YUKON RIVER SALMON SEASON REVIEW FOR 1998 AND TECHNICAL COMMITTEE REPORT

Prepared by

THE UNITED STATES/CANADA
YUKON RIVER JOINT TECHNICAL COMMITTEE

18-19 November, 1998

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 18-19 November, 1998. The agenda for the JTC meeting was to prepare the standard season summary report, including a review of the fisheries, stocks, and projects, and to provide a summary on marine fisheries along the lines of that last provided in the November 1993 JTC report. 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)
- Ian Boyce
- Gail Faulkner
- Brian Ferguson
- Sandy Johnston (co-chair)
- Sandra Morlacci
- Pam Vust

Contractors (Canada)
- Mary Ellen Jarvis

Alaska Department of Fish and Game (ADF&G)
- Louis Barton
- Dan Bergstrom
- Jeff Bromaghin
- Larry Buklis (co-chair)
- Dan Huttunen

United States Fish and Wildlife Service (USFWS)
- Monty Millard
- Tevis Underwood

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

Tanana Chiefs Conference
- Kevin Van Hatten

Yukon River Panel
- Hugh Monaghan

Attachment I provides the updated historical Yukon River salmon catch and escapement data 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. Attachment III is a summary of the status R & E Fund projects for 1998, as provided by the Executive Secretary of the Yukon River Panel.

2.0 1998 COMMERCIAL FISHERY - ALASKA

Preliminary estimates of commercial sales totaled 72,230 salmon and 413 pounds of unprocessed salmon roe for the Alaskan portion of the Yukon River drainage in 1998 (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 43,618 chinook, 28,611 summer chum, and 1 coho salmon. Roe sales by species totaled 260 pounds for chinook and 153 pounds for summer chum salmon. The total estimated commercial harvest including the estimated harvest to produce roe sold was 72,498 salmon; 43,699 chinook, 28,798 summer chum, and 1 coho salmon. The 1998 chinook salmon harvest was approximately 66% of the lowest commercial harvest since statehood and the lowest harvest since 1952. The summer chum salmon harvest was the lowest since 1968. No commercial fishing was allowed during the 1998 fall chum season. The 1993 through 1997 five-year-average harvests were as follows: 107,161 chinook, 425,551 summer chum, 90,975 fall chum, and 28,553 coho salmon.

The 1998 Yukon River chinook, summer chum, and fall chum salmon runs were among the weakest on record. These returns were completely unexpected based upon parent year escapements. Changing climate and ocean conditions appear to have impacted salmon survival. Chinook salmon showed signs of stress such as lower average weight than normal and unhealed lamprey marks.

A total of 671 permit holders participated in the fishery during 1998 (Table 1), which was 13% below the recent five-year-average and the lowest on record since 1972. A total of 643 permit holders fished in the Lower Yukon Area in 1998 which was 2% below the recent five-year-average. A total of 28 permit holders fished in the Upper Yukon Area, which was 76% below the recent five-year-average of 118 permits and the lowest on record since 1971.

Yukon River fishers in Alaska received an estimated $2 million for their catch in 1998, approximately 64% below the recent 5-year-average of $5.6 million. Six buyer-processors operated in the Lower Yukon Area, and three buyer-processors and 10 catcher-sellers operated in the Upper Yukon Area.

Lower Yukon fishers received an estimated average price per pound of $2.51 for chinook and $0.14 for summer chum salmon. The average price paid for chinook salmon in the Lower Yukon Area was the highest since 1993. 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 $1.9 million, which was 55% below the recent 5-year-average of $4.2 million. The average income for Lower Yukon Area fishers that participated in the 1998 fishery was $3,014.

Upper Yukon commercial fishers received an estimated average price per pound of $0.95 for chinook salmon, $2.00 for chinook salmon roe, $0.17 for summer chum salmon, and $1.90 for summer chum salmon roe. The exvessel value of the Upper Yukon Area fishery was $18,106; the lowest on record. Permit holders who participated in the 1998 fishery earned an average of $646 in the Upper Yukon Area.

Department test fishing projects sold a total of 878 chinook and 2,935 summer chum in District 1 and 48 chinook and 84 summer chum salmon in District 2 in 1998. These fish are not included in the commercial totals referenced above.

2.1 Chinook and Summer Chum Salmon

The 1998 preseason outlook was for a near average chinook salmon run and an average to above average summer chum salmon run. The commercial harvest in the Alaskan portion of the drainage was anticipated to be between 88,000 and 108,000 chinook and 200,000 to 600,000 summer chum salmon.

The Lower Yukon Area was generally free of ice by 22 May. The first chinook salmon catches were reported on 28 May near Sheldon Point by a subsistence fisher. The department's test fishing projects recorded the first chinook salmon catches on 1 June.

The chinook salmon run was assessed as being later than average and weak in abundance. Approximately 50% of the chinook salmon run had entered the lower river by 26 June; seven days later than average. The cumulative test fishing CPUE was 16.7 compared to the average of 25.0 for 1980-1997. The preliminary Pilot Station sonar passage estimate of 122,000 chinook salmon was well below the passage estimates of 240,000 fish in 1995 and 224,000 fish in 1997. All run assessment tools indicated lower numbers of chinook salmon entered the river than in other years. Overall, the chinook salmon run entered the river in short pulses, and in a relatively low but steady pattern. The normal pattern of entry is strong pulses.

Age composition sampling showed that, as had been expected for 1998, the chinook salmon run was composed of fewer 6-year olds than usual. However, the proportion of 7-year old fish was lower than expected. Harvest abundance was below anticipated levels for all ages. Although age- 5 fish comprised a large proportion of the chinook salmon commercial harvest, as had been anticipated, it was only near normal in abundance, while all other age groups were below normal in harvest abundance.

The summer chum salmon run was assessed as being later than average and very weak in abundance. According to test fishing CPUE data, approximately 50% of the summer chum run entered the lower river by 27 June; five days later than average. The preliminary Pilot Station sonar passage estimate through 18 July was 831,000 summer chum salmon. The 1997 passage estimate was 1.4 million fish and the 1995 passage estimate was 3.6 million summer chum salmon. Approximately 1.0 million summer chum salmon are needed past Pilot Station for

spawning escapements. No directed summer chum salmon commercial harvest was possible this year other than one 3-hour test period in District 1, based on Pilot Station sonar passage estimates and escapement estimates in the East Fork Andreafsky, Anvik, Clear, Gisasa, Kaltag, Nulato, Chena and Salcha Rivers. It will take several more seasons to evaluate the relationship between Pilot Station sonar passage estimates and subsequent harvests and spawning ground escapements.

The summer season commercial fishing harvest was very limited in 1998. The commercial harvest of chinook and summer chum salmon was below the low end of the guideline harvest range for all districts and subdistricts, except District 6 which was slightly above the upper end of the chinook salmon guideline harvest range. No harvest was taken in District 3 and no commercial openings were allowed in District 4. Fishing time was reduced to roughly one-third of normal in the three lower river districts and roughly one-half of normal in the upriver districts. Fishing periods were spread out more than usual in the Lower Yukon Area and there was only one period in Districts 5 and 6. There were no commercial fishing periods allowed in District 4 primarily due to the weak summer chum salmon run.

The anticipated Lower Yukon Area (Districts 1-3) commercial harvest was 82,000 to 100,000 chinook salmon. However, the harvest from fishing periods targeting chinook salmon with unrestricted mesh size gillnets was not expected to exceed 85,000 fish. The management concern is to protect the productivity of escapements; that is, not only escapement abundance but the proportion of female salmon in the escapements. Large mesh size gillnets utilized during unrestricted mesh size openings target older, larger chinook salmon, which includes a larger proportion of females than do smaller mesh gillnets used during restricted mesh size fishing periods. Fishing periods restricted to six inch or smaller mesh size gillnets result in higher catches of smaller, predominantly male, chinook salmon. Therefore, the amount of harvest taken with larger and smaller mesh gear must be carefully considered.

The normal 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 not as early as in 1996 and 1997, the 1998 commercial fishing season opened on 15 June in District 1 after approximately seven days of increasing subsistence and test fishery catches.

No additional periods were established until 23 June because of the extremely low salmon harvest taken during the first opening, and test fishing catches indicating well below average abundance. The indications of low abundance were completely unexpected particularly due to the relative historic stability of the chinook salmon run. It was very difficult to assess chinook salmon run strength and allowable harvest because of the strong possibility of late run timing. The test fishing and commercial harvest database since 1980 did not have any comparable year in low magnitude by which to gauge the 1998 run. Based on the low test fishing CPUE, a strategy of increasing the duration between fishing periods and reducing fishing time from the more typical 12-hour periods was employed. From 23 June through 3 July, only two 9-hour unrestricted mesh size gillnet periods were allowed each in Districts 1 and 2. The total harvest reached approximately 36,000 chinook salmon on 3 July, well below any year since 1961. The

last fishing period was reduced to six hours in duration in Districts 1 and 2 and was based on the likely dominance of lower river chinook salmon stocks and the near average escapement at the East Fork Andreafsky River weir.

Six inch maximum mesh size fishing periods are utilized to target summer chum salmon in the Lower Yukon Area. One 3-hour test commercial fishing period was allowed on 2 July.

The combined total harvest of 42,219 chinook salmon for Districts 1 and 2 (Table 1) was 30% below the low end of the guideline harvest range of 60,000 fish and 58% below the 1993-1997 average harvest of 100,000 fish. A total of 41,008 chinook salmon was harvested during unrestricted mesh size fishing periods and 1,211 chinook salmon were harvested during one fishing period restricted to six inch maximum mesh size gillnets. The overall average weight of 18.0 pounds in the commercial harvest was lower than the previous low of 19.6 pounds, and well below the average of 20.5 pounds. The average weight of chinook salmon was 18.1 pounds for the unrestricted mesh size harvest and 14.7 pounds for the six inch maximum mesh size harvest.

The combined commercial summer chum salmon harvest in District 1 and 2 of 28,118 fish (Table 1) was 76% below the recent 5-year-average harvest of 115,000 fish. A total of 20,134 summer chum salmon were caught during unrestricted mesh size fishing periods and 7,804 summer chum salmon were harvested during one 3-hour restricted mesh size test opening. The average weight of summer chum salmon was 6.7 pounds.

Preliminary age composition data from the Lower Yukon Area indicated 6-year-old fish accounted for approximately 34% of the chinook salmon samples from the commercial harvest. This was consistent with the below average return of 5-year-old fish in 1997. Approximately 43% of the chinook salmon commercial harvest in Districts 1 and 2 was females. Five-year-olds comprised approximately 35% of the summer chum salmon samples taken from the lower river commercial harvest.

Although District 3 was open for one commercial fishing period in 1998 no deliveries were made. Although commercial fishers initially expressed an interest in fishing in District 3, they all chose to fish in Districts 1 or 2.

District 4 was not opened to commercial fishing in 1998 primarily due to the poor run of summer chum salmon. Subsistence drift gillnet fishing for chinook salmon in Subdistrict 4-A was extended from its regulatory closing date of 14 July through 21 July by emergency order.

Commercial fishing was not allowed within the Anvik River Management Area. The Anvik River did not meet its minimum escapement goal of 500,000 summer chum salmon.

Only one 18-hour commercial fishing period was allowed in Subdistricts 5-A, 5-B, and 5-C, which occurred on 23 July, after the chinook salmon run was believed to be well distributed throughout these subdistricts. The harvest of 475 chinook salmon was 81% below the lower end of the guideline harvest range of 2,400 fish. A total of 96 summer chum in the round and 13

pounds of summer chum roe were sold for a total estimated harvest of 110 summer chum salmon.

Commercial fishing in Subdistrict 5-D was opened for one 24-hour period on 26 July. The Subdistrict 5-D harvest of 42 chinook salmon was 86% below the low end of the guideline harvest range of 300 chinook salmon.

Commercial fishing in District 6 was opened for only one 24-hour period on 17 July. The total estimated commercial harvest in 1998 was 963 chinook and 570 summer chum salmon in District 6. The chinook salmon harvest exceeded the upper end of the guideline harvest range of 800 fish. The summer chum salmon harvest was 96% below the low end of the guideline harvest range of 13,000 fish. Management of the fishery was primarily based on Chena and Salcha River tower counts. The one fishing period was directed at the harvest of chinook salmon.

2.2 Fall Chum and Coho Salmon

The Board of Fisheries (board) reviewed *The Yukon River Drainage Fall Chum Salmon Management Plan* during a meeting held in Fairbanks in December, 1997. During this meeting, the board received public, organization, and advisory committee comments concerning the fall chum salmon management plan. Comments included proposed amendments submitted by the Yukon River Drainage Fisheries Association (YRDFA). After deliberation, the board adopted a management plan, which contains the recommendations proposed by YRDFA, and will be in effect through the year 2000 fishing season.

The fall chum salmon management plan recommended that directed fall chum salmon commercial fisheries be allowed only when total inriver run size projections were greater than 675,000 fall chum salmon. Additionally, only the harvestable surplus above 625,000 fall chum salmon could be targeted in the Alaska commercial fisheries. The 1998 preseason projection of approximately 880,000 fall chum salmon suggested an Alaskan fall chum salmon commercial harvest of up to 255,000 fall chum salmon, given normal stock distribution. If fall chum salmon returned as projected, an Alaskan commercial harvest approaching the third quartile of each district's guideline harvest range could be expected.

Fall chum salmon enter the Yukon River beginning in mid-July. As the 1998 run materialized, the department used inseason management tools to adjust the run size projection and the corresponding allowable harvest. Lower Yukon River monitoring tools available to the department in 1998 included the lower Yukon River set gillnet test fishery, the Mountain Village drift gillnet test fishery, Pilot Station sonar passage estimates, subsistence catch reports, and age composition data. This information, in combination with the preseason projection, was the basis for initial management decisions in the lower Yukon River fisheries.

By early August, it was estimated that the 1998 fall chum salmon return would be significantly below the preseason projection, and likely below 600,000 fall chum salmon. The management plan directs that for an overall run assessment below 600,000 fall chum salmon, the department

shall close the commercial, sport, and personal use fisheries. No commercial salmon fishing occurred during the fall season in 1998. Effective 16 August, chum salmon catch and release restrictions were placed on sport fisheries throughout the Yukon River drainage. The sport fishery catch and release restriction remained in effect for the duration of the season. Also effective 16 August, the Subdistrict 6-C personal use salmon fishery near Fairbanks was closed and remained closed for the duration of the fishing season. The sport and personal use fishing restrictions were imposed prior to fall chum salmon becoming available in these respective fisheries. Essentially, because of these actions, no fall chum salmon were harvested in the commercial, sport, or personal use fisheries in 1998.

By late August, the department reviewed the available information and estimated that the 1998 fall chum salmon run size would probably be below 450,000 fall chum salmon. When the overall run size is between 350,000 and 450,000 fall chum salmon, the management plan directs that the department manage the subsistence fisheries to achieve a minimum 350,000 drainage-wide fall chum salmon escapement level. In most years, the subsistence harvest within the Yukon River drainage ranges between 100,000 and 200,000 fall chum salmon. Based on the projected run size, implementing subsistence salmon fishing restrictions became necessary.

Effective 27 August, the department restricted the subsistence salmon fisheries throughout most of the Yukon River drainage, Districts 1, 2, 3, 4, and 5, to a schedule of two 48-hour periods per week. Most areas were on a seven days per week subsistence salmon fishing schedule prior to imposing these restrictions. Exceptions to these restrictions were the tributaries of the Yukon River below the confluence of the Koyukuk River and within the Coastal District. In these areas, because of the low abundance of fall chum salmon present, subsistence salmon fishing remained on a seven-day per week schedule. The department also put the entire Subdistricts 6-A and 6-B on the two 42 hour subsistence salmon fishing periods per week schedule. The majority of Subdistricts 6-A and 6-B was already on this schedule, however, the Old Minto area and Kantishna River drainage fishing periods were also reduced to coincide with this schedule.

Typically, the vast majority of the fall chum salmon enter the Yukon River by early September. Additionally, by early September, escapement and fishery monitoring projects within the upper Yukon River drainage begin to provide valuable inseason information on run strength and timing of fall chum salmon. These upriver indicators include the village of Tanana test fish wheels, Chandalar and Sheenjek River sonar projects, and the Rapids-Rampart and Tanana River tagging projects. As the department became more confident in the inseason run size projection, it became apparent that further restrictions in the subsistence salmon fishery were needed in order to achieve a 350,000 drainage-wide fall chum salmon escapement level.

Effective 4 September, in Districts 4 and 5, and in Subdistricts 6-A and 6-B, the department further restricted the subsistence salmon fisheries to 48 hours per week. In most areas, subsistence fishing was placed on a schedule of two 24-hour periods per week. Further restrictions to the subsistence salmon fishing schedule occurred in District 5 and Subdistricts 6-A and 6-B, when these areas were eventually placed on a one 24-hour period per week schedule. Subdistrict 5-B, 5-C and 5-D subsistence fishing was placed on the one 24-hour period per week

schedule effective 22 September. Subdistrict 5-A, 6-A and 6-B subsistence fishing was placed on this same, very restrictive fishing schedule effective 28 September.

Subsistence salmon fishing restrictions, imposed to conserve fall chum salmon, were removed after the majority of fall chum salmon had migrated through traditional fishing areas bound for upriver spawning grounds. Lifting the subsistence salmon fishing restriction provided for additional subsistence fishing opportunities on later running coho salmon as well as other non-salmon species such as whitefish. District 1, 2 and 3 subsistence salmon fishing restrictions were lifted on 4 September, while they were lifted on 5 October in Subdistricts 5-A, 6-A and 6-B.

It is unfortunate that the 1998 fall chum salmon return required subsistence users throughout the drainage to be burdened with restrictions in order to improve escapement. Compliance with the subsistence salmon fishing restrictions was very good. While imposing these restrictions, the department worked extensively with users throughout the drainage. In addition to normal daily communications between the department and individual fishers, there were six YRDFA teleconferences during the fall season in 1998. The first teleconference occurred on 4 August, and the last YRDFA teleconference occurred on 16 September. During these teleconferences information was exchanged between fishers throughout the drainage and with the department. Fishing schedules were altered in some areas based on information fishers provided during these teleconferences.

Yukon River coho salmon have a slightly later, but overlapping, run timing with that of the fall chum salmon run, which complicates the fall season management program. However, fall chum salmon are the primary species of management concern during the fall season. There are no commercial guideline harvest ranges established for coho salmon. Currently, commercial harvest of coho salmon is a function of the timing, frequency, and duration of periods established for the more numerous fall chum salmon. In 1998 there were no fall chum salmon directed commercial fishing periods. Consequently, coho salmon were not sold commercially in 1998.

The board tabled YRDFA's coho salmon management plan proposal during its December 1997 meeting. The proposal will be taken up by the board during it's November 1998 meeting. The proposed coho salmon management plan allows for a directed coho salmon commercial fishery only under very special situations.

3.0 1998 COMMERCIAL FISHERY - CANADA

Bi-lateral efforts to negotiate new fishing arrangements to replace the management objectives and guidelines contained in the Interim Yukon River Salmon Agreement (IYRSA) failed in March 1998. This resulted in the expiry of the IYRSA. To guide fisheries management through the 1998 season, the Yukon Salmon Committee (YSC)[1] recommended the development of a

[1] Management of salmon in the Yukon is a shared responsibility between Fisheries and Oceans Canada (DFO) and the Yukon Salmon Committee (YSC). The YSC was established in 1995 pursuant to the Comprehensive Land

management plan for the Canadian chinook and chum salmon fisheries on the Yukon River that was based on the fundamental priority for stock conservation. The YSC recommended that catches only be constrained by conservation objectives and the allocation priority afforded to the First Nation fisheries for food, social and ceremonial purposes.

A preliminary total of only 390 chinook salmon, 0 chum salmon and 0 coho salmon was harvested in the Canadian Yukon River commercial fishery in 1998 (Table 3). This was the lowest combined commercial catch on records dating back to 1904 and was the result of extensive closures in the fishery due to conservation concerns for both chinook and chum runs.

A total of 21 commercial licenses was issued in 1998, six less than in 1997. Most of the reduction can be attributed to a licence buy-back program conducted by DFO and the YSC which occurred in the 1997/1998 fiscal year. The purpose of the program was to accommodate obligations arising from the UFA which will see increased participation by First Nation fishers in the commercial fishery. A total of five licences was purchased in the buy-back.

3.1 Chinook Salmon

With the preseason expectation of a total run size of about 143,000 Canadian-origin mainstem Yukon River chinook salmon in 1998, which was close to the recent cycle average of approximately 140,000 chinook, the elements of the chinook management plan recommended for 1998 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;

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 for an average return and accounting for the priorities of conservation and the needs of the aboriginal fishery, it was expected that at least 10,000 chinook salmon would be available for commercial harvest; and

iv) an initial fishery opening of 48 hours was scheduled to occur on the fifth day after the run was deemed to have commenced. This 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

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Claim Umbrella Final Agreement (UFA) between the Government of Canada, the Council for Yukon Indians and the Government of the Yukon. The Committee is a public board consisting of ten members, 70% of which are appointed by Yukon First Nations. Although the Committee currently operates by consensus, the voting structure of the Committee is organised so that, should a vote be necessary, 50% of the votes reside with appointees of Yukon First Nations.

closed - two days open - four days closed, was new for 1998. It was designed to conserve early-timed chinook stocks while allowing some limited commercial access to the resource. From 1990 to 1996, the weekly fishing periods were restricted to one day/week, from the Sunday or Monday following the first DFO fishwheel catch of chinook salmon, until 14 days after the run had deemed to have commenced. This often meant no extended fishing periods were permitted for the first 2.5 weeks of the season. In 1997, the opening schedule was reviewed and changed to provide for a complete closure in the fishery until 10 days after the run had deemed to have begun. These early season restricted periods appear to have been effective in rebuilding some early stocks. In some years, e.g. 1996, 1997, the peak catch-per-unit-effort occurred during the first 2 weeks of the season yet opportunities to fish these stocks were limited by the opening schedules in place for each of those particular years.

The first chinook salmon was caught in the DFO fishwheels on 27 June and catches remained sporadic through the second week of July. The beginning of the run was determined to occur 02 July and was marked by a vaguely increasing trend in the 3-day moving averages of the DFO fishwheel catches. According to the management plan, the commercial fishery should have opened on Tuesday, 07 July (statistical week 28), which was the fifth day after the run had deemed to have begun. However, DFO fishwheel catches were approximately 80% below average and information from ADF&G indicated the run entering the mouth of the river was far below expectations. The run at Pilot Station in the lower Yukon River in Alaska appeared to be approximately 65% below the 1997 chinook run size and run timing appeared to be a week to 10 days later than normal. It was surmised by DFO that if the situation did not improve, the number of chinook salmon migrating into Canada in the upper Yukon would not likely exceed 30,000 chinook. Based on this information, a decision was made by DFO on 03 July to postpone the first opening of the commercial fishery until after a special meeting of the Yukon Salmon Committee was convened 6 July to review the situation.

During the 6 July meeting, the Committee and DFO agreed that a limited assessment fishery was justified given the following: it was still very early in the season in the Canadian section of the drainage; there was some uncertainty over run indicators in the lower Yukon River in Alaska; and, there was a need to obtain assessment data within the Canadian section of the river upon which to base further decisions. In discussions with ADF&G managers, there was a sense that the lower Yukon sonar estimate of chinook passage at Pilot Station was conservative given reports of better than expected fishing results further upriver in Alaska. Based on the information at hand, the Committee recommended restricting the initial opening of the commercial fishery to 24 hours and delaying the start of it until noon Sunday 12 July. A second restricted opening of 24 to 48 hours the subsequent week would follow this opening. The YSC would meet again after the second opening to review the information. It was anticipated the tags recovered in the commercial fishery would provide the basis for inseason forecasts of border escapement that might be available at that time.

A further condition developed by the YSC on the recommended openings was that prior to implementing them, Yukon First Nations should be consulted. This consultation occurred at the Yukon First Nation General Assembly 07 July with a presentation by the Committee chairperson

with technical support provided by DFO. The elders at the Assembly expressed concerns about the low salmon numbers but there was no disagreement with the Committee recommendations.

The first opening in the commercial fishery was held noon 12 July to noon 13 July. A total of 12 fishers participated in the fishery and caught a total of 173 chinook, 2 of which were tagged. The CPUE was 14 chinook/fisher/day, 62% below the recent cycle average for this week of 37 chinook/fisher/day. Below average CPUE was anticipated particularly if the run timing was late; reports from ADF&G indicated the run was one to two weeks later than normal. Fishers reported the fish were in good condition but the average size was small compared to normal, likely indicating the major portion of the catch was composed of age-5 fish. This was consistent with information from ADF&G who found that the returns of age-6 and age-7 fish were below average.

The second opening in the commercial fishery was scheduled to commence 09:00 h Sunday, 19 July. This opening lasted 36 hours and the fishery closed 21:00 h Monday 20 July. A total of 11 fishers participated in the opening catching a total of 212 chinook; ten of these fish were tagged. The catch compared poorly with previous cycle average (1992-1997) daily catches for this week of 675 chinook/day. The CPUE for this opening was 13 chinook/fisher/day compared to an average of 47chinook/fisher/day. The low catch and drop in CPUE over the previous week was unexpected; normally the run strength would be increasing significantly at this time to reach a peak value in the third or fourth week of July. However, the poor performance of the commercial fishery was also reflected in the DFO fishwheel catches which were 58% below average on 21 July and the second lowest on record.

A conference call was held with the YSC on 22 July to update the catch and stock assessment information throughout the Yukon drainage. The chinook run assessment by ADF&G in the lower river was virtually completed by this time. Data from the ADF&G Pilot Station sonar indicated a total passage of approximately 118,000 chinook; on average, 99% of the run would have passed upstream by this time. This was well below estimates of >200,000 for each of 1995 and 1997, years when managers felt the estimates were reasonable. In each of those years, the upper Yukon border escapement estimates represented approximately 25% of the Pilot Station sonar estimate. If a similar relationship existed in 1998, the sonar data suggested a border escapement of approximately 30,000 chinook salmon. Other indicators of low run abundance in the lower Yukon included the U.S. commercial catch of approximately 43,000 chinook salmon which was reportedly the lowest catch since 1952, and the ADF&G river mouth test fishery index which was 35% below average.

The below average catches in the Canadian commercial fishery and in DFO fishwheels were reviewed with the YSC along with the first inseason forecasts of the number of chinook salmon expected to pass into the Canadian section of the upper Yukon River. The border escapement forecasts produced for the conference call on 22 July ranged from 32,000 to 43,000 chinook salmon. However, there was not a high degree of confidence in the estimates due to the low catches and tag recoveries upon which the estimates were based. The wide range in the forecasts was the result of two estimates being developed. The highest estimate was derived from commercial and aboriginal catch and tag recovery data from the Dawson area, whereas the lower

estimate was derived by adding in data supplied from the Chandindu River[2] weir. It was felt that the lower estimate was more robust since it included a higher recapture sample, even though the ratio of tags in the weir sample was much higher than recorded in the fishery catches.

Based on the poor run strength of the chinook return that was evident from both the catches and stock assessments to date, the YSC recommended that effective midnight 25 July, the commercial, domestic and sport fisheries for Yukon chinook salmon be closed until further notice. Run forecasts would be reviewed weekly and if they indicated the escapement and aboriginal fishery requirements would be achieved, consideration would be given to rescinding the closures.

Recognising the closure of the commercial fishery would seriously impact the mark-recapture program and the ability to update run estimates, the DFO and YSC developed a test fishery program in conjunction with the Tr'on dek Hwetch'in First Nation in Dawson City and Dawson area commercial fishers. The program involved the First Nation hiring up to five, two- person teams fishing with gillnets in prime commercial fishing areas two days each week. Each team consisted of one FN fisher and one commercial fisher. The fish that were caught went to the Tr'on dek Hwetch'in FN in Dawson and from there, they were distributed to other First Nations that were in need of fish.

A total of 737 chinook salmon was caught in the test fishery, which occurred generally from noon Monday through noon Wednesday each week for three consecutive weeks commencing 27 July. Associated with this catch was the recovery of 35 tags. Run forecasts were updated weekly as the new data became available and results were discussed with the YSC. Unfortunately, the forecasts declined as the season progressed from: 22,500 to 27,700 chinook forecast on 30 July; to 21,100 to 25,500 chinook forecast on 06 August; to 20,600 to 24,300 chinook forecast on 13 August. As a result of the poor run forecasts, the commercial, domestic and sport fisheries remained closed through the remainder of the season. In addition to poor run abundance, there was also concern about the very low water levels that persisted throughout the chinook season; most of the non-glacial watersheds were very low as a result of minimal precipitation. Also there were reports of higher than normal water temperatures in some locations.

The total commercial chinook catch of 390 fish, the lowest commercial chinook catch recorded since 1904, was 96% below the previous cycle average and was approximately 4% of the preseason expectation for a commercial catch of 10,000 chinook salmon. For comparison, the recent six-year cycle average commercial catch was 9,979 chinook (1992 to 1997); during this period the catch ranged from 5,311 chinook in 1997 to 12,028 chinook in 1994. The preliminary postseason estimate of the border escapement indicated a Canadian commercial harvest rate of 1.5% on chinook salmon in 1998 compared to the recent cycle average harvest rate of 21%.

[2] The Chandindu River weir operated for the first time in 1998, funded by the Yukon Restoration and Enhancement Fund. The river flows into the Yukon River from the north-east, approximately 32 km downstream from Dawson City. An unusually high proportion, i.e. 14.1%, of the fish that passed through the weir were tagged compared to only 4.0% in the fishery. The higher the proportion of tags in the recapture sample, the lower the estimate.

Fishing effort during the chinook season, i.e. through week 34, was 90% below average (29 boat-days versus an average of 284 boat-days).

3.2 Fall Chum Salmon

The chum salmon run to the upper Yukon was expected to be average in 1998 primarily originating from the escapement of 98,400 chum salmon in 1994 which was close to the recent 4-year average cycle escapement of 102,000 fish (1993-1996). The return of 5-year olds was expected be below average due to the below average escapement of 29,700 chum in 1993. The 1998 Canadian chum salmon management plan was developed to address the expectation of an average run and a desire to augment the spawning escapement to levels observed in recent years. The plan recommended by the YSC included the following components:

i) an escapement goal of >90,000 upper Yukon chum salmon. The Yukon Salmon Committee recommended a minimum escapement goal for 1998 that was more reflective of current escapement levels and was more acceptable to the Committee than the previous goal of >80,000 chum salmon agreed to in the IYRSA;

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 return and accounting for the priorities of conservation and the needs of the aboriginal fishery, it was expected that at least 31,000 chum salmon would be available for commercial harvest.

By mid-August, it was apparent from the lower Yukon run indicators in Alaska that, similar to the chinook and summer chum runs, the abundance of fall chum salmon was well below average and far below expectations. For example, information forwarded from ADF&G on 16 August indicated the number of chum salmon passing the Pilot Station sonar site was approximately 166,000 fish, 65% below average. On average, 65% of the run would have passed upstream by this date. Low numbers of fall chum salmon were also being caught in the Tanana north bank test fishwheel, and in the USF&W radio tagging and recovery wheels near Rampart.

Through 31 August, the DFO fishwheels had caught 33 chum salmon, the lowest catch on record and 94% below the previous 10-year average of 583 chum salmon. The poor run indicators to date in the lower river and at the DFO fishwheels prompted DFO to continue with the closures in the commercial, domestic and sport fisheries that had been in effect since the 25 July. The YSC was reconvened on 10 September to review the run status of chum salmon. With the DFO fishwheel catch through 09 September having climbed to only 84 chum salmon, compared to an average of 1,290 fish, and only marginal increases in the run indicators in Alaska, i.e. the Pilot Station sonar estimate was 46% below average, the YSC recommended continuing the closures until further notice. This meant that once again, the mark-recapture program being conducted by DFO to provide inseason estimates of run status would be without its primary mode of tag

recovery, i.e. the commercial fishery. Funding constraints prevented re-establishing the test fishery thus forcing the examination of alternative methods to predict the run size.

It was decided by DFO that in the absence of mark recovery data, the inseason chum forecasts of border escapement would be based on the historical run timing at the DFO fishwheels and the historical relationship between the DFO fishwheel catch and the border escapement estimates. This relationship is described in greater detail in section 6.2.2. **Upper Yukon Tagging Program (Yukon Territory)**. For the inseason forecasts, linear regression analysis of fishwheel and border escapement data for the years 1985 through 1997 (excluding 1995) yielded the following equation:

$$P = 22.45(C)+26,683$$

where: **P** = predicted border escapement; and
C = total fishwheel catch.

