

**YUKON RIVER TECHNICAL REPORT**

**1988**

**prepared by**

**THE JOINT CANADA/UNITED STATES  
YUKON RIVER TECHNICAL COMMITTEE**

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**Sidney, British Columbia**

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## 1.0 Introduction

The Chief Negotiators of the Canadian and United States delegations to the Yukon River Salmon Negotiations directed the Joint Technical Committee (JTC) to address the subject areas described in this document. The JTC met in Sidney, British Columbia on November 14-16, 1988. The meeting was attended by the following persons:

### Canadian Department of Fisheries and Oceans

Michael Henderson (co-chair)  
Sandy Johnston  
George Cronkite  
Terry Beacham

### Yukon Territorial Government

Mark Hoffman

### Alaska Department of Fish and Game

Ron Regnart (co-chair)  
Richard Randall  
Gene Sandone  
Bob Conrad  
Craig Whitmore  
Fred Andersen

### United States Fish and Wildlife Service

Dick Marshall

### National Marine Fisheries Service

Aven Anderson

## 2.0 1988 Commercial Fishery - Alaska

The fishery is divided into six districts with districts 1-3 and 4-6 comprising the lower Yukon and upper Yukon fisheries respectively (Figure 1). The 1988 catch of 1,474,204 salmon was the second largest ever recorded (1,655,087 in 1981). Species composition of the catch was 101,417 chinook, 1,152,254 summer chum, 133,921 fall chum and 86,612 coho salmon (Table 1). Additionally 256,486 pounds of summer chum salmon roe and 3,227 pounds of fall chum salmon roe were commercially harvested from an identical number of salmon (one pound of roe equals one female chum salmon).

The term, "recent 5-year average," is used extensively in this report and refers to the 1983-1987 period. An exception to this is that the "recent five year average" used to describe the commercial catches of fall chum and coho salmon refer to the 1982-1986 period since there was no commercial fishery for these species in 1987.

Record catches of summer chum and coho salmon were made in 1988. The summer chum and coho salmon catches were 91% and 85%, respectively, above the recent 5-year averages. The fall chum salmon catch, the second smallest catch since 1968, was 40% below the recent 5-year average. The chinook salmon catch was 21% below the recent 5-year average.

A total of 862 Commercial Fishery Entry Commission permit holders participated in the 1988 fishery. The ex-vessel value of the catch, including roe sales, was a record \$13.3 million (U.S.) (\$11.8 million lower Yukon, \$1.5 million upper Yukon).

As described in section 10.0 of this report, illegal fishing and processing activities were documented in some portions of the upper Yukon fishery in 1987. Enforcement activities by Fish and Wildlife Protection officers (Alaska Department of Public Safety) in this area were more effective in 1988 due to increased public contact, the random frequency of fishery patrols, the use of stakeout crews to monitor some processing activities and the monitoring of shipping and marketing outlets, some of which were identified during 1987 investigations. Additional regulations were placed on the Tanana River fishery (district 6) by the Alaska Board of Fisheries beginning with the 1988 season. New regulations provide for improved monitoring of processing, transportation and subsistence fishing activities through a permit system and decreased commercial and subsistence fishing time to provide for adequate spawning escapements.

## 2.1 Chinook Salmon

A more conservative plan for managing the chinook fishery has been developed in recent years in an attempt to begin rebuilding certain stocks that are sustaining excessive exploitation. Very large chinook salmon runs occurred during the 1979-1981 period which coincided with expansion in the catches of U.S. and Canadian fisheries. Although large catches were made during this period, averaging 198,000 total utilization, relatively large escapements were also achieved for all major stocks. Since 1981 most annual returns have been considerably below 1979-1981 levels and the catches, averaging 141,000 total utilization, have resulted in poor escapements for many Canadian stocks and marginal escapements for some Alaskan upriver stocks, especially during the last four or five years. Increases in Alaskan subsistence catches and Canadian commercial catches during the 1980's have contributed to present stock conditions.

Sustained yield fishery management for chinook salmon is directed to the commercial fishery through use of emergency order authority for scheduling fishing seasons, weekly fishing periods, and gill net mesh size restrictions. Also, guideline harvest ranges are established by regulation for each of the six districts. Although total harvest limits have not been established for the subsistence fishery, this fishery is regulated through gear, area and fishing time requirements in major fishing areas.

Present regulations provide a guideline harvest range for the commercial fishery in all districts of 67,350 to 129,150 (midpoint of 98,250). A majority of the commercial harvest is taken in districts 1 and 2 which have a combined 60,000

to 120,000 (midpoint of 90,000) guideline harvest range. The midpoint of the guideline harvest range is viewed as the optimum harvest for a run of average magnitude as judged by in-season run assessment. Annual harvests are allowed to fluctuate below or above the midpoint depending on indicated run strength. Current management is hindered by the lack of timely and precise estimates of total returns, escapements and stock composition in both the returns and the harvests.

The commercial fishing season in the lower river during recent years has been opened when increasing test net and/or subsistence catches have occurred over a span of 7 to 10 days. Delay of the commercial fishing season in this manner during most years was thought to provide increased escapement of upper river stocks that are subject to the highest exploitation due to their migration through all mainstem fisheries. Upper river stocks are often more abundant in the earlier portion of the run, but annual variation in stock composition and timing will greatly affect exploitation of these stocks in any given year.

Besides attempting to reduce exploitation on upper river stocks, another management objective was to achieve more uniform escapements of all stocks by spreading the harvest over a greater duration of the run. To achieve this objective, initial fishing periods in lower Yukon districts were reduced from 24 to 12 hours duration in 1988. Another companion strategy with a similar objective and also implemented for the first time in 1988, was restricting gill net mesh to a maximum mesh of 6 inches when the district 1 and 2 combined catch approached 60,000 fish. The smaller mesh size gill nets, which target chum salmon, result in chinook catches which are smaller in number and composed of a lower proportion of females and larger, older fish.

The preseason outlook for 1988 was for a below average return based on parent year escapements (primarily 1982 and 1983) and the low percentage of 1983 brood year fish (5-year-olds) that returned in 1987. The 1988 commercial catch in Alaska was projected to fall between 70,000 and 100,000 based on a return of this relative magnitude.

Timing of the chinook salmon migration into the lower river in 1988 appeared to be normal. The lower river was free of ice by May 20 and the first chinook were taken in subsistence and Department test nets on May 27. Test net catches remained at a low level until June 2 and then began increasing which indicated a trend of increasing run strength.

The first 12-hour fishing period occurred on June 9-10 in district 1 and June 12-13 in district 2 when gill nets were restricted to a maximum stretched mesh of 6 inches (Table 2). The early restricted mesh periods were scheduled to target a strong early summer chum run. The first directed chinook salmon fishery with unrestricted mesh nets occurred as a 12-hour period on June 13-14 in district 1 and June 15-16 in district 2. These periods were scheduled after approximately 10 days of increasing test net and subsistence catches in the lower river. Another restricted mesh period of only 6 hours duration was allowed in districts 1 and 2 following the first unrestricted mesh period to further target summer chums that were continuing to exhibit above average abundance.

A total of 36 hours (three 12-hour periods) was opened to fishing with unrestricted mesh gill nets in each of the two lower districts in 1988. This directed chinook salmon fishery amounted to a 57% reduction in fishing time compared to 1987.

The combined district 1 and 2 commercial catch following the last unrestricted mesh period (June 20-21 in district 1 and June 22-23 in district 2) was 60,338 chinook salmon. This harvest included 7,545 chinook taken as a by-catch during the two earlier restricted mesh periods when 175,000 summer chum were caught.

Following management plan guidelines, only restricted mesh fishing periods were scheduled during the remainder of the summer fishing season when an additional 31,932 chinook salmon were taken. The chinook salmon by-catch made during this period was considerably larger than the recent 5-year average of approximately 20,000 fish.

The total district 1 and 2 commercial catch of 92,297 was near the midpoint of the guideline harvest range and was 27% below the recent 5-year average. Some of the largest catches were made in coastal areas of Black River and between the south and middle mouths in district 1 and in the upper half of district 2. The 1988 return was judged to be of average magnitude based on Department test fishing and Pilot Station sonar project findings.

A record catch of 39,500 chinook salmon, or 43% of the total district 1 and 2 catch, was made during restricted mesh gill net fishing periods. During 1983-1987, the average catch made during restricted gill net fishing periods was only 18%. Several factors probably influenced the large chinook salmon by-catch in 1988 and these include: 1) increased fishing time with restricted mesh gill nets; 2) earlier scheduling of restricted mesh gillnet periods when chinook salmon abundance was greater; 3) greater abundance of younger age fish in the return; and, 4) fishermen are operating restricted mesh gill nets with greater efficiency for capturing chinook salmon.

Besides decreasing chinook salmon catch rates and redistributing the catches over time, increased fishing time with smaller mesh gill nets affected the age, sex, and size composition of the total catch. The average weight of the district 1 and 2 commercially caught chinook salmon was 19.6 pounds, the smallest on record. The average weights of chinook salmon taken during restricted and unrestricted mesh fishing periods were 15.9 and 22.3 pounds, respectively. Although still in preliminary form, age and sex composition data indicate that the total catch was composed of a smaller percentage of females and larger, older fish due to selectivity for males and the smaller, younger fish by restricted mesh gill nets.

A total of 1,767 chinook salmon was harvested in district 3, which was 12% below the midpoint of the guideline harvest range, and 30% below the recent 5-year average. Two fishing periods (12 hours each) with unrestricted mesh gill nets and two fishing periods (12 and 24 hours) with restricted mesh gill nets were allowed in this district.

The upper Yukon (districts 4-6) total chinook salmon catch was 7,353 fish which was 42% above the recent 5-year average. This larger than average catch was the

result of a record catch of 3,159 fish in district 4 (Table 4). A majority of the district 4 total chinook salmon catch has been traditionally utilized for subsistence (personal use) purposes by commercial fishermen, but high market demand and prices this season resulted in a larger quantity being sold to commercial buyers. There were 3,432 and 762 chinook salmon taken in the districts 5 and 6, respectively (Tables 5 and 6).

## 2.2 Summer Chum Salmon

Guideline harvest ranges have not been established for the summer chum commercial fishery. The fishery is managed on the basis of in-season information on the relative magnitude of the return and escapement as provided by test fishing, counting tower and sonar projects. Management of the summer chum run may be complicated by overriding conservation requirements for chinook salmon which migrate through the lower and middle river fisheries at the same time. Scheduling of restricted mesh fishing periods is a key element in management of these mixed species fisheries.

The first summer chums were captured in lower river test nets on May 27. Test net catches increased rapidly after this date indicating above average run strength.

As previously indicated in section 2.1, restricted mesh size fishing periods directed toward summer chum salmon were implemented in districts 1 and 2 prior to and following the first unrestricted mesh size chinook salmon directed fishing periods. These fishing periods of 12 and 6 hours duration were implemented in response to indications of an abundance of summer chum salmon, while the chinook salmon return was in an early stage of development. During these restricted mesh size fishing periods, 174,209 summer chum salmon were captured in districts 1 and 2 from June 9 until June 17 (Table 2). During unrestricted mesh size fishing periods from June 13 until June 23 in districts 1 and 2, 220,974 summer chum salmon were harvested.

Following the directed chinook salmon fishery, twice weekly restricted mesh fishing periods were scheduled until the season closure on July 15 when an additional 674,124 summer chums were taken during this time. All fishing periods during this time were 12 hours in duration except two 24-hour periods in district 1 and three 24-hour periods in district 2 that occurred in late June - early July. These longer fishing periods were scheduled on the basis of indicated summer chum run strength. Lagging escapements into the Andreafsky River, a major lower Yukon spawning tributary, required reducing the length of the last three fishing periods to 12 hours duration. Also the closed water area of the Andreafsky River confluence with the main Yukon was extended on July 10 for the same reason.

The total district 1 and 2 commercial harvest of summer chum salmon was a record 1,073,370 fish, 45% above the recent 5-year average. A total of 13,965 summer chum salmon was taken in District 3.

The upper Yukon summer chum salmon catch consisted of 64,919 fish and 256,486 pounds of roe, 24% and 34% above the recent 5-year averages, respectively. The majority of the fish production came from district 6 while the majority of roe

production came from district 4. The high volume of roe production in district 4 is the result of limitations placed on conventional fish processing and marketing due to poor flesh quality and high transportation costs.

### 2.3 Fall Chum Salmon

In response to poor fall chum salmon escapements from 1982 through 1984, the Alaska Board of Fisheries adopted the Yukon River Fall Chum Salmon Management Plan. This management plan reduced fall chum salmon guideline harvest ranges for each district with the lower end of the ranges at zero and the upper end at approximately one half of their former level. This resulted in a guideline harvest range of 0-160,250 fall chum salmon for all fishing districts (0-110,000 lower Yukon, 0-50,250 upper Yukon).

A below average return of fall chum salmon was expected in 1988 based on evaluation of brood year escapements and assuming average survival. A projection of the fall chum salmon return based on an estimate of total parent year escapements, the average maturity schedule, and expected returns per spawner indicated a limited commercial fishery could be allowed with the expected commercial harvest ranging between 0-80,000 fall chum salmon.

The management plan required that the lower Yukon area summer season commercial fishery close on July 15. During the closure, daily test fishing catches, subsistence catches, and sonar counts at Pilot Station are monitored to assess run strength. If fall chum salmon run strength is determined not to exceed spawning area and subsistence requirements, the commercial fishery remains closed. However, the management plan provides for reopening of the commercial fishery by emergency order, if the fall chum salmon run is of sufficient magnitude as evaluated by in-season run assessment techniques. Unless the run was early or unexpectedly large, it was anticipated that openings in the lower Yukon would not occur before mid-August. Additionally, the management plan indicated that no more than one fishing period may be allowed per week to allow the harvest to be spread throughout the run. This management strategy was also adopted to provide adequate time to assess the run, with openings tentatively scheduled to occur later in the run to optimize coho salmon harvests.

Fall chum salmon migratory timing into the lower Yukon area was early. Commercial catch sampling during the last period of the summer season in District 1 on July 14 and 15 indicated a large proportion of the catch was composed of fall chum salmon. Subsistence and test net catches documented substantial numbers of fall chum salmon entering the river July 23 through July 26. The cumulative sonar count at Pilot Station on August 2 was 225,000 fall chum salmon. In addition, during July 30 - August 2 fall chum salmon subsistence catches near Galena (river mile 530) had been good. In comparison with other years, these data indicated a surplus of fall chum salmon was available beyond spawning area and subsistence harvest requirements. Therefore, the decision was made to open the fishery on August 8 in district 1 and August 10 in district 2 and 3. This information was provided to processors and fishermen on August 3 to allow them time to prepare for the fishery. A fishing schedule of 12 hours duration in the coastal "Set Net Only Area," where tides further restrict fishing time, and of 6 hours duration in the remainder of district 1 and in districts 2 and 3 was established.

During the first fishing period a total of 48,986 fall chum salmon and 11,102 coho salmon was captured in the lower three districts (Table 3). A harvest of fall chum salmon of this magnitude was about equal to the midpoint of the lower Yukon area guideline harvest range and similar to the pre-season projected total harvest. These fishing periods coincided with the first significant entry of fall chum salmon into the Yukon River since announcement of the commercial fishing schedule. To ensure that escapement and upriver subsistence and commercial fishing requirements would be met, fishing was postponed after the first fishing periods. This delay also provided ADF&G greater time to evaluate run strength and for the ratio of coho salmon to fall chum salmon to increase within the districts. Fishing was reopened on August 17 in districts 2 and 3 and August 18 in district 1. Harvest rates were significantly lower following the first commercial fishing period in each district. With each fishing period the contribution of coho salmon to the total catch increased in all districts, and fishing effort decreased in districts 1 and 2. The commercial fishing season closed by emergency order in Districts 1, 2, and 3 on August 30, August 31, and August 22, respectively. The preliminary cumulative sonar count at Pilot Station through termination of the project on September 14 was approximately 507,000 fall chum salmon which indicated below average run strength based on 1985-1987 data.

A total of 79,480 fall chum salmon was taken in the lower Yukon which was 54% below the recent 5-year average.

The 54,441 fall chum salmon catch made in the upper Yukon districts was 2% below the recent 5-year average. Of this total, 21,790 fish were taken in district 6 (Tanana River) and 33,651 fish were taken in districts 4 and 5 (main Yukon River).

The commercial fishing season in district 4 was closed on August 1 in order to evaluate the early portion of the fall run prior to allowing commercial fishing. Based on test fish wheel and subsistence catches, the run was judged to be early and somewhat stronger than anticipated. Accordingly, the commercial fishing season was re-opened on August 7. A total of seven 48-hour periods was allowed prior to the season closure on August 30 (Table 4). Because of the much greater efficiency of the district 5 fishery, only two 24-hour periods were allowed in the lower three subdistricts (Table 5). District 6 fishing time amounted to three 24-hour fishing periods during September 9-21 (Table 6).

#### 2.4 Coho salmon

No guideline harvest range for coho salmon has been established. The pre-season coho salmon run outlook was for an above average return. The harvest of coho salmon is complicated by overlapping run timing with fall chum salmon, primarily during the later portion of the fall chum salmon return.

Coho salmon migratory timing into the lower Yukon area was about average. Consistent daily test net catches of coho salmon did not begin until August 5, with no significant entry occurring until August 8 and August 12-16. The preliminary Pilot Station sonar count of 264,000 coho salmon indicated above average run strength for this species.

