

SALMON STOCKS AND FISHERIES IN
THE YUKON AREA, ALASKA, 1989

A Report to the Alaska Board of Fisheries

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INTRODUCTION

Area Description and Legal Gear

The Yukon area includes all waters of the Yukon River drainage in Alaska and coastal waters from Canal Point Light near Cape Stephens to the Naskonat Peninsula. For management purposes, the area is divided into six districts and 10 subdistricts (Figure 1). Commercial and subsistence fishing occurs along the entire 1,200 mile length of the Yukon River in Alaska and in the lower 220 miles of the Tanana River. The Lower Yukon Area (Districts 1, 2, and 3) includes the coastal waters of the delta and that portion of the drainage from the mouth to Old Paradise Village (river mile 301). The Upper Yukon Area (Districts 4, 5, and 6) is that portion of the drainage upstream of Old Paradise Village to the US/Canada border, including the Tanana River drainage. Commercial and subsistence fisheries also occur in Canada, with fishery management activities conducted by the Canadian Department of Fisheries and Oceans (DFO). Annual Yukon River drainage salmon harvests have exceeded 1.1 million fish since 1974 (Tables 1-5).

Legal commercial fishing gear consists of set and drift gill nets in the Lower Yukon Area and fish wheels and set gill nets in the Upper Yukon Area. Open skiffs powered by outboard motors are used to operate the fishing gear and to deliver fish to tenders or buying stations. Subsistence fishing gear commonly used to capture salmon includes gill nets and fish wheels.

Management Considerations

The objective of the Department's research and management program is to manage the various salmon runs for optimum sustained yield. Management is made difficult by the character of salmon runs, the nature of the various fisheries, and the river itself. Since most of the commercial fisheries have only developed or expanded in recent years, there is a lack of adequate escapement and return data on which to fully evaluate the effects of increased commercial harvests. The various Alaska fisheries, which are scattered over 1,400 river miles, harvest mixed stocks which may be several weeks and hundreds of miles from their spawning grounds. Because the Yukon River commercial fisheries harvest mixed stocks, some tributary populations may be under- or overharvested in relation to their actual abundance.

Management of the Yukon River commercial salmon fishery must be conservative because of the difficulty in determining run size, harvesting of mixed stocks, increased effort and efficiency of the commercial fleet, allocation concerns, and the need to provide for

upriver escapements and subsistence requirements. Important management techniques, in addition to the guideline harvest ranges, include establishing gill net mesh size restrictions, weekly fishing periods, and season closures. Commercial fishing time may be adjusted by emergency order if analysis of commercial and test fish catch data and hydroacoustic abundance estimates indicate that the run is substantially smaller or larger than needed for escapement and subsistence requirements.

Subsistence has been designated by the legislature as the highest priority among beneficial uses of fish and game resources. The majority of Yukon River fishermen usually take salmon for both commercial and subsistence purposes in major commercial fishing areas. Therefore, it is necessary to place some restrictions on the subsistence fishery in order to enforce commercial fishing regulations. During the fishing season, however, substantially more subsistence fishing time is allowed than commercial fishing time.

Numerous research projects are underway, and additional studies are planned should additional funding become available, to obtain the biological information necessary for better management of the salmon runs. Current projects operated by the Alaska Department of Fish & Game (ADF&G), United States Fish and Wildlife Service (USFWS), or the Canadian DFO include: (1) chinook and chum salmon stock identification studies using scale pattern analysis and electrophoretic techniques, (2) side-scanning sonar, tower, fishway (Whitehorse, Canada), or weir enumeration to obtain accurate daily and seasonal escapement estimates in important tributaries (Anvik, Chandalar, Fishing Branch and Sheenjek Rivers), (3) main river sonar study (near Pilot Station) to obtain estimates of total Yukon River salmon abundance, (4) mainstem Tanana River fall chum salmon radio tagging to estimate escapement past Fairbanks, (5) chinook and fall chum salmon mark and recapture programs (Yukon Territory and Chena River) and aerial surveys (all species) to estimate seasonal escapements, (6) test fisheries in the delta area, near Ruby, and within the Tanana River which provide in-season run timing and relative abundance information. A new main river sonar project is planned for the Tanana River, with site selection and sonar development beginning in 1990, and (7) a study in District 4 to determine average roe weight per female and sex ratio of commercial harvest by gear type, to estimate total commercial related harvest from roe sales.

Background Description of Fishery

Five species of Pacific salmon occur in the Yukon River, with chum salmon being the most abundant, followed by chinook, coho, pink, and sockeye salmon. The chum salmon return is made up of an early (summer chum) run and a late (fall chum) run. Commercial chinook

salmon fishing in the Yukon River dates back to 1918, but the multi-species salmon fishery did not become fully developed until the mid-1970's. In the Alaskan portion of the Yukon River for the period 1984-1988, the average commercial salmon harvest was 1.01 million fish and 215,000 lbs roe (Table 2). The harvest of male summer chum salmon taken incidental to the salmon roe fishery in the Upper Yukon Area is not included in this total. The average subsistence harvest for 1984-1988 was 566,000 fish (Table 3).

Approximately 850 limited entry permit holders (680 in the 3 lower districts) and 25 processors participate in the fishery. The ex-vessel value of the commercial salmon catch averaged \$7.9 million for the period 1984-1988. Approximately 1,500 fishing families from 37 communities with a total population of nearly 9,000 (not including the greater Fairbanks area) harvest salmon for subsistence use within the Yukon River drainage in Alaska. Since statehood, the Commercial Fisheries and Subsistence (1988) Division staff has conducted postseason subsistence salmon harvest surveys and data analysis.

Due to changes in the state subsistence law, which limited subsistence hunting and fishing to rural Alaskan residents, the Board of Fisheries created personal use salmon fisheries in the Yukon area for non-rural residents of the state. In the Yukon area, these regulations primarily affected the greater Fairbanks area. Initially, only a fall chum salmon personal use fishery was implemented in 1987. Beginning in 1988, personal use fisheries were created for all salmon. Personal use fisheries are regulated much the same as subsistence fisheries except that salmon taken for personal use may be used only for human consumption and bait. In addition, personal use fishermen are required to obtain a fishing permit from ADF&G and to possess a resident sport fishing license. Typically, personal use catches are included with subsistence harvests in this report.

Salmon run timing into the Yukon River is quite variable. Chinook and summer chum salmon generally begin entering the river during late May or early June. The chinook salmon migration has usually passed through the lower river by the first week of July, while summer chum salmon are usually present in the lower river in significant numbers into July. Fall chum salmon generally begin entry into the river by the middle of July and are present into September. Coho salmon generally begin entering the river during the first week of August and entry continues into September.

Fishery Management

Chinook/Summer Chum Salmon

The lower Yukon commercial fishery is opened by emergency order

(generally 5-15 June) after it has been determined (by monitoring test fishing and subsistence catches) that a sustained migration of chinook salmon is in progress and that the early portion of the run has passed through the lower river. A guideline harvest range of 60,000-120,000 chinook salmon has been established for Districts 1 and 2, and a guideline harvest range of 1,800-2,200 chinook salmon has been established for District 3. Harvests near the midpoint of the guideline harvest ranges should be expected if the run is of average magnitude. No summer chum salmon guideline harvest range has been established.

Management of the summer chum salmon fishery in the Lower Yukon Area is greatly dependent on action taken for chinook salmon since both species exhibit similar run timing. Prior to the 1985 season, it was only after most of the chinook salmon harvest goal had been achieved that mesh size restrictions were implemented to direct the harvest toward summer chum salmon. Since 1985, during years of high summer chum salmon abundance and early run timing, restricted mesh size periods have been implemented to harvest available summer chum salmon prior to the end of the chinook salmon directed fishery. During the 1986, 1988 and 1989 seasons, the first commercial period was directed toward the harvest of summer chum salmon by restricting gill nets to six-inch maximum mesh size.

In the Upper Yukon Area (Districts 4-6), the commercial salmon fishing season is opened by emergency order in District 4 between 10 June and 25 June, and in District 5 on 15 June by regulation. Individual chinook salmon guideline harvest ranges are in effect for each district with a combined harvest range of 5,550-6,950 fish. No summer chum salmon guideline harvest level is in effect. In District 4, summer chum salmon roe remains the primary product. Relatively poor flesh quality and high costs of transportation have combined to minimize the export of summer chum salmon from this district. These chum salmon, however, produce a very high quality caviar which has been the primary product of the fishery for several years. Fishing in Districts 4 and 5 has generally occurred twice weekly during 48-hour fishing periods.

