon River drainage. The majority of this harvest is believed to have been taken within the Tanana River drainage.

f Catches estimated because catches of species other than chinook salmon were not differentiated.

g Subsistence harvest, summer chum salmon commercially harvested for the production of salmon roe in District 5 and 6, and the estimated subsistence use of commercially-harvested summer chum salmon in District 4.

h Data are preliminary.

j Data are unavailable at this time.

Attachment Table 6. Alaskan catch of Yukon River fall chum salmon, 1961-1999.

Year	Estimated Subsistence Use [a]	Harvest		
		Subsistence [b]	Commercial [c]	Total [d]
1961	101,772 [f,g]	101,772 [f]	42,461	144,233
1962	87,285 [f,g]	87,285 [f]	53,116	140,401
1963	99,031 [f,g]	99,031 [f]	0	99,031
1964	120,360 [f,g]	120,360 [f]	8,347	128,707
1965	112,283 [f,g]	112,283 [f]	23,317	135,600
1966	51,503 [f,g]	51,503 [f]	71,045	122,548
1967	68,744 [f,g]	68,744 [f]	38,274	107,018
1968	44,627 [f,g]	44,627 [f]	52,925	97,552
1969	52,063 [f,g]	52,063 [f]	131,310	183,373
1970	55,501 [f,g]	55,501 [f]	209,595	265,096
1971	57,162 [f,g]	57,162 [f]	189,594	246,756
1972	36,002 [f,g]	36,002 [f]	152,176	188,178
1973	53,670 [f,g]	53,670 [f]	232,090	285,760
1974	93,776 [f,g]	93,776 [f]	289,776	383,552
1975	86,591 [f,g]	86,591 [f]	275,009	361,600
1976	72,327 [f,g]	72,327 [f]	156,390	228,717
1977	82,771 [g]	82,771 [g]	257,986	340,757
1978	94,867 [g]	84,239 [g]	247,011	331,250
1979	233,347	214,881	378,412	593,293
1980	172,657	167,637	298,450	466,087
1981	188,525	177,240	477,736	654,976
1982	132,897	132,092	224,992	357,084
1983	192,928	187,864	307,662	495,526
1984	174,823	172,495	210,560	383,055
1985	206,472	203,947	270,269	474,216
1986	164,043	163,466	140,019	303,485
1987	361,663	361,663 [h]	0	361,663
1988	158,694	155,467	164,210	319,677
1989	230,978	216,229	301,928	518,157
1990	185,244	173,076	143,402	316,478
1991	168,890	145,524	258,154	403,678
1992	110,903	107,602	20,429 [k]	128,031
1993	76,925	76,925	0	76,925
1994	127,586	123,218	7,999	131,217
1995	163,693	131,369	284,178	415,547
1996	146,154	129,251	109,435	238,686
1997	96,899	95,425	58,187	153,612
1998	62,869	62,869	0	62,869
1999 [j]	[m]	[m]	20,371 [m]	20,371 [j]
Average				
1961-88	119,871	117,731	175,098	292,828
1989-98	137,014	126,149	118,371	244,520
1994-98	119,440	108,426	91,960	200,386

[a] Includes salmon harvested for subsistence purposes, and an estimate of the number of salmon carcasses harvested for the commercial production of salmon roe and used for subsistence. These data are only available since 1990.

[b] Includes salmon harvested for subsistence and personal use.

[c] Includes ADF&G test fish sales, fish sold in the round, and estimated numbers of female salmon commercially harvested for production of salmon roe (see Bergstrom et al. 1992: 1990 Yukon Area AMR).

[d] Does not include sport-fish harvest. The majority of the sport-fish harvest is believed to be taken in the Tanana River drainage. Sport fish division does not differentiate between the two races of chum salmon. However, the majority of this harvest is believed to be summer chum salmon.

[f] Catches estimated because catches of species other than chinook salmon were not differentiated.

[g] Minimum estimates because surveys were conducted prior to the end of the fishing season.

[h] Includes an estimated 95,768 and 119,168 fall chum salmon illegally sold in Districts 5 and 6 (Tanana River), respectively.

[j] Data are preliminary.

[k] Commercial fishery operated only in District 6, the Tanana River.

[m] Data are unavailable at this time.

Attachment Table 7. Canadian catch of Yukon River fall chum salmon, 1961-1999.

Year	Mainstem Yukon River Harvest					Porcupine River Aboriginal Fishery Harvest	Total Canadian Harvest
	Commercial	Domestic	Aboriginal Fishery	Combined Non-Commercial	Total		
1961	3,276		3,800	3,800	7,076	2,000	9,076
1962	936		6,500	6,500	7,436	2,000	9,436
1963	2,196		5,500	5,500	7,696	20,000	27,696
1964	1,929		4,200	4,200	6,129	6,058	12,187
1965	2,071		2,183	2,183	4,254	7,535	11,789
1966	3,157		1,430	1,430	4,587	8,605	13,192
1967	3,343		1,850	1,850	5,193	11,768	16,961
1968	453		1,180	1,180	1,633	10,000	11,633
1969	2,279		2,120	2,120	4,399	3,377	7,776
1970	2,479		612	612	3,091	620	3,711
1971	1,761		150	150	1,911	15,000	16,911
1972	2,532			0	2,532	5,000	7,532
1973	2,806		1,129	1,129	3,935	6,200	10,135
1974	2,544	466	1,636	2,102	4,646	7,000	11,646
1975	2,500	4,600	2,500	7,100	9,600	11,000	20,600
1976	1,000	1,000	100	1,100	2,100	3,100	5,200
1977	3,990	1,499	1,430	2,929	6,919	5,560	12,479
1978	3,356	728	482	1,210	4,566	5,000	9,566
1979	9,084	2,000	11,000	13,000	22,084		22,084
1980	9,000	4,000	3,218	7,218	16,218	6,000	22,218
1981	15,260	1,611	2,410	4,021	19,281	3,000	22,281
1982	11,312	683	3,096	3,779	15,091	1,000	16,091
1983	25,990	300	1,200	1,500	27,490	2,000	29,490
1984	22,932	535	1,800	2,335	25,267	4,000	29,267
1985	35,746	279	1,740	2,019	37,765	3,500	41,265
1986	11,464	222	2,200	2,422	13,886	657	14,543
1987	40,591	132	3,622	3,754	44,345	135	44,480
1988	30,263	349	1,882	2,231	32,494	1,071	33,565
1989	17,549	100	2,462	2,562	20,111	2,909	23,020
1990	27,537	0	3,675	3,675	31,212	2,410	33,622
1991	31,404	0	2,438	2,438	33,842	1,576	35,418
1992	18,576	0	304	304	18,880	1,935	20,815
1993	7,762	0	4,660	4,660	12,422	1,668	14,090
1994	30,035	0	5,319	5,319	35,354	2,654	38,008
1995	39,012	0	1,099	1,099	40,111	5,489	45,600
1996	20,069	0	1,260	1,260	21,329	3,025	24,354
1997	8,068	0	1,218	1,218	9,286	6,294	15,580
1998	0	0	1,742	1,742	1,742	6,159	7,901
1999 [a]	10,402	0	3,172	3,172	13,574	6,000	19,574
Average							
1961-88	9,080	1,227	2,554	3,121	12,201	5,599	17,600
1989-98	20,001	10	2,418	2,428	22,429	3,412	25,841
1994-98	19,437	0	2,128	2,128	21,564	4,724	26,289

[a] Data are preliminary.

Attachment Table 8. Alaskan catch of Yukon River coho salmon, 1961-1999.

Year	Estimated Subsistence Use [a]	Harvest			
		Subsistence [b]	Commercia [c]	Sport [d]	Total
1961	9,192 [f,g]	9,192 [f,g]	2,855		12,047
1962	9,480 [f,g]	9,480 [f,g]	22,926		32,406
1963	27,699 [f,g]	27,699 [f,g]	5,572		33,271
1964	12,187 [f,g]	12,187 [f,g]	2,446		14,633
1965	11,789 [f,g]	11,789 [f,g]	350		12,139
1966	13,192 [f,g]	13,192 [f,g]	19,254		32,446
1967	17,164 [f,g]	17,164 [f,g]	11,047		28,211
1968	11,613 [f,g]	11,613 [f,g]	13,303		24,916
1969	7,776 [f,g]	7,776 [f,g]	15,093		22,869
1970	3,966 [f,g]	3,966 [f,g]	13,188		17,154
1971	16,912 [f,g]	16,912 [f,g]	12,203		29,115
1972	7,532 [f,g]	7,532 [f,g]	22,233		29,765
1973	10,236 [f,g]	10,236 [f,g]	36,641		46,877
1974	11,646 [f,g]	11,646 [f,g]	16,777		28,423
1975	20,708 [f,g]	20,708 [f,g]	2,546		23,254
1976	5,241 [f,g]	5,241 [f,g]	5,184		10,425
1977	16,333 [g]	16,333 [g]	38,863	112	55,308
1978	7,787 [g]	7,787 [g]	26,152	302	34,241
1979	9,794	9,794	17,165	50	27,009
1980	20,158	20,158	8,745	67	28,970
1981	21,228	21,228	23,680	45	44,953
1982	35,894	35,894	37,176	97	73,167
1983	23,905	23,905	13,320	199	37,424
1984	49,020	49,020	81,940	831	131,791
1985	32,264	32,264	57,672	808	90,744
1986	34,468	34,468	47,255	1,535	83,258
1987	84,894	84,894 [h]	0	1,292	86,186
1988	69,080	69,080	99,907	2,420	171,407
1989	41,583	41,583	85,493	1,811	128,887
1990	47,896	44,641	46,937	1,947	93,525
1991	40,894	37,388	109,657	2,775	149,820
1992	53,344	51,921	9,608 [k]	1,666	63,195
1993	15,772	15,772	0	897	16,669
1994	48,926	44,594	4,452	2,174	51,220
1995	29,716	28,642	47,206	1,278	77,126
1996	33,651	30,510	57,352	1,588	89,450
1997	24,295	24,295	35,320	1,440	61,055
1998	17,781	17,781	1	951	18,733
1999 [j]	[m]	[m]	1,601	[m]	1,601
Average					
1961-88	21,470	21,470	23,339	647	45,086
1989-98	35,386	33,713	39,603	1,653	74,968
1994-98	30,874	29,164	28,866	1,486	59,517

[a] Includes salmon harvested for subsistence purposes, and an estimate of the number of salmon carcasses harvested for the commercial production of salmon roe and used for subsistence. These data are only available since 1990.

[b] Includes salmon harvested for subsistence and personal use.

[c] Includes ADF&G test fish sales, fish sold in the round, and estimated numbers of female salmon commercially harvested for the production of salmon roe (see Bergstrom et al. 1992: 1990 Yukon Area AMR).

[d] Sport fish harvest for the Alaskan portion of the Yukon River drainage. The majority of this harvest is believed to have been taken within the Tanana River drainage (see Schultz et al. 1993: 1992 Yukon Area AMR).

[f] Catches estimated because catches of species other than chinook were not differentiated.

[g] Minimum estimates because surveys were conducted prior to the end of the fishing season.

[h] Includes an estimated 5,015 and 31,276 coho salmon illegally sold in Districts 5 and 6 (Tanana River), respectively.

[j] Data are preliminary.

[k] Commercial fishery operated only in District 6, the Tanana River.

[m] Data are unavailable at this time.

Attachment Table 9. Chinook salmon escapement counts for selected spawning areas in the Alaskan portion of the Yukon River drainage, 1961-1999. [a]

	Andreafsky River			Anvik River		Nulato River			Gisasa River		Chena River			Salcha River		
	East Fork		West Fork	River	Index Area	North Fork	South Fork	Mainstem			River		Index Area	River		Index Area
Year	Aerial	Tower or Weir	Aerial	Aerial [b]	Aerial [b]	Aerial [c]	Aerial	Tower	Aerial	Weir	Population Estimate [m]	Aerial	Aerial [d]	Population Estimate [m]	Aerial	Aerial [f]
1961	1,003			1,226		376	167		266 [g]						2,878	
1962	675 [g]		762 [g]									61 [g,h]			937	
1963												137 [g]				
1964	867		705												450	
1965			344 [g]	650 [g]											408	
1966	361		303	638											800	
1967			276 [g]	336 [g]												
1968	380		383	310 [g]											739	
1969	274 [g]		231 [g]	296 [g]											461 [g]	
1970	665		574 [g]	368								6 [g]			1,882	
1971	1,904		1,682									193 [g,h]			158 [g]	
1972	798		582 [g]	1,198								138 [g,h]			1,193	1,034
1973	825		788	613								21 [g]			391	352 [j]
1974			285	471 [g]		55	23 [g]		161			1,016 [h]	959 [h]		1,857	1,620
1975	993		301	730		123	81		385			316 [h]	262 [h]		1,055	950 [j]
1976	818		643	1,053		471	177		332			531	496		1,641	1,473
1977	2,008		1,499	1,371		286	201		255			563			1,202	1,052
1978	2,487		1,062	1,324		498	422		45 [g]			1,726			3,499	3,258
1979	1,180		1,134	1,484		1,093	414		484			1,159 [g]			4,789	4,310 [j]
1980	958 [g]		1,500	1,330	1,192	954	369 [g]		951			2,541			6,757	6,126
1981	2,146 [g]		231 [g]	807 [g]	577 [g]		791					600 [g]			1,237	1,121
1982	1,274		851						421			2,073			2,534	2,346
1983				653 [g]	376 [g]	526	480		572			2,553	2,336		1,961	1,803
1984	1,573 [g]		1,993	641 [g]	574 [g]							501	494		1,031	906
1985	1,617		2,248	1,051	720	1,600	1,180		735			2,553	2,262		2,035	1,860
1986	1,954	1,530 [k]	3,158	1,118	918	1,452	1,522		1,346		9,065	2,031	1,935		3,368	3,031 [j]
1987	1,608	2,011 [k]	3,281	1,174	879	1,145	493		731		6,404	1,312	1,209	4,771	1,898	1,671
1988	1,020	1,339 [k]	1,448	1,805	1,449	1,061	714		797		3,346	1,966	1,760	4,562	2,761	2,553
1989	1,399		1,089	442 [g]	212 [g]						2,666	1,280	1,185	3,294	2,333	2,136
1990	2,503		1,545	2,347	1,595	568	430 [g,n]		884 [g]		5,603	1,436	1,402	10,728	3,744	3,429
1991	1,938		2,544	875 [g]	625 [g]	767	1,253		1,690		3,025	1,277 [g]	1,277 [g]	5,608	2,212 [g]	1,925 [g]
1992	1,030 [g]		2,002 [g]	1,536	931	348	231		910		5,230	825 [g]	799 [g]	7,862	1,484 [g]	1,436 [g]
1993	5,855		2,765	1,720	1,526	1,844	1,181		1,573		12,241 [k]	2,943	2,660	10,007 [k]	3,636	3,562
1994	300	7,801 [p,r]	213 [g]		913 [g]	843	952	1,795 [r]	2,775	2,888 [r]	11,877 [k]	1,570	1,570	18,399 [k]	11,823	11,189
1995	1,635	5,841 [p]	1,108	1,996	1,147	968	681	1,412	410	4,023	9,680	3,575	3,039	13,643 [k]	3,978	3,734
1996		2,955 [p]	624	839	709		100 [n]	756		1,952	6,833	2,233	2,112	7,958	4,866	4,800
1997	1,140	3,186 [p]	1,510	3,979	2,690			4,766	144	3,764	13,390 [k]	3,495	3,303	18,396 [k]	3,457 [g]	3,457 [g]
1998	1,027	4,011 [p]	1,249 [g]	709 [g]	648 [g]	507	546	1,536	889	2,356 [v]	4,745 [k]	440 [g]	386 [g]	5,027 [k]	2,055 [g]	1,923 [g]
1999 [s]		3,347 [p]			950 [g]			1,932		2,631 [v]	6,485 [k]		2,412	9,198 [k]		3,608
E.O. [t]	>1,500		>1,400	>1,300 [u]	>500 [u]	>800	>500		>600				>1,700			>2,500

continued

[a] Aerial survey counts are peak counts only. Survey rating was fair or good unless otherwise noted.
[b] From 1961-1970, river count data are from aerial surveys of various segments of the mainstem Anvik River. From 1972-1979, counting tower operated; mainstem aerial survey counts below the tower were added to tower counts. From 1980-present, aerial survey counts for the river are best available minimal estimates for the entire Anvik River drainage. Index area counts are from the mainstem Anvik River between the Yellow River and McDonald Creek.
[c] Includes mainstem counts below the confluence of the North and South Forks, unless otherwise noted.
[d] Chena River index area for assessing the escapement objective is from Moose Creek Dam to Middle Fork River.
[f] Salcha River index area for assessing the escapement objective is from the TAPS crossing to Caribou Creek.
[g] Incomplete and/or poor survey conditions resulting in minimal or inaccurate counts.
[h] Boat survey.
[j] Data unavailable for index area. Calculated from historic (1972-91) average ration of index area counts to total river counts (0.90:1.0).
[k] Tower counts.
[m] Mark-recapture population estimate.
[n] Mainstem counts below the confluence of the North and South Forks Nulato River included in the South Fork counts.
[p] Weir counts.
[r] Incomplete count because of late installation and/or early removal of project.
[s] Data are preliminary.
[t] Interim escapement goals. Established March, 1992.
[u] Interim escapement goal for the entire Anvik River drainage is 1,300 salmon. Interim escapement objective for mainstem Anvik River between the Yellow River and McDonald Creek is 500 salmon.

Attachment Table 10. Chinook salmon escapement counts for selected spawning areas in the Canadian portion of the Yukon River drainage, 1991-1999.

Year	Tincup Creek [a]	Tatchun Creek [b]	Little Salmon River [a]	Big Salmon River [a,c]	Nisutlin River [a,d]	Ross River [a,f]	Wolf River [a,g]	Whitehorse Fishway		Canadian Mainstem		
								Count	Percent Hatchery Contribution	Border Passage Estimate	Harvest	Spawning Escapement Estimate [j]
1961								1,068	0			
1962								1,500	0			
1963								483	0			
1964								595	0			
1965								903	0			
1966		7 [k]						563	0			
1967								533	0			
1968			173 [k]	857 [k]	407 [k]	104 [k]		414	0			
1969			120	286	105			334	0			
1970		100		670	615		71 [k]	625	0			
1971		130	275	275	650		750	856	0			
1972		80	126	415	237		13	391	0			
1973		99	27 [k]	75 [k]	36 [k]			224	0			
1974		192		70 [k]	48 [k]			273	0			
1975		175		153 [k]	249		40 [k]	313	0			
1976		52		86 [k]	102			121	0			
1977		150	408	316 [k]	77			277	0			
1978		200	330	524	375			725	0			
1979		150	489 [k]	632	713		183 [k]	1,184	0			
1980		222	286 [k]	1,436	975		377	1,383	0			
1981		133	670	2,411	1,626	949	395	1,555	0			
1982		73	403	758	578	155	104	473	0	36,598	16,808	19,790
1983	100	264	101 [k]	540	701	43 [k,n]	95	905	0	47,741	18,752	28,989
1984	150	153	434	1,044	832	151 [k]	124	1,042	0	43,911	16,295	27,616
1985	210	190	255	801	409	23 [k]	110	508	0	29,881	19,151	10,730
1986	228	155	54 [k]	745	459 [k]	72 [n]	109	557	0	36,479	20,064	16,415
1987	100	159	468	891	183	180 [k]	35	327	0	30,823	17,563	13,260
1988	204	152	368	765	267	242	66	405	16	44,445	21,327	23,118
1989	88	100	862	1,662	695	433 [p]	146	549	19	42,620	17,419	25,201
1990	83	643	665	1,806	652	457 [k]	188	1,407	24	56,679	18,980	37,699
1991			326	1,040		250	201 [r]	1,266 [h]	51 [h]	41,187	20,444	20,743
1992	73	106	494	617	241	423	110 [r]	758 [h]	84 [h]	43,185	17,803	25,382
1993		183	184	572	339	400	168 [r]	668 [h]	73 [h]	45,027	16,469	28,558
1994	101 [k]	477	726	1,764	389	506	393 [r]	1,577 [h]	54 [h]	46,680	20,790	25,890
1995	121	397	781	1,314	274	253 [k]	229 [r]	2,103	57	52,353	20,091	32,262
1996	150	423	1,150	2,565	719	102 [k]	705 [r]	2,958	35	47,955	19,546	28,409
1997	193	266 [k]	1,025	1,345	277		322 [r]	2,084	24	53,400	15,717	37,683
1998	53	189	361	523	146		66	777	95	22,588	5,838	16,750
1999 [s]	2 [k]	250	495	372	337		146	1,118	90	24,960	12,657	12,303
E.O.												33,000-43,000 [q]

continued

[a] Data obtained by aerial survey unless otherwise noted. Only peak counts are listed. Survey rating is fair to good, unless otherwise noted.
[b] All foot surveys except 1978 (boat survey) and 1986 (aerial survey).
[c] For 1968, 1970, and 1971 counts are from mainstem Big Salmon River. For all other years counts are from the mainstem Big Salmon River between Big Salmon Lake and the vicinity of Souch Creek.
[d] One Hundred Mile Creek to Sidney Creek.
[f] Big Timber Creek to Lewis Lake.
[g] Wolf Lake to Red River.
[h] Counts and estimated percentages may be slightly exaggerated. In some or all of these years a number of adipose-clipped fish ascended the fishway, and were counted, more than once. These fish would have been released into the fishway as fry between 1989 and 1994, inclusive.
[i] Estimated total spawning escapement excluding Porcupine River (estimated border escapement minus the Canandian catch).
[k] Incomplete and/or poor survey conditions resulting in minimal or inaccurate counts.
[m] Estimate derived by dividing the annual 5-area (Whitehorse Fishway, Big Salmon, Nisutlin, Wolf, Tatchun) count by the average proportion of the annual 5-area index count to the estimated spawning escapement from the DFO tagging study for years 1983, and 1985-1989.
[n] Information on area surveyed is unavailable.
[p] Counts are for Big Timber Creek to Sheldon Lake.
[q] Interim escapement objective. Stabilization escapement objective for years 1990-1995 is 18,000 salmon. Rebuilding step escapement objective for years 1996-2001 is 28,000 salmon.
[r] Counts are for Wolf Lake to Fish Lake outlet.
[s] Data are preliminary.