A near record number of 72,630 coho salmon was taken in the lower Yukon fishery. This catch was influenced by a larger than average return and the scheduling of fishing periods when coho salmon were abundant. The commercial catch of 13,982 coho salmon made in the upper Yukon fishery, the majority taken in district 6, was a record.

### 3.0 1988 Commercial Fishery - Canada

The Canadian commercial fishery harvested a total of 43,481 salmon in 1988 (Table 17) and was approximately 12% above the recent five-year average (1983-87) of 38,773 salmon. The catch was composed of 13,217 chinook, 30,263 chum and 1 coho. The chinook catch constituted a new record surpassing the previous record of 13,027 chinook caught in 1983. A total of 31 commercial licenses were issued in 1988 compared to 36 licenses in 1987.

#### 3.1 Chinook Salmon

The management plan adopted for the 1988 Canadian commercial chinook fishery was in essence, the same as the 1987 management plan. Fishing time in the early part of the season was restricted to two days per week until two weeks after the start of the chinook season. The beginning of the season was determined by the presence of an increasing trend in the DFO test fishwheels located just upstream of the international border. A three day moving average was used to establish this trend.

After July 16, the fishery was open for five days per week for the remainder of the chinook season in the lower fishing district, which extends from the Sixty Mile River downstream to near the Canada / U.S. border. An additional day of fishing time was permitted each week in the upper fishing area, located from the Sixty Mile River upstream to Tatchun Creek. Each week, the fishing periods commenced at 12:00 noon on Saturdays and extended over the specified time periods.

The preseason forecast was for a below average return of Canadian-origin chinook. Escapements in 1982 and 1983 were judged to be below optimum and were therefore expected to result in below average returns of five and six year old fish in 1988. Conversely, the above average escapement in 1981 was expected to result in a relatively strong age seven component.

The preliminary total commercial chinook catch in 1988 was a record 13,217 fish. For comparison, the catch in 1987 amounted to 10,864 chinook, and the 1983-87 five year average was 11,429 chinook. Preliminary tag recovery information suggested a Canadian commercial harvest rate of 30.1% on chinook salmon compared to 34.7% in 1987.

Overall, the chinook run timing appeared to be about average although strong initial catches may have given the appearance that the run was earlier than normal. The peak weekly catch, 4,292 chinook, occurred during July 23 to July 30 which is traditionally the peak week of the chinook season.

Fishing effort in the first two weeks of the fishery was light and thereafter increased steadily to a maximum of 20 fishermen fishing in the lower fishing area during the first week of August.

### 3.2 Fall Chum Salmon

After August 20, the fishing times in each commercial fishing district were reduced by one day per week for the fall chum season. Specifically, the lower fishing area was open for four days per week; the upper area was open five days per week. This was the same fishing plan that was adopted in 1987. In the upper river fishing zone, an area closure extending from the confluence of the Pelly and Yukon rivers upstream to Minto, was implemented from mid-September through the end of the season to conserve mainstem Yukon chum spawning populations.

The preseason forecast for Canadian-origin upper Yukon chum salmon was for an average return. The escapement in the primary brood year, 1984, was judged to be about average, although it was also estimated to be well below optimum. A poor return to the Fishing Branch River in 1984 was the main reason for predicting a below average return to Canadian portions of the Porcupine drainage for 1988.

The preliminary total commercial chum catch in 1988 was 30,263 fish. For comparison, the catch in 1987 amounted to 40,591 chum, and the 1983-87 five year average was 27,545. Preliminary tag recovery information suggested a Canadian commercial harvest rate of 44.5% on chum salmon compared to 32.4% in 1987.

Similar to some previous years, two distinct peaks in the chum catch were apparent this year. The first peak catch of 6,994 chum occurred in early September (Sept. 3 to Sept. 7). The second peak catch of 8,679 occurred during September 17 to 21.

### 3.3 Coho Salmon

One coho was caught in the Dawson area commercial fishery in 1988.

## 4.0 1988 Subsistence, Domestic, Indian Food and Sport Fisheries

### 4.1 Alaska

Subsistence fishery surveys, described in 7.1.3, are currently in progress and harvest data are still being tabulated and analyzed. Preliminary harvest data should be available by the early spring of 1989.

Sport fishery surveys, described in section 7.1.4, are also in progress and harvest data are not available. The 1987 sport harvest in the Tanana River system, not previously reported, was 502 chinook, 620 chum and 1,231 coho salmon. The majority of this catch came from the Chena, Salcha and the Delta-Clearwater Rivers near Fairbanks. There is no reliable estimate of the harvest taken elsewhere in the drainage, but it is believed to be relatively small.

## 4.2 Canada

The food fish monitoring program initiated in 1984 was continued in 1988. Although final tabulation of catches is still in progress, the preliminary estimates of total catch are 7,278 chinook and 2,953 chum salmon. A total of 6,170 chinook, 3,757 chum, and 306 coho were caught in the Indian food fishery in 1987. The 1983-87 five-year averages are 6,524 chinook and 4,169 chum.

The domestic catch data for 1988 is not yet finalized.

## 5.0 Status of Spawning Stocks

Documentation of total Yukon River salmon escapement has not been possible in the past due to the vast size of the drainage, turbid water conditions, and funding limitations. Total population estimates for major portions of the drainage were attempted at two locations of the mainstem Yukon River in 1987: at river mile 122, near Pilot Station using sonar counters; and just above the US/Canada border using tag and recapture techniques. This was the fourth consecutive year for the sonar enumeration program, and sixth out of the last seven years for the tagging program.

Most available stock specific escapement information in 1988, as in previous years, was obtained by aerial surveys of selected index streams, although ground and boat surveys, weirs, counting towers, sonar counters, tag and recapture studies, and the Whitehorse Dam fishway also provided escapement estimates (Table 7).

### 5.1 Chinook Salmon

#### 5.1.1 Alaska

Similar to recent years, spawning escapements in 1988 were variable throughout the drainage (Table 8). With the exception of the East Fork Andreafsky River, escapement objectives were achieved in all lower Yukon index streams. The combined aerial survey count for the East and West Forks of the Andreafsky River of 2,468 was the smallest recorded during the recent 5-year period. However the aerial survey count of 1,637 for the mainstem Anvik River was the largest ever recorded.

Annual escapement data for the Gisasa River, a tributary to the Koyukuk River, is omitted in Table 8. The 1988 aerial survey count for this stream of 797 fish was relatively high and achieved the escapement objective of 650.

Escapements into the Chena and Salcha Rivers, tributaries to the upper Tanana River, in 1988 increased over 1987 levels. However only the Chena River escapement achieved the desired escapement objective level.

Age, size and sex composition of the chinook salmon escapement, which may exhibit considerable annual variation, is not yet available for 1988. This information, along with the numbers of spawning fish, is required for assessing the relative productivity of annual spawning escapements and their potential contribution to future returns.

### 5.1.2 Canada

In the Canadian portion of the drainage, chinook escapements in the major spawning index areas generally showed some improvement over 1987 although below average counts were recorded in some cases (Table 8). For example, the 1988 Nisutlin River peak index count was 269 (ADF&G fixed wing) compared to the peak count in 1987 of 183 chinook (ADF&G survey). However, the count in both years were less than one half the recent five year average. Increased counts in 1988 over 1987 were also recorded in the Ross, Tincup, Takhini, and Wolf rivers and at the Whitehorse fishway.

The two indices which showed declines over 1987 were the Big Salmon and Little Salmon rivers. The peak index count in the Big Salmon River was 595 (DFO helicopter survey) in 1988 compared to 673 (DFO survey) in 1987. The Little Salmon peak aerial chinook count decreased from 468 (DFO) in 1987 to 368 in 1988 (DFO).

The estimated total spawning escapement in the Canadian portion of the upper Yukon drainage was 22,259 chinook. This estimate is roughly 30% higher than the recent five year average and well above the estimate for 1987 of 13,210 chinook. Preliminary results from the DFO tagging program are discussed in greater detail in section 7 of this report.

## 5.2 Summer Chum Salmon

### 5.2.1 Alaska

Based on historical escapement data, the Anvik River produces the bulk of the Yukon River summer chum salmon run. The sonar generated total escapement estimate for this stream in 1988 was 1,125,449 fish, which is more than double the escapement objective of 487,000 fish (Table 9). However, escapements recorded in a majority of the other index streams were below both the 5-year averages and optimum escapement levels. For example, the combined aerial survey count in both forks of the Andreafsky River was 88,488 which is approximately 45% below the recent 5-year average and 60% below the desired escapement objective.

## 5.3 Fall Chum Salmon

### 5.3.1 Alaska

Fall chum salmon escapement data are very preliminary as field surveys and data analysis were still being conducted during preparation of this report. Escapements to most major spawning areas in 1988 showed a decrease of approximately 50% from 1987 levels (Table 10).

Escapement objectives appear to have been achieved in only the upper Tanana River system in Alaska. For example the escapement objective for the Delta River is 11,000 based on total escapement estimates and the peak unexpanded foot survey count of this area is over 16,000. Other spawning areas in the upper Tanana River system (Southbank Tanana and Bluff Cabin Slough areas located upstream of

the Big Delta highway bridge) also received relatively good escapements this season.

Based on preliminary data, escapements in the Toklat River (lower Tanana River) and the Sheenjek River (upper Yukon) are about 50% and 25%, respectively, below escapement objective levels. Total escapement estimates for the Chandalar River (upper Yukon) have been available only since 1986 and are not shown in Table 10. The 1988 escapement to this stream was 33,619 compared to 59,314 and 52,416 in 1986 and 1987, respectively.

### 5.3.2. Canada

Poor flying conditions prevented complete coverage of the Canadian chum index areas in 1988. However, surveys conducted on two of the major systems, Kluane River and mainstem Yukon, indicated significant declines in escapement over the 1987 counts. A total of 6,950 chum was enumerated in the Kluane index area in 1988 compared to 12,000 in 1987. A similar trend was apparent in the mainstem Yukon index area where the 1988 count of 1,550 was about 75% below that for 1987, ie. 6,115 chum.

Below average escapements were also indicated by the Fishing Branch weir and the DFO tagging program. The Fishing Branch count of 23,597 chum was approximately 50% of the 1985 to 1987 average (45,407). The estimated total upper Yukon chum escapement in the Canadian portion of the drainage was 35,588 fish. This estimate, although preliminary, is well below the recent five year average of 75,672 chum. Preliminary results from these projects are described in greater detail in section 7 of this report.

## 5.4 Coho Salmon

### 5.4.1 Alaska

Escapement information for this species has been limited due to the late spawning dates when survey conditions are often poor and survey funds are unavailable. Escapement objectives have not been established for this species.

Most of the previous escapement studies have been concentrated in the Tanana River system where a majority of the production is believed to occur. The largest escapements have been documented in the Delta Clearwater River, a tributary to the upper Tanana River. The 1988 escapement in this stream of 21,600 fish nearly equalled the record escapement of 22,300 in 1987 (Table 7). However, escapement in nearby Clearwater Lake and outlet stream was only 825 fish compared to the recent 5-year average of about 2,000. Escapement in Lost Slough, a tributary to the Nenana River was 348 which was the smallest count made during the recent 5-year period.

Increased aerial survey coverage of the Andreafsky and Anvik Rivers, in the lower Yukon area, revealed sizeable spawning populations in these streams. Aerial counts of 2,743 and 1,203 were obtained for the Andreafsky and Anvik Rivers, respectively.

## 6.0 Marine Harvest of Yukon River Salmon

### 6.1 High Seas Salmon Gillnet Fisheries

The Japanese mothership and landbased gillnet fleets operating in the North Pacific - Bering Sea region reported chinook salmon catches of 26,000 and 47,000 respectively, in 1988 (Table 14). These were the smallest catches reported during the last 30 years. Estimated numbers of western Alaska (including Canadian Yukon) chinook Salmon included in these catches are not yet available.

### 6.2 Foreign, Joint Venture and U.S. Domestic Groundfish Fisheries

As a result of the recent expansion in the domestic groundfish fishery, fishing by foreign and joint venture groundfish fleets has been greatly curtailed since the mid-1980's. Foreign fishing has been prohibited since 1988 in the Bering Sea - Aleutian Islands area and since 1986 in the Gulf of Alaska. The estimated salmon (all species) catch made by the joint venture fleet in 1988 was 9,213 fish of which only 137 came from the Gulf of Alaska (Tables 15 and 16).

Continued concern exists over large foreign trawl fisheries operating in international waters ("doughnut" area) of the central Bering Sea. It is speculated that the total groundfish catch of all nations in this area may exceed 1,000,000 m.t. Since there are no international agreements that require observer coverage of this fleet, the incidental catch of chinook salmon, which is known to be abundant in this area, is unknown.

Due to the lack of an observer program, the numbers of salmon taken by the U.S. domestic groundfish fleet is also not known. This is of concern since the U.S. groundfish fishery is rapidly expanding with 400,388 m.t. taken in 1987 which represents 22% of the total groundfish catch of all nations in the Gulf of Alaska and Bering Sea - Aleutian areas. The U.S. groundfish catch in 1986 was 143,300 m.t. or only about 8% of the total groundfish catch by all nations in these areas.

### 6.3 Other Fisheries

#### 6.3.1 Alaska Peninsula

The majority of salmon captured during June in the Unimak and Shumagin Islands area, located on the south side of the Alaska Peninsula, are bound for terminal fisheries in the northern Gulf of Alaska and the Bering Sea, including the Yukon River. The stocks contributing to this fishery have been described by several tagging studies, including the 1987 study reported in Section 7.1.7 of this report, and a 1983 scale patterns analysis study. Sockeye salmon is the target species in the June fishery, but relatively large incidental catches of chum salmon are made. The sockeye salmon harvest is regulated by a quota that is annually adjusted according to the Bristol Bay sockeye salmon forecast. A 400,000 chum salmon quota was also in effect during 1986, but was not extended by the Alaska Board of Fisheries to the 1987 fishery. However, the Board adopted a 500,000 chum salmon quota for the 1988 fishery. A total of 759,500 sockeye and 513,000 chum salmon was taken in the June 1988 fishery. The previous 5 and

10-year average chum salmon harvest by this fishery are both approximately 480,000.

### 6.3.2 Norton Sound

A commercial harvest of 4,096 chinook salmon was taken in coastal Norton Sound waters in 1988. Some Yukon River chinook salmon are known to be intercepted by this fishery. The previous 5 and 10 year average harvests are 10,300 and 9,200 respectively.

## 7.0 1988 Project Summaries

### 7.1 Harvest Monitoring and Apportionment

#### 7.1.1 Commercial Catch Monitoring

Commercial salmon catches in Alaska were monitored by ADF&G on an in-season basis by the verbal report of catches from processors and by the subsequent computer processing of harvest sales receipts (fish tickets). Data were keypunched on microcomputers in the Emmonak field office for the lower Yukon area, and in the Fairbanks office for the upper Yukon area. Tabular summaries of catch and effort data by district and statistical area were then generated for each fishing period and for the total season to date. The verbal reports and subsequent catch data summaries allowed ADF&G managers to make timely in-season adjustments to harvest strategy in response to stock strength and performance of the fisheries. Harvest data for 1988 are presented in Section 2.0 of this report.

#### 7.1.2 Commercial Catch Sampling

Commercial salmon catches in Alaska were sampled for age-sex-size data at Emmonak, St. Marys, Mt. Village and Marshall in the lower Yukon area, and at Galena, Nenana, Fairbanks, and the Rampart to Haul Road Bridge area in the upper Yukon area. Samples collected in Districts 1 and 2 were processed during the field season, while those collected in the other districts are being processed at this time.

Chinook salmon harvested in the district 1 and 2 commercial fishery were approximately 30% age 6, 26% age 7, 24% age 5, and 17% age 4. The proportion of age 6 fish in the total season commercial catch was similar to 1986 and was the lowest observed since 1979. The proportion of age 7 fish was the highest ever recorded.

Typically, 4-year-old summer chum salmon account for the majority of the catch for any given fishing period, increasing in relative importance as the run progresses. This was the case during 1988 with age 4 and 5-year-old fish accounting for approximately 74% and 25% of the district 1 summer chum salmon catch, respectively. The harvest of summer chum salmon taken during unrestricted mesh size periods (June 13-21) was composed of a higher proportion of age 5 fish (34%) than during restricted mesh size periods (22%) which occurred between June 23 and July 15.

Age 4 and age 5 fall chum salmon accounted for approximately 70% and 28% of the District 1 commercial harvest, respectively.

Samples of coho salmon from the commercial fishery in District 1 are currently being analyzed.

### 7.1.3 Subsistence Fishery Surveys

Subsistence salmon catches in Alaska are estimated through comprehensive household interviews after the fishing season by ADF&G field workers. Mail-in questionnaires are sent to fishermen who were not contacted during the household interviews. Catch calendars are also mailed to all known subsistence fishermen prior to the fishing season to facilitate acquisition of catch and run timing information.

Additional measures are being taken to ensure the accuracy of the reported catches. In 1988 most Yukon River communities in Alaska were visited by field workers prior to the fishing season to update household lists and note household participation in the subsistence fishery. Catch calendars were also revised to reflect local terminology for salmon species harvested, to reduce double counting of fish, and to improve efficiency of computer data entry.

Subsistence catch data for 1988 should be available by the spring of 1989.

### 7.1.4 Sport Fishery Surveys

The salmon harvest by the sport fishery in the Tanana River drainage is estimated each year through a postal survey of licensed fishermen. Creel surveys of the Salcha River sport fishery provide an independent method of verification. Data from these two projects are not yet available for 1988.

