YUKON RIVER SALMON SEASON REVIEW FOR 1991 AND TECHNICAL COMMITTEE REPORT

Prepared by

THE JOINT UNITED STATES/CANADA
YUKON RIVER TECHNICAL COMMITTEE

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1.0 INTRODUCTION

The chief negotiators for the United States and Canadian delegations to the Yukon River salmon negotiations directed the Joint Technical Committee (JTC) to address the subject areas described in this report. The JTC met in Whitehorse on the 6th and 7th of November, 1991. The meeting was attended by the following persons:

Canadian Department of Fisheries and Oceans
- George Cronkite
- Sandy Johnston
- Ken Wilson (co-chair)

Yukon Territorial Government
- Don Toews

Alaska Department of Fish and Game
- Larry Buklis (co-chair)
- Gene Sandone

United States Fish and Wildlife Service
- Monty Millard

National Marine Fisheries Service
- Aven Anderson

This report is organized into seven sections and two attachments. Sections 2 through 6 review the 1991 fishing season on the Yukon River, the status of the spawning stocks, and results from selected projects. Section 7 addresses an assignment given to the JTC by the chief negotiators regarding further development of a program priority list. Attachment I provides an update of historical Yukon River salmon catch and escapement data in graphic and tabular form. Attachment II provides a written summary of the status of marine fisheries which may intercept Yukon River origin salmon.

2.0 1991 COMMERCIAL FISHERY - ALASKA

Preliminary commercial sales records total 782,443 salmon and 169,552 pounds of unprocessed salmon roe for the Alaskan portion of the Yukon River drainage (Figure 1) in 1991. This was composed of 101,240 chinook, 346,828 summer chum, 231,157 fall chum and 103,218 coho salmon sold in the round (Table 1). Additionally, roe sales by species totalled 3,829 pounds for chinook, 141,976 pounds for summer chum, 19,448 pounds for fall chum, and 4,299 pounds for coho salmon. With regards

to fish sold in the round, the chinook salmon catch was 5% below the 1986-90 average, summer chum 52% below average, fall chum 73% above average, and coho salmon two times greater than the average (Table 2). Roe sales were 32% below the 1986-90 average for summer chum salmon, and 3.3 times greater than the 1986-90 average for fall chum salmon. Note that the five year average for fall chum salmon includes 1987, when the commercial fishery was closed. Roe sales data were not available by species for chinook and coho salmon prior to 1990, therefore historical comparisons are not yet meaningful.

Yukon River fishermen in Alaska received an estimated $9.5 million for their catch, approximately 9% above the recent 5-year average. Ten buyer-processors operated in the Lower Yukon Area, and 12 buyer-processors and 2 catcher-processors operated in the Upper Yukon Area of Alaska.

Lower Yukon fishermen received an average landed price per pound of $3.70 for chinook, $0.36 for summer chum, $0.34 for fall chum, and $0.44 for coho salmon. Upper Yukon commercial fishermen received an estimated per-pound average price of $0.49 for chinook, $0.17 for summer chum, $3.99 for summer chum roe, $0.20 for fall chum, $3.61 for fall chum roe, and $0.21 for coho salmon.

2.1 Chinook Salmon

Chinook salmon migratory timing into the lower river appeared to be about average compared with other years. The Lower Yukon Area was generally free of ice by the 24th of May. The first chinook salmon was reported to have been captured by the 29th of May in Emmonak by a subsistence fisherman. The ADF&G test fishing nets near Emmonak also captured their first chinook salmon on the 29th of May. The chinook return was primarily through south and middle mouths based on commercial and test net catches. Test fishing catches of chinook salmon maintained above average catch rates for the entire summer season. Approximately 50% of the chinook salmon return had entered the lower river by the 19th of June based upon test fishing data. The estimated sonar passage of 77,000 chinook salmon at Pilot Station was the lowest since the project was initiated in 1986. However, offshore fish movement and sonar beam attenuation are two factors which may have affected accuracy of the passage estimate. The average weight of chinook salmon in the lower river commercial catch was 20.4 pounds. The average weight of chinook salmon harvested during unrestricted mesh size fishing periods and restricted mesh size periods was 20.7 and 15.7 pounds, respectively. The chinook salmon return was unusual in regard to the large age 5 contribution. This followed one year after a large age 4 component in 1990.

The commercial salmon fishing season was opened by emergency order after approximately ten days of increasing subsistence and test net catches in the lower

Yukon River. The chinook salmon directed fishery was opened on a staggered basis: the 13th of June in District 1, the 16th of June in District 2, and the 23rd of June in District 3. All subsequent fishing periods were established by emergency order. The first commercial fishing period in Districts 1 and 2 was 12 hours in duration. Because of continued strong catches in the test and commercial fisheries, subsequent fishing periods remained at 12 hours in duration.

The total District 1 and 2 chinook salmon harvest during the summer season was 91,872 fish, 2% above the mid-point of the guideline harvest range and 6% below the 1986-1990 average harvest. An additional 88 chinook salmon were harvested during the fall season. A total of 87,740 chinook salmon were harvested during unrestricted mesh size fishing periods and 4,220 chinook salmon were harvested during restricted mesh size fishing periods. Due to the above average abundance of chinook salmon and the below average abundance of summer chum salmon, unrestricted mesh size gill nets were allowed in five of the six summer season fishing periods in District 1 and five of the seven summer season fishing periods in District 2. Overall, chinook salmon commercial harvests were spread proportionately throughout the return.

In District 3, two unrestricted mesh size fishing periods (one 18 hours and one six hours in duration) were allowed. 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. A total of 2,344 chinook salmon were harvested in District 3, which was 17% above the mid-point of the guideline harvest range, and 35% above the recent five year average.

In District 4, the chinook salmon harvest is largely incidental to the directed summer chum salmon fishery. Virtually all of the District 4 chinook salmon commercial harvest is taken in Subdistricts 4-B and 4-C. After the first two fishing periods in those subdistricts, ending on the 2nd of July, the chinook salmon harvest was approximately 1,900 fish. Since the guideline harvest range for District 4 is 2,250 to 2,850 chinook salmon, the next commercial opening was delayed until the 7th of July, when summer chum salmon would be more numerous and chinook salmon less abundant. This strategy slowed down the chinook salmon harvest and allowed fishermen the opportunity to harvest to the low end of the summer chum salmon guideline harvest range. The total District 4 sale of 2,440 chinook salmon and 2,222 pounds of chinook salmon roe was slightly above the upper end of the guideline harvest range.

In District 5, chinook salmon is the primary species of commercial value during the early season due to the low availability and poor flesh quality of chum salmon. Commercial fishing periods were scheduled when the bulk of the run was in the district in order to reduce the impact on individual stocks. Two fishing periods (one 48-hour and one 18-hour) occurred in Subdistricts 5-A, 5-B, and 5-C for a total harvest of 3,256 chinook salmon and 62 pounds of roe, which was above the upper end of the guideline harvest range of 2,850 fish. One 48-hour fishing period was allowed in

Subdistrict 5-D for a harvest of 554 chinook salmon, which exceeded the guideline of 500 fish.

In District 6, the chinook salmon harvest is largely incidental to the directed summer chum salmon fishery due to the low harvest guideline for chinook (600 to 800 fish). The Alaska Board of Fisheries has directed that the Tanana River commercial fishery could be managed as a terminal fishery. The commercial fishery is usually not opened until escapement aerial surveys in the Chena and Salcha Rivers indicate adequate numbers of chinook salmon will escape. The first 42-hour fishing period occurred on the 15th of July, and fishermen fished a total of six 42-hour periods. Commercial sales totalled 686 chinook salmon and 1,545 pounds of chinook salmon roe.

2.2 Summer Chum Salmon

As for chinook salmon, the majority of the summer chum salmon run entered through the south and middle mouths. Comparative test net indices indicated the 1991 summer chum salmon return was well below average in abundance, although slightly larger in magnitude than the 1987 and 1990 returns. Approximately 50% of the summer chum salmon return had entered the lower river by the 24th of June according to test fishing CPUE data. The sonar project at Pilot Station estimated summer chum salmon passage to be 1,283,000 fish. However, offshore fish movement and sonar beam attenuation are two factors which may have affected accuracy of the passage estimate. Preliminary age composition information from District 1 and 2 indicated that the commercial catch was composed primarily of age 5 fish. This information suggests that the age 4 component of the return from the poor 1987 parent year was weak, as had been expected. The average weight of summer chum salmon in the lower river commercial catch was 6.7 pounds.

Due to the poor return of summer chum salmon, a restricted mesh size fishing period was not implemented in District 1 until the 4th of July, and in District 2 until the 30th of June. The summer commercial fishing season was closed after only this one restricted mesh size fishing period in District 1, and after only two in District 2 due to poor spawning escapement to the Andreafsky River (based upon an aerial survey conducted on the 7th of July). A total of 108,265 summer chum salmon was harvested during unrestricted mesh size fishing periods, and 205,043 were harvested in a total of three restricted mesh size fishing periods in Districts 1 and 2 combined. The total District 1 and 2 summer chum salmon commercial harvest of 313,308 fish was 52% below the recent 5 year average.

There was one restricted mesh size fishing period in District 3. A total of 2,383 summer chum salmon was harvested in two unrestricted mesh size fishing periods and 6,529 in the one restricted mesh size fishing period. The summer commercial fishing season closed on the 30th of June. The District 3 summer chum salmon

harvest was 8,912 fish, which was well above the recent 5 year average.

In District 4, the season opened on the 26th of June. Due to the catch rate anticipated in Subdistrict 4-A, four of the five fishing periods were limited to 24 hours in duration, while Subdistricts 4-B and 4-C remained on the regulatory 48-hour fishing periods. Subdistrict 4-A fishermen sold 5,289 summer chum salmon and 128,231 pounds of roe, which was within the guideline harvest range of 61,000 to 183,000 pounds of roe. Subdistricts 4-B and 4-C also fished five periods and sold 1,092 summer chum salmon and 9,001 pounds of roe, which was below the lower end of the guideline harvest range of 16,000 to 47,000 summer chum salmon. The Subdistrict 4-B and 4-C commercial fishery summer season was closed prior to reaching the low end of the summer chum salmon guideline harvest range due to exceeding the upper end of the chinook salmon guideline harvest range.

In District 5, summer chum salmon are caught incidentally to the chinook salmon fishery. A total of 30 summer chum salmon and 28 pounds of roe were sold.

In District 6, there were six 42-hour commercial fishing periods during the summer season. A total of 18,197 summer chum salmon and 4,716 pounds of roe were sold.

2.3 Fall Chum and Coho Salmon

Fall chum salmon migratory timing into the lower river initially appeared to be average. Historical test fishing and sonar data indicate that usually by the 10th of August 50% of the run has passed. However, according to other indicators, including upper river test fishery and escapement projects, the timing was somewhat later than had been estimated from the lower river test fishery. Three pulses of fall chum entered the river during August, on the 7th of August, on the 18th and 19th of August, and on the 22nd of August. Coho salmon test fishing data indicated the run was above average in magnitude and average in run timing.

The fall season commercial salmon fishery was opened by emergency order on the 29th of July in District 1, and on the 31st of July in Districts 2 and 3. A fishing schedule of 16 hours duration in the coastal "Set Net Only Area" where tides affect fishing opportunity, and of 9 hours duration in the remainder of District 1 and in Districts 2 and 3 was established. Typically, fall chum salmon enter the river in relatively short pulses during windy weather. However, the 1991 fall chum salmon return remained strong throughout late July and early August. A total harvest of 117,584 fall chums had been taken as of the 16th of August after six fishing periods in District 1 and five periods each in Districts 2 and 3. The fall chum run after the 16th of August remained strong and continued harvests occurred until the close of the fall season on the 27th of August. A total of 171,565 fall chum salmon and 96,898 coho salmon were harvested in Districts 1, 2, and 3 combined. The fall chum salmon

harvest was 23% above the midpoint of the 60,000 to 220,000 fall chum salmon guideline harvest range for Districts 1, 2, and 3 combined.

Prior to the 1991 fishing season, the Alaska Board of Fisheries closed the Kantishna and Toklat Rivers to subsistence fishing for fall chum salmon in order to rebuild Toklat River spawning escapement. However, subsequent decisions issued by the Alaska Superior Court provided for subsistence fishing to resume on those river systems in 1991 due to injunctive relief. The injunctive relief for the 1991 season does not alter the regulations beyond the 1991 season. On the 17th of August, in response to the court decisions, ADF&G reduced commercial fishing time downstream from the Kantishna River in an effort to benefit Toklat stock escapement.

Preliminary passage estimates at the Pilot Station sonar site through termination of operations on the 1st of September totalled 547,000 fall chum salmon and 79,000 coho salmon. However, similar to 1990, offshore fish passage was considered significant in 1991 and was accounted for to the extent possible in the fall season passage estimates. Sonar beam attenuation continued to be a factor as discussed above for the summer season.

In Subdistricts 4-B and 4-C the fall season opened on the 11th of August. However, due to depressed market conditions there were few outlets for the fish in 1991. The season remained open until the regulatory closing date on the 30th of September. The commercial harvest by two catcher-processors and a few fishermen who were able to secure a buyer totalled 3,737 fall chum salmon and 14 coho salmon sold in the round, and 1,669 pounds of fall chum salmon roe. The guideline harvest range is 5,000 to 40,000 fall chum and coho salmon combined for Subdistricts 4-B and 4-C combined.

The Subdistrict 5-A, 5-B, and 5-C fall season was announced for two 12-hour periods per week in 5-A and two 24-hour periods per week in 5-B and 5-C beginning on the 20th of August. Four fishing periods were allowed in each subdistrict. Harvest totalled 24,141 fall chum salmon and 3,625 pounds of roe. No coho salmon were reported sold. The guideline harvest range for Subdistricts 5-A, 5-B, and 5-C combined is 4,000 to 36,000 fall chum and coho salmon combined. Subdistrict 5-D was open for three fishing periods. Sales totalled 3,214 fall chum salmon in the round. No coho salmon were reported sold. The guideline harvest range for Subdistrict 5-D is 1,000 to 4,000 fall chum and coho salmon combined.

District 6, the Tanana River, was managed under a terminal fishery management plan as directed by the Alaska Board of Fisheries for the fourth consecutive year. Based on sustained high catches in test fish wheels and in the subsistence fishery, performance of down-river commercial fisheries on the later run component, and the limited total exploitation on the later run component, the fall chum salmon run in the Tanana River was assessed to be above average in strength. Three fishing periods

were allowed in each subdistrict in District 6. Due to Board of Fisheries concern for the Toklat River fall chum salmon stock, fishing periods in Subdistrict 6-A were 12-hours in duration, while they were 42-hours in Subdistricts 6-B and 6-C. Sales for District 6 totalled 28,500 fall chum salmon, 14,154 pounds of fall chum roe, 6,306 coho salmon, and 4,299 pounds of coho salmon roe.

3.0 1991 COMMERCIAL FISHERY - CANADA

The management plans for the Canadian chinook and chum fisheries on the Yukon River in 1991 were formulated to generally reflect the understandings reached in the last round of the Yukon Salmon Negotiations which were held in Juneau, during the week of the 23rd of April, 1990. Accordingly, the guideline harvest ranges for chinook and chum salmon, and the border and spawning escapement goal for chinook salmon, tentatively agreed to in Juneau, provided the foundation for the 1991 management plans.

A preliminary total of 41,690 salmon including 10,906 chinook salmon and 30,784 chum salmon was harvested in the 1991 Canadian Yukon River commercial fishery. The chinook catch was 5% below the recent chinook cycle (1985 - 1990) average catch of 11,427 chinook, whereas, the chum catch was 6% above the recent cycle average of 28,985 chum (1987 to 1990 average). A total of 30 commercial licenses was issued in 1991, similar to 1990. Most of the commercial chinook harvest was taken by gill nets set in eddies. However, during the chum season, more than 50% of the catch was estimated to have been taken in fish wheels. Nine fish wheels were used in 1991 compared to three in 1990.

3.1 Chinook Salmon

The elements of the chinook management plan adopted for 1991 included:

i) a minimum escapement goal of 18,000 chinook;

ii) a total upper Yukon guideline harvest range for all users of 16,800 to 19,800 chinook salmon;

iii) a commercial guideline harvest range of 9,100 to 12,100 chinook and a pre-season target of 9,780 chinook. Based on the pre-season forecast for a below average return, it was expected the catch would fall towards the lower end of the range; and,

iv) a one day per week fishery for the initial two weeks of the season, followed by a three-day per week fishing period. Thereafter, the openings for the remainder of the chinook season were planned to be for four days subject to the strength of the run and the harvest guideline. This regime was a further cut-back to the 50% reduction in fishing time during the early part of the season initiated in 1990. The change from 1 day/week openings to the 3 day/week opening was to occur exactly two weeks after the run had deemed to have commenced. One additional day/week would be allowed in the upper fishing district, ie. upstream of the Sixty Mile River after the initial one day/week periods.

The commercial fishery opened on the 1st of July for one day per week after the presence of chinook had been determined by the DFO test fish wheels located just upstream of the international border. The first chinook was caught in the fish wheels on the 28th of June. Effort during the first opening (11:00 am on the 1st of July to 11:00 am on the 2nd of July) was low with only six people fishing; however, the number of fishermen increased in succeeding weeks as chinook abundance increased. The fishery remained open for one day each week for the first two weeks of July and daily catches during this period were approximately five to seven times the average values. The average catch per day of 252 chinook during the second opening on the 8th and 9th of July, was a record for this week.

The fishing plan stipulated that fishing time would change to a three day fishing period exactly two weeks after an increasing trend in abundance had been determined at the DFO fish wheels. A three-day moving average of the daily fish wheel catches assisted in identifying this trend and the 2nd of July was chosen as the official "beginning" of the run. Therefore, the fishery was open for three days from 11:00 am on the 16th of July to 11:00 am on the 19th of July. Fishing success remained excellent during this opening and the average daily catch of 730 chinook per day was 85% above average (1985 to 1990) and was the third highest for this week on record. The peak average catch per day of the season occurred during this week. Usually the run peaks during the last week of July and the first week of August. The above average weekly catches in the fishery to this point resulted in above average total run forecasts and an increase in the commercial catch target to 10,500 - 11,000 chinook. Border escapement forecasts ranged from 53,600 from the week of the 8th of July, to 44,700 in the week of the 22nd of July, based on regressions of previous year's cumulative catch per day on border escapement.

Commencing on the 23rd of July, the fishery opened for four days per week in the commercial fishing area located downstream of the Sixty Mile River. (An additional day of fishing was permitted each week in the upper fishing area located from the Sixty Mile River upstream to Tatchun Creek after the week of the 8th of July). Fishing conditions during this week were poor due to very high water conditions and high debris loads. Consequently, average daily catches were below average, although a relatively low tag recovery rate in the fishery still indicated the likelihood of an above

average return.

The fishery in the succeeding week was extended 24 hours to five days to keep the catch on target with the 10,500 - 11,000 chinook guideline, and to compensate for the poorer than normal fishing conditions. Tag recovery rates remained low during this period and the DFO fish wheel catches were still above average. In spite of these indications of a strong return, daily catch rates in the commercial fishery were below average and continued to be so throughout the remainder of the season.

Fishing time was initially scheduled for three days for the week of the 12th of August but a 24 hour extension was granted, again because of poor initial fishing conditions and the fact that the cumulative catch was lagging behind the guideline harvest. For the remainder of the chinook season, fishing time was reduced to two days per week.

The total commercial chinook catch was 10,906 fish with 10,416 of the catch (approximately 96%) being harvested in the lower fishing area. For comparison, the recent six-year average commercial catch is 11,427 chinook (1985 to 1990); the lowest catch in this period occurred in 1989 with a catch of 9,789 chinook, whereas, a record catch of 13,217 occurred in 1988. In spite of the above average return, the commercial catch fell well within the guideline harvest range of 9,100 to 12,100 chinook and did not come closer to the upper part of the range primarily because of average to below average run strength during the latter half of the season. Preliminary tag recovery information suggested a Canadian commercial harvest rate of 27% on chinook salmon in 1991, compared to a cycle average harvest rate of 30% (1985 - 1990).

Comparisons of the average commercial chinook catch/day with previous years indicated the run was protracted with an above average early component contrasted by average to below average run strength during the latter half of the season. The strong early component was corroborated by the DFO fish wheel catches, however, the fish wheels indicated a stronger run later in the season than evident from the performance of the fishery. Both the cumulative DFO fish wheel catch and cumulative commercial catch per day were above average and were both the second highest on record.