Attachment Table 11. Summer chum salmon escapement counts for selected spawning areas in the Alaskan portion of the Yukon River drainage, 1973-1999. [a]

	Andreafsky River			Anvik River		Rodo River	Kaltag Creek	Nulato River			Gisasa River		Hogatza River		Tozitna River	Chena River		Salcha River	
	East Fork		West Fork					South Fork	North Fork [c]	Mainstem			Clear & Caribou Cr.	Clear Creek					
Year	Aerial	Sonar, Tower, or Weir Counts	Aerial	Tower & Aerial [b]	Sonar	Aerial	Tower	Aerial	Aerial	Tower	Aerial	Weir	Aerial	Tower	Aerial	Aerial	Tower	Aerial	Tower
1973	10,149 [d]		51,835	249,015												79 [d]		290	
1974	3,215 [d]		33,578	411,133		16,137		29,016	29,334		22,022				1,823	4,349		3,510	
1975	223,485		235,954	900,967		25,335		51,215	87,280		56,904		22,355		3,512	1,670		7,573	
1976	105,347		118,420	511,475		38,258		9,230 [d]	30,771		21,342		20,744		725 [d]	685		6,484	
1977	112,722		63,120	358,771		16,118		11,385	58,275		2,204 [d]		10,734		761 [d]	610		677 [d]	
1978	127,050		57,321	307,270		17,845		12,821	41,659		9,280 [d]		5,102		2,262	1,609		5,405	
1979	66,471		43,391		280,537			1,506	35,598		10,962		14,221			1,025 [d]		3,060	
1980	36,823 [d]		114,759		492,676			3,702 [d]	11,244 [d]		10,388		19,786		580	338		4,140	
1981	81,555	147,312 [f]			1,486,182			14,348								3,500		8,500	
1982	7,501 [d]	181,352 [f]	7,267 [d]		444,581						334 [d]		4,984 [d]		874	1,509		3,756	
1983		110,608 [f]			362,912			1,263 [d]	19,749		2,356 [d]		28,141		1,604	1,097		716 [d]	
1984	95,200 [d]	70,125 [f]	238,565		891,028								184 [d]			1,861		9,810	
1985	66,146		52,750		1,080,243	24,576		10,494	19,344		13,232		22,566		1,030	1,005		3,178	
1986	83,931	167,614 [g]	99,373		1,189,602			16,848	47,417		12,114				1,778	1,509		8,028	
1987	6,687 [d]	45,221 [g]	35,535		455,876			4,094	7,163		2,123		5,669 [d]			333		3,657	
1988	43,056	68,937 [g]	45,432		1,125,449	13,872		15,132	26,951		9,284		6,890		2,983	432		2,889 [d]	
1989	21,460 [d]				636,906											714 [d]		1,574 [d]	
1990	11,519 [d]		20,426 [d]		403,627	1,941 [d]		3,196 [d,h]	1,419 [d]		450 [d]		2,177 [d]		36	245 [d]		450 [d]	
1991	31,886		46,657		847,772	3,977		13,150	12,491		7,003		9,947		93	115 [d]		154 [d]	
1992	11,308 [d]		37,808 [d]		775,626	4,465		5,322	12,358		9,300		2,986		794	848 [d]		3,222	
1993	10,935 [d]		9,111 [d]		517,409	7,867		5,486	7,698		1,581				970	168	5,400	212	5,809
1994		200,981 [j,k]			1,124,689		47,295			148,762 [k]	6,827	51,116 [k]	8,247 [m]			1,137	9,984	4,916	39,450
1995		172,148 [j]			1,339,418	12,849	77,193	10,875	29,949	236,890 [g]	6,458	136,836		116,735	4,985	185 [d]	3,519 [k]	934 [d]	30,784
1996		108,450 [i]			933,240	4,380	51,269	8,490 [d,h]		129,694 [g]		157,589	27,090	100,912	2,310	2,061	12,810 [k]	9,722	74,827 [k]
1997		51,139 [i]			609,118	2,775 [d]	48,018			157,975 [g]	686 [d]	31,800	1,821 [d]	76,454	428 [d]	594 [d]	9,439 [k]	3,968 [d]	35,741 [k]
1998		67,591 [i]			471,865		8,113			49,140 [g]		18,228 [s]	120 [d]	212 [k]	7 [d]	24 [d]	5,901 [k]	370 [d]	17,289 [k]
1999 [q]		32,229 [l]			437,631		5,300			30,076 [g]		9,920 [s]		11,300			9,165 [k]		23,221 [g]
E.O. [n]	>109,000		>116,000		>500,000				>53,000 [o]				>17,000 [p]					>3,500	

continued

[a] Aerial survey counts are peak counts only, survey rating is fair or good unless otherwise noted.
[b] From 1972-1979 counting tower operated; escapement estimate listed is the tower counts plus expanded aerial survey counts below the tower (see Buklis 1982).
[c] Includes mainstem counts below the confluence of the North and South Forks, unless otherwise noted.
[d] Incomplete survey and/or poor survey timing or conditions resulted in minimal or inaccurate count.
[f] Sonar count.
[g] Tower count.
[h] Mainstem counts below the confluence of the North and South Fords of the Nulato River included in the South Fork counts.
[j] Weir count.
[k] Incomplete count due to late installation and/or early removal of project or high water events.
BLM helicopter survey.
[n] Interim escapement objective.
[o] Interim escapement objective for North Fork Nulato River only.
[p] Consists of Clear and Caribou Creeks interim escapement objectives of 9,000 and 8,000, respectively.
[q] Data are preliminary.
[r] Consists of Clear Creek only.

Attachment Table 12. Fall chum salmon escapement counts for selected spawning areas in Alaskan and Canadian portions of the Yukon River drainage, 1971-1999.

	Alaska				Canada							
										Canadian Mainstem		
Year	Toklat River [b]	Delta River [c]	Chandalar River [d]	Sheenjek River [d]	Fishing Branch River [f,g]	Mainstem Yukon River Index [g,h]	Koidern River [g]	Kluane River [g,j]	Teslin River [g,k]	Border Passage Estimate	Harvest	Spawning Escapement Estimate
1971					312,800							
1972		5,384			35,125 [n]			198 [p,r]				
1973		10,469			15,989 [s]	383		2,500				
1974	41,798	5,915		89,966 [t]	32,525 [s]			400				
1975	92,265	3,734 [v]		173,371 [t]	353,282 [s]	7,671		362 [r]				
1976	52,891	6,312 [v]		26,354 [t]	36,584			20				
1977	34,887	16,876 [v]		45,544 [t]	88,400			3,555				
1978	37,001	11,136		32,449 [t]	40,800			0 [r]				
1979	158,336	8,355		91,372 [t]	119,898			4,640 [r]				
1980 [ah]	26,346	5,137		28,933 [t]	55,268			3,150		39,130	16,218	22,912
1981	15,623	23,508		74,560	57,386 [w]			25,806		66,347	19,281	47,066
1982	3,624	4,235		31,421	15,901	1,020 [x]		5,378		47,049	15,091	31,958
1983	21,869	7,705		49,392	27,200	7,560		8,578 [r]		118,365	27,490	90,875
1984	16,758	12,411		27,130	15,150	2,800 [y]	1,300	7,200	200	81,900	25,267	56,633 [z]
1985	22,750	17,276 [v]		152,768	56,016 [s]	10,760	1,195	7,538	356	99,775	37,765	62,010
1986	17,976	6,703 [v]	59,313	84,207 [aa]	31,723 [s]	825	14	16,686	213	101,826	13,886	87,940
1987	22,117	21,180	52,416	153,267 [aa]	48,956 [s]	6,115	50	12,000		125,121	44,345	80,776
1988	13,436	18,024	33,619	45,206 [aa]	23,597 [s]	1,550	0	6,950	140	69,280	32,494	36,786
1989	30,421	21,342 [v]	69,161	99,116 [aa]	43,834 [s]	5,320	40	3,050	210 [p]	55,861	20,111	35,750
1990	34,739	8,992 [v]	78,631	77,750 [aa]	35,000 [ab]	3,651	1	4,683	739	82,947	31,212	51,735
1991	13,347	32,905 [v]		86,496 [ac]	37,733 [s]	2,426	53	11,675	468	112,303	33,842	78,461
1992	14,070	8,893 [v]		78,808 [ac]	22,517 [s]	4,438	4	3,339	450	67,962	18,880	49,082
1993	27,838	19,857		42,922 [ac]	28,707 [s]	2,620	0	4,610	555	42,165	12,422	29,743
1994	76,057	23,777 [v]		150,565 [ac,ad]	65,247 [s]	1,429 [p]	20 [p]	10,734	209 [p]	133,712	35,354	98,358
1995	54,513 [ah]	20,587	280,999	241,855 [ac,ad]	51,971 [s,aj]	4,701	0	16,456	633	198,203	40,111	158,092
1996	18,264	19,758	208,170	246,889 [ac,ad]	77,278 [s]	4,977		14,431	315	143,758	21,329	122,429
1997	14,511	8,000	199,874	80,423	26,959 [s]	2,189		3,350	207	94,725	9,286	85,439
1998	15,605	7,804	69,438	33,058	13,248 [s]	7,292		7,337	235	48,047	1,742	46,305
1999 [ad]			81,295	13,959	12,904			4,206	19 [p]	79,470	13,574	65,896
E.O. [af]	>33,000	>11,000		>64,000	50,000-120,000							>80,000

continued

[a] Latest table revision November 3, 1997.

[b] Expanded total abundance estimates for upper Toklat River index area using stream life curve (SLC) developed with 1987-1993 data. Index area includes Geiger Creek, Sushana River, and mainstem floodplain sloughs from approximately 0.25 mile upstream of roadhouse to approximately 1.25 miles downstream of roadhouse.

[c] Estimates are a total spawner abundance, generally from using spawner abudance curves and streamlife data.

[d] Side-scan sonar estimate for Sheenjek beginning in 1981 and for Chandalar in 1986-1990. Split beam sonar estimate for Chandalar beginning in 1995.

[f] Located within the Canadian portion of the Porcupine River drainage. Total escapement estimated using weir to aerial survey expansion factor of 2.72, unless otherwise indicated.

[g] Aerial survey count unless otherwise indicated.

[h] ..chun Creek to Fort Selkirk.

[j] Duke River to end of spawning sloughs below Swede Johnston Creek.

[k] Boswell Creek area (5 km below to 5 km above confluence).

[m] Excludes Fishing Branch River escapement (estimated border passage minus Canadian removal).

[n] Weir installed on September 22. Estimate consists of a weir count of 17,190 after September 22, and a tagging passage estimate of 17,935 prior to weir installation.

[p] Incomplete and/or poor survey conditions resulting in minimal or inaccurate counts.

[r] Foot survey.

[s] Weir count.

[t] Total escapement estimate using sonar to aerial survey expansion factor of 2.22.

[v] Population estimate from replicate foot surveys and stream life data.

[w] Initial aerial survey count was doubled before applying the weir/aerial expansion factor of 2.72 since only half of the spawning area was surveyed.

[x] Boat survey.

[y] Total index area not surveyed. Survey included the mainstem Yukon River between Yukon Crossing to 30 km below Fort Selkirk.

[z] Escapement estimate based on mark-recapture program unavailable. Estimate based on assumed average exploitation rate.

[aa] Expanded estimates for period approximateing second week August through middle fourth week September, using Chandalar River run timing data.

[ab] Weir was not operated. Although only 7,541 chum salmon were counted on a single survey flown October 26, a population estimate of approximately 27,000 fish was made through date of survey, based upon historic average aerial-to-weir expansion of 28%. Actual population of spawners was reported by DFO as between 30,000-40,000 fish considering aerial survey timing.

[ac] Total abundance estimates are for the period approximating second week August through middle fourth week of September. Comparative escapement estimates prior to 1986 are considered more conservative; approximating the period of end of August through middle week of September.

[ad] Data are preliminary.

[af] Interim escapement objective.

[ag] Based on escapement estimates for years 1974-1990.

[ah] Minimal estimate because of late timing of ground surveys with respect to peak of spawning.

[ai] Unexpanded peak ground count (not total abundance).

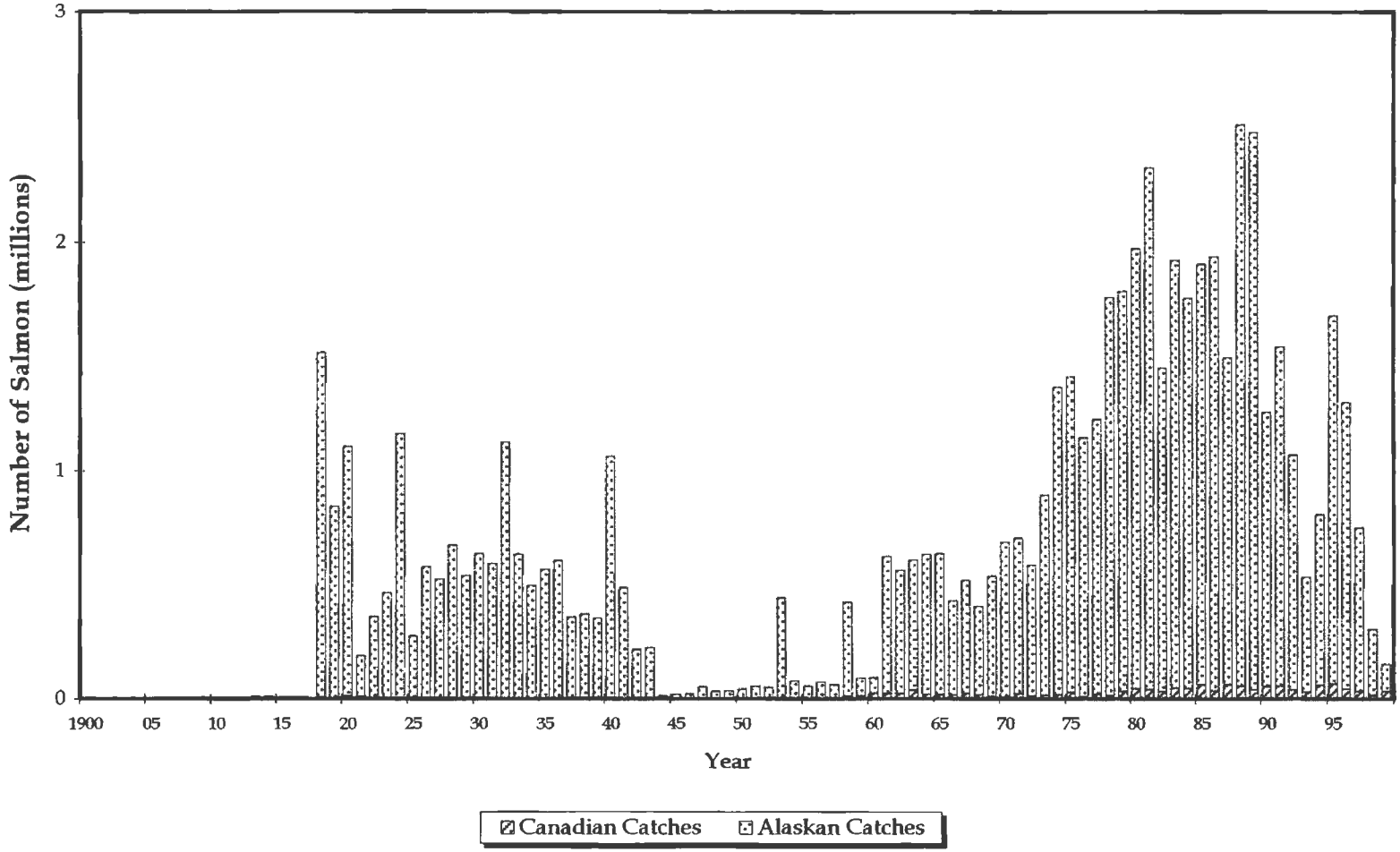
[aj] Incomplete count due to late installation and/or early removal of project or high water events.

Attachment Table 13. Coho salmon escapement counts for selected spawning areas in the Alaskan portion of the Yukon River drainage, 1972-1999. [a]

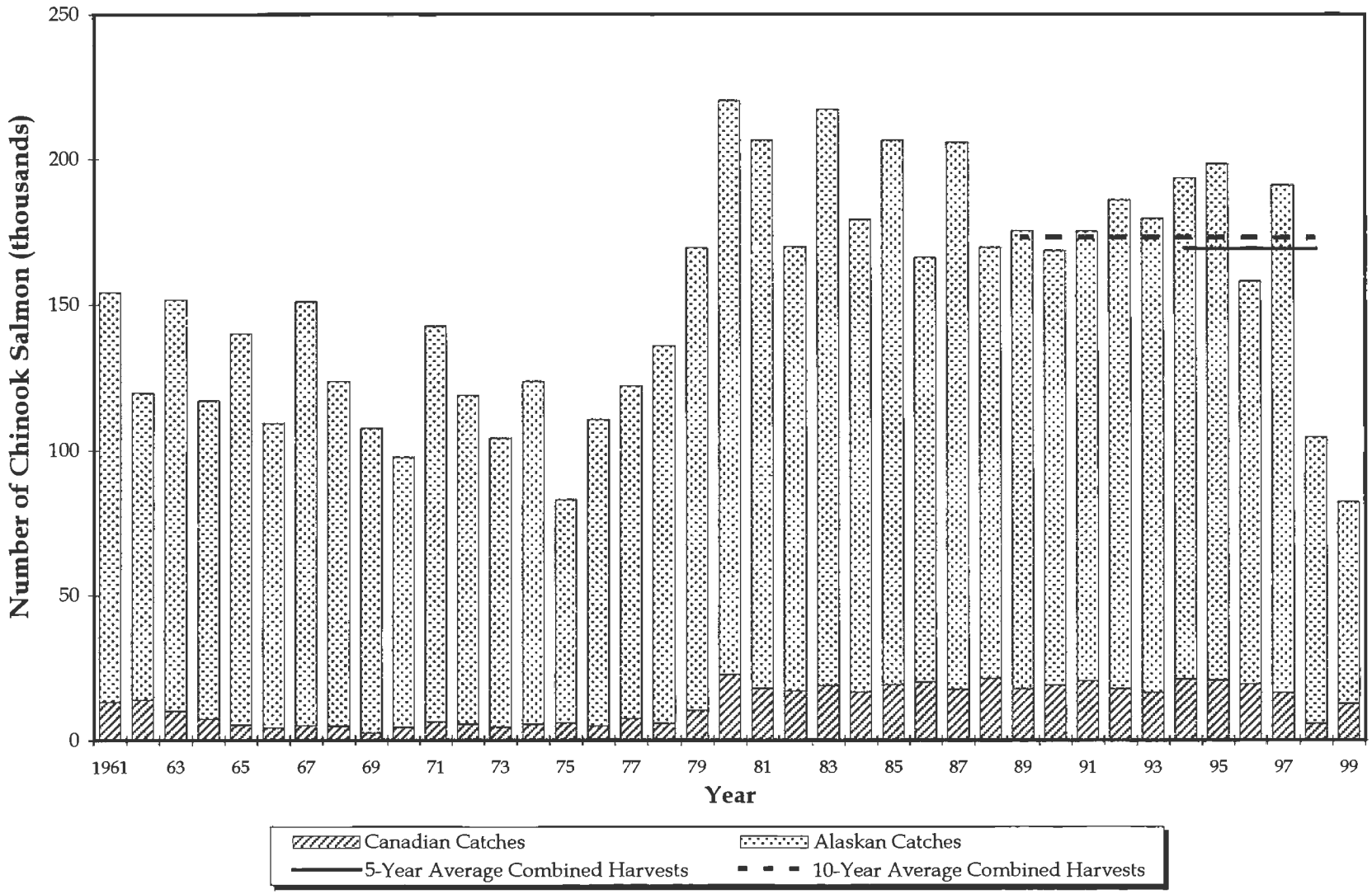
Year	Andreafsky River		Anvik River	Kantishna River		Nenana River				Delta Clearwater River [f,g]	Clearwater Lake and Outlet	Richardson Clearwater River
	East Fork	West Fork		Geiger Creek [b]	Barton Creek	Lost Slough	Nenana Mainstem [c]	Wood Creek [d]	Seventeen Slough			
1972										630	417	454 [k]
1973										3,322	551 [f]	375 [f]
1974						1,388			27	3,954 [j]	560	652 [f]
1975						943			956	5,100	1,575 [f, h]	4 [k]
1976			467 [k]	25 [j]		118			281	1,920	1,500 [f, h]	80 [k]
1977			81 [k]	60		524 [k]		310 [m]	1,167	4,793	730 [f, h]	327
1978						350		300 [m]	466	4,798	570 [f, h]	
1979						227			1,987	8,970	1,015 [f, h]	372
1980				3 [j]		499 [k]		1,603 [m]	592	3,946	1,545 [f, h]	611
1981	1,657 [k]					274		849 [n,r]	1,005	8,563 [p]	459 [k]	550
1982				81				1,436 [n,r]		8,365 [p]		
1983				42		766		1,042 [n]	103	8,019 [p]	253	88
1984				20 [j]		2,677		8,826 [n]		11,061	1,368	428
1985				42 [j]		1,584		4,470 [n]	2,081	5,358	750	
1986				5	496	794		1,664 [n]	218 [d,h]	10,857	3,577	146 [k]
1987				1,175		2,511		2,387 [n]	3,802	22,300	4,225 [f, h]	
1988	1,913	830	1,203	159	437	348		2,046 [n]		21,600	825 [f, h]	
1989				155	12 [k]			412 [n]	824 [k]	11,000	1,600 [f, h]	483
1990				211		688	1,308		15 [k]	8,325	2,375 [f, h]	
1991				427	467 [k]	564	447		52	23,900	3,150 [f, h]	
1992				77	55 [k]	372			490	3,963	229 [f, h]	500 [f]
1993				138	141	484	419	666 [n,s]	581	10,875	3,525 [f, h]	
1994				410	2,000 [n,s]	944	1,648	1,317 [n,s]	2,909	62,675 [w]	3,425 [f, h]	5,800 [f]
1995	10,901 [n]			142	192 [n,s,aa]	4,169	2,218	500 [n]	2,972 [k]	20,100	3,625 [f, h]	
1996	8,037 [n]			233	0 [n]	2,040	2,171	2,416 [j]	3,668 [d,h]	14,075 [x]	1,125 [f, y]	
1997	9,462 [n]			274		1,524 [ab]	1,446	1,464 [j,ac]	1,996 [d,h]	11,525 [z]	2,775 [f, h]	
1998	5,417 [n]			157		1,360	2,771		1,374	11,100	2,775 [f, h]	
1999 [t]	2,963 [n]											
E.O.										>9,000 [u]		