The coefficient of correlation of this relationship was r=0.692 and the relationship was significant (p-value = 0.015).

The following equation was used to predict the total fishwheel catch (C) for the season:

$$\mathbf{C = C_t/T_t}$$

where: $\mathbf{C_t}$ = fishwheel catch to date; and
$\mathbf{T_t}$ = historical run timing (proportion of the run through to date).

Three timing scenarios were used: one assumed the run timing was average; the second assumed the run timing was one week late; and the final scenario assumed the run was two weeks late. Run timing in the lower Yukon appeared to be average to slightly later than average although timing appeared to be somewhat more delayed further upstream. On 09 September, the border escapement forecasts ranged from 31,000 to 47,000 chum salmon, well below the number required for spawning escapement.

The YSC met again on 17 September. At that time the Pilot Station sonar count in the lower river was nearly completed; the estimate was approximately 397,000 fall chum compared to an average of 722,000 fish. In examining the relationship between the sonar estimates and corresponding border escapement estimates for 1995 and 1997, the border escapement represented approximately 15% of the sonar count in each of these years. Assuming a similar relationship existed in 1998, the expected border escapement was approximately 60,000 chum salmon based on limited sonar data. By contrast, the DFO fishwheel catch to 16 September was 89% below average and the border escapement forecasts ranged from approximately 35,000 to 49,000 chum salmon. Information from the Fishing Branch weir also indicated poor run abundance with the count being 97% below average. In light of the continued poor run outlooks, the YSC recommended continuation of the fishery closures.

The outlook remained dismal through the end of September and it became clear that there would be no fishery openings for the remainder of the season. A review on 28 September indicated some improvement in the DFO fishwheel catches, but the cumulative catch was still 83% below average. Forecasts based on the fishwheel regressions now projected a run into Canada of 46,000 to 58,000 chum salmon, well below the spawning escapement goal of >90,000 chum for 1998. The Fishing Branch weir count had increased somewhat but remained 80% below average. Run indicators in the middle and upper Yukon drainage sections in Alaska ranged from 54% to 90% below average.

The YSC continued to meet weekly for the first half of October during which time the conservation concerns for the chum salmon run continued. The final review conducted 15 October, indicated a border escapement of 47,000 to 51,000 chum salmon. The DFO fishwheel catch through 07 October, when the wheels were pulled, was the lowest on record and was 74% below average. The Fishing Branch count through 12 October was 75% below average.

Similar to the chinook season, water levels throughout the chum season were abnormally low in the mainstem Yukon and many of its tributaries, and water clarity was higher than usual. This was the first year the commercial fishery was closed during the entire chum salmon season due to conservation concerns. Combined with the extremely restricted chinook fishery, this marked the worst commercial season on record.

4.0 1998 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 1998 subsistence harvest data will not be completed until early 1999. The estimated 1997 subsistence salmon harvest in the Alaska portion of the Yukon River drainage totaled approximately 57,000 chinook, 113,000 summer chum, 95,000 fall chum, and 24,000 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 in the Yukon River drainage. 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. From 1995 through 1998 the Subdistrict 6-C salmon fishery was 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 1998 fishing season will not be completed until early 1999. Personal use harvests within the Fairbanks Non-subsistence Area will only include a minimal harvest of summer chum and chinook salmon prior to the close of Subdistrict 6-C to the taking of salmon which extended from 24 July through 15 October 1998. There was no personal use harvest of fall chum and coho salmon in 1998. In 1997, 117 fishers were issued personal use salmon fishing permits. Fishers fishing under personal use regulations harvested approximately 300 chinook, 400 summer chum, 300 fall chum, and 350 coho salmon.

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 has taken place in the past at locations where more intense sport fishing occurs, but none were conducted during this past season. 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 normally more

abundant, and 2) the chum 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 (1992-96) 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 1997 was estimated to total 1,913 chinook salmon, 475 chum salmon, and 1,440 coho salmon. Harvest data are not yet available for 1998.

4.2 Canada

4.2.1 Aboriginal Fishery

The third year of a multi-year comprehensive survey of the Aboriginal fishery was conducted in 1998 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 were, and are currently being, determined independently from locally conducted, post season interviews for chinook and chum salmon and inseason for coho salmon.

The preliminary estimate of the 1998 total upper Yukon chinook salmon catch in the Aboriginal fishery was 4,668 fish (std = 213), 38% below the 1992-1997 cycle average of 7,550 chinook and 47% below the final estimate of 8,888 chinook in 1997. The overall total effort during the chinook season, i.e. through the end of August, was 29,996 net-hours, 6% higher than the fishing effort in 1997. However, not all First Nations expended more fishing effort in 1998. For example, conservation concerns of the Teslin FN and the Ta'an FN (Whitehorse area) lead to reductions in fishing time by 60% and 68%, respectively. In addition, in the case of the Teslin FN, restrictions in fishing time were voluntarily imposed in response to low chinook returns. At Old Crow, the preliminary estimated chinook harvest in 1998 was 99 fish, 75% below the 1992-1997 average of 391 chinook and 88% below the 1997 catch of 811 chinook salmon.

The preliminary estimate of the 1998 harvest of upper Yukon chum salmon in the Aboriginal fishery is 1,742 fish (std = 233) compared to the recent cycle average of 2,224 chum salmon. The final chum catch estimate for 1997 was estimated to be 1,218 fish. Compared to 1997, the overall total fishing effort for the chum season (i.e. after the end of August) was up by 22% in 1998. In the Old Crow fishery, 6,159 chum salmon were harvested (preliminary) in the Porcupine River near Old Crow. This number will change since data from additional interviews have yet to be tabulated.

Coho catches in Canada are generally limited to the Porcupine River where they are taken in the Old Crow fishery in late October and November. Catch information for 1998 was not available for this report. In 1997, 298 coho salmon were harvested, slightly more than the previous 4-year cycle average of 236 coho salmon.

4.2.2 Domestic Fishery

Conservation concerns and extensive fishery closures contributed to reduced catch levels in the 1998 domestic fishery with only one of eight fishers reporting catches. The fishery was closed for the season midnight 25 July. The preliminary total harvest of 24 chinook salmon was well below the previous cycle average of 270 chinook salmon. No chum salmon were caught in 1998 due to the fishery being closed for the entire chum season. Chum salmon have not been recorded in the domestic fishery catch since 1989.

4.2.3 Sport Fishery

At midnight, 25 July, the sport fishery for Yukon River chinook salmon was closed for the season. This essentially closed the fishery before chinook salmon reached the popular fishing areas such as the Yukon River near Tatchun Creek. Observations from employees of the Tatchun Creek chinook enumeration program, funded by the R&E Fund suggested minimal, if any, sport harvest.

5.0 STATUS OF SPAWNING STOCKS

5.1 Chinook Salmon

5.1.1 Alaska

Yukon River chinook salmon abundance in 1998 was assessed as weak, based on commercial harvest data and on escapement estimates from selected tributaries. The return of five-year-old chinook salmon was much less than expected given the large return of four-year-olds in 1997. Production from the 1992 parent year appears to be poor given the escapements documented that year. Chinook salmon escapements in 1998 were below the recent 4- or 5-year averages throughout the drainage with minimum escapement goals achieved in only three surveyed tributaries. 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 near escapement goal levels. An aerial survey count of 1,249 chinook salmon in the West Fork Andreafsky was 11% below the minimum escapement goal of 1,400 salmon. The East Fork Andreafsky River aerial survey count of 1,027 chinook salmon was 32% below the minimum escapement goal of 1,500 salmon. The USFWS weir count of 4,011 chinook salmon for the East Fork Andreafsky River was 19% below the 4-year average weir count of 4,946. Age and sex composition samples were collected in 1998. The estimated age composition was 17% age 4, 71% age 5, and 11% age 6 fish. Males predominated the escapement samples at 71% of the total.

An aerial survey of the Anvik River on 23 July, conducted under poor conditions, resulted in a count of 648 chinook salmon within the escapement index area, which exceeded the minimum goal of 500 salmon by 30%. Age and sex composition samples were collected in 1998 by carcass survey. Five year old chinook salmon dominated these samples, comprising 60% of the total with four and six year old fish (15% and 24%) comprising most of the remainder. Males were more numerous than females, accounting for 67% 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. Aerial surveys with fair ratings resulted in counts of 546 and 503 chinook salmon in the North Fork and South Fork, respectively. 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 1,536 chinook salmon was 30% below the recent 4-year average of 2,182 chinook salmon. Age and sex composition samples were collected in 1998. Analyses of these data are not yet complete.

On 31 July an aerial survey was conducted on the Gisasa River, a tributary to the Koyukuk River. The survey under poor conditions observed 889 chinook salmon. The minimum escapement goal is 600 chinook salmon. The USFWS counted 2,273 chinook salmon migrating through the Gisasa River weir, which was approximately 28% below the recent 4-year average of 3,157. Age and sex composition samples were collected in 1998. Analyses of these data are not yet complete.

A weir was not operated on the South Fork of the Koyukuk River in 1998 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.

Since 1993, inseason assessment of chinook salmon escapement to the Tanana River drainage has been based on counts of chinook salmon passing the Chena and Salcha River tower sites operated by Sport Fish Division of ADF&G. High, turbid water hampered the operations on the Chena and Salcha Rivers several times during the 1998 season. The preliminary tower count estimate for the Chena River was 4,423 chinook salmon, which was the lowest escapement since 1991. The preliminary tower count estimate for Salcha River was 4,990 chinook salmon, which was the lowest escapement since 1989. The minimum aerial survey escapement goals for the Chena River and Salcha River index areas are 1,700 and 2,500 salmon, respectively. High water resulted in poor aerial survey conditions on the both rivers although multiple attempts were made from 16 July through 10 August. The highest count was 427 chinook salmon for the Chena River index area. The highest count of 2,055 chinook salmon for the Salcha River index area was only 28% below the minimum escapement goal. Age and sex composition samples were collected in 1998 from carcass surveys on both rivers. The age composition estimated from the carcass samples was 5% age 4, 72% age 5, and 17% age 6 fish. Males were more numerous than

females, accounting for 61% of the samples. Five year old chinook salmon dominated escapement samples in the Salcha River accounting for 74% of the total. Males comprised 62% of the fish sampled.

An aerial survey flown 2 August on the Goodpaster River with a survey rating of fair observed 591 chinook salmon.

In 1998, the U.S. Department of the Interior, Bureau of Land Management (BLM) was not able to operate a weir on Beaver Creek due to flood conditions.

5.1.2 Canada

The preliminary mark-recapture estimate of the total spawning escapement for the Canadian portion of the upper Yukon drainage is 16,769 chinook salmon, 44% below the 1992-1997 average of 29,697 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. The Ross River index was not flown in 1998 due to budgetary constraints, difficulties in chartering a helicopter, and conflicts with other stock assessment programs. 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 19 August. Countability was rated as good. A total of 348 chinook salmon was observed. This count is 52% below the recent cycle average (1992-1997). The Big Salmon River, Nisutlin River, and Wolf River indices were flown on 21 August. As in 1997, excellent viewing conditions were encountered due to favourable water levels and clear, calm weather. Consequently the countability on the Big Salmon River and the Wolf River surveys was rated as excellent, while that encountered on the Nisutlin River survey was rated as good. (The Nisutlin River index is somewhat wider than the other rivers; consequently the countability is generally less.) A total of 487 chinook salmon was enumerated on the Big Salmon River index, 64% below the recent cycle average. The Nisutlin River index count of 143 chinook salmon was 62% below average. On the Wolf River index, only 59 chinook salmon were observed: this count was 82% below average. The final chinook aerial survey conducted by DFO took place on August 22 on Tincup Creek. The visibility during this survey was excellent for the entire index area. Fifty chinook salmon were observed; this count was 61% below average.

Throughout the aerial survey index areas, water levels were judged to be significantly lower than those observed in previous years.

Timing of the aerial surveys appeared close to peak spawning, perhaps a couple of days early on indices other than the Little Salmon River. The contribution of dead fish to total counts ranged from 88% below the recent cycle average (on the Nisutlin River) to 9% below the recent cycle average (on the Wolf River). The unweighted average proportion of dead fish was 43% below the recent cycle average. Many unoccupied redds were observed. However, the vast majority of them are believed to be associated with previous years' spawners.

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. For example, low water conditions in 1998 improved visibility, contributing to high countability.

The Whitehorse Rapids Fishway chinook salmon count of 777 fish, provided by the Yukon Fish and Game Association, was 44% below the recent cycle average. The sex ratio observed at the fishway was 21% female. Further details are provided in Section 6.2.4.

The Yukon Fish and Game Association also operated weirs on Wolf Creek and Michie Creek, both of which are upstream of the Whitehorse Fishway. The Wolf Creek weir provided a count of only seven chinook salmon, two of which were female. A total of 131 chinook salmon was counted through the Michie Creek weir; as observed at the fishway in Whitehorse, the sex composition was only 21% female. Passage of chinook salmon through both these weirs, but particularly the Wolf Creek weir, appeared to be delayed perhaps due to low water conditions.

The Blind Creek weir project, conducted by the Ross River Dena Council, provided a count of 369 chinook salmon between 19 July and 19 August, 1998. Of the 220 fish sexed, 94 (43%) were identified as females. Three weir panels were removed at 17:30 hours on 3 August and replaced at 11:00 hours on 5 August to allow fish holding below the weir to pass upstream. Some of these fish had been holding below the weir since 19 July. During the time that the weir panels were removed, 204 chinook salmon, comprising 55% of the run, passed upstream. It was not possible to determine the gender of some of these fish. The Blind Creek weir count in 1998 was 61% below the count obtained in 1997 of 957 chinook salmon.

For the second consecutive year, a weir was also installed on Tatchun Creek by Quixote Consulting. Enumeration commenced on 15 July and terminated on 5 September, when the weir was removed from the stream. Four hundred and five (405) chinook salmon were observed; 29% of these were identified as female. The total count was 66% below that obtained in 1997. As observed at the Blind Creek weir the migration was temporally compressed. At Tatchun Creek, the fish appeared to hold in the mainstem Yukon River for a significant period before ascending the creek. This delay is believed to have been caused by the extremely low water conditions observed at the mouth of Tatchun Creek in 1998.

A foot survey was conducted by DFO on Tatchun Creek on 25 August. The survey revealed that a beaver dam was blocking access to an estimated 95% of the stream. A total of 183 chinook salmon was observed between the blockage and the weir. This accounted for 59% of the weir count at the time the survey was conducted.

Weirs were installed on two additional upper Yukon River tributaries for the first time in 1998. As reported previously in Section 3.1, the Yukon Commercial Fishers Association installed a weir on the Chandindu River, also known as the Twelvemile River, located downstream of Dawson City. Installation of the weir was originally scheduled for mid-June but was delayed by flood conditions. A total of 132 chinook salmon was enumerated between July 4 and August 25; only 13% of these fish were female. Two Whitehorse residents installed a weir on MacIntyre Creek, a small tributary of the Yukon River downstream of Whitehorse. Less than ten chinook salmon were counted through this weir.

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 Morley River, Gladys River, Mica Creek, Needle Rock Creek, Sidney Creek, Jennings River, upper Teslin River, and Nordenskiold River. The Morley River survey, flown on August 27, 1998, resulted in a count of 50 fish. This was 78% below the number observed on a survey conducted on the Morley River on August 23, 1997.

5.2 Summer Chum Salmon

Preliminary postseason analysis of comparative commercial harvest and escapement data indicates the summer chum salmon run was very weak in 1998. Spawning escapements to selected tributaries were 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 were hampered by poor weather conditions in most of the drainage. It should be noted that severe flooding on the Koyukuk River drainage in August 1994 may have affected salmon returns there in 1998.

Minimum aerial survey-based escapement goals for summer chum salmon have been established for the East and West Fork Andreafsky River, North Fork Nulato River, Clear and Caribou Creeks of the Hogatza-Koyukuk River drainage, and the Salcha River. Because these minimum escapement goals are based on aerial survey index counts, they do not represent the total escapement to the spawning tributary. There is a sonar-estimate based escapement goal for summer chum salmon in the Anvik River.

The preliminary Anvik River sonar-based escapement estimate of 471,886 summer chum salmon was approximately 6% below the minimum escapement goal of 500,000 and the sixth lowest since 1979. The run was lower than expected based on parent year escapements of 517,409 and 1,124,689 in 1993 and 1994, respectively. Age and sex composition samples were collected in 1998. Four year old fish comprised 80% of the samples, and females accounted for 60% of the samples.

Weir projects were operated by USFWS on the East Fork Andreafsky and Gisasa Rivers. A total of 67,591 summer chum salmon was counted passing through the weir on the East Fork Andreafsky River. This count was 49% below the recent 4-year-average of 133,180 fish. 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 1998 due to poor survey conditions. The weir count indicated the minimum escapement goal for the East Fork Andreafsky River was not met. Age and sex composition samples were collected at the weir site in 1998. The age composition of those samples was 83% age four, 15% age five, and 2% age six fish. Females made up 57% of the total number sampled.

A total of 17,825 summer chum salmon was counted passing through the Gisasa River weir. A summer chum salmon escapement goal has not been established for this river. However, the 1998 weir count was 44% below the 1997 weir count and the lowest on record since project inception in 1994. Age and sex composition samples were collected in 1998. Analysis of these data are not yet complete.

A weir was not operated on the South Fork of the Koyukuk River in 1998 by the USFWS due to flood conditions.

Aerial surveys were flown on selected Koyukuk River tributaries and the Melozitna River. Aerial surveys flown with a survey rating of fair resulted in a count of 395 summer chum salmon in the Melozitna River on 22 July, 1,237 summer chum salmon in the Dakli River on 31 July, 24 summer chum salmon in the Jim River, and 151 summer chum salmon in Henshaw Creek on 1 August.

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. USFWS and TCC operated a counting tower on Clear Creek, a tributary of the Hogatza River within the Koyukuk River drainage.

The estimated summer chum salmon escapement into Kaltag Creek in 1998, 8,113 fish, was 85% below the recent 4-year-average escapement of 55,546 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 49,140 salmon, which was 71% below the recent 4-year-average of 168,330 fish. Based on this tower count, the aerial escapement goal of 53,000 summer chum salmon was not met. An aerial survey of the Nulato River for summer chum salmon was not conducted due to poor weather conditions. Age and sex composition samples were collected in 1998. Analyses of this data is not yet complete.

This was the fourth consecutive year the Clear Creek tower on the Hogatza River was operated. No chum salmon were counted passing through the weir prior to 2 July. High water precluded

counting beginning on 2 July. Partial counts on 9 July and 13 July totaled 174 summer chum salmon. The recent 3-year average is 98,034 summer chum salmon for the entire season. The aerial escapement goal is a minimum of 8,000 summer chum salmon. An aerial survey on 31 July with a poor rating observed 120 summer chum salmon.

High, turbid water at times hampered tower counting operations on the Chena and Salcha Rivers at times during the 1998 season. The 1998 Chena River tower count was 6,011 summer chum salmon, which was 36% below the 1993, 1994, 1996, and 1997 average count of 9,410 fish. The Salcha River tower count of 17,682 summer chum salmon was 53% below the recent 5-year (1993-1997) average of 37,324 fish. Aerial surveys of both rivers were conducted either too early or under poor weather conditions. The highest survey for the Chena River of 24 summer chum salmon was observed on 20 July under poor survey conditions. An aerial survey of the Salcha River flown on 4 August under poor survey conditions estimated 390 summer chum salmon. The Salcha River aerial survey index minimum escapement goal is 3,500 summer chum salmon. Chum salmon age and sex composition samples were not collected in 1998 from carcass surveys on either river due to high water conditions.

In 1998, BLM was not able to operate a weir on Beaver Creek due to flood conditions.

5.3 Fall Chum Salmon

5.3.1 Alaska

Although final assessment of overall run size and spawner distribution is not yet available, preliminary indications are that the 1998 Yukon River fall chum salmon run was well below the preseason projection of 880,000 fish. Timing of the run was approximately 10 days later than average, and among the latest on record. The preliminary sonar passage estimate at Pilot Station was 397,200 ± 12,700 (90% C.I.) fall chum salmon for the period 19 July through 9 September. This estimate, together with the late timing of the run and an estimated subsistence harvest below the sonar site on the order of 8,200 fall chum salmon (average for 1993-1997), suggests total run size to have been on the order of 400,000 to 450,000 fish.

A review of upper river test fishing data and escapement information suggests that both the upper Yukon River (non-Tanana) and Tanana River run components were weak in 1998. Preliminary results from the USFWS mark-recapture study near Rampart indicate the upper Yukon River run component was less than half of that estimated in 1997 (198,000 vs. 370,000). Escapements in Alaskan tributary streams of the upper river were weak based upon observations made in the Chandalar and Sheenjek Rivers. The preliminary 1998 fall chum salmon escapement estimate in the Chandalar River was 69,000 fish; well below the 1995-1997 average of 228,000. No fall chum salmon escapement goal has been established for this stream. Although sonar operations were suspended in the Sheenjek River for five to six days due to prevailing high water conditions early in the season, total escapement was estimated to have approximated 33,000 fall chum salmon for the 53 day period 9 August through 30 September. This is likely the poorest escapement observed to this river since inception of sonar counting operations in 1981, given the

historic dates of project operation. The Sheenjek River minimum escapement goal of 64,000 fall chum salmon was not achieved.

The Tanana River fall chum salmon run component was also weak in 1998 based upon test fishing results from the south bank Yukon River near Tanana as well as those in the Tanana River. Although fall chum salmon spawning ground surveys are still being conducted at selected locations throughout the Tanana River drainage, preliminary results from intensive ground surveys of the Toklat River spawning area indicate that the minimum goal of 33,000 fall chum salmon was not achieved to that area.

For the upper Tanana River (upstream of the Kantishna River), the preliminary mark-recapture abundance estimate through 5 October was 64,400 ± 13,800 (95% C.I.) fall chum salmon, the lowest abundance estimate obtained in the four years the tagging study has operated. It is approximately 11% below the 1997 estimate (72,000), more than 50% below the 1996 estimate (135,000), and more than 75% below the 1995 estimate (268,000 chum salmon). Intensive ground surveillance of the Delta River spawning area was initiated in early October, with surveys to continue weekly throughout November. Only 5,700 chum salmon were present in this stream on the peak survey to date. While it appears unlikely, it is not yet known with certainty if the minimum escapement goal (11,000) will be achieved in 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

Estimation of total chum salmon spawning escapement for the Canadian portion of the upper Yukon drainage was compromised in 1998 by low harvest and tag recovery levels. The preliminary total spawning escapement estimate based on mark-recapture data is 46,305 chum salmon. Details are presented in Section 6.2.2.

Chum salmon aerial surveys were conducted on the Kluane River, the mainstem Yukon River and on the Teslin River. The mainstem Yukon River index was flown on 15 October. Inclement weather and reports of high turbidity delayed the Kluane River survey until October 26. On average during the previous ten years, this survey was flown on October 18. However, judging by the proportion of dead fish in the counts relative to average, a delay in the Kluane River survey timing appeared beneficial. The Teslin River index was flown on 31 October. Historical data are presented in Attachment I.

The Kluane River index count of 7,337 chum salmon was 35% below the 1994-1997 average. In contrast, the mainstem Yukon River index count of 7,292 chum salmon was 84% above the recent cycle average. The 1994 mainstem Yukon River count is excluded from the cycle average because of poor fish countability. Fish countability for both the Kluane River and mainstem Yukon River surveys was good in 1998. Low water levels, particularly on the mainstem Yukon River, and lack of ice cover enhanced countability. The 1998 Teslin River index count of 235

chum salmon was 39% below the recent cycle average (with 1994 excluded due to poor viewing conditions). The fish countability during the Teslin River index survey was rated as fair because of low light levels and snow.

In the Porcupine River drainage, the Fishing Branch River weir count of 13,248 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 59% of the count. Details are presented in Section 6.2.7.

Sampling for age/length/sex was conducted on post-spawned chum salmon on the Kluane River, the mainstem Yukon River. A total of 600 samples was obtained. Thirty-three percent (33%) of the fish sampled were female. It is likely that the survey timing and sampling method may have biased counts towards males.

5.4 Coho Salmon

Coho salmon escapement assessment is very limited in the Yukon River drainage due to funding limitations and survey conditions generally encountered during periods of peak coho salmon spawning activity. Most of the escapement information that has been collected on coho salmon is from the Tanana River drainage. The only escapement goal established is for the Delta Clearwater River (DCR), which has a minimum goal of 9,000 fish. This goal is based on the number of coho salmon observed from a boat survey of the DCR index area during peak spawning activity. The escapement goal was achieved in 1998 as evidenced from results of a boat survey conducted by Sport Fish Division on 20 October. A total of 11,100 coho salmon was counted. Spawning ground surveys to other selected areas throughout the Tanana River drainage are still underway. Among the surveys being conducted are those by TCC in the Nenana River drainage with BSFA funding.

Through a cooperative agreement between the USFWS and BSFA, 1998 marked the fourth consecutive year that East Fork Andreafsky weir operations were extended into September to collect coho salmon escapement data. A total of 5,295 coho salmon was passed through 13 September, the last day of operation in 1998. This compares to 9,462 coho salmon counted past the weir through the same date in 1997; 8,037 through 16 September in 1996; and 10,901 through 12 September 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. 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 (Alaskan portion) comprehensive salmon planning, conducted by ADF&G and YRDFA; (2) Yukon River chinook salmon stock identification, conducted by ADF&G; (3) Yukon River sonar, conducted by ADF&G with assistance from AVCP; (4) Chandalar River sonar, conducted by USFWS; (5) Tanana River fall chum salmon tagging project, conducted by ADF&G with assistance from BSFA; (6) Upper Yukon River chum salmon genetic sampling, conducted by USFWS; (7) Yukon River chum salmon ecology studies, conducted by USGS-BRD; and (8) Toklat River fall chum salmon restoration study, conducted by ADF&G.

6.1.1 Yukon River (Alaskan Portion) Comprehensive Salmon Plan

ADF&G and YRDFA recently completed a Yukon River Comprehensive Salmon Plan which encompasses the Alaska portion of the Yukon River drainage. This process involved user groups, various government agencies, and other interested parties with the goal of developing a comprehensive plan for the Alaska portion of the Yukon River drainage. The intent of the plan was to define goals and objectives, provide reference information on the stocks and fisheries, identify potential restoration and enhancement opportunities and concerns, recommend appropriate procedures, and evaluate priorities. ADF&G had a cooperative agreement with YRDFA to facilitate and contribute to the planning process. The Commissioner of ADF&G officially approved the plan on 7 August 1998.

6.1.2 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 in Yukon River fishery harvests. Three region-of-origin groupings of chinook salmon, or runs, have been identified within the Yukon River drainage. The lower and middle run stocks spawn in the Alaska portion of the drainage, and the upper run stock spawns in the Canadian portion of the drainage.

Scale pattern analysis (SPA) is used to apportion the major age group(s) of the District 1, 2, 3, and 4 chinook salmon harvest to run 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 in District 5 and Canada are apportioned entirely to the upper run stock based on the geographic location of the harvest. Likewise, harvests occurring in District 6 are apportioned to the middle run stock based on geographic location.

In the spring of 1998, investigation began on the feasibility of developing new SPA software. It was determined that a new program could make improvements in two areas. First, the analytical methods were improved using a maximum likelihood estimator model instead of the linear discriminant model used previously. Second, the analytical programs used prior to 1998 were cumbersome, requiring several sequentially run programs. These steps required manual interpretation of results at each step. The numerous step wise iterations and requisite manual input for each step were eliminated in the new software package. A control file is now used which contains all the necessary data for the analytical program, and an output file is produced with the results. The new software was completed in October of this year, and was tested using previously analyzed data. Scale pattern data collected in 1997 was the first to be processed with the new program. Preliminary results for 1997 are under review. Data from years prior to 1997 will be re-processed as time allows so that the historical database will be comprised of estimates generated by the improved methodology and will be comparable to current and future year results.

During 1998, stock standards for the lower run stock group were collected from escapements of chinook salmon in the Andreafsky, Anvik and Gisasa Rivers. Middle run stock standards were obtained from chinook salmon escapements in the Chena and Salcha Rivers of the Tanana River drainage. DFO contributed scale samples from the mark-recapture tagging fishwheels near the U.S./Canada border. These scale sample collections for 1998 will be processed for age and SPA data through the winter.

6.1.3 Yukon River Sonar

The goal of the Yukon River sonar project at Pilot Station is to estimate daily upstream passage of chinook, summer chum, fall chum, and coho salmon. The project has been conducted annually since 1986, except for 1992 when the project was operated for experimental purposes, and 1996 when it was operated for training purposes only. 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 changed to operate at a frequency of 120 kHz to allow greater ensonification range and to minimize signal loss. The newly configured equipment was field tested in 1993 using standard acoustic targets and was verified to perform well. Use of lower frequency equipment increased the ability to detect fish at long range.

Since project inception, attempts have been made to classify detected targets as to direction of travel by aiming the acoustic beam at an upstream or downstream angle relative to fish travel. This technique was discontinued after 1994 to enhance detection. Significant enhancements in 1995 included further refinements to the species apportionment process and implementing an aiming strategy designed to maximize fish detection. Because of these recent changes in methodology, data from 1995, 1997, and 1998 are not directly comparable to any previous project data.

Salmon passage estimates at Pilot Station are based on a sampling design in which sonar equipment is typically operated in 3-hour intervals, three times each day. In 1998 the sonar equipment was operated 24 hours per day on six occasions and 14 hours per day three times during the field season. The combined passage 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 activities resulted in the capture of 9,402 fish during 2,139 drifts, including 598 chinook salmon, 3,545 summer chum salmon, 2,119 fall chum salmon, 1,239 coho salmon, and 1,901 fish of other species. In addition, the area behind the transducer was tested for the presence of target species by controlling one end of a gill net from a boat and the opposite end from shore. No target species were captured in this area. Pink salmon dominated catches in this area mid-season followed by cisco (*Coregonus* spp.) catches during the latter portion of the field season. Captured fish were distributed to nearby residents daily.

The sonar project was operational from 6 June through 9 September in 1998. Rising water during the first week of sampling peaked on 13 June carrying heavy debris and creating acoustic signal loss believed to be caused by the high sediment load. Signal loss was compensated for by increasing echo sounder transmit levels. However, one entire day of sampling, 8 June, was missed on the right bank because of debris. Occasional sonar periods were missed when large waves cresting over the top of the transducers caused the signal to fade or in severe cases to disappear entirely. These periods of wave action did not affect an entire day's data and rarely affected an entire sonar period. The data for 8 June was extrapolated based on estimates from the opposite bank. Missed sonar periods were estimated by data obtained from the same day.

Preliminary passage estimates for 1998, 1997, and 1995 are listed below:

Species	1998 Estimated Passage	1998 Lower 90% CI	1998 Upper 90% CI	1997 Estimated Passage	1995 Estimated Passage
Large Chinook *	83,175	75,869	90,481	133,691	203,282
Small Chinook	38,871	33,735	44,007	90,399	36,938
Total Chinook	122,046			224,090	240,220
Summer Chum	830,633	805,862	855,404	1,411,233	3,638,180
Fall Chum	397,157	384,497	409,817	623,367	1,247,540
Total Chum	1,227,790			2,034,600	4,885,720
Coho **	176,792	165,826	187,758	153,502	154,464
Other Species***	241,627			273,165	594,335
TOTAL	1,768,255			2,685,357	5,874,739

*Chinook Salmon >700 mm.
**This estimate may not include the entire run.
***Includes pink salmon, cisco, whitefish, sheefish, burbot, suckers, char, sockeye salmon, and northern pike.

6.1.4 Chandalar River Sonar

Due to the importance of Chandalar River (river mile 996) fall chum salmon as a refuge and subsistence resource, a five-year sonar study was initiated in 1994 to reassess the population status using split-beam hydroacoustics. The initial year, 1994, was used to develop site-specific operational methods, evaluate site characteristics, and describe possible data collection biases. In 1995, a post-season estimate of 280,999 upstream swimming chum salmon passed the site and *in situ* target strength evaluations were completed. During the 1996 season, daily in-season counts were generated, with a post-season estimate of 208,170 chum salmon. In 1997, the project was fully operational, with an escapement estimate of 199,874 chum salmon with a 95% C.I. of ±5,664.