### 7.1.5 Stock Apportionment Studies for Chinook Salmon

#### 7.1.5.1 Stock Apportionment Estimates of Chinook Catch

Analysis of scale patterns, age compositions, and geographic distribution of 1987 Yukon River chinook salmon catches and escapements were used by ADF&G to estimate geographic region of origin of commercial and subsistence harvest. These data were available only in a very preliminary form at the April 1988 meeting of the US/Canada delegations, and are therefore briefly summarized here. Geographic contribution to total Yukon River utilization of chinook salmon in 1987 was estimated at approximately 131,000 (65%) upper run, 36,353 (18%) middle run, and 34,539 (17%) lower run fish. The fraction of the Districts 1 and 2 commercial catch apportioned to the lower run generally increased during the period of the analysis while the fraction apportioned to the upper run generally declined. The estimated contributions for each run in 1987 were within the ranges observed for the upper (35-68%), middle (5-35%), and lower (12-31%) runs during the preceding 5 years of the study (1982-1986).

The catch apportionment study was continued by ADF&G in 1988. Scale samples were collected by ADF&G from commercial and test fishing catches in Districts 1 and 2, and from commercial and subsistence harvests in Districts 4, 5, and 6.

Commercial harvests in Yukon Territory were sampled by DFO. Age and sex composition data were compiled in-season during the chinook salmon season for use by fishery managers in Districts 1 and 2. Samples were also collected from escapements to the Andraefsky, Anvik, Nulato, Gisasa, Chena, and Salcha rivers in Alaska, and from the mainstem Yukon, Tatchun, Little salmon, Big Salmon, Ross, Nisutlin, and Takhini Rivers in Canada. Preliminary results from this study will not be available until the spring of 1989.

A protein electrophoresis study initiated in 1987 by USFWS was also continued in 1988. Tissue samples were collected by ADF&G and USFWS in conjunction with scale sampling from commercial and test fishing catches in District 1. Approximately 100 tissue samples were also collected from each escapement sampled for scales in Alaska. A total of 176 adult fish were sampled for tissues from Canadian escapements sampled for scales. Samples from 1987 and 1988 are currently being processed by USFWS and preliminary results will not be available until the spring of 1989.

#### 7.1.5.2 Chinook Salmon Parasite Study

Canada initiated a study in 1988 to determine if parasites found in Yukon River chinook salmon could be used to identify the stock of origin of fish caught in mixed stock fisheries. The design of the program required sampling juvenile chinook salmon throughout the Yukon River watershed in 1988 and 1989 and adult chinook in 1989. The purpose of the adult sample is to determine if parasites acquired in freshwater during the juvenile stage persisted through to the adult stage.

In 1988 samples were collected from 15 locations in the Canadian portion of the Yukon River watershed in August. These locations ranged from Forty Mile Creek near the Yukon Territory - Alaska border to several sites upriver from Whitehorse. In addition to the August samples, a sample was collected from Bearfeed Creek in May and from Tatchun Creek in May, June and July. Samples from the U.S. portion of the Yukon River were collected from the Anvik and Andraefsky rivers in July by ADF&G.

Approximately one-half of the Canadian samples have been processed to date. Results from these samples show a very low incidence of any type of parasite in juvenile chinook salmon.

Scales from the juvenile chinook salmon collected for the parasite study as well as CWT marked chinook that returned to the Whitehorse Hatchery in 1988 are being examined to determine if there are missing freshwater annuli. The results of this study will be presented at the next meeting of the Technical Committee.

### 7.1.6 Stock Apportionment Studies for Chum Salmon

#### 7.1.6.1 Stock Apportionment of the 1987 Fall Chum Salmon Catch Based on ADF&G Scale Pattern Analyses

Analysis of scale patterns was investigated as a method of estimating stock composition of fall chum salmon harvests in 1987 using technique modifications recommended from previous studies. Mean classification accuracies were low for all models examined. Mean accuracy ranged from 25.1% to 32.9% for eight-way classifications of samples from the Toklat, Delta, Tanana (Bluff Cabin Slough), Chandalar, Sheenjek, Fishing Branch, Kluane, and mainstem Yukon Rivers. Three-way classifications to region of origin yielded mean accuracies ranging from 54.2% to 68.4%. A three-way region of origin model for age 4 males was used to apportion weekly District 1 test fishing catches. However, precision of estimates was considered unacceptably low.

#### 7.1.6.2 Stock Apportionment of the 1987 Chum Salmon Catch Based on the USFWS Electrophoresis Study

The USFWS used electrophoresis of fish tissue proteins to estimate the contributions of Yukon River summer and fall chum salmon component stocks in 1987 to the U.S. district 1 commercial and test fishery catches. Samples from individual spawning populations used to establish stock standards were included from the following locations:

Canada	Fishing Branch (fall chum) Yukon Main Stem (fall chum) Kluane (fall chum)
United States	Sheenjek (fall chum) Chandalar (fall chum) Toklat (fall chum) Tanana (fall chum) Koyukuk (summer chum) Nulato (summer chum) Anvik (summer chum) Andreafsky (summer chum)

Commercial catch samples from June 16 to July 3 were used for summer run analysis and test net catches from July 6 to August 26 were used in the fall chum analysis.

Twelve loci, or protein genetic locations, have been identified as useful stock discriminators. This is an increase of five genetic loci over the 1984-1986 analysis. Genetic differentiation between summer and fall chum salmon stocks was quite distinct using the 12 loci. Within the fall stocks, Kluane and Toklat stocks appear quite genetically distinct. However, there is a lack of clear genetic distinction between the remainder of the fall stocks. Within the summer run stocks, no stock specific identifying characters were found in the 12 loci examined.

Genetic similarity of spawning stocks from one country of origin to stocks from the other country present sources of bias in stock composition estimates. Tanana and Fishing Branch were somewhat similar to one another as were Sheenjek, Yukon main stem Yukon and Chandalar.

Genetic markers were tested for stability over time using data gathered from a number of Canadian and U.S. stocks from 1984 to 1987. No significant differences were found in genetic markers among years.

Samples collected from the district 1 commercial catches between June 16 and July 3 and from the Emmonak test fishery catch from July 6 to August 26 were divided into approximately weekly time segments for the 1987 chum salmon run. Stock composition estimates for individual spawning stocks were calculated and then summed to estimate Canadian and Alaskan stock contributions by week. Estimated Canadian contributions from June 16 to July 19 averaged 3% and ranged from 0 to 14%. Estimated Canadian contributions from July 21 to August 26 averaged 36% and ranged from 31% to 37%. The following reservations are applicable to these stock composition estimates:

- i) the stocks used in the baseline may not adequately represent the potential contribution by country of origin to the estimated stock contributions;
- ii) sufficient genetic differentiation between some U.S. and Canadian fall chum stocks has not yet been demonstrated. This may result in bias in the stock contribution estimates by country of origin;
- iii) the samples collected from the commercial and test net fisheries may not represent a random sample of the population.

The following recommendations were made to improve the accuracy of the stock composition estimates:

- 1) complete genetic information should be acquired from all stocks used in the baseline. Additional Canadian stocks could include Teslin, Donjek, White, Koidern and Big Salmon rivers. Additional U.S. stocks could include Giasa, Melozitna, Rodo, Chena and Salcha rivers for summer stocks and late run Koyukuk for fall chum stocks. This list may not be complete and other major stocks should be sampled when identified;
- ii) additional genetic markers should be identified that will aid in the identification of U.S. and Canadian origin stocks. The use of non-genetic markers such as scale characters should be examined for use in stock composition estimates;
- iii) a program should be designed to permit representative samples of the catch to be collected from each major fishery for electrophoretic analysis.

### 7.1.7 South Alaska Peninsula Tagging Study (1987)

This section provides updated information from a final report issued on a 1987 tagging study by ADF&G in the South Unimak and Shumagin Islands June fishery. A total of 6,987 sockeye and 6,323 chum salmon was tagged and released from June 6 through July 2 on days when the fishery was closed. Tag releases were weighted toward the latter portion of the fishery.

As of March 1, 1988 a total of 1,912 or 27.3% of the total releases of sockeye salmon tags and 833 or 13.2% of the total release of chum salmon tags was recovered in terminal fisheries throughout Alaska and other areas from a voluntary recovery program. There were 524 chum salmon tag recoveries made in the Bristol Bay and Arctic-Yukon-Kuskokwim areas which represented 68% of all recoveries made in Alaska (Table 11). The geographical distribution of chum salmon recoveries was greater than that for sockeye salmon with returns extending from British Columbia to Kotzebue. There were also 36 recoveries in Japanese coastal fisheries and hatchery returns and 11 recoveries in U.S.S.R. coastal fisheries.

The voluntary tag recovery program, in which fishermen from all user groups participated along with commercial fishery processors, was publicized throughout central and western Alaskan fisheries. For this reason, returns from other areas, including Asia, were probably minimal due to unreported tag recoveries.

Tag recoveries made voluntarily in central and western Alaska fisheries were adjusted for unreported tags based on a reported fraction of tagged to untagged fish identified in a concurrent fishery sampling program in these fisheries. The estimated recoveries in catches were then expanded to the entire estimated total return by dividing by the estimated exploitation rate in the respective fishery. It was estimated that 1,792 chum salmon tags occurred in western and central Alaska salmon returns. Assuming that tagging mortality for chum salmon was approximately 36% (an estimate for sockeye), the Asian contribution to the Unimak and Shumagin tag releases may have been as high as 57%.

The following stock composition estimates were calculated assuming that Asian stocks were not present in the tag releases. This assumption leads to over-estimates of stock composition for Alaskan stocks and, therefore, these estimates represent more of an upper bound rather than a mean estimate. Bristol Bay, Kuskokwim and North Alaska Peninsula stocks dominated the estimated recoveries accounting for 82.2% of the combined Unimak and Shumagin releases (Table 13). Chum salmon stocks located north of the Alaska Peninsula were better represented in the Unimak releases, while stocks located east of Unimak Island exhibited greater abundance in the Shumagin releases.

Yukon River chum salmon were further classified into summer and fall stocks based on both the area and time of capture. A total of 19 summer chum and 6 fall chum tags was recovered in the Yukon River through the voluntary program (Table 12).

It was not possible to sample the Yukon River summer chum subsistence fishery, so ADF&G sampling efforts were confined to the district 1 and 2 commercial fishery which resulted in only 3 summer chum tag recoveries during the last

fishing period. The expanded estimate for summer chum recoveries in the District 1 and 2 total commercial catch was 25 tagged fish.

A commercial fishery for Yukon River fall chums did not occur in Alaska during 1987. Significant numbers of fall chums were directly observed in a variety of sampling programs including test fishing, subsistence fishery survey, escapement monitoring and tagging projects. In this collective sampling effort, approximately 120,000 fall chum were examined for tags resulting in the sighting of one tagged fish at the Fishing branch River weir in Canada. This effort represented 16.1% of the estimated total return. Based on the 16.1% sampling fraction, 6 tagged fish would be expected in the 1988 Yukon River fall chum return.

The Yukon River fishery sampling program was deemed inadequate for accurately estimating total recoveries necessary to determine stock composition. In view of the limited fish sampling program, the reported fraction estimated for the Kuskokwim area was applied to the Yukon River voluntary recoveries to determine stock composition. This was based on similarities of the fisheries in the Yukon and Kuskokwim Rivers. Based on this method of analysis, the estimated composition of Yukon River summer and fall chum salmon in the Unimak/Shumagin tag releases was 3.3% and 1.7% respectively (Table 13).

A high degree of overlap in presence of different stocks in the South Peninsula June fishery was evident. Any differences noted in mean date of release between stocks were obscured by variance incurred by small sample sizes.

#### 7.1.8 Age, Morphology and Biochemical Genetic Variation of Yukon River Chinook Salmon

Terry Beacham summarized the results contained in a manuscript entitled, "Age, Morphology and Biochemical Genetic Variation of Yukon River Chinook Salmon" by T. Beacham, C. Murray and R. Whithier. The abstract of the manuscript is as follows:

Chinook salmon populations in the Yukon Territory were examined for variation in age and size of spawning adults, juvenile morphology and biochemical genetics during 1985-87. Yukon River chinook salmon spend at least one winter in fresh water as juveniles, with approximately 6% of the returning adults spending two winters.

Males matured at younger ages and generally smaller mean lengths-at-age than did females. Differences in juvenile morphology were observed among populations with juveniles in habitat with faster water velocities having larger fins and thicker bodies than those in slower velocity habitats. Genetic differentiation among populations was observed, with the greatest variation between those populations in the Yukon River drainage and an Alsek River population. Within the Yukon River drainage, chinook salmon from the Whitehorse fishway and Takhini River were distinct from other populations surveyed. Some variation in allelic frequency between adults and juveniles sampled from the same locations was observed. Annual stability of allelic frequencies, particularly in adults, was observed for 17 polymorphic loci examined.

## 7.2 Run Abundance Indicators

### 7.2.1 Lower Yukon Test Fishing

Salmon run timing, abundance, and entry patterns are indexed by ADF&G with set gillnets in the Yukon River delta. Samples are collected from test net catches during commercial fishery closures to determine the age-sex-size composition of salmon escaping the commercial fishery. The project is essentially unchanged since 1980.

Chinook and summer chum salmon were indexed using 8 1/2" and 5 1/2" gillnets from May 27 through July 15. The date of the first chinook salmon captured in test nets (May 27) and the mean April air temperature in Nome, Alaska (23°F) were indicative of early run timing. However, test net catches remained relatively low until June 7 and overall timing of the chinook run was judged to be average. Cumulative catch per unit of effort (CPUE) data indicated the chinook salmon run was of average magnitude and similar to the 1983, 1984 and 1986 runs.

Fall chum salmon were identified in test net catches beginning on July 11. Cumulative CPUE data for four standardized 6-inch mesh nets operated from July 16 through September 1 indicated that migratory timing was early and the size of the run was below average. Coho salmon were first captured in test nets on July 18 and CPUE data indicated that the coho salmon run timing was average, but abundance was below average. There were indications that some of the test nets fished poorly compared to adjacent subsistence nets and some sites had to be relocated. Examination of other indices of run abundance (main river sonar, commercial catch rates) indicate the fall chum and coho salmon returns were larger than indicated by test fishing.

This was also the second consecutive season for operating a drift gillnet test fishery for the purpose of determining the feasibility of indexing chinook salmon abundance. Project methodology was improved in 1988 and it is recommended that future effort include operation of 5 1/2 inch mesh nets to also index summer chum abundance.

### 7.2.2 Upper Yukon Test Fishing (Alaska)

Fall chum and coho salmon run timing and abundance have been indexed with fish wheels in the upper Yukon area on the north bank (1981-1988) and south bank (1981-1986) of the Yukon River near Ruby. Tagging studies, conducted in the mid-to-late 1970's, indicated that fall chum salmon migrating along the north bank at this site were primarily bound for spawning areas in the upper Yukon and Porcupine River drainages, while those moving along the south bank were bound primarily for Tanana River drainage spawning areas.

Operation of the south bank fish wheel was discontinued after the 1986 season due to the misleading data gained from the project that year. The very high catches made in the south bank fish wheel during 1986 suggested a strong fall chum salmon return to the Tanana River; in reality, however, the run was relatively weak and escapements disappointing.

During 1988 the north bank wheel was operated from July 31 through September 10. The fall chum run had a bimodal distribution with peaks occurring on August 11 and on August 26. Based on comparative test fish wheel catches, the fall chum salmon run was judged to have been early and average to slightly below average in magnitude. Due to the low number of coho salmon captured in this wheel, it is not appropriate to judge run strength of this species using these data.

In an attempt to gain a better understanding of salmon runs in the Tanana River, test fish wheels were operated for the first time in 1988 at Manley, Nenana, and Fairbanks. During the chinook and summer chum runs, one wheel was operated at Manley and one in the Nenana area. Peak catches of chinook salmon occurred at Manley on July 15 and at Nenana on July 10. Peak summer chum salmon catches occurred on July 15 at Manley and on July 20 in Nenana.

Four test fish wheels were operated on the Tanana River during the fall chum and coho salmon runs. Peak chum and coho catches were recorded at Manley on September 4 and September 8; at Nenana on September 8 and September 14 (wheel #1), and on September 5 and September 6 (wheel #2), and at Fairbanks on September 12 and September 22.

In-season estimates of run strength using these data were not attempted because of the lack of prior year catches as a basis for comparison.

### 7.2.3 Yukon River Sonar

Hydroacoustic counters were operated by ADF&G on the mainstem Yukon River near Pilot Station (River Mile 122) from June 2 through September 14 in 1988. Sonar counts were apportioned to species based on test fishing catches using drift gillnets of several different mesh sizes. Species apportionment estimates are being refined on a post-season basis to generate final daily and total season population estimates by species.

Preliminary 1988 counts were 81,834 chinook, 1,875,830 summer chum, 506,993 fall chum, 263,887 coho and 536,312 pink salmon. Annual counts since 1985 are listed below:

Year	Dates of Operation	Chinook	Summer Chum	Fall Chum	Coho	Pink
1985	6\22-8\26	49,383	2,309,430	328,452	85,441	a\
1986	6\9-9\12	86,451	1,926,034	526,814	199,797	1,055,746 <sub>a\</sub>
1987	6\9-9\6	109,653	655,645	586,585	241,409	
1988	6\2-9\14	<u>80,834</u>	<u>1,875,830</u>	<u>506,993</u>	<u>263,887</u>	<u>536,323</u>
	Average	81,580	1,691,735	487,211	197,634	-

a/ counts so low they were included with other species.