continued

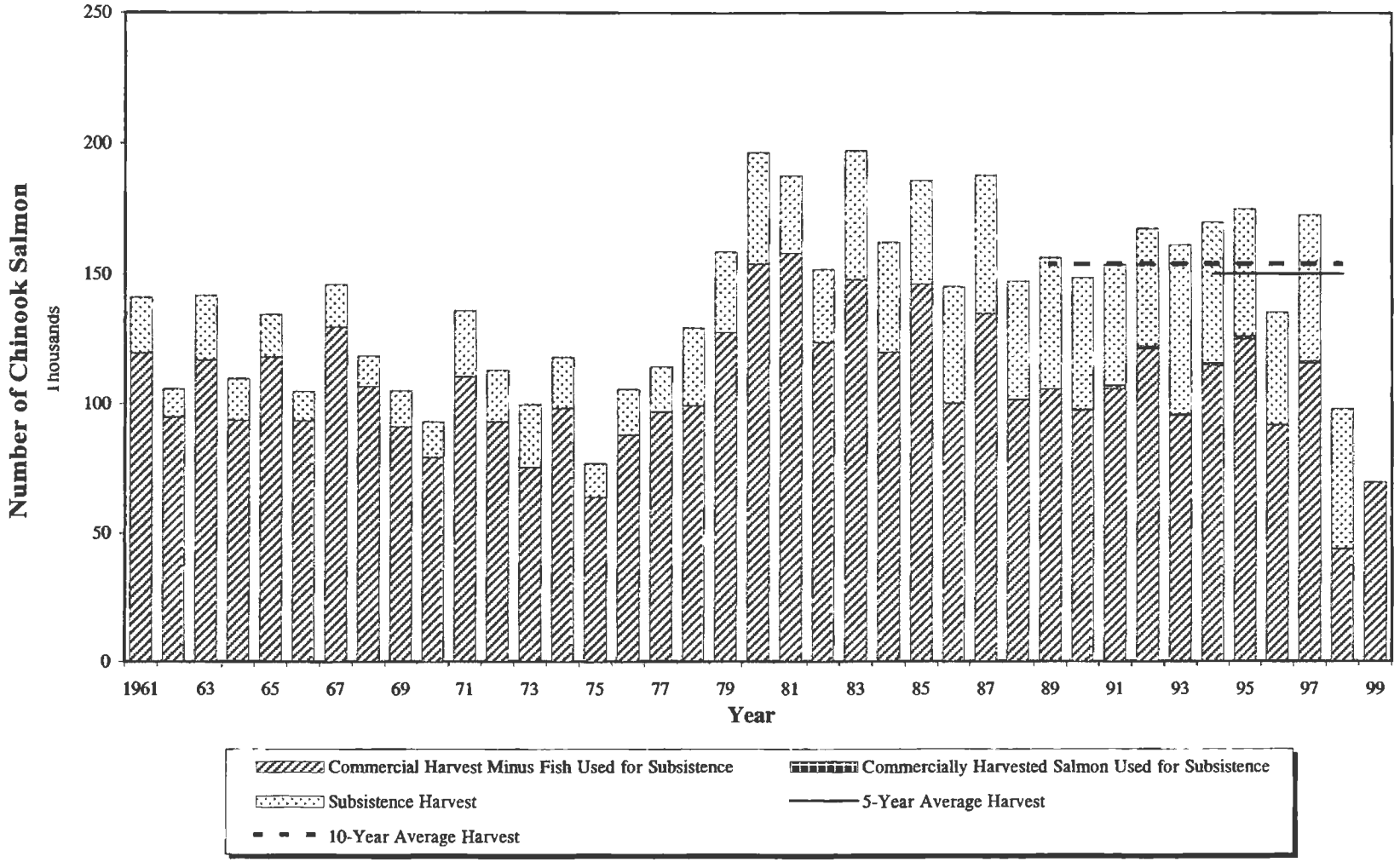
[a] Aerial surveys unless otherwise noted. Only peak counts presented. Survey rating is fair to good, unless otherwise noted.
[b] Foot survey, unless otherwise indicated.
[c] Mainstem Nenana River between confluences of Lost Slough and Teklanika River.
[d] Surveyed by F.R.E.D.
[f] Surveyed by Sport Fish division.
[g] Boat survey counts in the lower 17.5 river miles, unless otherwise indicated.
[h] Boat survey.
[j] Aerial survey.
[k] Poor survey.
[m] Foot survey.
[n] Weir count.
[p] Expanded estimate based on partial survey counts and historic distribution of spawners from 1977-1980.
[r] Coho weir was operated at the mough of Clear Creek (Shores Landing).
[s] Incomplete count because of late installation and/or early removal of project.
[t] Data are preliminary.
[u] Interim escapement objective established March, 1993, based on boat survey counts of coho salmon in the lower 17.5 river miles during the period October 21-27.
[w] An additional 17,565 coho salmon were counted by helicopter in the Delta Clearwater outside of the normal mainstem index area.
[x] An additional 3,300 coho salmon were counted by helicopter in the Delta Clearwater outside of the normal mainstem index area.
[y] An additional 350 coho salmon were counted in Clearwater Lake Inlet.
[z] An additional 2,375 coho salmon were counted by helicopter in the Delta Clearwater outside of the normal mainstem index area.
[aa] An additional 1,000 coho salmon were estimated pooled downstream of weir on October 2, just prior to weir removal.
[ab] Survey of western floodplain sloughs only.
[ac] Beginning at confluence of Clear Creek, the survey includes counts of Glacier and Wood Creeks up to their headwaters.



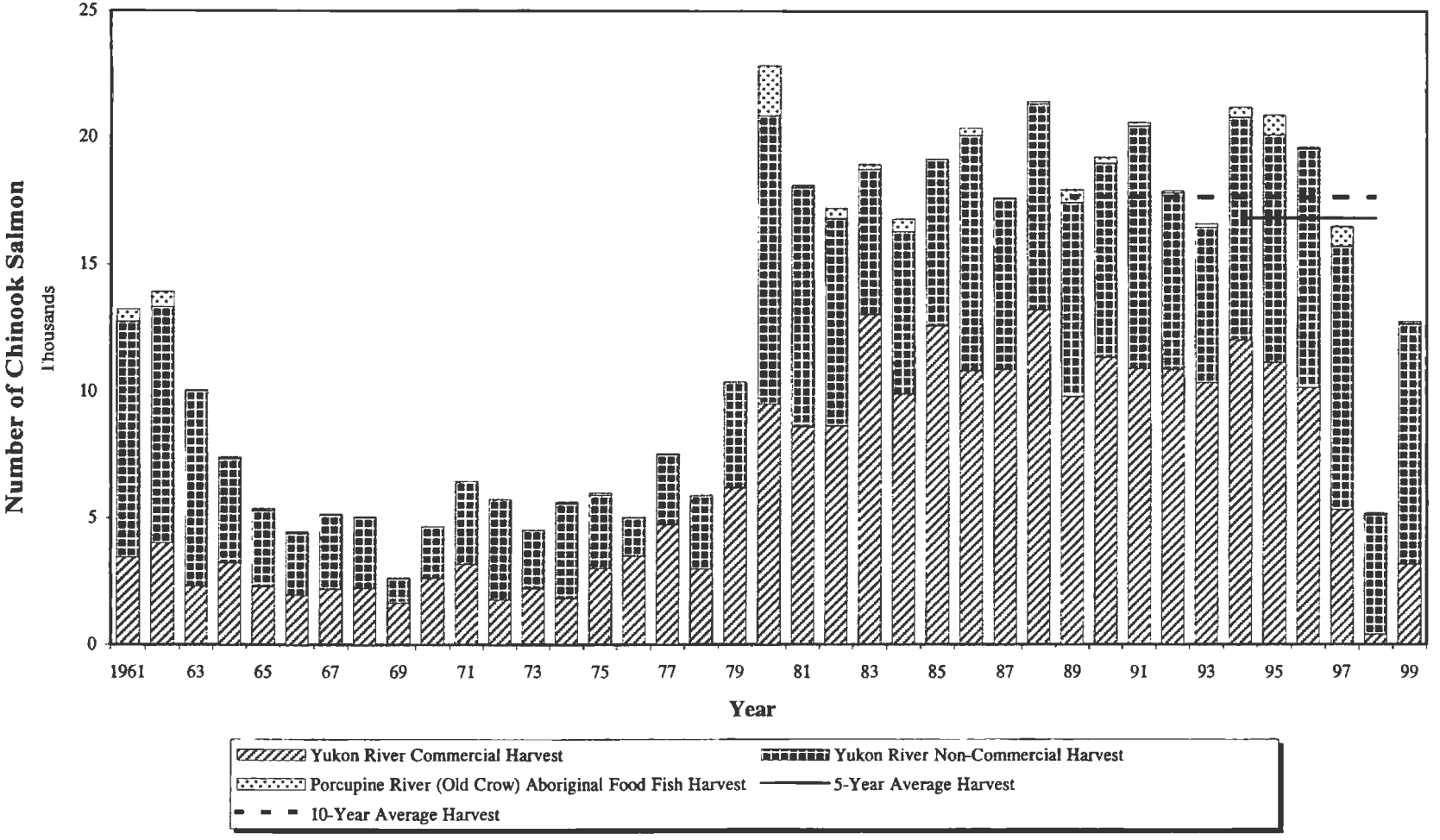
Attachment Figure 1. **Total utilization of chinook, chum and coho salmon, Yukon River, 1900-1999. The 1999 Alaskan harvest includes only commercial catch data. Other Alaskan harvest estimates are unavailable at this time.**



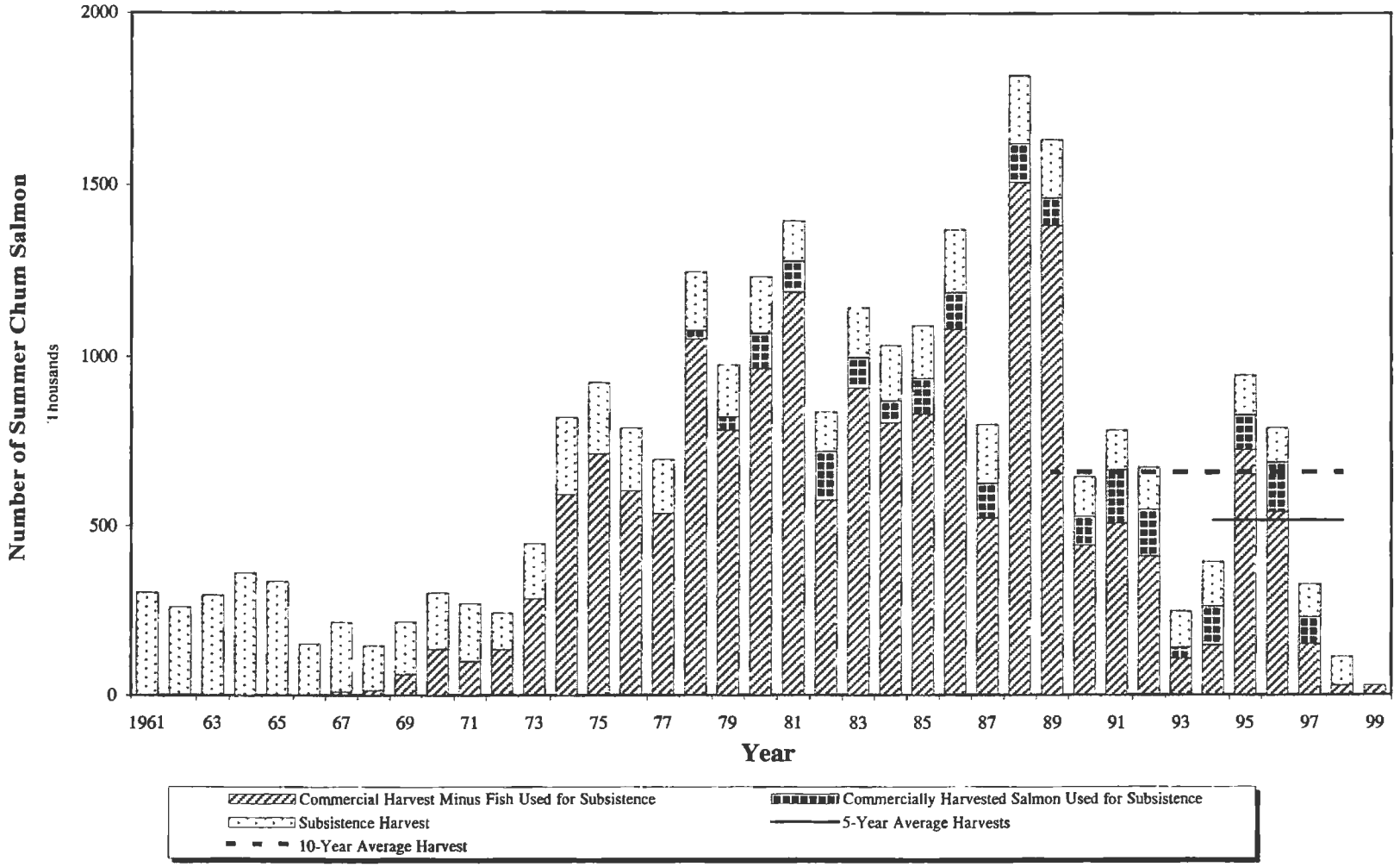
Attachment Figure 2. **Total utilization of chinook salmon, Yukon River, 1961-1999. The 1999 Alaskan harvest includes only commercial catch data. Other Alaskan harvest estimates are unavailable at this time.**



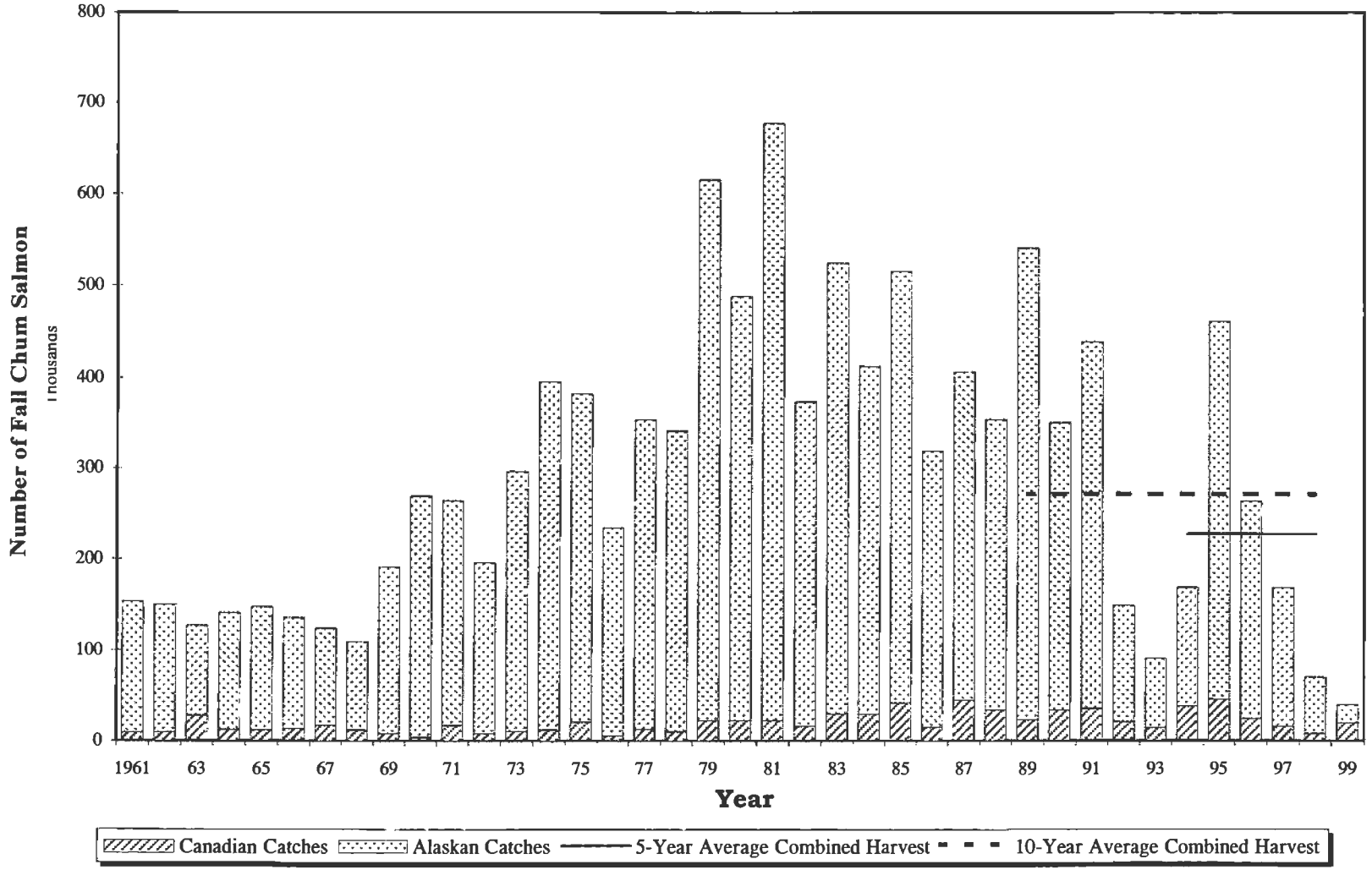
Attachment Figure 3. **Alaskan harvest of chinook salmon, Yukon River, 1961-1999. The 1999 harvest includes only commercial catch data. Other Alaskan harvest estimates are unavailable at this time.**



Attachment Figure 4. **Canadian harvest of chinook salmon, Yukon River, 1961-1999.**



Attachment Figure 5. **Alaskan harvest of summer chum salmon, Yukon River, 1961-1999. The 1999 harvest includes only commercial catch data. Other Alaskan harvest estimates are unavailable at this time.**



Attachment Figure 6. **Total utilization of fall chum salmon, Yukon River, 1961-1999. The 1999 Alaskan harvest includes only commercial catch data. Other Alaskan harvest estimates are unavailable at this time.**