In 1998, the project ran from 8 August through 26 September, four days longer than in past years due to the late timing of the fall chum run. The season was plagued by high water, with 33 days missed on the right bank and two days missed on the left bank. The ratio estimator method and associated variance were used to predict the daily missing right bank counts from left bank data for this time period. Excluding down times from high water, sonar on both banks was operated continuously (24 h/d). All acquired targets were manually tracked from the raw acoustic data and

electronically written to file. Upstream fish were separated from downstream targets. Chart recordings and tracked data were compared daily to ensure that the digital processor filters did not affect target acquisition. A preliminary count of 75,811 chum salmon with a 95% C.I. of ±5,938 was obtained for 1998. Detailed acoustic analyses and a post-season final escapement estimate will be completed this winter and a progress report provided by June 1999.

6.1.5 Tanana River Fall Chum Salmon Tagging

A cooperative fall chum salmon stock assessment project by ADF&G and BSFA was conducted on the Tanana River for the fourth consecutive year in 1998. The primary objective was to estimate the abundance of fall chum salmon in the Tanana River upstream of the Kantishna River using mark-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 pass the tagging site.

A single fish wheel was operated in the Tanana River approximately 8 km above the mouth of the Kantishna River to capture chum salmon for tagging. The wheel was equipped with a live box and a three-person crew tagged chum salmon during a 12-hour daily deployment schedule. Chum salmon were tagged with individually numbered spaghetti tags, and each tagged fish had its right pelvic fin clipped as a secondary mark. A total of 1,800 chum salmon was tagged and released from 18 August through 5 October.

Two additional fish wheels operated approximately 60-70 km upstream of the tagging wheel to recapture tagged chum salmon. The two recovery wheels, each equipped with a live box, were fished 24 hours per day on opposite sides of the river and within 2 km of each other. A total of 79 tags was recovered from 3,243 chum salmon examined in the recovery wheels during the period 16 August through 6 October. Tag recoveries are also being made from spawning ground surveys currently under way, to provide stock-specific run timing information where possible.

The preliminary Bailey estimate of the total number of fall chum salmon that passed the tagging site through 5 October 1998 was approximately 64,400 ± 13,800 fish (95% C.I.). However, post season diagnostic data analyses are still being conducted. It appears likely that stratified modeling will be required since the marked proportion of fish in recovery wheels varied through time.

6.1.6 Upper Yukon River Chum Salmon Genetic Sampling

New genetic tools for Yukon River chum salmon are being developed and tested by the USFWS Fish Genetics Laboratory at the Anchorage Regional Office. Protein electrophoresis is one genetic tool that has been useful for chinook salmon; however, discrimination between some U.S.- and Canadian-origin chum salmon stocks has been problematic. The state-of-the-art methods being tested permit direct examination of the DNA molecule. Three classes of genetic

markers are being evaluated: nuclear genes, microsatellites, and SINEs (Short Interspersed Nuclear Elements). Efforts to date have yielded one gene, 14 microsatellites, and one SINE that appear to be useful. Tests will be performed to determine the potential for the new genetic tools to improve stock identification within mixed stock fisheries. Additional advantages of the newer methods include non-lethal sampling and simplified field logistics.

Mixed stock collections were taken at Rampart in conjunction with a mark-recapture study being conducted by the USFWS Fairbanks Fishery Resources Office. Fin clips, which were being used as secondary marks for the tagging study, were collected from up to 400 fish daily. Stock composition estimates will be performed on a subset of the samples using the new genetic tools currently under development.

6.1.7 Yukon River Chum Salmon Ecology Studies

The original proposal for this U.S. Geological Survey - Biological Resources Division (USGS-BRD) project 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 possible 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 a test 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 draft progress report for brood years 1996 and 1997 is currently undergoing internal USGS review and will be released before the end of 1998. 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 estimated using a hydraulic pump, and smolt outmigrations using funnel traps and mark-recapture. A synopsis of the results from the Chena River study site for brood year 1997 follows.

A total of 507 chum salmon (320 males and 187 females) was 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 was mapped and characterized (in terms of water depth and

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 82.6% and varied from 62% to 91% within the study site. Modifications of traps and marking procedures allowed monitoring smolt outmigrations. The initial estimate is that 55,000 brood year 1997 smolt originated within the study site. Confidence intervals still need to be calculated for this estimate. Using the preliminary smolt estimate, the survival from PED to smolt outmigration was about 15%.

These results demonstrate that significant headway is being made and that this research will provide detailed information on chum salmon spawning ecology within the study sites. However, variances associated with the estimates need to continue to be reduced so that trends and changes can be detected. USGS-BRD is currently testing an adaptive sampling design for intra-gravel estimates of egg densities. Further, boot-strap techniques will be used to estimate variances for smolt estimates. Complete results for brood years 1996 and 1997 are presented in the progress report referred to previously.

6.1.8 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 1998 season was the third year of the four year adult recovery project.

TCC continued to investigate the quality of spawning habitat on the Toklat River spawning grounds during 1998. 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.

6.2 Canada

6.2.1 Upper Yukon River Salmon Test Fishing (Yukon Territory)

DFO has collected run timing and relative abundance data for chinook and chum salmon using fishwheels situated near the Canada/U.S. border since 1982 (excluding 1984). 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. Test fishing results are presented in this section and are also referred to in Section 3.0.

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 4,000 hours, from 16 June to 29 September inclusive. Sheep Rock continued to fish until the first hours of 7 October. Low water levels began to have a negative effect on fishwheel operations starting in late September. From approximately 24 September onwards, the baskets on the White Rock fishwheel were scraping bottom a significant proportion of the time. After 30 September, the Sheep Rock fishwheel was plagued with similar problems.

The first chinook salmon was caught in the downstream fishwheel, White Rock, on 27 June. On average during the last ten years the first chinook salmon has been caught on 28 June. The run as observed at the DFO fishwheels was slow in gathering strength. There was a short-lived peak of 59 fish occurring on 28 July. On average during the previous ten years, the run has peaked on 20 July. The mid-point of the run was observed on 29 July, one week later than the average mid-point during the previous ten years, 22 July.

The combined total fishwheel catch of chinook salmon in 1998 was 2,080 fish, 39% below the recent cycle average. The sex composition as observed in the fishwheel catches was 26% female. This is somewhat lower than the annual proportion of females averaged over the years 1988 through 1997 (32% female). Note that existing information suggests that chinook salmon sex ratio estimates based on fishwheel harvests may be biased in favour of males because of differential capture probabilities between sexes.

The first chum salmon was captured in the DFO fishwheels on 23 July. On average over the previous ten years, the first chum salmon has been captured July 21. The run mid-point occurred on 16 September; the mid-point dates over the previous ten years average at 13 September. However the mid-point dates have been quite variable, ranging from 5 September to 23 September. The peak catch date, September 27, was quite late. On average the run peaks on September 15, although, as with run-mid point dates, peak count dates have been quite variable, ranging from 31 August to 5 October. A minor pulse of fish, comprising 48 chum salmon preceded the September 27 peak by about five days. After September 27, fishwheel catches

declined steadily and rapidly. The total catch was 907 chum salmon. This is 83% below the recent cycle average (5,309 chum salmon).

Orange spaghetti tags which had been applied at Rampart, Alaska were observed on 24 chum salmon captured by the fishwheels. No radio tags or grey spaghetti tags were seen. Approximately 825 fish chum salmon were examined for pelvic fin clips. Pelvic fin clips were observed only on fish which possessed tags which had been applied at Rampart; hence, no tag loss was identified.

6.2.2 Upper Yukon River 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 fishwheels. Tagging events are twice daily, 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.

Chinook Salmon

Poor inseason run abundance and extensive fishery closures limited the use of commercial harvest data in developing a mark-recapture estimate; only 385 chinook salmon were harvested commercially downstream of the Stewart River. In the absence of a commercial fishery, a test fishery was conducted by Aboriginal fishers, in concert with commercial fishers, to recapture tagged fish. This test fishery yielded a catch of 737 chinook salmon. There was an additional catch of 545 chinook salmon in the aboriginal fishery near Dawson which was examined for tags.

The preliminary 1998 estimates for both chinook and chum salmon were developed using the Petersen method, pooling sexes, length classes and all temporal strata. It was assumed that 10% of the tags were unavailable for recovery in the study area due to tag loss or drop-out of fish. This methodology is consistent with that used in previous years. Spaghetti tags were applied to 1,007 chinook salmon. Downstream of the Stewart River, 1,667 chinook salmon were harvested, 66 of which had DF0 spaghetti tags.

The preliminary 1998 chinook salmon border escapement estimate is 22,588 fish (95% confidence interval = 17,812 to 28,621 fish). Subtracting the harvest of 5,819 fish, approximately 16,769 chinook salmon are estimated to have reached the various spawning

grounds. This falls short of the 1998 escapement goal of >28,000 chinook salmon by 40%, and is 44% below the recent cycle average of 29,697 fish.

As mentioned previously, a weir was operated for the first time on the Chandindu River, a Yukon River tributary situated between the tagging site and Dawson City, i.e. downstream of the Stewart River. A higher tag ratio relative to that observed in the fishery was encountered in the Chandindu River escapement. When the data from the weir project is included in the mark-recapture estimate, the estimated border escapement drops to 19,171 chinook salmon (95% confidence interval = 15,521 to 23,668 fish). This is 3,417 fish (15%) lower than the estimate generated without the Chandindu River weir data. Further consideration will be given to the issue of consistency in mark-recapture methodology with regard to the long–term database, versus the use of a higher capture and recapture sample, prior to deciding which estimate of 1998 border escapement is better.

Comparative border and spawning escapement estimates from the tagging program for 1982 through 1998 are presented in Attachment I.

Chum Salmon

A total of 903 chum salmon was tagged using the DFO fishwheels in 1998. The catch and tag recapture component of the mark-recapture study for chum salmon was limited to the aboriginal fishery near Dawson City. This fishery occurred from statistical week 38 (ending 19 September) to statistical week 41 (ending 10 October), and captured 1,239 chum salmon. Seventy-three percent (73%) of these fish were harvested in statistical weeks 39 and 40. A total of twenty DFO spaghetti tags was recovered. Pooling the tags applied, catch and tag recoveries (assuming, as with the chinook salmon mark-recapture estimate, that 10% of the fish tagged were unavailable for recapture) and applying the Petersen formula generates an estimate of 48,047 for border escapement. The 95% confidence interval surrounding this point estimate is 31,268 to 72,390 chum salmon. This confidence interval is relatively large due to the low numbers available for the estimator (i.e. the number of tags applied and recovered, as well as number of fish harvested). Subtracting the total chum harvest of 1,742 fish indicates a spawning escapement of 46,305 chum salmon.

In light of the large confidence interval associated with the mark-recapture estimate, some other means of estimating the 1998 border escapement of chum salmon were investigated. A regression analysis was conducted using fishwheel catch as the independent variable and estimated border escapement as the dependant variable for the years 1983 to 1997. Data from 1982 were excluded because the Sheep Rock fishwheel did not exist at the time. Data from 1995 were also excluded from the analysis because, in 1995, the fishwheel catch and border escapement were significantly higher than those of other years, and it was felt that this data would artificially increase the value of R-square. The regression yielded an R-square of 0.43. The relationship was significant ($p<0.015$). Using this relationship, a border escapement estimate of 50,914 was calculated. Subtracting harvest yields a spawning escapement estimate of 52,656 chum salmon. The 95% confidence interval surrounding this point estimate is very high,

+/-64,972 chum salmon. It should also be noted that the fishwheels may have been less efficient during the 1998 chum season than during previous chum seasons due to low water levels and, possibly, increased water clarity[3]. Consequently the preceding numbers may actually underestimate the 1998 escapement relative previous years' escapements.

A regression analysis was also conducted to evaluate the relationship between spawning escapement estimates derived through the mark-recapture program and each of the mainstem Yukon River index and the Kluane River index aerial survey results. Data from 1982 to 1998 were used; the data points from 1995 were included because they were not deemed to lie outside of most other data points, as was observed in the fishwheel catch data set. The Teslin River survey results were not analysed, because the annual counts are significantly lower than those obtained from the Kluane River index and the mainstem Yukon River index, and also the Teslin River index survey was not conducted in 1982 or 1983.

The regression of the mainstem Yukon River index on estimates of spawning escapement generated from mark-recapture methodology revealed that there was no significant relationship between the two. The R-square and the p-value generated were 0.04 and 0.5 respectively. In contrast, a significant relationship between the Kluane River index results and the mark recapture estimates is evident. The R-square calculated through this regression was 0.60 and the p-value equalled 0.001.

Because of the apparent lack of correlation between mainstem Yukon River index aerial survey results and mark recapture estimates, and the lower counts and shorter time series associated with the Teslin River index, only the Kluane River index results were used to generate an estimate of spawning escapement.

The Kluane River index regression generated the following relationship:

$$\mathbf{S = 5.98(C) + 21{,}731}$$

where: **S**= estimated spawning escapement (upper Yukon drainage wide); and
C = Kluane River index aerial survey count.

Inserting the 1998 aerial count of 7,337 chum salmon into the equation results in an upper Yukon River (excluding the Porcupine River) drainage-wide estimate of spawning escapement equal to 65,567 chum salmon. The 95% confidence interval surrounding this estimate is +/-34,388 chum salmon. It is smaller than that obtained using the fishwheel regression relationship, but still larger than that associated with the mark-recapture estimate. The point estimate for border escapement, calculated by adding harvest, comes to 67,309 chum salmon.

Three methods of calculating the border escapement are presented above. Results are summarized in the following table. The second point estimate, using the observed historical

[3] The Yukon River water in the vicinity of the fishwheels was unusually clear in 1998. Increased clarity could contribute to higher fishwheel avoidance by chum salmon and reduce capture rates.

relationship between fishwheel catch and border escapement, may underestimate 1998 escapement due to the fact that low water levels are believed to have had a negative effect on fishwheel performance in 1998. The negative effect is believed to have been greatest in late September and early October when it is possible that a significant number of chum salmon were still migrating. All methods for calculating escapement in 1998 generated large confidence intervals.

Calculated escapement estimates for upper Yukon River chum salmon, 1998.

Method	Border Escapement Estimate	95% Confidence Interval	Spawning Escapement Estimate
Mark-recapture	48,047	31,268 to 72,390	46,305
Fishwheel regression	50,914	-15,799 to 114,144	52,656
Kluane River index regression	67,309	32,921 to 101,698	65,567

Further analysis of existing data is warranted. In the interim, it is felt that a reasonable point estimate of the border escapement in 1998 would be in the range of 48,047 to 67,309 chum salmon. Subtracting harvest from border escapement, it is currently estimated that 46,305 to 65,567 chum salmon reached the various spawning grounds in 1998. The rebuilding goal for 1998 was > 80,000 chum salmon. Comparative border and spawning escapement estimates from 1982 through 1998 are presented in Attachment I. For preliminary comparative purposes, the mark-recapture border passage estimate of 48,047 chum salmon and the spawning escapement of 46,305 are used in the tables and graphs presented in this report.

6.2.3 Harvest Sampling

The Canadian commercial and test fishery chinook salmon harvests were sampled in 1998 for age, length, sex, coded-wire tag (CWT) data, and spaghetti tag loss data. Preliminary results indicate an unweighted sex composition of 39% female. This compares with unweighted sex compositions obtained from commercial harvests of 38% female in 1996 and 48% female in 1995. One hundred and sixty-seven (167) 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. Seven adipose-clipped fish were observed in the commercial fishery sample. The heads from the adipose-clipped fish were retained for CWT retrieval.

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.

6.2.4 Whitehorse Rapids Fishway Chinook Enumeration

A total of 777 chinook salmon ascended the Whitehorse Rapids Fishway between July 29 and September 3, 1998. This was 54% below the 1992-1997 cycle average count of 1,692 fish. The percentage of females was 21% (161 fish), which was also below the recent cycle average (39%). There were at least 150 mortalities in the fishway, constituting a 24% mortality rate for females and 18% mortality rate for males. The 1998 and 1997 seasons have seen what are believed to be record numbers of mortalities in the fishway. In 1997, 116 mortalities were observed, 91% of which were female. However, relative to the total fishway count (which in 1997 was 2,084 chinook salmon) the 1998 mortality rate was higher. 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. There were some anecdotal reports in 1998 that the overall fitness of Yukon River chinook salmon appeared lower, perhaps as a result of poor marine conditions.

Adipose-clipped fish accounted for 58% of the count, and numbered 433 males and 21 females. The adipose-clipped counts were expanded by the marked to not-marked release ratios using the age composition of adipose-clipped fish (sexes treated separately) observed in 1996. Preliminary calculations indicated a hatchery run contribution of 95%. Final estimates will be generated after the coded-wire tags obtained from fish sampled at the fishway are decoded.

The run mid-point was observed on 19 August, and the peak count was observed on 21 August. On average during the previous six years, the run mid-point and peak counts have both occurred on 14 August.

As has been observed each year since 1994, a number of chinook ascended the fishway more than once. In 1998, these fish comprised less than 1% of the run. Coded-wire tag data from 1994, 1995, 1996, and 1997 indicate that the fish that exhibited this behaviour had been released into the fishway as fry, after rearing in the hatchery. The fishway was first used as a release site for adipose-clipped hatchery fry in 1989; hence, it is possible that the number of adipose-clipped fish may be exaggerated somewhat in annual counts beginning in 1991, when the first three-year-olds would have returned. Adjustments have not been made to 1991 - 1994 adipose-clip tallies. Starting in 1995, all adipose-clipped chinook salmon ascending the fishway were marked with a caudal punch in order to eliminate the possibility of multiple-counting.

In 1998, 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 Wolf and Michie Creek weirs. 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).

6.2.5 Whitehorse Hatchery Operations

All of the 268,800 chinook salmon fry on hand at the Whitehorse Rapids Fish Hatchery in May 1998 were marked with adipose fin-clips and coded-wire tags, then released into the Yukon River system upstream of Whitehorse. The fry releases into the Yukon River system were as follows: 45,000 into Wolf Creek; 126,000 into Michie Creek; 46,000 into Judas Creek, (a Marsh Lake tributary) and 50,000 into the McClintock River above the confluence of Michie Creek. The Michie Creek fry were released into three sites; upstream of Michie Lake, at the outlet of Michie Lake and in Byng Creek. A summary of Whitehorse Rapids Fish Hatchery fry releases from 1985 through 1998 is presented in Table 6.

In 1998, broodstock collection began after 11 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 50 fish, comprising 30% of the female population. All of these chinook salmon females were successfully spawned with the exception of two fish which died during holding. 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, 21 females were captured and spawned successfully. This unforeseen problem did not allow hatchery staff to collect enough males for all of the females to be matrix spawned. Two females used for brood stock lacked adipose fins, and therefore were known to be of hatchery origin. A total of 104 males were used in the brood stock program, of which 11 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 362,402 green eggs were taken between August 23 and September 7, 1998. The fertilization rate was estimated to be 90%. Shocking and second inventory of eyed eggs began on October 14 and was completed on October 27, 1998, after the eggs had become fully eyed. Total mortality from the green egg stage to the eyed stage (including pre-eyed mortalities which numbered approximately 11,719 eggs) is estimated at 48,041 eggs. This corresponds to a survival rate from the green egg stage to the eyed egg stage of 87%. The average fecundity for the females taken for brood stock was 5,100 eggs.

6.2.6 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 1998, the weir was operational from mid July until 0300 hrs on 22 October. Weir installation usually occurs in mid to late August. In 1998, however, the VGFN received funding through the Restoration and Enhancement Fund to operate the weir from mid-July until 26 August in order to determine the magnitude of the chinook salmon escapement to the upper Fishing Branch River. No salmon were observed at the weir during that time, but two chinook salmon were observed after August 26. High water interfered with counting during the latter part of August and the first chum was observed on 31 August. The peak count (1,001 chum salmon) occurred on 24 September and the run mid-point was observed on 29 September. The timing of the peak count and mid-point was late compared to recent cycle averages of 16 September and 19 September respectively. Despite a forecast for an above average run in 1998 (qualified as being potentially optimistic in light of apparent poor production from the 1993 brood year), the cumulative count through the weir was 13,248 fall chum salmon, the lowest estimate on record (including estimates generated through aerial surveys). The 1998 count was 76% below the recent cycle average of 55,364 and 74% below the lower end of the interim escapement goal range of 50,000 - 120,000 chum salmon.

A total of 190 orange spaghetti tags which had been applied at Rampart, Alaska were observed. Eighty-six of these tags were recovered. Four radio tags were recovered out of more than ten which were identified by a receiver at the weir site (see Section 6.3). Over 10,000 fish were examined for pelvic fin clips and missing tags. Three fish lacking tags were observed with pelvic fin clips and tagging needle marks. One additional radio tagged fish was observed lacking a spaghetti tag; this fish had been spaghetti tagged at Rampart. Two additional fish lacking tags were observed with pelvic fin clips. However, tagging needle marks were not observed on these fish and it is believed the pelvic fin abnormality may have occurred naturally. More information regarding recovery of radio tags or spaghetti tags which had been applied at Rampart, Alaska is presented in Section 6.3..

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. In 1998, two coho salmon were counted passing the weir site.

DNA samples were collected from 74 juvenile coho salmon captured at 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.

6.2.7 Community Development and Education Program

In 1989, a community based incubation box program was initiated with the objectives of: 1) developing and demonstrating remote/isolated small scale incubation systems; 2) producing sufficient numbers of fry in specific locations for coded-wire tag releases; and, 3) providing local schools with a supply of eyed eggs for small (50-100 egg capacity) classroom incubators. The incubators are intended primarily for chinook salmon. A 120,000-egg capacity box was

constructed on McIntyre Creek in Whitehorse, and a 60,000-egg capacity box was constructed on the North Klondike River near Dawson City. In 1991 and 1992, two 60,000-egg boxes were installed on the Mayo River. The Mayo incubation boxes have been idle since 1994; the Klondike River box has not been used since 1996. A summary of fry releases from these incubation boxes is presented in Table 7.

Since the spring of 1996, the Whitehorse Correctional Centre has operated the McIntyre incubation box. The release sites for the Takhini River chinook stock incubated in the McIntyre box have included Flat Creek, a small, north bank tributary of the Takhini River, and the mainstem Takhini River, close to the outlet of Kusawa Lake. In June 1998, approximately 50,000 chinook salmon fry were released into the Takhini River system including: an estimated 48,834 fry that had been adipose clipped and coded-wire tagged; 739 fry that had been adipose clipped but lacked tags; and, 496 unmarked fry. Of these, 11,604 fry were released into Flat Creek and 38,465 fry were released into the Takhini River. About 23,000 chinook fry were also released into Tatchun Creek, including an estimated: 22,138 fry that had been adipose clipped and coded-wire tagged, 413 fry that had been adipose clipped but lacked tags, and 262 unmarked fry.

Several foot surveys were conducted but no adult returns were seen at Flat Creek in 1998. One chinook head was obtained from the Takhini River broodstock. At least two Flat Creek fish, released from the 1991 brood year, were harvested in the fishery at Emmonak in 1998. In 1997, 18 clipped spawners were seen in Flat Creek. The CWT lab could not detect any tags in these heads, as a result of either poor tag retention, a tag lab insensitive to half tags, or both. This seems to indicate that there could have been a significant number of "no tag " heads in the fishery that were actually from the McIntyre project. In an attempt to minimize future problems with tag loss, the 1998 tagging contract was awarded to a professional tagger from British Columbia who has carried out the Whitehorse Rapids Hatchery tagging for many years. One head was also taken from a Tatchun Creek clipped fish in 1998, but has not yet been processed.

Approximately 24,000 Takhini chinook eggs and 21,000 Tatchun chinook eggs are currently being incubated at McIntyre Creek. Egg take numbers were low this year as low salmon numbers led to difficulty obtaining broodstock. Tatchun egg survival to the eyed stage was also low (68%), with fungus causing high mortality. The Whitehorse Correctional Centre is currently building a shelter for a stack of heath trays which will be installed this winter. If the stack operates well throughout the winter, it could make pre-eyed picking possible, and thus help to control mortality due to fungus.

The educational program "Salmon in the Classroom" is again available in all Yukon schools. Curriculum material including "Salmon in the Classroom", "Gently Down the Stream", "Water Stewardship" and "Streamkeepers Handbook" is available in all Yukon schools. Teachers also have the option of operating classroom incubators as part of the program. Over the 1997-1998 school year, 22 schools in nine Yukon communities incubated eggs from 3 stocks of chinook and 2 stocks of chum. Eighteen schools received 50 to 100 eyed chinook eggs from the McIntyre incubation project, and 4 schools received an average of 600 chum eggs. Survival rates ranged from 26 to 96 percent. Students released almost 2,300 fry back into their natal systems in the

spring of 1998. Three schools are currently incubating 1998 chum salmon eggs. Nineteen schools are incubating chinook eggs.

A Streamkeepers Society, which fosters stream stewardship was formed in the Yukon in 1995. The society conducted training workshops in the spring and fall in 1998 to introduce interested people to the Streamkeepers Handbook modules. The Society is currently monitoring temperatures at 5 sites in the Whitehorse area as part of a fry emergence study. In 1998, they also provided funding for schools to participate in salmon related field trips. Both of these projects were supported by the Restoration and Enhancement Fund.

6.3 Upper Yukon River Fall Chum Salmon Radio Telemetry and Mark-Recapture Project

Radio telemetry studies have been proposed as a means for providing information on stock composition, abundance and timing, movement patterns, and the location of undocumented spawning areas for salmon returns in the upper Yukon River basin. A large-scale telemetry program was conducted by NMFS in 1998. The program consisted of four primary components: 1) installation of remote tracking stations in the drainage to record the movements of radio-tagged fish, 2) large-scale tagging study on fall chum salmon to collect information on run characteristics and handling response, 3) feasibility study on chinook salmon to assess handling response, and 4) development of an automated database and geographical mapping system (GIS) to summarize telemetry data. Support for the program was provided by the USFWS, ADF&G, DFO, and TCC. Field operations were completed in late October, and the information presented in this summary should be considered preliminary.

Remote tracking stations were installed near the tagging site, at the U.S./Canada border on the Yukon River mainstem, on the Porcupine River, and on the Fishing Branch River during 1996-97. In 1998, additional stations were installed on the Chandalar, Sheenjek, Black and lower Porcupine Rivers, and on the mainstem Yukon River near Circle. Stations were also installed on Canadian sections of the mainstem Yukon and Kluane Rivers to record radio-tagged fish entering and leaving two chum salmon index areas. A total of 16 stations were operated during 1998.

Adult salmon were captured with fish wheels located at Rampart Rapids about 60 km upriver from the Yukon-Tanana River confluence. Fifty chinook salmon were tagged with radio transmitters from 22 July to 11 August, and 530 fall chum salmon were tagged from 24 August to 16 September. The transmitters were inserted through the mouth and placed in the stomach of the fish. The fish responded well to tagging, with 46 chinook (92%) and 503 fall chum salmon (95%) resuming upriver movement after release. Fourteen chinook and 24 fall chum salmon were caught in U.S. and Canadian fisheries.

Radio-tagged fall chum salmon were tracked to areas throughout the upper Yukon River basin. Of the 481 fish that moved upriver and were not caught in fisheries, 305 (63%) travelled to areas in the Yukon River mainstem, while 176 (37%) were located in the Porcupine River drainage. Fish returning to the Chandalar River comprised the largest portion of the sample, with 163 fish

(34%) tracked to that area. Ten fish (2%) were last located in the U.S. section of the Yukon River mainstem upriver from Circle. Ninety-three fish (19%) travelled to the Canadian section of the Yukon River mainstem, including 69 fish downriver from the Yukon-Pelly River confluence, 9 fish in the main stem index area, 5 fish upriver from the Yukon-Tatchun Creek confluence, and 10 fish in the Kluane River. Thirty-nine fish (8%) also remained in U.S. areas associated with the Yukon Flats; this component may include fish caught in the fishery but not reported, mortalities due to predation or handling, and fish utilizing main stem and off-channel areas.

Sheenjek River fish were the primary component of the Porcupine run, with 120 fish (25%) returning to that tributary. Nine fish (2%) were tracked to Black River, nine fish (2%) to other portions of the U.S. section of the mainstem Porcupine River, and 38 fish (8%) to the Canadian portion of the Porcupine River drainage, including 14 fish that travelled to the Fishing Branch River. Aerial surveys in late October located 9 fish in the Canadian mainstem Porcupine River and 2 fish in the lower Miner River. These fish were located near areas of open water, and at one site, untagged fish were also observed. Fall helicopter surveys of the Chandalar and Sheenjek Rivers also provided information on specific spawning locations.

Stock timing varied for different groups of fish. Chandalar River fish were abundant at the capture site throughout the study, ranging from 30% to 40% of the weekly sample. A similar pattern was observed for Sheenjek River fish, with between 21% and 35% of the weekly sample. The timing for fish travelling to the Yukon River mainstem was later, comprising 7-8% of the sample during the first two weeks of the study, and 20-23% of the sample during the last two weeks. However, fish tracked to the Kluane River were tagged during the first and second week.

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 salmon return will be developed by weighting telemetry data with abundance estimates developed from the mark-recapture study conducted by the USFWS.

Movement rates were determined for fish moving to different sections of the drainage. Average movements ranged from 37 km/day to 44 km/day, with fish destined for areas farther upriver exhibiting faster rates. The fastest movement rate observed was 54 km/day for a fish travelling to the upper reaches of the Porcupine River. Further analysis will also examine stock-specific movements within different sections of the drainage.

Information on handling and tagging methods is being evaluated. During the first two weeks of tagging, 240 fall chum salmon were separated into three treatment groups: 1) fish radio-tagged immediately after capture and released, 2) fish radio- and spaghetti-tagged immediately after capture and released, and 3) fish held in a live box for 3-5 hours, radio- and spaghetti-tagged and released. Fish tagged and released immediately after capture resumed upriver movements sooner than fish that had been held. Information on distribution and movement patterns is being summarized by treatment groups.

Radio-tagged chinook salmon were located in sections of the Yukon River mainstem; no fish were observed in the Porcupine River. Thirty-seven fish moved upriver and were not caught in

fisheries. Of these, 23 fish (62%) were tracked to upper reaches of the drainage, including 4 fish that remained in the U.S. upriver from Circle, 5 fish past the U.S./Canada border, and 14 fish upriver of the Yukon-Pelly River confluence. Information on movement patterns is being summarized. In general, chinook salmon moved substantially faster than fall chum salmon. Response to handling (held in the fish wheel live box versus immediate release) is also being analyzed.

An automated database-GIS map, developed to assist in summarizing telemetry data, was used effectively during the 1998 season. Although a prototype, the system operated throughout the study, and was essential in monitoring the remote tracking system, and the preparation of in-season summaries used to assess chum salmon returns and plan field operations. Additional work is being conducted to refine and enhance the database-GIS system capabilities.

For the third consecutive year, fish wheels at Rampart were used to capture fall chum salmon for a mark-recapture population estimate. Crews tagged 8,527 fish between 3 August and 19 September 1998. The late start date was the result of late run timing and low catches. The left pelvic fin was clipped on all spaghetti-tagged fish. Recovery fish wheels at Rampart sampled from 21 August to 23 September and examined 15,581 fall chum salmon for marks. The proportion of tag recoveries at the recapture site was 4.7%, excluding multiple recaptures. The preliminary population estimate for the seven weeks sampled was calculated at 198,376 ± 21,087. Males made up 46% and females 54% of the tagged fish.

Monitoring recapture to capture ratios (R/C) in upriver areas continued through USFWS cooperators. The percent of fish bearing marks, from downstream to upstream, were 4.7% at Rampart, 3.8% at Beaver, 3.7% at Fort Yukon, and 0.5% at Circle. Data were also collected in Canada. Further efforts to evaluate hypotheses that may explain the progressively lower R/C ratios observed with increasing distance traveled included an evaluation of stress levels of held fish using blood components, an evaluation of oxygen levels in the livebox, histopathology sampling, and radio telemetry treatment groups. Preliminary data indicate that some blood stress indicators trend in proportion to the time fish were held. Oxygen levels in a livebox with 174 fish ranged from 9.2 to 10.9 ppm with a water temperature of 7.7° C. This suggests no depletion in dissolved oxygen occurred in liveboxes during tagging. Detailed annual reports regarding findings should be completed in spring 1999.