The maximum number of commercial fisherman active during any one week of the chinook salmon run was 16 fishermen, two less than in 1990.

3.2 Fall Chum Salmon

The conservation initiatives undertaken in 1990 were continued in 1991 for upper Yukon chum salmon. The chum management plan included the following components:

i) an escapement goal of 82,600 upper Yukon chum salmon. This was the weighted average of the principal brood year escapements, 1986 and 1987. In the absence of an escapement goal agreed to by both Canada and the U.S., it was the Canadian objective to set an escapement target at this level so brood-stock levels could hopefully be maintained;

ii) a guideline harvest range for all Canadian upper Yukon fisheries of 23,600 to 32,600 chum;

iii) a commercial guideline harvest range of 20,900 to 29,900 chum salmon with a pre-season target of 27,300 chum in view of an average to above average expected return;

iv) reduced fishing time (two days/week) for the first two weeks of the chum season, followed by four day/week openings commencing the first week of September subject to assessments of run strength and the guideline harvest ranges.

Fishing time was reduced to two days per week during the last half of August as chinook abundance declined and the chum run began to build. Daily catches of chum salmon during the last two weeks of August were below average and effort was relatively light with one to three fishermen fishing. Commencing on the 2nd of September, fishing time was increased to four days per week. The average catch per day for this week, 680 chum/day, was the second highest on record and was 43% above the recent cycle average (1987-1990) for this week.

Near record catches were again recorded in the following week (fishing from the 9th to the 13th of September), and the average daily catches in week 38 of 3,162 chum/day (fishing from the 16th to the 20th of September), and 3,341 chum/day in week 39 (fishing from the 23rd to the 25th of September) were weekly records. The catch per day during week 38 was 81% above the recent four-year average for this week, and the catch per day during week 39 was 87% above the weekly average. Fishing time was cut to two days during week 39, which was the peak of the chum season, to keep the cumulative catch within the upper limit of the guideline harvest range. The fishery closed on the 25th of September, the earliest closing date on record.

The bi-modality observed in the run timing in each of the previous two years was not evident in the commercial fishery in 1991. This was possibly due to a poor return of early-timed stocks which was reflected in the below average catches in late August. There was also some evidence of this in the spawning distribution. However, the initial weakness in chum catches was vastly overshadowed by the record and near record high average daily catches during the month of September. Generally, the run timing appeared to be about average with the run steadily building in strength to a peak near the end of September.

The total commercial chum harvest of 30,784 fish exceeded the commercial guideline harvest range of 20,500 to 29,500 in spite of reductions in fishing time and the earliest season closure on record. For comparison, the 1987-1990 average catch was 28,985 chum ranging from 17,549 chum in 1989 to a record catch in 1987 of 40,591 chum salmon. Based on preliminary tag recovery data, the harvest rate in the commercial fishery was approximately 27%, compared to 33% in 1990 and the 1987-1990 cycle average of 35%. The run strength based on fishery performance indicators was higher than indicated by DFO fish wheel catches and tagging results. This may have been affected by the high water conditions which persisted throughout most of the chum salmon run. High water may have made the fish more bank oriented than usual which in turn would make them more susceptible to capture in the fishery, especially considering the increased use of fish wheels in the commercial fishery this year. A maximum of 15 people fished in any one week during the chum season.

4.0 NON-COMMERCIAL FISHERIES

4.1 Alaska

4.1.1 Subsistence Fishery

Subsistence "catch calendars" were mailed to each fishing household in all Yukon River drainage communities in Alaska in May for use during the fishing season. Direct interviews were conducted with fishermen immediately following the season. Subsistence fishermen in portions of District 5 and all of District 6 were required to obtain subsistence fishing permits and record harvest data. Fishermen not contacted by other means are now being contacted by mail. Analysis of 1991 subsistence harvest data will not be completed for several months.

Data for 1990 were not available for inclusion in the November 1990 JTC report, and are therefore summarized here. The court ruled in July of 1990 that every resident of the State of Alaska was an eligible subsistence user, making the personal use category obsolete. Preliminary estimates of the 1990 subsistence harvest in the Alaska portion of the Yukon River drainage totalled 52,113 chinook, 118,471 summer chum, 182,033 fall chum, and 47,816 coho salmon. These estimates do not include commercially caught summer chum salmon retained for subsistence purposes in District 4.

4.1.2 Sport Fishery

Approximately ninety percent of the sport fishing effort in the Alaskan portion of the

Yukon River drainage occurs in the Tanana River drainage, mostly along the road system. Only a small portion of the effort is directed toward anadromous salmon, although major sport fisheries targeting anadromous salmon take place annually in the Chena, Salcha, Chatanika, and other Interior Alaska river systems. Sport fishing effort and harvests are annually monitored through a state-wide sport fishery survey. Some on-site fishery monitoring also takes place at locations where more intense sport fishing occurs. Harvest information for 1991 is not yet available. However, it is expected that harvests for 1991 will be similar to recent years, for which harvest estimates have averaged about 1,000 anadromous chinook salmon, 1,200 anadromous chum salmon, and 1,600 anadromous coho salmon. It is estimated that most of these anadromous salmon harvests occurred within the Tanana River drainage.

4.2 Canada

4.2.1 Indian Fishery

Data has not yet been compiled for the 1991 Indian fishery catches. It is anticipated that the total upper Yukon IFF chinook catch will be similar to the 1990 catch of about 7,100 chinook; and the chum catch is expected to be above the recent cycle average of approximately 2,900 chum.

Coho catches in Canada are generally limited to the Porcupine drainage where they are taken in the Old Crow fishery. The recent average for this fishery is approximately 500 coho. Catch data for chinook, chum and coho from the Porcupine River are not yet available.

4.2.2 Domestic Fishery

Catch data for the domestic fishery are still preliminary. The total chinook catch reported to date is 227 fish; chum catch records are not yet available.

4.2.3 Sport Fishery

As in previous years, no sport fishery harvest data was collected in 1991. In the past it was assumed that approximately 300 chinook were harvested annually by sport fishermen in Canadian sections of the Yukon River basin. However, there are concerns that actual catches have significantly exceeded this level.

5.0 STATUS OF SPAWNING STOCKS

5.1 Chinook Salmon

5.1.1 Alaska

Chinook salmon escapement objectives were generally met in the Alaska portion of the Yukon River drainage. In the lower river tributaries, aerial survey index counts were obtained of 1,938 chinook salmon in the East Fork and 2,544 in the West Fork of the Andreafsky River, and 625 within an index area of the Anvik River. Escapement objectives are 1,600 and 1,000 for the East and West Forks of the Andreafsky River, respectively, and 500 for the Anvik River index area. Average to above average numbers of chinook salmon were observed in aerial surveys of the Nulato (2,020 fish) and Gisasa (1,690 fish) Rivers in the middle portion of the drainage. Aerial surveys of the Chena and Salcha Rivers, in the Tanana River drainage, provided indices of 1,276 and 2,212 chinook salmon, respectively. The surveys for these two streams were conducted prior to peak of spawning, therefore it is considered that the aerial survey escapement objectives of 1,700 for the Chena River and 2,500 for the Salcha River were probably met. ADF&G has conducted tagging studies on the Chena River since 1986, and on the Salcha River since 1987, to estimate chinook salmon escapement population sizes. Preliminary estimates for 1991 are 3,200 chinook salmon for the Chena River and 5,600 chinook salmon for the Salcha River. These preliminary estimates for 1991 compare to a range of 2,666 in 1989 to 9,065 in 1986 for the Chena River, and a range of 3,294 in 1989 to 10,728 in 1990 for the Salcha River.

5.1.2 Canada

Last minute budget authorization was received by DFO for chinook aerial surveys, however the survey timing was near normal. Rivers surveyed included the Little Salmon, Ross, Wolf, Nisutlin and the Big Salmon. High water conditions were experienced in all surveys, affecting survey results strongly in some systems.

No chinook surveys observed escapements as large as those in 1990. The Little Salmon was below average, but survey conditions were only fair due to slightly turbid water and the survey was believed to be about one week late. The Ross River escapement was above average for a survey rated fair due to slightly turbid water and less than ideal light conditions. The Wolf River escapement was above average, again with a survey rated fair due to slightly turbid water and glare. The Nisutlin River survey was aborted because of turbid water conditions. The Big Salmon count was above average for a survey rated as good. Tatchun Creek and the Tincup River were not surveyed in 1991 due to time constraints. Anecdotal information for Tatchun Creek was that the escapement was good.

The Whitehorse Fishway count of 1,266 represents an increase of 95% over the most recent five year average of 649. It should be noted that this return included 506 (40%) coded-wire tagged hatchery returns. Of this 40%, 232 were adult females, 198 were adult males and 76 were jacks or precocious males. This represents a minimum estimate of the return of hatchery chinook since not all hatchery chinook are tagged. If hatchery chinook returns are excluded (506+) the return of wild chinook would be approximately 750 in 1991. A more accurate estimate of wild escapement will be available at a later date when age information is available for the 1991 run.

The preliminary tagging estimate of total spawning escapement for the Canadian portion of the upper Yukon drainage was 22,582 chinook. This estimate represents an decrease of roughly 2% over the most recent five year average of 23,130. Preliminary results of the DFO tagging programme are discussed in greater detail in section 6 of this report.

5.2 Summer Chum Salmon

A preliminary sonar estimate of 860,525 summer chum salmon to the Anvik River was approximately 78% above the escapement objective of 487,000 fish. Two aerial surveys of the Andreafsky River system conducted on the 7th and 22nd of July, both indicated escapements well below the objective levels. The peak aerial survey count on the 22nd July of 58,180 summer chum salmon for the East and West Fork combined was well below the escapement objectives of 109,000 for the East Fork and 116,000 for the West Fork. Surveys of the Nulato (25,641 fish), Gisasa (7,003 fish), and Hogatza (9,947 fish) Rivers, conducted under generally good survey conditions, indicated that summer chum salmon escapements to these systems were below desired levels. The magnitude of the Anvik River stock size compared to the other summer chum salmon stocks, the mixed stock characteristics of the fisheries, and the variable status of the stocks makes it difficult to optimize the overall harvest and escapement for all of the stocks.

5.3 Fall Chum Salmon

5.3.1 Alaska

Fall chum salmon escapement assessment was not yet completed when this report was prepared. The preliminary sonar estimate of approximately 90,000 fall chum salmon for the Sheenjek River is well above the escapement objective of 64,000 fish. Additional funding was provided which enabled the start of the Sheenjek River sonar project approximately two weeks earlier than in the past to include the entire salmon migration period. The project was operated from the 9th of August through the 23rd of September in 1991. The Chandalar River sonar project, operated by the USFWS

from 1986 through 1990, was not operational in 1991. Escapement to the Toklat River, in the lower portion of the Tanana River drainage, was only about 40% of the objective of 33,000 fish. Escapement surveys have not yet been completed in the upper Tanana River drainage, but preliminary information indicates that escapement objectives will be achieved for the upper Tanana River index areas.

5.3.2 Canada

Chum aerial surveys were conducted on the main-stem Yukon, Kluane, Koidern, Teslin and Fishing Branch rivers by DFO in 1991. In addition, a foot survey was conducted on the Kluane River for biological sampling and tag recovery. Aerial surveys conducted on the Kluane River showed an above average escapement with counts up from 1990. The main-stem Yukon was below the most recent five year average. The Kluane survey was rated as excellent and the main-stem survey was rated as fair with turbid water and some icing conditions. Historically, survey counts for the Kluane stocks were generally higher than those for the Minto area stocks. In 1991 this trend was again noted with the Kluane stock the stronger. Fifty-three chum were counted in the Koidern River, again a fraction of the counts of 1984 and 1985 of over 1100 chum, but still showing some increase over most recent years. The Teslin River survey in 1991 showed an above average index count with fair survey conditions due to turbid water and glare problems.

The Fishing Branch River weir was operated in 1991 under a joint programme with the Vuntut Gwitch'in First Nation of Old Crow and DFO with funding from the Economic Development Agreement of the Federal and Territorial governments. The Fishing Branch weir showed an escapement in 1991 below the 1985 to 1990 average.

The preliminary tagging estimate of total spawning escapement for the Canadian portion of the upper Yukon drainage was approximately 76,447 chum, below the escapement goal of 82,600 set by canada in the absence of an agreed upon spawning escapement objective, up from the 1990 estimate of 51,755. This estimate represents an increase of 30% over the most recent five year average of 58,611 chum. It should be noted that this five year average has been declining for several years. Preliminary results of the DFO tagging programme are discussed in greater detail in section 7 of this report.

5.4 Coho Salmon

Coho salmon escapement assessment is very limited in the Yukon River drainage due to funding limitations and survey conditions at that time of year. Most of the information that has been collected is from the Tanana River drainage. The boat survey count of coho salmon escapement in the Delta Clearwater River for 1991 was a

record high 23,900 fish. Since 1971, documented abundance of coho salmon spawners in this system had ranged from 630 fish in 1972 to 22,300 in 1987.

6.0 PROJECT SUMMARIES

6.1 Alaska

The major run assessment, harvest monitoring, and spawning escapement studies in Alaska described in prior JTC reports were continued in 1991. Operational methods for these projects remained basically the same as previously described. Results from these projects are incorporated in the fishery and stock status portions of this report, or are reported in the tables of catch and escapement data. However, the stock identification and Yukon River sonar projects are discussed in some detail here due to their relative importance and the need to update prior information.

6.1.1 Salmon Stock Identification

Analysis of chinook salmon scale patterns, age compositions, and geographic distribution of catches and escapements are used by ADF&G on an annual basis to estimate geographic region of origin of the fishery harvests. Data have not yet been analyzed for 1991. Prior year scale patterns analysis (SPA) studies provided the following estimates of region of origin for the total Yukon River drainage chinook salmon harvest (commercial and non-commercial harvests in Alaska and Canada combined):

Year	Lower Run Origin	Middle Run Origin	Upper Run Origin
1982	15%	23%	62%
1983	12%	36%	51%
1984	29%	36%	35%
1985	31%	19%	50%
1986	27%	6%	68%
1987	17%	18%	65%
1988	27%	12%	61%
1989	25%	18%	57%
1990	20%	23%	57%

Note that the lower and middle regions of origins are within Alaska, and the upper region of origin is within the Canadian portion of the drainage.

The USFWS continued research into the feasibility of using protein electrophoresis methodology to identify chinook and chum salmon stocks in the mixed stock District 1 fishery in 1991. This work was initiated in 1987, and status reports have been provided to the delegations periodically as warranted by new information. Previously reported stock composition estimates for all years are undergoing reanalysis. The results will be provided to the delegations upon completion of technical review.

6.1.2 Yukon River Sonar

As in previous years, hydro-acoustic counters and test gill nets were operated by ADF&G on the main-stem Yukon River near Pilot Station from the 5th of June through the 1st of September 1991 to estimate salmon passage by species. Preliminary estimates of salmon passage for 1991 were approximately 77,000 chinook, 1,283,000 summer chum, 547,000 fall chum, and 79,000 coho salmon. Accuracy of the 1991 estimates is under review due to sonar beam attenuation and the offshore movement of fish, especially during the fall season. Annual estimates of salmon passage for prior years, which have been revised since the November 1990 JTC report, are presented here for reference as follows:

Year	Dates of Operation	Chinook	Summer Chum	Fall Chum	Coho	Pink
1986[a,b]	6/09-9/12	155,000	1,831,000	557,000	180,000	1,062,000
1987[b]	6/09-9/06	116,000	826,000	596,000	226,000	13,000
1988[b]	6/02-9/14	121,000	1,773,000	424,000	263,000	612,000
1989[b]	6/04-9/11	92,000	1,604,000	606,000	169,000	3,000
1990[c]	6/05-9/04	155,000	926,000	484,000	232,000	206,000
1991[c]	6/05-9/01	77,000	1,283,000	547,000	79,000	N/A

[a] Passage estimates for all species in 1986 were expanded based on river bank profile and water depth. This expansion was not necessary for subsequent years.

[b] Passage estimates for all species in 1986 through 1989 include only fish passage within the insonified zone.

[c] Passage estimates for fall chum and coho salmon in 1990 and 1991 include an estimate of passage beyond the insonified zone. Passage estimates for other species in 1990 and 1991 include only fish passage within the insonified zone.

6.2 Canada

6.2.1 Yukon River Test Fishing

Run timing and relative abundance data were collected by DFO for both chinook and

chum salmon from two fish wheels located near the Canada/U.S. border. Although the primary purpose of the fish wheels was to capture salmon for the tagging programme, consistency in the site selection and fishing time since 1982 does provide the opportunity for some inter-annual and in-season comparisons.

In 1991 the DFO fish wheel catch data indicated a chinook run with a strong and early component tapering to an approximately average mid component leading to a strong late run component, giving an overall protracted run timing. The run at the DFO fish wheels displayed two peaks, the first on the 12th of July and the second on the 6th of August, with the main portion of the run passing by the wheels between the 6th of July and the 12th of August.

Throughout the 1991 chinook tagging season the water levels appeared approximately normal. It is difficult to determine the relative magnitude of the run peak but preliminary population estimates indicate a smaller run size than that seen in 1990. The comparative weekly catches in the commercial fishery suggested a good return with a strong early component.

The DFO fish wheel catch data indicated a chum run of bimodal nature again in 1991. The run timing curve was about average but with a late start. The water levels during the 1991 chum run were extremely high throughout most of the chum season again this year, with levels equalling those seen in July. It may be that these unusually high water levels caused the chum to migrate closer to shore and increased their use of eddies, making them more prone to capture.

Small numbers of chum were first caught in the tagging fish wheels and the commercial fishery in mid to late July as was noted in several other years. The chum salmon present in the Canadian portion of the drainage prior to mid to late August might not be best described as "fall" chum.

6.2.2 Upper Yukon River Tagging Programme

DFO has conducted a salmon tagging programme on salmon stocks in the Canadian section of the drainage since 1982 (excluding 1984). The objectives of the study have been to estimate the total return of chinook and fall chum salmon to Canada (excluding the Porcupine drainage which is partially enumerated by the Fishing Branch weir or by aerial surveys) and to obtain estimates of total escapement, harvest rates, migration rates and run timing. Spaghetti tags are applied to salmon captured alive in the test fish wheels and subsequent recoveries are made by the different user groups fishing upstream. Population estimates are derived from those tags recovered in the commercial fishery below the Stewart River.