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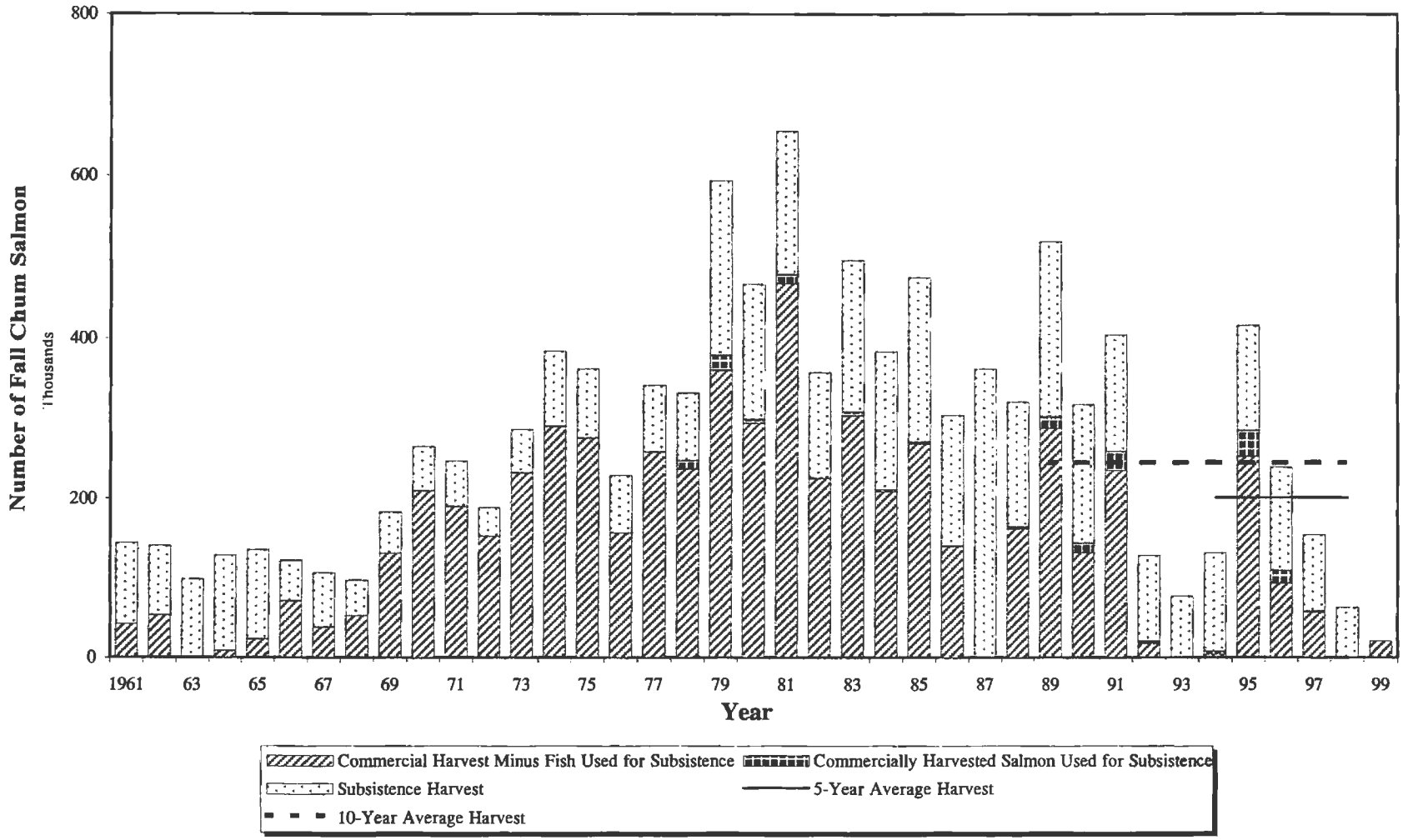
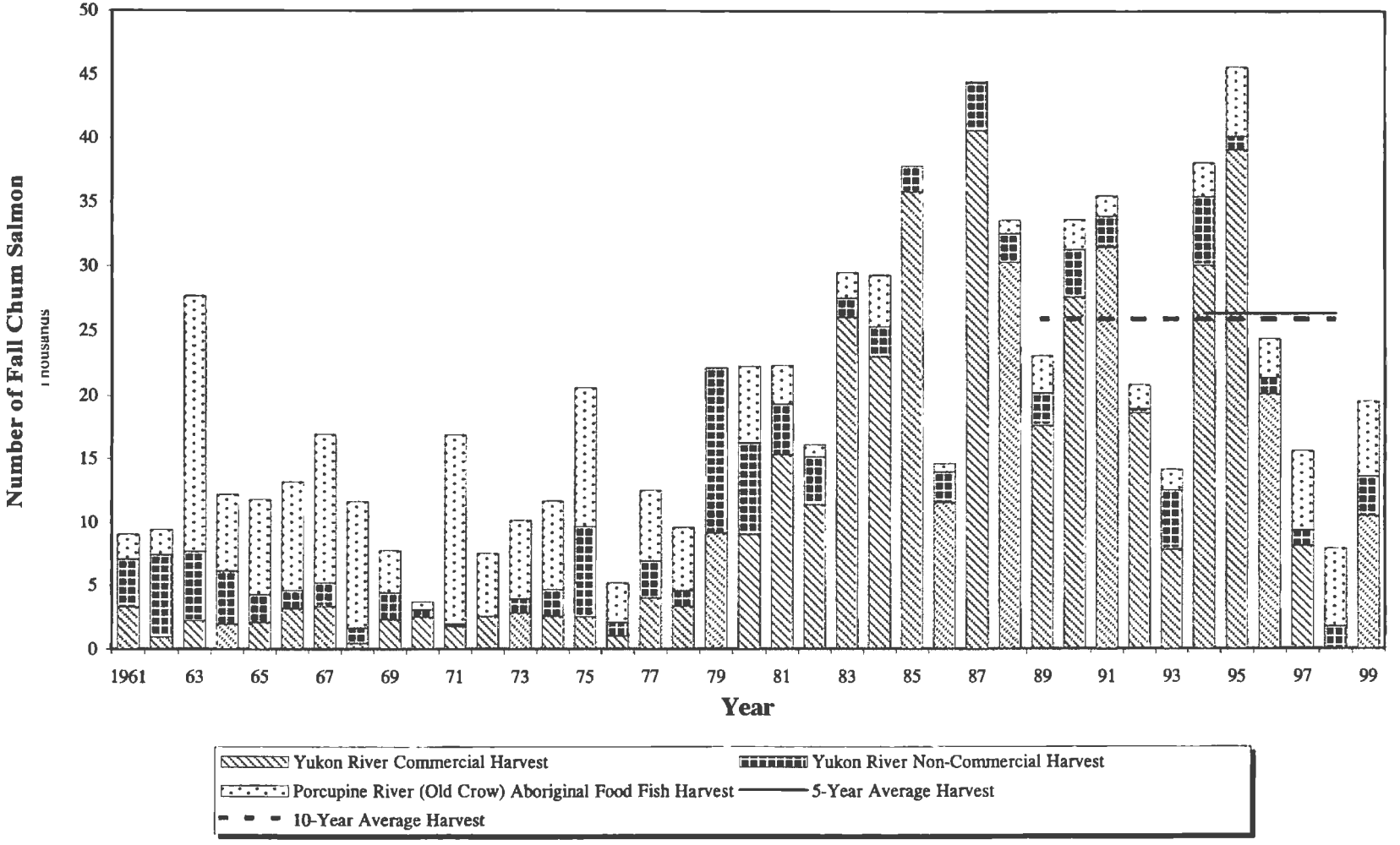
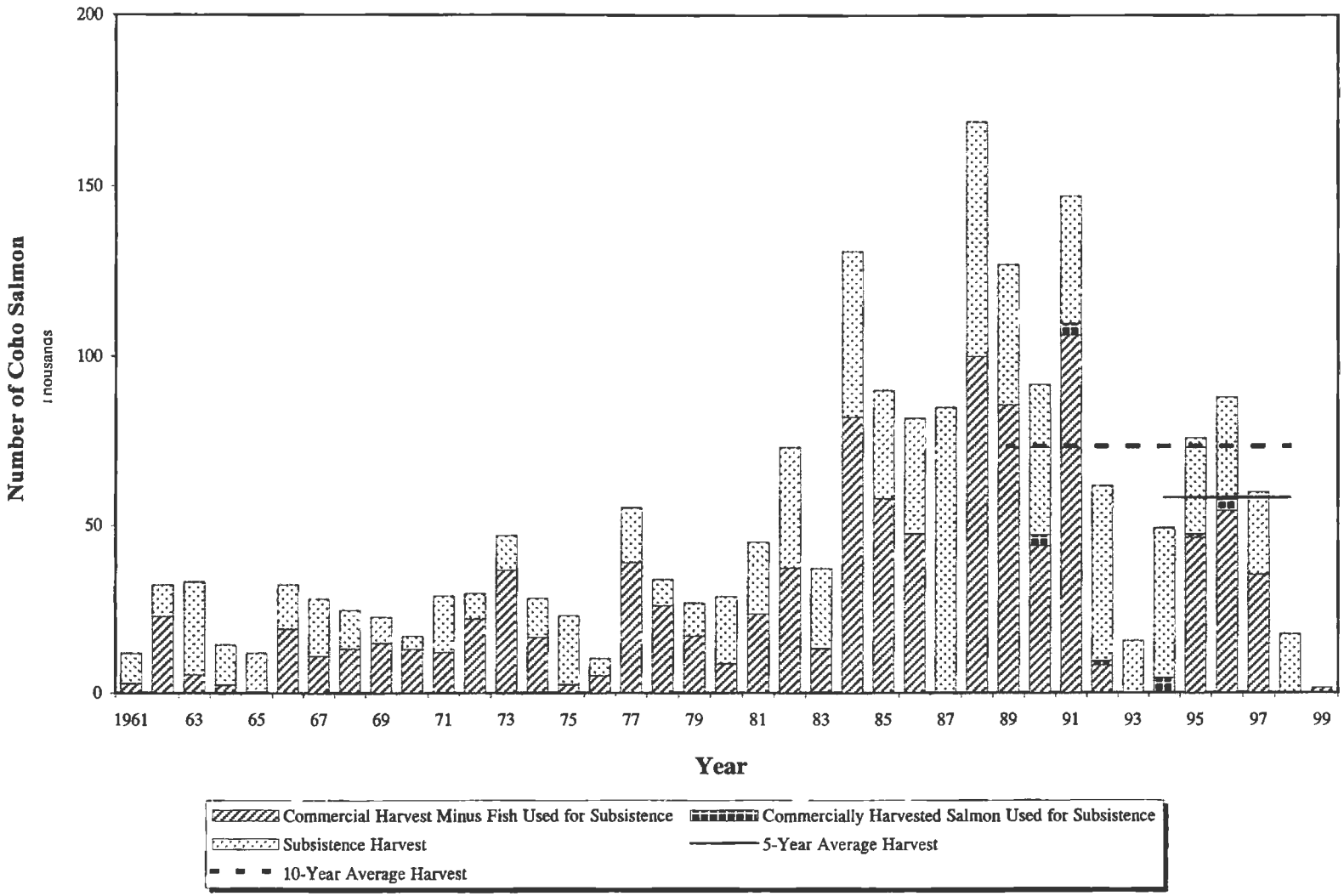


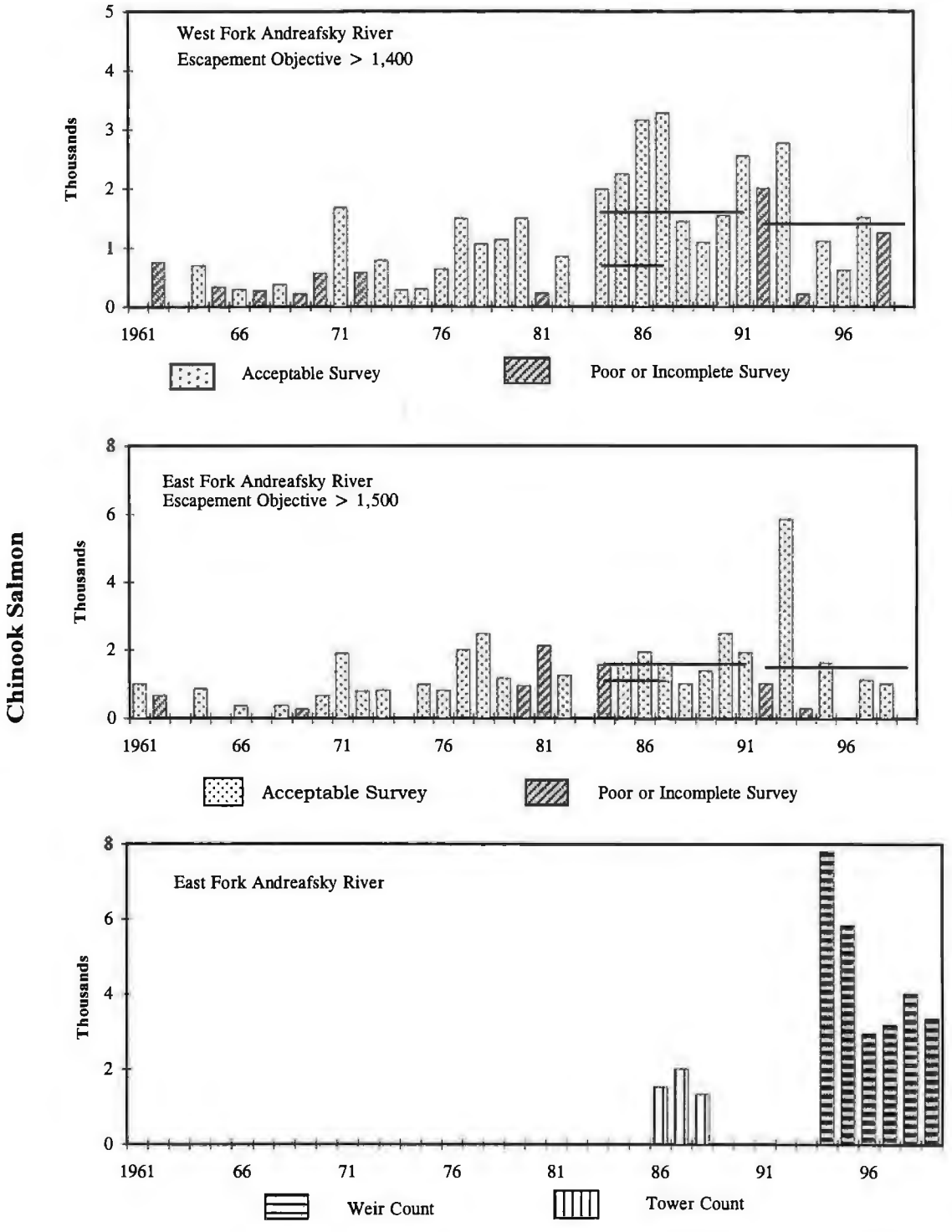
Attachment Figure 7. **Alaskan harvest of fall chum salmon, Yukon River, 1961-1999. The 1999 harvest includes only commercial catch data. Other Alaskan harvest estimates are unavailable at this time.**



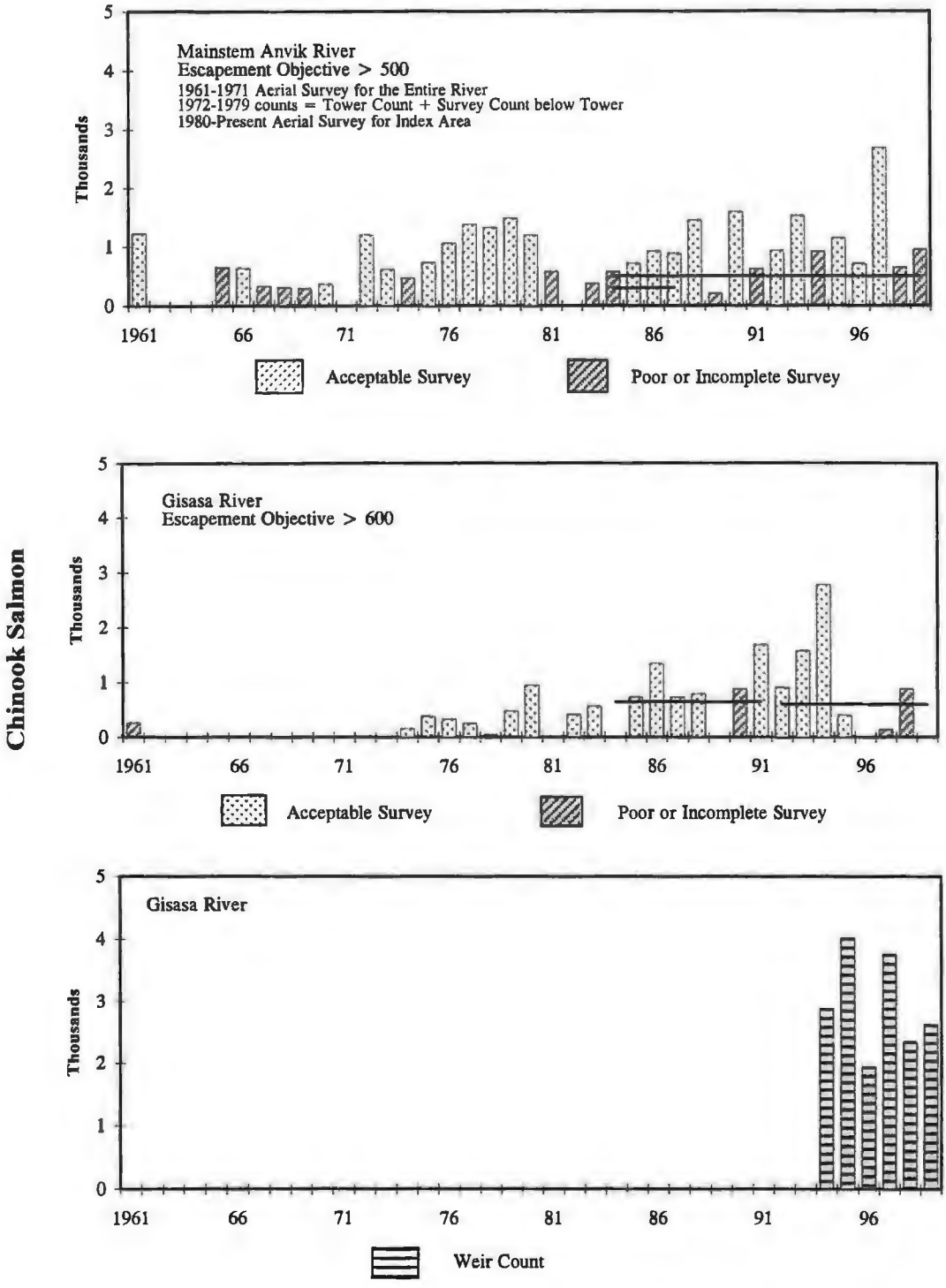
Attachment Figure 8. Canadian harvest of fall chum salmon, Yukon River, 1961-1999.



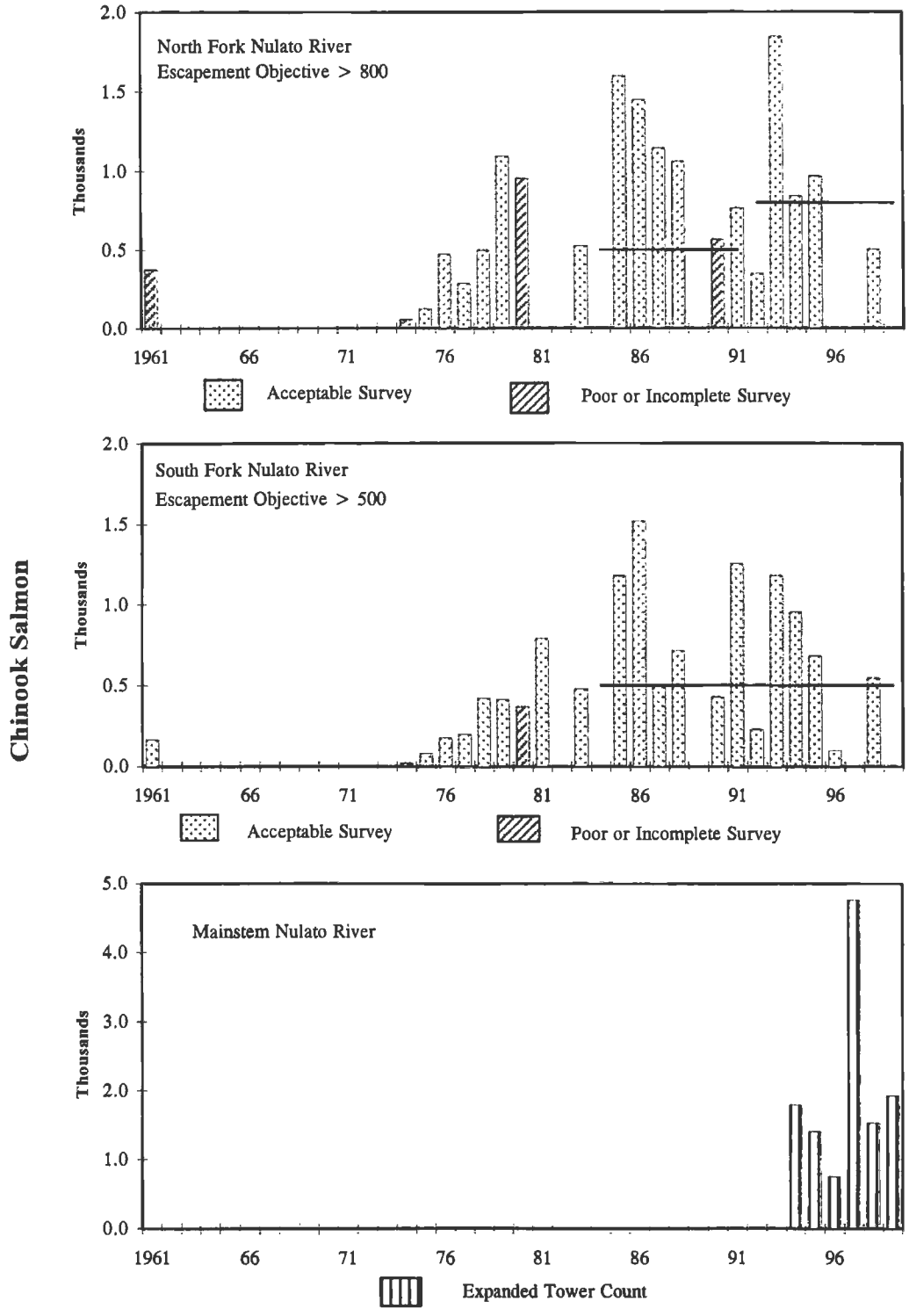
Attachment Figure 9. **Alaskan harvest of coho salmon, Yukon River, 1961-1999. The 1999 harvest includes only commercial catch data. Other Alaskan harvest estimates are unavailable at this time.**



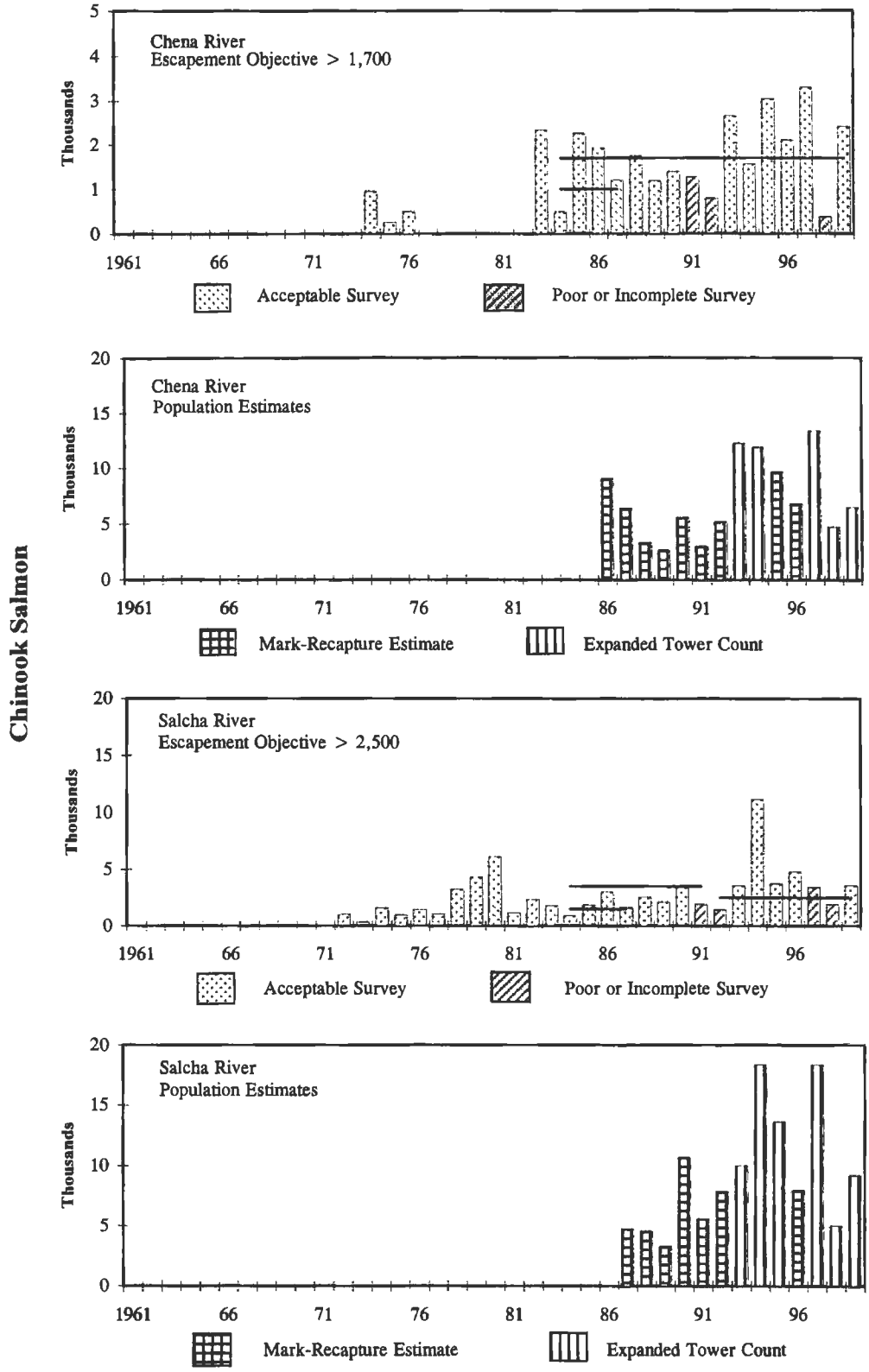
Attachment Figure 10. Chinook salmon escapement data for selected spawning areas in the Alaskan portion of the Yukon River drainage, 1961-1999. Data are aerial survey observations unless noted otherwise. Horizontal lines represent interim escapement goal objectives or ranges. Note that the scale of the vertical axis differs between projects.