6.4 Restoration and Enhancement Fund Projects

The Executive Secretary of the Yukon River Panel provided a briefing to the JTC on the status of the Restoration and Enhancement (R & E) Fund projects for 1998. Results for some of these projects have been discussed elsewhere in this report as they relate to information on the fisheries, stocks, and projects. A concise summary of the status of R & E Fund projects for 1998, handed out by the Executive Secretary at the JTC meeting, is appended to this report as Attachment III.

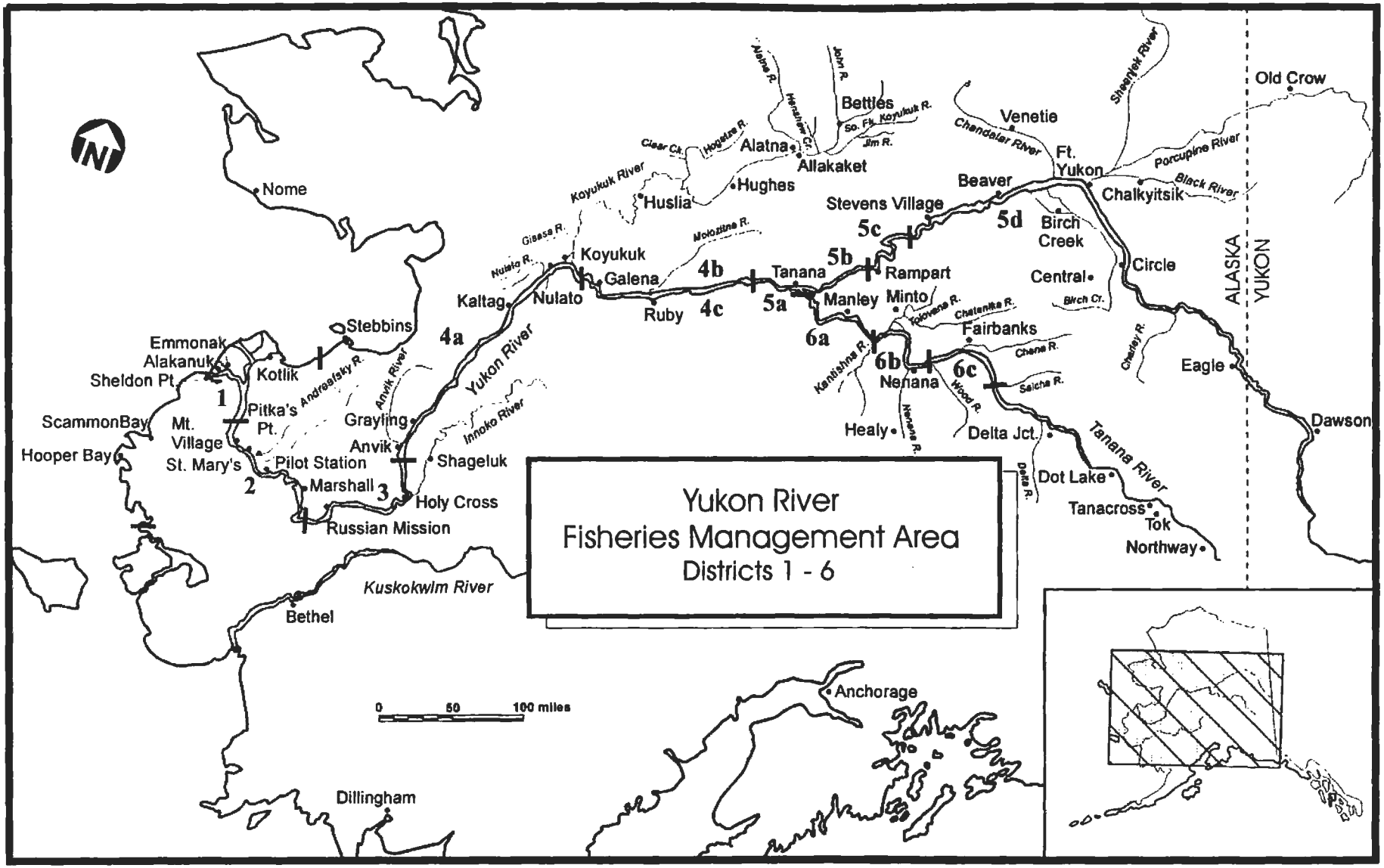

Figure 1. Map of the Alaska portion of the Yukon River Drainage.

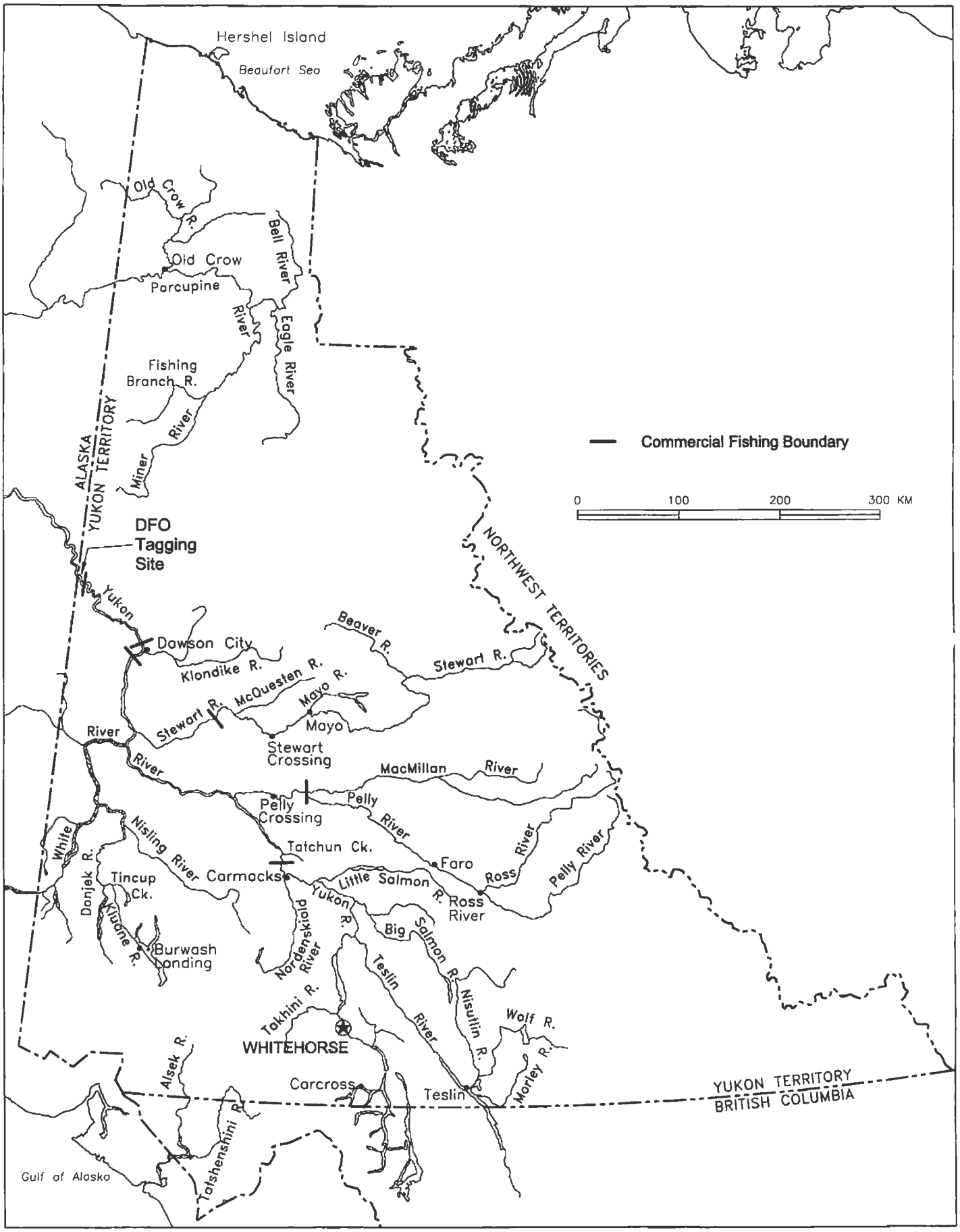

Figure 2. Map of the Canadian portion of the Yukon River showing commercial fishing boundaries

Table 1. Preliminary estimates of commercial salmon sales and estimated harvests in the Alaska portion of the Yukon River drainage, 1998.[a,b]

District Subdist.	No. of Fishermen[c]	Chinook			Summer Chum			Fall Chum			Coho			Total		
		Numbers	Roe	Harvest	Numbers	Roe	Harvest	Numbers	Roe	Harvest	Numbers	Roe	Harvest	Numbers	Roe	Harvest
1	430	25,413	0	25,413	21,270	0	21,270	0	0	0	0	0	0	46,683	0	46,683
2	231	16,806	0	16,806	6,848	0	6,848	0	0	0	1	0	1	23,655	0	23,655
Subtotal	643	42,219	0	42,219	28,118	0	28,118	0	0	0	1	0	1	70,338	0	70,338
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Lower Yukon	643	42,219	0	42,219	28,118	0	28,118	0	0	0	1	0	1	70,338	0	70,338
Anvik River	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4-A	-	-	-	-	-	-	- [d]	-	-	-	-	-	-	-	-	-
4-B,C	-	-	-	-	-	-	- [d]	-	-	-	-	-	-	-	-	-
Subtotal District 4	-	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
5-A,B,C	15	475	0	475	96	13	110	-	-	-	-	-	-	571	13	585
5-D	3	42	0	42	0	0	0	-	-	-	-	-	-	42	0	42
Subtotal District 5	*18*	*517*	*0*	*517*	*96*	*13*	*110*	*0*	*0*	*0*	*0*	*0*	*0*	613	13	627
District 6	10	882	260	963	397	140	570	0	0	0	0	0	0	1,279	400	1,533
Total Upper Yukon	28	1,399	260	1,480	493	153	680	0	0	0	0	0	0	1,892	413	2,160
Total Yukon Area	671	43,618	260	43,699	28,611	153	28,798	0	0	0	1	0	1	72,230	413	72,498

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
1993-97 Avg.	106,385	2,892	135,483	161,896	79,884	10,329	26,804	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, domestic, aboriginal and test fishery catches of chinook and chum salmon in the Yukon River in 1998.

Statistical Week	Week Ending	Start Date	Finish Date	Days Fished	Number Fishing	Boat-Days	Chinook Salmon	Chum Salmon	Coho Salmon
27	04-Jul			0	0	0.0	0	0	0
28	11-Jul			0	0	0.0	0	0	0
29	18-Jul	12-Jul	13-Jul	1	12	12.0	173	0	0
30	25-Jul	19-Jul	20-Jul	1.5	11	16.5	212	0	0
31	01-Aug	26-Jul	26-Jul	closed	0	0.0	0	0	0
32	08-Aug	02-Aug	02-Aug	closed	0	0.0	0	0	0
33	15-Aug	09-Aug	09-Aug	closed	0	0.0	0	0	0
34	22-Aug	16-Aug	16-Aug	closed	0	0.0	0	0	0
35	29-Aug	23-Aug	23-Aug	closed	0	0.0	0	0	0
36	05-Sep	30-Aug	30-Aug	closed	0	0.0	0	0	0
37	12-Sep	06-Sep	06-Sep	closed	0	0.0	0	0	0
38	19-Sep	14-Sep	14-Sep	closed	0	0.0	0	0	0
39	26-Sep	21-Sep	21-Sep	closed	0	0.0	0	0	0
40	03-Oct	28-Sep	28-Sep	closed	0	0.0	0	0	0
41	10-Oct	05-Oct	05-Oct	closed	0	0.0	0	0	0
42	17-Oct	13-Oct	13-Oct	closed	0	0.0	0	0	0
Dawson area subtotal				2.5		28.5	385	0	0
Upriver commercial subtotal							5	0	
Total Commercial Harvest				closed midnight July 25			**390**	**0**	**0**
Domestic Harvest				closed midnight July 25			**24**	**0**	**0**
Estimated Recreational Harvest				closed midnight July 25			**0**	**0**	**0**
Aboriginal Harvest	(Upper Yukon season estimate to October 29, 1998)						**4668**	**1742**	**0**
Test fishery catch							**737**	**0**	**0**
TOTAL CANADIAN UPPER YUKON HARVEST							**5819**	**1742**	**0**
Old Crow AF - Porcupine R.	(incomplete - includes data from interviews thru Oct 3)						**99**	**6159**	**0**

Table 4. Salmon fishery projects conducted in the Alaskan portion of the Yukon River drainage in 1998.

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 (Alaskan Portion) Comprehensive Salmon Plan	Alaskan portion of the Yukon River drainage	develop a comprehensive plan for restoration and enhancement of salmon stocks of the Alaskan portion of the Yukon River drainage; define goals and objectives; identify potential opportunities and concerns; recommend appropriate procedures; evaluate priorities	concluded in 1998	ADF&G , YRDFA, & USFWS	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
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 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
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.	Aug -Sept.	Asa'carsarmiut Trad. Council	all aspects implementation with R & E funding
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

continued

Table 4. (page 2 of 3).

Project Name	Location	Primary Objective(s)	Duration	Agency	Responsibility
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
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 ACE BSFA	all aspects 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 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 Weir	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
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	USFWS, 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
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
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

continued

Table 4. (page 3 of 3).

Project Name	Location	Primary Objective(s)	Duration	Agency	Responsibility
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	all aspects
				BSFA	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 Manley Recovery RM 765 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	all aspects
				BSFA	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.	ADF&G	all aspects
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

Agency Acronyms:

ACE	= Alaska Cooperative Extension
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 1998.

Project Name	Location	Primary Objective(s)	Duration	Agency	Responsibility
Yukon Mark-Recapture and Chinook Test Fishery	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 YSC, YRCFA, THFN	all aspects chinook test fishery
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 and chinook salmon returning to the Fishing Branch River and obtain age, size, tag and sex composition data.	July - Oct	VGFN DFO	chinook season chum season
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 - August	YFGA	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
MacIntyre Creek Weir	Whitehorse	- enumerate chinook escapement to MacIntyre Creek. and obtain sex and tag composition data.	July - August	Waugh/Young	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
Michie Creek Weir	near Whitehorse	- enumerate chinook returns to Michie Creek and obtain age, size, sex and tag composition data.	August - Sept	YFGA	all aspects

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Escapement Sampling	various tributaries	- to obtain age and size composition of chum spawning escapement;	August - Oct	DFO	all aspects
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
Upper Lakes Radio Tag Application and Tracking	near Whitehorse	- to apply transmitters to chinook at the Whitehorse Fishway and conduct tracking to assess spawning distribution of chinook in the Yukon River upstream of Whitehorse.	August - Sept	YFGA	all aspects
Whitehorse Rapids Fish Hatchery and Coded-wire Tag Project	Whitehorse	- to incubate 320K chinook eggs obtained at the Whitehorse Fishway; - to rear fry until spring, then mark, tag, and release upstream of Whitehorse hydroelectric facility.	ongoing	YFGA DFO	all aspects coded-wire tagging
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 WCC	technical support 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

Table 6. Summary of releases and recoveries of Coded-wire Tagged Chinook Salmon from Whitehorse Hatchery, 1985 - 1998

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						
Michie	25-May-85	023226	28269	518						
Michie	25-May-85	023247	43325	518						
Wolf	1985	no-clip	0	0			0		10520	10520
SUM			98264	1555						
Michie		023731								
Wolf	1985	no-clip	0	0			0		5720	5720
SUM										
Michie	05-Jun-87	024812	47644	1361	0.028	b	49005	2.5	9598	58603
Michie	05-Jun-87	024813	49344	808	0.016	b	50152	2.5	9141	59293
Michie	05-Jun-87	024814	51888	559	0.011	b	52447	2.5	9422	61869
Michie	05-Jun-87	024815	43367	2066	0.045	b	45433	2.5	7868	53301
Michie	05-Jun-87	024258	25945	245	0.009	b	26190	2.5	4171	30361
Wolf	30-May-87	024259	26752	123	0.005	b	26875	2.5	422	27297
SUM			244940	5162			250102		40822	290724
Michie	10-Jun-88	025549	77670	1991		15	79661	2.8	84903	164564
Michie	10-Jun-88	025550	78013	1592		11	79605	2.7	85288	164893
Wolf	05-Jun-88	no-clip	0	0			0		25986	25986
SUM			155683	3583			159266		196177	355443
Wolf	1989	no-clip	0	0			0		22388	22388
Michie	06-Jun-89	026004	26161	326	0.015		26487	2.3	0	26487
Michie	06-Jun-89	026005	24951	128	0.004		25079	2.3	0	25079
Michie	06-Jun-89	026006	25098	291	0.018		25389	2.4	0	25389
Michie	06-Jun-89	026007	25233	156	0.0008		25389	2.2	118112	143501
Fishway	06-Jun-89	026008	25194	357	0.013		25551	2.7	0	25551
Fishway	06-Jun-89	026009	25190	351	0.0125		25541	2.7	0	25541
SUM			151827	1609			153436		118112	271548
Wolf	06-Jun-90	no-clip	0	0			0		11969	11969
Michie	02-Jun-90	020238	24555	501	0.02		25056	2.3	0	25056
Michie	02-Jun-90	020239	24345	753	0.03		25098	2.3	0	25098
Fishway	02-Jun-90	020260	24508	501	0.0200		25009	2.2	0	25009
Fishway	02-Jun-90	020263	25113	254	0.01		25367	2.2	0	25367
SUM			98521	2009			100530		11969	112499
Wolf	08-Jun-91	180322	49477	793	0.015		50270	2.3	0	50270
Fishway	06-Jun-91	180323	52948	193	0.0025		53141	2.3	0	53141
Michie	06-Jun-91	180324	50020	176	0.0025		50196	2.3	87348	137544
SUM			152445	1162			153607		87348	240955
Wolf	04-Jun-92	180829	48239	0	0		48239	2.4	0	48239
Fishway	04-Jun-92	180828	49356	99	0.002		49455	2.3	0	49455
Michie	04-Jun-92	180830	52946	643	0.012		53589	2.2	249166	302755
SUM			150541	742			151283		249166	400449
Wolf	06-Jun-93	181215	50248	0	0		50248	2.3	0	50248
Fishway	06-Jun-93	181216	49957	434	0.009		50391	2.3	0	50391
Michie	06-Jun-93	181217	50169	0	0		50169	2.3	290647	340816
SUM			150374	434			150808		290647	441455
Wolf	02-Jun-94	181427	50155	270	0.0053		50425	2.3	0	50425
Michie	02-Jun-94	181428	50210	127	0.0002		50337	2.3	158780	209117
Fishway	02-Jun-94	181429	50415	125	0.0002		50540	2.3	0	50540
SUM			150780	522			151302		158780	310082
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			69607				70249		4552	74801
Wolf	26-May-96	18748	10131	102	0.001	5	10233	2.3	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			320962				324933		0	324933

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	2.3	0	15000
Wolf	1-Jun-97	182326	20334	0		4	20334		0	20334
Wolf	8-Jun-97	182906	10158	0		8	10158		0	10158
									0	
									0	
									0	
Fox	11-Jun-97	182554	25242	0		3	25242	2.43	0	25242
Fox	11-Jun-97	182555	24995	253		3	25248		0	25248
									0	
									0	
Byng	11-Jun-97	182907	10029	0		1	10029	2.37	0	10029
Byng	11-Jun-97	182905	10155	0		1	10155		0	10155
									0	
									0	
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
SUM			310838				312196		0	312196
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	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	2.6	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
SUM			262034				268386		0	268386

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 1991-1998

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
ke R, Nor	Chinook	1991	Tatchun R	180645	Spring Fry	Tatchun R	/ /	92/08/31	11734	0	817	12551	2.47
.ke R, Nor	Chinook	1991	Tatchun R	023356	Spring Fry	Tatchun R	/ /	92/08/31	6453	0	852	7305	2.47
.dike 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
'yre Cr	Chinook	1992	Tatchun R	0201010402	Spring Fry	Tatchun R	93/06/17	93/06/17	4654	633	335	5622	0.76
.yre 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, 1903-1998.

	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	45,600	66,487	198,550	1,483,437	1,681,987
1996	138,562	1,117,481	1,256,043	19,612	24,354	43,966	158,174	1,141,835	1,300,009
1997	174,625	543,484	718,109	16,528	15,667	32,195	191,153	559,151	750,304
1998 [f]	43,699 [g]	28,799 [g]	72,498	5,918 [h]	7,901	13,819	49,617	36,700	86,317
Average									
1903-87	80,194	737,926	687,036	7,121	16,094	14,327	74,933	721,376	637,044
1988-92	155,660	1,568,960	1,724,620	19,422	29,734	49,156	175,082	1,598,694	1,773,776
1993-97	165,249	803,785	969,033	18,971	27,622	46,593	184,220	831,407	1,015,627

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, 1961-1998.

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 [f]	5,918 [i]	43,699 [h]	49,617	7,901	0 [h]	7,901
Average						
1961-87	10,382	136,151	146,533	17,009	291,834	308,843
1988-92	19,422	155,660	175,082	29,288	337,204	366,492
1993-97	18,971	165,249	184,220	27,526	203,197	230,724

[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, 1961-1998.

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 [g]	[h]	[h]	43,699	[h]	43,699
Average					
1961-86	24,452	24,452	109,401	753	134,142
1987-91	50,025	49,634	109,302	763	159,699
1992-96	52,433	51,669	110,276	2,017	163,962

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, 1961-1998.

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 [b]	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
1961-87	5,149	674	4,593	300		5,031	10,181	226	10,382
1988-92	11,223	287	7,315	370		7,972	19,195	227	19,422
1993-97	9,800	269	7,790	664		8,723	18,523	449	18,971

[a] Sport fish harvest unknown prior to 1980.

[b] Data are preliminary.

Attachment Table 5. Alaskan catch of Yukon River summer chum salmon, 1961-1998.

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 [h]	[j]	[j]	28,798	[j]	28,798
Average					
1961-86	221,841	192,003	466,459	672	658,720
1987-91	262,946	155,754	978,726	1,105	1,135,584
1992-96	223,425	117,529	491,610	1,050	610,190

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, 1961-1998.

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 [j]	[m]	[m]	0	0
Average				
1961-87	118,433	116,333	175,501	291,834
1988-92	170,942	159,580	177,625	337,204
1993-97	122,251	111,238	91,960	203,197

[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, 1961-1998.

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 [a]	0	0	1,742	1,742	1,742	6,159	7,901
Average							
1961-87	8,296	1,290	2,580	3,153	11,449	5,774	17,009
1988-92	25,066	90	2,152	2,242	27,308	1,980	29,288
1993-97	20,989	0	2,711	2,711	23,700	3,826	27,526

[a] Data are preliminary.

Attachment Table 8. Alaskan catch of Yukon River coho salmon, 1961-1998.

Year	Estimated Subsistence Use [a]	Harvest			
		Subsistence [b]	Commercial [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 [j]	[m]	[m]	1	[m]	1
Average					
1961-87	19,707	19,707	20,503	485	40,407
1988-92	50,559	48,923	70,320	2,124	121,367
1993-97	30,472	28,763	28,866	1,475	59,104

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, 1961-1998. [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 [g]	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 [i]
1974			285	471 [g]		55 [g]	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 [i]
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 [i]
1980	958 [g]		1,500	1,330	1,192	954 [g]	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 [i]
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 [g]	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 [g]	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 [s]	1,140	3,186 [p]	1,510	3,979	2,690			4,766	144 [g]	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]		648 [g]	507	546	1,536	889 [g]	2,273	4,423 [k]		427 [g]	4,990 [k]		2,055 [g]
E.O. [t]	>1,500		>1,400	>1,300 [u]	>500 [u]	>800	>500		>600				>1,700			>2,500

continued

Attachment Table 9. (page 2 of 2).

[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, 1991-1998.

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 [s]	50	183	348	487	143		59	777	95 [s]	22,588	5,819	16,769
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.
[j] 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, 1973-1998. [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	6,458	136,886		116,735	4,985	185 [d]	3,519 [k]	934 [d]	30,784
1996		108,450 [j]			933,240	4,380	51,269	8,490 [d,h]		129,694		157,589	27,090 [m]	100,912	2,310	2,061	12,810 [k]	9,722	74,827 [k]
1997 [q]		51,139 [j]			609,118	2,775 [d]	48,018			157,975	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 [j]			471,886		8,113			49,140		17,825	120 [d,r]		7 [d]		6,011 [k]	390 [d]	17,682 [k]
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.
[m] 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, 1971-1998.

	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,z]				
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 [z]				
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 [z]				
1979	158,336	8,355		91,372 [t]	119,898			4,640 [z]				
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 [z]		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]		153,000 [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	235,000 [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	247,965 [ac,ad]	77,278 [s]	4,977		14,431	315	143,758	21,329	122,429
1997 [ad]	14,511	8,000	199,874	80,423	26,959 [s]	2,189		3,350	207	94,725	9,286	85,439
1998 [ad]	15,605	7,804	69,438	32,894	13,248 [s]	7,292		7,337	235	48,047	1,742	46,305
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] Tatchun 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).

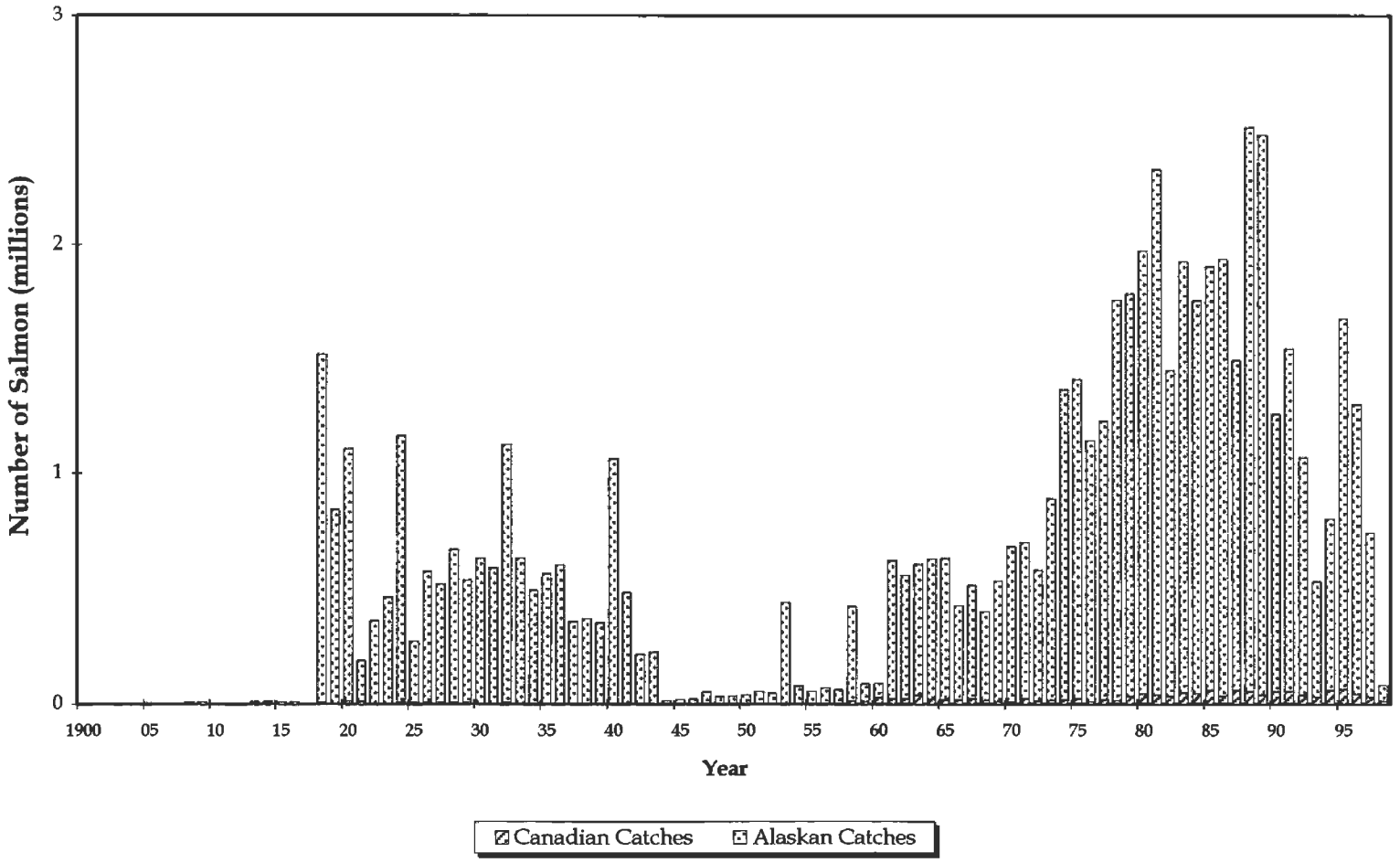
[aj] Incomplete count due to late installation and/or early removal of project or high water events.