Fall Chum/Coho Salmon

The fall chum and coho salmon fishing season is established by emergency order. Fall chum salmon harvest levels are governed by guideline harvest ranges in the Lower Yukon Area (0-110,000 fish) and by combined fall chum and coho salmon guideline harvest levels in the Upper Yukon Area (0-50,250 fish). These guideline harvest levels have been in effect since 1986. No coho salmon guideline harvest level is in effect in the Lower Yukon Area. Coho salmon harvest levels are dependent on management actions taken for fall chum salmon. In each district, fishing frequency and duration is dependent on the Department's perception of the strength of the fall chum salmon return.

Tanana River

The Board of Fisheries adopted a salmon management plan for the Tanana River (District 6) in May 1988 after documentation of large scale illegal sales of salmon and salmon roe in 1987. Under this plan, the early season opens on 20 June and closes by 10 August, and the fall season opens by emergency order and closes by 30 September. Additionally, commercial fishing periods were restricted to twice weekly 42-hour fishing periods during the early season and one 42-hour fishing period per week during the fall season. Management of this district is based on existing guideline harvest ranges, however, the ranges may be exceeded if it can be determined that doing so will not jeopardize escapement requirements. Subsistence fishing periods were also restricted to two 42-hour fishing periods per week from 20 June through 30 September and were concurrent with commercial fishing periods during the commercial fishing season. New regulations also required subsistence permits and in-season subsistence catch reporting in District 6.

1990 Regulation Proposals

There are numerous regulation proposals submitted for Board of Fisheries action; many involve commercial salmon fishing allocations between districts. Subsistence regulation proposals involve fishing time and changes in fishing gear type. The Department has submitted a proposal which addresses subsistence fishing time and closures for the Toklat River due to fall chum escapements which are re-building more slowly in that system than for other stocks. In addition, there are a number of proposals regarding the Tanana River Management Plan (fishing time and seasons, and guideline harvest ranges).

STOCK STATUS

Chinook Salmon

Chinook salmon spawning populations are widely distributed throughout the Alaskan and Canadian portions of the Yukon River drainage. Major spawning streams in the Alaska portion of the drainage include the Andreafsky, Anvik, Nulato, Salcha and Chena Rivers. In the Canadian portion of the drainage (Yukon Territory), important chinook salmon systems include the Big Salmon and Nisutlin Rivers.

In Alaska, for the period 1984-1988, total utilization (commercial, subsistence, and personal use combined) averaged 166,000 fish, a decrease of 7% compared to the previous 5-year average (1979-1983) of 178,000 fish (Tables 2 and 3). Subsistence catches increased 25% during this time period while the commercial catch decreased 15%. During these same periods Canadian total utilization of chinook salmon has increased 9% (Table 4).

Information obtained from scale pattern analysis and tagging studies indicate that Canadian origin chinook salmon stocks have undergone increased exploitation in recent years resulting in escapements which will not maintain sustained yield. These high exploitation rates were the result of excessive chinook salmon harvests during the mid-1980's on returns of average magnitude. Unusually large returns during 1979-1981 set a trend for high harvest levels from 1982 through 1985 when run strength was closer to average levels.

Summer Chum Salmon

Summer chum salmon can be distinguished from fall chum salmon by the following characteristics: (1) earlier run timing (early June to mid-July in the lower river), (2) rapid maturation in fresh water, (3) smaller body size (6-7 pounds), (4) greater population size, and (5) spawn primarily in lower 600 miles of the drainage.

The Anvik River supports the largest summer chum spawning population. Other important spawning areas include the Andrafsky, Nulato, Rodo, Salcha, and Hogatza River drainages. Although runs fluctuate in abundance from year to year, Yukon River summer chum salmon stocks have not experienced declining escapements (Table 7). Documented harvests and escapements during recent years show returns which range from 1.2 to 5.6 million fish.

Total utilization of summer chum salmon has been greater than 797,000 fish annually since 1978 with the harvest during most years in excess of one million fish (Table 1). Average commercial sales decreased 13% for the period 1984-1988 as compared to those of 1979-1983, while subsistence catches increased 7% during the same time periods (Table 3). The recent five year average (documented sales during 1984-1988) roe production in the upper Yukon was 213,000 pounds, 59% greater than the average harvest taken from 1979-1983 (134,000 pounds roe).

Fall Chum Salmon

Fall chum salmon have the following differentiating characteristics

from summer chum salmon: (1) later run timing (mid-July to early September in the lower river), (2) larger size (7-9 pounds), robust body shape, and bright silvery appearance in the lower river, (3) smaller population size, and (4) spawning occurs in the upper portions of the drainage in spring fed streams.

Major spawning areas are located in the Porcupine River drainage (Sheenjek River in Alaska and Fishing Branch River in Canada), Chandalar River in Alaska, Tanana River drainage in Alaska (Toklat River, Delta River, and mainstem Tanana River upstream of Fairbanks) and the upper Yukon River drainage in Canada (Kluane River and mainstem Yukon River). Spawning occurs during September through November.

Tagging studies conducted in the 1970's indicated Porcupine River and upper Yukon River fall chum salmon are distinguished from Tanana River fall chum salmon by their earlier run timing and their orientation along the north bank of the Yukon River in the Ruby area (river mile 530-700), as opposed to the south bank orientation of Tanana River drainage fall chum salmon.

In the Lower Yukon Area, the majority of fall chum salmon are harvested for commercial purposes while in the Upper Yukon Area an increased proportion of fall chum salmon are harvested for subsistence purposes. Total utilization of fall chum salmon in Alaska increased through 1985. For the period 1981-1985, catches averaged 473,000 fish, an increase of 20% compared to the previous 5-year average (1976-1980) of 392,000 fish (Tables 2 and 3). This was due to increased catches in both subsistence and commercial fisheries. During these same periods Canadian total utilization of Yukon River fall chum salmon increased 93% (Table 4).

In response to poor fall chum salmon escapements from 1982 through 1984, difficulties in assessing in-season run strength, and the increasing efficiency of the fleet, the Alaska Board of Fisheries adopted several regulatory restrictions beginning in 1983. Initially, these restrictions included a commercial fishery closure during late July in the Lower Yukon Area to protect the early portion of the run, establishment of a coastal "Set-Net-Only Area" which prohibited drift net operation, establishment of emergency order authority to implement fishing periods, and a reduction in commercial fishing time. In 1986, the Alaska Board of Fisheries established a more restrictive Fall Chum Salmon Management Plan. These regulations provided for fishery closures by date at the end of the summer season, emergency order authority to establish seasons and fishing periods, reduced guideline harvest ranges, reduced commercial fishing time, and allowed no commercial fishing unless the run was determined to be average or better in magnitude. Overall, spawning escapements appear to have stabilized since 1985, although the Toklat River and to a lesser extent, Fishing Branch River stocks have not re-built to adequate escapement levels.

Coho Salmon

Coho salmon escapement information is very limited. Comparative escapement information for this species is available only from the Tanana River drainage where escapements appear to have increased since 1984 (Table 9). The Delta Clearwater River near Delta Junction supports the largest known population of coho salmon within the Yukon River drainage.

The commercial harvest of coho salmon in the Lower Yukon Area is dependent upon the timing and duration of the fall chum season. Coho salmon are taken incidentally to the fall chum fishery in most districts, but in some years contribute substantially to the commercial and subsistence harvests. Commercial catches in the Yukon area during the period 1984-1988 averaged approximately 57,000 coho salmon (Table 2). Approximately 54,000 cohos are also taken annually (1984-1988) for subsistence use (Table 3).

1989 SEASON SUMMARY

A total of 1,441,240 salmon were commercially harvested in the Alaskan portion of the Yukon River in 1989 (Table 5). The catch was composed of 102,296 chinook salmon, 966,279 summer chum, 287,179 fall chum and 85,486 coho salmon (Table 5). Additionally, a record 288,549 pounds of summer chum salmon roe and 14,749 pounds of fall chum salmon roe were harvested. The chinook salmon catch was 15% below the recent 5-year average (1984-1988). The summer chum salmon catch and roe production were 41% and 35%, respectively, greater than the recent 5-year average. The fall chum salmon harvest in the Alaska portion of the drainage was 85% greater than the 1984-1988 average. A near record coho harvest was achieved. The commercial harvest by Canada was 9,439 chinook salmon (18% below the recent 5-year average), and approximately 17,000 fall chum salmon, (40% below the recent 5-year average) (Table 4).