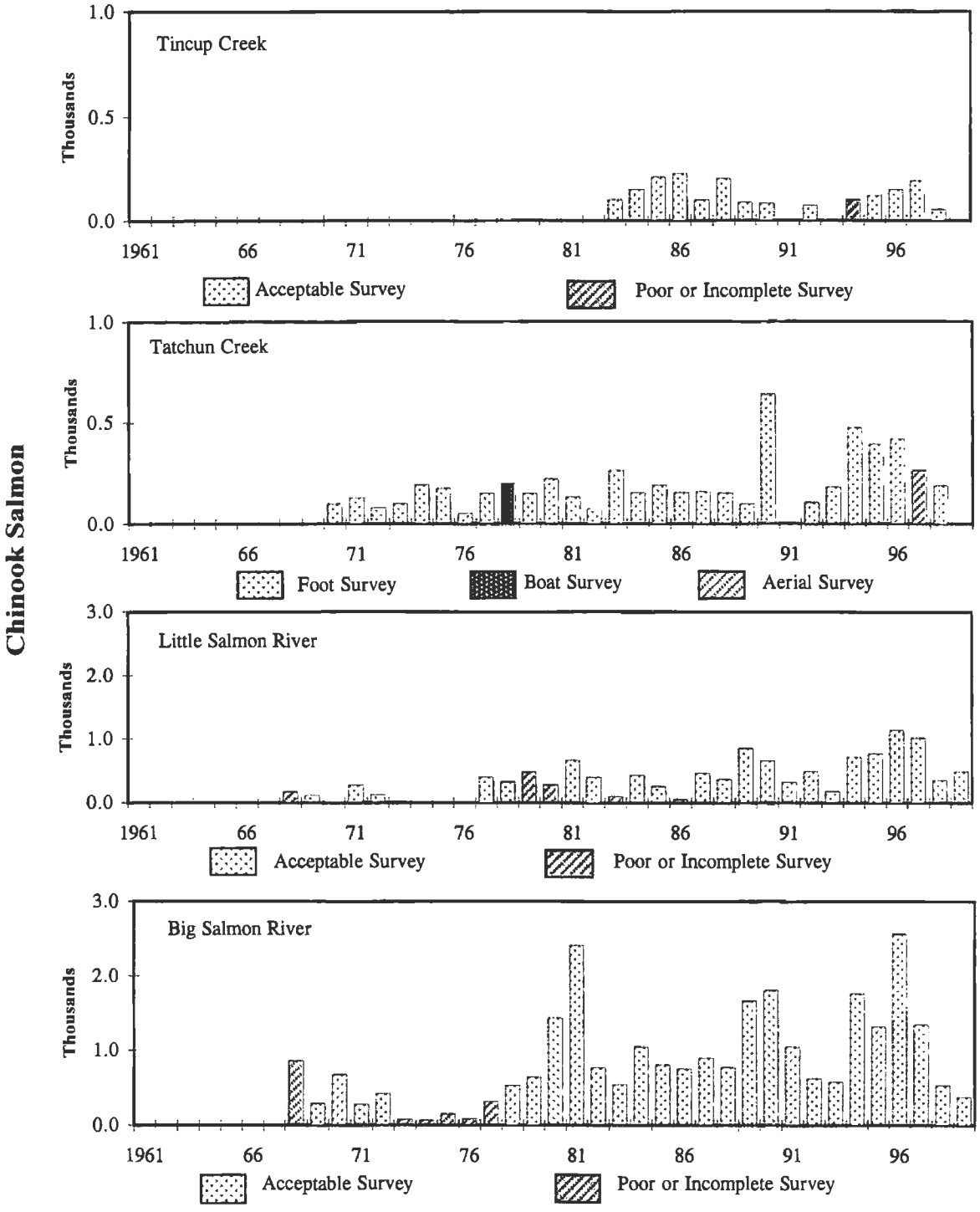
Attachment Figure 10 (page 2 of 4).



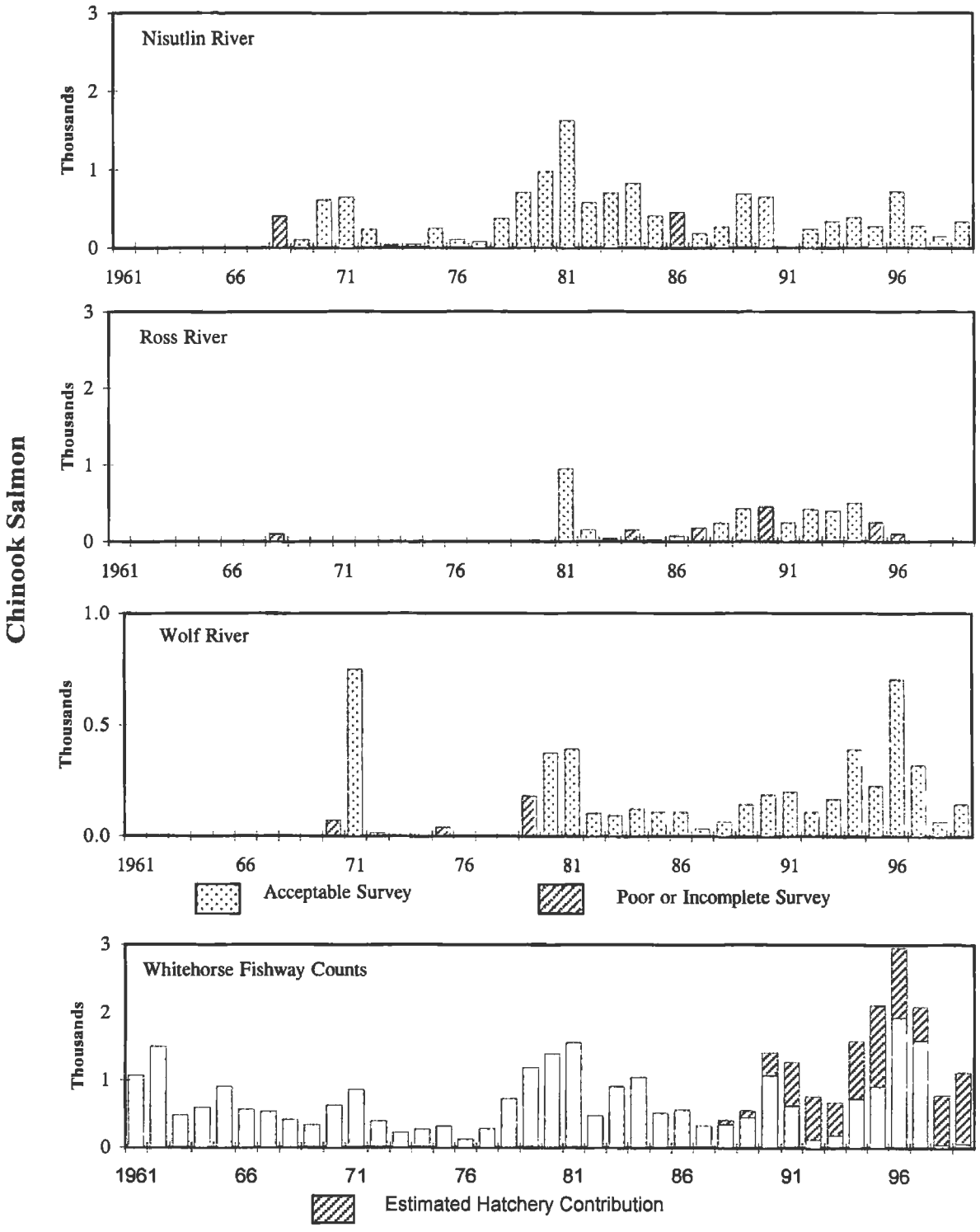
Attachment Figure 10 (page 3 of 4).



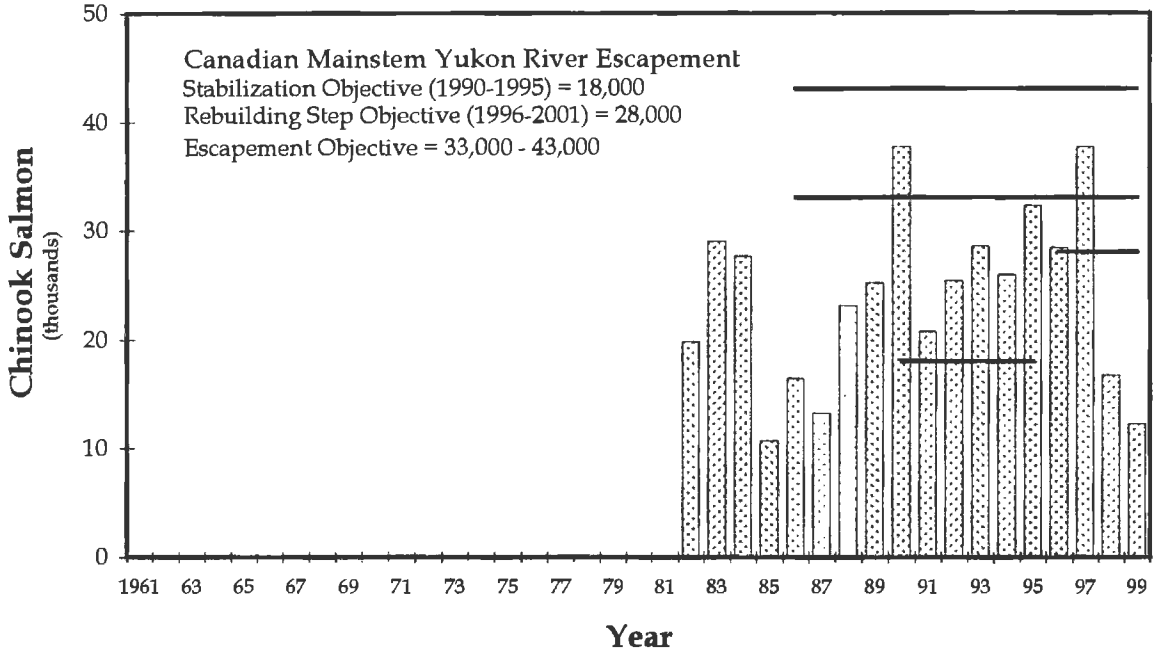
Attachment Figure 10 (page 4 of 4).



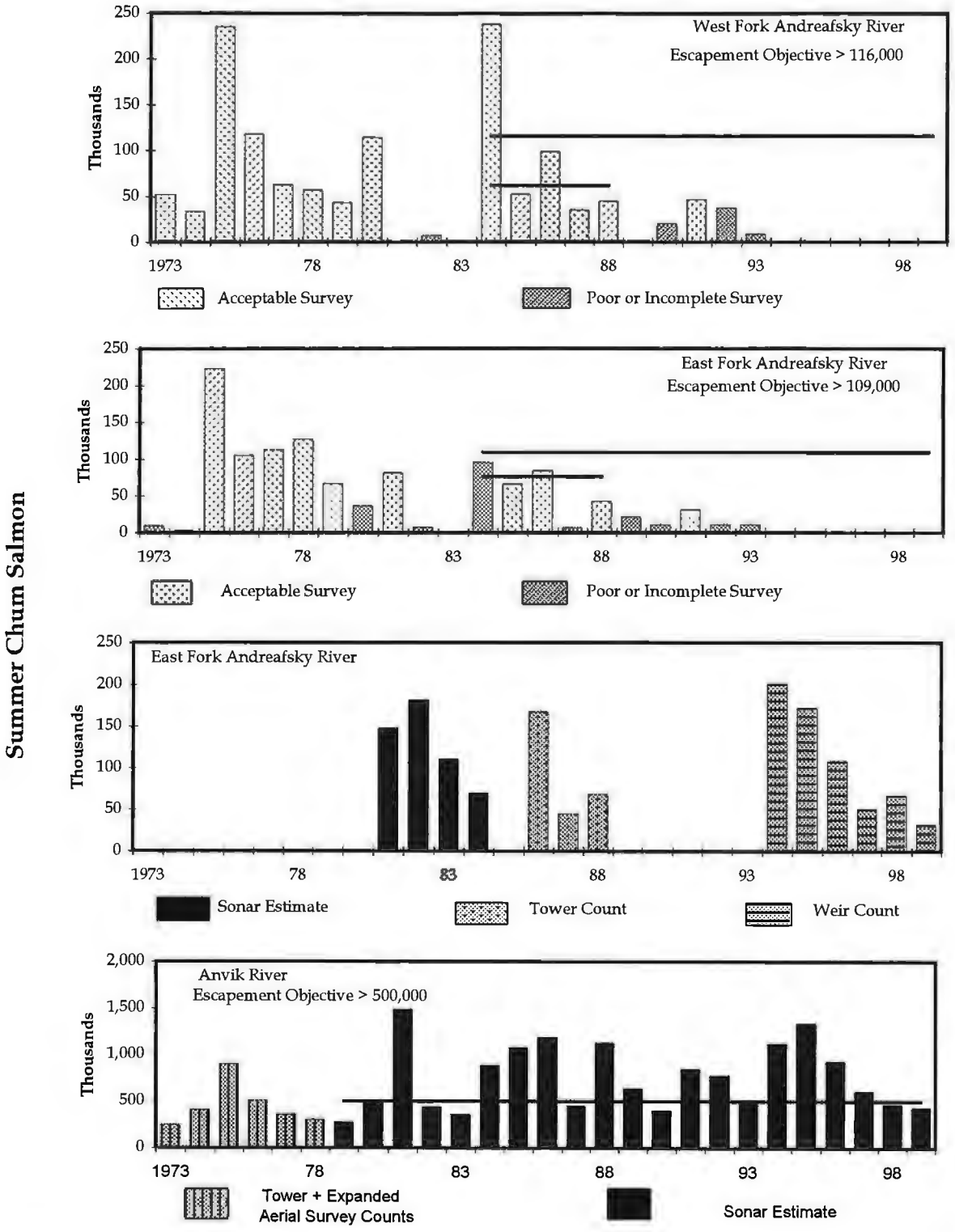
Attachment Figure 11. Chinook salmon escapement data for selected spawning areas in the Canadian portion of the Yukon River drainage, 1961-1999. Data are aerial survey observations unless noted otherwise. Note the scale of the vertical axis is variable.



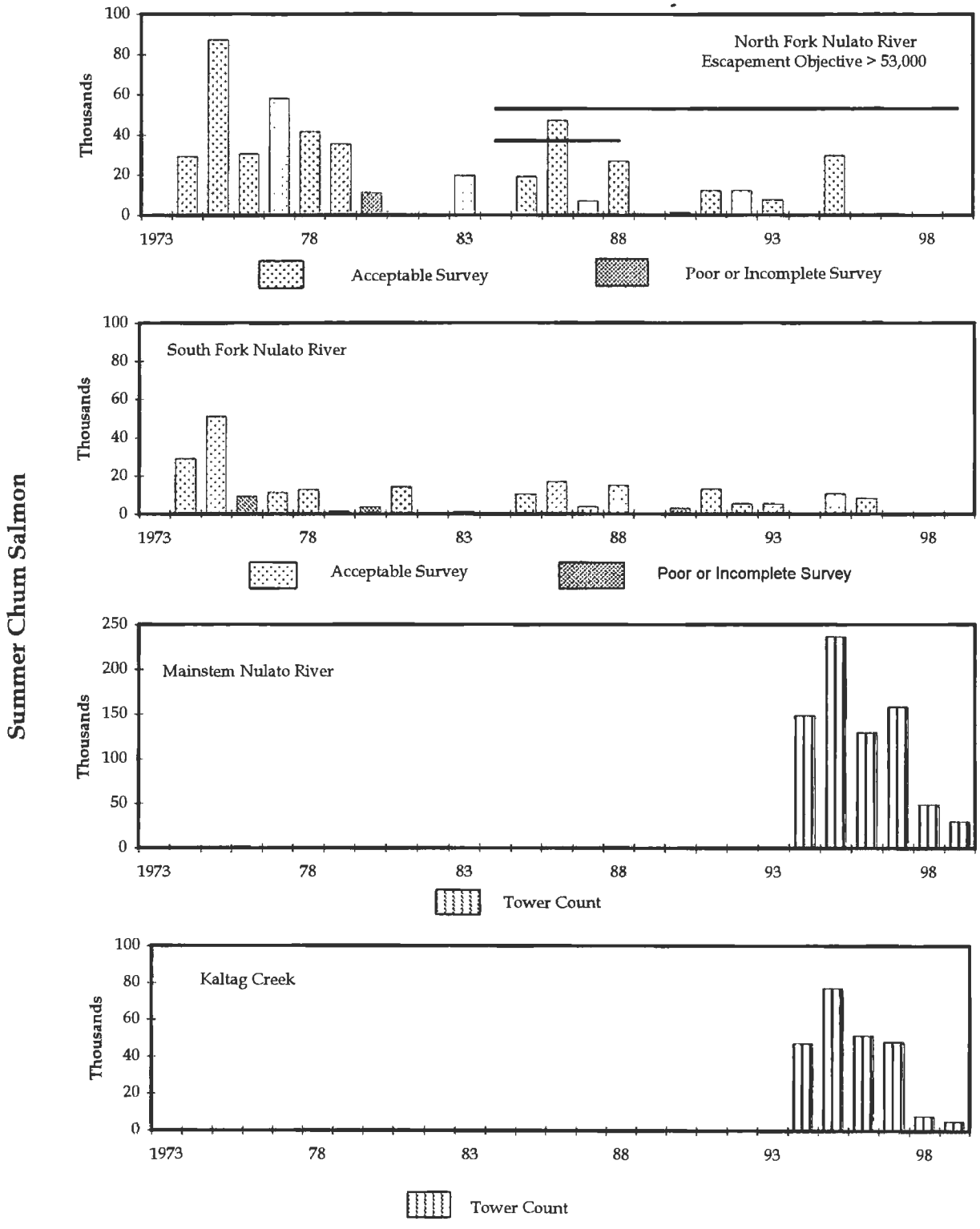
Attachment Figure 11 (page 2 of 2).