Analysis of the 1991 data is incomplete, however the preliminary chinook salmon

border population estimate is 40,993 fish (95% C.I. = 37,138 to 45,230). Of this number, approximately 22,582 chinook are estimated to have reached the various spawning grounds. Population and spawning escapement estimates for all years follow for comparison:

CANADIAN CATCHES AND ESCAPEMENTS OF YUKON RIVER CHINOOK 1982-1991

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
YEAR	COMM.	DOM.	IFF	SPORT	CDN TOTAL YUKON(a)	OLD CROW	TOTAL IFF(b)	TOTAL CDN(c)	BORDER ESC (d)	SPAWN ESC (e)
1982	8,640	435	7,433	300	16,808	400	7,833	17,208	36,598	19,790
1983	13,027	400	5,025	300	18,752	200	5,225	18,952	47,741	28,989
1984	9,885	260	5,850	300	16,295	500	6,350	16,795	43,911	27,616
1985	12,573	478	5,800	300	19,151	150	5,950	19,301	29,881	10,730
1986	10,797	342	8,625	300	20,064	300	8,925	20,364	36,479	16,415
1987	10,864	330	6,119	300	17,613	51	6,170	17,664	30,823	13,210
1988	13,217	282	7,178	650	21,327	100	7,278	21,427	44,445	23,118
1989	9,789	400	6,930	300	17,419	525	7,455	17,944	42,620	25,201
1990	11,324	247	7,101	300	18,972	258	7,359	19,230	56,679	37,707
1991*	10,906	227	6,978	300	18,411	200	7,178	18,611	40,993	22,582

(1991* - data preliminary and some numbers are estimates)

(a) = total of column (2)+(3)+(4)+(5)
(b) = total of column (4)+(7)
(c) = total of column (6)+(7)
(d) = calculated from tagging programmes, except 1984 (based on escapement index)
(e) = (10)-(6)

The preliminary population estimate of chum salmon migrating into Canada (excluding the Porcupine) in 1991 is 112,850 fish (95% C.I. = 104,756 to 121,531). Of this number, approximately 76,447 chum are estimated to have reached the various spawning grounds. For comparison, population and spawning escapement estimates for all years are as follows:

CANADIAN CATCHES AND ESCAPEMENTS OF YUKON RIVER CHUM 1982-1991

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
YEAR	COMM.	DOM.	IFF	SPORT	TOTAL(a) YUKON	OLD CROW	TOTAL IFF(b)	TOTAL CDN(c)	BORDER ESC(d)	SPAWN ESC(e)
1982	11,312	683	3,096	0	15,091	1,000	4,096	16,091	47,049	31,958
1983	25,990	300	1,200	0	27,490	2,000	3,200	29,490	118,365	90,875
1984	22,932	535	1,800	0	25,267	4,000	5,800	29,267	81,900	56,633
1985	35,746	279	1,740	0	37,765	3,500	5,240	41,265	99,775	62,010
1986	11,464	222	2,150	0	13,836	700	2,850	14,536	101,826	87,990
1987	40,591	132	3,622	0	44,345	135	3,757	44,480	125,121	80,776
1988	30,263	349	1,882	0	32,494	1,071	2,953	33,565	69,280	36,786
1989	17,549	100	2,462	0	20,111	2,909	5,371	23,020	55,861	35,750
1990	27,537	0	3,655	0	31,192	2,410	6,065	33,602	82,947	51,755
1991*	30,784	0	5,619	0	36,403	1,642	7,261	38,045	112,850	76,447

(1991* - data preliminary, some numbers are estimates)

(a) = total of column (2)+(3)+(4)+(5)
(b) = total of column (4)+(7)
(c) = total of column (6)+(7)
(d) = calculated from tagging programmes, except 1984 (based on assumed harvest rates)
(e) = (10)-(6)

6.2.3 Whitehorse Fishway Chinook Enumeration

The Whitehorse Fishway was operated by the Yukon Fish and Game Club and DFO with funding from various departments of the Federal and Territorial Governments and the Yukon Fish and Game Club. The much upgraded facility provides public education and a chance to view various species of freshwater fish as well as both juvenile and adult chinook salmon. Visitors are also able to watch brood stock collection and egg takes for the Whitehorse hatchery. There was a total of 31,036 visitors in 1991.

A total of 1,266 chinook salmon was enumerated at the Whitehorse Fishway in 1991. This represents a 95% increase over the 1986-1990 average of 649 chinook. A strong return of hatchery chinook was seen this year with a total of 506 clipped fish counted (232 female adults, 198 male adults and 76 male jacks). Hatchery chinook accounted for at least 40% of the total run through the ladder. This percentage is likely underestimated because not all hatchery fry were tagged.

The total fishway chinook count consisted of 549 females and 717 males. Of these, 82 females and 86 males were taken for hatchery brood stock. The chinook taken for the hatchery were sampled for age-size-sex data and heads were taken from adipose clipped individuals. The chinook run timing at the fishway appeared to be similar to 1990 with 50% of the run being recorded by the 14th of August. The first chinook appeared on the 25th of July which is a fairly early showing (on average the first chinook arrives on the 1st of August) and the peak count of 105 occurred on the 16th of August. The total potential naturally spawning population was 445 females and 626 males after subtracting the mortalities and hatchery brood stock.

6.2.4 Whitehorse Hatchery Operations

From a total fertilized egg count of 301,523 eggs in September 1990, 239,972 fry were released in June 1991 for an egg to fry survival rate of 80%. From the 1990 brood stock a total of approximately 50,000 coded-wire tagged juveniles were released below the dam and approximately 50,000 tagged juveniles were released into Wolf Creek. A total of 136,558 juveniles were released into Michie Creek of which approximately 50,000 were coded-wire tagged.

The 1991 egg take yielded approximately 393,000 viable eggs from adult chinook captured as they migrated upstream through the Whitehorse Fishway (the average female fecundity was 5,240). A total of 168 chinook salmon including 82 females and 86 males were sacrificed for brood stock in 1991.

High water temperatures (17 degrees C) were again experienced in the fishway in 1991 but many chinook were in an advanced state of maturity and were spawned

immediately. Some hatchery brood stock was held in the cool, ground water fed hatchery Capilano troughs with good success. Due to the advanced sexual state of these fish, maturation in the cooler hatchery water (6 degrees C) was not a problem although the maturity was somewhat delayed. Holding brood stock in the hatchery avoids the recurring problem of theft of brood stock. Chinook have been stolen during several incidents of break-in and vandalism at the ladder in the past. Adult holding facilities at the hatchery are minimal but the hatchery manager found the situation to be workable.

A total of 82 female and 86 male chinook were spawned for the hatchery. The green egg inventory was 419,160 eggs, of which 393,000 proved viable and are presently being incubated. The average female fecundity was 5,240 eggs/female. A total of 22 females and five males died at the fishway in 1991. Most of these mortalities occurred in the fishway and were likely due to warm water and/or a debris blockage later in the run.

At least 5 adult chinook returned to spawn in Wolf Creek in Whitehorse. Wolf Creek has been a local public education enhancement project in conjunction the Yukon Fish and Game Club.

6.2.5 Fishing Branch River Fall Chum Weir

A weir to enumerate fall chum 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 programme was re-established in 1985 and continued through 1989. The weir was not operated in 1990 due to budgets cuts, but was rejuvenated in 1991. The weir was operated in 1991 under a joint programme with the Vuntut Gwitch'in First Nation of Old Crow and DFO with funding from the Economic Development Agreement of the Federal and Territorial governments. The following table presents the weir counts since 1985 for comparative purposes:

Year	Run Timing	Total Count	Approx. % Female
1985	Sep 06-Oct 20	56,016	56%
1986	Sep 01-Oct 19	31,378	54%
1987	Aug 29-Oct 18	48,956	58%
1988	Sep 05-Oct 16	23,597	58%
1989	Aug 30-Oct 17	43,834	49%
1990*	?	30,000-40,000	?
1991	Sep 01-Oct 15	37,733	59%

*(estimated from aerial survey expansion)

6.3 Cooperative Projects

6.3.1 Sonar Project Development

The USFWS obtained funding for main river sonar project development in the Yukon River drainage in 1991. A subcommittee of the JTC responsible for sonar project planning on the Yukon River was formed at a meeting in Whitehorse in March 1991. Discussions at that meeting resulted in the development of an initial planning document. A sonar training course was held in Anchorage in April, and was attended by biologists from USFWS, ADF&G, and DFO. Specific activities planned for the 1991 field season were site surveys on the main-stem Yukon and Porcupine Rivers near the U.S./Canada border, and acquisition of new equipment by the USFWS.

The Yukon River sonar site survey was conducted cooperatively by ADF&G, USFWS, and DFO staff on the 1st to the 3rd of August. Potential sites from 8 miles below Eagle to the DFO salmon tagging camp in Canada were surveyed with a portable fathometer for river bottom mapping. All members of the survey team were in agreement that the best site appeared to be situated about one mile downstream from Eagle. The river is a single channel with a width of about 700 to 800 feet and a maximum depth of about 40 feet. The river bottom at this site has two relatively constant slopes with a minimum of irregularities. Logistic support at this site would be excellent due to the proximity to the town of Eagle. Land ownership is by the State of Alaska. Regardless of the selected sonar site, capturing fish to estimate species composition in the proximity of the sonar beam is likely to be a problem throughout the entire area. Drift gill netting, the most common method used for species composition estimates associated with sonar studies, will be impeded by the swift currents and the potential for underwater snags.

The Porcupine River sonar site survey was conducted cooperatively by ADF&G and USFWS staff from the 12th to the 15th of August. Potential sites in a five mile stretch immediately upstream of the Coleen River in Alaska, and in a ten mile stretch immediately below the U.S./Canada border, were surveyed with a portable fathometer for river bottom mapping. Sites immediately upstream of the Coleen River ranged in width from 750 to 1,200 feet, and maximum depth from 15 to 20 feet. Surface water velocity was 4 to 5 ft/sec. Logistic support would need to be by float plane, or wheel plane depending on water levels and exposure of gravel bars. Sites immediately below the border ranged in width from 450 to 600 feet, and maximum depth from 10 to 20 feet. Logistic support would most likely need to be by float plane. Sites above the border in Canada were not considered feasible due to river braiding. Evaluation of the various potential sites will be conducted by the JTC sonar subcommittee.

Further sonar project development in 1992 would be dependent on funding and agency commitments. Full project operation with daily salmon passage estimates for fisheries management would require several years of research and development. In

the second year of project development the JTC sonar subcommittee recommended the following objectives in their planning document:

1) Select optimal site based on technical and non-technical factors and pursue land use agreements.

2) Acquire additional hydro-acoustic and field support equipment necessary to implement project.

3) Establish field camp(s) at selected site(s).

4) Fit sonar beams to selected site(s) and detect fish targets.

5) Continue personnel training opportunities.

7.0 YUKON RIVER TECHNICAL PROGRAMME NEEDS

7.1 Introduction

In the November 1990 technical report the JTC reviewed research and management programme needs. Specific programmes were discussed under the headings of:

Run Forecasting
Run Abundance Assessment
Harvest monitoring
Spawning Escapement Monitoring
Run Reconstruction by Stock
Enhancement, and
Management Systems

New programmes and improvements to existing programmes were identified and recommended.

In the context of a Yukon River Salmon Treaty the Yukon River Panel may, in the future, ask the JTC to use these data to estimate, among other things, the numbers of Canadian origin Yukon River salmon:

1.) caught in specified U.S. fisheries

2.) crossing the border between Alaska and Canada

3.) spawning in the Canadian portions of the Yukon River drainage, or

4.) produced by a particular number of spawners in the Canadian portion of the Yukon River drainage.

From a technical viewpoint there may be several approaches to answering each of these questions. For example, several methods of estimating the number of Canadian origin salmon caught in Alaskan fisheries may be feasible. These methods might include scale pattern analysis, genetic stock identification, tag and recapture studies or some other technique.

A through discussion was conducted by the JTC regarding the existing salmon fisheries research and management programme on the Yukon River. There was a general consensus that JTC planning in the future should focus on the technical programme directly related to treaty implementation. At the same time, It was further agreed that the JTC needed to maintain its broad technical role in evaluation and coordination of the Yukon River salmon fishery research and management programme.

The JTC felt that with significant elements of the treaty yet to be resolved through the negotiation, it is not yet clear precisely what will be demanded of the technical programme in the long term. For the coming season three programmes were recommended by the JTC as high priorities. They were:

1.) Implementation of year 2 in the development of a sonar on the Yukon River near the Canada/U.S. border.

2.) Studies on the Porcupine River to include continuation of the Fishing Branch weir by DFO and implementation of stock distribution studies by USF&W.

3.) Evaluation of the status of Yukon River salmon stock identification research.

7.2 Existing Technical Programme

The following is a listing of the major technical elements of the current salmon fisheries management programme on the Yukon River. This listing is not in any order of priority either for the management of Yukon River stocks in general, or for the management of Canadian origin Yukon River salmon stocks in particular.

U.S. Programmes

1. Fishery Monitoring (ADF&G)
2. Subsistence Harvest Surveys (ADF&G)
3. Sport Harvest Surveys (ADF&G)
4. Catch and Escapement Sampling (ADF&G and USFWS)
5. Stock Identification (ADF&G and USFWS)
6. Test Fishing (ADF&G)
    a. Big Eddy and Middle Mouth Gill Nets
    b. Ruby Fish Wheel
    c. Manley Fish Wheel
    d. Nenena Fish Wheel
7. Main-stem Sonar - Operational (ADF&G)
    a. Yukon River at Pilot Station
8. Main-stem Sonar - Planning (ADF&G, USFWS, DFO)
    a. Yukon River near U.S./Canada Border
    b. Porcupine River near U.S./Canada Border
9. Tributary Sonar (ADF&G)
    a. Anvik River
    b. Sheenjek River
10. Tributary Tagging Studies (ADF&G)
    a. Chena River Chinook
    b. Salcha River Chinook
11. Tributary Aerial/Ground Escapement Surveys (ADF&G)

Canadian Programmes

1. Tributary Aerial/Ground Escapement Surveys (DFO)
2. Main-stem Yukon River Tagging and Test Fishing (DFO)
3. Whitehorse Fishway Chinook Enumeration (DFO)
4. Fishing Branch River Fall Chum Weir (DFO)
5. Whitehorse Hatchery Tagging (DFO)
6. Fishery Monitoring (DFO)
7. Indian Food Fishery Harvest surveys (DFO)

FIGURES AND TABLES

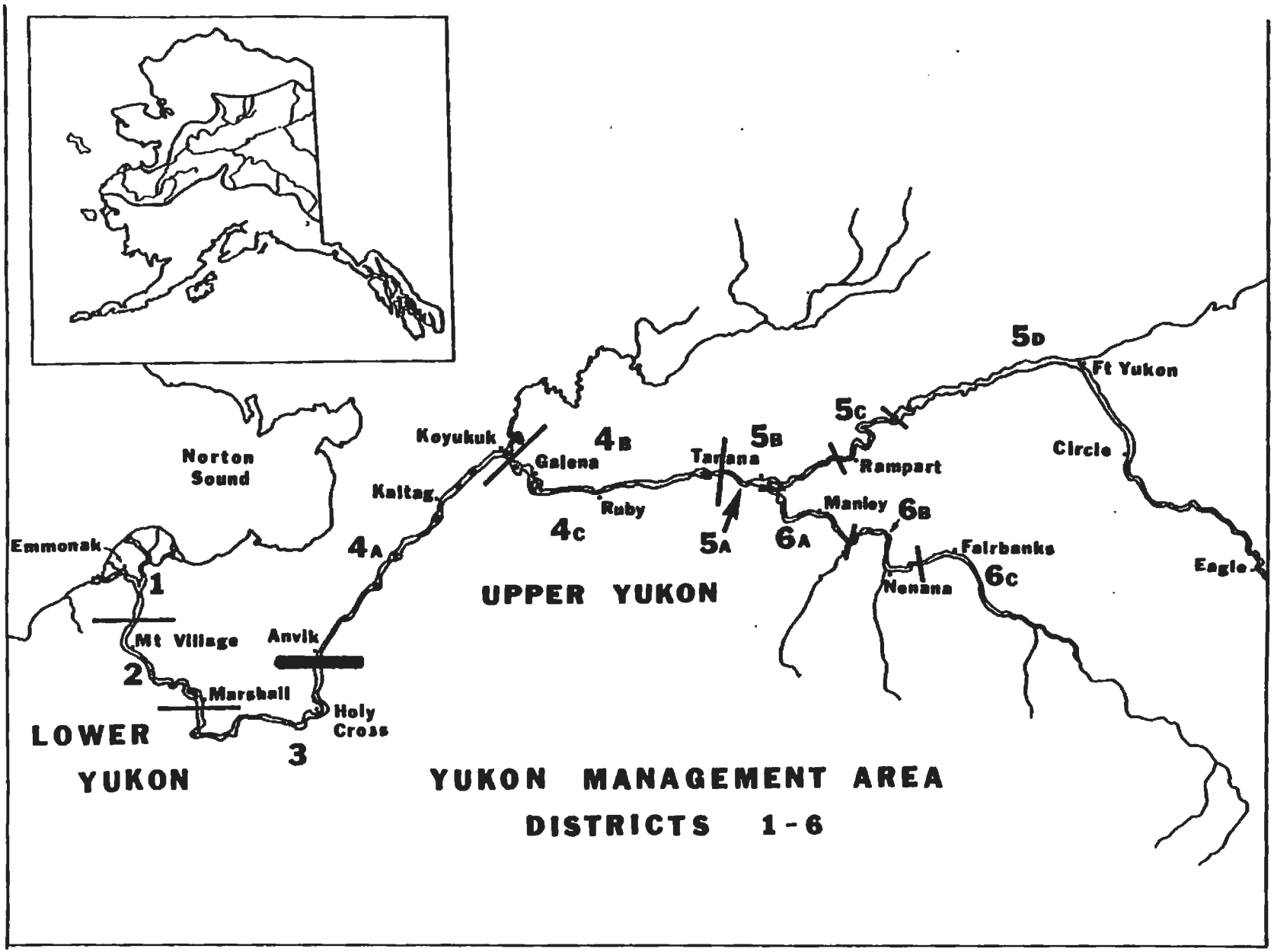


Figure 1. Map of the Alaskan portion of the Yukon River, showing fishing district boundaries.

Table 1. Alaskan commercial sales of Yukon River salmon in 1991. a

District Subdist.	No. of Fishermen	Chinook		Summer Chum		Fall Chum		Coho		Total Salmon	
		Numbers	Roe (lbs)	Numbers	Roe (lbs)	Numbers	Roe (lbs)	Numbers	Roe (lbs)	Numbers	Roe (lbs)
1	497	53,014	-	138,159	-	59,724	-	54,095	-	304,992	-
2	272	38,946	-	175,149	-	102,628	-	40,898	-	357,621	-
Subtotal	674	91,960	-	313,308	-	162,352	-	94,993	-	662,613	-
3	29	2,344	-	8,912	-	9,213	-	1,905	-	22,374	-
Total Lower Yukon	680	94,304	-	322,220	-	171,565	-	96,898	-	684,987	-
4-A	68	69	162	5,289	128,231	0	0	0	0	5,358	128,393
4-B,C	21	2,371	2,060	1,092	9,001	3,737	1,669	14	0	7,214	12,730
Subtotal District 4	92	2,440	2,222	6,381	137,232	3,737	1,669	14	0	12,572	141,123
5-A,B,C	27	3,256	62	4	28	24,141	3,625	0	0	27,401	3,715
5-D	4	554	0	26	0	3,214	0	0	0	3,794	0
Subtotal District 5	30	3,810	62	30	28	27,355	3,625	0	0	31,195	3,715
District 6	22	686	1,545	18,197	4,716	28,500	14,154	6,306	4,299	53,689	24,714
Total Upper Yukon	153	6,936	3,829	24,608	141,976	59,592	19,448	6,320	4,299	97,456	169,552
Total Yukon Area	833	101,240	3,829	346,828	141,976	231,157	19,448	103,218	4,299	782,443	169,552

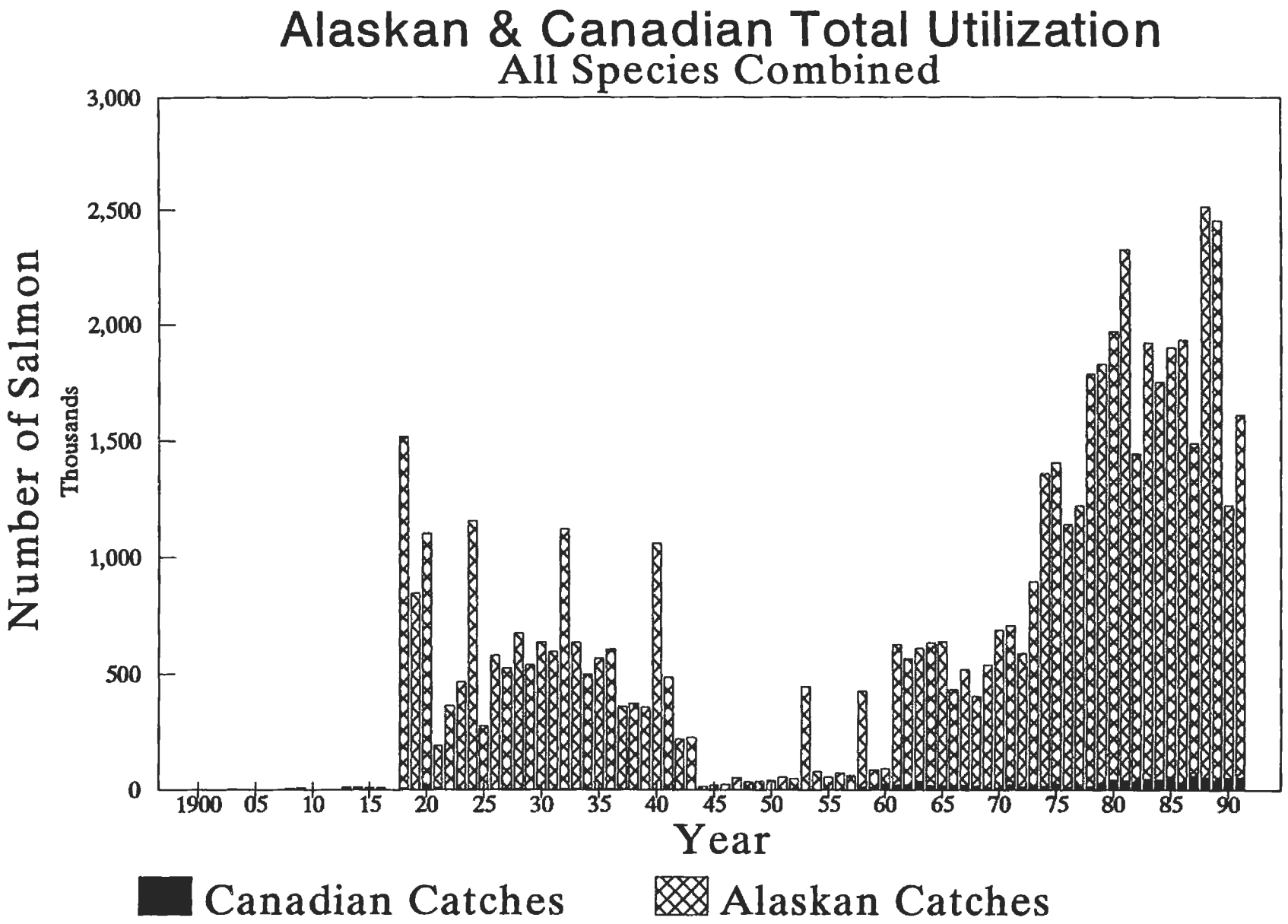
a Harvest reported in numbers of fish sold in the round and pounds of unprocessed roe.