Varying river conditions, dates of project operation, run timing and species and/or stock abundance may affect the accuracy and, thus, the comparability of these annual counts. The much greater abundance of summer chums each year and pink salmon during even numbered years may affect the estimates for chinook salmon which migrate at the same time. Fall chum estimates are similar.

influenced by the overlapping migration of summer chums (mid-July) and cohos (mid-August through September).

#### 7.2.4 Upper Yukon Test Fishing (Yukon Territory)

Run timing and relative abundance data were collected by DFO for both chinook and chum salmon from three fishwheels located near the U.S./Canada border. Although the primary purpose of the fishwheels was to live-capture salmon for the tagging program, consistency in the site selection and fishing time since 1982 does provide the opportunity for some inter-annual and in-season comparisons. In 1988, the DFO fishwheel catch data indicated an average chinook run timing with a single peak generated around July 17 to July 20. Extremely high water conditions were experienced in 1988 and the resulting debris caused damage to the fishwheels and somewhat limited the early part of the commercial and test fishwheel fishing effort. Due to the effect of the high water it is difficult to determine the relative magnitude of the run peak but preliminary population estimates indicate a run size greater than that seen in 1987 (43,936 in 1988, 30,823 in 1987). The comparative weekly catches in the commercial fishery also suggested a run size in excess of the 1987 run. Escapement indices, as previously discussed, also generally showed increased returns over the previous year although in some cases, were still below the recent average.

In general, the 1988 fall chum salmon return appeared to be approximately one week earlier than in 1987 according to peak catches in the tagging fishwheels. As described earlier, the commercial fishery catches showed a strongly bimodal run timing curve with an early component much stronger than that observed in 1987. This bimodality was not strongly apparent in the tagging fishwheel catches.

Small numbers of chum first appeared in the tagging wheels and the commercial fishery in mid-July as was noted in 1987. It is questionable as to whether the chum salmon present in the Canadian portion of the drainage prior to mid to late August should be termed "fall" chum since the time of entry into the mouth of the Yukon River would likely be sometime in June.

Total tagging fishwheel catches and preliminary population estimates derived from tagging data currently indicate a 1988 chum run size which was much smaller than the 1987 estimate (68,082 in 1988, 125,121 in 1987).

#### 7.2.5 Upper Yukon Tag and Recovery Program

A tagging program has been conducted on salmon stocks in the Canadian section of the drainage since 1982 by DFO. The objectives of the study have been to estimate the total return of chinook and fall chum salmon to Canada (excluding the Porcupine drainage) and to obtain estimates of total escapement, harvest rates, migration rates and run timing. Spaghetti tags are applied to salmon live-captured in the test fishwheels and subsequent recoveries are made by the different user groups fishing upstream. Population estimates are derived from those tags recovered in the commercial fishery downstream of the Stewart River. Analysis of the 1988 data is not yet complete, however a preliminary chinook salmon estimate of 43,936 has been calculated. Of this number, approximately

22,259 have been estimated to have escaped to the spawning grounds. For comparison, population and spawning escapement estimates for all years are as follows:

CHINOOK

Year	Total Catch	Porcupine Catch	Canadian Upper Yukon Catch	Upper Yukon Spawning Escapement	Upper Yukon Border Escapement
1982	16,908	400	16,508	20,090	36,598
1983	18,652	200	18,452	29,289	47,741
1985	19,001	150	18,851	11,030	29,881
1986	20,064	300	19,764	16,715	36,479
1987	17,664	51	17,613	13,210	30,823
1988*	19,267	300	18,967	24,969	43,936

(\* preliminary figures)

The preliminary population estimate for chum salmon in 1988 is 68,082. Of this number, approximately 36,569 have been estimated to have escaped to the spawning grounds as of November 14, 1988. These numbers are based at present incomplete data as the run is still in progress. For comparison, population and spawning escapement estimates for all years are as follows:

FALL CHUM

Year	Total Catch	Porcupine Catch	Canadian Upper Yukon Catch	Upper Yukon Spawning Escapement	Upper Yukon Border Escapement
1982	16,091	1000	15,091	34,780	49,871
1983	29,490	2000	27,490	90,875	118,365
1985	41,265	3500	37,765	62,010	99,775
1986	14,536	700	13,836	87,990	101,826
1987	44,489	135	44,345	80,776	125,121
1988*	31,663	150	31,513	36,569	68,082

(\* preliminary figures)

### 7.3 Spawning Escapement Studies

#### 7.3.1 East Fork Andreafsky River Tower

Summer chum salmon escapement to this stream was enumerated by ADF&G using side-scanning sonar from 1981 through 1984. Visual enumeration of salmon escapement since 1986 has been made with counting towers which also provides estimates for chinook and pink salmon.

Expanded totals of 68,937 summer chum, 1,339 chinook and 295,723 pink salmon were counted from June 21 through July 25 in 1988. The summer chum estimate was 30% below the average total escapement of 98,400 for the recent 5-year period (excluding 1985 when only aerial survey counts were available). The chinook salmon estimate was smaller than the two previous estimates (2,011 in 1987 and 1,530 in 1986). The pink salmon estimate was considerably larger than the 1986 parent year estimate of 124,618.

Salmon obtained from beach seining live fish and carcass surveys were sampled for age-sex-size information. Age 4 male and female chum salmon co-dominated the beach seine sample of 525 fish, contributing 34.3% and 35.6% respectively. The sex ratio of the summer chum salmon sample was nearly 1:1. Age 5, age 6, and age 3 chum salmon contributed 25.7%, 3.0% and 1.3%, respectively, to the sample.

The chinook salmon age-class composition of the total sample, 403 salmon, was co-dominated by age 4 male, 28.0%, age 5 male, 24.3%, age 6 female, 19.4%, and age 7 female, 14.1%. Male salmon dominated the sample sex ratio, accounting for 61.3% of the total.

#### 7.3.2 Anvik River Sonar

Summer chum salmon escapement to the Anvik River was enumerated by ADF&G using side-scan sonar in 1988 for the eleventh consecutive year. An adjusted total of 1,125,449 summer chum salmon was counted from June 21 through July 27. The 1988 escapement was 131% above the escapement objective of 487,000 fish and 82% above the long-term (1972-1987) average escapement of 617,000 salmon.

Fish were sampled for age-sex-size data, but this information is not yet available.

#### 7.3.3 Chena River Chinook Salmon Tagging Study

A chinook salmon mark-and-recapture study was conducted by ADF&G in the Chena River, tributary to the Tanana River, to estimate total spawning population size. Set gillnets (both 5 3/4" and 8 1/4" mesh) were fished at several sites near river mile 15 to capture adult chinook salmon for tagging. A total of 254 fish was tagged and released in good condition between June 29 and July 27. Tagged fish were recovered later by intensive repeated carcass surveys of the spawning areas from July 29 to August 12. Approximately 50 marked chinook salmon were recovered from nearly 1,000 examined for marks. A final population estimate is not yet available.

The chinook salmon run was also sampled for age, sex, size composition. Samples were also collected for subsequent GSI and SPA analyses.

#### 7.3.4 Salcha River Chinook Salmon Tagging Study

This was the second year of a mark-and-recapture study by ADF&G to estimate population size of adult chinook salmon in the Salcha River, a tributary of the Tanana River. A total of 459 chinook salmon was captured by electrofishing, tagged, and released within the lower 100 kilometres of the river from 26 July to 2 August. A total of 873 fish was subsequently sampled for tags during August 3 to 5. There were 92 recaptured fish.

A preliminary Darroch estimate of the population abundance is 4,562 (standard error = 556). The final estimate may vary depending on further analysis and possible stratification by sex. The final 1987 population estimate was 4,771 chinook salmon (standard error = 504).

#### 7.3.5 Sheenjek River Sonar

ADF&G operated a side scanning sonar project to enumerate fall chum salmon escapements in the Sheenjek River (Porcupine River drainage) each year since 1981. A preliminary sonar count this season of approximately 38,800 fish was obtained from August 20 through September 27. This count does not include 5-6 partial days of down-time throughout the counting period due to high water problems. It is anticipated that when the data analysis is completed, the total estimated 1988 escapement will approximate 45,000 fish. That level of escapement would be the third lowest sonar estimate on record and will fall below the escapement objective of 62,000 fish. Annual escapement estimates since 1981 have ranged from a low of 27,130 (1984) to a high of 152,768 (1985).

Sampling objectives for electrophoretic tissue samples was achieved this season, but collection fell short of the targeted sample size for age-sex-size composition.

#### 7.3.6 Chandalar River Sonar

From August 11 to September 24, 1988 two side-scanning sonar devices were operated by USFWS to enumerate fall chum salmon escapement into the Chandalar River, a tributary of the upper Yukon River. A seasonal total of 33,619 chum salmon was estimated compared with counts of 59,314 and 52,416 in 1986 and 1987, respectively. Counting accuracy was somewhat impaired due to the extremely high water conditions encountered mid-season. River discharge increased a total of eight vertical feet, ceasing sonar operations on August 24-29 and again on September 7-9. Missing daily counts were estimated by interpolation (Figure 2).

Fixed-wing aerial surveys were flown on September 14, 20, and 28 in an attempt to correlate sonar counts with aerial peak spawning counts. The highest aerial count was 5,735 chums on the September 28 flight. Survey conditions were poor for each survey because of high water and poor visibility. Chum were found spawning in 60-70 miles of river with the greatest concentrations near the village of Venetie. During each survey, 3-5 gillnets were counted near the

village. This subsistence harvest needs to be factored into the spawning escapement estimate, however, that information is not available at this time.

#### 7.3.7 Tanana River Fall Chum Salmon Radio Telemetry Study

A radio telemetry study was conducted by ADF&G during 1988 to determine the location of major fall chum salmon spawning areas in the upper Tanana River (upstream of Fairbanks) as well as to obtain information on run timing past the Fairbanks area during the period of transmitter application. The study was partially funded by the USFWS.

A total of 73 low frequency (48-50 MHz) and 5 high frequency (152-154 MHz) radio transmitters were applied to chum salmon from September 1-27. All chum salmon tagged were captured by fish wheel and released (after a 30-45 minute holding period) approximately 6 river miles downstream of Fairbanks. The 5 high frequency transmitters were modified for external application by epoxying two needles to each transmitter and securing them to fish with Petersen discs.

Twelve aerial tracking surveys were flown between September 2 and October 27 and will continue at a rate of 1-2 per week, weather permitting, throughout November. Only one attempt was made during this period, without success, to locate the 5 high frequency transmitters which were deployed on September 26 and 27.

Two of the fish tagged with low frequency transmitters were captured and killed in a subsistence gillnet located approximately 10 miles upstream of the release site. A total of 69 (or 97%) of the remaining fish tagged with low frequency transmitters were located during one or more of the aerial tracking surveys. The most recent surveys on October 20 and 27 accounted for 65 (92%) of these fish. A majority of these fish were in the vicinity of known major spawning areas near Big Delta.

No new major spawning areas have been located to date, but final project results will not be available until early 1989.

#### 7.3.8 Whitehorse Fishway Chinook Enumeration

A total of 405 chinook salmon was enumerated at the Whitehorse Fishway in 1988 (Table 11). This represents 61% of the 1983-1987 average of 668 chinook although the return in 1988 showed some improvement over the previous year.

The daily counts separated according to sex amount to 145 females and 260 males for a female to male ratio of 0.56:1. Of these totals, 74 females and 60 males were taken for hatchery brood stock. Twelve of the females taken died of unknown causes and therefore a total 62 females were actually used for hatchery broodstock. The most recent green egg inventory arrived at an egg count of 354,901, with an average female fecundity of 5,776. Surprisingly, approximately 50 adipose-clipped males (jacks) were recovered at the fishway in 1988.

The fishway chinook taken for the hatchery were sampled for age-size-sex data and tissue samples were collected for electrophoretic analysis. Run timing appeared to be similar to 1987 with 50% of the run being recorded by August 15

as compared to August 18 in 1987. The first chinook appeared on July 31 and the peak count of 36 occurred on August 14.

#### 7.3.9 Big Salmon River Chinook Weir

A total of 344 chinook salmon was counted through the Big Salmon River weir between August 9 and August 31, 1988. This represents an incomplete weir count due to unusual flood conditions which occurred during the early portion of the run. Comparisons made with aerial surveys and carcass counts against the weir in years where a complete weir count was obtained, was used to make an estimate of the total return past the weir this year. This estimate is 1200 to 1400 chinook which represents an increase of approximately 20 to 40% over the 1987 count of 998.

It is difficult to determine the time of peak migration due to the incomplete weir count but it is likely to have occurred around August 10. Run timing appeared to be similar to that of 1987 and 1986. Daily and cumulative weir counts along with carcass counts against the weir appear on Table 12. Stream residence time again appeared to be two weeks, as seen in both 1987 and 1986.

Approximately 20% of the run was sampled for age-size-sex data and approximately 100 tissue samples were taken by the ADF&G stream survey crew from spawned out adults for electrophoretic analysis. In addition, juvenile samples were obtained for parasite studies and juveniles were also measured throughout the programme to try and derive growth data.

#### 7.3.10 Fishing Branch River Fall Chum Weir

A weir to enumerate fall chum salmon escapements to the Fishing Branch River (Porcupine drainage) was operated from 1972 to 1975. Counts during this period ranged from 16,000 to 353,000 fall chum salmon. This program was re-established in 1985 and continued through 1988. The 1985 count was 56,016 chum (56.3% females) during the period from September 6 to October 20. In 1986, the weir was operational September 1 through October 19. A total of 31,378 (54% females) fall chum were enumerated. This count represent 56% of the 1985 return. The 1987 weir count was 48,956 (54.4% females) fall chum counted between August 29 and October 18. In 1988 the weir count was 23,597 (57.8% females) between September 5 and October 16, representing only 51.9% of the previous 3 year average. A total of approximately 800 chum salmon was live-sampled at the weir and 150 tissue samples were taken from spawned out chum salmon for electrophoretic analysis. Run timing in 1988 showed a somewhat less pronounced and earlier peak than that of 1987. For comparative purposes, the run peaks occurred on September 30, 1985, September 9, 1986, September 19, 1987 and September 12, 1988. In addition to the chum weir count in 1988, a total of 10 coho and one chinook salmon were also enumerated at the Fishing Branch River. Further work is required to determine the run sizes of both of these species, which are very important to the people of Old Crow.

#### 7.3.11 Escapement Surveys

Salmon escapement abundance is indexed at selected spawning areas throughout the & drainage primarily by aerial surveys from fixed winged aircraft (ADF&G) and

helicopter (DFO). Some of the escapement information is also obtained from surveys by boat and foot. Results of those surveys conducted to date are presented in the stock status section of the report (section 5.0).

## 8.0 Enhancement

### 8.1 Clear Hatchery

As reported previously, this salmon enhancement program, operated by ADF&G, has been greatly curtailed. Fall chum and chinook salmon egg take were discontinued in 1986 and 1987, respectively. Coho salmon egg take will continue and hatchery-reared juveniles will be released in the Tanana River system and in closed system lakes to primarily enhance sport fishing opportunities. ADF&G hatchery personnel operated a weir again this season on Wood Creek, a tributary to the Nenana River (Tanana System). A total of 3,961 fall chum (all hatchery-reared) and 2,046 coho salmon (estimated 30% hatchery-reared) was counted at the weir compared to counts of 1,528 and 2,450, respectively, in 1987. A total of 362 coho salmon (181 females) were artificially spawned producing approximately 700,000 eggs. Two fin-clipped coho salmon were collected in the lower Yukon fishery near Emmonak by ADF&G.

### 8.2 Whitehorse Hatchery

Good survival was obtained at the Whitehorse hatchery in 1987. From a total egg take of 420,861 eggs in September, 1987 355,433 fry were released (June, 1988) for an egg to fry survival rate of 83%. A total of 329,447 fry was released into Michie Creek and 25,986 were released into Wolf Creek. None of the fry released into Wolf Creek were coded-wire tagged but 155,831 of the fry released into Michie Creek were tagged.

The 1988 egg take yielded about 350,903 eggs taken from chinook salmon captured as they migrated through the Whitehorse Fishway over the Whitehorse dam. A total of 134 chinook salmon including 74 females and 60 males, was sacrificed for brood stock. At the present time the eggs are still in their critical stage with most eyeing-up without problems. Currently, egg survival is estimated at 90%.

## 9.0 1989 Run Outlook

### 9.1 Chinook Salmon

#### 9.1.1 Alaska

The majority of the chinook salmon returning to the Yukon River are 6-year old fish, however, 5 and 7-year old fish make a significant contribution to the run. Spawning escapement information was limited for the 1983 brood year (age 6 fish in 1989) due to poor survey conditions in lower Yukon streams. Escapements in other portions of the drainage during 1983 ranged from below to above average in magnitude. Spawning escapements for 1984 brood year fish (age 5 in 1989) ranged from average to above average in magnitude except in the Tanana River where index escapements were considerably below average. Average proportions of age 4 and 5 fish occurred in the 1988 commercial catch, which normally may indicate at least average survival and production for these brood years.

However, the proportions of these age classes in the commercial catch was influenced by increased use of small mesh gillnets which selectively capture smaller and younger fish. The return of age 7 fish (1982 brood year) is expected to be below average as the returns of this year class has been below average during the last two years. Based on this limited amount of information, the magnitude of the 1989 return is anticipated to be no better than average.