Yukon River fishermen in Alaska received an estimated \$10.1 million for their catch, approximately 30% greater than the recent 5-year average. Nine buyer-processors operated in the Lower Yukon Area, and 16 buyer-processors and 11 registered catcher-sellers operated in the Upper Yukon Area of Alaska.

Lower Yukon fishermen received an average price per pound of \$2.77 for chinook, \$0.34 for summer chum, \$0.50 for fall chum, and \$0.66 for coho salmon. Upper Yukon commercial fishermen received an estimated per-pound average price of \$0.83 for chinook, \$0.27 for summer chum, \$0.27 for fall chum, \$0.35 for coho salmon, and \$4.41

for salmon roe.

Subsistence "catch calendars" were mailed to each household in all Yukon River drainage communities in May 1989 for use during the 1989 fishing season. Subsistence harvest information should be available in mid-February 1990 following data entry, analysis, and completion of draft reports. The average subsistence salmon catch in the Alaska portion of the drainage from 1984-1988 was 45,430 chinook, 252,890 summer chum, 213,341 fall chum and 53,957 coho salmon for a combined total of 565,618 fish.

Personal use harvest information should be available in mid-February 1990. The total personal use harvest in 1988 was 2,683 chinook, 3,547 summer chum, 4,890 fall chum, and 1,308 coho salmon. The majority of the harvest was taken in Districts 5 and 6. An estimated 186 fishermen (14 Lower Yukon Area and 172 Upper Yukon Area) participated in the personal use fishery in 1988.

Chinook Salmon

The Yukon delta was generally free of ice by 31 May. Chinook salmon migratory timing into the lower river appeared to be about average while summer chum salmon migratory timing was early. The first chinook salmon was reported to have been captured 1 June in St. Marys by a subsistence fisherman. The first chinook and summer chum salmon were caught in Department test fishing nets on 5 June and 6 June, respectively. The chinook salmon entry was primarily through North and Middle Mouths in 1989 based on commercial and test net catches. Department test net catches of summer chum salmon increased rapidly while chinook catches increased less dramatically. The increase of chinook and summer chum salmon abundance was further documented by subsistence catch reports.

In response to early run timing and the large abundance of summer chum salmon, special restricted mesh size (six inch or smaller) fishing periods were implemented prior to the first unrestricted mesh size fishing periods in Districts 1 and 2. This allowed an earlier start of the commercial fishing season and an increased harvest of summer chum salmon than would have resulted if the fishery had been delayed until sufficient chinook were present to initiate the unrestricted mesh size fishery.

The first unrestricted mesh size fishing period was opened by emergency order after approximately 7-10 days of increasing subsistence and test net catches in the lower Yukon River. The fishery was opened on a staggered basis: 15 June in District 1, 18 June in District 2, and 21 June in District 3. A fishing schedule of two 12-hour periods per week was established.

The unrestricted mesh size fishing season in Districts 1 and 2

consisted of two 12-hour fishing periods and one 6-hour fishing period in each district. This was the least amount of fishing time directed for chinook salmon in the history of the fishery. The cumulative chinook salmon harvest for Districts 1 and 2 following the second District 2 unrestricted mesh size period was 57,600 fish. This harvest included 9,345 chinook salmon taken during special chum salmon directed fishing periods prior to the opening of the unrestricted mesh size fishing season. In addition to the catch being near 60,000 fish, analysis of comparative test fishing and sonar enumeration data indicated that the chinook salmon return was apparently a little below average in magnitude at this stage of the run. Therefore, fishing time was reduced to 6 hours during the last unrestricted mesh size fishing period in Districts 1 and 2. A total of seven additional restricted mesh size fishing periods in District 1 (12-hour periods), and six restricted mesh size fishing periods in District 2 (five 12-hour periods, and one 6-hour period) were allowed. A total of 29,203 chinook salmon were harvested during the restricted mesh size fishing periods following the chinook salmon directed fishery.

The total District 1 and 2 chinook salmon harvest was 92,378 fish, 3% above the mid-point of the guideline harvest range and 18% below the 1984-1988 average harvest.

In District 3, three 12-hour unrestricted mesh size fishing periods and three 12-hour restricted mesh size fishing periods were allowed from 21 June through 10 July. Fishing periods were established to occur simultaneously with District 2 commercial fishing periods to provide fishermen in the lower end of District 3 the convenience of selling fish to District 2 buyers. The initial delay in opening District 3 allowed the first segment of the chinook salmon return to pass through the district prior to the commercial fishery. In response to subsistence fishermen requests, the upper end of District 3 was closed 30 June to commercial fishing to allow increased subsistence fishing opportunities. A total of 1,645 chinook salmon were harvested in District 3, which was 18% below the mid-point of the guideline harvest range, and 20% below the recent five year average.

District 4 opened to commercial fishing by emergency order on 21 June on a twice weekly 48-hour fishing schedule. A total of 12 fishing periods occurred between 21 June and 1 August when the season closed by regulation. The commercial catch of 2,806 chinook salmon in District 4 was the second largest on record. Based on deliveries, the run peaked between 5 July and 14 July.

All subdistricts of District 5 opened by regulation on 23 June. Subdistricts 5A, 5B, and 5C closed by emergency order 6 July and Subdistrict 5D closed by emergency order on 14 July. Fishing was allowed during twice weekly 48-hour periods. A total of 3,286 chinook salmon were reported by commercial fishermen in District

5. In Subdistricts 5A, 5B and 5C, the total catch was 2,901 chinook salmon which exceeded the guideline harvest range of 2,400-2,800 fish. In Subdistrict 5D, the total catch was 385 chinook salmon which was within the guideline harvest range of 300-500 chinook salmon.

As in 1988, Commercial Fisheries Division staff met with fishermen to discuss management of the District 6 fishery prior to the fishing season. It was decided that the opening of the commercial season on the Tanana River would be delayed by approximately two weeks from the date allowed by regulation (20 June). The intent of this strategy was to allow the early portion of the chinook salmon run to pass through the district prior to commercial fishing, in an attempt to ensure that chinook salmon escapement objectives in the Chena and Salcha Rivers would be met and thereby eliminate the need for mid-season closures. Chinook salmon in the Tanana River commercial fishery are considered to be incidental to the more abundant and (collectively) more valuable summer chum salmon. Therefore, it was considered preferable to implement a closure early in the season before summer chum salmon became abundant. This plan was implemented by emergency order, and staggered openings of the commercial season were scheduled as follows: Subdistrict 6-A on 7 July, Subdistrict 6-B on 10 July, and Subdistrict 6-C on 14 July.

The commercial catch of 1,741 chinook salmon was allowed to exceed the guideline harvest range of 600-800 fish after escapement objectives in the Chena and Salcha Rivers were anticipated to be met.

In-season chinook salmon abundance indicators, including lower river test fishing data and sonar enumeration at Pilot Station (73,000 fish) indicated a slightly below average return. Chinook salmon spawning escapements in 1989 were variable in magnitude between spawning areas in the lower, middle, and upper portions of the Yukon River drainage. Aerial surveys indicated that spawning escapements appeared to be near objective levels in the lower river, below escapement objectives in middle river tributaries, and above escapement levels documented between 1985 and 1988 in Canadian spawning areas. The majority of aerial surveys were rated fair to poor in the Alaskan portion of the drainage and some systems were not surveyed due to poor weather.

Chinook salmon spawning escapement survey counts were 1,399 for the West Fork Andreafsky River, 1,089 for the East Fork, and under poor survey conditions, 268 for the Anvik River (Table 6). The East Fork Andreafsky River count was below the objective of 1,600 chinook, however, the West Fork Andreafsky River count met the objective of 1,000 chinook salmon. The Nulato River was not surveyed due to poor weather. Aerial surveys documented 1,280 and 2,333 chinook salmon in the Chena and Salcha Rivers, respectively, under fair to poor survey ratings. Escapement objectives of 1,700

and 3,500 chinook salmon for the Chena and Salcha Rivers, respectively, were not met.