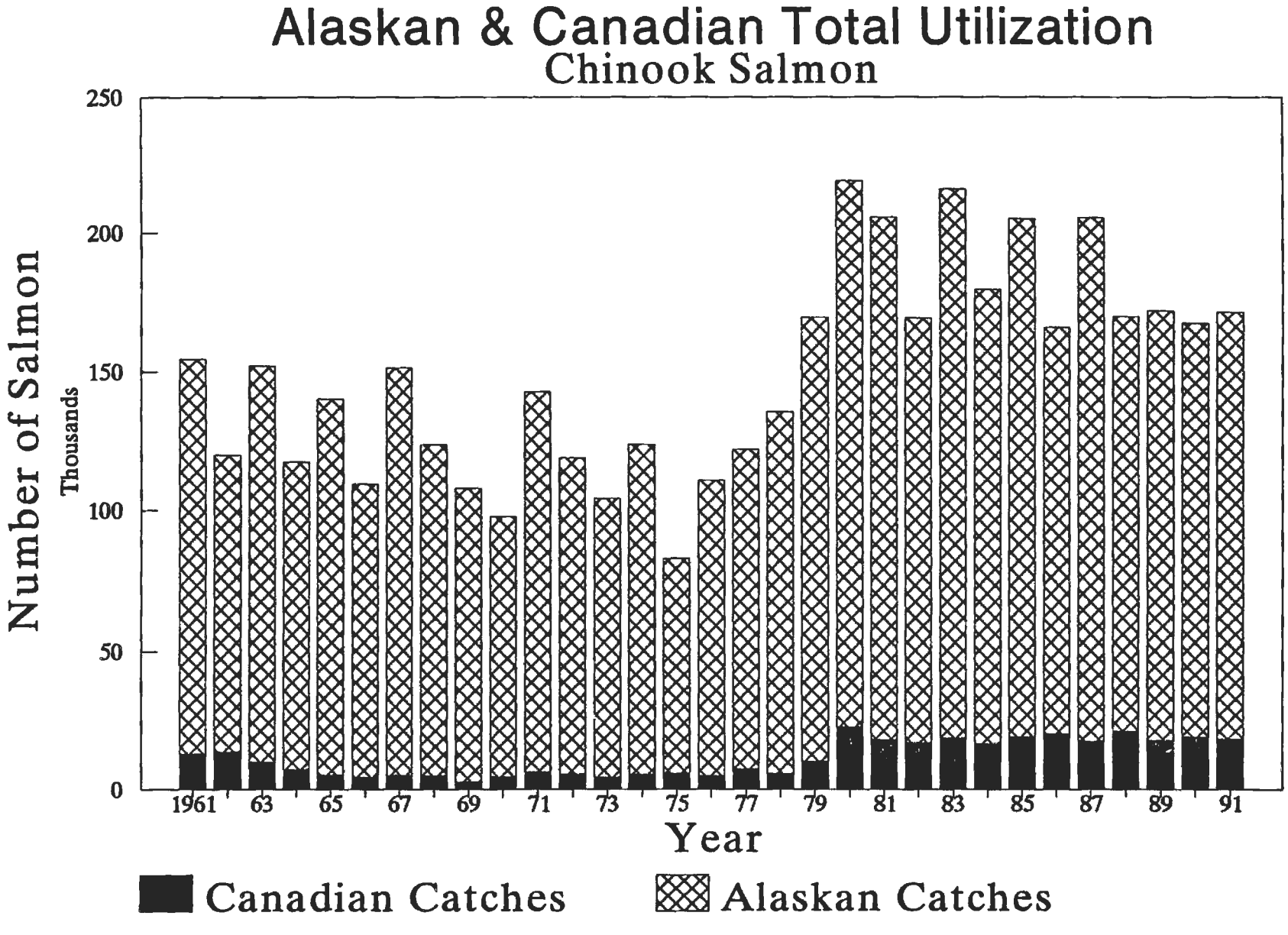
Table 2. Alaskan commercial sales of Yukon River salmon, 1961-1991. a

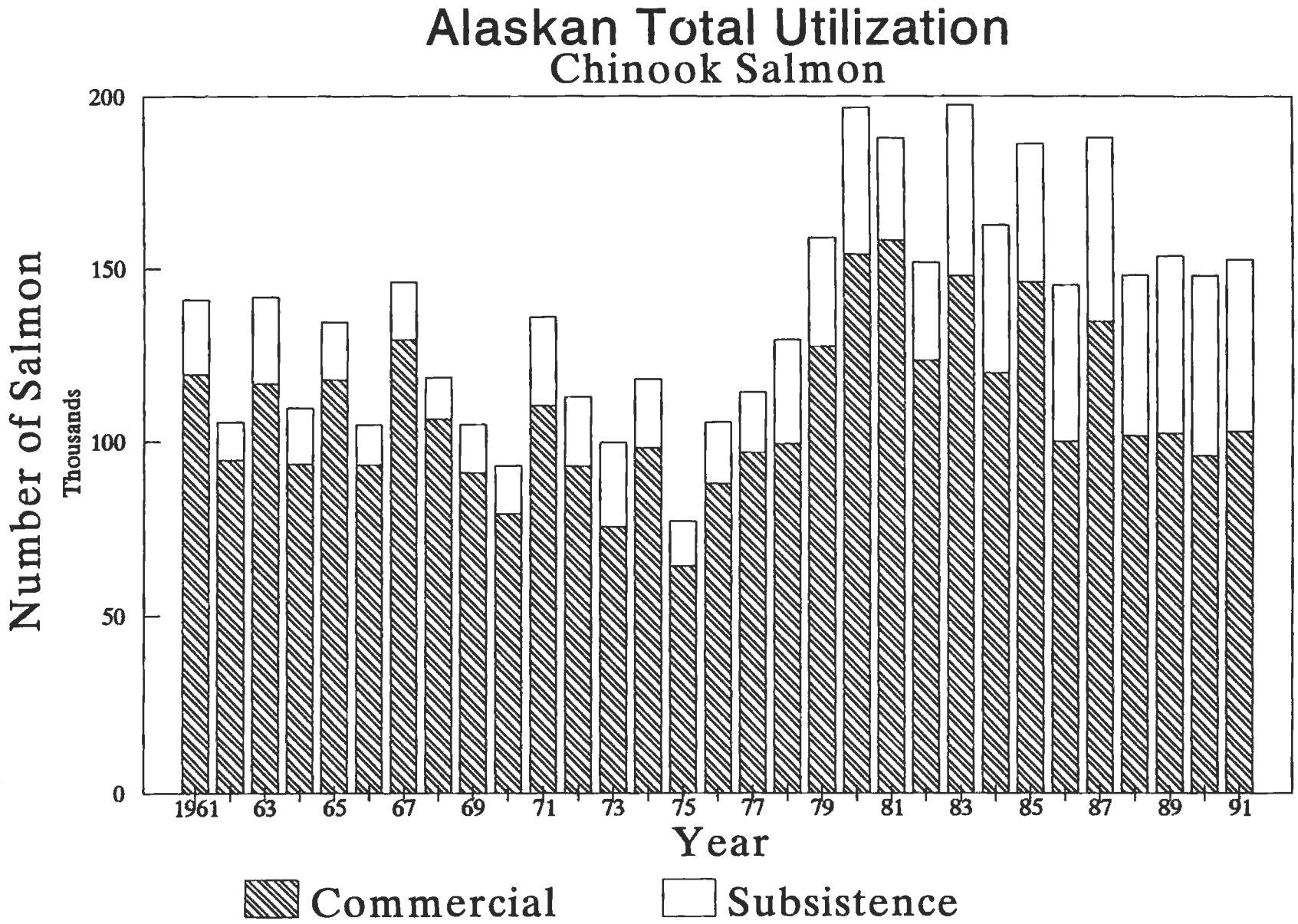
Year	Chinook		Summer Chum		Fall Chum		Coho	
	Numbers	Roe	Numbers	Roe	Numbers	Roe	Numbers	Roe
1961	119,664	-	-	-	42,461	-	2,855	-
1962	94,734	-	-	-	53,116	-	22,926	-
1963	117,048	-	-	-	0	-	5,572	-
1964	93,587	-	-	-	8,347	-	2,446	-
1965	118,098	-	-	-	23,317	-	350	-
1966	93,315	-	-	-	71,045	-	19,254	-
1967	129,656	-	10,935	-	38,274	-	11,047	-
1968	106,526	-	14,470	-	52,925	-	13,303	-
1969	91,027	-	61,966	-	131,310	-	15,093	-
1970	79,145	-	137,006	-	209,595	-	13,188	-
1971	110,507	-	100,090	-	189,594	-	12,203	-
1972	92,840	-	135,668	-	152,176	-	22,233	-
1973	75,353	-	285,509	-	232,090	-	36,641	-
1974	98,089	-	589,892	-	289,776	-	16,777	-
1975	63,838	-	710,295	-	275,009	-	2,546	-
1976	87,776	-	600,894	-	156,390	-	5,184	-
1977	96,757	-	534,875	-	257,986	-	38,863	-
1978	99,168	-	1,052,226	25,761	236,383	10,628	26,152	-
1979	127,673	-	779,316	40,217	359,946	18,466	17,165	-
1980	153,985	-	928,609	139,106	293,430	5,020	8,745	-
1981	158,018	-	1,006,938	189,068	466,451	11,285	23,680	-
1982	123,644	-	461,403	152,819	224,187	805	31,176	-
1983	147,910	-	744,879	149,999	302,598	5,064	13,320	-
1984	119,904	-	588,597	167,224	208,232	2,328	81,940	-
1985	146,188	-	516,997	248,625	267,744	2,525	57,672	-
1986	99,970	-	721,469	271,691	139,442	577	47,255	-
1987	134,760	-	442,238	121,968	0	0	0	-
1988 b	101,421	-	1,152,237	256,535	133,975	3,227	86,612	-
1989 b	101,840	-	959,994	288,549	270,195	14,749	83,353	-
1990 b	95,361	1,731	305,518	109,376	123,921	10,801	41,745	3,888
1991 c	101,240	3,829	346,828	141,976	231,157	19,448	103,218	4,299
1986-90 Avg	106,670	-	716,291	209,624	133,507	5,871	51,793	-

a Sales reported in numbers of fish sold in the round and pounds of unprocessed roe.
b Does not include District 6 test fishing sales.
c Does not include any test fishing sales.

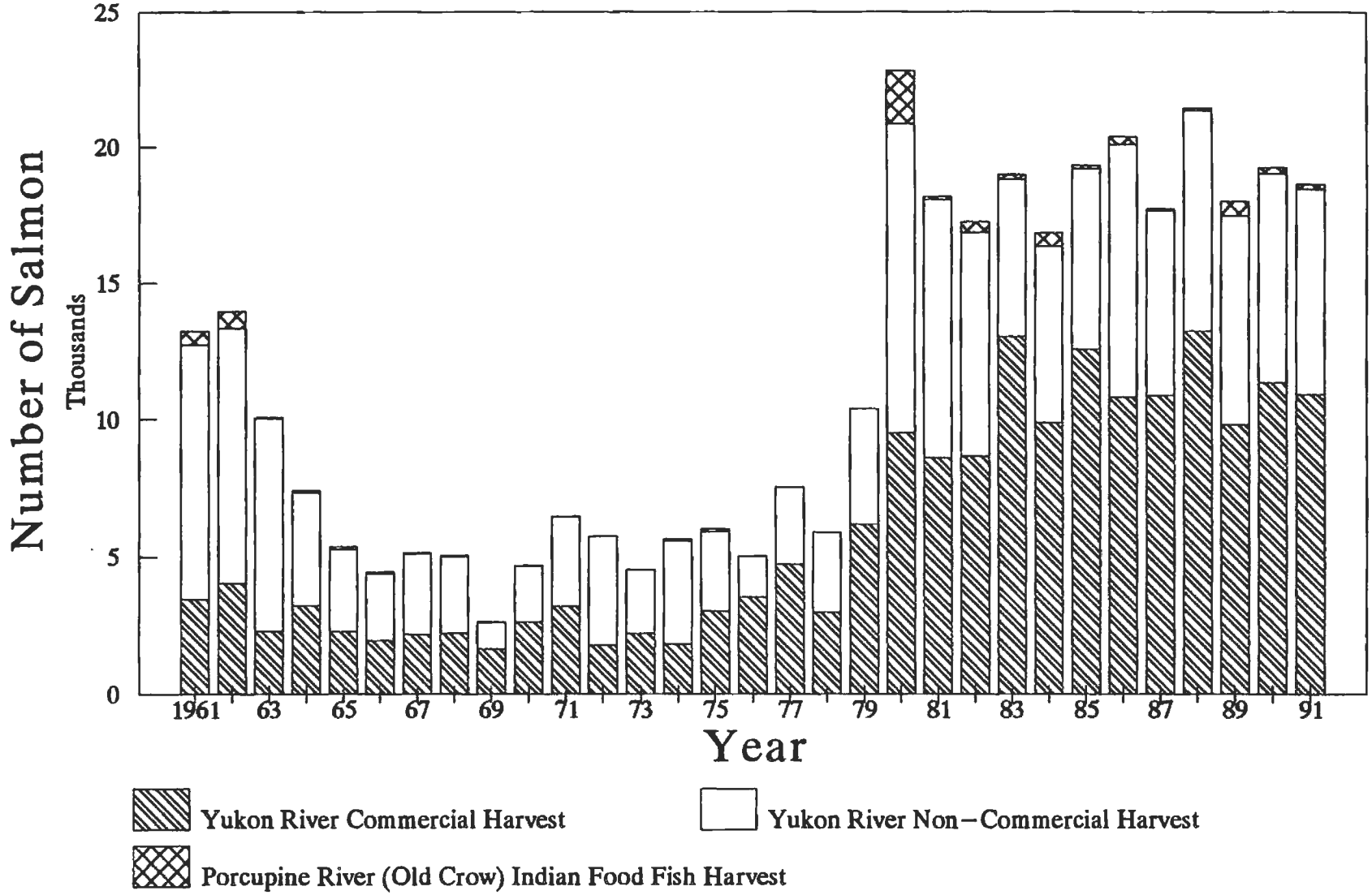
ATTACHMENT I.
HISTORICAL YUKON RIVER SALMON CATCH AND ESCAPEMENT DATA


Alaskan & Canadian Total Utilization
All Species Combined
Number of Salmon
Thousands
3,000
2,500
2,000
1,500
1,000
500
0
1900
05
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
Year
Canadian Catches
Alaskan Catches

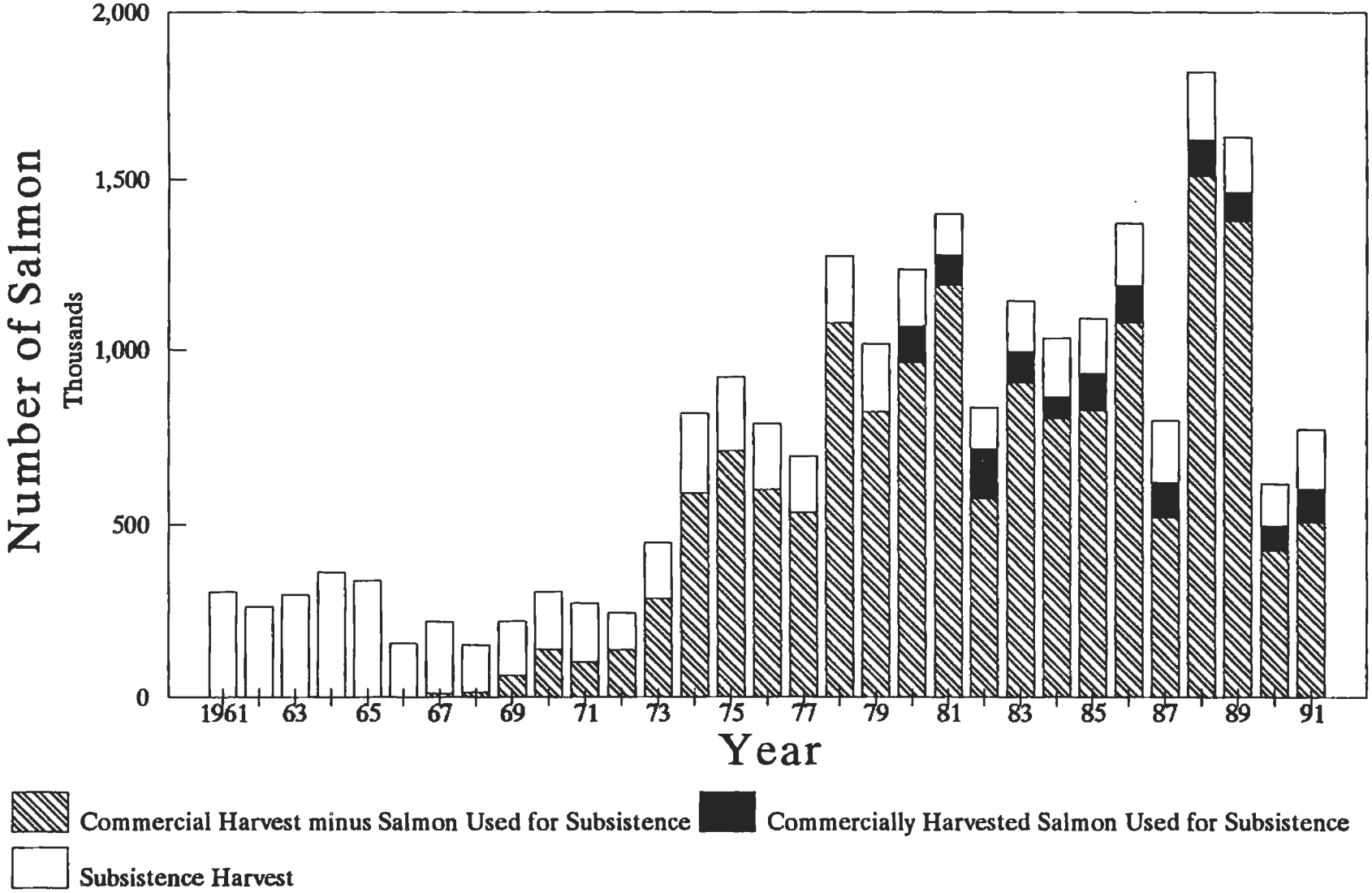

Alaskan & Canadian Total Utilization
Chinook Salmon
Number of Salmon
Thousands
250
200
150
100
50
0
1961
63
65
67
69
71
73
75
77
79
81
83
85
87
89
91
Year
Canadian Catches
Alaskan Catches