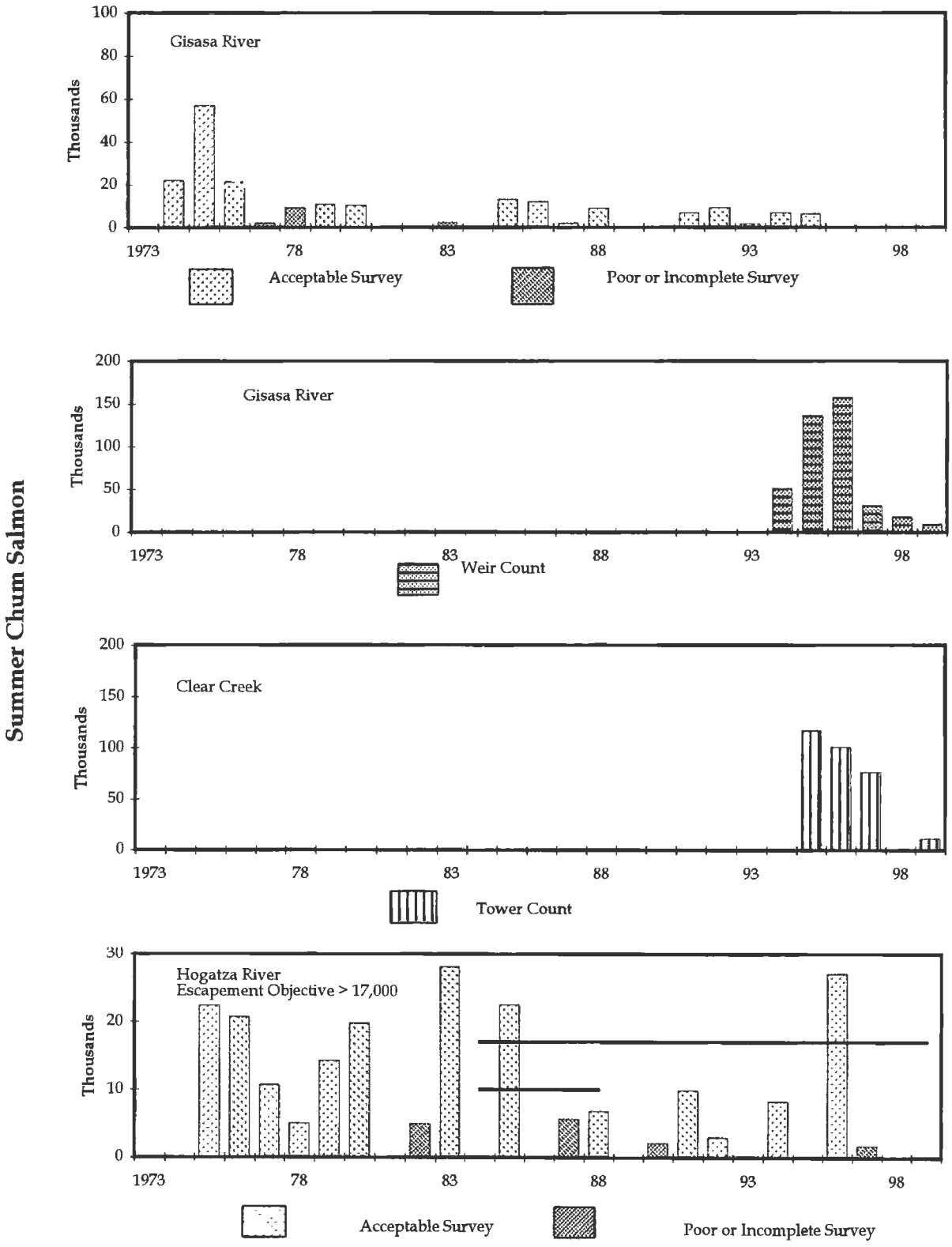
Attachment Figure 12. Estimated total chinook salmon spawning escapement in the Canadian portion of the mainstem Yukon River drainage, 1982-1999. Horizontal lines represent the interim escapement goal range of 33,000-43,000 salmon, the stabilization objective of 18,000 salmon, and the rebuilding step objective of 28,000 salmon.



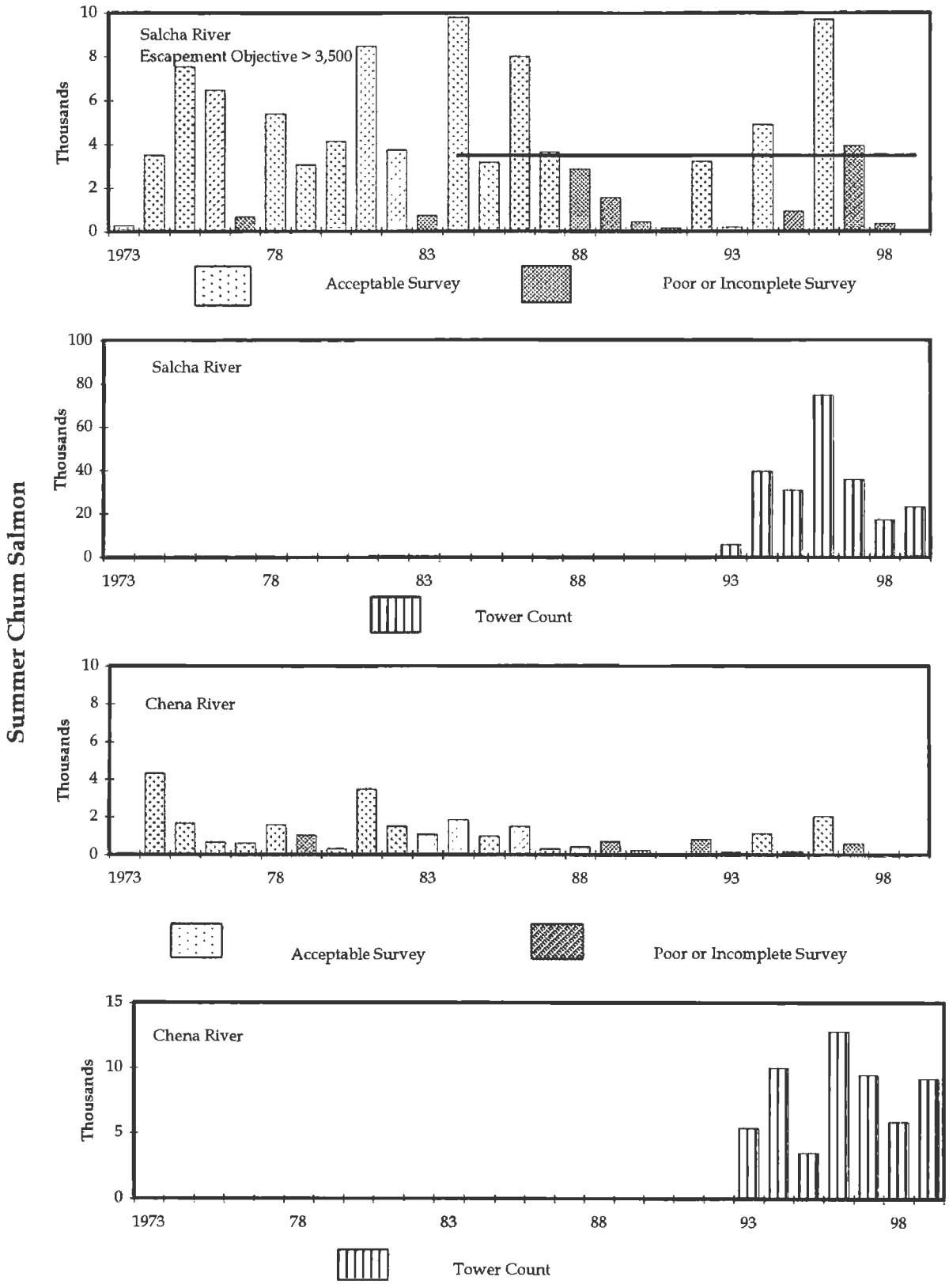
Attachment Figure 13. Summer chum salmon escapement data for selected spawning areas in the Yukon River drainage, 1973-1999. Horizontal lines represent interim escapement goal objectives or ranges. Data are aerial survey observations unless noted otherwise. Note that the scale of the vertical axis is variable.



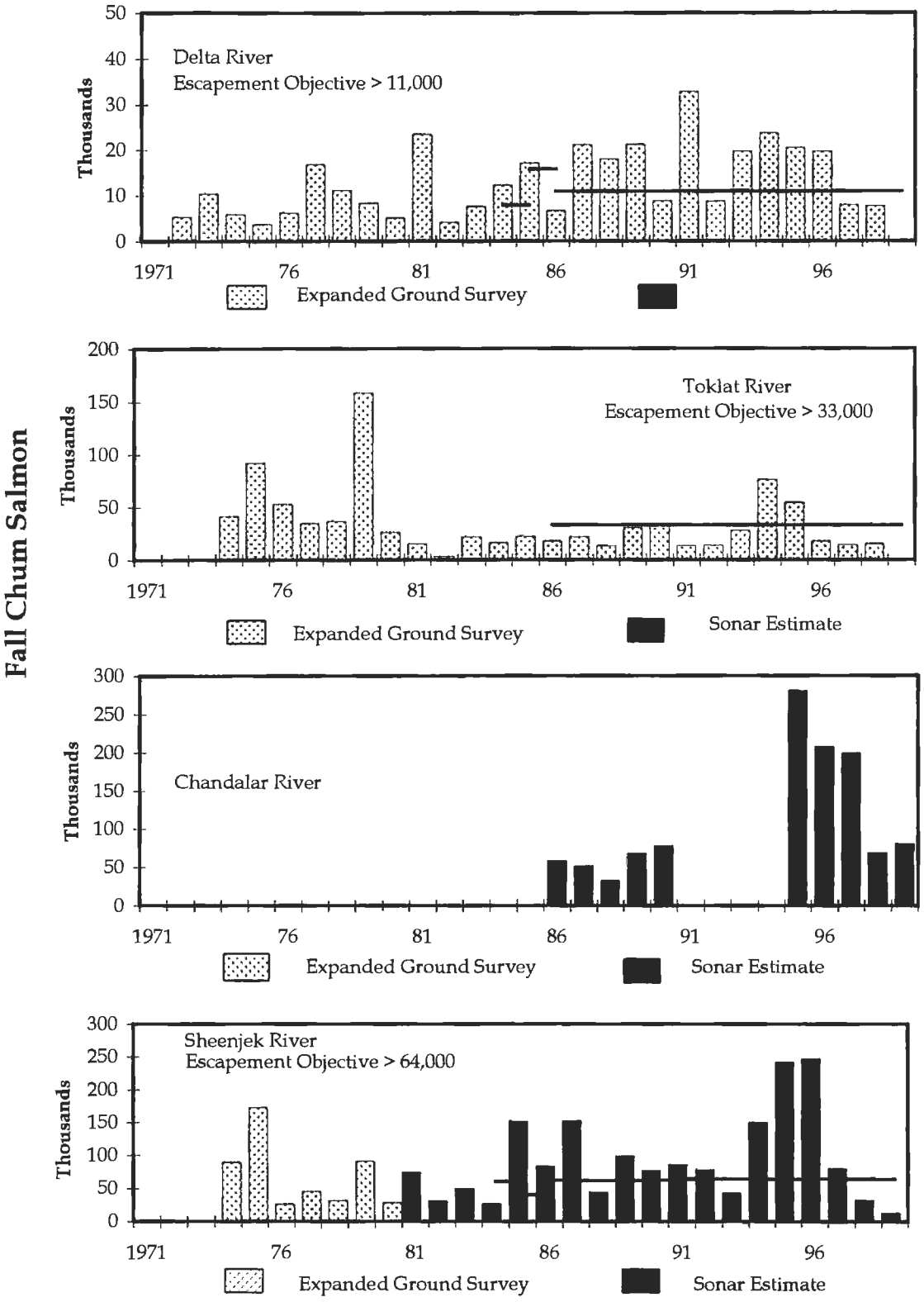
Attachment Figure 13 (page 2 of 4).



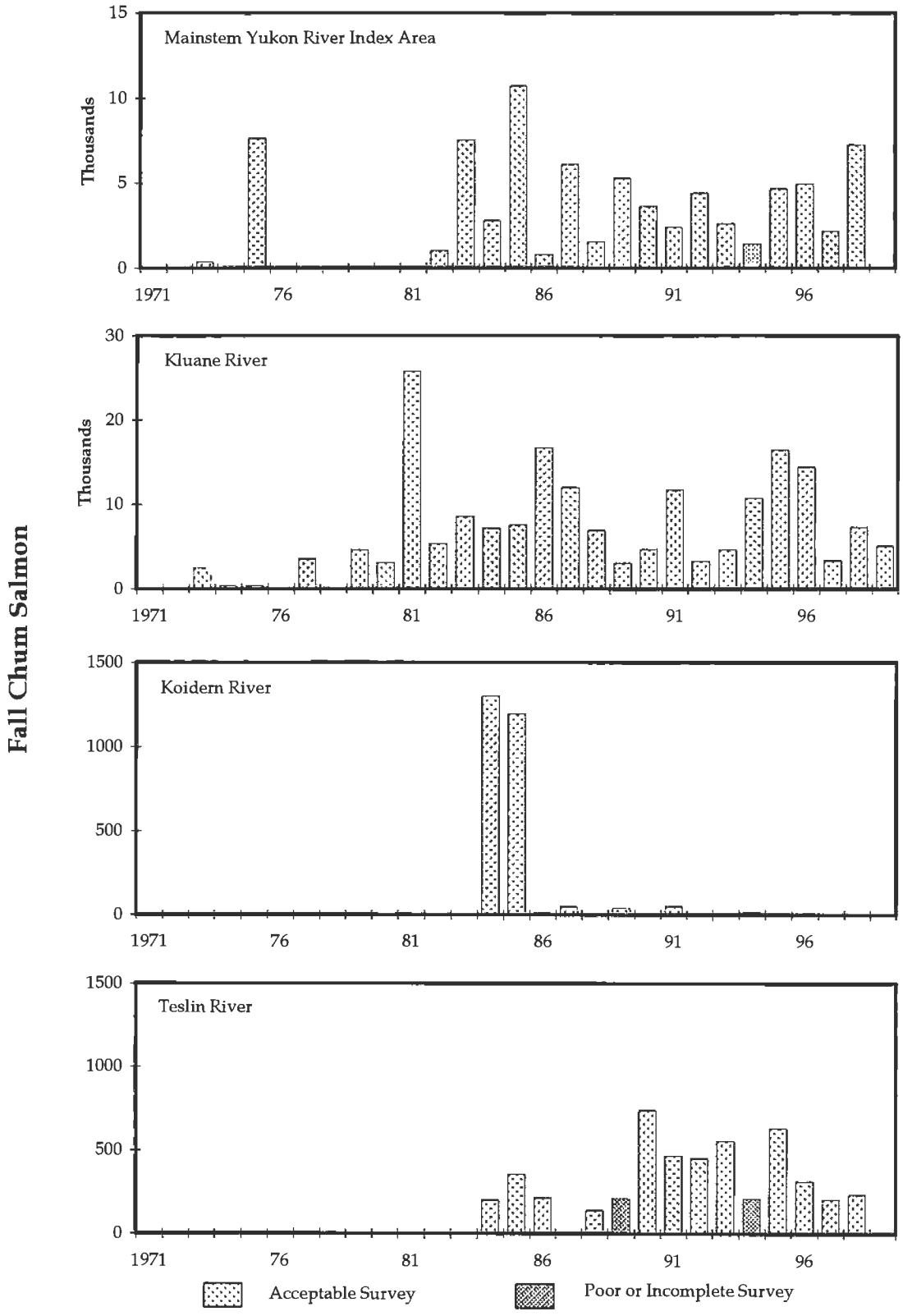
Attachment Figure 13 (page 3 of 4).



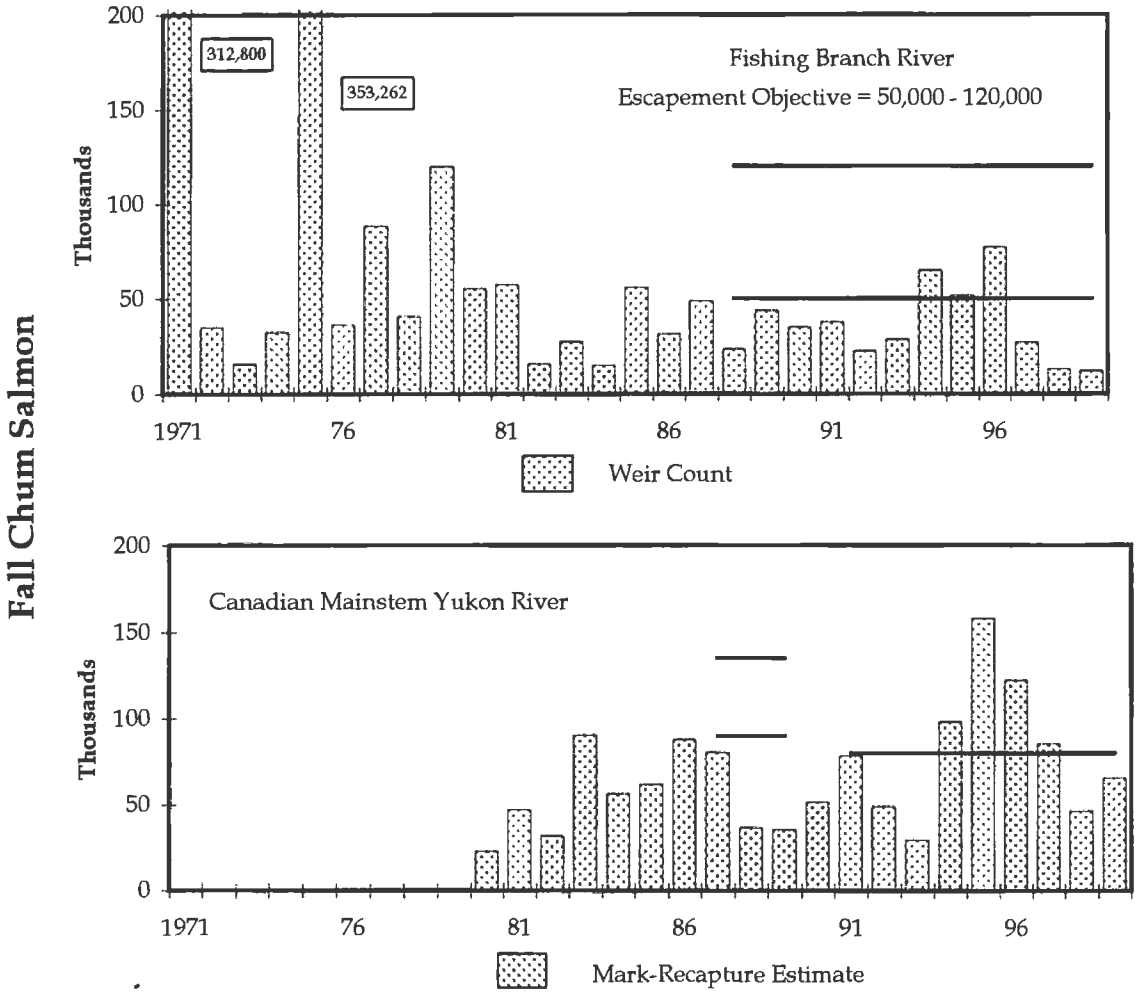
Attachment Figure 13 (page 4 of 4).



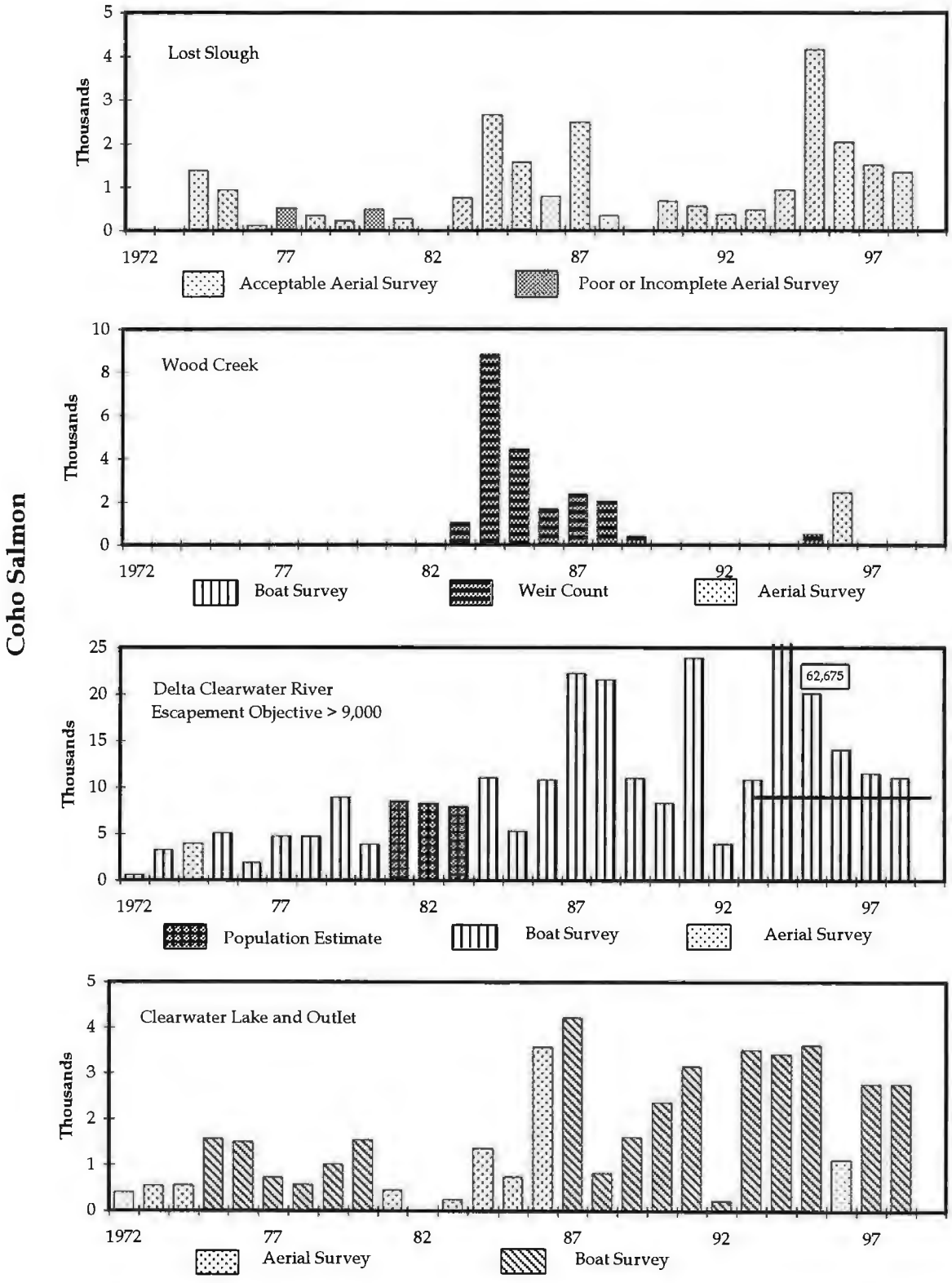
Attachment Figure 14. Fall chum salmon escapement estimates for selected spawning areas in the Alaskan portion of the Yukon River drainage, 1971-1999. Horizontal lines represent interim escapement goal objectives or ranges. Note that the scale of the vertical axis is variable.