Chinook salmon spawning escapements in Canadian Yukon River tributaries were better than recent years (Table 6). A total of 549 chinook salmon were enumerated at the Whitehorse fishway which was the largest number since 1984. Aerial surveys of the principle index area of the Nisutlin River resulted in a peak count of 695 fish which was also the largest number of spawners documented since 1984. Escapement to the Big Salmon River approached that observed in 1981, which was the largest on record.

The total chinook salmon spawning escapement in the Canadian portion of the mainstem Yukon River was estimated to be 26,000 fish (preliminary) based on a DFO mark and recapture study. This estimate was above all other years except 1983 (Table 6), although it was about 21% below the low end of the interim escapement objective of 33,000-43,000 fish.

Summer Chum Salmon

In Districts 1 and 2, fishing periods directed toward summer chum salmon with gill nets restricted to six-inch maximum mesh size were implemented prior to the first chinook salmon directed fishing periods. These fishing periods of 12 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. A total of 143,978 summer chum salmon were captured in Districts 1 and 2 during these restricted mesh size fishing periods. During unrestricted mesh size fishing periods from 15 June until 25 June in Districts 1 and 2, 126,360 summer chum salmon were harvested.

After the unrestricted mesh size fishing season ended, test fishing data indicated a large abundance of summer chum salmon entering the river, therefore, additional fishing periods with gill nets restricted to six-inch maximum mesh size were allowed on 24-25 June in District 1 and 27 June in District 2. Approximately 290,000 chums were harvested during a four day time span from 24 June through 27 June. The next regularly scheduled period in District 2 was not allowed in order to reassess run strength. The sonar project at Pilot Station indicated increased fish passage rates on 28 June, and a six-hour period was implemented on 29 June in District 2. After this period, the regular fishing schedule was maintained throughout the remainder of the season.

Commercial chum salmon harvests in 1988 and early in the 1989 season indicated that 12-hour fishing periods provided ample opportunity for fishermen to harvest chums and to allow buyers to handle the volume of fish during a large return. Therefore, when

the twice weekly restricted mesh size fishing schedule was initiated, fishing periods were maintained at 12 hours duration. This was a 12-hour reduction in fishing time per period from prior years during this portion of the run. During these periods, an additional 612,255 summer chum salmon were harvested. The total District 1 and 2 summer chum salmon commercial harvest was 891,593 fish, 43% above the recent 5-year average. The commercial fishing season closed 15 July by regulation.

The District 3 commercial fishery allowed for three 12-hour restricted mesh size periods following three 12-hour unrestricted mesh size fishing periods. The commercial season closed 10 July as the chinook salmon harvest approached the lower end of the guideline harvest range, and summer chum salmon flesh quality deteriorated. The closure additionally provided subsistence fishermen an increased opportunity to harvest salmon. The District 3 summer chum salmon harvest was 7,578 fish, approximately double the recent 5-year average (1984-1988). The estimated passage of summer chum salmon past the Yukon Sonar project at Pilot Station was 1.6 million fish.

As in recent years, the summer chum salmon fishery in District 4 was predominantly a salmon roe fishery. A total of 283,305 pounds of salmon roe and 18,572 summer chum salmon were commercially harvested during twelve 48-hour fishing periods. Peak catches of summer chum salmon were made during the fishing period on 9-11 July which produced approximately 45,000 pounds of salmon roe. An average roe weight of 0.9 pounds per female was calculated from data collected in 1988 and 1989. Therefore, approximately 315,000 female chum salmon were harvested. A field crew estimated that females made up 62% of the harvest, thus the total District 4 commercial related harvest was close to 500,000 summer chum salmon. Due to roe prices, the majority of fish sold in-the-round were males. Of the remaining chum salmon captured during the fishery, some were sold as dog food and some were retained by fishermen and used for subsistence purposes, but a large portion were unaccounted for.

Summer chum salmon are generally of poor quality and are not abundant in District 5. During the 1989 season, approximately 150 summer chums and 370 pounds of roe were sold incidentally to the commercial fishery for chinook salmon.

The summer chum salmon fishery in District 6 (Tanana River) occurred coincidental to the chinook salmon fishery. Between 7 July and 9 August, ten 42-hour fishing periods occurred. A total of 42,115 summer chum salmon and 4,871 pounds of roe were sold which was very similar to the 1984-1988 average.

Very few aerial survey estimates of summer chum salmon spawning escapements were obtained due to poor weather (Table 7). The East Fork Andreafsky River tower project was not operated in 1989

because of budget constraints. An aerial survey count of 21,460 summer chum salmon for the East Fork Andreafsky River was obtained prior to peak spawning. An escapement estimate of 636,906 summer chum salmon was obtained by sonar in the Anvik River, which was 31% greater than the escapement objective of 487,000 fish. High, turbid water conditions in the Chena and Salcha Rivers prohibited evaluation of summer chum salmon escapements. An estimated 1,627,000 summer chum salmon were counted past the Pilot Station sonar site from 8 June through 18 July.

Fall Chum and Coho Salmon

An average return of fall chum salmon was expected in 1989 based on evaluation of brood year escapements and assuming average survival. The primary contributor to the 1989 return was expected to be 4-year old fish produced by the 1985 parent year. 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 the Lower Yukon Area commercial catch would be near the mid-point of the pre-1986 guideline harvest range (170,000 fish).

Initially, fall chum salmon migratory timing into the lower river appeared to be early. However, by late August, it was apparent that run timing was average and of longer duration than other comparable years. Commercial catch sampling during the last period of the summer season in District 1 on 13 and 14 July indicated a large proportion of the catch was composed of fall chum salmon. Subsistence and test net catches documented a fairly sustained entry of fall chum salmon from 16 July through 27 July. After 27 July, three pulses of fall chum entered the river during 3-6 August, 13-14 August, and 17-18 August. Coho salmon migratory timing into the lower river was about average. Consistent daily test net catches of coho salmon did not begin until 3 August, with no significant entry occurring until 8 August.

The fall season commercial salmon fishery was opened by emergency order on 28 July in District 1 and 30 July in Districts 2 and 3. A fishing schedule of 12 hours duration in the coastal "Set Net Only Area" where tides affect actual fishing time, and six hours duration in the remainder of District 1, and in Districts 2 and 3, was established. Fishing time was more conservative than anticipated in the management plan due to the efficiency of the fleet and the vulnerability of fall chum salmon because of their pulse type of entry pattern. Typically, fall chum salmon enter the river in relatively short pulses during windy weather. Fishing time was increased by four hours in the "Set Net Only Area" and three hours in the remainder of the Lower Yukon Area approximately half-way through the commercial fishing season.

A total harvest of 143,000 fall chums had been taken as of 16 August. Historical test fishing and sonar data indicated that usually by 17 August, over 80% of the run has passed. The District 1 period scheduled for 17-18 August was cancelled to assure that a large enough portion of the fall chum salmon run would pass through the Lower Yukon Area to adequately contribute to: 1) escapement requirements; 2) subsistence harvest requirements; and 3) provide for reasonable commercial harvests in upper Yukon districts. This delay additionally allowed the Department to further evaluate run strength and for the ratio of coho salmon to fall chum salmon within the districts to increase.

After this action was taken, test fish catches of fall chum salmon increased; therefore, further commercial fishing was allowed. Eliminating a single period did result in an atypical distribution of catches between Districts 1 and 2. This was the first year in which District 2 had a larger fall chum salmon catch than District 1, although the harvest has been nearly equal in some years. A total catch of 77,876, 97,906, and 15,332 fall chum salmon occurred in Districts 1, 2, and 3, respectively.

The commercial fishing season closed by emergency order on 25 August in District 1 and on 27 August in Districts 2 and 3. Sonar data indicated that coho salmon passage rates were lower than all previous years (1985-1988). The Lower Yukon Area coho salmon catch was 24,670 in District 1, 38,517 in District 2, and 3,988 in District 3. The preliminary cumulative sonar fish passage estimates at Pilot Station through termination of the project on 11 September were approximately 683,000 fall chum salmon and 181,000 coho salmon.