### 9.1.2 Canada

The total in-river return of Canadian-origin chinook during the past five years (1983-87) has averaged approximately 122,000 fish (based on Canadian population estimates, in-river catch data and Alaskan scale patterns analysis). The spawning escapement for this period averaged about 17,400 which is considerably below the interim escapement goal range of 33,000 to 43,000. The majority of the return is usually composed of 6-year old fish (64.2%) with significant contribution from 7-year olds (16.9%), and 5-year olds (14.9%).

Assuming the age composition produced from each of the principle brood years will be similar to the recent average, the major contributor to the 1989 chinook run is expected to originate from the 1983 brood year. Lesser but significant production should also stem from the 1982 and 1984 brood years. The total estimated Canadian chinook salmon escapement in these years (excluding Porcupine) was as follows:

YEAR	ESTIMATED SPAWNING ESCAPEMENT
1982	20,100
1983	29,300
1984	16,500

Combining the brood year escapement and average age composition data with an expected average production rate of 3 returning adults per spawner, the projected total return in 1989 is roughly 77,000 fish. This represents a below average return compared to the recent five-year average.

## 9.2 Summer Chum Salmon

### 9.2.1 Alaska

Summer chum salmon return primarily as 4-year old fish, although substantial 5-year old returns often result from brood years with high survival rates. The return of 4-year old fish in 1989 will be dependent on production from the 1985 brood year and survival of the resulting cohort. Based on available catch and escapement data, the magnitude of the 1985 summer chum salmon run was judged above average in abundance. The return of 5-year olds in 1989 is expected to be above average in strength based on the above average return of 4-year olds in 1988. The Anvik River summer chum salmon stock is expected to be the primary contributor to the 1989 return. In summary, based on evaluation of brood year run size data and assuming average survival, it is expected that the Yukon River summer chum salmon return in 1989 will be above average in magnitude.

### 9.3 Fall Chum Salmon

#### 9.3.1 Alaska

Similar to the summer run, fall chum salmon return primarily as 4-year old fish. Escapements in 1985 (which will produce 4-year olds in 1989) ranged from below average to above average in magnitude. The contribution of age 3 fish in the 1988 return was at least average based on preliminary data suggesting an at least average return of 4-year old fish in 1989. The return of 5-year fish (1984 brood year) is expected to be below average based on the contribution of 4-year olds to 1988 catches and below average escapements in 1984. In summary, based on evaluation of brood year escapements and assuming average survival, an average return of fall chum salmon is expected in 1989. Escapement data in 1985 suggests that the 1989 return will have a strong contribution from Porcupine River drainage stocks.

#### 9.3.2 Canada

The estimated escapement of Canadian-origin chum stocks (excluding the Porcupine drainage) has averaged 75,700 over the period 1983 to 1987. This is below the interim escapement goal range of 90,000 to 135,000. On average, the run is composed primarily of four-year old fish (73%), with lesser though variable proportions of three and five-year olds.

It is expected that the major contributing brood year for the 1989 return will be 1985 when tagging studies indicated a total escapement of about 62,000 chum. Assuming a productivity of two returning adults per spawner and combining this with age composition data and other brood year escapement data, the 1989 return is expected to approximate 121,000. Qualitatively, this estimate represents a below average return.

The return of chum salmon to Canadian portions of the Porcupine drainage should originate primarily from the 1985 brood year. The escapement through the Fishing Branch River weir in 1985 was approximately 56,100 which is in the lower part of the interim escapement goal range of 50,000 to 120,000. The weir has been in operation since 1985 (following a ten year absence) and counts have averaged about 40,000 from 1985 through 1988. The above average escapement in 1985 is expected to result in an above average return of chum salmon to this system in 1989. It should be emphasized however, that chum stocks in both the upper Yukon and Porcupine drainages appear to have been depressed in recent years, and therefore recent averages probably do not represent healthy stocks.

### 9.4 Coho Salmon

#### 9.4.1 Alaska

Coho salmon return primarily as 4-year old fish. Comprehensive escapement information for coho salmon is lacking, but escapement surveys in the Tanana River system indicated average run strength in 1985. An average sized return is projected in 1989.

## 10.0 Illegal Sales of Salmon and Salmon Roe in Alaska During 1987

Investigations by the Division of Fish and Wildlife Protection (FWP) in the Alaska Department of Public Safety have documented the volume of illegal sales of salmon and salmon roe in districts 5 and 6 during 1987. There have been 268 criminal charges filed against 17 fishermen to date by FWP for review and prosecution by the district attorney's office in Fairbanks. Civil charges have also been filed by FWP against one processor and are currently being prepared for a second processor.

Estimated illegal sales of salmon totalled 2,789 chinook and 42,274 "fall chum" salmon. The term "fall chum," is used here since these sales may also include an unknown volume of coho salmon which migrate through the fishery at the same time. Shipments and shipping records of frozen salmon were labelled "chums" without positive species identification being made. The vast majority of these fish (77% chinook, 90% "fall chum") came from the Tanana River (district 6) and represent only U.S. stocks. Only 653 chinook and 4,042 "fall chums" were taken in the main Yukon River (district 5) where both U.S. and Canadian stocks occur.

The majority of illegally sold salmon and roe in district 5 came from the area between the district 4 border and the Dalton Highway Bridge. It is believed that an unknown volume of illegally sold salmon and roe reported in district 5 actually came from the upper portion of district 4. Most of the illegally sold salmon and roe in district 6 came from the Manley Hot Springs and Nenana areas.

Illegal sales of chinook salmon were reported in numbers of fish by FWP and do not involve the sale of roe. The 653 illegally sold fish in district 5 amounted to only 3% of the reported commercial and subsistence catch of this species in this district. The 2,136 illegally sold chinook salmon in district 6 was much more significant, representing 40% of the reported commercial and subsistence catch and exceeding the reported commercial catch by 934 fish.

The illegal sales of "fall chum" salmon were reported by FWP in pounds of processed fish (dressed, heads off) which have been converted to estimated numbers of fish. It is estimated that 4,042 and 38,232 "fall chums" were illegally sold in districts 5 and 6, respectively. This amounted to 3% of the reported subsistence catch of fall chums in district 5 (2.9% for combined fall chum and coho subsistence catch) and 96% of the reported subsistence catch of fall chums in district 6 (60% for the combined fall chum and coho subsistence catch). The estimated numbers of illegally sold "fall" chums in district 6 exceeded the regulatory commercial guideline harvest for this district of 0 to 10,250 fall chum and coho salmon combined.

Commercial fishing for fall chum and coho salmon was closed throughout the Alaskan fishery in 1987. All of the illegal sales of "fall chums" in districts 5 and 6 occurred during the closed commercial fishing season. Illegal chinook salmon sales probably occurred during and after the commercial fishing season for this species in both districts.

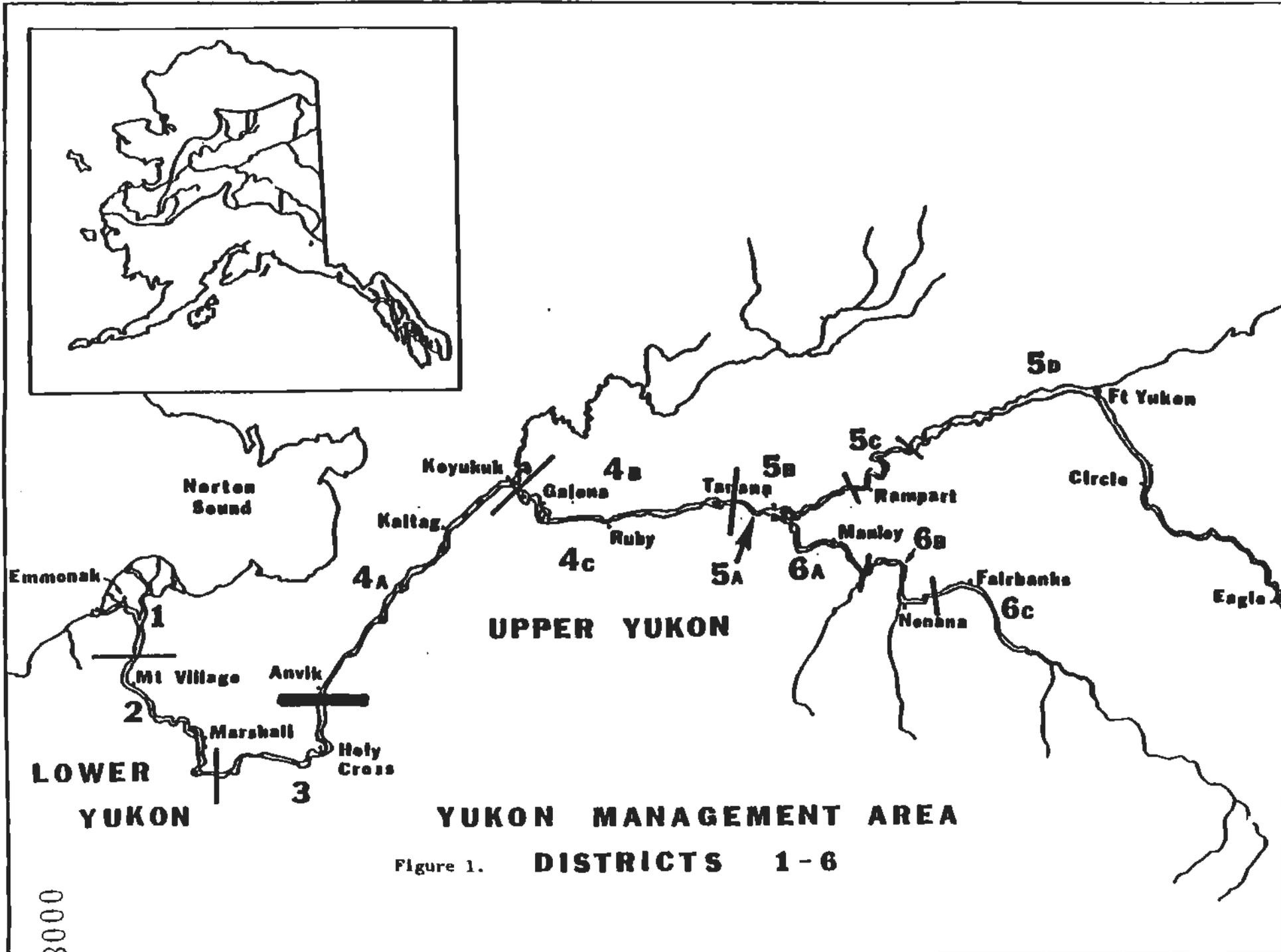
A total of 110,948 pounds of processed roe was also reported in the illegal sales in both districts in 1987. It is estimated that this amounted to 133,138 pounds of raw product, with 52,620 pounds taken from district 5 and 80,518 pounds taken

from district 6. It is known that illegally sold roe was produced from both fall chums and cohos based on seized processor records. The illegally sold salmon roe came from salmon taken in the subsistence fishery.

The reported poundages of illegally sold salmon roe were converted to estimated equivalent catches using several factors including average roe weight per female and sex composition of the catch. These conversion factors are based on limited information and the accuracy of the estimated equivalent catches cannot be quantified.

The estimated equivalent catches were compared to the reported subsistence catches (from ADF&G household interviews) for those portions of districts 5 and 6 where a majority of the illegal roe sales was believed to have occurred. The estimated equivalent catch of 101,898 (fall chum and coho salmon combined) exceeded the reported subsistence catch by 26,442 fish (26%) in district 5 (from the district 4 border to the Dalton Highway Bridge). The estimated equivalent catch of 122,804 exceeded the reported subsistence catch by 70,569 fish (57%) in district 6 (Manley Hot springs and Nenana).

These differences may be the result of one or more of the following: 1) under-reporting of subsistence catches; 2) factors used to convert roe poundages to equivalent catches were incorrect; and, 3) illegal sales included roe from other areas. The difference between the estimated equivalent catch and the reported subsistence catch may be exaggerated in district 5 since an unknown volume of illegally sold roe reported for this district actually came from other areas (for example, the upper portion of district 4. The reported subsistence catch for the entire district 5 area was 136,133 (fall chum and coho salmon combined). The reported subsistence catch for the entire district 6 area was 64,106 (fall chum and coho salmon combined).



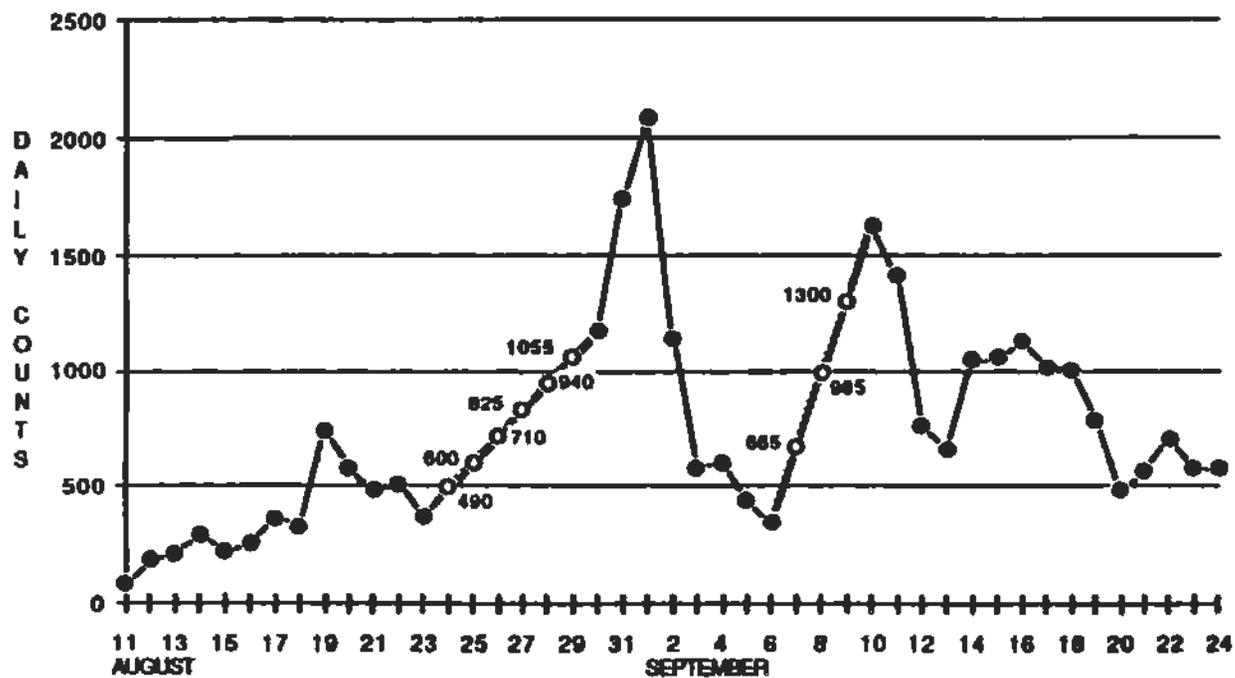
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Figure 2

1988 DAILY CHANDALAR SONAR COUNTS  
NORTH and SOUTH BANKS

N=33,619



35

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Table 1. Alaskan commercial catch of Yukon River salmon in 1988.\*

District Subdist.	No. of Fishermen	Summer Chum			Fall Chum		Coho	Total Salmon	
		Chinook	Chum	Roe (lbs)	Chum	Roe (lbs)		Salmon	Roe (lbs)
1	460	57,109	648,198	0	43,329	0	36,433	787,271	0
2	260	35,188	425,172	0	31,861	0	34,776	526,997	0
Subtotal	680 <sup>b</sup>	92,297	1,073,370	0	77,390	0	71,211	1,314,268	0
3	24	1,767	13,965	0	2,090	0	1,419	19,241	0
Total Lower Yukon	683 <sup>b</sup>	94,064	1,087,335	0	79,480	0	72,630	1,333,509	0
4 A	70	19	19,033	230,237	0	0	0	19,032	230,237
4 B,C	33	3,140	4,981	24,250	13,662	1,421	2	23,785	25,671
5 A,B,C	34	2,971	722	353	14,217	0	0	17,910	353
5 D	4	461	0	0	2,772	0	8	3,241	0
6	38	762	40,183	1,646	21,790	1,806	13,972	76,707	32
Total Upper Yukon	179	7,333	64,919	256,486	54,441	3,227	13,982	140,695	259,713
Total Yukon Area	862	101,417	1,152,254	256,486	133,921	3,227	86,612	1,474,204	259,713
5 Year Average 1983-1987	855	129,189	602,836	191,901	228,441 <sup>c</sup>	2,099	47,473 <sup>c</sup>	1,007,939	194,000

(a) Commercial catch of 1,037 pink salmon taken in Lower Yukon not included in totals.

(b) Some fishermen operated in more than one district.

(c) 1982 - 1986 Average since there was no fishery in 1987.

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Table 2. Chinook and summer chum salmon commercial catch and effort by district, lower Yukon River area, 1988.