Attachment Figure 15. Fall chum aerial survey data for selected spawning areas in the Canadian portion of the Yukon River drainage, 1971-1999. Note that the scale of the vertical axis is variable.



Attachment Figure 16. Fall chum salmon escapement estimates for spawning areas in the Canadian portion of the Yukon River drainage, 1971-1999. Horizontal lines represent interim escapement goal objectives or ranges.



Attachment Figure 17. Coho salmon escapement data for selected spawning areas in the Yukon River drainage, 1972-1999. Horizontal line indicates the interim escapement goal. Note that the scale of the vertical axis is variable.

ATTACHMENT II

MARINE FISHERIES INFORMATION

ATTACHMENT II. MARINE FISHERIES INFORMATION

1.0 INTRODUCTION

Yukon River salmon migrate as juveniles out of the river and into the Bering Sea. Where they go once they enter the ocean is only partly understood, but evidence from tagging studies and the analysis of scale patterns indicate that these salmon spread throughout the Bering Sea, some move considerably south of the Aleutian Island chain into the Gulf of Alaska and North Pacific Ocean, and some move north into the Chukchi Sea. While in the ocean, they mix with salmon stocks from Asia and elsewhere in North America. Figure 1 shows the general ocean distribution of Asian and North American chinook salmon.[1]

While in the ocean, some of these salmon are caught by commercial fisheries that take place in marine waters. In 1999, marine commercial fisheries with a bycatch that likely included some Yukon River salmon included: (1) the U.S. groundfish trawl fisheries in the Bering Sea-Aleutian Islands area and in the Gulf of Alaska, and (2) the purse seine and gill net salmon fishery in the South Alaska Peninsula ("False Pass") area. Other commercial fisheries which operate in marine waters of the Bering Sea and Gulf of Alaska where Yukon River salmon occur, but which catch few, if any, salmon include: (1) the U.S. longline fisheries for Pacific halibut, Pacific cod, and other groundfish, (2) the U.S. pot fisheries for Pacific cod and other groundfish, and Dungeness, king, and Tanner crab, and (3) the U.S. purse seine and gillnet fisheries for Pacific herring.
Until 1992, five large commercial fisheries in the ocean caught large numbers of salmon, some of which were likely Yukon River salmon. However, under international agreements, those fisheries no longer operate. They were (in order of decreasing salmon catches): (1) the Japanese high-seas mothership and land-based salmon gill net fisheries; (2) the high-seas squid gillnet fisheries in the North Pacific Ocean of Japan, the Republic of Korea, and the Republic of China (Taiwan); (3) the foreign groundfish fisheries of the Bering Sea and Gulf of Alaska, (4) the joint venture groundfish fisheries of the Bering Sea and the Gulf of Alaska, and (5) the groundfish trawl fishery by many nations in the international waters area of the Bering Sea ("the Doughnut Hole").

As has been noted in the past, a small commercial salmon gill net fishery operates in subdistricts at various river mouths in Norton Sound, and is managed by the Alaska Department of Fish and Game and the Alaska Board of Fisheries. A small portion of the chinook and chum salmon caught in the southern subdistricts may be bound for the Yukon River. In 1999, the commercial catch of chinook and chum salmon for all of the Norton Sound subdistricts combined totaled 2,500 chinook and 7,900 chum salmon. The prior 5-year (1994-1998) average commercial catch was 7,800 chinook and 24,400 chum salmon.

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[1] A new ocean distribution map for chum salmon is being prepared by K. Myers, FRI.

Salmon run failures were evident in 1998 across a broad region of Alaska, including the Yukon River in Alaska and Canada. While the causes for the production failures are not known, attention has focused on the marine environment because of the broad scope of the production failures. Likely factors that have received the most attention to date have included the effects of El Nino, ocean and climate regime shifts, and competition to relative to ocean carrying capacity.

2.0 BERING SEA AND GULF OF ALASKA GROUNDFISH FISHERY

2.1 History and Management of the Groundfish Fishery

The U.S. groundfish fisheries in the Bering Sea-Aleutian Islands area and in the Gulf of Alaska are managed under the Magnuson-Stevens Fisheries Conservation and Management Act by the North Pacific Fishery Management Council (NPFMC), and are regulated by the National Marine Fisheries Service (NMFS).

In general, the groundfish fisheries of the Gulf of Alaska are managed and regulated separately from those in the Bering Sea-Aleutian Islands area. Both major areas contain a number of smaller regulatory areas, which are numbered. The groundfish fisheries east of 170° west longitude and north of the Alaska Peninsula are considered to be in the Bering Sea-Aleutian Islands Area (Figure 2 and 3). The groundfish fisheries operating in waters south of the Alaska Peninsula and east of 170° west longitude are considered to be in the Gulf of Alaska Area (Figure 4).

The U.S. groundfish fishery off the coast of Alaska expanded rapidly during the last 15 years . In 1977, the year after the Magnuson Act went into effect, the U.S. groundfish harvest off Alaska amounted to only 2,300 metric tons (mt, 1 mt = 2,025 pounds), or only 0.2% of the total groundfish harvest off Alaska by all nations. Most of that U.S. catch was Pacific halibut caught with hook-and-line gear.

The Magnuson Act, which claimed exclusive fishery jurisdiction by the United States of waters to a distance 200 nautical miles seaward from the coast, allowed the U.S. to gradually replace the foreign groundfish fisheries by "joint-venture" fisheries, in which U.S. fishermen caught the fish and delivered them at sea to foreign fish processing vessels. The joint-venture fishery, in turn, was replaced by an entirely U.S. fishery. The estimated ex-vessel value of the total Alaskan commercial fisheries from 1982 through 1997 is given in Table 1.

The U.S. groundfish fisheries use basically three types of fishing gear: trawls, hook-and-line, and pots. In 1998, 1,273 vessels landed groundfish caught off Alaska. Of these, 916 used hook-and-line gear, 262 used trawls, 231 used pots. Table 2 summarizes the number of vessels that landed

groundfish by gear type in the two areas from 1992 to 1998. Table 3 summarizes the number of vessels by length within each type of fishing gear from 1992 to 1996.

Many of the North Pacific Councils actions in 1998 were related to Bering Sea pollock allocations. It took final action on the inshore/offshore allocation of pollock in June 1998 and addressed the ramifications of the American Fisheries Act of 1998 which set Bering Sea pollock allocations and participants in legislation, allowed for the formation of offshore fishing cooperatives, and created opportunities for development of onshore co-ops. The formation of these co-ops may set aside future development of an individual fishing program for pollock. Another major issue affecting the BSAI and GOA pollock and other groundfish fisheries was a NMFS biological opinion that the BSAI and GOA pollock fisheries jeopardized the recovery of Steller sea lions in those areas.

2.2 The Observer Program

Under U.S. law and regulations, salmon may not be retained by the U.S. groundfish fishery and must be returned to the sea. The groundfish observer program began in 1977 on foreign groundfish vessels operating within the U.S. Exclusive Economic Zone (200 nautical miles from the U.S. shore). It continued with the joint-venture fishery until its end. Until 1990, however, there was little information on the accidental or incidental catch of salmon by the U.S. groundfish fishery.

In 1990, the United States began a scientific observer program for the U.S. groundfish fishery off the coast of Alaska. In general, a groundfish harvesting or processing vessel must carry a NMFS certified observer on board whenever fishing or fish processing operations are conducted if the operator is required by the NMFS Regional Administrator to do so, and a shoreside groundfish processing plant must have a NMFS certified observer present whenever groundfish is received or processed if the plant is required to do so by the NMFS Regional Administrator.

The amount of observer coverage is usually related to the length of the vessel or the amount of fish processed by a shoreside plant or mothership processing vessel. Groundfish harvesting vessels having a length of 125 feet or more are required to carry observers at all times when they are participating in the fishery. Vessels with lengths between 60 through 124 feet are required to carry observers during 30 percent of their fishing days during trips when they fish more than 3 days. Vessels shorter than 60 feet do not have to carry observers unless required to do so by the Administrator of the NMFS Alaska Region. Mothership or Shoreside processing plants processing 1,000 metric tons (mt) or more per month are required to have 100 percent observer coverage, those processing between 500 and 1,000 mt per month are required to have 30 percent coverage, and those processing less than 500 mt per month need no observer coverage unless it was required specifically by the NMFS Regional Administrator.

Observers must be trained and certified. To be certified as an observer by the National Marine Fisheries Service, an applicant must have a bachelor's degree in fisheries, wildlife biology, or a related field of biology or natural resource management. Observers must be capable of performing strenuous physical labor, and working independently without direct supervision under stressful

conditions. Because observers are not employees of the Federal Government but instead hired by certified contractors, applicants must apply directly to a certified contractor. If hired, the contractor will arrange for them to attend a 3-week observer training course in Seattle or Anchorage. Upon successful completion of the course, they will be certified as a groundfish observer.

In addition to the observer coverage, all groundfish harvesters **over 60 feet** and processors must maintain and submit logbooks on their groundfish harvests and their catch of the prohibited species, including crabs, halibut, herring, and salmon

2.3 Estimated Catch of Salmon in the Groundfish Fisheries

NMFS estimates the number of salmon caught in the groundfish fisheries from the observer reports and the weight of groundfish caught. Observers are instructed to collect random samples of each net haul before it has been sorted, and to gather information from each salmon in a haul. Observers record the species caught and the number of each species, determine the sex of dead or dying salmon, record the weight and length of each salmon, collect scales, and check for missing adipose fins. If a salmon is missing its adipose fin, the observer removes and preserves the snout, which may contain a coded-wire tag.

NMFS scientists then use the number of salmon of each species caught in each haul sampled, the weight of groundfish caught in each haul sampled, and the total weight of groundfish harvested during the sampling period to estimate the total number of salmon of each species caught by the entire groundfish fleet. Table 4 presents a summary of the estimated numbers of chinook and other salmon caught by the U.S. groundfish fisheries from 1990 through October 1999. Table 4 indicates that the number of salmon caught by the groundfish fisheries varies considerably by species of salmon, by year, and between the Bering Sea-Aleutian Islands Area and the Gulf of Alaska. For the most part, chinook and chum salmon make up most of the catch, with coho a distant third, and sockeye and pink salmon minor components.

The catch of salmon in the Bering Sea-Aleutian Islands (BSAI) area in 1999 as of 16 October was 81,583 (17,115 chinook and 64,468 other salmon) and in the Gulf of Alaska the salmon catch was 32,183 (28,169 chinook and 7,240 other salmon). Certain areas in the BSAI have been declared salmon savings area for both chum and chinook salmon (Figures 2 and 3) based on high rates of catch in the past.[2] After the 1998 season, because of the concerns regarding chinook salmon conservation in western Alaska and in response to a proposal submitted by BSFA, the NPFMC lowered the allowable bycatch of chinook salmon in the BSAI trawl fishery.

One of the big unanswered questions is what stocks of salmon are being caught by the U.S. groundfish fisheries and how many of each stock. Some information comes from coded-wire tagged salmon recovered by observers. But that information only shows that certain coded-wire

[2] Information on past and present bycatch of salmon in the BSAI and GOA groundfish fisheries can be obtained from the NMFS Alaska Region web page at www.fakr.noaa.gov.

tagged stocks are caught, it says nothing specific about the many stocks without coded-wire tags. Canada has coded-wire tagged upper Yukon River chinook salmon for a number of years. To date, five have been recovered in the Bering Sea groundfish fisheries (Table 5, Figure 5).

Currently, NMFS and ADF&G are looking at genetic stock identification (GSI) techniques to shed more light on the question. More of the stocks in the U.S. and Canada are being defined. particularly chinook and chum salmon, and more GSI information is becoming available on the stocks in Japan and Russia, as well. NMFS observers have collected GSI samples from chum salmon caught by the trawls in the BSAI, ADF&G has sampled the chum catch in the June False Pass fishery, and the Japanese in cooperation with NMFS collected chum salmon samples from the Okhosk Sea and various areas in the North Pacific and Bering Sea. Regional origins as determined by GSI from these three studies are shown in Table 6.

3.0 SOUTH ALASKA PENINSULA ("FALSE PASS") JUNE FISHERY

A purse seine and gill net fishery targeting Bristol Bay sockeye salmon, with an incidental catch of chum salmon bound for Bristol Bay, the Arctic-Yukon-Kuskokwim region, and Asia, operates during the month of June in the South Alaska Peninsula area in the vicinity of Unimak Island and the Shumagin Islands. This fishery, known as the "False Pass" fishery, has operated since 1911, and is managed by the Alaska Department of Fish and Game and the Alaska Board of Fisheries. For management and statistical purposes, the Alaska Department of Fish and Game includes the False Pass area in Statistical Area M.

The 1999 management plan allocated 8.3% of the preseason forecasted Bristol Bay sockeye salmon harvest to the False Pass June fishery, which calculated to a guideline harvest level of 1,250,000 sockeye salmon. The Alaska Board of Fisheries has made changes to the fishery management plan for the False Pass June fishery on a periodic basis. The most recent changes to the fishery management plan were made during the January 1998 meeting of the Board. These changes included lowering of the chum salmon cap from 700,000 fish to a floating cap that can range from 350,000 to 650,000 chum depending on an Arctic-Yukon-Kuskokwim (AYK) harvest projection based on the previous year's harvest of summer chum salmon in AYK. Management concerns for specific chum salmon stocks in AYK are also a factor in determining the cap for a given year. The chum salmon cap for 1999 was 350,000 to 400,000 fish.

Total catch in the False Pass June fishery in 1999 was 1,375,000 sockeye and 245,000 chum salmon. The sockeye salmon catch was 10% above the guideline harvest level, while the chum salmon catch was 30% below the low end of the cap. Table 7 summarizes historical sockeye and chum salmon catches in this fishery since 1980.

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Table 1. Ex-vessel value of the catch in the commercial fisheries off Alaska by species group, 1982-97, (value in $ millions and percentage of total).

Year	Shellfish	Salmon	Herring	Halibut	Groundfish	Total
1982	216.5	310.7	19.9	25.7	211.0	783.8
1983	147.7	320.6	29.8	43.0	188.0	729.1
1984	103.4	343.0	20.4	19.6	239.4	725.8
1985	106.9	389.6	36.9	37.5	260.1	831.0
1986	183.0	404.1	38.4	70.1	268.6	964.2
1987	215.2	473.0	41.7	76.3	336.7	1142.9
1988	235.6	744.9	56.0	66.1	444.6	1547.1
1989	279.2	506.7	18.7	84.4	425.3	1314.3
1990	355.1	546.7	24.0	86.9	474.9	1487.6
1991	301.1	300.1	28.6	91.6	548.3	1269.7
1992	335.1	544.5	27.0	48.0	656.9	1611.5
1993	328.5	391.1	14.1	53.6	425.8	1213.1
1994	321.2	424.4	21.6	84.7	465.2	1317.1
1995	282.9	495.9	39.1	59.5	593.7	1471.1
1996	175.2	346.5	44.8	74.2	541.9	1182.6
1997	172.1	247.8	15.9	106.5	583.1	1125.4
			Percentage of Total			
1982	27.6	39.6	2.5	3.3	26.9	100.0
1983	20.3	44.0	4.1	5.9	25.8	100.0
1984	14.2	47.3	2.8	2.7	33.0	100.0
1985	12.9	46.9	4.4	4.5	31.3	100.0
1986	19.0	41.9	4.0	7.3	27.9	100.0
1987	18.8	41.4	3.6	6.7	29.5	100.0
1988	15.2	48.2	3.6	4.3	28.7	100.0
1989	21.2	38.6	1.4	6.4	32.4	100.0
1990	23.9	36.8	1.6	5.8	31.9	100.0
1991	23.7	23.6	2.3	7.2	43.2	100.0
1992	20.8	33.8	1.7	3.0	40.7	100.0
1993	27.1	32.2	1.2	4.4	35.1	100.0
1994	24.4	32.2	1.7	6.4	35.3	100.0
1995	19.2	33.7	2.7	4.0	40.4	100.0
1996	14.8	29.4	3.8	6.3	45.7	100.0
1997	15.3	22.0	1.4	9.5	51.8	100.0

Note: The value added by at-sea processing is not included in these estimates of ex-vessel value. Includes Joint venture and foreign groundfish catch.

Source: National Marine Fisheries Service, Alaska Region; National Marine Fisheries Service Office of the Pacific Marine Fisheries Commission, Pacific Fisheries Information Network, 7600 Sand Point Way N.E., BIN C15700, Seattle, WA 98115- 0070.

Table 2. Number and total registered net tons of vessels that caught groundfish off Alaska by area and gear, 1992-1998.

	Gulf of Alaska		Bering Sea and Aleutians		All Alaska	
Gear/Year	Number of vessels	Registered net tons	Number of vessels	Registered net tons	Number of vessels	Registered net tons
Hook and line						
1992	1,811	54,698	163	22,076	1,848	64,050
1993	1,515	48,571	115	19,086	1,537	53,068
1994	1,386	51,264	138	17,822	1,410	54,422
1995	1,107	39,203	175	18,395	1,159	45,317
1996	1,017	39,658	158	16,902	1,066	45,762
1997	975	32,455	137	15,616	1,004	38,116
1998	876	31,402	115	16,032	916	38,582
Pot						
1992	226	11,822	73	13,584	277	22,598
1993	103	4,867	21	2,956	118	7,282
1994	110	5,767	40	5,253	136	9,787
1995	188	13,939	126	16,457	263	24,419
1996	146	9,121	103	14,579	217	20,151
1997	147	8,917	84	13,369	202	19,056
1998	178	10,653	79	12,033	231	19348
Trawl						
1992	233	48,547	201	87,268	300	93,405
1993	193	37,107	182	80,259	282	87,786
1994	187	34,247	164	77,830	256	84,565
1995	220	49,909	184	80,551	264	86,024
1996	199	40,124	192	77,789	277	83,374
1997	206	37,452	168	72,324	262	78,725
1998	198	32,077	166	68,074	262	74,448
All gear						
1992	2,118	104,833	408	115,193	2,243	162,352
1993	1,718	84,334	309	98,995	1,837	139,097
1994	1,571	84,051	335	98,381	1,683	139,075
1995	1,396	95,026	464	112,253	1,545	144,446
1996	1,269	82,935	439	107,061	1,448	140,338
1997	1,245	73,808	381	98,655	1,374	127,919
1998	1,140	67,491	337	92,419	1,273	121,953

Note: Includes only vessels fishing Federal TACs. Registered net tons totals exclude mainly smaller vessels for which data were unavailable. The percent of Vessels missing are: 1992 - 8%, 1993 - 7%, 1994 - 6%, 1995 - 5%, and 1996 - 7%.

Source: Blend estimates, fish tickets, Norpac data, federal permit file, CFEC vessel data, National Marine Fisheries Service, 7600 Sand Point Way N.E., BIN C15700, Seattle, WA

Table 3. Numbers of vessels that caught groundfish off Alaska by area, vessel length class (feet), catcher type, and gear, 1992-96.

	Gulf of Alaska				Bering Sea and Aleutian				All Alaska			
	Vessel length class				Vessel length class				Vessel length class			
Number of vessels	<60	60-124	125-230	>230	<60	60-124	125-230	>230	<60	60-124	125-230	>230
Catcher vessels (excluding catcher processors)												
Fixed												
1992	1649	209	7	0	68	75	11	0	1660	239	15	0
1993	1367	148	0	0	36	36	3	0	1375	163	3	0
1994	1455	190	2	0	66	48	5	0	1470	212	6	0
1995	1216	199	9	0	91	136	19	0	1251	255	23	0
1996	1116	179	7	0	64	125	17	0	1143	222	18	0
Trawl												
1992	63	109	15	0	6	97	29	1	66	131	29	1
1993	64	86	9	0	10	87	22	0	71	126	22	0
1994	62	82	18	0	3	77	26	0	62	110	26	0
1995	58	108	20	0	3	95	22	1	59	122	24	1
1996	63	82	17	0	6	91	31	0	66	115	32	0
All Gear												
1992	1684	297	22	0	74	167	40	1	1695	344	44	1
1993	1409	218	9	0	45	123	25	0	1423	273	25	0
1994	1483	247	20	0	69	125	31	0	1498	297	32	0
1995	1241	286	29	0	94	225	40	1	1275	349	46	1
1996	1147	245	24	0	69	216	47	0	1176	320	49	0
Catcher-processors												
Fixed												
1992	3	24	23	0	0	28	46	0	3	30	48	0
1993	4	27	23	0	1	31	31	0	4	32	31	0
1994	3	30	21	0	2	33	26	0	3	35	26	0
1995	5	18	16	0	2	28	27	0	5	29	27	0
1996	4	13	11	0	1	21	32	0	4	21	32	0
Trawl												
1992	0	8	28	6	0	12	40	19	0	13	40	19
1993	0	8	22	5	0	9	37	21	0	9	38	21
1994	0	5	17	4	0	5	34	21	0	6	34	21
1995	0	8	20	8	0	10	35	22	0	10	36	22
1996	0	7	28	2	0	7	34	21	0	8	34	21
All Gear												
1992	3	31	49	6	0	33	79	19	3	36	80	19
1993	4	34	43	5	1	39	62	21	4	40	62	21
1994	3	35	38	4	2	38	58	21	3	41	58	21
1995	5	26	36	8	2	36	60	22	5	37	61	22
1996	4	19	39	2	1	27	65	21	4	27	65	21
All catchers												
All Gear												
1992	1684	323	70	6	74	198	110	20	1695	373	114	20
1993	1410	247	52	5	45	157	85	21	1424	302	85	21
1994	1484	271	58	4	71	156	86	21	1499	321	87	21
1995	1243	307	63	8	95	248	96	22	1277	371	101	22
1996	1149	258	63	2	70	232	108	21	1178	334	110	

Table 4. Estimated number of chinook and other salmon caught by the groundfish fisheries off the coast of Alaska, 1990 through October 1999 (Berger 1999). Data for 1999 through 10/16/99.