The summer chum and chinook salmon fishery in District 4 was closed on 1 August in order to evaluate the early portion of the fall run prior to allowing any commercial removal. Based on catches from the test fish wheel near Ruby and on subsistence catches, the run was judged to be as strong or stronger than anticipated. Accordingly, the commercial fishing season was reopened on 6 August. Ten 48-hour periods were allowed prior to the season closure on 12 September. The harvest of 11,776 fall chum salmon, 3,407 pounds of roe, and 3 coho salmon was taken by 20 fishermen in Subdistricts 4-B and 4-C. There is no fall season commercial fishery in Subdistrict 4-A.

In Subdistricts 5-A, 5-B and 5-C, four 24-hour commercial fishing periods were allowed between 12 August and 10 September. A total of 15,296 fall chum salmon, 3,596 pounds of roe, and 84 coho salmon were taken by 20 fishermen. The fall commercial fishery in Subdistrict 5-D was opened 5 September and 10 September. Four fishermen harvested 2,919 fall chum salmon and 393 pounds of roe.

In District 6, contracted fishermen operated two fish wheels (one at Manley, one at Nenana) to provide in-season relative abundance

and timing data for the second consecutive year. Although the database is limited, this information was useful for managing the fishery.

The initial commercial fishing period on 1 and 2 September was 24 hours in duration. Since available data (test fish catches, subsistence catches, and preliminary aerial surveys) indicated a surplus of fall chum salmon to be available, a fishing schedule of one 42-hour period per week was implemented.

The commercial harvest was 49,090 fall chum salmon in District 6, which was 2.8 times the 1984-1988 average. A total of 7,353 pounds of roe were sold, the most since 1978. The commercial coho salmon catch of 16,084 fish was a record harvest and was more than double the recent 5-year average. The commercial fishing season was closed prior to the regulatory closure date of 30 September due to concern for coho salmon escapements, Toklat River fall chum salmon escapement, and to provide for subsistence fishing since the majority of subsistence catches had not occurred by this date.

Fall chum salmon spawning escapements in the Porcupine River drainage appeared to be good (Table 8). The Sheenjek River escapement was estimated to be approximately 102,000 fall chum salmon, which was 65% above the escapement objective of 62,000 fish. A total of 43,820 fall chum were counted at the Fishing Branch weir in Canada which was 10% above the average escapement for 1985-1988, but 12% below the interim escapement objective of 50,000 fish.

Fall chum salmon escapement in the Tanana River drainage appeared to be above average. The preliminary escapement estimate to the Upper Toklat River was 30,447 fall chum salmon, which was the largest escapement since 1979. The Delta River escapement of 20,000 fish was similar to 1985 and 1988 escapements and was 61% above the escapement objective of 11,000 fish.

Although fall chum salmon escapements appeared to be good in the Tanana and Porcupine River drainages, escapement in the mainstem Yukon River in Canada apparently was well below desired levels. The DFO mark and recapture tagging study preliminary spawning escapement estimate was approximately 35,000 fish, well below the interim escapement objective of 90,000-135,000 fish.

Over 200 radio tags were applied to fall chum salmon captured near Fairbanks in 1989. This project was conducted in an effort to estimate the total population of fall chum salmon stocks in the upper portion of the Tanana River. Preliminary results are expected to be complete in February 1990.

Limited coho salmon escapement information is obtained annually. Escapements in the Tanana River drainage were about average (Table 9).

OUTLOOK FOR 1990

Chinook Salmon

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 area escapements in the lower Yukon and Canadian portions of the drainage in the 1984 brood year (age 6 in 1990) were judged to be average to above average in magnitude as indicated by comparative escapement information. Spawning escapements in the Tanana River drainage were well below average in 1984. Survival and production of the 1984 brood year was apparently average based on preliminary findings of a normal contribution of 5-year old fish to the 1989 commercial catch. It is expected that the 1990 return of 5-year olds (1985 brood year) will be average based on near average escapements during 1985, and average numbers of 4-year old fish in the 1989 commercial catch. The return of 7-year old fish (1983 year class) is expected to be average, as the return of this year class in 1988 as 5-year-olds, and in 1989 as 6-year-olds, was average in magnitude. Overall, the 1990 chinook salmon return is anticipated to be average in strength. The commercial harvest in Alaska (Districts 1-6) is expected to total 85,000 to 107,000 chinook salmon (80,000-100,000 fish in the Lower Yukon Area, 5,000-7,000 fish in the Upper Yukon Area).

Summer Chum Salmon

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 1990 will be dependent on production from the 1986 brood year and survival of the resulting cohort. Based on available catch and escapement data, the magnitude of the 1986 summer chum salmon return was judged to be above average in abundance. The return of 5-year old fish in 1990 is expected to be above average in strength based on the above average return of 4-year old fish in 1989. The Anvik River summer chum salmon stock is expected to be the primary contributor to the 1990 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 1990 will be above average in magnitude. The commercial harvest is expected to be similar to the 1988 and 1989 harvests (900,000-1,000,000 fish and 250,000 pounds of roe).

Fall Chum Salmon

Similar to summer chum salmon, fall chum salmon return primarily as 4-year old fish. Escapements in 1986 (which will produce 4-year old fish in 1990) ranged from below average in the Tanana River drainage to about average in magnitude in the Porcupine River drainage and Yukon River mainstem in Canada. The contribution of age-3 fish in the 1989 return was below average to average based on preliminary age composition data. The return of 5-year old fish (1985 brood year) is expected to be above average overall based on the strong contribution of age-4 fish to 1989 catches and the majority of stocks having above average escapements in 1985. The only poor escapement in 1985 was the Yukon River mainstem in Canada which also experienced a poor return in 1989. In summary, based on evaluation of brood year escapements and assuming average survival, an average return of fall chum salmon is expected in 1990, however, the return of the Tanana River stock is anticipated to be relatively poor. The commercial harvest is anticipated to be near 220,000 fall chum salmon, the mid-point of the pre-1986 guideline harvest range (170,000 in the Lower Yukon Area and 50,000 in the Upper Yukon Area).

A more comprehensive analysis of fall chum salmon information including estimates of total return sizes, maturity schedule and return per spawner data resulted in a return projection of 784,000 fish. The current drainage-wide escapement objective is 312,000 fall chum salmon. The recent five year average (1984-1988) subsistence harvest was approximately 188,000 fish. Thus, a total of 284,000 fall chum may be available for commercial fisheries (including Canadian harvests). As stated above, with a relatively poor return to the Tanana River drainage anticipated, the commercial harvest will probably not reach this level in order to achieve escapement objectives.

Coho Salmon

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 1986. The commercial harvest is expected to be 50,000-75,000 fish and will be dependent on the timing and frequency of fishing periods allowed for fall chum salmon.

Table 1. Total utilization (Alaska and Canada) of Yukon River salmon, 1961-1989.

Year	Chinook	Summer Chum ^{a,b}	Fall Chum ^{a,c}	Coho ^{a,c}	Total
1961	154,398	305,317	144,233	12,047	615,995
1962	119,781	261,856	140,401	32,456	554,494
1963	151,987	297,094	99,031	33,271	581,383
1964	117,226	361,080	128,707	14,633	621,646
1965	140,086	336,848	135,600	12,139	624,673
1966	109,339	154,508	122,548	32,446	418,841
1967	151,254	217,168	107,018	28,211	503,651
1968	123,674	148,350	97,552	24,916	394,492
1969	107,651	218,157	183,373	22,869	532,050
1970	97,682	303,510	265,096	17,154	683,442
1971	142,638	271,577	246,756	29,115	690,086
1972	118,827	243,674	188,178	29,765	580,444
1973	104,192	446,521	285,760	46,877	883,350
1974	123,684	817,703	383,552	28,423	1,353,362
1975	82,883	922,183	361,600	23,254	1,389,920
1976	110,607	787,766	228,717	10,425	1,137,515
1977	121,865	694,377	340,757	55,196	1,212,195
1978	135,346	1,266,290	340,816	33,939	1,776,391
1979	169,053	1,010,820	615,377	26,959	1,822,209
1980	219,255	1,288,284	488,305	28,903	2,024,747
1981	205,517	1,397,330	677,257	44,908	2,325,012
1982	168,710	839,238	373,175	73,070	1,454,193
1983	216,040	1,144,649	525,016	37,215	1,922,920
1984	178,827	1,040,299	412,322	130,960	1,762,408
1985	204,960	1,091,757	515,481	89,936	1,902,134
1986	165,272	1,371,187	318,021	81,723	1,936,203
1987	205,248	797,481	406,143	84,894	1,493,766
1988	168,788	1,820,397	354,231	169,045	2,512,461
1989 ^d					
5-Yr Avg 1979-83	195,715	1,136,064	535,826	42,211	1,909,816
5-Yr Avg 1984-88	184,619	1,224,224	401,240	111,312	1,921,394

^a Alaskan subsistence catches estimated for 1961-1976 since catches of salmon other than chinook salmon were not differentiated by species until 1977.