DISTRICT 1								
Period Dates	Mesh Size	Hours Fished	No. of Fishermen	Chinook	Ave. Wt.	Chum	Ave. Wt.	
1	6/09-6/10	Restricted	12	374	3,350	17.9	64,010	7.5
2	6/13-6/14	Unrestricted	12	388	5,862	24.0	46,383	7.3
3	6/15	Restricted	6	280	1,650	18.7	42,824	7.3
4	6/16-6/17	Unrestricted	12	400	15,971	22.2	91,647	7.2
5	6/20-6/21	Unrestricted	12	402	10,959	22.5	21,186	7.2
6	6/23-6/24	Restricted	12	410	8,773	13.9	148,242	6.9
7	6/27-6/28	Restricted	12	392	3,280	16.0	38,744	6.9
8	6/30-7/01	Restricted	24	398	4,588	18.1	119,891	6.9
9	7/04-7/05	Restricted	24	312	1,610	18.0	33,269	6.7
10	7/07-7/08	Restricted	12	278	601	15.6	20,706	6.7
11	7/11-7/12	Restricted	12	222	268	17.7	9,712	6.7
12	7/14-7/15	Restricted	12	215	197	17.0	11,584	7.2
Subtotal			162	456	57,089	19.9	648,198	7.1

DISTRICT 2								
Period Dates	Mesh Size	Hours Fished	No. of Fishermen	Chinook	Ave. Wt.	Chum	Ave. Wt.	
1	6/12-6/13	Restricted	12	222	1,705	18.0	39,339	7.1
2	6/15-6/16	Unrestricted	12	211	2,666	22.6	12,899	7.4
3	6/17	Restricted	6	188	852	13.7	28,024	7.1
4	6/19-6/20	Unrestricted	12	222	9,031	22.0	32,012	7.1
5	6/22-6/23	Unrestricted	12	224	8,312	21.5	20,922	7.2
6	6/26-6/27	Restricted	12	227	4,526	14.3	91,587	6.9
7	6/29-6/30	Restricted	24	228	3,912	14.8	59,487	6.8
8	7/03-7/04	Restricted	24	215	2,229	16.2	70,792	6.9
9	7/06-7/07	Restricted	24	199	1,277	15.4	39,730	6.8
10	7/10-7/11	Restricted	12	167	451	15.9	15,733	6.5
11	7/13-7/14	Restricted	12	137	220	16.2	14,647	6.7
Subtotal			162	250	35,181	19.0	425,172	6.9

DISTRICT 3								
Period Dates	Mesh Size	Hours Fished	No. of Fishermen	Chinook	Ave. Wt.	Chum	Ave. Wt.	
1	6/19-6/20	Unrestricted	12	11	297	24.4	1,358	7.1
2	6/22-6/23	Unrestricted	12	13	995	21.8	1,588	7.2
3	6/26-6/27	Restricted	12	17	309	16.2	5,394	6.5
4	6/29-6/30	Restricted	24	16	166	14.2	5,625	6.5
Subtotal			60	22	1,767	20.6	13,965	6.7

LOWER YUKON TOTALS

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	Hours Fished	No. of Fishermen	Chinook	Ave. Wt.	Chum	Ave. Wt.
Total Y-1 and Y-2	324	674	92,270	19.6	1,073,370	7.0
Total Y-1, Y-2, and Y-3	384	678	94,037	19.6	1,087,335	7.0

Table 3. Fall chum and coho salmon commercial catch and effort by district, Lower Yukon River area, 1988.

District Y-1										
Period	Date	Hours	Number of Fishermen	Chinook		Coho		Fall Chum		% Coho
				No.	Avg Wt	No.	Avg Wt	No.	Avg Wt	
Y-1-13	8/8-9	6/12	284	8	10.5	8,410	7.2	32,480	8.2	20.6
Y-1-14	8/18-19	6/12	164	2	18.5	2,543	7.4	533	7.7	82.7
Y-1-15	8/22-23	6/12	246	5	13.8	11,714	7.5	6,870	7.5	63.0
Y-1-16	8/25-26	6/12	198	2	22.0	7,884	7.5	4,109	7.4	65.7
Y-1-17	8/29-30	6/12	178	3	9.3	5,884	7.4	1,537	7.5	79.3
Subtotal		30/60	328	20	13.1	36,435	7.4	45,529	8.0	44.5

District Y-2										
Period	Date	Hours	Number of Fishermen	Chinook		Coho		Fall Chum		% Coho
				No.	Avg Wt	No.	Avg Wt	No.	Avg Wt	
Y-2-12	8/10	6	173	3	14.0	2,682	7.3	16,018	8.2	14.3
Y-2-13	8/17	6	210	3	10.7	13,068	7.0	9,482	7.5	58.0
Y-2-14	8/21	6	164	0	0.0	6,935	7.3	2,126	7.5	76.5
Y-2-15	8/28	6	200	0	0.0	8,181	7.3	3,133	7.3	72.3
Y-2-16	8/31	6	148	1	35.0	3,910	7.4	1,102	7.7	78.0
Subtotal		30	233	7	15.6	34,776	7.2	31,861	7.8	52.2

District Y-3										
Period	Date	Hours	Number of Fishermen	Chinook		Coho		Fall Chum		% Coho
				No.	Avg Wt	No.	Avg Wt	No.	Avg Wt	
Y-3-05	8/10	6	3	0	0.0	10	6.3	98	8.0	9.3
Y-3-06	8/17	6	12	0	0.0	641	6.7	1,450	7.7	30.7
Y-3-07	8/21	6	10	0	0.0	768	7.1	542	7.5	58.6
Subtotal		18	13	0	0.0	1,419	6.9	2,090	7.6	40.4

Total Lower Yukon		78/60 a	563	27	13.7	72,630	7.3	79,480	7.9	47.7
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a A total of 60 hours fishing time in the Set Net Only area of District 1 and 78 hours in the remainder of the Lower Yukon area.

000880

Table 4. Commercial salmon catch and effort in district 4, upper Yukon River area, 1988

	Period Dates	Hours Fished	No. of Fishermen	Period Catch in Numbers and Pounds							
				ROE	Pounds	CHINOOK	Pounds	COHO	Pounds	CHUM	Pounds
1	6/19-6/21	48	52	0	5,100	0	0	0	0	1,557	11,398
2	6/22-6/24	48	64	0	7,193	92	2,028	0	0	1,862	12,960
3	6/26-6/28	48	79	0	28,109	131	2,440	0	0	3,890	28,187
4	6/29-7/01	48	83	0	35,685	263	4,677	0	0	7,268	53,898
5	7/03-7/05	48	88	0	48,160	779	9,774	0	0	3,795	29,246
6	7/06-7/08	48	89	0	37,684	858	10,967	0	0	2,959	22,313
7	7/10-7/12	48	87	0	31,509	506	6,454	0	0	1,138	8,532
8	7/13-7/15	48	78	0	24,901	241	3,400	0	0	369	2,687
9	7/17-7/19	48	67	0	13,773	106	1,570	0	0	324	2,172
10	7/20-7/22	48	63	0	9,983	79	918	0	0	135	890
11	7/24-7/26	48	40	0	7,034	42	597	0	0	44	298
12	7/27-7/29	48	42	0	4,747	50	792	0	0	454	3,980
13	7/31-8/01	30	15	0	601	3	48	0	0	219	1,934
CHINOOK AND SUMMER CHUM CATCHES			95	0	254,487	3,150	43,673	0	0	24,014	178,495
14	8/07-8/09	48	13	0	194	6	95	0	0	2,015	17,692
15	8/10-8/12	48	12	0	198	2	25	0	0	1,997	18,302
16	8/14-8/16	48	12	0	156	1	11	0	0	1,275	10,923
17	8/17-8/19	48	10	0	129	0	0	0	0	577	4,608
18	8/21-8/23	48	11	0	212	0	0	2	13	2,073	17,325
19	8/24-8/26	48	14	0	275	0	0	0	0	3,806	30,389
20	8/28-8/30	48	14	0	257	0	0	0	0	3,919	29,686
FALL CHUM AND COHO CATCHES			29	0	1,421	9	131	2	13	15,662	128,925
Season Total			97	0	255,900	3,159	43,804	2	13	39,676	307,420

000881

Table 5. Commercial salmon catch and effort in district 5, upper Yukon area, 1988.

	Period Dates	Hours Fished	No. of Fishermen	Period Catch in Numbers and Pounds							
				ROE	Pounds	CHINOOK	Pounds	COHO	Pounds	CHUM	Pounds
1	6/15-6/16	42	1	0	0	5	153	0	0	0	0
2	6/17-6/19	48	3	0	0	23	702	0	0	0	0
3	6/21-6/23	48	15	0	42	277	7,531	0	0	19	133
4	6/24-6/26	48	14	0	53	360	9,260	0	0	122	854
5	6/28-6/30	48	20	0	74	636	15,391	0	0	186	1,302
6	7/01-7/04	72	22	0	51	764	18,848	0	0	126	862
7	7/05-7/06	18	26	0	133	985	19,960	0	0	269	1,880
8	7/07-7/09	72	3	0	0	87	1,855	0	0	0	0
9	7/10-7/14	114	3	0	0	295	6,592	0	0	0	0
CHINOOK AND SUMMER CHUM CATCHES			28	0	353	3,432	80,292	0	0	722	5,031
10	8/18-8/19	24	15	0	0	0	0	0	0	6,591	51,328
11	8/20-8/21	24	16	0	0	0	0	0	0	7,626	59,243
12	9/09-9/14	110	2	0	0	0	0	0	52	2,772	21,053
FALL CHUM AND COHO CATCHES			20	0	0	0	0	0	52	16,989	522
Season Total			35	0	353	3,432	80,292	0	52	17,711	136,653

000882

Table 6. Commercial salmon catch and effort in district 6, upper Yukon area, 1988.

	Period Dates	Hours Fished	No. of Fishermen	Period Catch in Numbers and Pounds							
				ROE	Pounds	CHINOOK	Pounds	COHO	Pounds	CHUM	Pounds
1	7/01-7/03	42	1	0	0	0	0	0	0	62	434
2	7/04-7/06	42	5	0	12	0	0	0	0	203	1,421
3	7/08-7/10	42	15	0	170	105	1,830	0	0	1,570	11,081
4	7/11-7/13	42	22	0	94	90	1,640	0	0	3,582	24,984
5	7/15-7/17	42	21	0	216	38	801	0	0	3,876	27,097
6	7/18-7/20	42	25	0	100	30	479	0	0	5,855	40,675
7	7/22-7/24	42	25	0	109	188	2,841	0	0	5,065	34,718
8	7/25-7/27	42	24	0	231	153	2,675	0	0	4,518	29,317
9	7/29-7/31	42	24	0	151	63	1,204	0	0	3,619	23,052
10	8/01-8/03	42	23	0	149	39	609	0	0	2,767	17,388
11	8/05-8/07	42	22	0	124	31	547	0	0	2,252	13,786
12	8/08-8/10	42	20	0	163	16	249	0	0	2,552	15,637
13	8/12-8/14	42	14	0	64	3	60	60	399	2,016	13,071
14	8/15-8/17	42	14	0	55	6	53	0	0	2,238	14,288
CHINOOK AND SUMMER CHUM CATCHES			33	0	1,646	762	12,996	60	399	40,183	266,949
15	9/09-9/10	24	28	0	340	0	0	2,296	15,169	8,084	62,000
16	9/13-9/14	24	29	0	228	0	0	5,954	39,951	8,879	68,720
17	9/20-9/21	24	28	0	1,230	0	0	5,662	37,195	4,827	36,104
FALL CHUM AND COHO CATCHES			32	0	1,806	0	0	13,912	92,315	21,790	166,832
Season Total			38	0	3,452	762	12,996	13,972	92,714	61,973	433,781

000883

Table 7. Salmon spawning escapement estimates obtained by aerial surveys in the Yukon River drainage, 1988. a

Stream (drainage)	Date	Survey Rating	Chinook	Summer Chums	Fall Chums	Coho
<b>Andreafsky River</b>						
East Fork (Tower Count)	6/21-7/25		1,339	68,937	--	--
East Fork (Aerial)	7/16,9/13	Good,Good	(1,020)	(43,056)	--	1,913
West Fork (Aerial)	7/16,9/13	Fair,Fair	1,448	45,432	--	830
	Subtotal		2,787	114,369	--	2,743
<b>Atchuelinguk River (Chulinak R)</b>	7/16	Fair	915	47,174	--	176
<b>Yukon River (Pilot Station)</b>						
Main River Sonar b,c,w	6/2-9/14		(88,834)	(1,875,880)	(506,993)	(263,887)
<b>Innoko River</b>						
Reindeer Lake and River	7/29	Poor	0	21	--	--
<b>Anvik River</b>						
<b>Aerial Counts</b>						
Mainstem River	7/16,9/7	Fair,Fair	1,637	(120,450)	--	1,012
Beaver Creek	7/16	Fair	26	(5,700)	--	--
Canyon Creek	7/16	Fair	10	(5,800)	--	--
Otter Creek	7/16,9/7	Fair,Fair	100	(31,140)	--	--
Swift River	7/16,9/7	Fair,Fair	17	(7,750)	--	--
Yellow River	7/16	Fair	7	(1,510)	--	--
Sonar Count c,d	6/21-7/27		--	1,125,449	--	--
	Subtotal		1,805	1,125,449	--	1,203
<b>Rodo River</b>	7/14	Fair	282	13,872	--	--
<b>Nulato River</b>						
Below Forks	7/14	Good	72	0,565	--	--
South Fork	7/14	Good	714	15,132	--	--
North Fork	7/14	Good	989	18,386	--	--
	Subtotal		1,775	42,083	--	--
<b>Koyukuk River Drainage</b>						
<b>Gisasa River</b>	7/14,7/29	Good,Good	797	9,284	--	--
<b>Dakli River</b>	7/15	Good	0	4,985	--	--
Wheeler Creek	7/15	Good	0	6,793	--	--
	Subtotal		0	11,778	--	--
<b>Hogatza River</b>						
Caribou Creek	7/15	Good	0	4,020	--	--
Clear Creek	7/15	Good	0	2,870	--	--

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	Subtotal		0	6,898	--	--
Henshaw Creek	7/28	Good-Poor	180	1,106	--	--
South Fork Koyukuk River	7/28, 10/8z	Good, Poor	260	437	250 z	--
Jim River	7/28, 10/8z	Good, Poor	159	291	30 z	--
	Subtotal		419	728	280	--
Total Koyukuk River			1,396	29,786	280	--
Melozitna River						
Melozitna Hot Springs Creek	7/15	Fair	0	1,503	--	--
Tozitna River	7/23	Good	116	2,903	--	--
Lower Tanana River Drainage						
Kantishna River Drainage						
Toklat River						
Barton Creek	10/22	Fair	--	--	--	437
Floodplain vic Rdhse f	10/19-22	Good	--	--	10,786	36
Floodplain vic Rdhse (aerial)	10/11	Fair	--	--	(14,225)y	0
Geiger Creek g	10/20	Good	--	--	1,952	159
Sushana River g	10/21	Good	--	--	25	1
Population Estimate for upper Toklat area h			--	--	(13,324)	--
	Subtotal		--	--	12,763	633
Nenana River Drainage						
Seventeen Mile Slough	9/7	Good	--	--	200	--
Lost Slough	10/11	Fair	--	--	--	340
Julius Creek						
Clear Creek z	7/9-29		200 z	--	--	--
Wood Creek Weir Counts i	9/19-10/14		--	--	3,991 u	2,046
	Subtotal		200	--	4,191	2,394
Chena River (Aerial)	7/20, 7/27	Fair-Poor	1,966	432	--	--
Population Estimate j			(N.Y.A.)	--	--	--
	Subtotal		1,966	432	--	--
Salcha River (Aerial)	7/27, 8/1	Good, Poor	2,761	2,889	--	--
Population Estimate c, j, k			(4,562)	--	--	--
Foot Survey downstr bridge	10/23		--	--	10	--
	Subtotal		2,761	2,889	10	--
Total Lower Tanana River			4,927	3,321	16,964	3,027
Upper Tanana River Drainage						

Vicinity Benchmark 735 Slough	10/21	Good	--	--	20	--
Mainstem Tanana sloughs between Little Delta R and vicinity						
Andersen Slough	10/21	Good	--	--	550	--
Vicinity Andersen Slough	10/21	Good	--	--	315	--
Southbank Tanana Delta River	10/21	Fair	--	--	7,000	--
Aerial Survey	10/21	Good	--	--	(5,560)	--
Foot Survey	10/31	Good	--	--	16,591	17
Population Estimate h			--	--	(10,024)	--
Bluff Cabin Slough	10/21	Good	--	--	4,401	--
Bluff Cabin Spring	10/21	Good	--	--	--	40
Slough across from Bluff C.Sl.	10/28	Good	--	--	33	--
Clearwater Lake Outlet Slough	10/21	Good	--	--	2,312	--
Clearwater Lake and Outlet n,k	10/28	Good	--	--	--	825
Delta Clearwater River n,k	10/27-28	Good-Fair	--	--	75	21,600
Onemile Slough	10/21	Fair	--	--	1,520	--
Vicinity Pearse Slough	10/21	Good	--	--	1,715	--
Billy Creek Slough	10/28	Poor	--	--	151	--
Total Upper Tanana River			--	--	34,763	22,402
Total Tanana River			4,927	3,321	51,727	25,509
Bear Creek (foot)	7/21		--	67	--	--
Chandalar River						
Sonar Estimate c,d,e	8/11-9/24		--	--	33,619 c	-
Porcupine River Drainage						
Sheenjek River						
Sonar Estimate c,d	8/25-9/24		--	--	38,800 c	-
Coleen River z	9/12		--	--	20	-
Fishing Branch River (weir) c,q			--	--	23,597 c	-
Total Porcupine River				--	62,425	-
Nation River e,n	8/1-4,9/15		3	2	--	-
Tatonduk River e,n	8/19		--	4	--	-
Total Alaskan Portion of Drainage			14,806	1,380,634	124,454 t	29,531
Yukon Territory Streams						
White River						
Donjek River						
Kluane River q	10/19	Fair	--	--	6,950	
Tincup Creek q		Good	204	--	--	
Koidern River q	10/19	Good	--	--	0	

000886

	Subtotal		284	--	6,950	--
Pelly River						
Ross River	q	8/22	Fair	282	--	--
Ross River		8/18	Poor	(194)	--	--
Lewis Lake Outlet		8/18	Poor	48	--	--
Hoole River		8/18	Fair	132	--	--
	Subtotal		374	--	--	--
Tatchun Creek g						
		8/30		130	--	--
Little Salmon River						
ADF&G Aerial Survey		8/17	Fair	(318)	--	--
DFO Aerial Survey		8/23	Fair	368	--	--
Big Salmon River						
Big Salmon Lake to Scurvy Cr		8/16	Good-Fair	111	--	--
Scurvy Cr to Moose Cr		8/16	Good	300	--	--
Moose Cr to DFO weir		8/16	Good	200	--	--
DFO weir count	c	8/9-30	Incomplete	(344)	--	--
DFO weir to Bat Cr		8/16	Good	27	--	--
Bat Cr to Souch Cr		8/16	Good	119	--	--
	Subtotal		765	--	--	--
Teslin River Drainage						
Nisutlin River		8/15-16	Good-Fair	482	--	--
Wolf River		8/17	Fair-Good	121	--	--
Swift River		8/19	Poor	29	--	--
Morley River		8/19	Poor	17	--	--
Jennings River		8/19	Poor	14	--	--
	Subtotal		663	--	--	--
Takhihi River g						
Ibex River	q	8/20	Good	225	--	--
		8/29	?	3	--	--
	Subtotal		228	--	--	--
Whitehorse Fishway Counts c,q,r						
		7/31-9/3		405	--	--
Mainstem Yukon River						
Tatchun Creek to Ft Selkirk	q	8/18	Fair	-	--	1,550
Population Estimates	c,j,q,s			(43,936) <sup>c</sup>	--	(68,882) <sup>c</sup>
	Subtotal		--	--	--	1,550
Total Yukon Territory				3,137	--	32,097 <sup>c</sup>
Yukon River Drainage Totals				17,143	1,380,634	156,551

a Only peak estimates listed; carcass counts included. Data in parentheses not included in totals or subtotals.

b Biosonics sonar estimate.

c Preliminary.