Year	Chinook	Chum	Coho	Sockeye	Pink	Total
BSAI						
1990	14,085	16,202	153	30	31	30,501
1991	48,873	29,706	396	79	79	79,133
1992	41,955	40,090	1,266	14	80	83,405
1993	45,964	242,895	321	22	8	289,210
1994	44,380	95,978	231	20	202	140,811
1995	23,079	20,901	858	0	21	44,859
1996	63,205	77,771	218	5	1	141,200
1997	50,218	67,349	114	3	69	117,753
1998	58,966	----------	-69,237-	----------		128,203
1999	17,115	----------	-64,468-	----------		81,583
GOA						
1990	16,913	2,541	1,482	85	64	21,085
1991	38,894	13,713	1,129	51	57	53,844
1992	20,462	17,727	86	33	0	38,308
1993	24,465	55,268	306	15	799	80,853
1994	13,973	40,033	46	103	331	54,486
1995	14,647	64,067	668	41	16	79,439
1996	15,761	3,969	194	2	11	19,937
1997	15,119	3,349	41	7	23	18,539
1998	16,941	----------	-13,539-	----------		30,480
1999	28,169	----------	7,240-	----------		32,183

Table 5. Coded-wire tagged Yukon River chinook salmon recoveries in the U.S. groundfish fisheries.

Brood Year	Tag Number	Date Tagged	Date Recovered	Location	
				Lat.	Long.
1988	026006	Jun-89	25-Mar-92	56 44	173 15
1990	180322	Jun-91	14-Mar-94	60 06	178 58
1991	180830	Jun-92	24-Feb-95	55 19	164 43
1992	181215	Jun-93	06-Dec-94	56 52	171 18
1992	181216	Jun-93	02-Jun-97	59 29	167 49

Table 6. Regional stock composition estimates (%) of chum salmon from four studies using genetic stock identification.

	Region of Origin				
Area Sampled	Asia	Western Alaska Summer Run	Fall Yukon	Alaska Peninsula	PWS/SE Alaska/ BC/Washington
Okhotsk Sea[1]					
1993	90.6	7.9	0.0	1.0	0.5
Western North Pacific[1]					
1993	86.7	8.2	0.0	5.1	0.1
1996	93.7	2.3	0.0	2.5	1.5
1997	77.9	11.1	0.0	11.1	0.0
1998	82.1	7.6	0.0	5.4	4.9
(Sample seized from Chinese vessel 1999)[5]	87.8	2.0	0.0	8.1	2.1
Central North Pacific[1]					
1996	78.9	12.9	0.0	6.6	1.6
Eastern North Pacific[1,4] (Gulf of Alaska)					
1996	15.7	14.8	0.0	13.1	56.6
(Central Gulf of Alaska					
1998 (49-52°N, 145°W)	10.9	15.1	0.4	28.8	44.9
1998 (53-56°N, 145°W)	15.1	13.2	0.7	21.6	49.4
1998 (49-56°N, 145°W)	11.2	14.5	0.4	24.7	49.6
(Western Gulf of Alaska)					
1998 (45-50°N, 165°W	77.8	13.0	0.3	3.9	5.0
Off Vancouver Island[1]					
1995	18.9	0.7	0.0	21.4	59.1
Central Bering Sea[1]					
1996	79.6	4.3	0.0	15.5	0.7
Bering Sea [2] (Trawl Bycatch)					
1994	46.9	22.3	3.6	3.0	24.2
1995	36.7	31.4	6.3	1.7	23.9
Area M (False Pass)					
Shumagin[3]					
1994	34.0	44.0	3.0	8.0	9.0
1995	25.0	52.0	1.0	8.0	12.0
1996	34.0	36.0	2.0	19.0	10.0
South Unimak[3]					
1993	22.0	59.0	1.0	7.0	11.0
1994	27.0	57.0	2.0	9.0	6.0
1995	26.0	65.0	1.0	3.0	7.0
1996	23.0	40.0	5.0	17.0	14.0

Sources: [1] Urawa et al. 1998
[2] Wilmot et al. 1997
[3] Seeb et al. 1997
[4] Urawa et al. 1999
[5] Wilmot et al. 1999.

Table 7. Commercial harvest of sockeye and chum salmon in the "False Pass" June Fishery, 1980 – 1999. Source of data: ADF&G.

Year	Sockeye	Chum
1980	3,206,000	509,000
1981	1,821,000	564,000
1982	2,119,000	1,095,000
1983	1,964,000	786,000
1984	1,388,000	337,000
1985	1,791,000	434,000
1986	471,000	352,000
1987	794,000	443,000
1988	757,000	527,000
1989	1,745,000	455,000
1990	1,346,000	519,000
1991	1,549,000	773,000
1992	2,458,000	426,000
1993	2,974,000	532,000
1994	1,461,000	582,000
1995	2,105,000	537,000
1996	1,029,000	360,000
1997	1,628,000	322,000
1998	1,288,000	246,000
1999	1,375,000	245,000

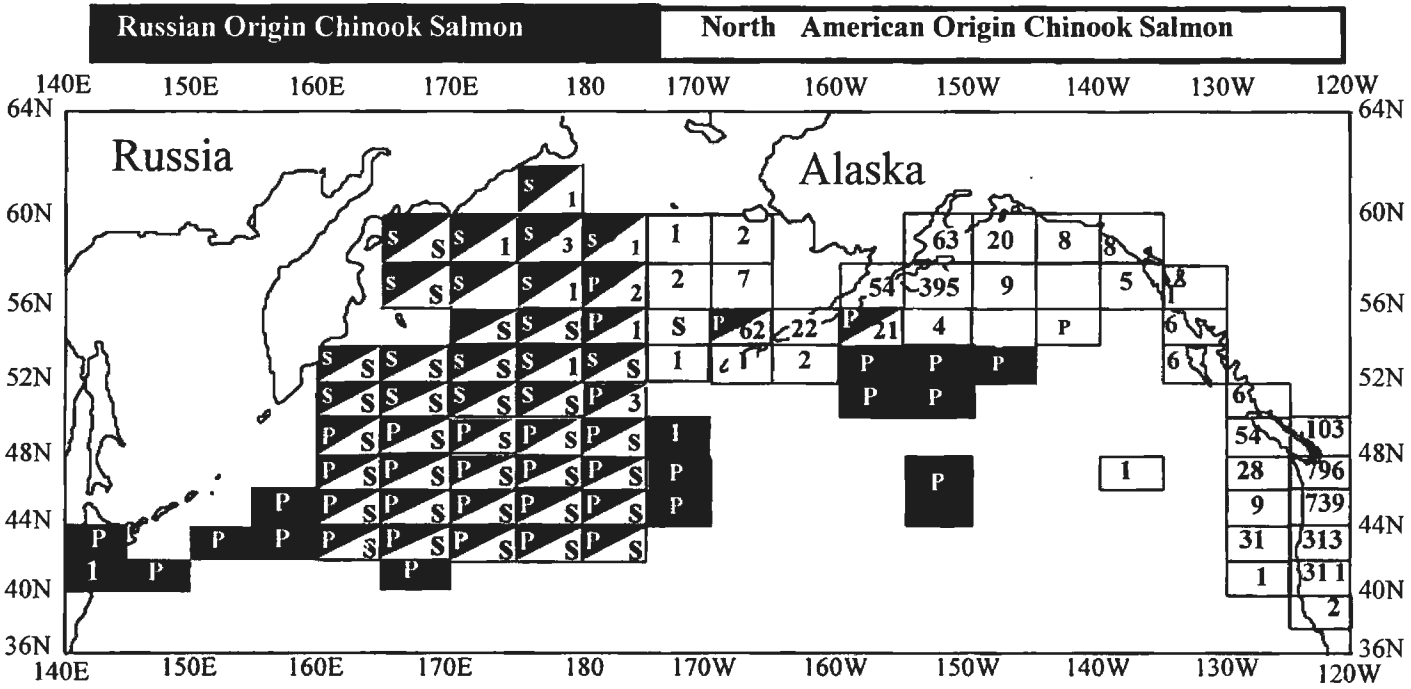

Figure 1. Ocean distribution of Russian (black areas) and North American (white areas) chinook salmon shown by International North Pacific Fisheries Commission (INPFC) 2°-latitude by 5° longitude statistical areas. If tagging experiments prove occurrence, the number of recoveries is shown. The high-seas salmon tag (1953-1997) and coded-wire tag (1983-1997) recovery databases are archived at the FRI. If there is not information from tagging, then a *P* means occurrence is hypothesized from detection of *Myxobolus* spp. parasite "tags", and an *S* means a statistically significant estimate for the stock group was obtained in NMFS and FRI scale-pattern analyses. Scale pattern estimates stratified by INPFC statistical subareas are applied to all 2°-latitude by 5°-longitude strata within that subarea.

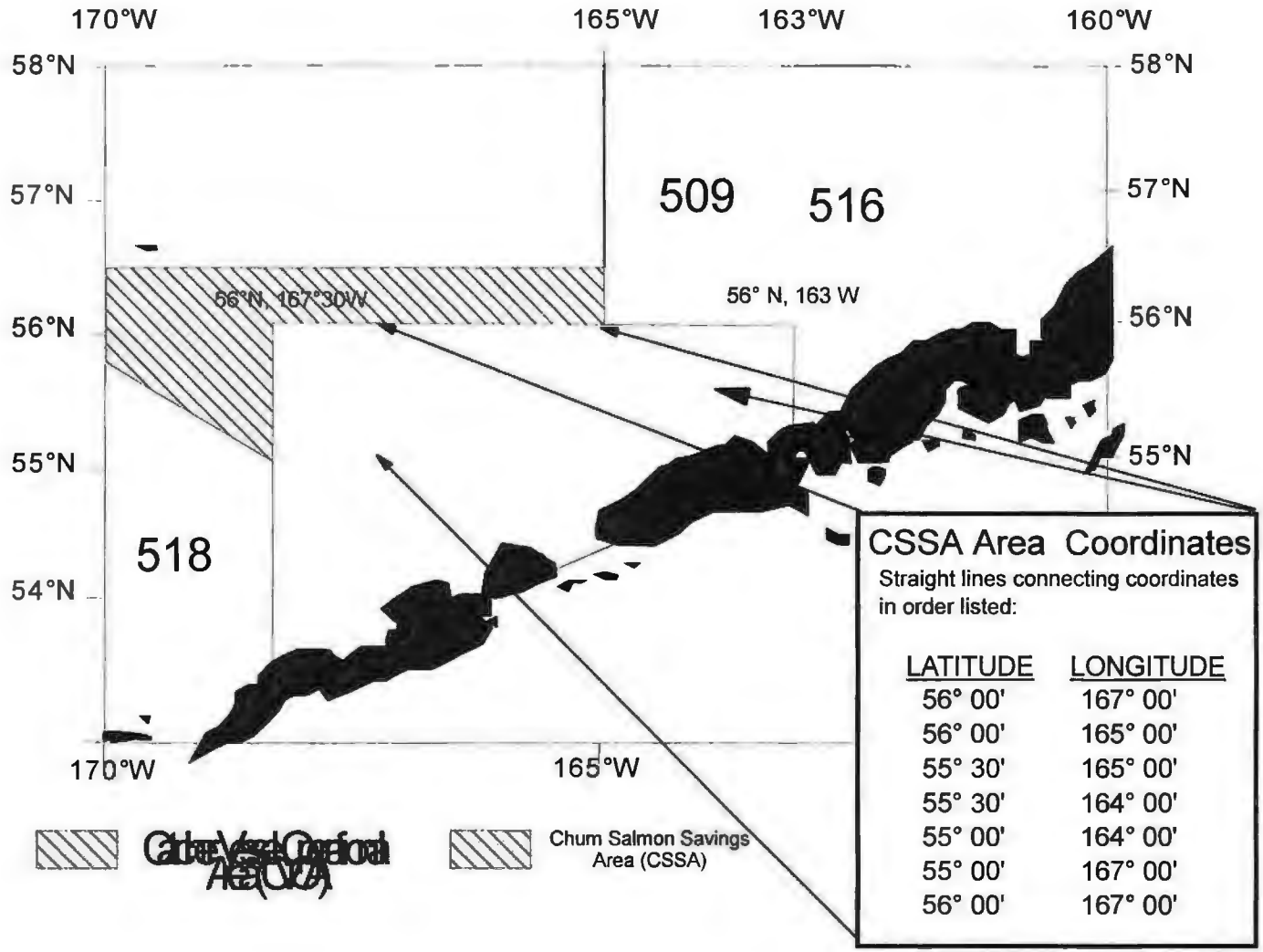

Figure 2. Statistical reporting areas and chum salmon savings area for the U. S. groundfish fisheries in the Bering Sea.

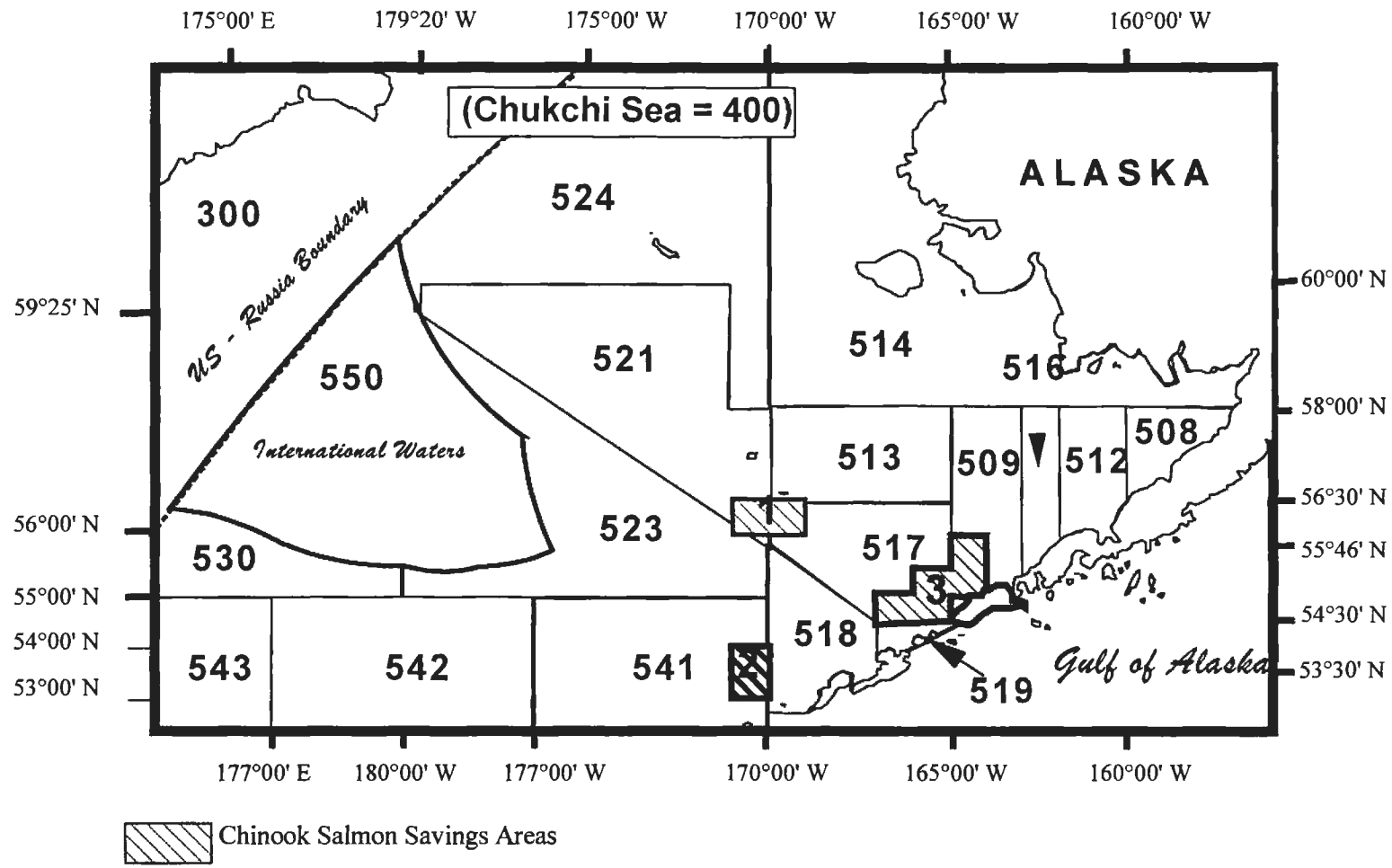

Figure 3. Statistical reporting areas and chinook salmon saving areas for the U. S. groundfish fisheries in the Bering Sea.

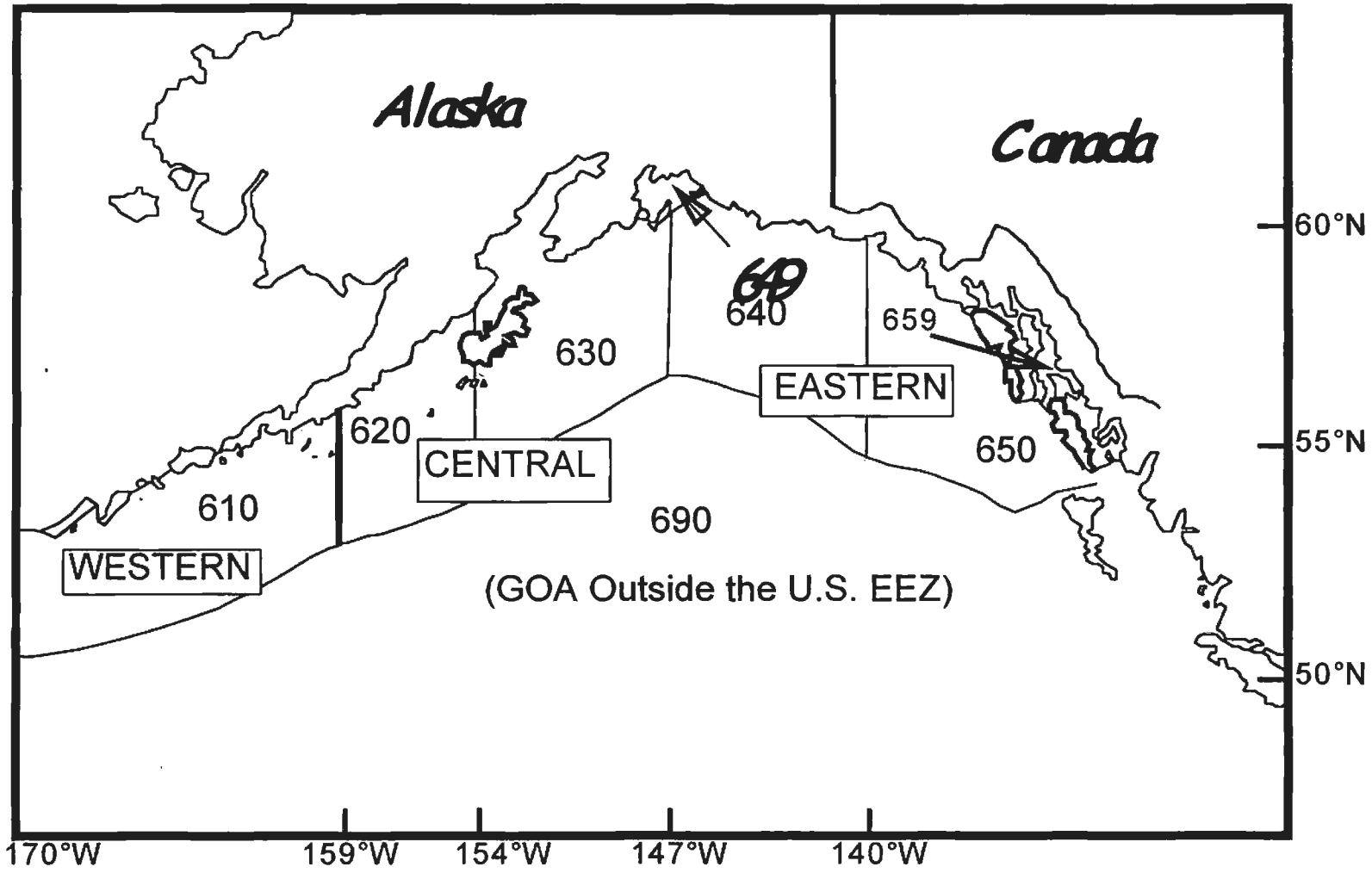

Figure 4. Statistical reporting areas for the U.S. groundfish fisheries in the Gulf of Alaska (GOA).

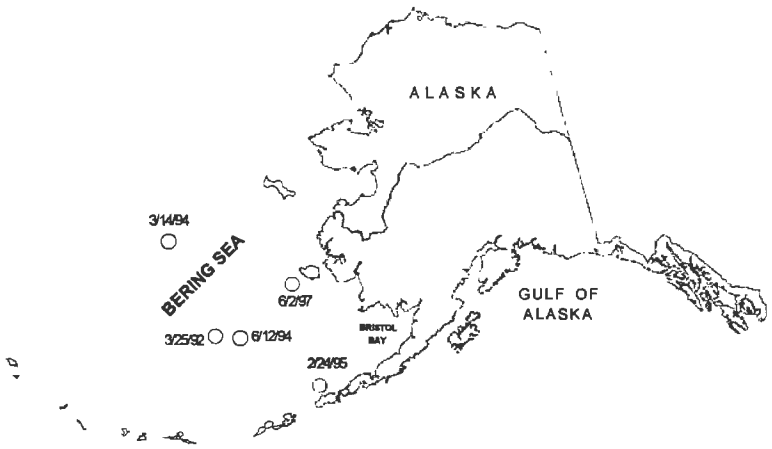

Figure 5. Locations and dates of recoveries of coded-wire tagged Yukon River chinook salmon.