^b Includes estimates of commercial related catches in District 4 roe fishery which were not sold.

^c Minimum estimates for 1961-1978 because subsistence surveys were typically conducted well before the end of the fishing season.

^d Subsistence catch data not available until February, 1990.

Table 2. Alaskan commercial sales of Yukon River salmon, 1961-1989.^{a,b}

Year	Chinook	Summer Chum		Fall Chum		Coho	Total	
		Numbers	Roe	Numbers	Roe		Numbers	Roe
1961	119,664	-	-	42,461	-	2,855	164,980	-
1962	94,734	-	-	53,116	-	22,926	170,776	-
1963	117,048	-	-	0	-	5,572	122,620	-
1964	93,587	-	-	8,347	-	2,446	104,380	-
1965	118,098	-	-	23,317	-	350	141,765	-
1966	93,315	-	-	71,045	-	19,254	183,614	-
1967	129,656	10,935	-	38,274	-	11,047	189,912	-
1968	106,526	14,470	-	52,925	-	13,303	187,224	-
1969	91,027	61,966	-	131,310	-	15,093	299,396	-
1970	79,145	137,006	-	209,595	-	13,188	438,934	-
1971	110,507	100,090	-	189,594	-	12,203	412,394	-
1972	92,840	135,668	-	152,176	-	22,233	402,917	-
1973	75,353	285,509	-	232,090	-	36,641	629,593	-
1974	98,089	589,892	-	289,776	-	16,777	994,534	-
1975	63,838	710,295	-	275,009	-	2,546	1,051,688	-
1976	87,776	600,894	-	156,390	-	5,184	850,244	-
1977	96,757	534,875	-	257,986	-	38,863	928,481	-
1978	99,168	1,052,226	25,761	236,383	10,628	26,152	1,413,929	36,389
1979	127,673	779,316	40,217	359,946	18,466	17,165	1,284,100	58,683
1980	153,985	928,609	139,106	293,430	5,020	8,745	1,384,769	144,126
1981	158,018	1,006,938	189,068	466,451	11,285	23,680	1,655,087	200,353
1982	123,644	461,403	152,819	224,187	805	37,176	846,410	153,624
1983	147,910	744,879	149,999	302,598	5,064	13,320	1,208,707	155,063
1984	119,904	588,597	167,224	208,232	2,328	81,940	998,673	169,552
1985	146,188	516,997	248,625	267,744	2,525	57,672	988,601	251,150
1986	99,970	721,469	271,691	139,442	577	47,255	1,008,136	272,268
1987	134,760	442,238	121,968	0	0	0	576,998	121,968
1988	101,421	1,152,237	256,535	159,703	3,227	99,907	1,513,268	259,762
1989	102,296	966,279	288,549	287,179	14,749	85,486	1,441,240	303,298
<hr/>								
5-Yr Avg								
1984-88	120,449	684,308	213,209	155,024	1,731	57,355	1,017,135	214,940
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5-Yr Avg								
1984-88	114,272	625,335	0	104,903	0	47,515	892,025	0
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5-Yr Avg								
1984-88	6,177	58,972	213,209	50,121	1,731	9,840	125,110	214,940

^a Catches reported in numbers of fish sold in the round and pounds of unprocessed roe.

^b Includes ADF&G test fish sales.

Table 3. Alaskan subsistence catch of Yukon River salmon, 1961-1989.^a

Year	Chinook	Summer Chum ^b	Fall Chum ^{b,c}	Coho ^{b,c}	Total
1961	21,488	305,317	101,772	9,192	437,769
1962	11,110	261,856	87,285	9,480	369,731
1963	24,862	297,094	99,031	27,699	448,686
1964	16,231	361,080	120,360	12,187	509,858
1965	16,608	336,848	112,283	11,789	477,528
1966	11,572	154,508	51,503	13,192	230,775
1967	16,448	206,233	68,744	17,164	308,589
1968	12,106	133,880	44,627	11,613	202,226
1969	14,000	156,191	52,063	7,776	230,030
1970	13,874	166,504	55,501	3,966	239,845
1971	25,684	171,487	57,162	16,912	271,245
1972	20,258	108,006	36,002	7,532	171,798
1973	24,317	161,012	53,670	10,236	249,235
1974	19,964	227,811	93,776	11,646	353,197
1975	13,045	211,888	86,591	20,708	332,232
1976	17,806	186,872	72,327	5,241	282,246
1977	17,581	159,502	82,771	16,333	276,187
1978	30,297	197,144	94,867	7,787	330,095
1979	31,005	196,187	233,347	9,794	470,333
1980	42,724	272,398	172,657	20,158	507,937
1981	29,690	208,284	188,525	21,228	447,727
1982	28,158	260,969	132,897	35,894	457,918
1983	49,478	240,386	192,928	23,895	506,687
1984	42,428	230,747	174,823	49,020	497,018
1985	39,771	264,828	206,472	32,264	543,335
1986	45,238	290,825	164,043	34,468	534,574
1987	53,124	275,914	361,663 ^d	84,894 ^d	775,595
1988	46,590	202,137	159,703	69,138	477,568
1989 ^e					
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5-Yr Avg 1984-88 Alaska	45,430	252,890	213,341	53,957	565,618
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5-Yr Avg 1984-88 Lower Yukon	15,234	65,725	24,898	12,401	118,258
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5-Yr Avg 1984-88 Upper Yukon	30,196	187,165	188,443	41,556	447,360

^a Includes personal use catches beginning in 1987.

^b Catches estimated for 1961-1976 since catches of salmon other than chinook salmon were not differentiated by species until 1977.

^c Minimum estimates for 1961-1978 because surveys were typically conducted well before the end of the fishing season.

^d Includes estimates of catches from illegal fish and roe sales in Districts 5 and 6.

^e Subsistence catch data not available until February, 1990.

Table 4. Canadian catch of Yukon River chinook and fall chum salmon, 1961-1989.

Year	Chinook			Fall Chum		
	Commercial	Non-Commercial ^a	Total	Commercial	Non-Commercial ^{a,b}	Total
1961	3,446	9,800	13,246	3,276	5,800	9,076
1962	4,037	9,900	13,937	936	8,500	9,436
1963	2,283	7,794	10,077	2,196	25,500	27,696
1964	3,208	4,200	7,408	1,929	10,258	12,187
1965	2,265	3,115	5,380	2,071	9,718	11,789
1966	1,942	2,510	4,452	3,157	10,035	13,192
1967	2,187	2,963	5,150	3,343	13,618	16,961
1968	2,212	2,830	5,042	453	11,180	11,633
1969	1,640	984	2,624	2,279	5,497	7,776
1970	2,611	2,052	4,663	2,479	1,232	3,711
1971	3,178	3,269	6,447	1,761	15,150	16,911
1972	1,769	3,960	5,729	2,532	5,000	7,532
1973	2,199	2,323	4,522	2,806	7,329	10,135
1974	1,808	3,823	5,631	2,544	9,102	11,646
1975	3,000	3,000	6,000	2,500	18,100	20,600
1976	3,500	1,525	5,025	1,000	4,200	5,200
1977	4,720	2,807	7,527	3,990	8,489	12,479
1978	2,975	2,906	5,881	3,356	6,210	9,566
1979	6,175	4,200	10,375	9,084	13,000	22,084
1980	9,500	13,046	22,546	9,000	13,218	22,218
1981	8,593	9,216	17,809	15,260	7,021	22,281
1982	8,640	8,268	16,908	11,312	4,779	16,091
1983	13,027	5,625	18,652	25,990	3,500	29,490
1984	9,885	6,610	16,495	22,932	6,335	29,267
1985	12,573	6,428	19,001	35,746	5,519	41,265
1986	10,797	9,267	20,064	11,464	3,072	14,536
1987	10,864	6,500	17,364	40,591	3,889	44,480
1988	13,217	7,560	20,777	30,263	3,302	33,565
1989 ^c	9,439	7,414	16,853	17,000	3,500	20,500
5-Yr Avg 1984-88	11,467	7,273	18,740	28,199	4,423	32,623

^a Indian Food Fish, Sport and Domestic fisheries combined.