Attachment Table 13. Coho salmon escapement counts for selected spawning areas in the Alaskan portion of the Yukon River drainage, 1972-1998. [a]

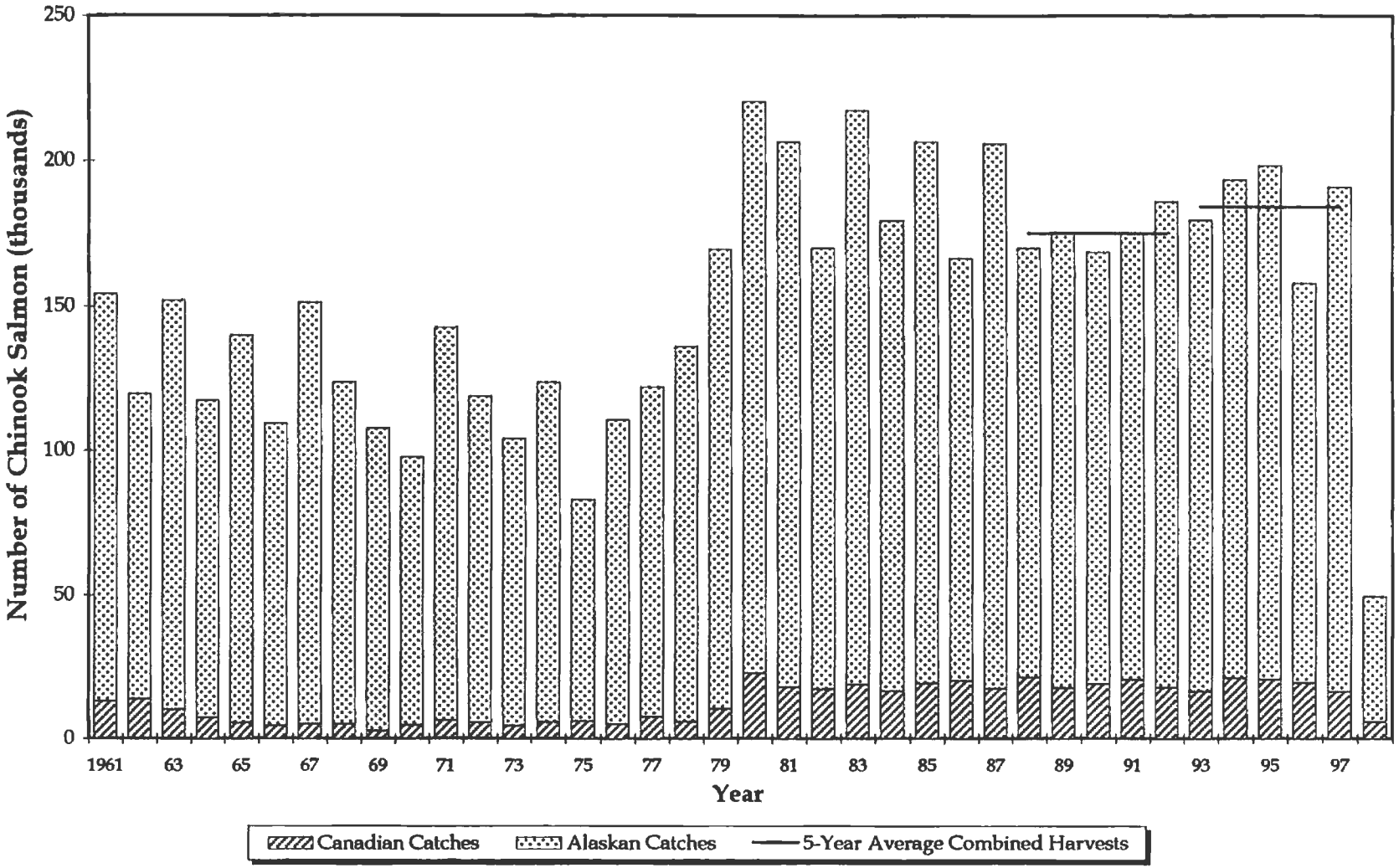
Year	Andreafsky River			Kantishna River		Nenana River				Delta Clearwater River [f,g]	Clearwater Lake and Outlet	Richardson Clearwater River
	East Fork	West Fork	Anvik River	Geiger Creek [b]	Barton Creek	Lost Slough	Nenana Mainstem [c]	Wood Creek [d]	Seventeen Slough			
1972										630	417	454 [k]
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 [t]	5,417 [n]			157		1,360	2,771		1,374	11,100	2,775 [f,h]	
E.O.										>9,000 [u]		

continued

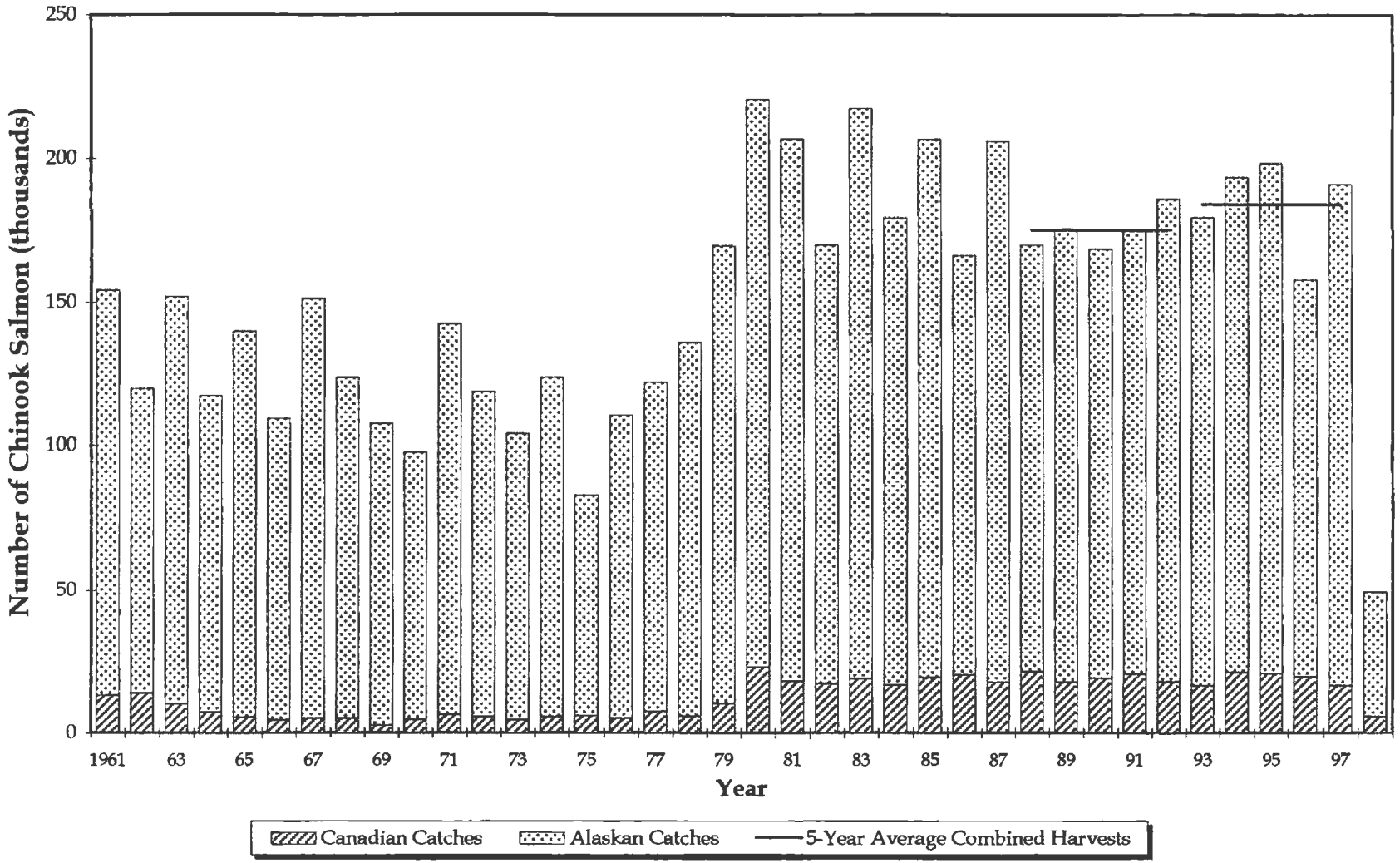
[a] Aerial surveys unless otherwise noted. Only peak counts presented. Survey rating is fair to good, unless otherwise noted.
[b] Foot survey, unless otherwise indicated.
[c] Mainstem Nenana River between confluences of Lost Slough and Teklanika River.
[d] Surveyed by F.R.E.D.
[f] Surveyed by Sport Fish 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, 1900-1998. The 1998 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, 1961-1998. The 1998 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, 1961-1998. The 1998 Alaskan harvest includes only commercial catch data. Other Alaskan harvest estimates are unavailable at this time.**

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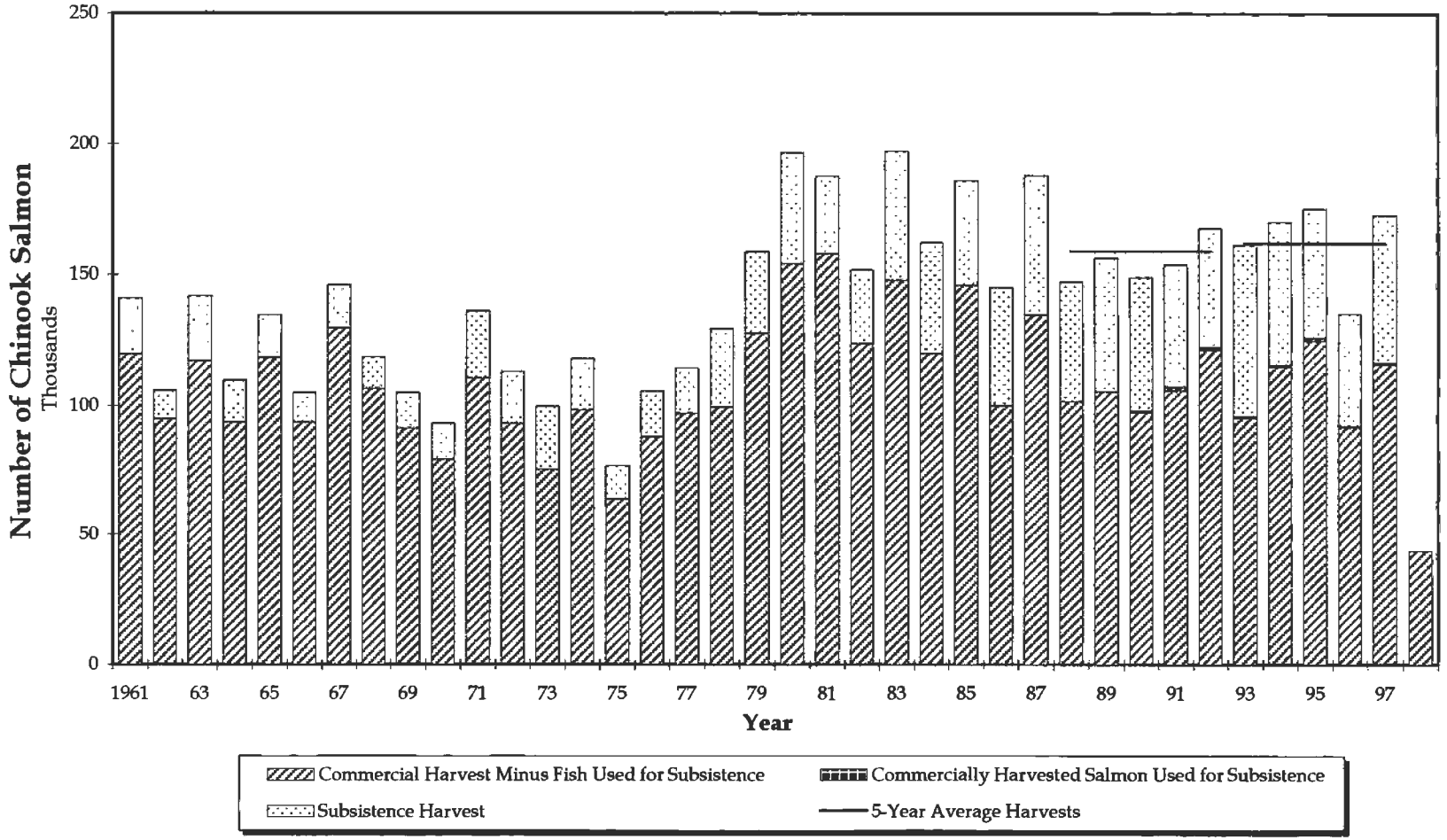
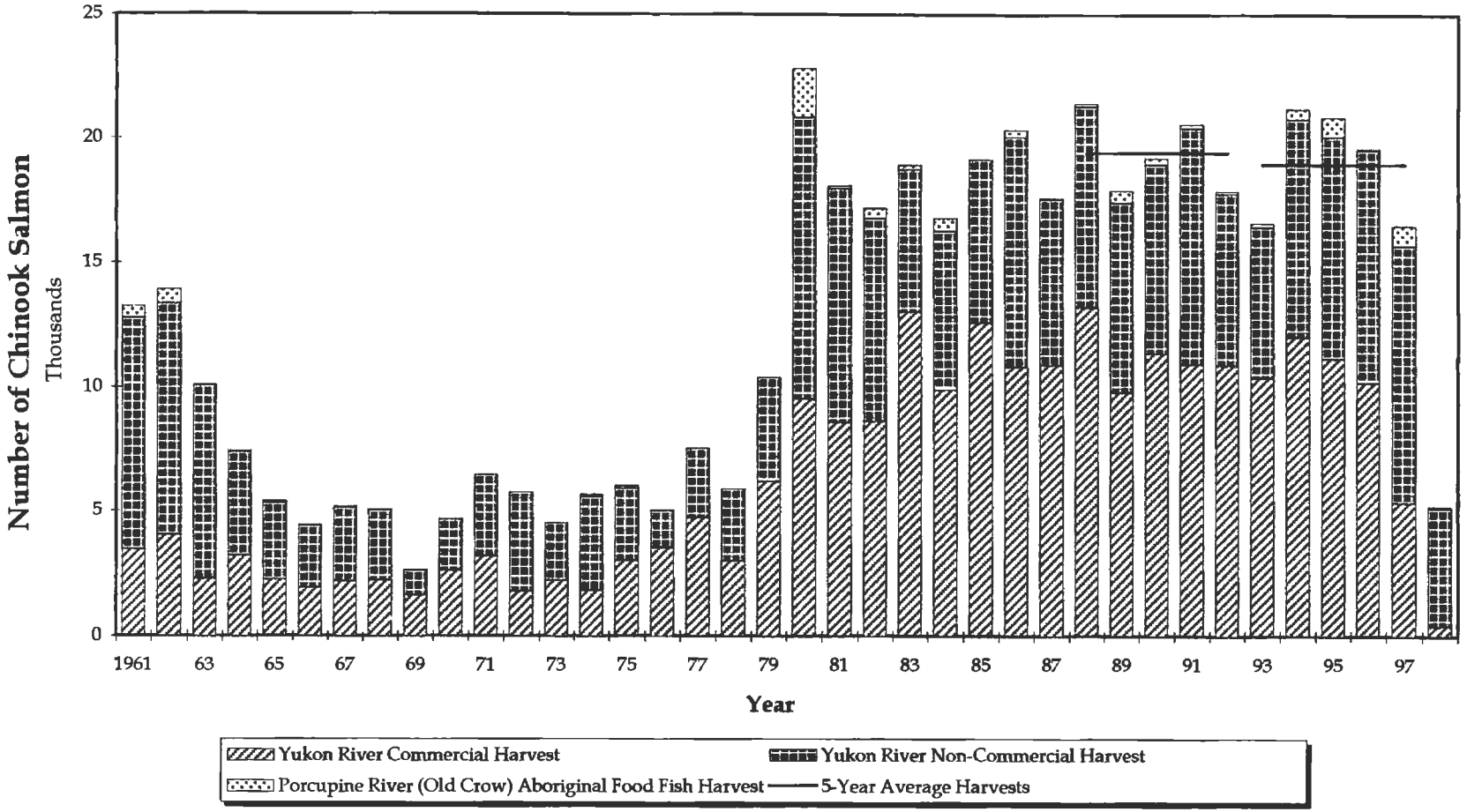
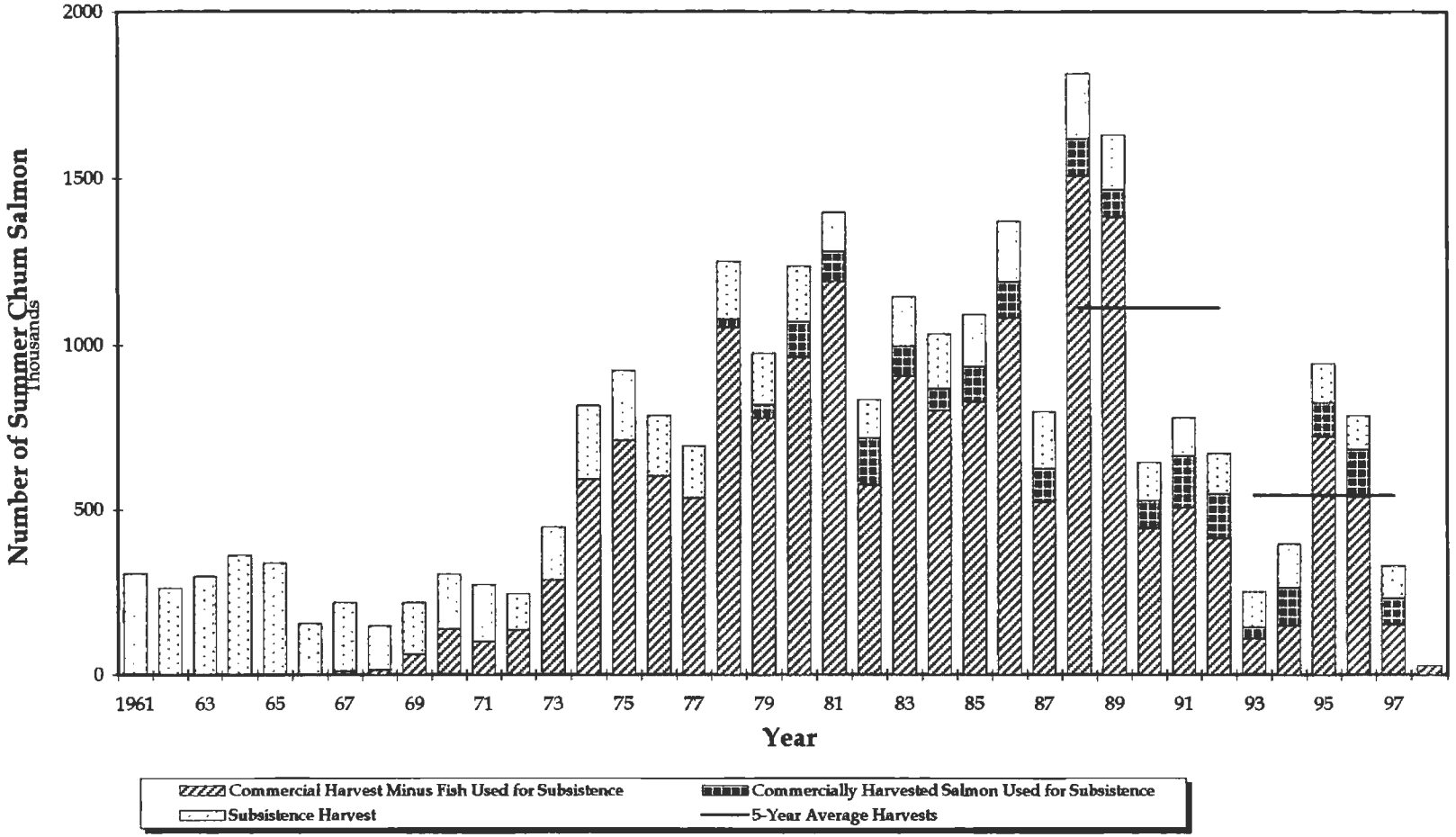


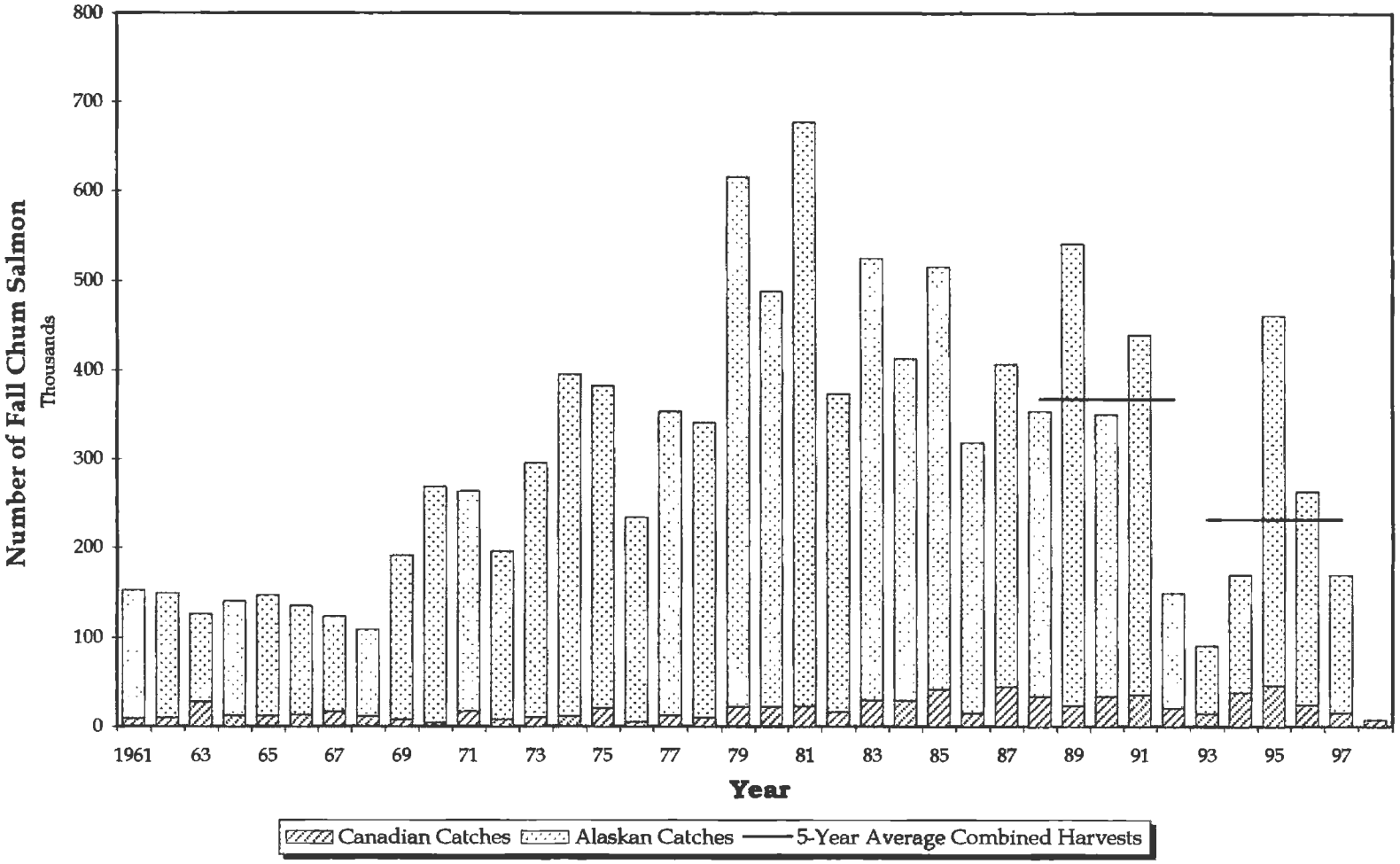
Attachment Figure 3. **Alaskan harvest of chinook salmon, Yukon River, 1961-1998. The 1998 harvest includes only commercial catch data. Other Alaskan harvest estimates are unavailable at this time.**



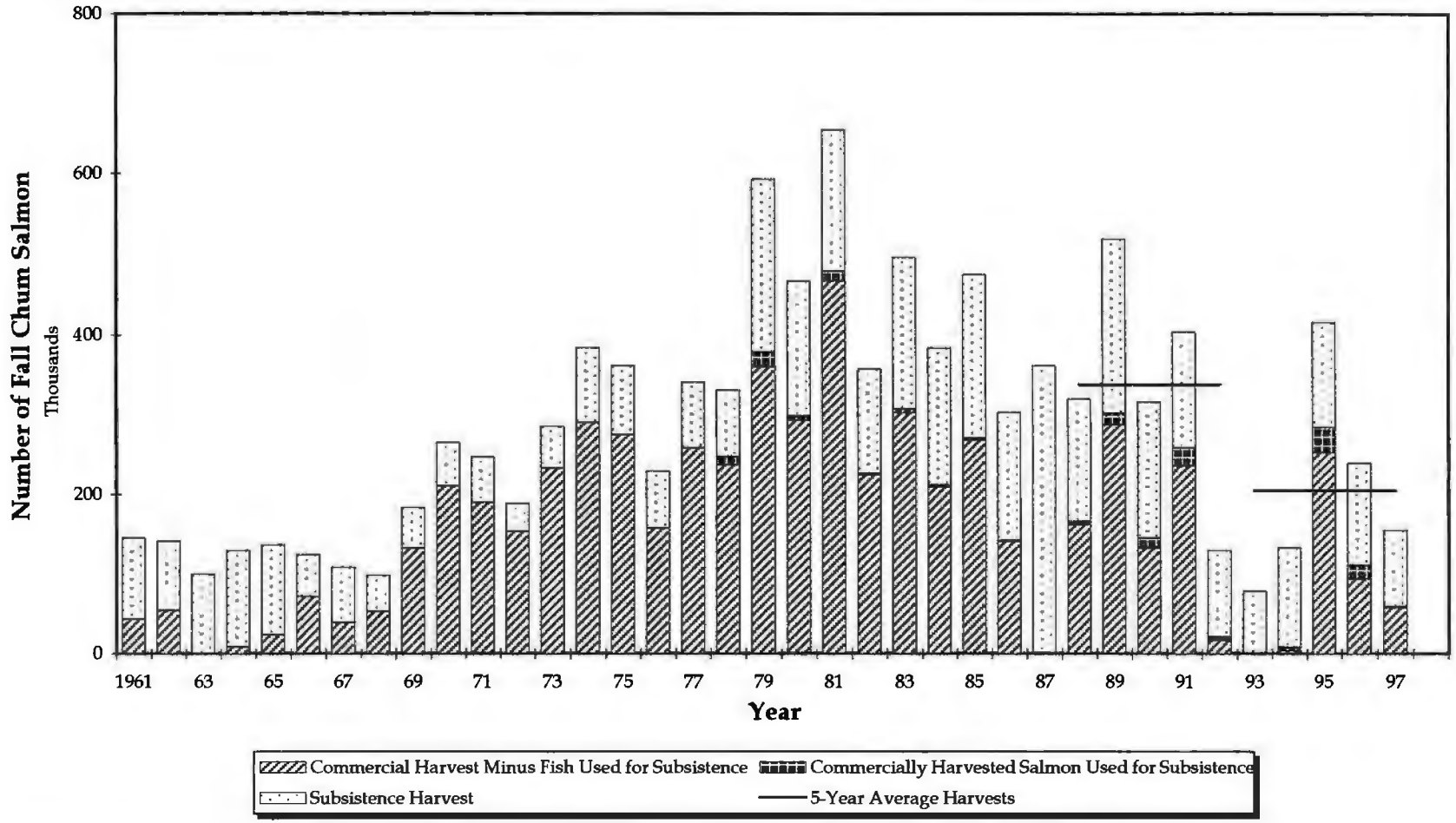
Attachment Figure 4. Canadian harvest of chinook salmon, Yukon River, 1961-1998.



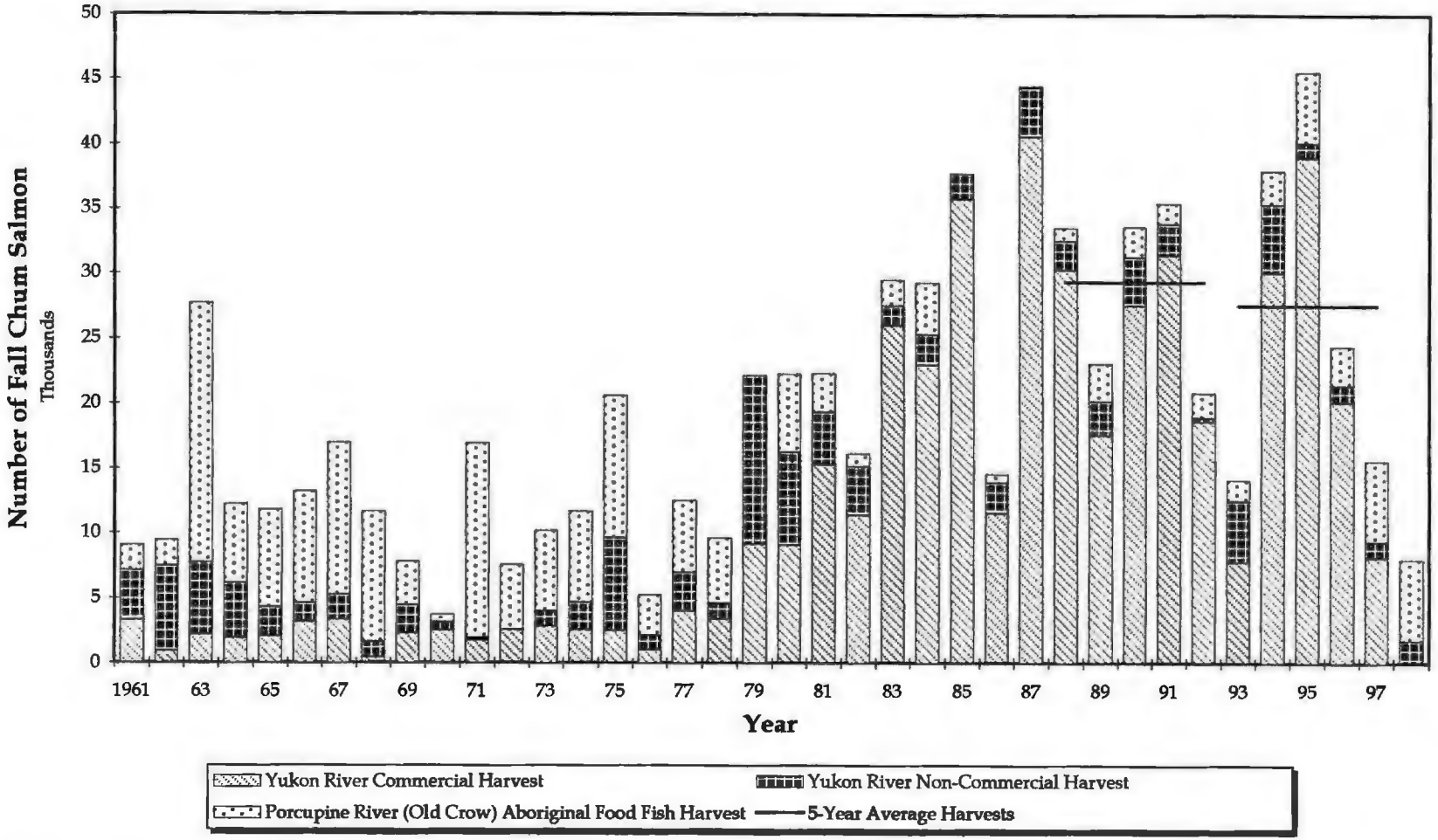
Attachment Figure 5. **Alaskan harvest of summer chum salmon, Yukon River, 1961-1998. The 1998 harvest includes only commercial catch data. Other Alaskan harvest estimates are unavailable at this time.**



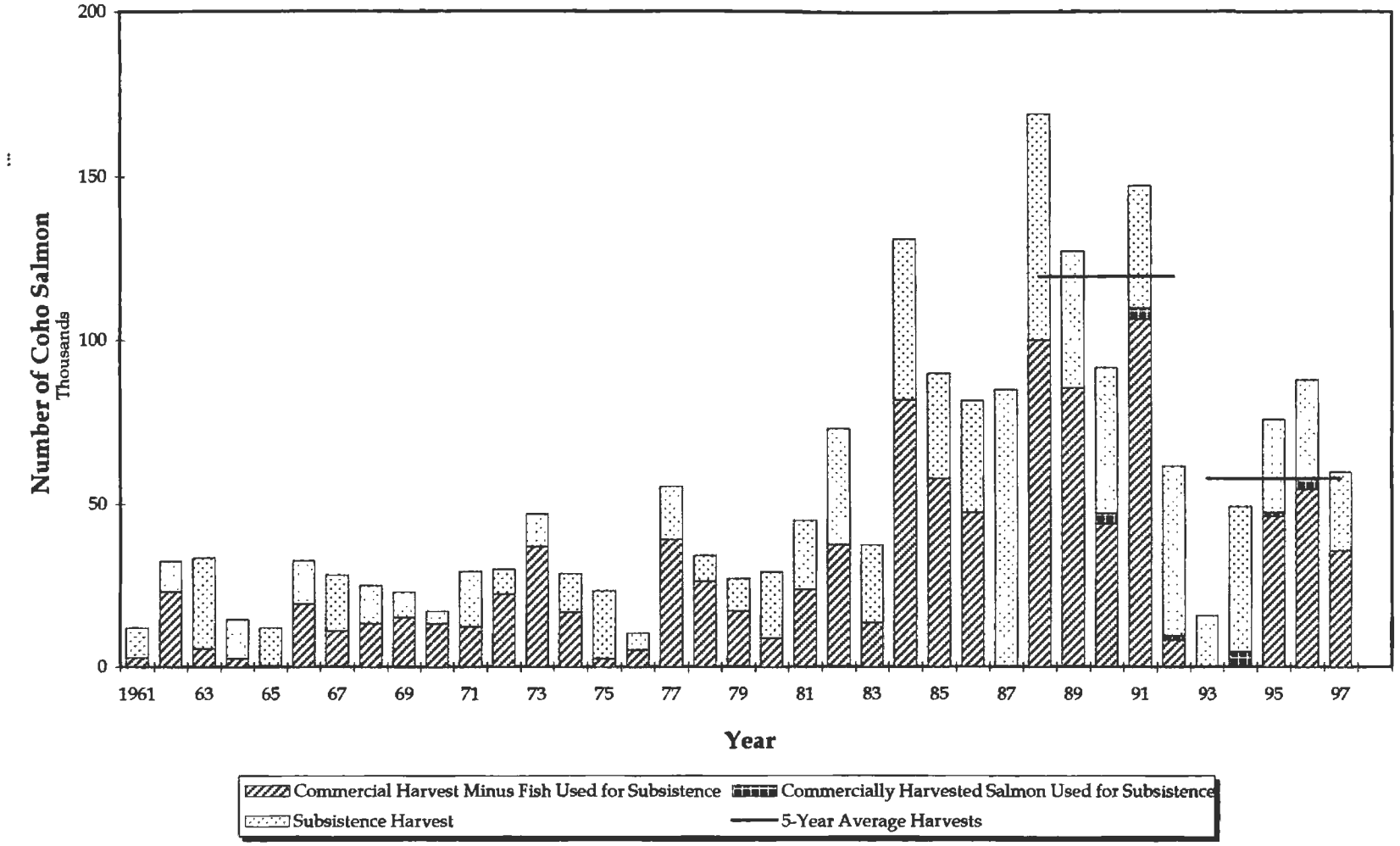
Attachment Figure 6. **Total utilization of fall chum salmon, Yukon River, 1961-1998. The 1998 Alaskan harvest includes only commercial catch data. Other Alaskan harvest estimates are unavailable at this time.**



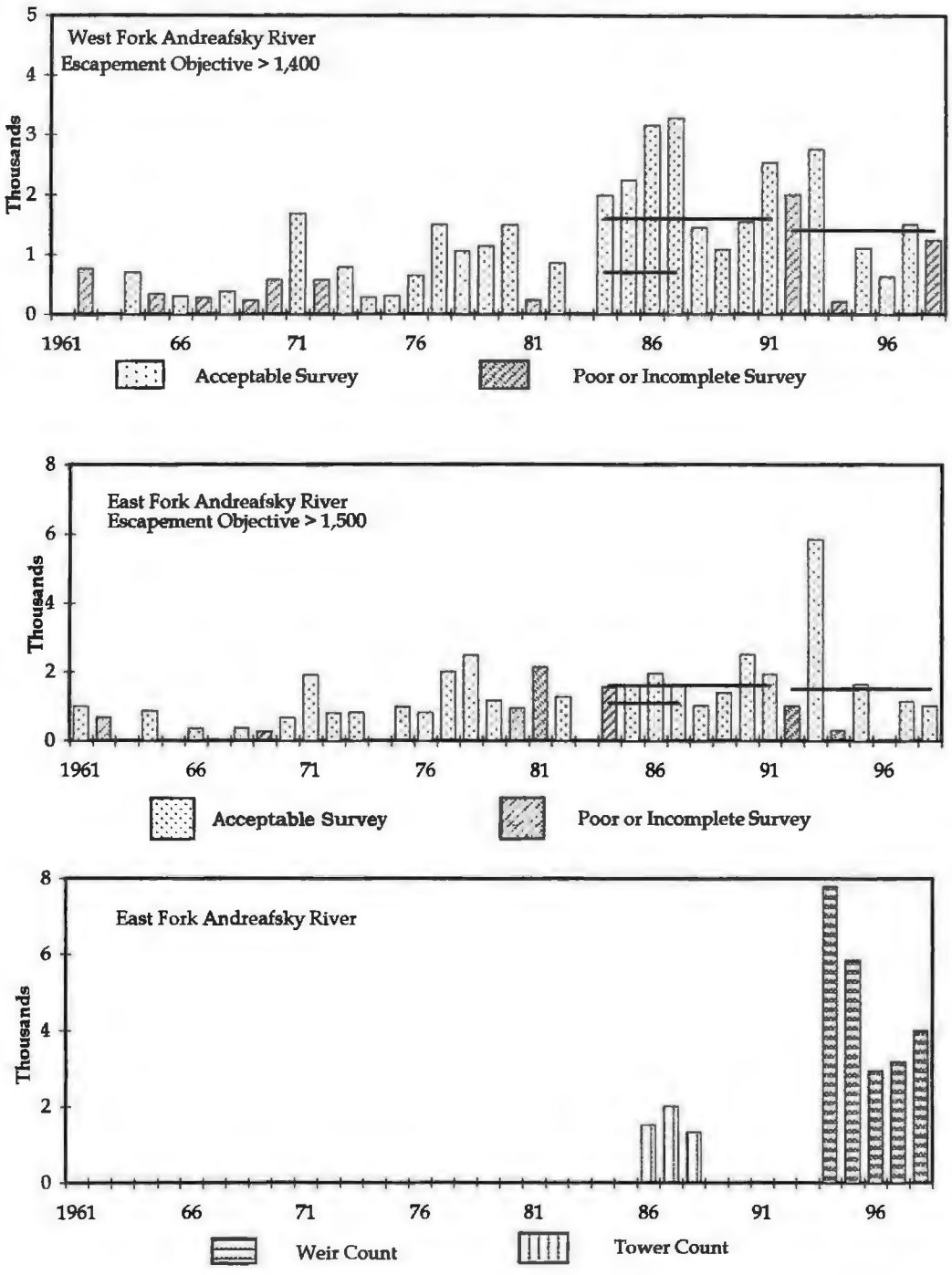
Attachment Figure 7. **Alaskan harvest of fall chum salmon, Yukon River, 1961-1998. The 1998 harvest includes only commercial catch data. Other Alaskan harvest estimates are unavailable at this time.**



Attachment Figure 8. Canadian harvest of fall chum salmon, Yukon River, 1961-1998.