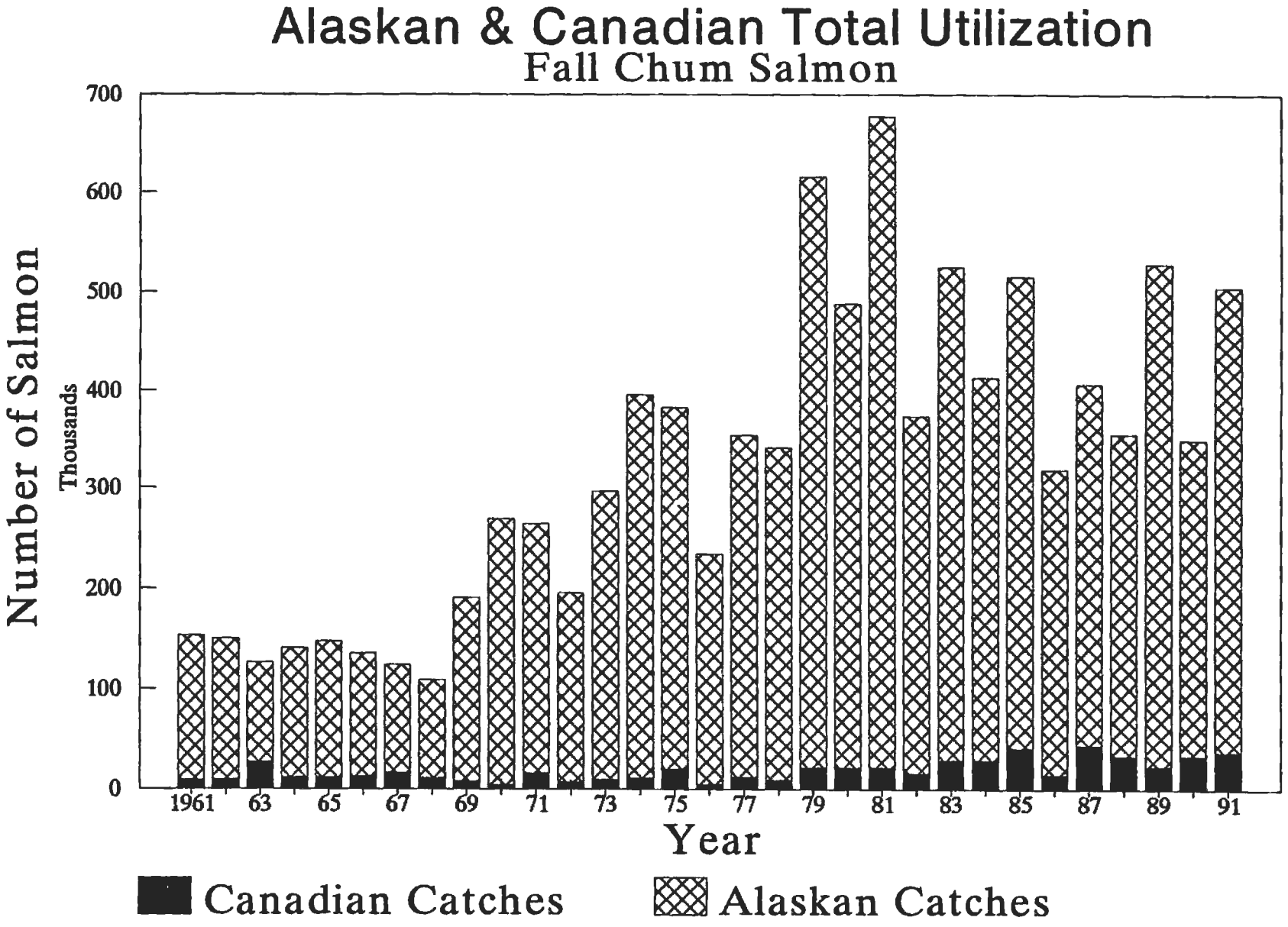

Alaskan Total Utilization
Chinook Salmon
Number of Salmon
Thousands
200
150
100
50
0
1961
63
65
67
69
71
73
75
77
79
81
83
85
87
89
91
Year
Commercial
Subsistence

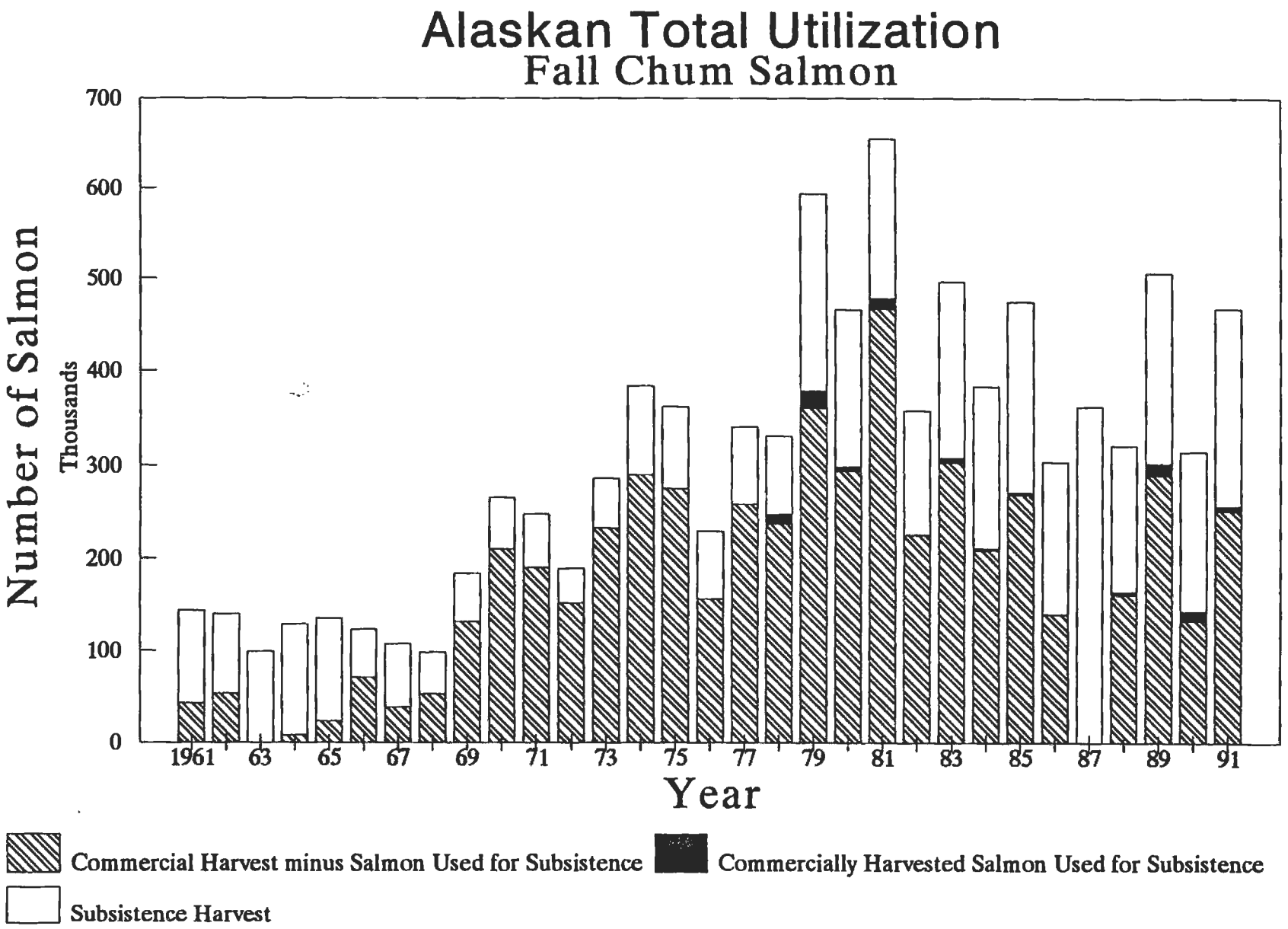
Canadian Total Utilization
Chinook Salmon



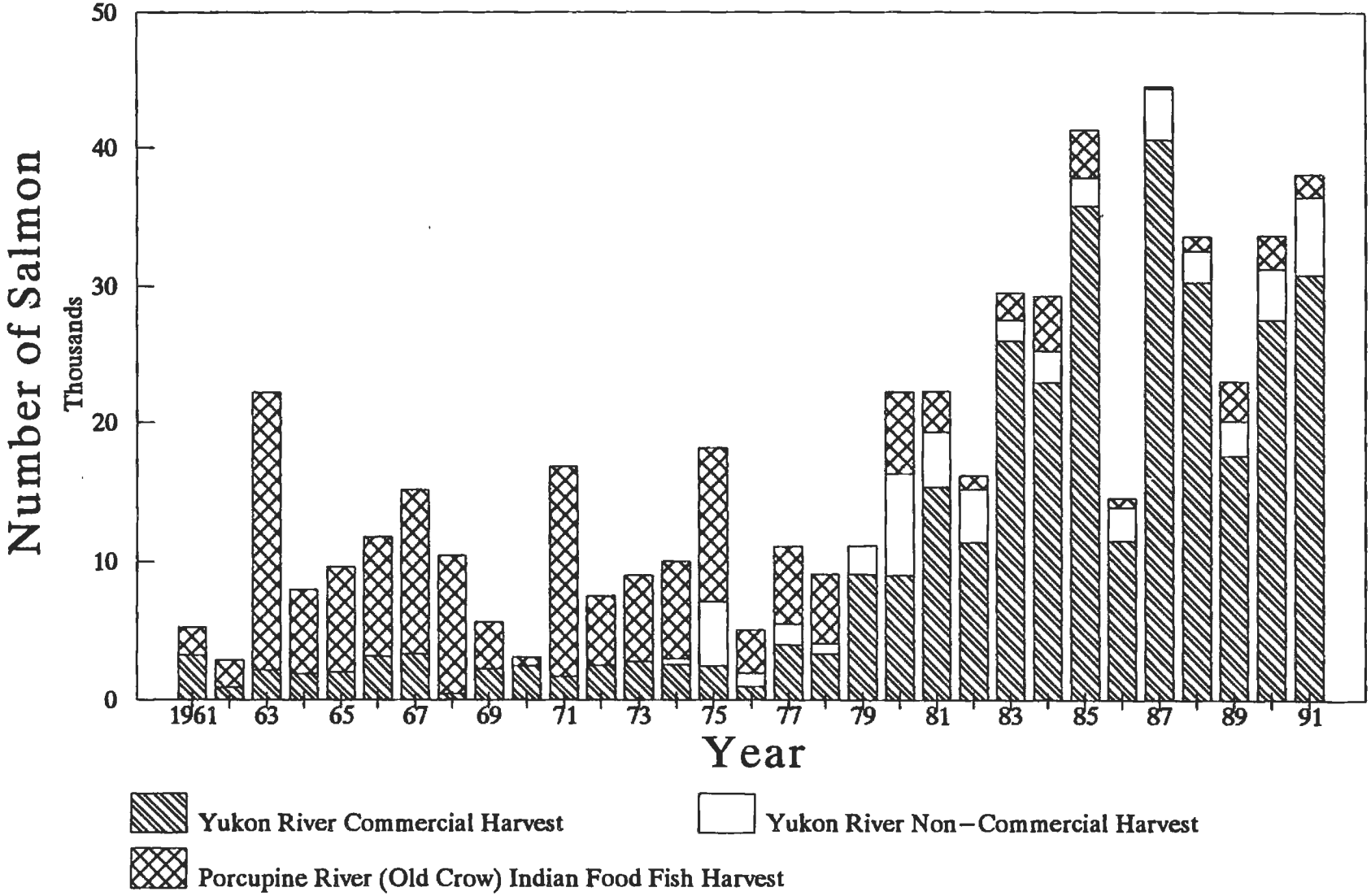
Alaskan Total Utilization
Summer Chum Salmon

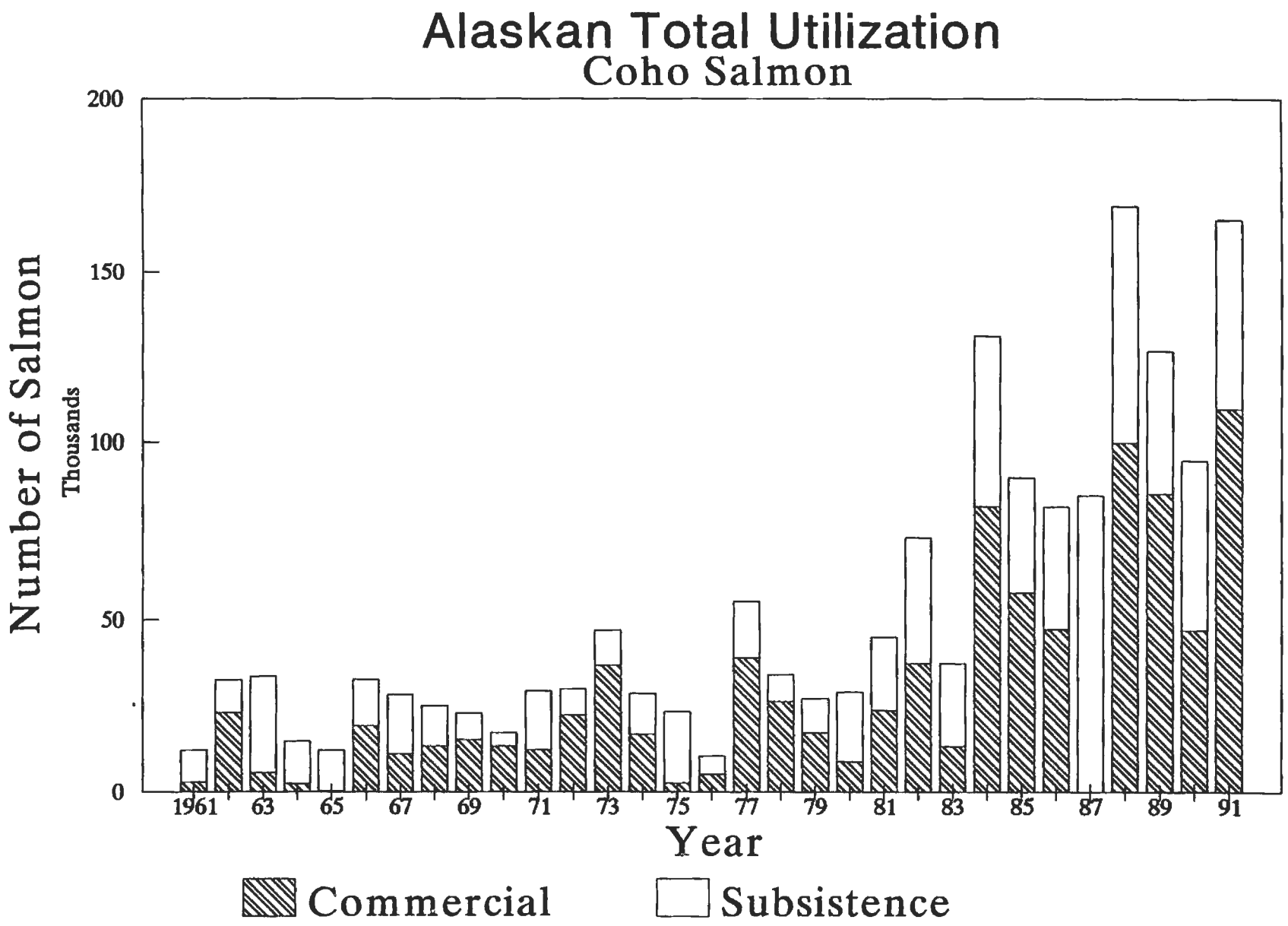



Alaskan & Canadian Total Utilization
Fall Chum Salmon
Number of Salmon
Thousands
700
600
500
400
300
200
100
0
1961
63
65
67
69
71
73
75
77
79
81
83
85
87
89
91
Year
Canadian Catches
Alaskan Catches

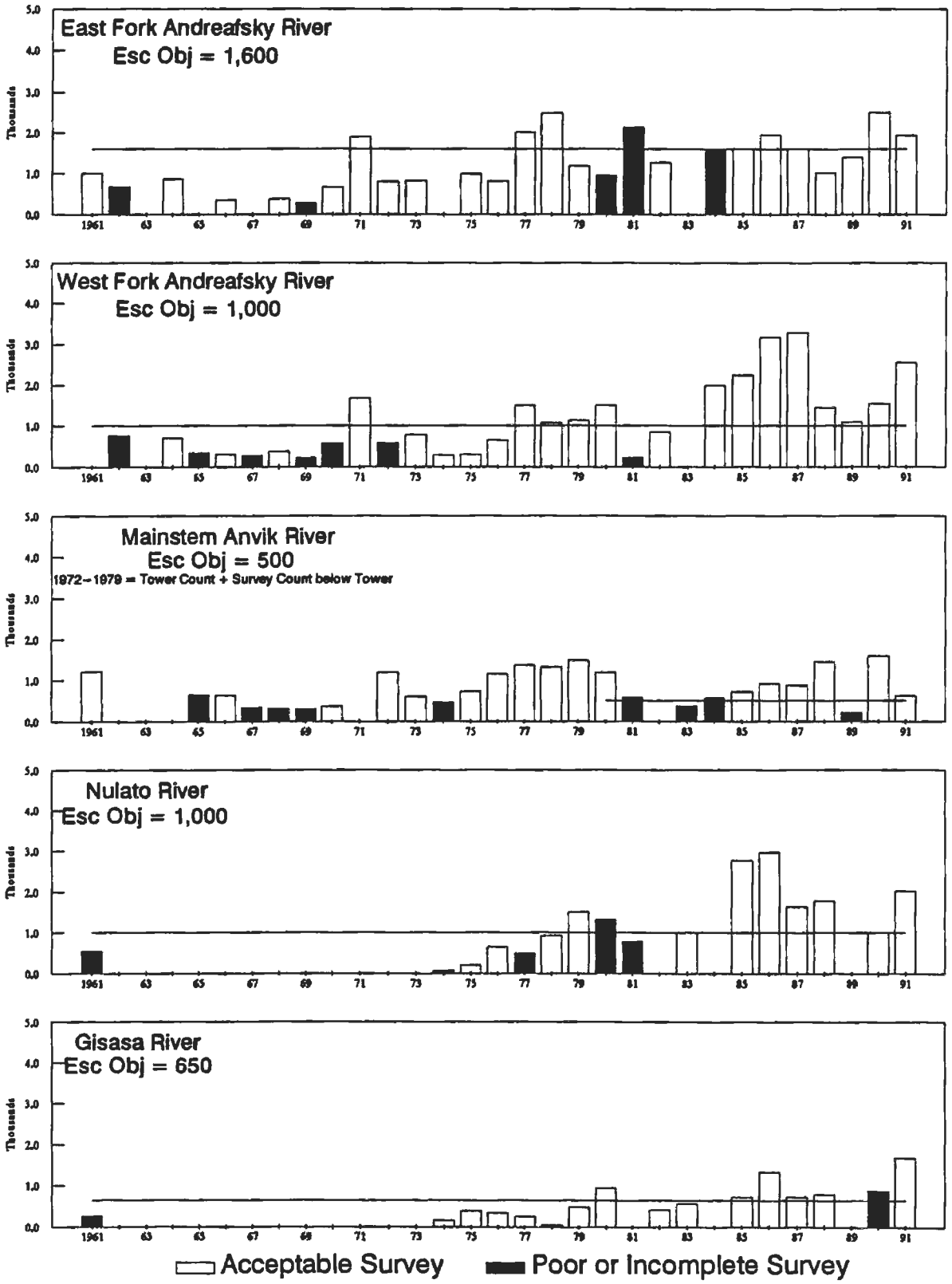

Alaskan Total Utilization
Fall Chum Salmon
Number of Salmon
Thousands
700
600
500
400
300
200
100
0
1961
63
65
67
69
71
73
75
77
79
81
83
85
87
89
91
Year
Commercial Harvest minus Salmon Used for Subsistence
Commercially Harvested Salmon Used for Subsistence
Subsistence Harvest