^b Includes small numbers of coho salmon taken at Old Crow.

^c Preliminary estimates.

Table 5. Alaskan commercial salmon sales by district, Yukon River, 1989.

District Subdist.	No. of Fishermen	Chinook	Summer Chum		Fall Chum		Coho	Total Salmon	
			Numbers	Roe (lbs) ^a	Numbers	Roe (lbs) ^b		Numbers	Roe (lbs)
1	445	59,153	547,631	0	77,876	0	24,670	709,330	0
2	243	33,225	343,962	0	97,906	0	38,517	513,610	0
Subtotal	680	92,378	891,593	0	175,782	0	63,187	1,222,940	0
3	16	1,645	7,578	0	15,332	0	3,988	28,543	0
Total Lower Yukon	687	94,023	899,171	0	191,114	0	67,175	1,251,483	0
4-A	80	59	14,397	270,039	0	0	0	14,456	270,039
4-B,C	34	2,747	4,175	13,266	11,776	3,407	3	18,701	16,673
Subtotal District 4	99	2,806	18,572	283,305 ^c	11,776	3,407	3	33,157	286,712
5-A,B,C	33	2,901	113	373	15,296	3,596	84	18,394	3,969
5-D	5	385	41	0	2,919	393	0	3,345	393
Subtotal District 5	38	3,286	154	373	18,215	3,989	84	21,739	4,362
District 6	32	1,741	42,115	4,871	49,090	7,353	16,084	109,030	12,224
Total Upper Yukon	169	7,833	60,841	288,549	79,081	14,749	16,171	163,926	303,298
Total Yukon Area ^d	856	102,296	966,279	288,549	287,179	14,749	85,486	1,441,240	303,298

- ^a May include small amount of chinook salmon roe.
^b Includes small amount of coho salmon roe.
^c Total commercial related catch was approximately 500,000 fish.
^d Includes ADF&G test fish sales in District 6.

Table 6. Chinook salmon escapement counts for selected spawning areas in the Yukon River drainage, 1961-1989. ^a

Year	Andreafsky		Anvik		Nulato	Chena	Salcha	Big Salmon b	Nisutlin c	Whitehorse Fishway	Canada Mainstem Tagging
	E. Fork	W. Fork	Aerial	Tower							
1961	1,003	-	1,226	-	543 d	-	2,878	-	-	1,068	-
1962	675 d	762 d	-	-	-	-	937	-	-	1,500	-
1963	-	-	-	-	-	137 d	-	-	-	484	-
1964	867	705	-	-	-	-	450	-	-	587	-
1965	-	355 d	650 d	-	-	-	408	-	-	903	-
1966	361	303	638	-	-	-	800	-	-	563	-
1967	-	276	336 d	-	-	-	-	-	-	533	-
1968	380	383	310 d	-	-	-	739	827 d	407	414	-
1969	231 d	274 d	296 d	-	-	-	461 d	286 d	105 d	334	-
1970	665	574 d	368	-	-	-	1,882	670	615	625	-
1971	1,904	1,682	-	-	-	193 d,e	158 d	200 d	650	856	-
1972	798	582 d	-	1,198	-	138 d,e	1,193	415	237	391	-
1973	825	788	-	613	-	21 d	391	75 d	36 d	224	-
1974	-	285	-	471 d	78 d	1,035 e	1,857	70 d	150 d	273	-
1975	993	301	-	730	204	316 e	1,055	153 d	249	313	-
1976	818	643	-	1,154	648	531	1,641	86 d	102	121	-
1977	2,008	1,499	-	1,371	487 d	563	1,202	316 d	77 d	277	-
1978	2,487	1,062	-	1,324	920	1,726	3,499	524 d	375	725	-
1979	1,180	1,134	-	1,484	1,507	1,159 d	4,789	632	713	1,184	-
1980	958 d	1,500	1,237	-	1,323 d	2,541	6,757	1,436	975	1,383	-
1981	2,146 d	231 d	763 d	-	791 d	600 d	1,237 d	2,411	1,626	1,539	-
1982	1,274	851 d	-	-	-	2,073	2,534	758	578	473	19,790
1983	-	-	653 d	-	1,006	2,553	1,961	540	701	905	28,989
1984	1,573 d	1,993	629 d	-	-	501	1,031	1,044	832	1,042	-
1985	1,617	2,248	993	-	2,780	2,553	2,035	801	409	536	10,730
1986	1,954	3,158	1,027	-	2,974	2,031 d	3,368	745	459 d	541	16,415
1987	1,608 d	3,141	1,043	-	1,638	1,312 d	1,898	891	275	327	13,210
1988	1,020	1,448	1,637	-	1,775	1,966	2,761	765	267	405	22,259
1989	1,399	1,089	268 d	-	-	1,280 d	2,333 d	1,662	695	549	26,108 f

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

^b Big Salmon Lake - Souch Cr.

^c Sidney Cr. - 100 Mile Cr.

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

^e Boat survey.

^f Preliminary estimate.

Table 7. Summer chum salmon escapement counts for selected spawning areas in the Yukon River drainage, 1973-1989. a

Year	Andreafsky			Anvik				
	E. Fork		W. Fork	Tower and Aerial	Sonar	Nulato	Hogatza	Salcha
	Aerial	Sonar						
1973	10,149 b	-	51,835	86,665 b	-	-	-	-
1974	3,215 b	-	33,578	201,277	-	51,160	-	3,510
1975	223,485	-	235,954	845,485	-	138,495	22,355	7,573
1976	105,347	-	118,420	406,166	-	40,001 b	20,744	6,474
1977	112,722	-	63,120	262,854	-	69,660	10,734	677 b
1978	127,050	-	57,321	251,339	-	54,480	5,102	5,405
1979	66,471	-	43,391	280,537	-	37,104	14,221	3,060
1980	36,823 b	-	115,457	-	492,676	14,946 b	19,786	4,140
1981	81,555	147,312	-	-	1,479,582	14,348 b	-	8,500
1982	7,501 b	181,352	7,267 b	-	444,581	-	4,984 b	3,756
1983	-	110,608	-	-	362,912	21,012 b	28,141	716 b
1984	95,200 b	70,125	238,565	-	891,028	-	-	9,810
1985	66,146	-	52,750	-	1,080,243	29,838	22,566	3,178
1986	83,931	167,614 c	99,373	-	1,189,602	64,265	-	8,028
1987	6,687 b	45,221 c	35,535	-	455,876	11,257	5,669 b	3,657
1988	43,056	68,937 c	45,432	-	1,125,449	42,083	6,890	2,889 b
1989 d	21,460 b	-	-	-	636,906	-	-	1,574 b

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

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

c Tower count.

d Preliminary.

Table 8. Fall chum salmon escapement estimates for selected spawning areas in the Yukon River drainage, 1979-1989. a