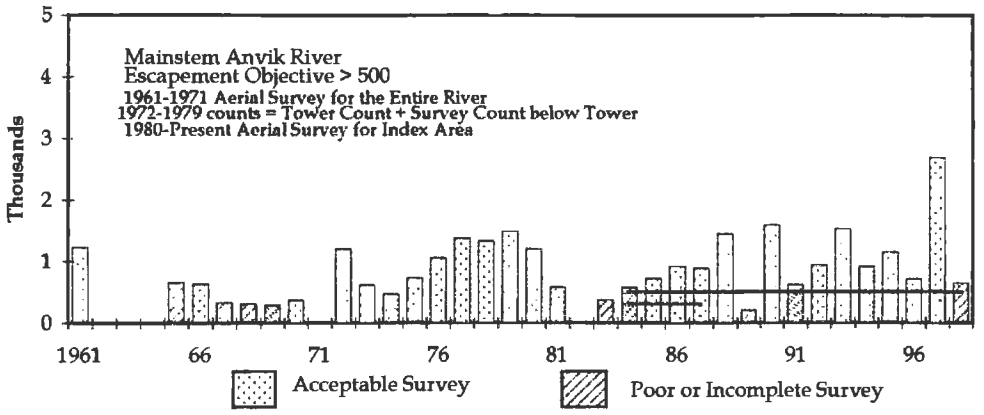


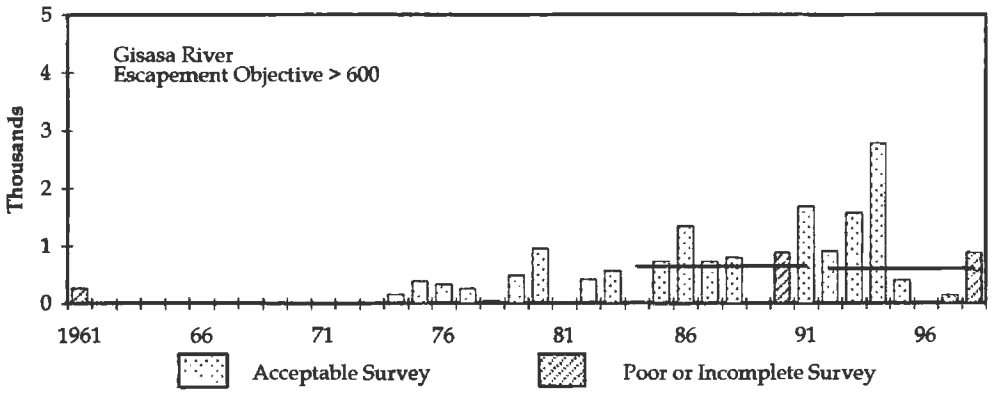
Attachment Figure 9. **Alaskan harvest of coho salmon, Yukon River, 1961-1998. The 1998 harvest includes only commercial catch data. Other Alaskan harvest estimates are unavailable at this time.**

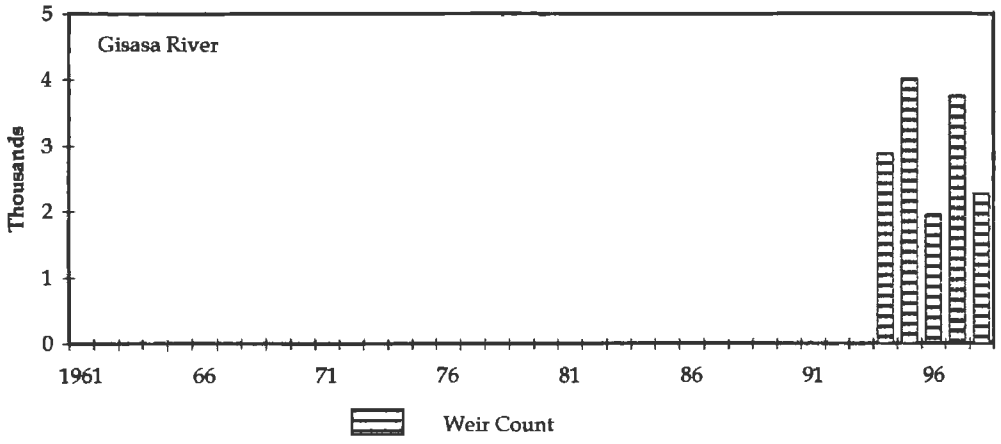


Attachment Figure 10. Chinook salmon escapement data for selected spawning areas in the Alaskan portion of the Yukon River drainage, 1961-1998. Data are aerial survey observations unless noted otherwise. Horizontal lines represent interim escapement goal objectives or ranges. Note that the scale of the vertical axis

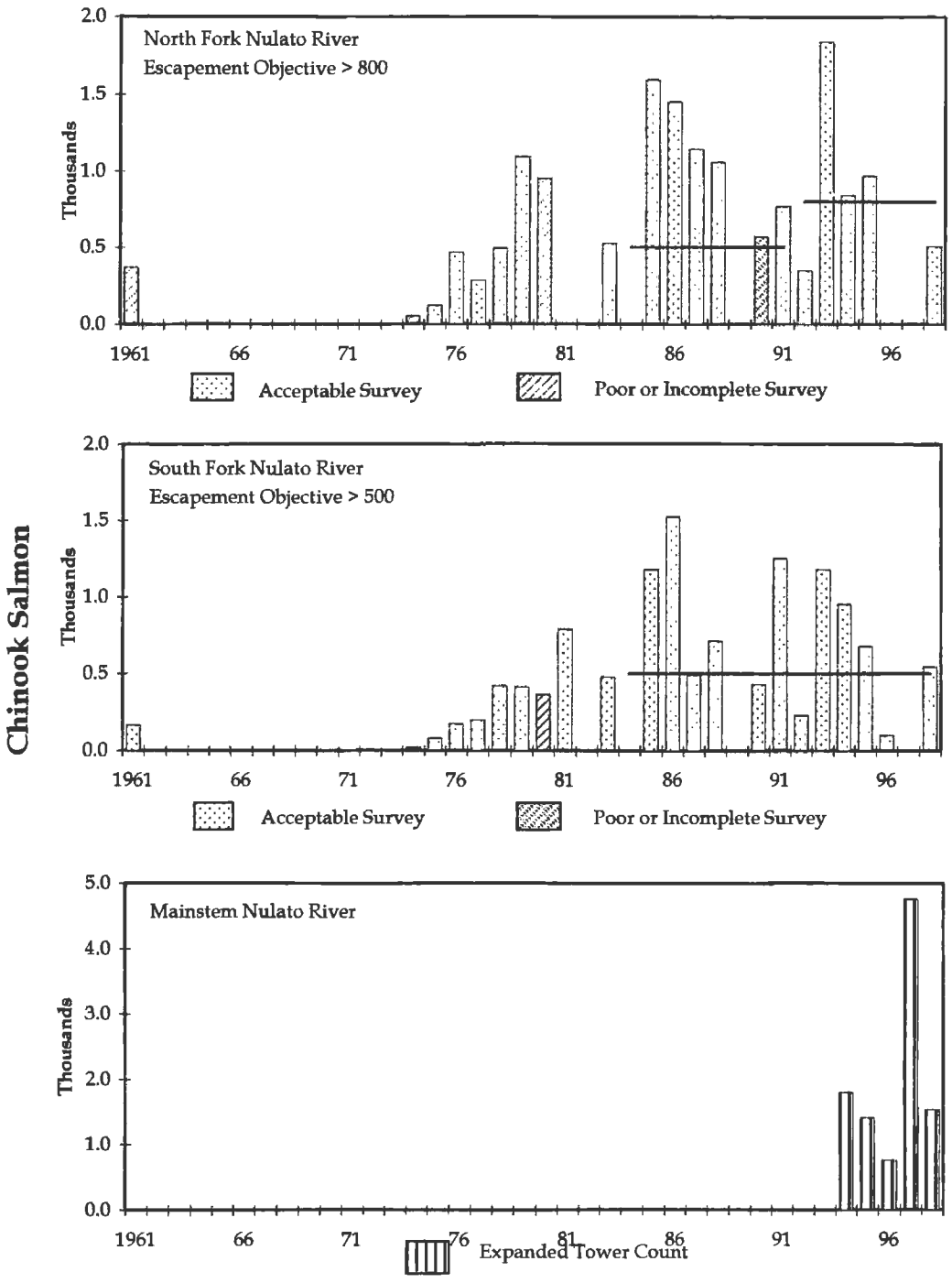
Chinook Salmon



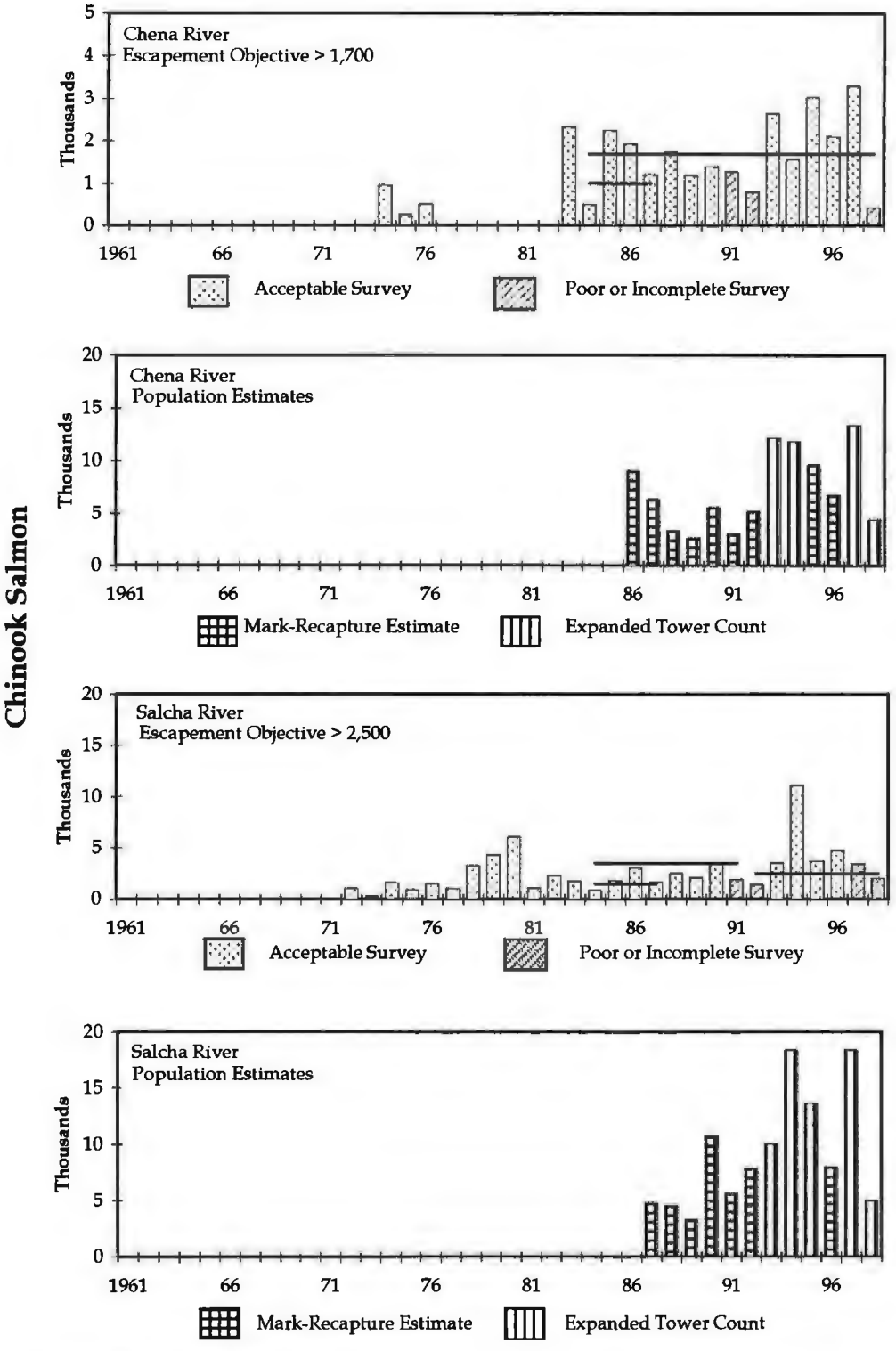




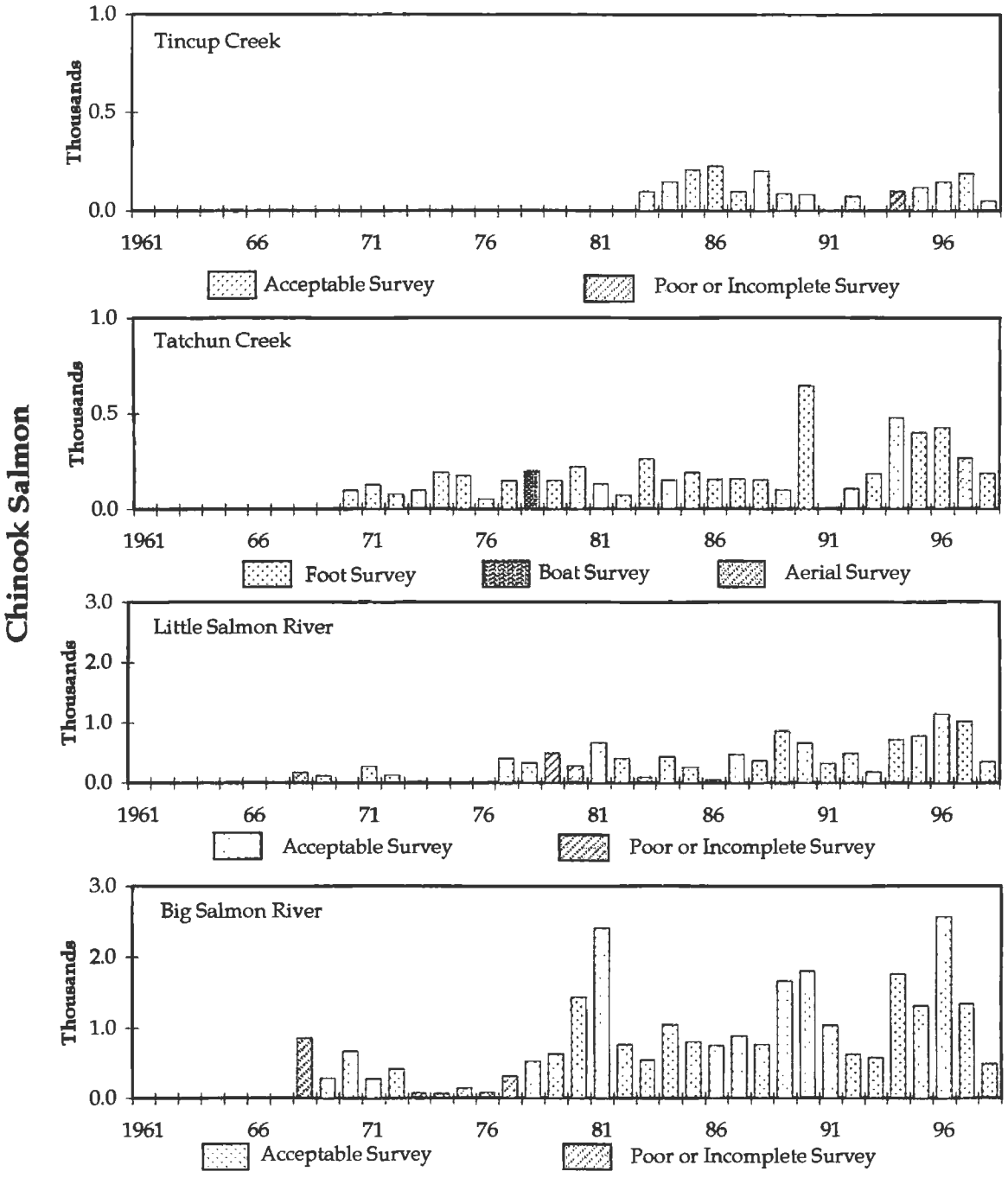
Attachment Figure 10 (page 2 of 4).



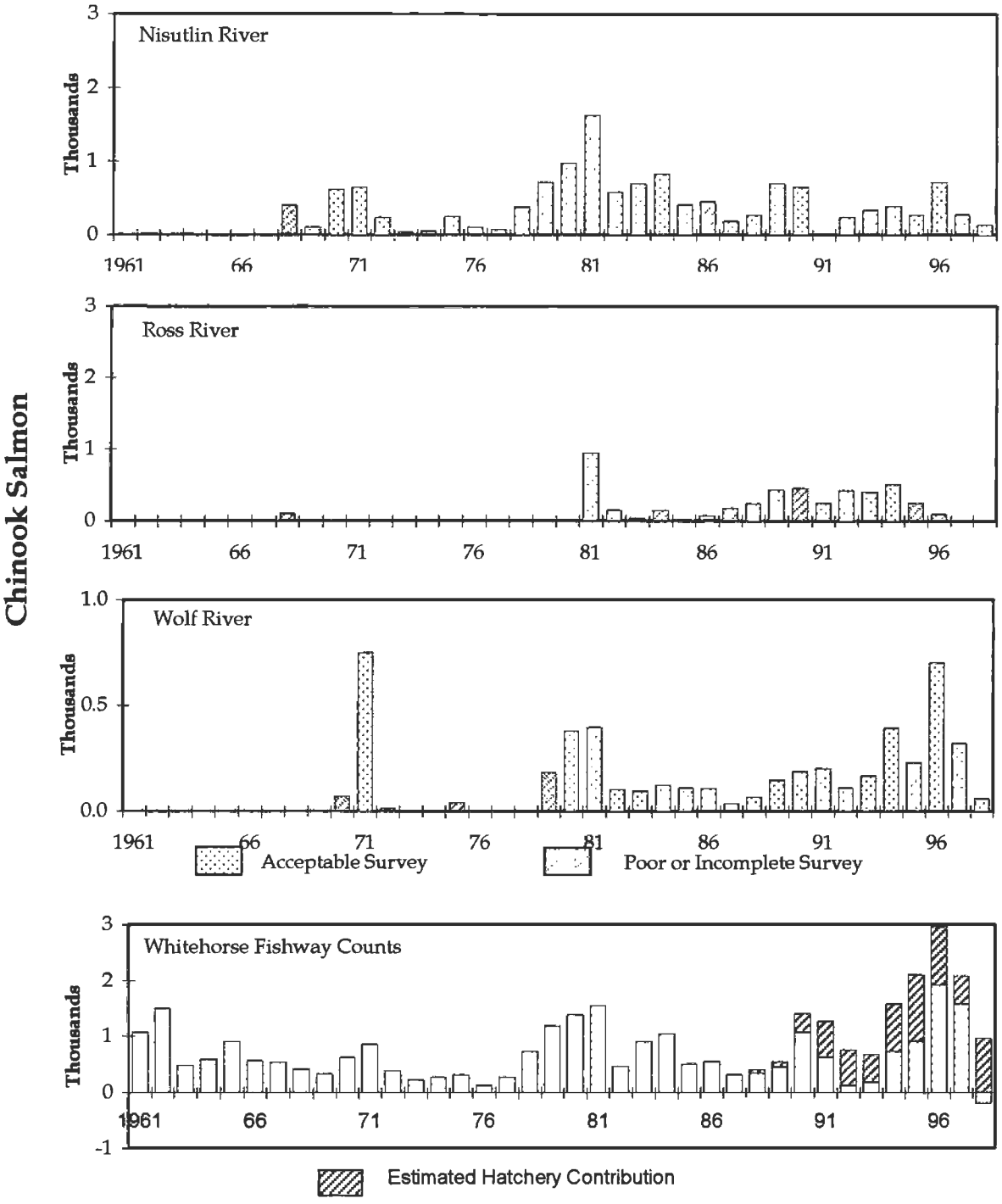
Attachment Figure 10 (page 3 of 4).



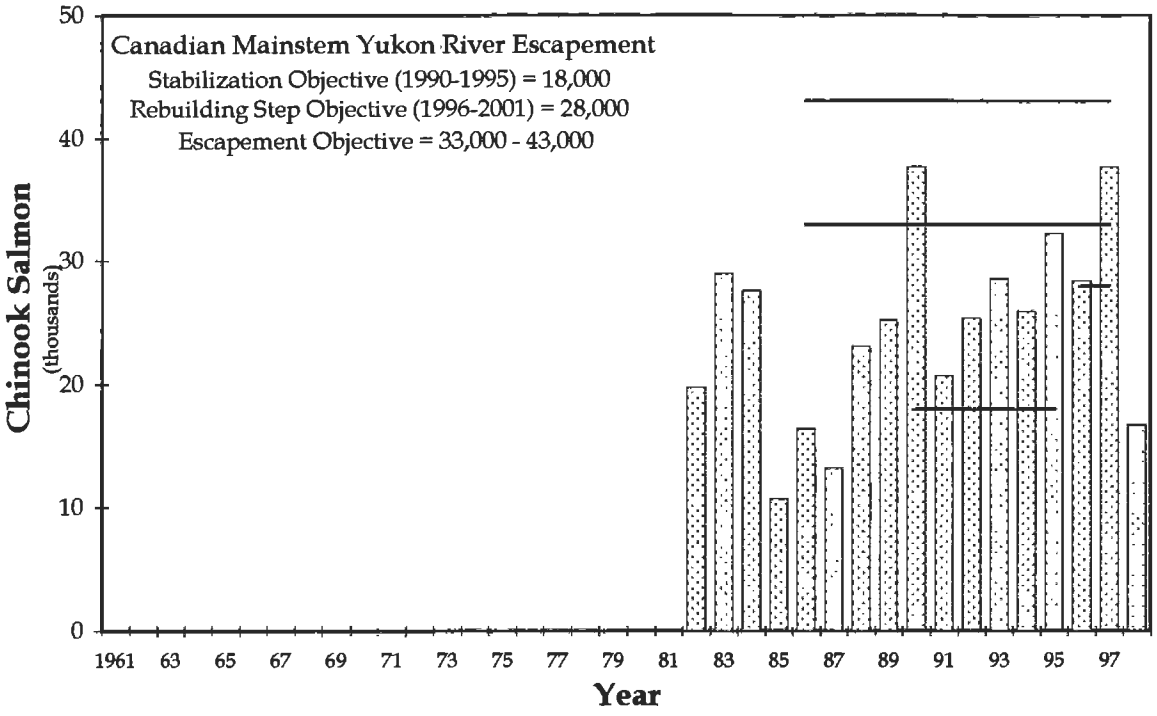
Attachment Figure 10 (page 4 of 4).



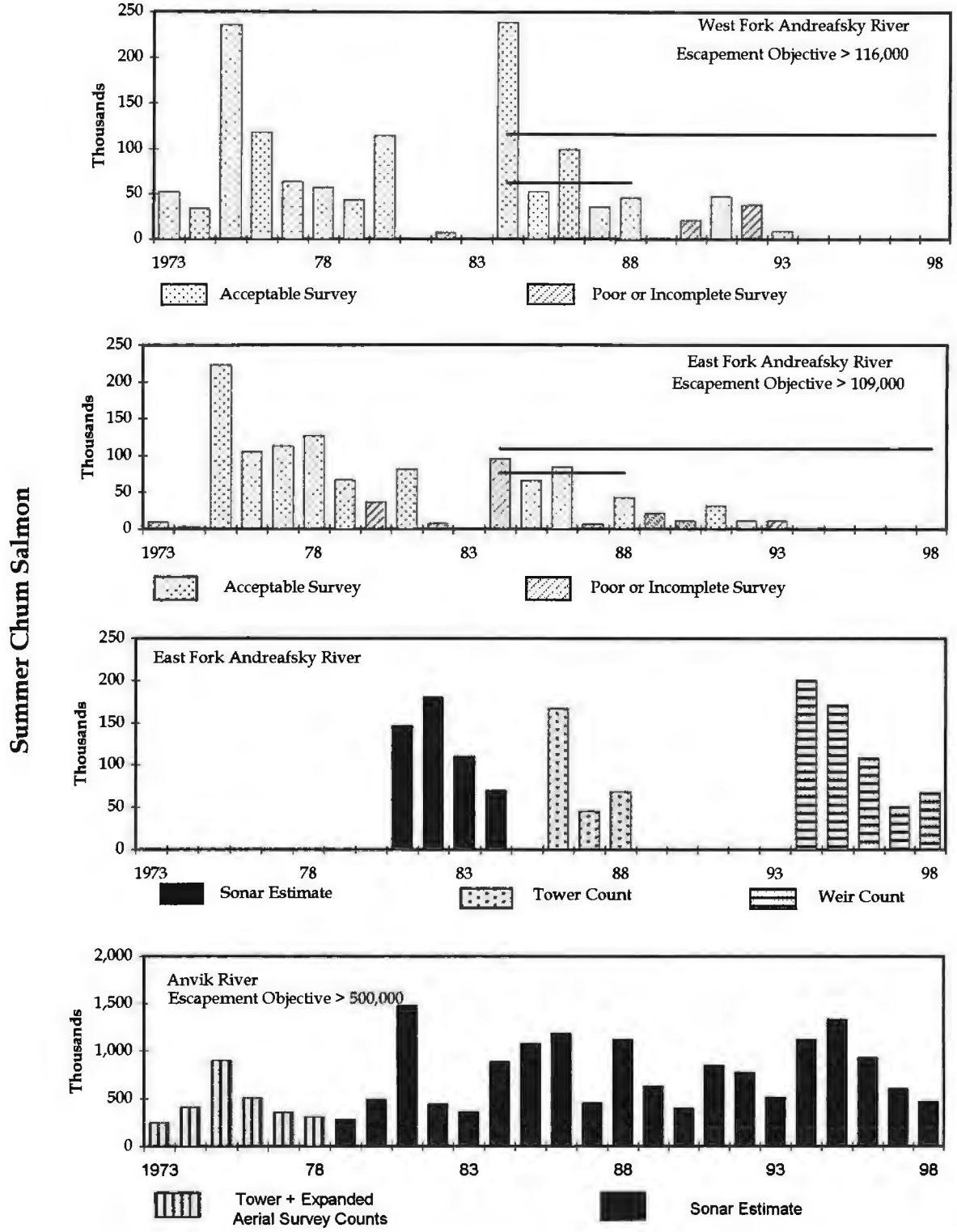
Attachment Figure 11. Chinook salmon escapement data for selected spawning areas in the Canadian portion of the Yukon River drainage, 1961-1998. Data are aerial survey observations unless noted otherwise. Note the scale of the vertical axis is variable.



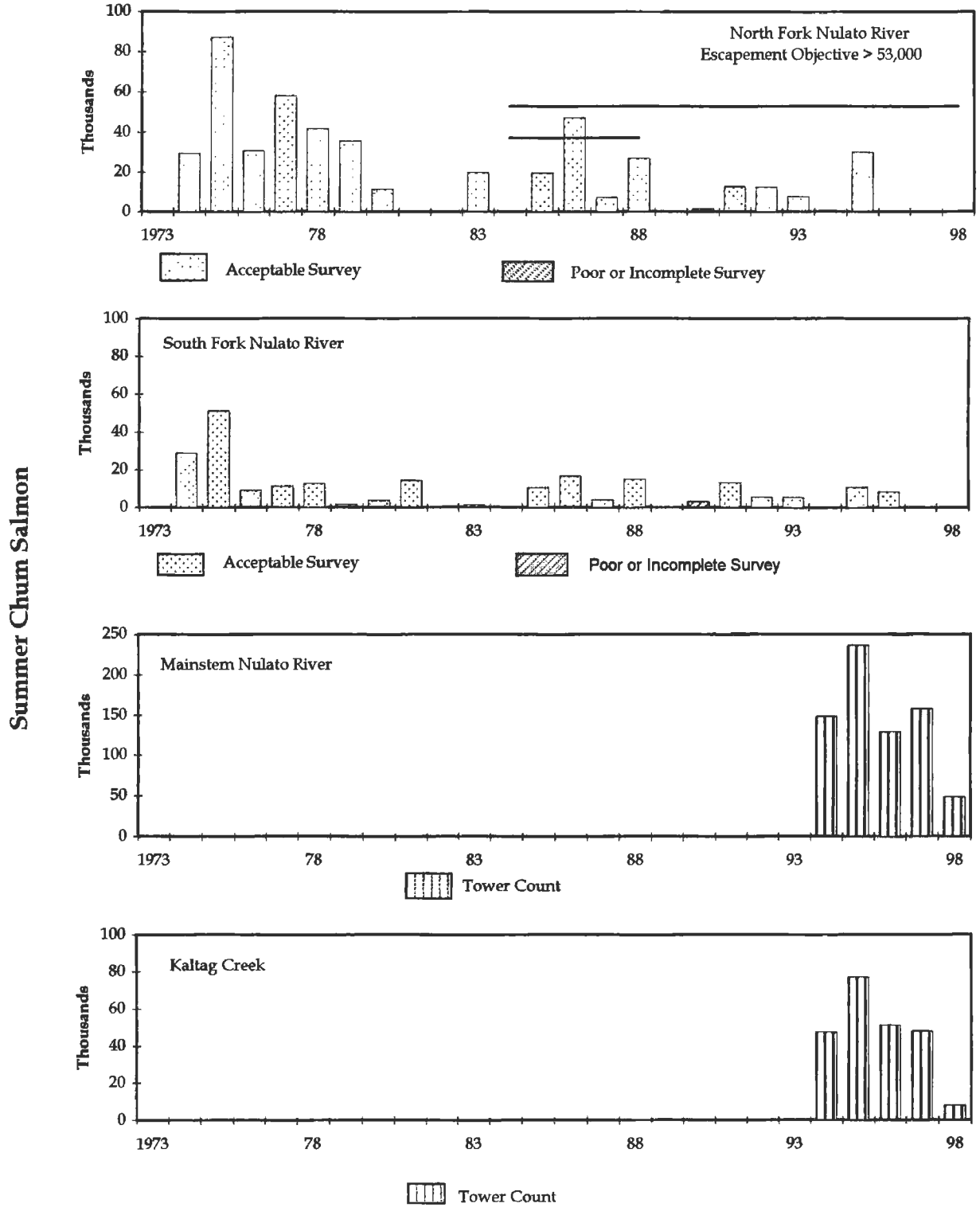
Attachment Figure 11 (page 2 of 2).