Canadian Total Utilization
Fall Chum Salmon

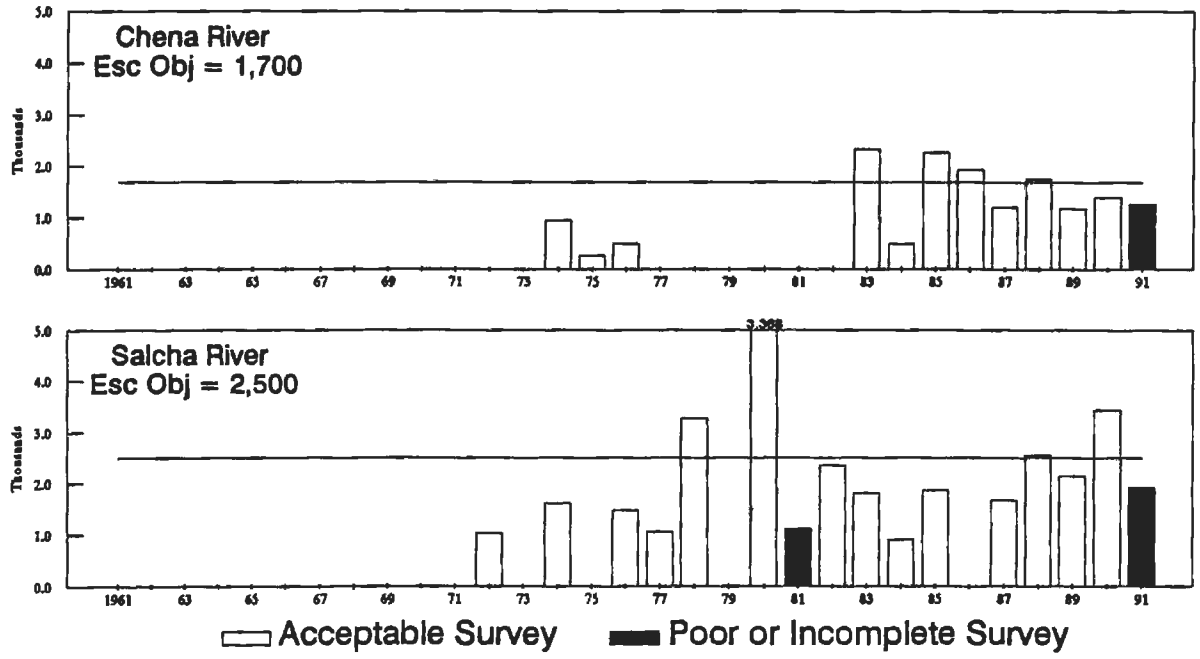



Alaskan Total Utilization
Coho Salmon
Number of Salmon
Thousands
200
150
100
50
0
1961
63
65
67
69
71
73
75
77
79
81
83
85
87
89
91
Year
Commercial
Subsistence

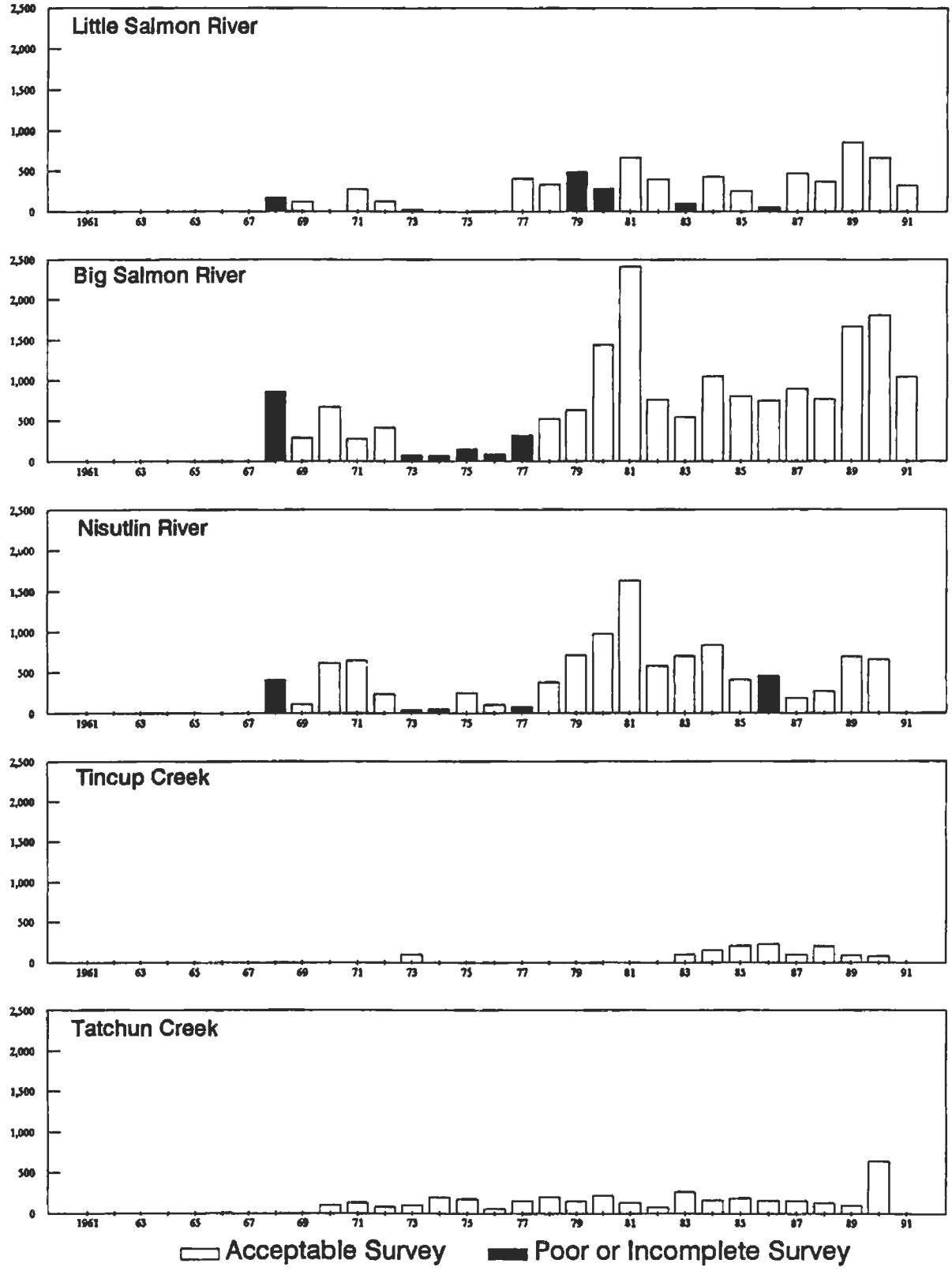
Lower Yukon River (U.S.) Chinook Salmon
Escapement Indices



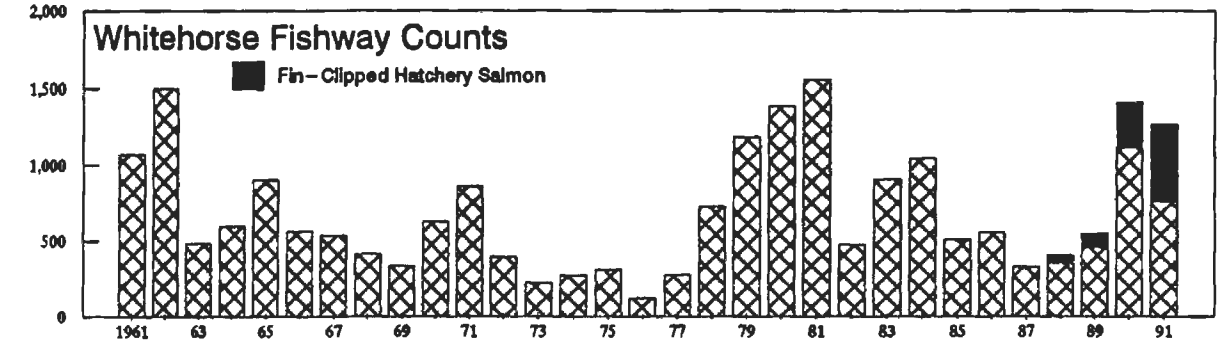
Middle Yukon River (U.S.) Chinook Salmon
Escapement Indices

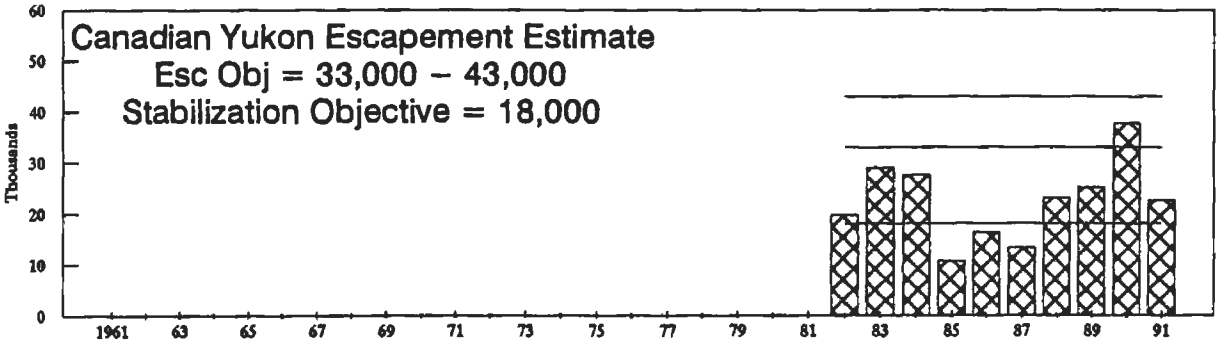


Upper Yukon River (Canada) Chinook Salmon
Escapement Indices

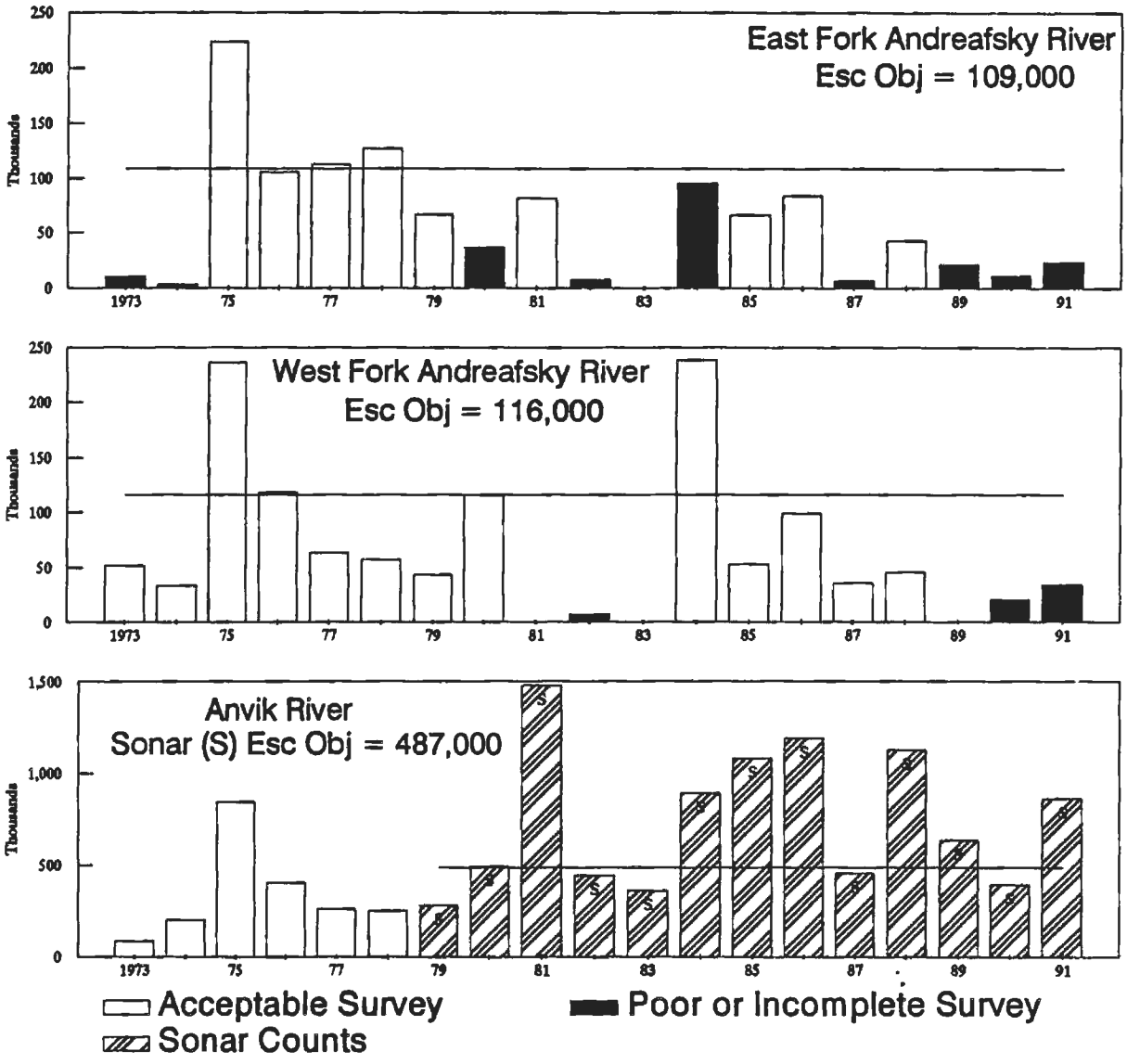


Upper Yukon River (Canada) Chinook Salmon
Escapement Count and Estimate

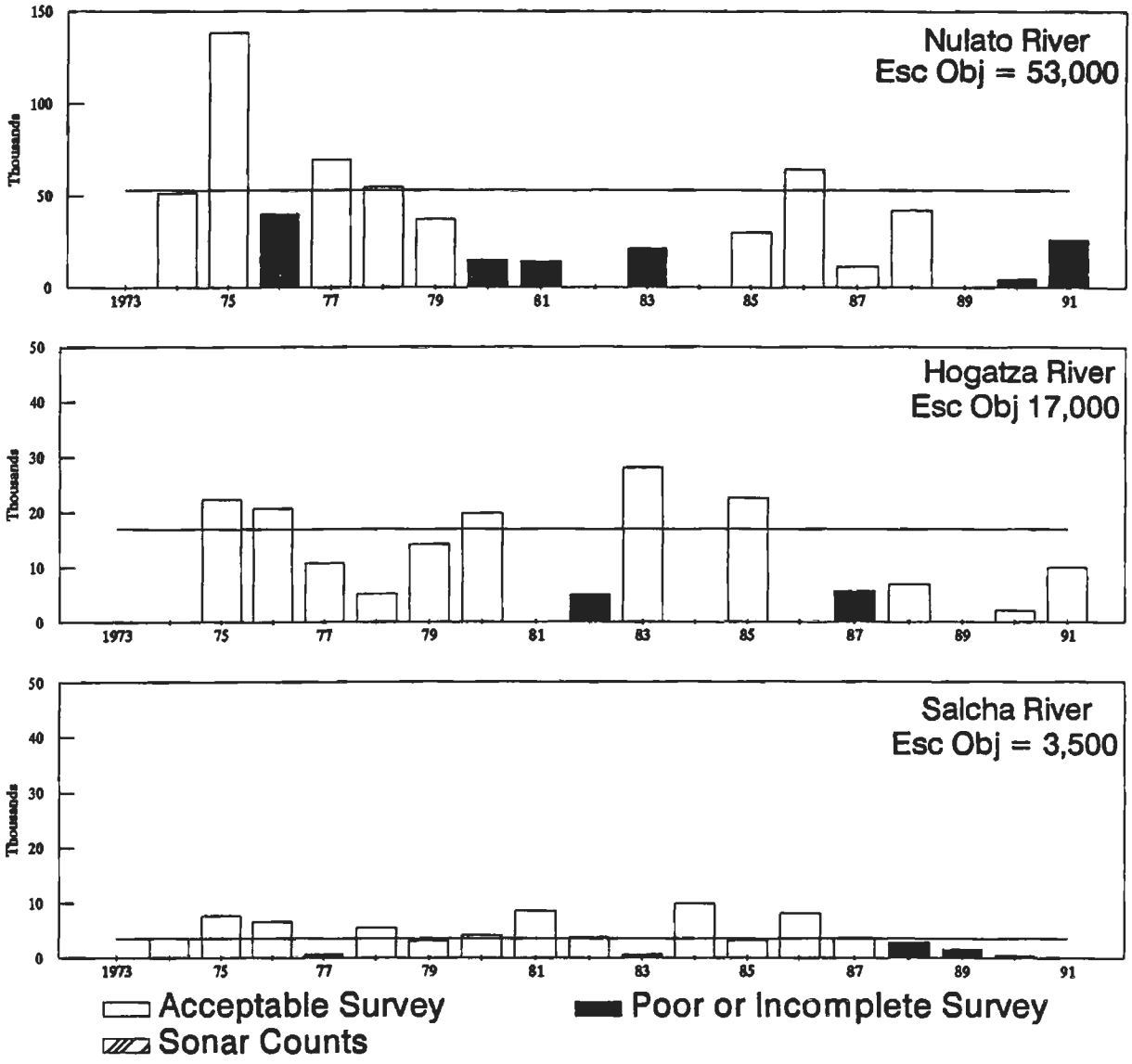




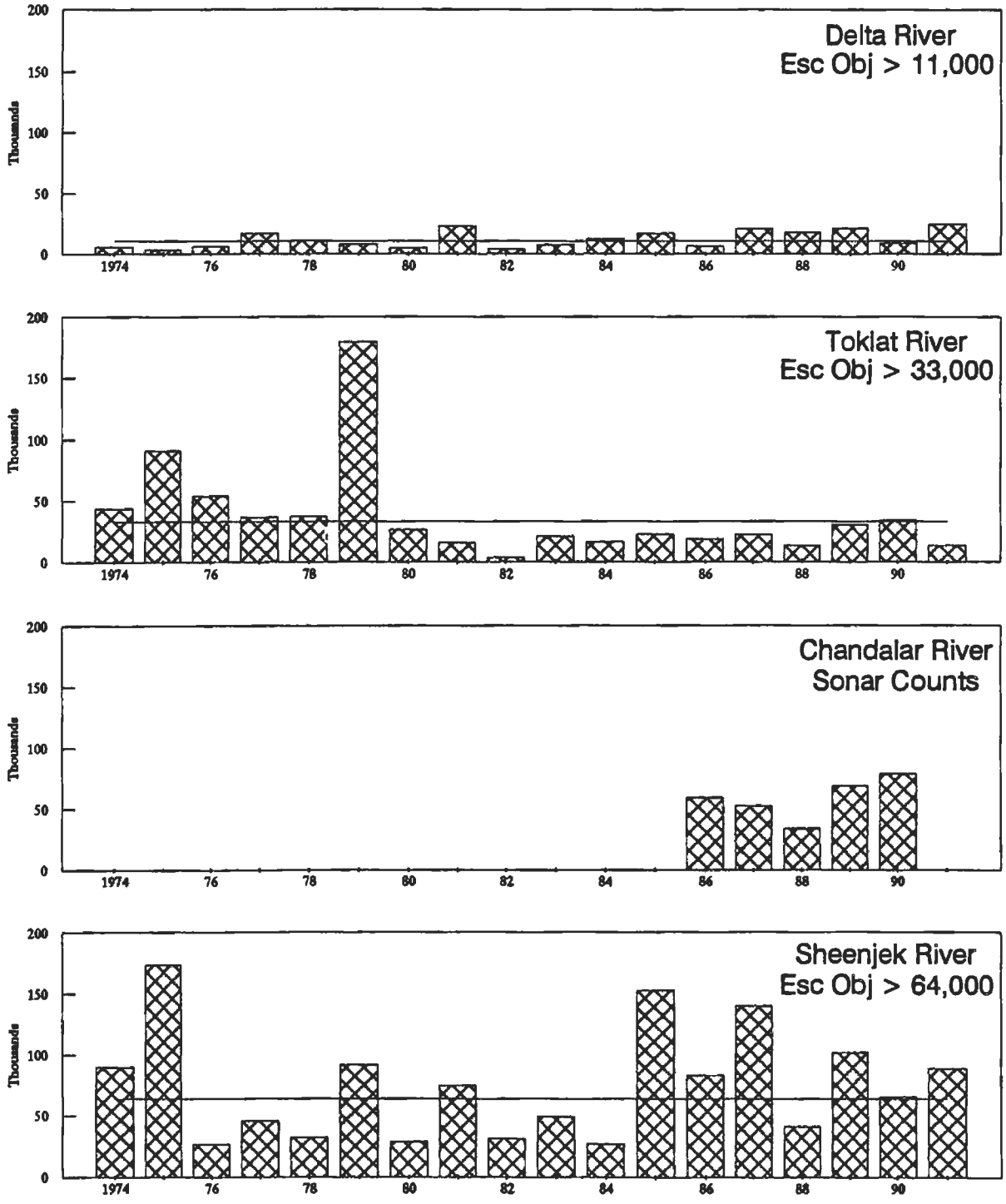
Yukon River Summer Chum Salmon
Escapement Indices