- d Bendix side scan sonar estimate.
  - e U.S. Fish and Wildlife Service estimate.
  - f Combined foot and aerial estimate.
  - g Foot survey.
  - h Population estimate based upon replicate foot surveys and streamlife data.
  - i F.R.E.D. Division estimate.
  - j Population estimate based upon mark and recapture study.
  - k Sport Fish Division estimate.
  - n Boat survey.
  - q Canadian Department of Fisheries and Oceans (DFO) estimate.
  - r Includes 134 (74 females, 60 males) taken for hatchery brood stock. Of the remaining 271 which escaped 50 were hatchery-marked jack males. Thus, less than 221 chinooks passed were wild stock.
  - s Canadian estimates for Yukon Territory streams excluding the Fishing Branch River. Commercial and subsistence catches have not been removed from these estimates.
  - t Total for Alaskan portion of drainage does not include Fishing Branch River. Total for Yukon Territory includes Fishing Branch River.
  - u A total of 300 chum salmon were artificially spawned.
  - v A total of 362 coho salmon were artificially spawned for the Clear Hatchery. A total of 150 of the coho salmon returning to the weir were hatchery marked fish. All of these were included in the egg takes.
  - w An estimated 536,312 pink salmon were also estimated passing the sonar site.
  - y Aerial estimate was less reliable than combined aerial/foot surveys conducted October 19-22.
  - z Documentation by public.
- N.Y.A. - Not Yet Available

000888

Table 7. Preliminary salmon spawning escapement estimate indices and population counts in the Yukon River drainage, 1988.<sup>a</sup>

Stream (drainage)	Date	Survey Rating	Chinook	Summer Chums	Fall Chums	Coho
<b>Andreafsky River</b>						
East Fork (Tower Count)	6/21-7/25		1,338	68,837	--	--
East Fork (Aerial)	7/16,9/13	Good,Good	(1,020)	(43,058)	--	1,913
West Fork (Aerial)	7/16,9/13	Fair,Fair	1,448	45,432	--	830
Subtotal			2,787	114,369	--	2,743
Atochuelinguk River (Chulinak R)	7/16	Fair	815	47,174	--	176
Yukon River (Pilot Station)						
Main River Sonar b,c,w	6/2-9/14		(80,834)	(1,875,880)	(506,993)	(263,887)
Innoko River						
Reindeer Lake and River	7/29	Poor	0	21	--	--
Anvik River						
Aerial Counts						
Mainstem River	7/16,9/7	Fair,Fair	1,837	(120,450)	--	1,012
Beaver Creek	7/16	Fair	26	(5,700)	--	--
Canyon Creek	7/16	Fair	10	(5,800)	--	--
Otter Creek	7/16,9/7	Fair,Fair	108	(31,140)	--	76
Swift River	7/16,9/7	Fair,Fair	17	(7,750)	--	115
Yellow River	7/16	Fair	7	(1,510)	--	--
Sonar Count c,d	6/21-7/27		--	1,125,449	--	--
Subtotal			1,805	1,125,449	--	1,203
Redo River	7/14	Fair	282	13,872	--	--
Nulato River						
Below Forks	7/14	Good	72	6,565	--	--
South Fork	7/14	Good	714	15,132	--	--
North Fork	7/14	Good	989	18,386	--	--
Subtotal			1,775	42,083	--	--
<b>Koyukuk River Drainage</b>						
Gisasa River	7/14,7/29	Good,Good	797	9,284	--	--
Dakli River	7/15	Good	0	4,985	--	--
Wheeler Creek	7/15	Good	0	8,793	--	--
Subtotal			0	11,778	--	--
Caribou Creek	7/15	Good	0	4,020	--	--
Clear Creek	7/15	Good	0	2,870	--	--
Subtotal			0	8,890	--	--
Henshaw Creek	7/26	Good-Poor	180	1,106	--	--
South Fork Koyukuk River	7/28,10/8z	Good,Poor	260	437	250 z	--
Jim River	7/28,10/8z	Good,Poor	159	291	30 z	--
Subtotal			419	728	280	--
Total Koyukuk River			1,395	29,786	280	--
Melozitna River						
Melosi Hot Springs Creek	7/15	Fair	0	1,503	--	--
Tozitna River	7/23	Good	116	2,983	--	--
<b>Lower Tanana River Drainage</b>						
<b>Kantishna River Drainage</b>						
Toklat River						
Barton Creek	10/22	Fair	--	--	--	437
Floodplain vic Rdhae f	10/19-22	Good	--	--	10,786	36
Floodplain vic Rdhae (aerial)	10/11	Fair	--	--	(14,225)y	0
Geiger Creek g	10/20	Good	--	--	1,952	159
Sushana River g	10/21	Good	--	--	25	1

Table 7. Continued page 2.

Population Estimate for upper Toklat area h			--	--	(13,324)	--
Subtotal			--	--	12,763	633
Nanana River Drainage						
Seventeen Mile Slough	9/7	Good	--	--	200	--
Lost Slough	10/11	Fair	--	--	--	348
Julius Creek						
Clear Creek z	7/9-29		200 z	--	--	--
Wood Creek Weir Counts i	8/19-10/14		--	--	3,991 u	2,046 v
Subtotal			200	--	4,191	2,394
Chena River (Aerial)	7/20,7/27	Fair-Poor	1,966	432	--	--
Population Estimate j			(N.Y.A.)	--	--	--
Subtotal			1,966	432	--	--
Salcha River (Aerial)	7/27,8/1	Good,Poor	2,761	2,888	--	--
Population Estimate c,j,k			(4,562)	--	--	--
Foot Survey dnwstr bridge	10/23		--	--	10	--
Subtotal			2,761	2,889	10	--
Total Lower Tanana River			4,927	3,321	16,984	3,027
Upper Tanana River Drainage						
Vicinity Benchmark 735 Slough	10/21	Good	--	--	20	--
Maintained Tanana sloughs between Little Delta R and vicinity						
Andersen Slough	10/21	Good	--	--	550	--
Vicinity Andersen Slough	10/21	Good	--	--	315	--
Southbank Tanana	10/21	Fair	--	--	7,000	--
Delta River						
Aerial Survey	10/21	Good	--	--	(5,560)	--
Foot Survey	10/31	Good	--	--	18,591	17
Population Estimate h			--	--	(18,024)	--
Bluff Cabin Slough	10/21	Good	--	--	4,481	--
Bluff Cabin Spring	10/21	Good	--	--	--	40
Slough across from Bluff C.Sl.	10/28	Good	--	--	33	--
Clearwater Lake Outlet Slough	10/21	Good	--	--	2,312	--
Clearwater Lake and Outlet n,k	10/28	Good	--	--	--	825
Delta Clearwater River n,k	10/27-28	Good-Fair	--	--	75	21,600
Onemile Slough	10/21	Fair	--	--	1,520	--
Vicinity Pearse Slough	10/21	Good	--	--	1,715	--
Billy Creek Slough	10/28	Poor	--	--	151	--
Total Upper Tanana River			--	--	34,763	22,482
Total Tanana River			4,927	3,321	51,727	25,509
Bear Creek (foot)	7/21		--	67	--	--
Chandalax River						
Sonar Estimate c,d,e	8/11-9/24		--	--	33,619 c	--
Porcupine River Drainage						
Sheenjek River						
Sonar Estimate c,d	8/25-9/24		--	--	38,800 c	--
Coleen River z	9/12		--	--	28	--
Fishing Branch River (weir) c,q			--	--	23,597 c	--
Total Porcupine River			--	--	62,425	--
Nation River e,n	8/1-4,8/15		3	2	--	--
Tatonduk River e,n	8/19		--	4	--	--
Total Alaskan Portion of Drainage			14,008	1,380,634	124,454 t	29,631

000890

Table 7. Continued - page 3.

## Yukon Territory Streams

White River							
Donjak River							
Kluane River	q	10/18	Fair	--	--	6,950	--
Tincup Creek	q	8/18	Good	204	--	--	--
Koidern River	q	10/19	Good	--	--	0	--
Subtotal				204	--	6,950	--
Fally River							
Ross River	q	8/22	Fair	202	--	--	--
Ross River		8/18	Poor	(194)	--	--	--
Lewis Lake Outlet		8/18	Poor	40	--	--	--
Hools River		8/18	Fair	132	--	--	--
Subtotal				374	--	--	--
Tatchun Creek g							
				130	--	--	--
Little Salmon River							
ADFG Aerial Survey		8/17	Fair	(318)	--	--	--
DFO Aerial Survey		8/23	Fair	368	--	--	--
Big Salmon River							
Big Salmon Lake to Sourvy Cr		8/18	Good-Fair	111	--	--	--
Sourvy Cr to Moose Cr		8/18	Good	300	--	--	--
Moose Cr to DFO weir		8/18	Good	208	--	--	--
DFO weir count	c	8/9-30	Incomplete	(344)	--	--	--
DFO weir to Bat Cr		8/18	Good	27	--	--	--
Bat Cr to Souch Cr		8/18	Good	118	--	--	--
Subtotal				765	--	--	--
Teslin River Drainage							
Nisutlin River		8/15-16	Good-Fair	482	--	--	--
Wolf River		8/17	Fair-Good	121	--	--	--
Swift River		8/19	Poor	29	--	--	--
Morley River		8/18	Poor	17	--	--	--
Jennings River		8/19	Poor	14	--	--	--
Subtotal				663	--	--	--
Tehihi River q							
Iber River	q	8/20	Good	225	--	--	--
Iber River	q	8/29	?	3	--	--	--
Subtotal				228	--	--	--
Whitehorse Fishway Counts c,q,r							
				405	--	--	--
Mainstem Yukon River							
Tatchun Creek to Ft Selkirk	q	10/18	Fair	--	--	1,550	--
Population Estimates	c,j,q,s			(43,936)c	--	(68,082)c	--
Subtotal				--	--	1,550	--
Total Yukon Territory				3,137	--	32,097 t	--
Yukon River Drainage Totals				17,143	1,380,634	156,551	29,631

a Only peak estimates listed; carcass counts included. Data in parentheses not included in totals or subtotals.

b Biosonics sonar estimate.

c Preliminary.

d Bendix side scan sonar estimate.

e U.S. Fish and Wildlife Service estimate.

f Combined foot and aerial estimate.

g Foot survey.

h Population estimate based upon replicate foot surveys and streamlife data.

i F.R.E.D. Division estimate.

j Population estimate based upon mark and recapture study.

k Sport Fish Division estimate.

n Boat survey.

q Canadian Department of Fisheries and Oceans (DFO) estimate.

000891

Table 7. Continued - page 4.

- r Includes 134 (74 females, 60 males) taken for hatchery brood stock. Of the remaining 271 which escaped 50 were hatchery-marked jack males. Thus, less than 221 chinooks passed were wild stock.
  - s Canadian estimates for Yukon Territory streams excluding the Fishing Branch River. Commercial and subsistence catches have not been removed from these estimates.
  - t Total for Alaskan portion of drainage does not include Fishing Branch River. Total for Yukon Territory includes Fishing Branch River.
  - u A total of 300 chum salmon were artificially spawned.
  - v A total of 362 coho salmon were artificially spawned for the Clear Hatchery. A total of 150 of the coho salmon returning to the weir were hatchery marked fish. All of these were included in the egg takes.
  - w An estimated 536,312 pink salmon were also estimated passing the sonar site.
  - y Aerial estimate was less reliable than combined aerial/foot surveys conducted October 19-22.
  - z Documentation by public.
- N.Y.A. - Not Yet Available

000892

Table 8. Chinook salmon escapement index counts for selected spawning areas in the Yukon River drainage, 1959-1988. a

Year	Andreafsky		Anvik		Nulato	Chena	Salcha	Big Salmon	Nisutlin	Whitehorse Fishway
	E Fork	W Fork	Aerial	Tower						
1959										1,054
1960	1,020	1,220	1,950		756	132 b	1,660			660
1961	1,003		1,226		543 b		2,878			1,068
1962	675 b	762 b					937			1,500
1963						137 b				484
1964	867	705					450			587
1965		355 b	650 b				408			903
1966	361	303	638				800			563
1967		276	336 b							533
1968	380	383	310 b				739	827 b	407	414
1969	231 b	274 b	296 b				461 b	286 b	105 b	334
1970	665	574 b	368				1,082	670	615	625
1971	1,904	1,682				193 d	158 b	200 b	650	856
1972	798	582 b		1,198		130 d	1,193	560	237	391
1973	825	788		613		21 b	391	75 b	36 b	224
1974		285		471 b	78 b	1,035 c	1,057	70 b	150 b	273
1975	993	301		730	204	316 c	1,055	153 b	239	313
1976	818	643		1,154	648	531	1,641	86 b	102	121
1977	2,008	1,499		1,371	487 b	563	1,202	316 b	77	277
1978	2,407	1,062		1,324	920	1,726	3,499	524	375	725
1979	1,180	1,134		1,484	1,507	1,159 b	4,789	632	713	1,184
1980	958 b	1,500	1,330		1,323 b	2,541	6,757	1,568	975	1,383
1981	2,146 b	231 b	807 b		791 b	600 b	1,237 b	2,411	1,626	1,539
1982	1,274	851 b				2,073	2,534	757	578	473
1983			653 b		1,006	2,553	1,961	540	701	905
1984	1,573 b	1,993	641 b			501	1,031	1,044	832	1,042
1985	1,617	2,248	1,051		2,780	2,553	2,035	801	409	536
1986	1,954	3,158	1,118		2,974	2,031 b	3,368	745	459 b	541
1987	1,068	3,141	1,174		1,638	1,312	1,898	1,121	183	327
1988	1,020	1,448	1,637		1,775	1,966	2,761	765	269	405 e

a Data obtained by aerial survey unless otherwise noted. Only peak counts are listed.

Interim escapement objectives: East Fork Andreafsky - 1,600

West Fork Andreafsky - 1,000

Anvik (mainstem, primarily upstream from Yellow R.) - 500

Nulato - 1,000

Chena - 1,700

Salcha - 3,500

Interim escapement objectives have not been established for individual Canadian spawning areas.

b Incomplete survey and/or poor survey timing or conditions resulted in minimal or inaccurate count.

c Boat survey.

d Boat survey that was incomplete or conducted under poor conditions.

e includes 50 fin clipped fish of hatchery origin

000893

Table 9. Summer chum salmon escapement population estimates and index counts for selected spawning areas in the Yukon River drainage, 1974-1988. a

	Andreafsky			Anvik				
	E Fork Aerial	E F Sonar or Tower	W Fork Aerial	Tower & Aerial	Sonar	Mulato	Hogatza	Salcha
1974	3,215	b	33,578	281,277		51,168		3,510
1975	223,485		235,954	845,485		138,495	22,355	7,573
1976	185,347		118,420	486,166		40,881	b 20,744	6,474
1977	112,722		63,128	262,854		69,668	18,734	677 b
1978	127,858		57,321	251,339		54,488	5,182	5,485
1979	66,471		43,391		288,537	37,184	14,221	3,868
1980	36,823	b	115,457		492,676	14,946	b 19,786	4,148
1981	81,555	147,312			1,479,582	14,348	b	8,588
1982	7,581	b 181,352	7,267	b	444,581		4,984	b 3,756
1983		118,688			362,912	21,812	b 28,141	716 b
1984	95,288	b 78,125	238,565		891,828			9,818
1985	66,146		52,758		1,888,243	29,838	22,566	3,178
1986	83,931	167,614	99,373		1,189,682	64,265		8,828
1987	6,687	45,221	3,537		455,876	11,257	5,669	b 3,657
1988	43,856	68,937	45,432		1,125,449	42,883	6,898	2,889 b

a Data obtained by aerial survey unless otherwise noted. Only peak counts are listed.