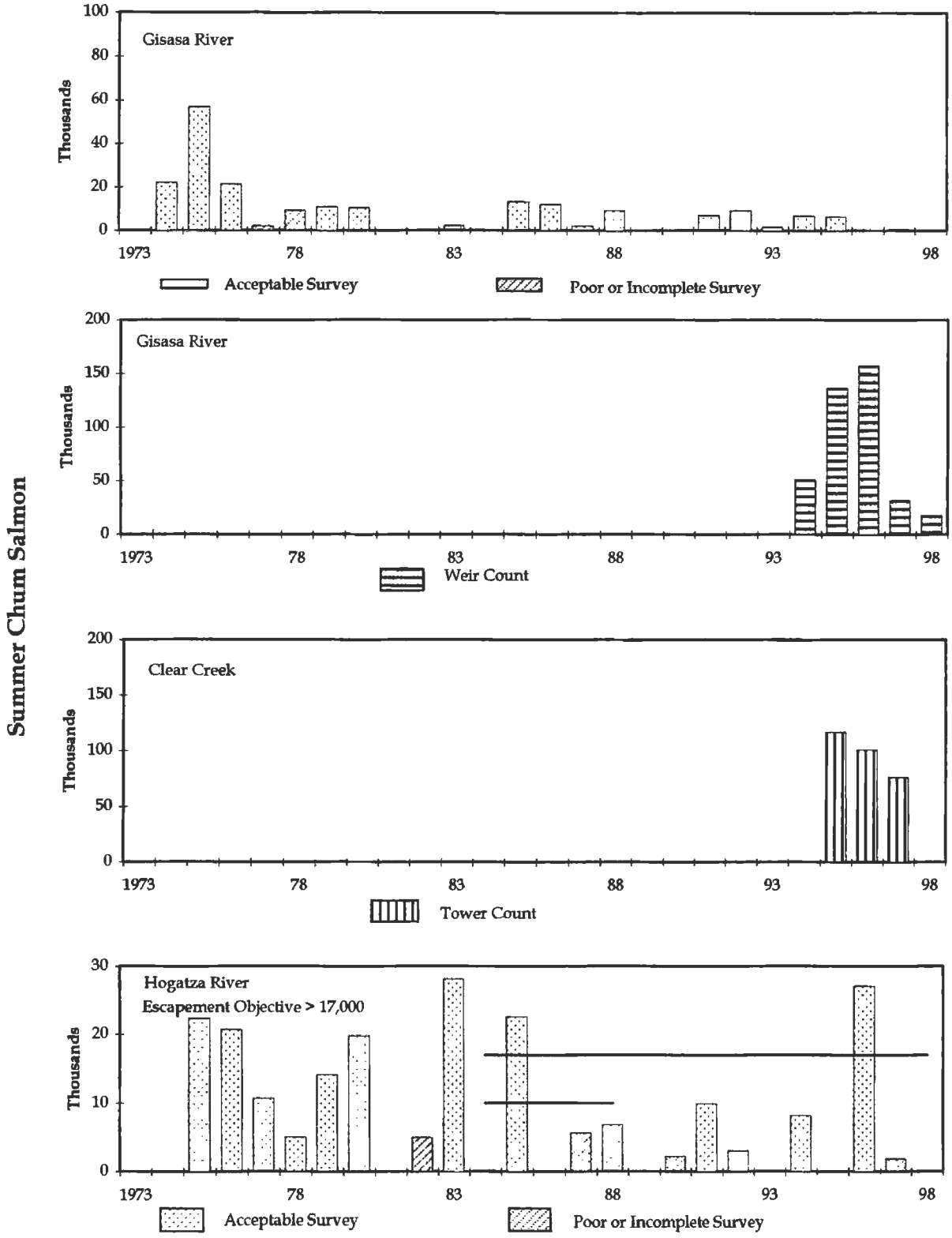
Attachment Figure 12. Estimated total chinook salmon escapement to the Canadian portion of the mainstem Yukon River, 1982-1998. Horizontal lines represent the interim escapement goal range of 33,000-43,000 salmon, the stabilization objective of 18,000 salmon, and the rebuilding step objective of 28,000 salmon.



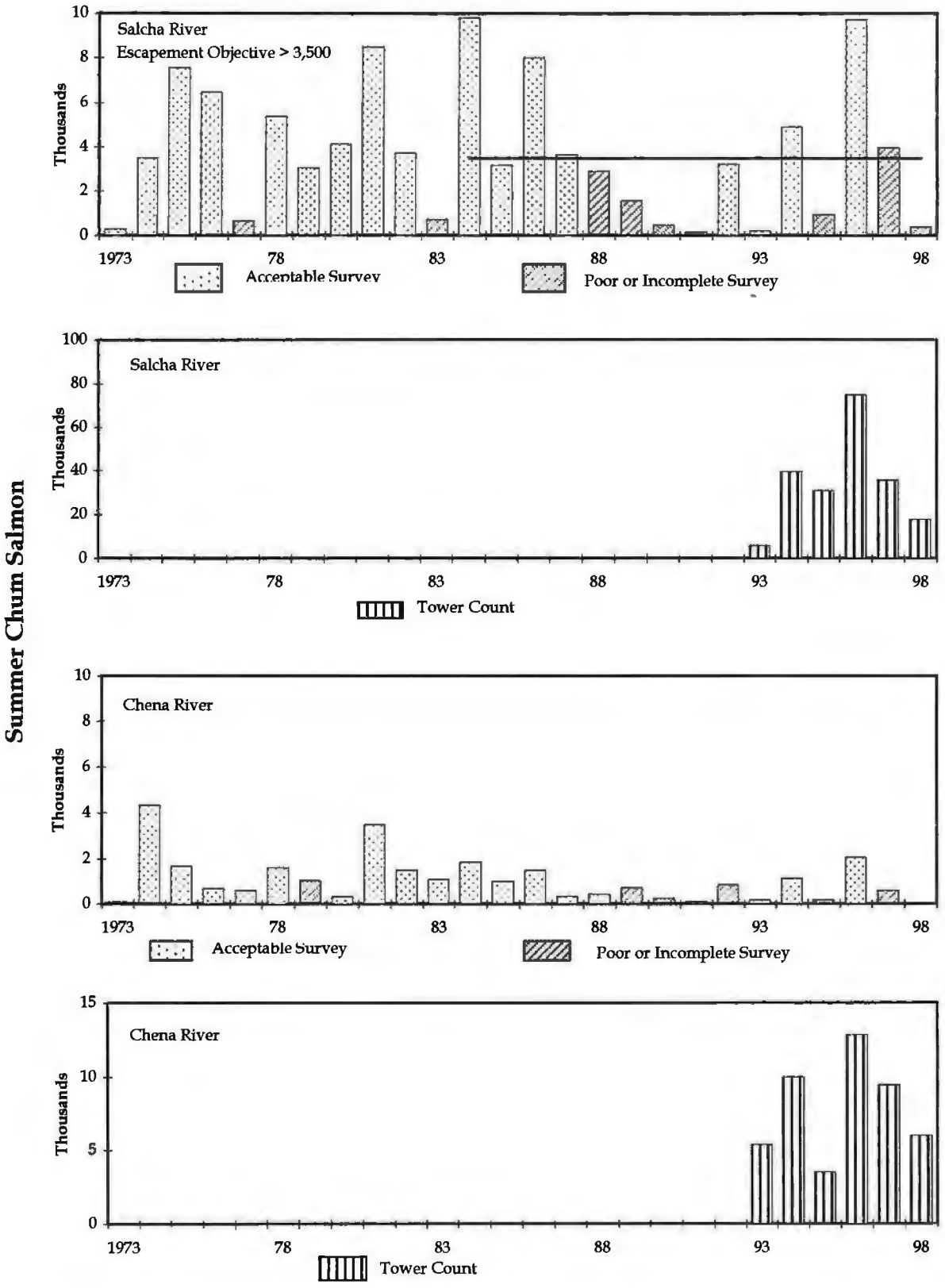
Attachment Figure 13. Summer chum salmon escapement data for selected spawning areas in the Yukon River drainage, 1973-1998. Horizontal lines represent interim escapement goal objectives or ranges. Data are aerial survey observations unless noted otherwise. Note that the scale of the vertical axis is variable.



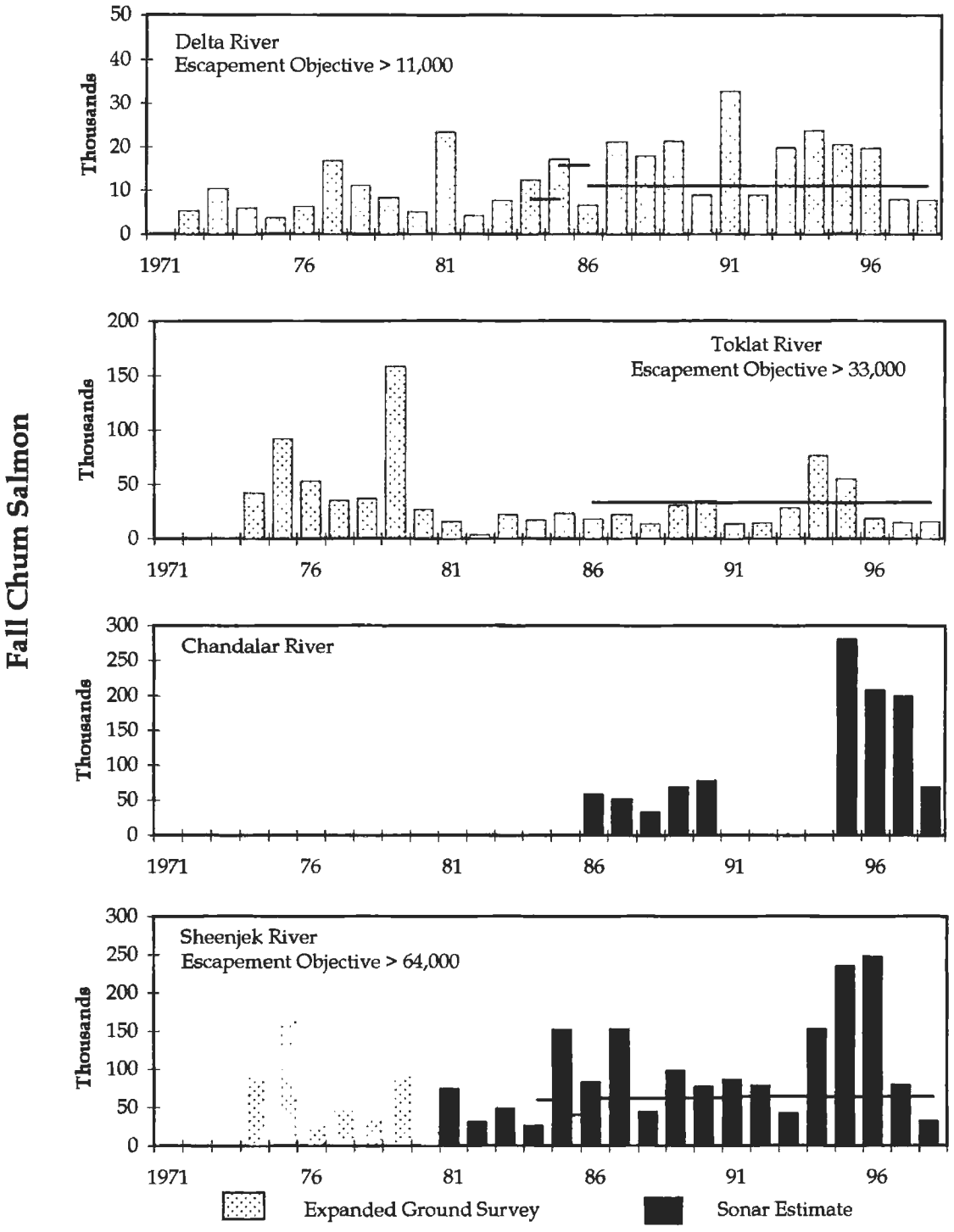
Attachment Figure 13 (page 2 of 4).



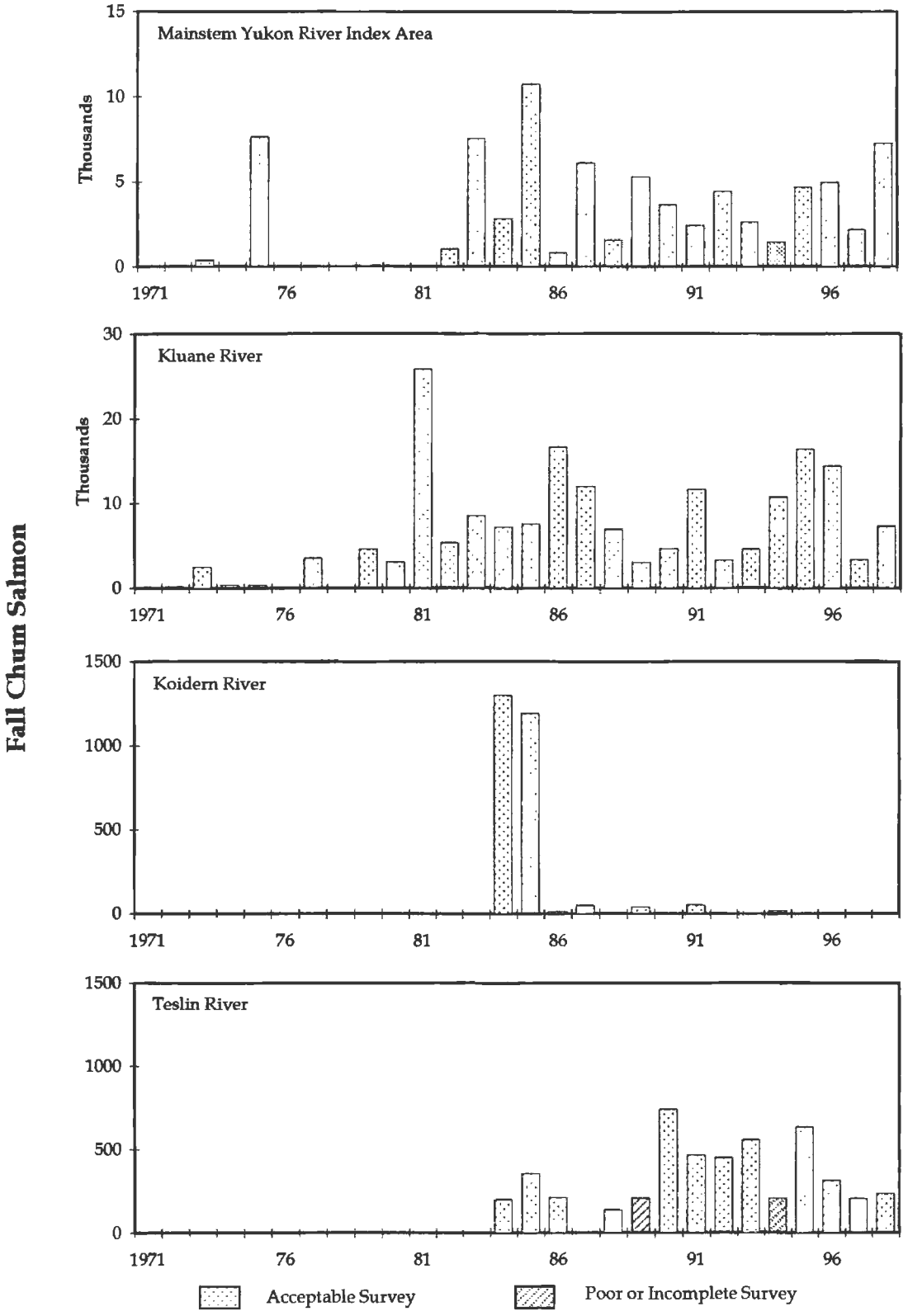
Attachment Figure 13 (page 3 of 4).



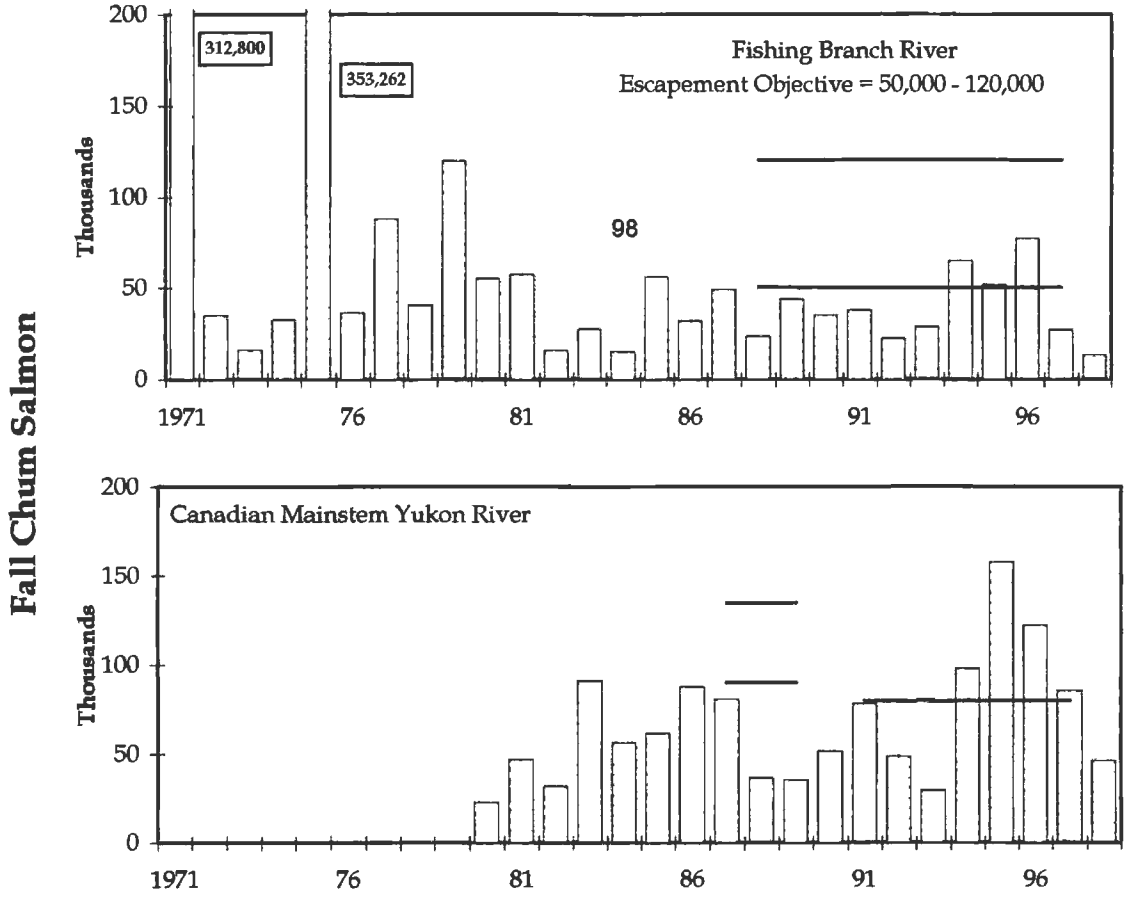
Attachment Figure 13 (page 4 of 4).



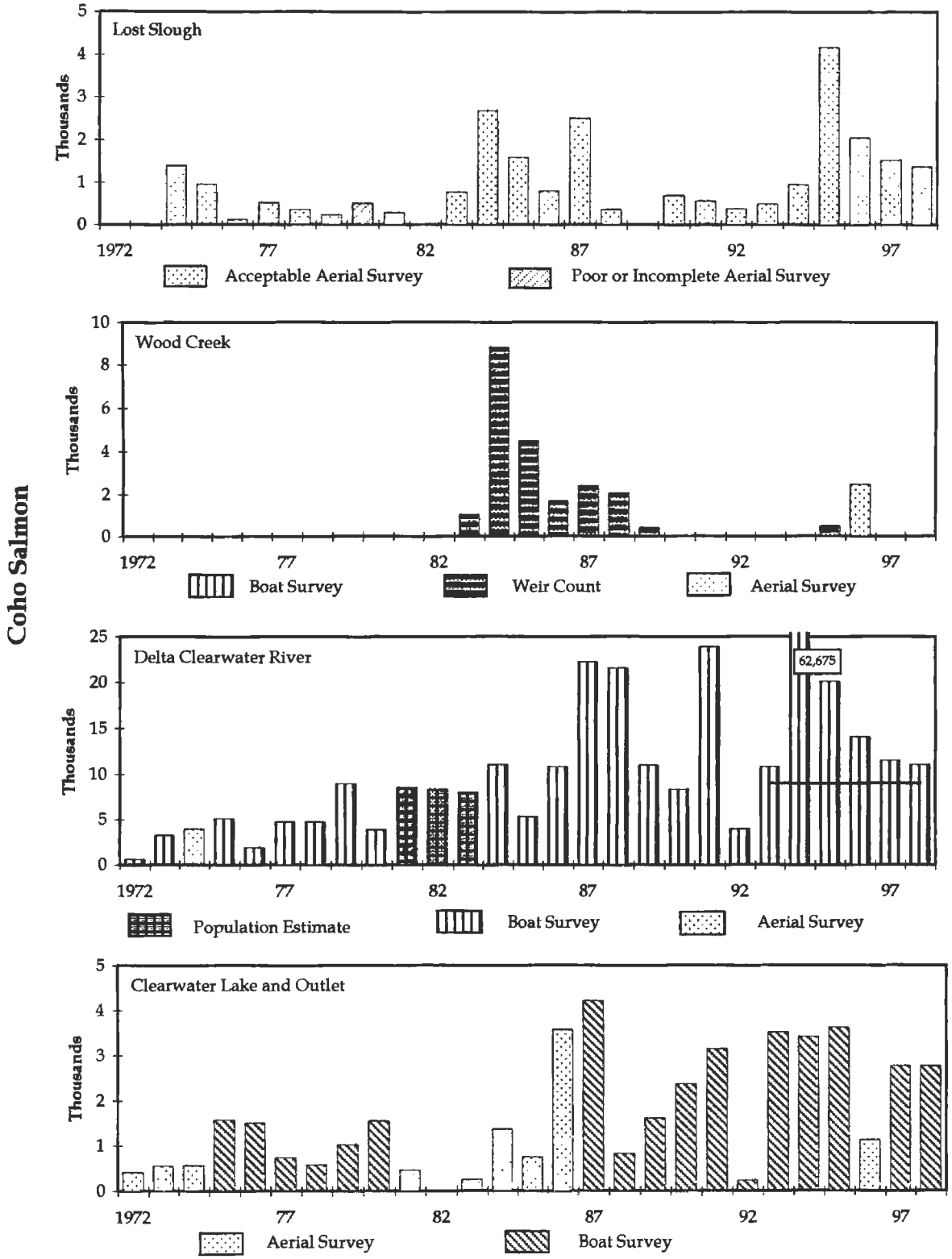
Attachment Figure 14. Fall chum salmon escapement estimates for selected spawning areas in the Alaskan portion of the Yukon River drainage, 1971-1998. Horizontal lines represent interim escapement goal objectives or ranges. Note that the scale of the vertical axis is variable.



Attachment Figure 15. Fall chum aerial survey data for selected spawning areas in the Canadian portion of the Yukon River drainage, 1971-1998. 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, 1971-1998. 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, 1972-1998. 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.[4]

While in the ocean, some of these salmon are caught by commercial fisheries that take place in marine waters. In 1998, 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 jointventure 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 1998, the commercial catch of chinook and chum salmon for all of the Norton Sound subdistricts combined totaled

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

7,400 chinook and 16,300 chum salmon. The prior 5-year (1993-1997) average commercial catch was 8,100 chinook and 31,900 chum salmon.

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 relative to ocean carrying capacity.

2.0 BERING SEA AND GULF OF ALASKA GROUNDFISHFISHERY

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, 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 1996 is given in Table 1.

The U. S. groundfish fisheries use basically three types of fishing gear: trawls, hook-and-line, and pots. In 1996, 1,686 vessels landed groundfish caught off Alaska. Of these, 1,302 used hook-and-line gear, 280 used trawls, 219 used pots. Table 2 summarizes the number of vessels that

landed groundfish by gear type in the two areas from 1986 to 1996. Table 3 summarizes the number of vessels by length within each type of fishing gear from 1982 to 1996.

Beginning in 1998, the development of a commercial directed fishery for forage fish, which are a critical food source for many marine mammals, seabirds, and fish species, was prohibited. Forage fish are abundant fishes that are preyed upon by marine mammals, seabirds, and commercially important groundfish species. Significant declines in marine mammal and seabirds in the BSAI and GOA have raised concerns that decreases in the forage fish biomass may contribute to further decline of these species.

Following nearly two years of analyses, Council discussions, and industry participation, the Council approved requiring 100% retention of pollack and Pacific cod in all BSAI and GOA fisheries beginning on January 1, 1998. Rock sole and yellowfin sole retention requirements will follow, but will be delayed until 2003 to allow for development of markets and gear technological responses by vessels engaged in these fisheries. State regulations to extend these requirements to onshore processing plants have also been implemented.

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. A shoreside groundfish processing plant also 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 are 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 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 November 1998. 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 area in 1998 was 110,996 (48,387 chinook and 62,609 chum salmon) and in the Gulf of Alaska the salmon catch was 30,175 (16,582 chinook and 2,504 chum salmon). Certain areas in the BSAI have been declared salmon

savings areas[1] for both chum and chinook salmon (Figures 2 and 3) based on high rates of catch in the past.

One of the big unanswered questions is how many salmon of each stock are being caught by the U.S. groundfish. Some information comes from coded-wire tagged salmon recovered by observers. But that information only shows that certain coded-wire 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 CWT's 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 1998 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 1,865,000 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 1998 was 350,000 to 400,000 fish.

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[1] Salmon savings areas are areas in which trawl fishing will be suspended if salmon bycatch exceeds specified levels.

Total catch in the False Pass June fishery in 1998 was 1,288,000 sockeye and 246,000 chum salmon. The sockeye salmon catch was 31% below 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, 1982-96, ($ millions and percentage of total).

Year	Shellfish	Salmon	Herring	Halibut	Groundfish	Total
			Value ($ millions)			
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	538.4	1179.1
			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

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, 1992-1996

	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	1,636	54,073	138	17,822	1,659	57,218
1995	1,354	43,043	175	18,395	1,406	49,157
1996	1,254	41,845	158	16,902	1,302	47,584
Pot						
1992	226	11,822	73	13,584	277	22,598
1993	103	4,867	21	2,956	118	7,282
1994	112	5,811	40	5,253	138	9,831
1995	191	14,069	126	16,457	266	24,549
1996	148	9,144	103	14,416	219	20,040
Trawl						
1992	233	48,547	201	87,268	300	93,405
1993	193	37,107	182	80,259	282	87,786
1994	188	34,268	164	77,830	257	84,586
1995	220	49797	181	80,226	265	86,045
1996	202	40,378	192	78,029	280	83,628
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	1,822	86,881	335	98,381	1,933	141,892
1995	1,643	98,685	461	111,928	1,793	148,238
1996	1,508	85,314	439	107,138	1,686	142,218

Note: 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 98115-0070.

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	21

Table 4. Estimated number of chinook and other salmon caught by the groundfish fisheries off the coast of Alaska, 1990 through October 1998 (Berger 1998).

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	48,387	62,609	---	---	---	110,996
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	16,582	2,504	----------11,089----------			30,175
TOTAL		556,962	856,672	18,598	510	1,792	1,434,534

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 three 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
Central North Pacific[1]					
1996	78.9	12.9	0.0	6.6	1.6
Eastern North Pacific[1] (Gulf of Alaska)					
1996	15.7	14.8	0.0	13.1	56.6
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

Table 7. Commercial harvest of sockeye and chum salmon in the "False Pass" June Fishery, 1980-1998. 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

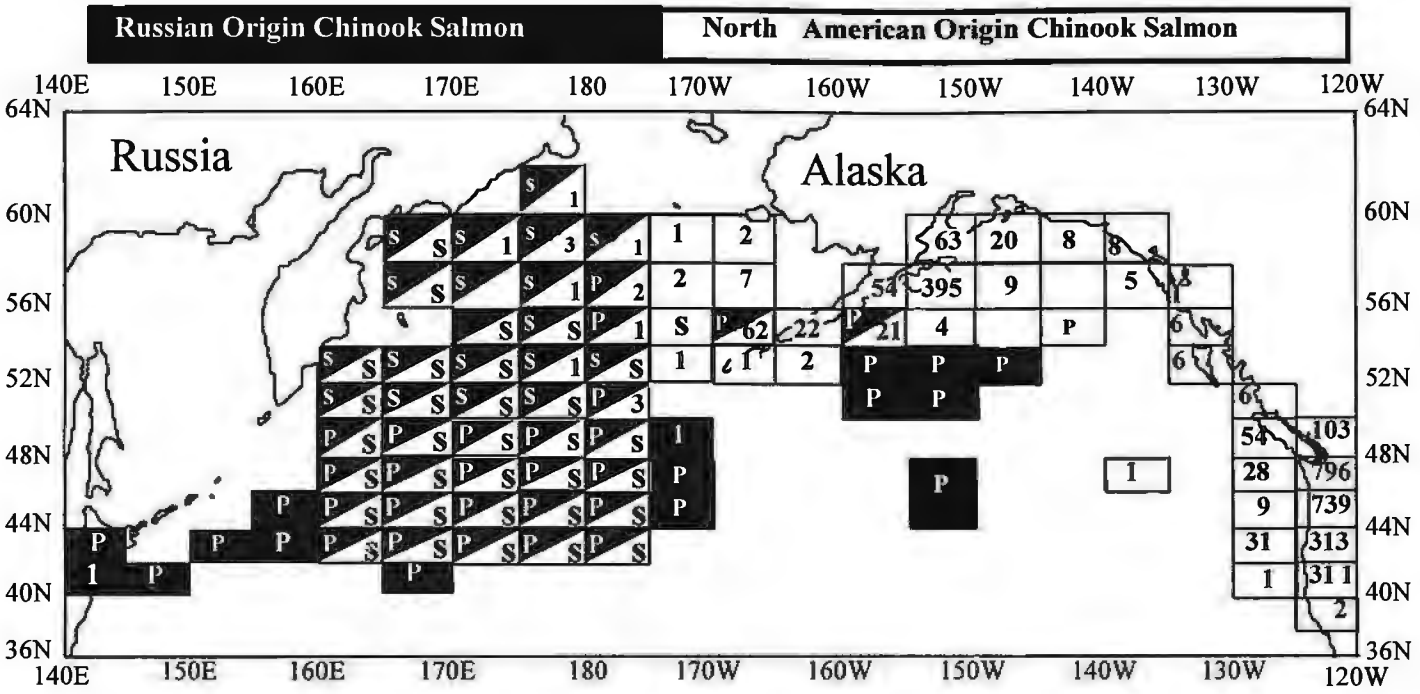

Figure 1. Ocean distribution of Russian (black areas) and North American (white areas) chinook salmon shown by International North Pacific Fisheries Commission (INPFC) 2°-latitude by 5° longitude statistical areas. If tagging experiments prove occurrence, the number of recoveries is shown. The high-seas 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.