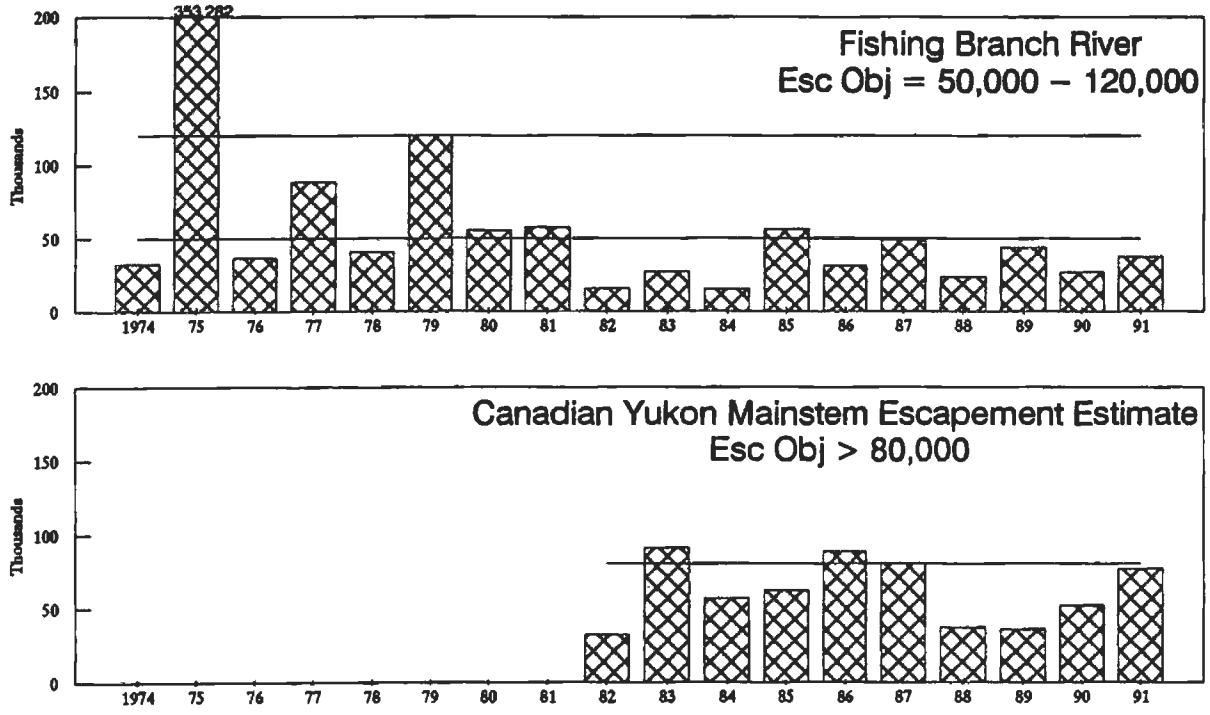
Yukon River Summer Chum Salmon
Escapement Indices



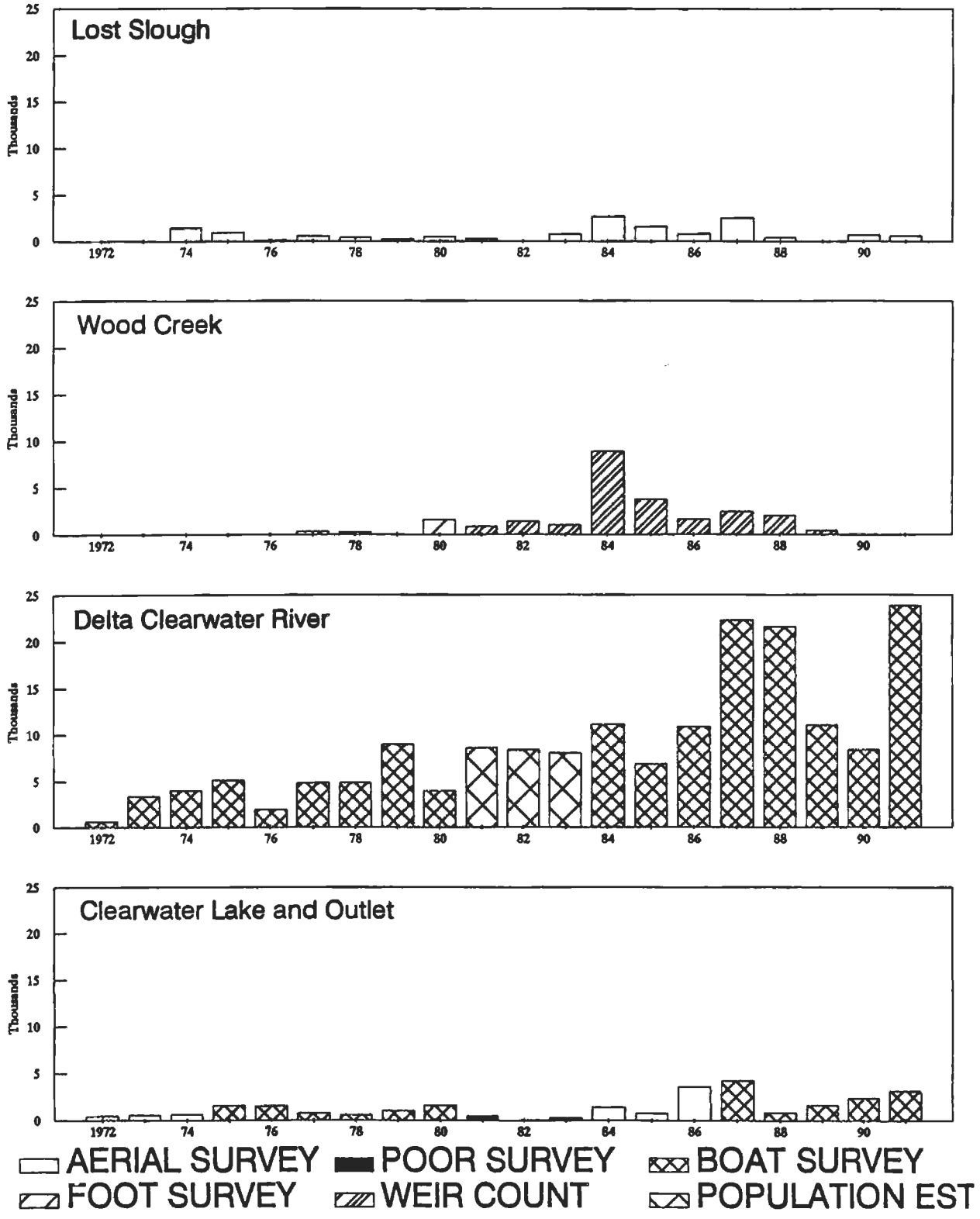
Yukon River (U.S.) Fall Chum Salmon
Expanded Population Estimates and Sonar Counts



Yukon River (Canada) Fall Chum Salmon
Expanded Population Estimates



Yukon River Coho Salmon
Escapement Indices



Appendix Table 1. Alaskan and Canadian total utilization of Yukon River salmon, 1903–1991.[a]

Year	Alaska			Canada			Total		
	Chinook	Other Salmon	Total	Chinook	Other Salmon	Total	Chinook Salmon	Other Salmon	Total
1903				4,666		4,666			4,666
1904									
1905									
1906									
1907									
1908				7,000		7,000			7,000
1909				9,238		9,238			9,238
1910									
1911									
1912									
1913				12,133		12,133			12,133
1914				12,573		12,573			12,573
1915				10,466		10,466			10,466
1916				9,566		9,566			9,566
1917									
1918	12,239	1,500,065	1,512,304	7,066		7,066	19,305	1,500,065	1,519,370
1919	104,822	738,790	843,612	1,800		1,800	106,622	738,790	845,412
1920	78,467	1,015,655	1,094,122	12,000		12,000	90,467	1,015,655	1,106,122
1921	69,646	112,098	181,744	10,840		10,840	80,486	112,098	192,584
1922	31,825	330,000	361,825	2,420		2,420	34,245	330,000	364,245
1923	30,893	435,000	465,893	1,833		1,833	32,726	435,000	467,726
1924	27,375	1,130,000	1,157,375	4,560		4,560	31,935	1,130,000	1,161,935
1925	15,000	259,000	274,000	3,900		3,900	18,900	259,000	277,900
1926	20,500	555,000	575,500	4,373		4,373	24,873	555,000	579,873
1927		520,000	520,000	5,366		5,366		520,000	525,366
1928		670,000	670,000	5,733		5,733		670,000	675,733
1929		537,000	537,000	5,226		5,226		537,000	542,226
1930		633,000	633,000	3,660		3,660		633,000	636,660
1931	26,693	585,000	591,693	3,473		3,473	30,166	585,000	595,166
1932	27,899	1,092,000	1,119,899	4,200		4,200	32,099	1,092,000	1,124,099
1933	28,779	603,000	631,779	3,333		3,333	32,112	603,000	635,112
1934	23,365	474,000	497,365	2,000		2,000	25,365	474,000	499,365
1935	27,865	537,000	564,665	3,466		3,466	31,131	537,000	568,131
1936	43,713	560,000	603,713	3,400		3,400	47,113	560,000	607,113
1937	12,154	346,000	358,154	3,746		3,746	15,900	346,000	361,900
1938	32,971	340,450	373,421	860		860	33,831	340,450	374,281
1939	28,037	327,650	355,687	720		720	28,757	327,650	356,407
1940	32,453	1,029,000	1,061,453	1,153		1,153	33,606	1,029,000	1,062,606
1941	47,608	438,000	485,608	2,806		2,806	50,414	438,000	488,414
1942	22,487	197,000	219,487	713		713	23,200	197,000	220,200
1943	27,650	200,000	227,650	609		609	28,259	200,000	228,259
1944	14,232		14,232	986		986	15,218		15,218
1945	19,727		19,727	1,333		1,333	21,060		21,060
1946	22,782		22,782	353		353	23,135		23,135
1947	54,026		54,026	120		120	54,146		54,146
1948	33,842		33,842				33,842		33,842
1949	36,379		36,379				36,379		36,379
1950	41,808		41,808				41,808		41,808
1951	56,278		56,278				56,278		56,278
1952	38,637	10,868	49,505				38,637	10,868	49,505
1953	58,859	385,977	444,836				58,859	385,977	444,836
1954	64,545	14,375	78,920				64,545	14,375	78,920
1955	55,925		55,925				55,925		55,925
1956	62,208	10,743	72,951				62,208	10,743	72,951
1957	63,623		63,623				63,623		63,623
1958	75,625	337,500	413,125	11,000	1,500	12,500	86,625	339,000	425,625
1959	78,370		78,370	8,434	3,098	11,532	88,804	3,098	89,902
1960	67,597		67,597	9,653	15,608	25,261	77,250	15,608	89,902

–continued–

Appendix Table 1. (page 2 of 2).

Year	Alaska			Canada			Total		
	Chinook	Other Salmon	Total	Chinook	Other Salmon	Total	Chinook Salmon	Other Salmon	Total
1961	141,152	461,597	602,749	13,246	9,076	22,322	154,398	470,673	625,071
1962	105,844	434,663	540,507	13,937	9,436	23,373	119,781	444,099	563,880
1963	141,910	429,396	571,306	10,077	27,696	37,773	151,987	457,092	609,079
1964	109,818	504,420	614,238	7,408	12,187	19,595	117,226	516,607	633,833
1965	134,706	484,587	619,293	5,380	11,769	17,169	140,086	496,376	636,462
1966	104,887	309,502	414,389	4,452	13,192	17,644	109,339	322,694	432,033
1967	146,104	352,397	498,501	5,150	16,961	22,111	151,254	369,358	520,612
1968	118,632	270,818	389,450	5,042	11,633	16,675	123,674	282,451	406,125
1969	105,027	424,399	529,426	2,624	7,776	10,400	107,651	432,175	539,826
1970	93,019	585,760	678,779	4,663	3,711	8,374	97,682	589,471	687,153
1971	136,191	547,448	683,639	6,447	16,911	23,358	142,638	564,359	706,997
1972	113,098	461,617	574,715	5,729	7,532	13,261	118,827	469,149	587,976
1973	99,670	779,158	878,828	4,522	10,135	14,657	104,192	789,293	893,485
1974	118,053	1,229,878	1,347,731	5,631	11,646	17,277	123,684	1,241,324	1,365,008
1975	76,883	1,307,152	1,384,035	6,000	20,600	26,600	82,883	1,327,752	1,410,635
1976	105,582	1,026,908	1,132,490	5,025	5,200	10,225	110,607	1,032,108	1,142,715
1977	114,338	1,090,330	1,204,668	7,527	12,479	20,006	121,865	1,102,809	1,224,674
1978	129,465	1,640,523	1,769,988	5,881	9,566	15,447	135,346	1,650,089	1,785,435
1979	158,678	1,638,820	1,797,498	10,375	22,084	32,459	169,053	1,660,904	1,829,957
1980	196,709	1,731,440	1,928,149	20,846	22,218	43,064	217,555	1,753,658	1,971,213
1981	187,708	2,097,214	2,284,922	18,009	22,281	40,290	205,717	2,119,495	2,325,212
1982	151,802	1,264,580	1,416,382	16,808	16,091	32,899	168,610	1,280,671	1,449,281
1983	197,388	1,677,390	1,874,778	18,752	29,490	48,242	216,140	1,706,880	1,923,020
1984	162,332	1,546,685	1,709,017	16,295	29,267	45,562	178,627	1,575,952	1,754,579
1985	185,959	1,655,909	1,841,868	19,151	41,265	60,416	205,110	1,697,174	1,902,284
1986	145,208	1,756,395	1,901,603	20,064	14,493	34,557	165,272	1,770,888	1,936,160
1987	187,884	1,244,043	1,431,927	17,613	44,480	62,093	205,497	1,288,523	1,494,020
1988	147,980	2,312,893	2,460,873	21,327	33,565	54,892	169,307	2,346,458	2,515,765
1989	153,560	2,259,361	2,412,921	17,419	23,020	40,439	170,979	2,282,381	2,453,360
1990 [b]	147,887	1,026,321	1,174,208	18,980	33,622	52,602	166,867	1,059,943	1,226,810
1991 [c]	152,550	1,404,588	1,557,138	18,411	38,045	58,456	170,961	1,442,633	1,613,594

[a] Commercial and subsistence harvest combined in numbers of fish, including "equivalent fish" converted from roe sales. See ADF&G 1985 Yukon Area Annual Management Report for data sources and methods of catch estimation for some years.

[b] Alaskan subsistence harvest data preliminary.

[c] Alaskan subsistence harvest data unavailable. Most recent 5-year subsistence harvest average substituted. Canadian harvest data preliminary.

Appendix Table 2. Alaskan and Canadian total utilization of Yukon River chinook and fall chum salmon, 1961–1991.[a]

	Chinook			Fall Chum		
Year	Canada[b]	Alaska[c]	Total	Canada[b]	Alaska[c]	Total
1961	12,746	141,152	153,898	9,076	144,233	153,309
1962	13,337	105,844	119,181	9,436	140,401	149,837
1963	10,033	141,910	151,943	27,696	99,031 [d]	126,727
1964	7,332	109,818	117,150	12,187	128,707	140,894
1965	5,286	134,706	139,992	11,789	135,600	147,389
1966	4,387	104,887	109,274	13,192	122,548	135,740
1967	5,107	146,104	151,211	16,961	107,018	123,979
1968	5,012	118,632	123,644	11,633	97,552	109,185
1969	2,597	105,027	107,624	7,776	183,373	191,149
1970	4,655	93,019	97,674	3,711	265,096	268,807
1971	6,438	136,191	142,629	16,911	246,756	263,667
1972	5,729	113,098	118,827	7,532	188,178	195,710
1973	4,518	99,670	104,188	10,135	285,760	295,895
1974	5,556	118,053	123,609	11,646	383,552	395,198
1975	5,900	76,883	82,783	20,600	361,600	382,200
1976	5,000	105,582	110,582	5,200	228,717	233,917
1977	7,498	114,338	121,836	12,479	340,757	353,236
1978	5,881	129,465	135,346	9,566	331,250	340,816
1979	10,375	158,678	169,053	22,084	593,293	615,377
1980	20,846	196,709	217,555	22,218	466,087	488,305
1981	18,009	187,708	205,717	22,281	654,976	677,257
1982	16,808	151,802	168,610	16,091	357,084	373,175
1983	18,752	197,388	216,140	29,490	495,526	525,016
1984	16,295	162,332	178,627	29,267	383,055	412,322
1985	19,151	185,959	205,110	41,265	474,216	515,481
1986	20,064	145,208	165,272	14,493	303,485	317,978
1987	17,613	187,884	205,497	44,480	361,663 [d]	406,143
1988	21,327	147,980	169,307	33,565	320,666	354,231
1989	17,419	153,560	170,979	23,020	505,718	528,738
1990 [e]	18,980	147,887	166,867	33,622	314,490	348,112
1991 [f]	18,411	152,550	170,961	38,045	466,936	504,981
Average						
1961–80	7,412	122,488	129,900	13,091	242,475	255,567
1981–85	17,803	177,038	194,841	27,679	472,971	500,650
1986–90	19,081	156,504	175,584	29,836	361,204	391,040

[a]Catch in numbers of fish, including "equivalent fish" converted from roe sales.
[b]Commercial, Indian Food, and Domestic catches combined.
[c]Commercial, subsistence, and personal–use catches combined.
[d]Subsistence catch only; commercial fishery did not operate.
[e]Alaskan subsistence harvest data preliminary.
[f]Subsistence harvest data unavailable. Most recent 5–year subsistence harvest average substituted.

Appendix Table 3. Alaskan catch of Yukon River chinook salmon, 1961–1991.[a]

Year	Subsistence Harvest[b]	Commercial Harvest	Total Utilization
1961	21,488	119,664	141,152
1962	11,110	94,734	105,844
1963	24,862	117,048	141,910
1964	16,231	93,587	109,818
1965	16,608	118,098	134,706
1966	11,572	93,315	104,887
1967	16,448	129,656	146,104
1968	12,106	106,526	118,632
1969	14,000	91,027	105,027
1970	13,874	79,145	93,019
1971	25,684	110,507	136,191
1972	20,258	92,840	113,098
1973	24,317	75,353	99,670
1974	19,964	98,089	118,053
1975	13,045	63,838	76,883
1976	17,806	87,776	105,582
1977	17,581	96,757	114,338
1978	30,297	99,168	129,465
1979	31,005	127,673	158,678
1980	42,724	153,985	196,709
1981	29,690	158,018	187,708
1982	28,158	123,644	151,802
1983	49,478	147,910	197,388
1984	42,428	119,904	162,332
1985	39,771	146,188	185,959
1986	45,238	99,970	145,208
1987	53,124	134,760 [c]	187,884
1988	46,559	101,421	147,980
1989	51,280	102,280	153,560
1990 [d]	52,113	95,774 [f]	147,887
1991 [e]	49,663	102,887 [f]	152,550
Average			
1961–80	20,049	102,439	122,488
1981–85	37,905	139,133	177,038
1986–90	49,663	106,841	156,504

[a] Catch in numbers of fish. Includes ADF&G test fish.
[b] Includes personal–use catches.
[c] Includes 653 and 2,136 chinook salmon illegally sold in District 5 and 6 (Tanana River), respectively.
[d] Subsistence harvest data preliminary
[e] Preliminary. Subsistence harvest data unavailable. Most recent 5–year subsistence harvest average substituted.
[f] Includes "equivalent fish" converted from roe sales.