Interim escapement objectives: East Fork Andreafsky (aerial) - 189,000  
 West Fork Andreafsky (aerial) - 116,000  
 Anvik (sonar) - 487,000  
 North Fork Mulato - 53,000  
 Hogatza (Clear and Caribou Creeks) - 17,000  
 Salcha - 3,588

b Incomplete survey and/or poor survey timing or conditions resulted in minimal or inaccurate count.

000894

Table 10. Fall chin salmon expanded population escapement estimates for selected spawning areas in the Yukon River drainage, 1974-1988.

Year	Upper			Fishing	Total
	Delta a	Toklat b	Sheenjek c	Branch d	
1974	5,915	43,484	89,966	32,525 w	171,890
1975	3,734 p	90,984	173,371	353,282 w	621,371
1976	6,312 p	53,882	26,354	36,584	123,132
1977	16,876 p	36,462	45,544	88,488	187,282
1978	11,136	37,857	32,449	40,800	121,442
1979	8,355	179,627	91,372	119,898	399,252
1980	5,137	26,373	28,933	55,268	115,711
1981	23,588	15,775	74,568	57,386 e	171,229
1982	4,235	3,681	31,421 s	15,901	55,158
1983	7,785	28,887	49,392 s	27,288	105,104
1984	12,411	16,511	27,138 s	15,158	71,282
1985	17,276 p	22,885	152,768 s	56,188 w	248,949
1986	6,783	18,983	83,197 s	31,173 w	139,976
1987	21,188 p	22,141	148,886 s	48,956 w	232,363
1988 f	16,591	12,763	45,888 s	23,597 w	92,938

a Total escapement estimates made from migratory time density curve (Baxton 1986) unless otherwise indicated; (p) population estimate from replicate foot surveys and stream life data.

Interim escapement objectives: Delta - 11,000  
 Upper Toklat - 33,000  
 Sheenjek - 62,000  
 Fishing Branch - 56,800/120,000

b Total escapement estimates using Delta River migratory time density curve and percentage of live salmon present by survey date in the upper Toklat River area.

c Total escapement estimates using sonar to aerial survey expansion factor of 2.221 unless otherwise indicated; (s) sonar estimate.

d Total escapement estimates using weir to aerial survey expansion factor of 2.72 unless otherwise indicated; (w) weir estimate.

e 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.

1988 f Data are very preliminary: Delta and upper Toklat estimates are unexpanded peak counts from aerial and/or foot surveys and the Sheenjek estimate is an approximation of total expanded sonar count.

000895

Table 11. Summary of unadjusted chum salmon recoveries from voluntary program, South Peninsula tagging study.

Fishery	Recoveries in Fisheries				Combined Area Releases	Non-fishery Recoveries	
	Unimak Releases (#'s)	(%)	Shumagin Releases (#'s)	(%)		Unimak Releases	Shumagin Releases
Kotzebue	2	66.7%	1	33.3%	3		
Norton Sound	6	60.0%	4	40.0%	10	3	
Yukon							
Summer Run	14	73.7%	5	26.3%	19	1	
Fall Run	2	33.3%	4	66.7%	6		
Total Yukon	16	64.0%	9	36.0%	25	1	
Kuskokwim							
Kuskokwim Bay	6	75.0%	2	25.0%	8	5	1
Kuskokwim River	94	67.6%	45	32.4%	139	1	1
Total Kuskokwim	100	68.0%	47	32.0%	147	6	2
Bristol Bay							
Togiak	69	77.5%	20	22.5%	89	1	1
Nushagak	132	77.6%	38	22.4%	170		
Naknek/Kvichak	23	60.5%	15	39.5%	38	1	
Egegik	12	75.0%	4	25.0%	16		
Ugashik	8	72.7%	3	27.3%	11		
Total Bristol Bay	244	75.3%	80	24.7%	324	2	1
North Peninsula							
Northern District	25	67.6%	12	32.4%	37		
Northwestern District	18	90.0%	2	10.0%	20		
Total	43	75.4%	14	24.6%	57		
South Peninsula June							
Unimak(Southwestern)	37	49.3%	38	50.7%	75		
Shumagin		0.0%	2	100.0%	2		
S.E. Mainland		0.0%		0.0%	0		
Total	37	48.1%	40	51.9%	77		

000896

Table 11(Continued). Summary of unadjusted chum salmon recoveries from voluntary program, South Peninsula tagging study.

Fishery	Recoveries in Fisheries				Non-fishery Recoveries		
	Unimak Releases (#'s)	Unimak Releases (%)	Shumagin Releases (#'s)	Shumagin Releases (%)	Combined Area Releases	Unimak Releases	Shumagin Releases
South Peninsula July							
Southwestern	6	35.3%	11	64.7%	17		1
Southcentral	10	33.3%	20	66.7%	30		
Shumagin	4	22.2%	14	77.8%	18		
S.E. Mainland	13	65.0%	7	35.0%	20		
Total	33	38.8%	52	61.2%	85		1
Chignik	1	10.0%	9	90.0%	10		
Kodiak		0.0%	4	100.0%	4		
Cook Inlet	1	25.0%	3	75.0%	4		2
Prince William Sound	1	100.0%		0.0%	1		2
Southeast							1
Coastal British Columbia	0	0.0%	1	100.0%	1		
Coastal Japan	7	19.4%	29	80.6%	36		
Coastal USSR	6	54.5%	5	45.5%	11		
Unknown Area	14	82.4%	3	17.6%	17		
All Areas Combined	511		301		812	12	9
Total Recoveries	833						

000897

Table 12. Date and location of release, date and fishing district of recovery, and fall or summer run designation for tagged chum salmon returning to the Yukon River.

Tag Number	Release Area	Release Date	Fishing District of Recovery	Statistical Area of Recovery	Recovery Date	Run Designation b/
15600	Shumagine	6/08/87	Hooper Bay	337 - 00	6/24/87	Summer
16007	Unimak	6/13/87	Hooper Bay	337 - 00	6/27/87	Summer
16654	Unimak	6/23/87	Y-1	334 - 10	7/10/87	Summer
24749	Shumagine	6/18/87	Y-1	334 - 10	7/07/87	Summer
22082	Unimak	6/24/87	Y-1	334 - 11	7/10/87	Summer
15501	Shumagine	6/06/87	Y-1	334 - 12	6/29/87	Summer
16260	Unimak	6/16/87	Y-1	334 - 13	7/02/87	Summer
16689	Unimak	6/23/87	Y-1	334 - 13	7/13/87	Summer
24654	Shumagine	6/18/87	Y-1	334 - 13	7/10/87	Summer
16591	Unimak	6/19/87	Y-1	334 - 13	7/10/87	Summer
17157	Unimak	6/24/87	Y-1	334 - 14	7/10/87	Summer
24905	Shumagine	6/19/87	Y-1	334 - 15	7/10/87	Summer
17115	Unimak	6/24/87	Y-1	334 - 17	7/10/87	Summer
15371	Unimak	6/19/87	Y-2	334 - 20	7/19/87	Fall
16164	Unimak	6/13/87	Y-2	334 - 20	7/02/87	Summer
16319	Unimak	6/18/87	Y-2	334 - 20	7/09/87	Summer
16384	Unimak	6/19/87	Y-2	334 - 20	7/19/87	Fall
16033	Unimak	6/13/87	Y-2	334 - 21	7/01/87	Summer
24818	Shumagine	6/19/87	Y-2	334 - 22	7/19/87	Fall
16401	Unimak	6/19/87	Y-2	334 - 23	7/12/87	Summer
24522	Shumagine	6/18/87	Y-4	334 - 40	8/19/87	Fall
16182	Unimak	6/13/87	Y-4	334 - 41	7/14/87	Summer
17130	Unimak	6/24/87	Y-4	334 - 42	7/31/87	Summer
26038	Shumagine	7/01/87	Y-6	334 - 62	9/27/87	Fall
26052	Shumagine	7/01/87	Y-6	334 - 62	9/11/87	Fall

a/ Includes only tag recoveries for which the date and location of recovery are known.

b/ Date and location serve as criteria for classification of each recovery to the summer or fall run of chum salmon. In accordance with management strategy and implementation of guideline harvest levels, all chum salmon through District Y-1 prior to 7/16 are classified as summer chum salmon. Fish passing through District Y-1 on 7/16 and after are fall chum salmon. Estimated travel time between Districts Y-1 and Y-2 is three days. Chum salmon passing through District Y-2 prior to 7/19 are summer chum salmon. Fish passing through District Y-2 on 7/19 and after are considered fall run chum salmon. District Y-6a is closed by regulation 8/1 to conserve fall chum salmon returns.

000898

Table 13. Summary of results of 1987 South Peninsula tagging study for chum salmon. Included are numbers and proportions of tagged fish in returns to various Western and Central Alaska salmon fisheries and tagged fish dying from tagging mortality, and Asian stocks.

Fishery	Combined Releases			Unimak Releases			Shumagin Releases		
	Numbers of Tagged Fish In Return	Proportion With Asian Stocks	Proportion Without Asian Stocks	Numbers of Tagged Fish In Return	Proportion With Asian Stocks	Proportion Without Asian Stocks	Numbers of Tagged Fish In Return	Proportion With Asian Stocks	Proportion Without Asian Stocks
Kotzebue	7	0.2%	0.4%	5	0.2%	0.4%	2	0.1%	0.3%
Norton Sound	28	0.7%	1.6%	17	0.8%	1.5%	11	0.6%	1.9%
Yukon Summer	57	1.4%	3.3%	42	1.9%	3.7%	15	0.8%	2.6%
Yukon Fall	29	0.7%	1.7%	10	0.5%	0.9%	19	1.1%	3.2%
Kuskokwim	516	13.0%	30.1%	352	16.0%	31.2%	164	9.2%	27.9%
Bristol Bay	667	16.8%	38.9%	498	22.6%	44.1%	170	9.6%	29.0%
North Peninsula	155	3.9%	9.0%	120	5.4%	10.6%	35	2.0%	6.0%
South Peninsula July	189	4.7%	11.0%	75	3.4%	6.6%	115	6.5%	19.6%
Other Stocks	66	1.7%	3.9%	9	0.4%	0.8%	56	3.2%	9.5%
<b>Total Alaskan Stocks</b>	<b>1714</b>	<b>43.0%</b>	<b>100.0%</b>	<b>1128</b>	<b>51.1%</b>	<b>100.0%</b>	<b>587</b>	<b>33.1%</b>	<b>100.0%</b>
Tagging Mortality	2264	---		1252	---		1012	---	
South Peninsula June Fishery Removals	77	---		37	---		40	---	
Asian Stocks	2268	57.0%		1078	48.9%		1189	66.9%	
<b>Total Releases</b>	<b>6323</b>			<b>3495</b>			<b>2828</b>		
Surviving Releases	3982			2206			1776		

57

668000

Table 14. Total catch and estimated catch of Western Alaska (including Canadian Yukon) chinook salmon (in thousands of fish) in Japanese high seas salmon gillnet fisheries, 1964-1988 a,b

Year	Mothership		Landbased		Combined	
	Total Catch	W.AK Catch	Total Catch	W.AK Catch	Total Catch	W.AK Catch
1964	410	179	208	40	618	219
1965	185	106	102	20	287	126
1966	208	108	118	22	326	130
1967	128	71	115	22	243	93
1968	362	244	97	18	459	262
1969	554	367	88	17	642	384
1970	437	312	148	28	585	340
1971	206	132	139	27	345	159
1972	261	189	107	20	368	209
1973	119	56	165	31	284	87
1974	361	208	188	36	549	244
1975	162	108	137	20	299	407
1976	285	117	201	42	486	159
1977	93	55	146	31	239	86
1978	105	36	210	63	315	99
1979	126	69	160	45	286	114
1980	704	416	160	22	864	438
1981	88	30	190	55	278	85
1982	107	45	165	41	272	86
1983	87	31	178	44	265	75
1984	82	36	92	21	174	57
1985	66	25	101	22	167	47
1986	60	24	77	20 <sup>c</sup>	137	44 <sup>c</sup>
1987 <sup>d</sup>	39	20	77	NA	116	NA
1988	26	NA	47	NA <sup>e</sup>	73	NA <sup>e</sup>

a Sources: 1964-83: Rogers, Donald et al., 1984. Origins of chinook salmon in the area of Japanese Mothership Fisheries. Fisheries Research Institute, University of Washington. 113 pgs. 1964-1987 WA catch estimate for mothership fishery: Mike Dahlburg, National Marine Fisheries Service, Juneau, AK.

b Western Alaska catches represent fish from Bristol Bay, Kuskokwam, Yukon River and Norton Sound areas.

c Eric Rogers, Donald. April, 1987. Interceptions of Yukon Salmon by High Seas Fisheries. Fishery Research Institute, University of Washington, 34 pp. Dahlburg, Michael T. (NMFS) reported 9/27/86 an estimate of 24,000 west AK chinook salmon intercepted by mothership fleet. The difference between these two estimates results in the estimate of 20,000 Western AK chinooks intercepted in the landbased fishery for 1986.

d Preliminary information.

e Data not available.

000900

Table 15. Estimated incidental catches (numbers and metric tons) of salmon (*Oncorhynchus* spp.) in the foreign and joint venture groundfish fisheries in the Bering Sea and Aleutian Islands region, 1977 - 1988<sup>a</sup>.

Year	Foreign		Joint Venture		Total	
	Number <sup>b</sup>	Tons <sup>b</sup>	Numbers	Tons	Numbers	Tons
1977	47,840	198	NF	NF	47,840	198
1978	44,548	137	NF	NF	44,548	137
1979	107,706	340	NF	NF	107,706	340
1980	120,104	381	1,898	7	122,002	388
1981	42,337	137	854	3	43,191	140
1982	21,241	85	2,382	8	23,623	92
1983	18,173	66	24,493	54	42,666	120
1984	16,516	51	67,622	160	84,138	211
1985	10,003	33	10,420	30	20,423	63
1986	1,643	5	19,340	66	20,983	71
1987	3,386	13	10,848	41	14,937	54
1988	NF	NF	9,213	N/A	9,213	N/A

a Estimated catches for years 1977 - 1987 from Berger and Weikart, 1988, NOAA Tech. MEMO. NMFS F/NWC - 148. Data for 1988 from NMFS, Alaska Region, Juneau, Alaska

b N/A = Data not available. NF = No fishing.

000901

Table 16. Estimated incidental catches (numbers and metric tons) of salmon (*Oncorhynchus* spp.) in the foreign and joint venture groundfish fisheries in the Gulf of Alaska, 1977 - 1988<sup>a</sup>.

Year	Foreign		Joint Venture		Total	
	Number <sup>b</sup>	Tons <sup>b</sup>	Numbers	Tons	Numbers	Tons
1977	5,272	19	NF	NF	5,272	19
1978	45,603	131	c	c	45,603	131
1979	20,410	69	1,050	2	21,460	71
1980	35,901	107	168	1	36,069	108
1981	30,860	96	0	0	30,860	96
1982	5,556	19	1,411	3	6,967	22
1983	9,621	32	4,253	12	13,874	44
1984	12,001	36	63,845	169	75,846	205
1985	365	2	13,737	39	14,102	41
1986	NF	NF	20,820	54	20,820	54
1987	NF	NF	1,221	4	1,221	4
1988	NF	NF	137	N/A	137	N/A

a Estimated catches for years 1977 - 1988 from Berger and Weikart, 1988, NOAA Tech. MEMO. NMFS F/NWC - 148.

b N/A = Data not available. NF = No fishing.

c No estimates of incidental catch were made of the limited joint-venture fishery in 1978.

000902

Table 17. Catches for the 1988 Yukon River Chinook and Chum fisheries.

Week Ending	Chinook		Chum		No. of Fishermen	Days Fishing
	TFW	TTD	TFW	TTD		
Jun 26	1	1	---	---	--	2
Jul 03	4	4	---	---	2	2
Jul 10	55	59	---	---	10	2
Jul 17	363	422	---	---	13	2
Jul 24	2,267	2,267	---	---	16	5
Jul 31	4,292	6,981	14	14	17	5
Aug 07	3,678	10,659	84	98	20	5
Aug 14	1,967	12,626	53	151	17	5
Aug 21	399	13,025	56	207	10	4
Aug 28	68	13,093	154	361	6	4
Sep 04	30	13,123	2,208	2,569	8	4
Sep 11	10	13,133	6,994	9,563	10	4
Sep 18	9	13,142	5,227	14,790	10	4
Sep 25	---	13,142	8,679	23,469	12	4
Oct 02	---	---	5,085	28,554	14	4
Oct 09	---	---	839	29,393	8	4
Oct 16	---	---	521	29,914	4	4
		75 <sup>a</sup>		349 <sup>a</sup>		
Total		13,217		30,263		

a Represents catch that was reported late without any associated date of capture information.

000903