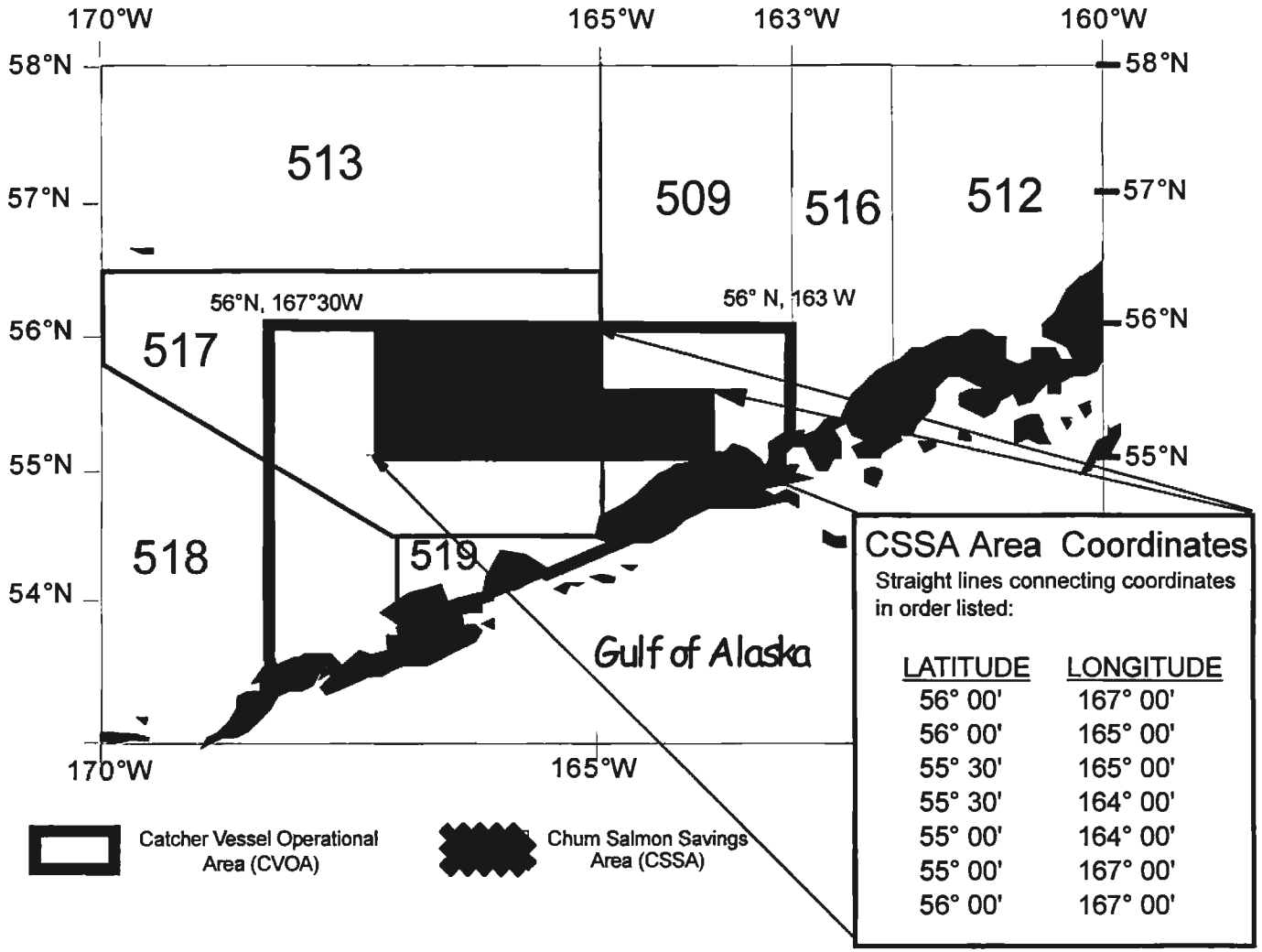

Figure 2. Statistical reporting areas and chum salmon savings area for the U. S. groundfish fisheries in the Bering Sea.

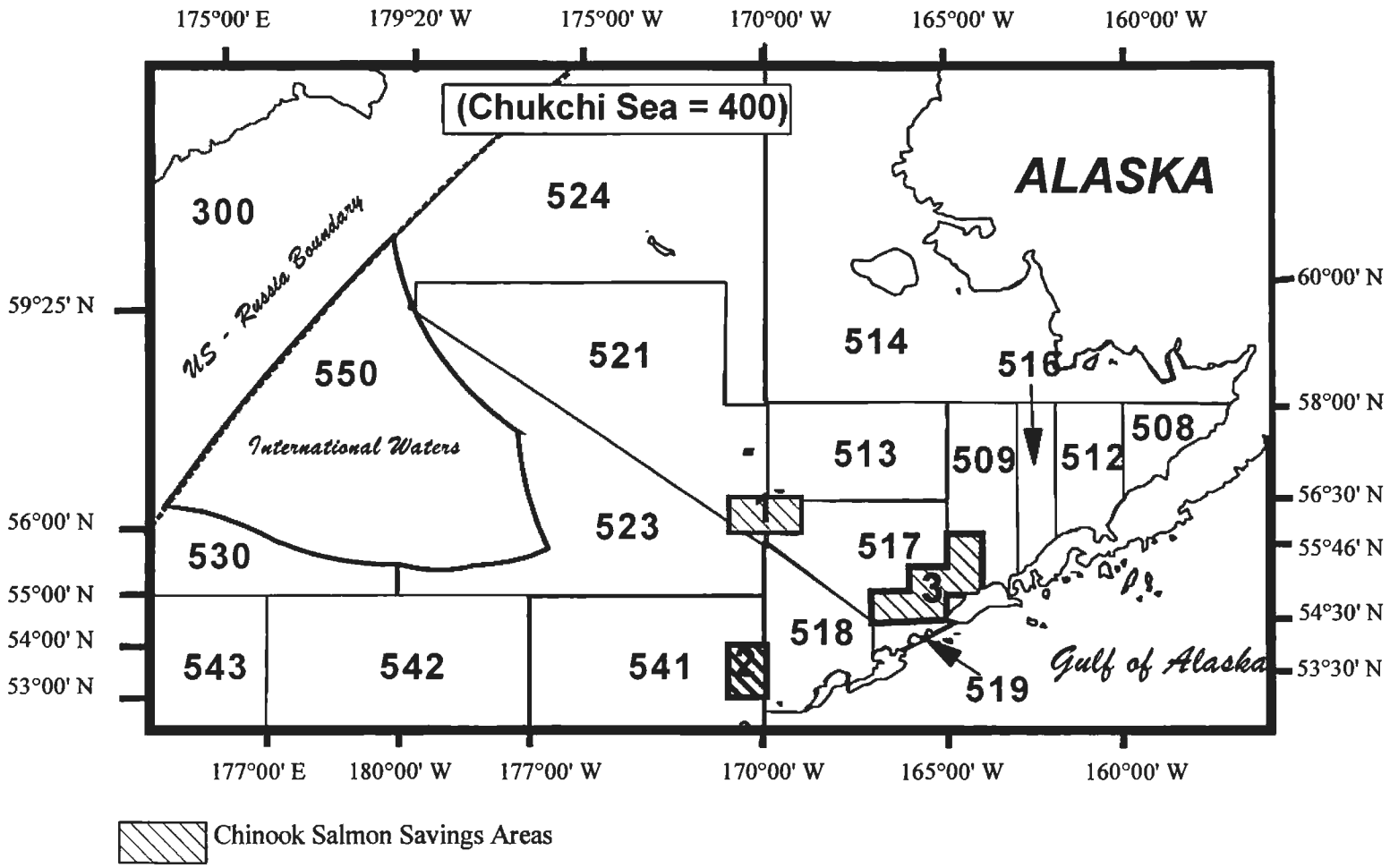

Figure 3. Statistical reporting areas and chinook salmon saving areas for the U. S. groundfish fisheries in the Bering Sea.

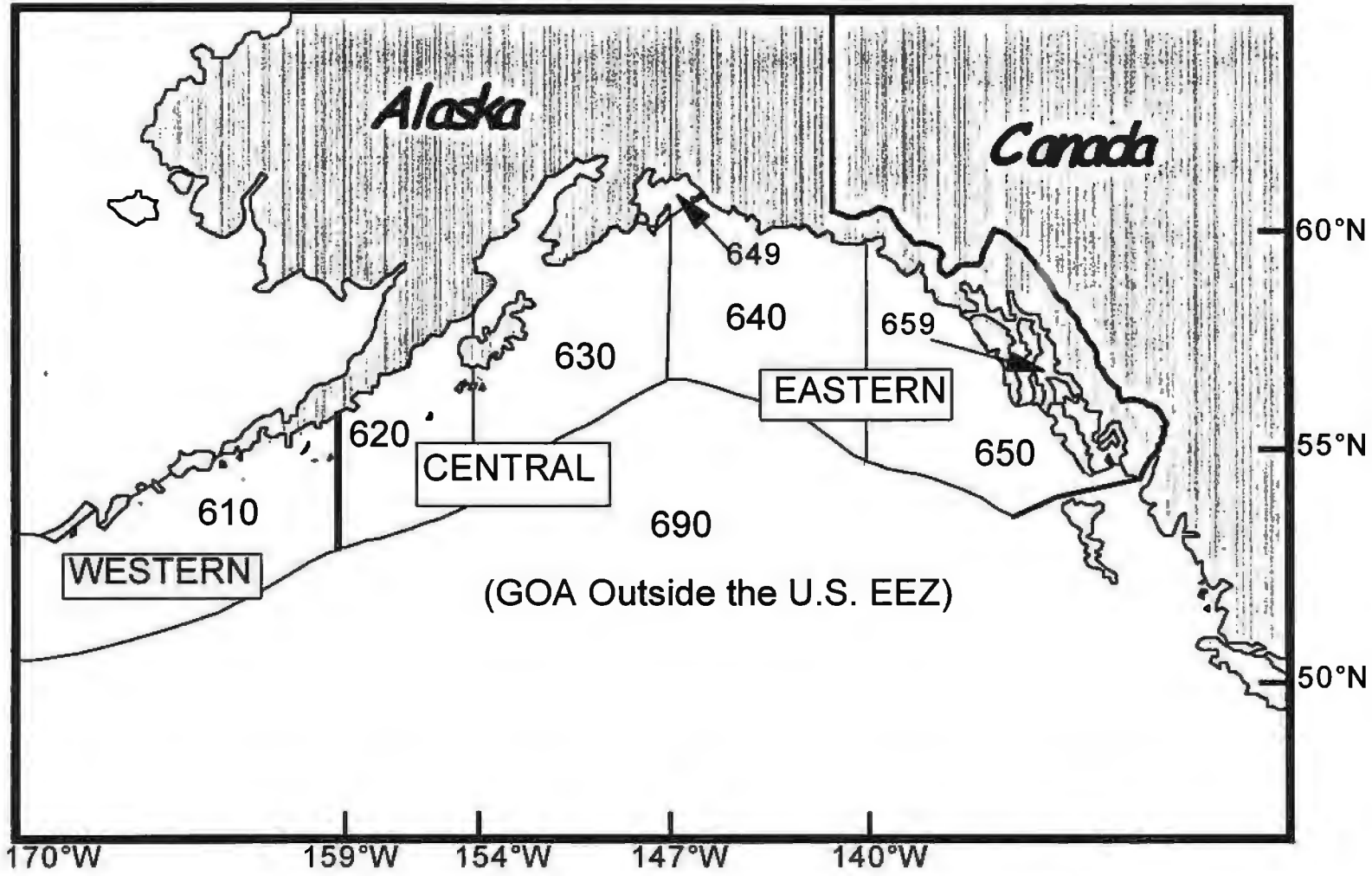

Figure 4. Statistical reporting areas for the U.S. groundfish fisheries in the Gulf of Alaska (GOA).

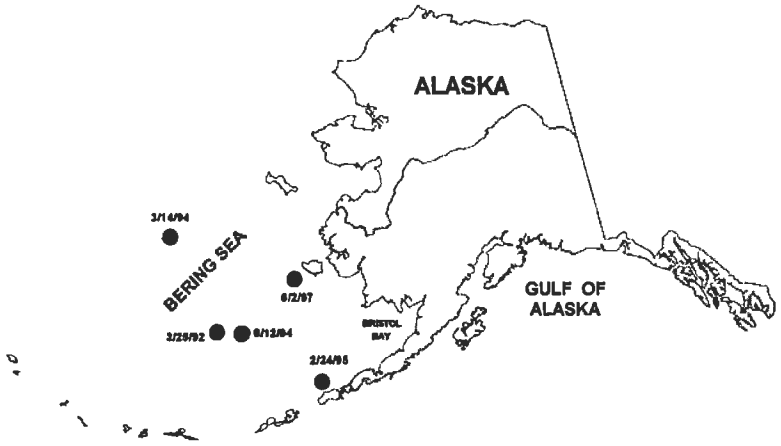

Figure 5. Locations and dates of recoveries of coded-wire tagged Yukon River chinook salmon.

ATTACHMENT III

UPDATE FROM THE YUKON RIVER PANEL EXECUTIVE SECRETARY ON THE STATUS OF THE RESTORATION AND ENHANCEMENT FUND PROJECTS FOR 1998

STATUS

OF

1998 RESTORATION & ENHANCEMENT PROJECTS

November 16, 1998

The Yukon River Panel approved 30 R&E projects in 1989 for an expenditure of $677,200US/$934,000Cdn. All projects were contracted and launched except for two projects. One project was not contracted, and another that was contracted was halted because the fishery to be monitored was closed. Following is brief description and the status of each project.

RE-01-98 Bering Sea Fishermen's Association $1,300US/$1,800Cdn
Canadian Commercial Harvest Reduction & Compensation Program – Phase 1
This project involved an initial investigation of the possibilities for the development of a future program (phase 2) that would result in the reduction of commercial harvest, with compensation for Canadian fishers, to increase escapement of chinook salmon to the spawning grounds.
Project completed and final report submitted.
In summary: "Canadian commercial fishermen were opposed to the proposal since in their eyes it would reduce the total volume of fish going though their plant and thus reduce the viability of their fishery. There was some agreement that in years of very high abundance with high volumes of fish moving through the plant that some harvest of fish could be forgone and compensated for in order to explore the upper levels of escapement performance." It would appear that unless greater support for such a program develops amongst Canadian commercial fishers that phase 2 is not likely to be developed and proposed.

RE-04-98 Bering Sea Fishermen's Association $33,300US $46,600Cdn
Mountain Village Fall Season Gillnet Test Fishery & Tanana Village Area Fall Season Fishwheel Test Fisheries.
A slight modification of a project conducted with R&E funding last year - URE-01-97.
Project successfully completed documenting these test fisheries with in-season management data provided to ADF&G.
Progress report provided and final report due December 15, 1998.

RE-05-98 Tanana Chiefs Conference **$29,700US/$41,600Cdn**

Generating Geospatial Data of Migration Timing and Tag Retention For Adult Fall Chum Salmon, and Harvest Data for Chinook and Chum Salmon on the Yukon River Alaska

This project was launched as a pilot in a number of upper Yukon River Alaskan communities with the collection of the field data being completed. Two communities did not participate – Stevens Village and Eagle.

The progress report is currently under review. A final report is due February 1, 1999.

RE-06-98 Yukon Conservation Society **$5,600US/$7,800Cdn**

Small Steam Investigations and of Monkey Creek

This project involves the investigation of this creek in the Marsh Lake area in Southern Yukon to determine the presence of chinook salmon and assess the habitat.

The fieldwork was conducted from May (minnow trapping) and late July (overflight observations and minnow trapping). A draft final report has been submitted and is presently being reviewed. The final report is expected to be complete by December 15, 1998.

RE-09-98 Fisheries and Oceans Canada **$59,400US/$83,200Cdn**

Upper Yukon/Porcupine Radio Telemetry Tracking Station Placement, Fall Chum Radio Tracking

This project involves the application of this technology in the Canadian portion of the Yukon system (in concert with the US National Marine Fisheries Service).

The project has been successfully conducted involving: the establishment of two tracking towers on the mainstem Yukon, two towers in the Kluane region, and aerial reconnaissance on the Porcupine River system. Age/gender samples were taken; but no radio tags were recovered. (Ian will report more details at the JTC meeting.)

The final report for this project is expected December 30, 1998.

RE-10-98A Pt.1-Kate Maddigan/Pt.2-Emmonak Tribal Council **$6,800US/$9,500Cdn**

Yukon River Coded Wire Tag Recovery in Alaska

This was a pilot project to determine the feasibility of sampling the commercial chinook harvest in the lower Yukon River.

The project was contracted in two parts – the physical activity of the sampling at the two fish processing plants, conducted by the Emmonak tribal Council (RE-10A-98 Part 2); and, the pilot project design, oversight and reporting conducted by Ms. Kate Maddigan (RE-10-98 Part 1).

Close planning and coordination between the contractors produced a successful pilot project involving a sampling of in excess of 1400 salmon harvested, identifying 13 salmon with clipped fins, the origin of which are now being confirmed through CWT identification.

A combined draft final report is presently being reviewed, a final report is expected December 15, 1998.

RE-10-98B Mike Dehn **$11,400US/$16,000Cdn**

Analysis and Strategy to Maximize the Management Benefits from the Coded Wire Tag recovery Program

This project involves the statistical analysis of stock identifications systems, including the results of projects RE-10A Part 1&2-98, that will be essential to the management of various stocks of Yukon River chinook salmon.

The project has just begun with the review of existing data systems and the interview of several fishery managers.

A draft final report is expected by December 20, with a final report expected by January 31, 1999.

RE-11-98 Tr'ondek Hwech'in First Nation and Yukon River Commercial Fisher's Association Klondike Area Central Incubation/Outplanting Facility:Brood Stock Feasibility **$76,600US/$107,300Cdn**

This is a progression of approved project CRE-05-97. (Part 1 - Initial assessment/design location considerations completed; Part 2, phase 1 – field data including, water chemistry and temperature, completed and final report presently being reviewed; phase 2 part 2 – location and design of facility authorized November, 1997 but on hold pending availability of funding.)

The purpose of this project was to monitor the return of salmon to a tributary (Chandindu River) in the Dawson area, providing information on the ratio of marked (spaghetti tag) salmon for stock management purposes, and to determine a source of brood stock for a future regional incubation/outplanting facility.

This project involved the design, construction and implementation of a weir under adverse (exceptionally high-water conditions. Because of these conditions "a few" fish had moved upstream prior to the placement of the weir ; never-the-less, 130 chinook were counted, along with "a lot" of fall chum; with the operation being shut down on schedule (but, perhaps a bit early, due to the late run); the tag ratio of salmon was high (though the total number of fish was relatively low, reflective of the overall run strength) suggesting an important stock.

The final report for this project is expected December 15,1998.

RE-13-98 Streamkeepers North **$1,300US/$1,900Cdn**

Salmon Emergence Monitoring

This is a very limited project to develop a database on these characteristics of Yukon salmon involving the placement of emergence traps and temperature loggers linked to a computer base station.

Four emergence traps were constructed and placed in Wolf and McIntyre creeks on redds. The traps were not successful in catching emergent fry, perhaps because of the timing of their placement. Data from the fry trapping, including Flat Creek will be provided in the next progress report. Temperature loggers have been placed in Wolf, Flat, McIntyre creeks and McIntyre Creek incubation boxes. In addition, several data loggers were borrowed later in the season and placed in the Takhini and Yukon rivers.

The final report for this project is due December 31, 1998. Note: The final report will be subsequently amended (*gratis*, by the contractor) to include the winter/spring 1999 water temperature data.

RE-14-98 Streamkeepers North **$3,300US$4,600Cdn**
Salmon in the Classroom Field Trips
A continuation of CRE-24-97 - a project by Yukon school groups involving field trips to release incubated salmon fry, to study salmon habitat, and to participate in related field trips.
Twenty-two Yukon schools in nine communities incubated salmon eggs, with an average success ration of 76% releasing almost 2400 fry. All classes participated in field trips, including visits to the Whitehorse Rapids Fish Hatchery, the McIntyre Creek salmon incubation project, the salmon display at the local museum, the Whitehorse fishway and projects at Wolf Creek.
The final report for this project has been received.

RE-15-98 Whitehorse Correctional Centre **$13,300US/$19,100Cdn**
McIntyre Creek Salmon Incubation Project
Involves the objectives of: developing and demonstrating remote/isolated small scale incubation system; producing sufficient numbers of fry in specific locations for coded-wire tag releases; and, providing local schools with a supply of eyed eggs for small classroom incubators.
This is a continuation of project RE-25-97, and is linked to RE-10,13,14,18,23 & 34-98. The Whitehorse Correctional Centre has operated this project since 1996.
In June 1998 approximately 50,000 chinook salmon fry were released into the Takhini River system - an estimated 48,834 adipose clipped and retaining tags, 739 adipose clipped but without tags, and 496 unmarked. Of these, 11,604 were released into Flat Creek and 38,465 were released into the Takhini River. About 23,000 chinook fry were also released into Tatchun Creek, including an estimated 22,138 adipose clipped and retaining tags, 413 adipose clipped without tags, and 262 unmarked.
No adult returns were seen at Flat creek in 1998. One head was obtained from the Takhini River broodstock, and at least two Flat Creek release from the 1991 broodyear were harvested in the fishery at Emmonak this year. In 1997 18 clipped spawners were seen in Flat creek.
Approximately 24,000 Takhini chinook eggs and 21,000 Tatchun chinook eggs are currently being incubated at McIntyre creek. Egg take numbers were low this year as low salmon numbers led to difficulty obtaining broodstock. Tatchun egg survival to the eyed stage was also low (68%), with fungus causing high morality. The Whitehorse Correctional Centre is currently building a shelter for a stack of heath trays, which will be installed this winter. If a stack operates well throughout the winter, it could make pre-eyed picking possible, and thus help to control mortality due to fungus.
The educational program "Salmon in the Classroom" is again available in all Yukon schools. Stremkeepers Society, which fosters steam stewardship was formed in Yukon in 1995 with related programs assisted by the focus of this project.

RE-16-98 Environmental & Administrative Services Yukon & Champagne-Aishihik First Nation **$43,600US/$61,000Cdn**

Champagne-Aishihik First Nation's Salmon Restoration and Enhancement Development and Implementation Plan for the Upper Nordenskiold River

This is the upper end of the system that was assessed by CRE-17-97 by a different contractor.

This project is linked to the Greater Kluane Land Use Plan and several resource management projects of the Champagne-Aishihik First Nation in this area – the Upper Nordenskiold River system of southwest Yukon.

The positive values of the salmon habitat of this system were documented. However, the fry trapped were minimal and few adult (dead and alive) salmon were observed, suggesting (in combination with the traditional knowledge documented) that the past and potential of this system as salmon habitat is very considerable. Given the good habitat and present low levels of salmon in the system, there is considerable potential for a project to restore this system.

The final report without the winter data is due December 15. The final report is due March 15, 1999.

RE-17-98 Research Northwest **$12,100US/$16,900Cdn**

Archival Research - Yukon River Basin, Yukon Territory

This is an extension of project CRE-11-97 in which the archives related to information on salmon in the Southern Yukon River basin was documented.

The national archives in Ottawa and the regional archives in Vancouver have been researched, as well as other sources (including CRE-05-97) to obtain all archival information on salmon habitat and fisheries in the northern Yukon system in Canada.

New information has been obtained on general descriptions of salmon runs in the Yukon River system, and specific description of the Pelly River systems, the Yukon mainstem, and the Porcupine Rifer system.

The final report – due January 5, 1999 - will combine this new information with that reported in the previous project (CRE-11-97) into an amalgamated archival report for the whole Yukon system in Canada.

RE-18-98 Yukon Fish & Game Association **$32,600US/$45,600Cdn**

Upper Lakes Chinook Coded-Wire Tagging

This project is a continuation of project CRE-19-97 and is linked to RE-10-98.

This involves the implantation of coded wire tags in all chinook salmon reared at the Whitehorse Rapids Fish Hatchery.

It was projected that approximately 320,000 fry would be tagged for release in southern Yukon through this project.

The final report on this project is due in December 1998.

RE-19-98 Kwanlin Dun First Nation **$33,800US/$47,300Cdn**
Downstream Migration Project - Juvenile Migration/Mortality from Streams above the Whitehorse Power Generating Dam
The purpose of this project was to conduct a pilot project to develop proficiency in fry trapping methodology and to provide information to be used in subsequent investigation of downstream migration of chinook salmon.
Several detailed progress reports were submitted indicating that limited data was collected using the techniques involved and the report is inconclusive.
The final report has been completed - the review of which is pending.

RE-20-98 White Mountain Env. Csltg/Teslin Tlingit Council **$55,300US/$77,400Cdn**
Restoration/Enhancement Study Plan for the Teslin Drainage Basin
This is an extension of project CR-08-97 in the Teslin area of southwester Yukon.
The project is proceeding well with good summer data obtained on the system noting numerous fry in the Nisutlin drainage indicating an important rearing area; extended knowledge of spawning in this system developed with observations of spawning in Sidney Creek and salmon rearing documented in the Rose River system.
First draft of the final report expected November 30, with the final report being completed by January 15, 1999.

RE-23-98 Matt Waugh/Nigel Young **$8,200US/$11,500Cdn**
McIntyre Creek Chinook Salmon Restoration
Relates to project RE-15-98 and a number of other projects in the present and previous year.
The fieldwork has been completed and preliminary analysis of the data directed to habitat restoration, enumeration of adult chinook salmon and public education.
The final report to be submitted by November 30, 1998.

RE-24-98 Kluane First Nation **$6,200US/$8,700**
Tincup Creek Restoration and Enhancement Project
This project involves the collection and analysis of traditional knowledge pertaining to salmon on this river system in western Yukon as a basis for planning future work on this system. This information will help guide the development of a future project proposal for a field project to assess this system and any future restoration needs.
Most of the interviews have been conducted. The contractor is working with a technical consultant in analyzing the information obtained. This project is behind schedule due to a late start-up. The final report is expected December 15, 1998.

RE-25-98 Vuntut Gwitchin First Nation **$28,800US/$40,300Cdn**
Fishing Branch River Chinook Salmon Assessment
This project involves an extended operation of the weir on the Fishing Branch River to count the escapement of chinook salmon.

The results were minimal. The returning chinook run in this system is thought to be relatively low under normal conditions and was observed as being particularly low this year because of the overall run size being very low throughout the system. There was no spawning in the headwaters. The final report is due on January 30, 1999.

RE-26-98 W.R. Ricks Consulting **$4,800US/$6,700Cdn**
Security Considerations Wolf Creek Fish Passage Structure/Signage
This project is a follow-up to CRE-22-97.
The objective was to put a physical structure in place to ensure the use of the local area would be safe for the public, and to encourage the educational values of the site by improving the viewing opportunities of salmon spawning in Wolf Creek. Also, a sign was to be erected to note the contribution to this and previous projects in the area by the Yukon River Panel's Restoration & Enhancement Fund, the Yukon Fish & Game Association, Fisheries and Oceans Canada, and Yukon Renewable Resources.
The viewing deck and fence have been put in place, and the sign has been constructed and will be put in place this week.

RE-27-98 Yukon Fish & Game Association **$18,900US/$26,500Cdn**
Enumerate Adult Chinook Salmon Returning to Michie and Wolf Creek
This project is linked to RE-18&28-98.
The weir at Wolf Creek was installed and operated as approved but relatively few fish were encountered because of the unusually poor run, and a survey of chinook carcasses was conducted after the operation of the weir was concluded. The Michie creek enumeration weir was moved to a new site and maintained with logistical assistance from DFO.
The final report for this project is due this week.

RE-28-98 Yukon Fish & Game Association **$36,400US/$50,900Cdn**
Radio Tag Adult Chinook Salmon Returning to the Whitehorse Rapids Fishway
This project is linked to CRE-27-98.
Thirty-eight chinook salmon were tagged at the Whitehorse Rapids Fishway, released above the dam and 30 tags were purchased and made available to Fisheries and Oceans Canada, with half the fish being "adipose clipped" thereby indicating they were released from the Hatchery.
Four aerial surveys were conducted with most of the fish being located in the Michie and McClintock creeks. Five salmon returned downstream through the rapids, one passed under the bridge into Tagish Lake but later returned downstream to the McClintock then upstream to the weir (RE-27-98), one "mainstream spawner was located, and 4 fish were unaccounted for in the survey.
The final report for this project is in progress.

RE-31-98 Patricia Smith **$3,500US/$4,900Cdn**

Assessment of the Chinook Salmon Spawning Population of Crooked Creek

Completion of project CRE-01-97, to conduct a helicopter survey of spawning activity (conditions did not permit this to be conducted last year) and to obtain winter water quality information.

The spawning survey was successfully completed under good conditions. Six adult chinook salmon were counted, no redds were spotted, and 11 carcasses were seen.

A final report has been submitted with the exception of the water quality data that will be incorporated in March, 1999 resulting in the final report.

RE-32-98 Mundessa Dev. Corp. (Ta'an Kwach'an F.N.) **$32,000US/$42,000Cdn**

Chinook Salmon Restoration Activities in Fox, Laurier, & Joe Creeks

This project was to be a continuation (to obtain early summer data) of project CRE-16-97.

This project was not launched.

RE-33-98 Jane Wilson & Associates **$40,600US/$56,900Cdn**

Investigation into Restoration/Enhancement Possibilities for Tributaries to the Pelly River in the Vicinity of Pelly Crossing

Project has proceeded on schedule acquiring traditional knowledge, background and field data, including creek/reach data being compiled for Mica, Willow, Needlerock and Grayling creeks. Problems were encountered with low water levels and low returns.

Final report, excepting the winter water quality data is scheduled for December 1, 1998 and the complete final report is scheduled for March 15, 1999.

RE-34-98 Quixote Consulting **$29,100US/$40,700Cdn**

Tatchum Creek Spawner Enumeration & Baseline Data Collection

This is a continuation of project CRE-18-97.

The field work for this project has been completed. The data indicates the overall count of Tatchun Creek chinook salmon in 1998 which was approximately 35%of the numbers found in 1997 and the run this year was relatively late (first chinook moving up the creek to spawning beds on August 16, compared wit August 3 in 1997). Baseline data was collected from a 33% sample size and included sex ratios, length, body condition, and 5 scale samples per fish. Monitoring for the presence of "spaghetti' tags or adipose fin clipped fish indicating coded wire tags was completed for all ascending spawners.

The final report for this project is due December 31, 1998.

RE-35-98 Quixote Consulting **$16,600US/$23,200Cdn**

Tatchun Creek Creel & Yukon River Recreational Chinook Harvest Assessment

In part, this project compliments RE-34-98 and is linked to CRE-18-97.

The contractor geared up to implement this project but the project was halted before it was launched in the field because the sport fishery was closed.

RE-36-98 White River First Nation **$25,900US/$36,300Cdn**

Chinook Habitat and Stock Assessment - Lower Donjek Drainage

The field work for this project has been completed and the overall objectives achieved. Surveys of the river system were conducted by boat, including minnow trapping in three streams. Helicopter over flights of the Nisling river were successful resulting in a good assessment of the number of active spawners and moralities. Substantial information on chinook salmon was gathered on the lower Donjek. It was reported that a strong interest in salmon resources and the project were demonstrated by the participants of the White river First Nation.

The final report for this project is due December 31, 1998.

RE-37-98 Nacho Nyak Dun First Nation **$16,400US/$22,900Cdn**

Chinook Salmon Assessment - North and South McQuesten River watersheds

This is a continuation of projects CRE-29&30-98.

The fieldwork has been completed for this project and the data from CRE-29-97, CRE-30-97, and RE-37-98 has been combined into a single draft final report on the North and South McQuesten River projects for both years. This report will be finalized with the inclusion of the winter water quality data, due as a final report on March 15, 1999.