	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989 s
TANANA RIVER DRAINAGE											
Upper Toklat River b	96,550 d	23,054	13,907	3,309 e	15,105 e	15,861	21,824 d	12,708 d	18,350 d	10,786 d	29,474 d
Lower Toklat River	64,540	(2,140)	--	--	--	--	--	--	2,220	--	--
Upper Tanana River											
Benchmark #735 Slough	2,714	1,900 e	168 c	--	--	--	1,093	--	--	20	118 c
Delta River	8,125	4,637	22,375 e,g	3,433 e	7,230 e	12,327 e	17,276 h	6,703 h	21,180 h	18,024 h	20,000 h
South Bank Tanana i	20,820	3,444	7,063	--	1,350 c	2,150	975 c	1,610 c	--	7,000	939 c
Bluff Cabin Slough	6,875	3,190	6,120	1,156 e	12,715 e	4,017 e	2,655	3,458 e	9,395 e	4,481	5,385 c
One Mile Slough	3,850 c	885 c	632	--	1,115 c	560 c	366 c	1,949	2,500 e	1,520	1,108
Subtotal	42,384	14,056	36,358	4,589 j	22,410 j	19,054 j	22,365	13,720 j	33,075 j	31,045 j	27,550 j
Total Tanana Index	203,474	37,110	50,265	7,898 j	37,515 j	34,915 j	44,189	26,428 j	53,645 j	41,831 j	57,024 j
PORCUPINE RIVER DRAINAGE											
Sheenjek River	41,140	13,027	74,560 k	31,421 k	49,392 k	27,130 k	152,768 k	83,197 k	140,086 k,t	45,000 k	101,748 k
Fishing Branch River (YT)	44,080	20,319 c	10,549 j	5,846	10,000	5,570	56,016 l	31,378 l	48,956 l	23,597 l	43,834 l
Total Porcupine River	85,220	33,346	85,109 m	37,267 m	59,392 m	32,700 m	208,784 m	114,370 m	189,042 m	68,597 m	145,582 m
CHANDALAR RIVER	--	2,607	4,906 n,j	1,145 n	--	--	2,535 o	59,313 o,k	52,416 o,k	33,619 o,k	69,161 o,k
UPPER YUKON TRIBUTARIES											
Kluane River (YT)	4,640 e	3,150	25,806	5,378 e	8,578 e,j	7,200	7,538	16,686	12,000	6,950	3,050
Yukon River (YT) p	--	--	250 j	1,020	7,560	2,800	10,760	825	6,115	1,550	5,320
MAINSTEM YUKON CANADA (tagging) r	--	--	--	34,780 r	90,875 r	--	62,010 r	87,990 r	80,776 r	35,588 r	35,000 r

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a Data are peak aerial survey estimates rated fair to good unless otherwise indicated.

b Includes following areas: Toklat River in vicinity of Knights Roadhouse; Sushana River; Geiger Creek. Lower Toklat River counts are included in Total Tanana River Index for years 1979 and 1987.

c Poor survey.

d Combined aerial and ground surveys.

e Ground surveys.

g Peak aerial count was 10,664.

h Population estimate based upon replicate ground surveys.

i Richardson Highway to Blue Creek

j Incomplete, partial survey of index area(s).

k Bendix side scan sonar estimate. (For Sheenjek River -- includes expansion for uninsonified mid-river zone).

l Weir counts.

m Figure includes sonar or weir estimate and is not comparable on a year to year basis.

n Fair to poor survey rating.

o USFWS estimates.

p Vicinity of Ft Selkirk to Carmacks.

r Estimated total spawning escapement to Canada (excluding Porcupine R.) from DFO tagging project.

s Very preliminary estimates (analysis still underway).

t Includes estimated 20,000 in the river prior to sonar counts.

Table 9. Coho salmon escapement counts for selected spawning areas in the Yukon River drainage, 1972-1989. a

Year	Nenana River Drainage					Delta Clearwater River d,e	Clearwater Lake and Outlet	Richardson Clearwater River
	Lost Slough	Clear Creek	Wood Creek b	17 Mile Slough	Subtotal			
1972	-	-	-	-	-	632	417	454 g
1973	-	-	-	-	-	3,322	551 d	375 d
1974	1,388	-	-	27	1,415	3,954	560	652 d
1975	943	-	-	956	1,899	5,100	1,575 d,e	4 g
1976	118	13	-	281	412	1,920	1,500 d,e	80 g
1977	524	-	310 c	1,167	2,001	4,793	730 d,e	327
1978	350	-	300 c	466	1,116	4,798	570 d,e	-
1979	227	-	-	1,987	2,214	8,970	1,015 d,e	372
1980	499	-	1,603 c	592	2,694	3,946	1,545 d,e	611
1981	274	-	849 h	1,005	2,128	8,563 f	459 g	550
1982	-	-	1,436 h	-	1,436	8,365 f	-	-
1983	766	-	1,044 h	103	1,913	8,019 f	253	88
1984	2,677	2,600 b,e	8,805 h	-	14,082	11,061	1,368	428
1985	1,584	-	3,775 h	2,081	7,440	5,358	750	-
1986	794	605 b,e	1,664 h	218 g	3,281	10,857	3,577	146 g
1987	2,511	-	2,450 h	3,802	8,763	22,300	4,225 d,e	-
1988	348	-	2,046 h	-	2,394	21,600	825 d,e	-
1989	-	-	412 h	824 g	1,236	11,000	1,600 d,e	483

a Only peak counts presented. Survey rating is fair-good unless indicated otherwise.

b Surveyed by F.R.E.D.

c Foot survey.

d Surveyed by Sport Fish.

e Boat survey.

f Population estimate.

g Poor survey.

h Weir count.

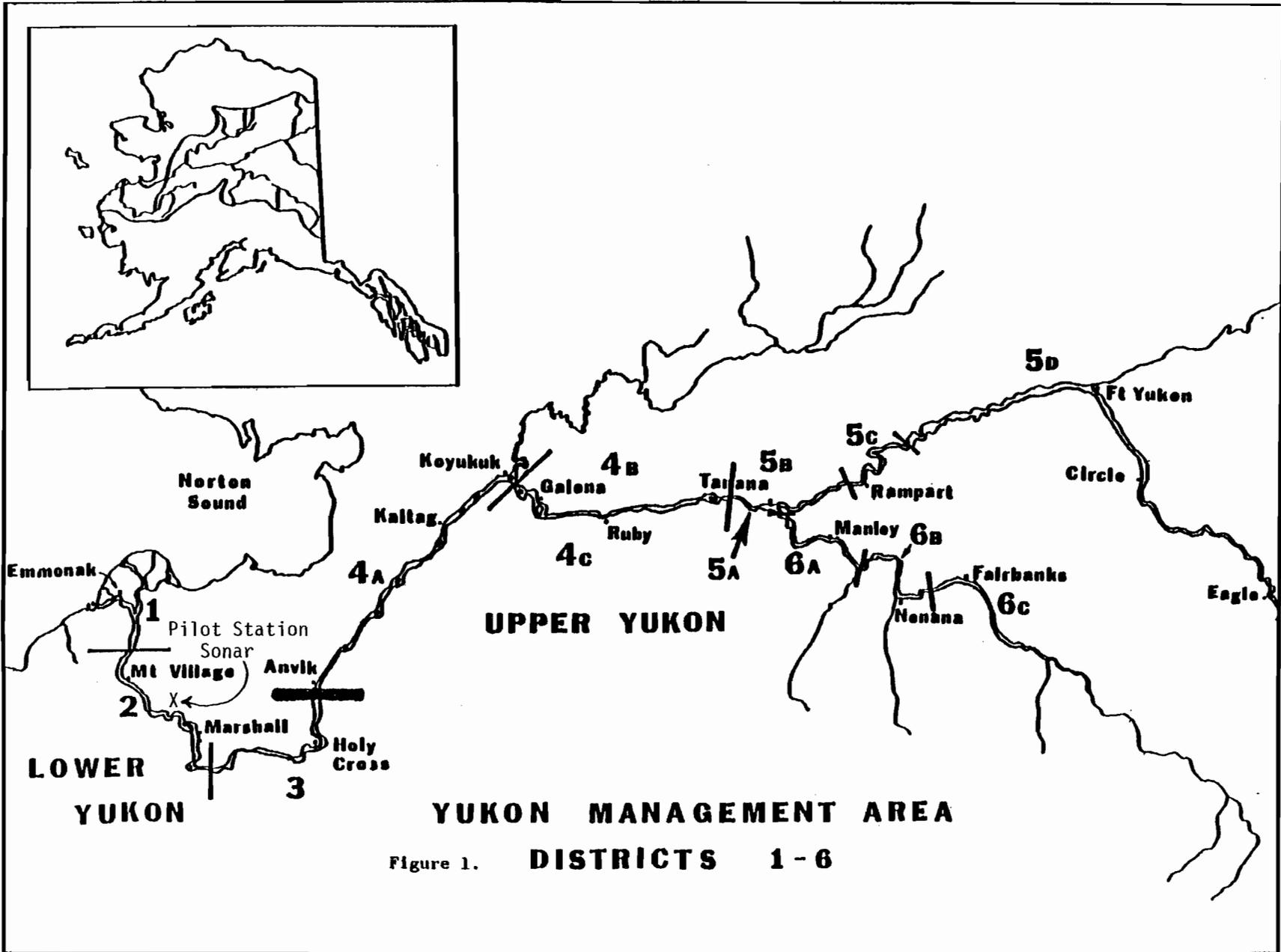


Figure 1. DISTRICTS 1 - 6