Appendix Table 4. Canadian catch of Yukon River chinook salmon, 1961–1991.[a]

Year	Mainstem Yukon River Harvest					Porcupine River Indian Food Fish	Total Utilization
	Commercial	Domestic	Indian Food Fish	Sport[b]	Total		
1961	3,446		9,300		12,746	500	13,246
1962	4,037		9,300		13,337	600	13,937
1963	2,283		7,750		10,033	44	10,077
1964	3,208		4,124		7,332	76	7,408
1965	2,265		3,021		5,286	94	5,380
1966	1,942		2,445		4,387	65	4,452
1967	2,187		2,920		5,107	43	5,150
1968	2,212		2,800		5,012	30	5,042
1969	1,640		957		2,597	27	2,624
1970	2,611		2,044		4,655	8	4,663
1971	3,178		3,260		6,438	9	6,447
1972	1,769		3,960		5,729	–	5,729
1973	2,199		2,319		4,518	4	4,522
1974	1,808	406	3,342		5,556	75	5,631
1975	3,000	400	2,500		5,900	100	6,000
1976	3,500	500	1,000		5,000	25	5,025
1977	4,720	531	2,247		7,498	29	7,527
1978	2,975	421	2,485		5,881	–	5,881
1979	6,175	1,200	3,000		10,375	–	10,375
1980	9,500	3,500	7,546	300	20,846	2,000	22,846
1981	8,593	237	8,879	300	18,009	100	18,109
1982	8,640	435	7,433	300	16,808	400	17,208
1983	13,027	400	5,025	300	18,752	200	18,952
1984	9,885	260	5,850	300	16,295	500	16,795
1985	12,573	478	5,800	300	19,151	150	19,301
1986	10,797	342	8,625	300	20,064	300	20,364
1987	10,864	330	6,119	300	17,613	51	17,664
1988	13,217	282	7,178	650	21,327	100	21,427
1989	9,789	400	6,930	300	17,419	525	17,944
1990	11,324	247	7,109	300	18,980	247	19,227
1991[c]	10,906	227	6,978	300	18,411	200	18,611
Average							
1961–80	3,233	994	3,816		7,412	186	7,598
1981–85	10,544	362	6,597	300	17,803	270	18,073
1986–90	11,198	320	7,192	370	19,081	245	19,325

[a] Catch in numbers of fish.
[b] Sport fish harvest unknown prior to 1980.
[c] Preliminary.

Appendix Table 5. Alaska catch of Yukon River summer chum salmon, 1961–1991.[a]

Year	Estimated Subsistence Use[b]	Subsistence Harvest[c]	Commercial Harvest[d]	Total Utilization
1961	305,317 [e]	305,317 [e]		305,317
1962	261,856 [e]	261,856 [e]		261,856
1963	297,094 [e]	297,094 [e]		297,094
1964	361,080 [e]	361,080 [e]		361,080
1965	336,848 [e]	336,848 [e]		336,848
1966	154,508 [e]	154,508 [e]		154,508
1967	206,233 [e]	206,233 [e]	10,935	217,168
1968	133,880 [e]	133,880 [e]	14,470	148,350
1969	156,191 [e]	156,191 [e]	61,966	218,157
1970	166,504 [e]	166,504 [e]	137,006	303,510
1971	171,487 [e]	171,487 [e]	100,090	271,577
1972	108,006 [e]	108,006 [e]	135,668	243,674
1973	161,012 [e]	161,012 [e]	285,509	446,521
1974	227,811 [e]	227,811 [e]	589,892	817,703
1975	211,888 [e]	211,888 [e]	710,410	922,298
1976	186,872 [e]	186,872 [e]	600,894	787,766
1977	159,502	159,502	534,875	694,377
1978	197,144	197,144	1,078,190	1,275,334
1979	196,187	196,187	822,381	1,018,568
1980	272,398	167,705	1,068,745	1,236,450
1981	208,284	117,629	1,279,701	1,397,330
1982	260,969	117,413	717,013	834,426
1983	240,386	149,180	995,469	1,144,649
1984	230,747	166,630	866,040	1,032,670
1985	264,828	157,744	934,013	1,091,757
1986	290,825	182,337	1,188,850	1,371,187
1987	275,914	174,945	622,541	797,486
1988	311,724	202,683	1,620,499	1,823,182
1989	249,582	163,043	1,464,130	1,627,173
1990 [f]	193,164	118,471	498,629	617,100
1991 [f,g]	264,242	168,296	604,242	772,538
Average				
1961–80	213,591	208,356	439,359	515,908
1981–85	241,043	141,719	958,447	1,100,166
1986–90	264,242	168,296	1,078,930	1,247,226

[a] Includes ADF&G test fish catch.
[b] Includes salmon harvested soley for subsistence, plus an estimate of the number of salmon carcasses harvested for the commercial production of salmon roe and used for subsistence
[c] Includes salmon harvested soley for subsistence.
[d] Includes fish sold in the round plus an estimate of the numbers of fish commercially harvested for the commercial production of salmon roe.
[e] Catches of summer chum salmon estimated for 1961–1976 since catches other than chinook salmon were not differentiated by species.
[f] Preliminary.
[g] Subsistence harvest data unavailable. Most recent 5–year subsistence harvest average substituted.

Appendix Table 6. Alaska catch of Yukon River fall chum salmon, 1961–1991.[a]

Year	Estimated Subsistence Use[b]	Subsistence Harvest[c]	Commercial Harvest[d]	Total Utilization
1961	101,772 [e,f]	101,772 [e,f]	42,461	144,233
1962	87,285 [e,f]	87,285 [e,f]	53,116	140,401
1963	99,031 [e,f]	99,031 [e,f]	0	99,031
1964	120,360 [e,f]	120,360 [e,f]	8,347	128,707
1965	112,283 [e,f]	112,283 [e,f]	23,317	135,600
1966	51,503 [e,f]	51,503 [e,f]	71,045	122,548
1967	68,744 [e,f]	68,744 [e,f]	38,274	107,018
1968	44,627 [e,f]	44,627 [e,f]	52,925	97,552
1969	52,063 [e,f]	52,063 [e,f]	131,310	183,373
1970	55,501 [e,f]	55,501 [e,f]	209,595	265,096
1971	57,162 [e,f]	57,162 [e,f]	189,594	246,756
1972	36,002 [e,f]	36,002 [e,f]	152,176	188,178
1973	53,670 [e,f]	53,670 [e,f]	232,090	285,760
1974	93,776 [e,f]	93,776 [e,f]	289,776	383,552
1975	86,591 [e,f]	86,591 [e,f]	275,009	361,600
1976	72,327 [e,f]	72,327 [e,f]	156,390	228,717
1977	82,771 [f]	82,771 [f]	257,986	340,757
1978	94,867 [f]	84,239 [f]	247,011	331,250
1979	233,347	214,881	378,412	593,293
1980	172,657	167,637	298,450	466,087
1981	188,525	177,240	477,736	654,976
1982	132,897	132,092	224,992	357,084
1983	192,928	187,864	307,662	495,526
1984	174,823	172,495	210,560	383,055
1985	206,472	203,947	270,269	474,216
1986	164,043	163,466	140,019	303,485
1987	361,663	361,663 [g]	0	361,663
1988	159,703	156,476	164,190	320,666
1989	216,693	203,790	301,928	505,718
1990 [h]	182,033	171,089	143,401	314,490
1991 [h,j]	216,827	211,297	255,639	466,936
Average				
1961–80	88,817	87,111	155,364	242,475
1981–85	179,129	174,728	298,244	472,971
1986–90	216,827	211,297	149,908	361,204

[a] Includes ADF&G test fish catch.
[b] Includes salmon harvested soley for subsistence, plus an estimate of the number of salmon carcasses harvested for the commercial production of salmon roe and used for subsistence
[c] Includes salmon harvested soley for subsistence.
[d] Includes fish sold in the round plus an estimate of the numbers of fish commercially harvested for the commercial production of salmon roe.
[e] Catches of fall chum salmon estimated for 1961–1976 since catches other than chinook salmon were not differentiated by species.
[f] Minimum estimates of fall chum salmon for 1961–1978 because surveys were conducted prior to the end of the fishing season.
[g] Includes an estimated 22,377 and 87,992 fall chum salmon illegally sold in Districts 5 and 6 (Tanana River), respectively.
[h] Preliminary.
[j] Subsistence harvest data unavailable. Most recent 5–year subsistence harvest average substituted.

Appendix Table 7. Canadian catch of Yukon River fall chum salmon 1961–1991.[a]

Year	Mainstem Yukon River Harvest				Porcupine River Indian Food Fish	Total Utilization
	Commercial	Domestic	Indian Food Fish	Total		
1961	3,276		3,800	7,076	2,000	9,076
1962	936		6,500	7,436	2,000	9,436
1963	2,196		5,500	7,696	20,000	27,696
1964	1,929		4,200	6,129	6,058	12,187
1965	2,071		2,183	4,254	7,535	11,789
1966	3,157		1,430	4,587	8,605	13,192
1967	3,343		1,850	5,193	11,768	16,961
1968	453		1,180	1,633	10,000	11,633
1969	2,279		2,120	4,399	3,377	7,776
1970	2,479		612	3,091	620	3,711
1971	1,761		150	1,911	15,000	16,911
1972	2,532		0	2,532	5,000	7,532
1973	2,806		1,129	3,935	6,200	10,135
1974	2,544	466	1,636	4,646	7,000	11,646
1975	2,500	4,600	2,500	9,600	11,000	20,600
1976	1,000	1,000	100	2,100	3,100	5,200
1977	3,990	1,499	1,430	6,919	5,560	12,479
1978	3,356	728	482	4,566	5,000	9,566
1979	9,084	2,000	11,000	22,084	–	22,084
1980	9,000	4,000	3,218	16,218	6,000	22,218
1981	15,260	1,611	2,410	19,281	3,000	22,281
1982	11,312	683	3,096	15,091	1,000	16,091
1983	25,990	300	1,200	27,490	2,000	29,490
1984	22,932	535	1,800	25,267	4,000	29,267
1985	35,746	270	1,740	37,765	3,500	41,265
1986	11,464	222	2,150	13,836	657	14,493
1987	40,591	132	3,622	44,345	135	44,480
1988	30,263	349	1,882	32,494	1,071	33,565
1989	17,549	100	2,462	20,111	2,909	23,020
1990	27,537	0	3,675	31,212	2,410	33,622
1991 [b]	30,784	0	5,619	36,403	1,642	38,045
Average						
1961–80	3,035	2,042	2,551	6,300	6,791	13,091
1981–85	22,248	682	2,049	24,979	2,700	27,679
1986–90	25,481	161	2,758	28,400	1,436	29,836

[a] Catch in numbers of fish.
[b] Preliminary.

Appendix Table 8. Alaska catch of Yukon River coho salmon, 1961–1991.[a]

Year	Subsistence	Commercial	Total Utilization
1961	9,192 [b,c]	2,855	12,047
1962	9,480 [b,c]	22,926	32,406
1963	27,699 [b,c]	5,572	33,271
1964	12,187 [b,c]	2,446	14,633
1965	11,789 [b,c]	350	12,139
1966	13,192 [b,c]	19,254	32,446
1967	17,164 [b,c]	11,047	28,211
1968	11,613 [b,c]	13,303	24,916
1969	7,776 [b,c]	15,093	22,869
1970	3,966 [b,c]	13,188	17,154
1971	16,912 [b,c]	12,203	29,115
1972	7,532 [b,c]	22,233	29,765
1973	10,236 [b,c]	36,641	46,877
1974	11,646 [b,c]	16,777	28,423
1975	20,708 [b,c]	2,546	23,254
1976	5,241 [b,c]	5,184	10,425
1977	16,333 [c]	38,863	55,196
1978	7,787 [c]	26,152	33,939
1979	9,794	17,165	26,959
1980	20,158	8,745	28,903
1981	21,228	23,680	44,908
1982	35,894	37,176	73,070
1983	23,895	13,320	37,215
1984	49,020	81,940	130,960
1985	32,264	57,672	89,936
1986	34,468	47,255	81,723
1987	84,894 [d]	0	84,894
1988	69,138	99,907	169,045
1989	40,977	85,493	126,470
1990 [e]	47,816	46,915 [g]	94,731
1991 [f]	55,459	109,656 [g]	165,115
Average			
1961–80	12,520	14,627	27,147
1981–85	32,460	42,758	75,218
1986–90	55,459	55,914	111,373

[a] Catch in numbers of fish. Includes ADF&G test fish catches.
[b] Catches estimated for 1961–1976 since catches other than chinook salmon were not differentiated by species.
[c] Catches for 1961–1978 represent minimum numbers since surveys were conducted prior to the end of the fishing season.
[d] Includes an estimated 4,996 and 31,276 coho salmon illegally sold in Districts 5 and 6 (Tanana River), respectively.
[e] Subsistence harvest data preliminary.
[f] Preliminary. Subsistence harvest data unavailble. Most recent 5–year subsistence harvest average substituted.
[g] Includes "equivalent fish" converted from roe sales.

Appendix Table 9. Chinook salmon escapement counts for selected U.S. spawning stocks in the Yukon River drainage, 1961–1991.[a]

Year	Andreafsky River		Anvik River[b]		Nulato River	Gisasa River	Chena River		Salcha River	
	East Fork	West Fork	Aerial	Tower			River	Index	River	Index
1961	1,003	–	1,226	–	543[c]	266[c]	–	–	2,878	–
1962	675[c]	762[c]	–	–	–	–	61[c,d]	–	937	–
1963	–	–	–	–	–	–	137[c]	–	–	–
1964	867	705	–	–	–	–	–	–	450	–
1965	–	344[c]	650[c]	–	–	–	–	–	408	–
1966	361	303	638	–	–	–	–	–	800	–
1967	–/	276[c]	336[c]	–	–	–	–	–	–	–
1968	380	383	310[c]	–	–	–	–	–	739	–
1969	274[c]	231[c]	296[c]	–	–	–	–	–	461[c]	–
1970	665	574[c]	368	–	–	–	6[c]	–	1,882	–
1971	1,904	1,682	–	–	–	–	193[c,d]	–	158[c]	–
1972	798	582[c]	–	1,198	–	–	138[c,d]	–	1,193	1,034
1973	825	788	–	613	–	–	21[c]	–	391	–
1974	–	285	–	471[c]	78[c]	161	1,016[d]	959	1,857	1,620
1975	993	301	–	730	204	385	316[d]	262	1,055	–
1976	818	643	–	1,153	648	332	531	496	1,641	1,473
1977	2,008	1,499	–	1,371	487[c]	255	563	–	1,202	1,052
1978	2,487	1,062	–	1,324	920	45[c]	1,726	–	3,499	3,258
1979	1,180	1,134	–	1,484	1,507	484	1,159[c]	–	4,789	–
1980	958[c]	1,500	1,192	–	1,323[c]	951	2,541	–	6,757	6,126
1981	2,146[c]	231[c]	577[c]	–	791[c]	–	600[c]	–	1,237[c]	1,121[c]
1982	1,274	851	–	–	–	421	2,073	–	2,534	2,346
1983	–	–	376[c]	–	1,006	572	2,553	2,336	1,961	1,803
1984	1,573[c]	1,993	574[c]	–	–	–	501	494	1,031	906
1985	1,617	2,248	720	–	2,780	735	2,553	2,262	2,035	1,860
1986	1,954	3,158	918	–	2,974	1,346	2,031	1,935	3,368	–
1987	1,608	3,281	879	–	1,638	731	1,312	1,209	1,898	1,671
1988	1,020	1,448	1,449	–	1,775	797	1,966	1,760	2,761	2,553
1989	1,399	1,089	212[c]	–	–	–	1,280	1,185	2,333	2,136
1990	2,503	1,545	1,595	–	998	884[c]	1,436	1,402	3,744	3,429
1991	1,938	2,544	625	–	2,020	1,690	1,276[c]	1,276[c]	2,120[c]	1,922[c]
E.O.[e]	1,600	1,000	500[f]	–	1,000	650	–	1,700[g]	–	2,500[h]

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

[b] From 1961–1970, aerial survey count data are from various segments of the mainstem Anvik River. From 1971–1979, mainstem aerial survey counts below the tower were added to tower counts. From 1980–present, aerial survey counts are from the mainstem Anvik River between the Yellow River and McDonald Creek.

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

[d] Boat survey.

[e] Interim escapement objective.

[f] Interim escapement objective for the mainstem Anvik River between the Yellow River and McDonald Creek.

[g] Interim escapement objective for the mainstem Chena River between Moose Creek Dam and the Middle Fork River.

[h] Interim escapement objective for the mainstem Salcha River between TAPS and Caribou Creek.

Appendix Table 10. Chinook salmon escapement counts for selected Canadian spawning stocks in the Yukon River drainage, 1961–1991.[a]

Year	Tincup Creek	Tatchun River[b]	Little Salmon River	Big Salmon River[d]	Nisutlin River[e]	Wolf River[f]	Whitehorse Fishway[g]	Canada Mainstem Tagging Estimate[h]
1961	–	–	–	–	–	–	1,068	–
1962	–	–	–	–	–	–	1,500	–
1963	–	–	–	–	–	–	483	–
1964	–	–	–	–	–	–	595	–
1965	–	–	–	–	–	–	903	–
1966	–	7[c]	–	–	–	–	563	–
1967	–	–	–	–	–	–	533	–
1968	–	–	173[c]	857[c]	407[c]	–	414	–
1969	–	–	120	286	105	–	334	–
1970	–	100	–	670	615	71[c]	625	–
1971	–	130	275	275	650	750	856	–
1972	–	80	126	415	237	13	391	–
1973	100	99	27[c]	75[c]	36[c]	–	224	–
1974	–	192	–	70[c]	48[c]	–	273	–
1975	–	175	–	153[c]	249	40[c]	313	–
1976	–	52	–	86[c]	102	–	121	–
1977	–	150	408	316[c]	77	–	277	–
1978	–	200	330	524	375	–	725	–
1979	–	150	489[c]	632	713	183[c]	1,184	–
1980	–	222	286[c]	1,436	975	377	1,383	–
1981	–	133	670	2,411	1,626	395	1,555	–
1982	–	73	403	758	578	104	473	19,790
1983	100	264	101[c]	540	701	95	905	28,989
1984	150	161	434	1,044	832	124	1,042	27,616[j]
1985	210	190	255	801	409	110	508	10,730
1986	228	155	54[c]	745	459[c]	109	557	16,415
1987	100	159	468	891	183	35	327	13,210
1988	204	130	368	765	267	66	405	23,118
1989	88	100	862	1,662	695	146	549	25,201
1990	83	643	665	1,806	652	188	1,407	37,699
1991	–	–	326	1,040	–	201	1,266	22,582[k]
E.O.[m]								33,000–43,000

[a] Data obtained by aerial survey unless otherwise noted. Only peak counts are listed.
[b] All foot surveys except 1978 (boat survey) and 1986 (aerial survey).
[c] Incomplete and/or poor survey conditions resulting in minimal or inaccurate counts.
[d] For 1968, 1970, and 1971 counts are from mainstem Big Salmon River. For all other years counts are from the mainstem Big Salmon River between Big Salmon Lake and the vicinity of South Creek.
[e] One Hundred Mile Creek to Sidney Creek.
[f] Wolf Lake to Red River.
[g] Includes 50, 90, 292, and 506 fin–clipped hatchery–origin salmon in 1988, 1989, 1990, and 1991 respectively.
[h] Estimated total spawning escapement excluding Porcupine River (estimated border escapement minus the Canadian catch.
[j] Estimate derived by dividing the 1984 5–area (Whitehorse Fishway, Big Salmon, Nisutlin, Wolf, Tatchun) count by the average proportion of the 5–area index count to the estimated spawning escapements from the DFO tagging study for years 1982, 1983, and 1985–1990.
[k] Preliminary
[m] Interim escapement objective.

Appendix Table 11. Summer chum salmon escapement counts for selected spawning areas in the Yukon River drainage, 1973–1991.[a]

Year	Andreafsky River			Anvik River		Nulato River	Hogatza River[e]	Salcha River
	East Fork							
	Aerial	Sonar or Tower	West Fork	Tower & 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[c]	–	–	1,479,582	14,348[b]	–	8,500
1982	7,501[b]	181,352[c]	7,267[b]	–	444,581	–	4,984[b]	3,756
1983	–	110,608[c]	–	–	362,912	21,012[b]	28,141	716[b]
1984	95,200[b]	70,125[c]	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[d]	99,373	–	1,189,602	64,265	–	8,028
1987	6,687[b]	45,221[d]	35,535	–	455,876	11,257	5,669[b]	3,657
1988	43,056	68,937[d]	45,432	–	1,125,449	42,083	6,890	2,889[b]
1989	21,460[b]	–	–	–	636,906	–	–	1,574[b]
1990	11,519[b]	–	20,426[b]	–	395,303	4,615[b]	2,177[b]	450[b]
1991[g]	23,619[b]		34,561[b]	–	860,525	25,641	9,947	154[b]
E.O.[f]	109,000		116,000		487,000	53,000	17,000	3,500

[a] Data obtained by aerial survye 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] Sonar count.
[d] Tower count.
[e] Includes Caribou and Clear Creeks with escapement objectives of 8,000 and 9,000, respectively.
[f] Interim escapement objective.
[g] Preliminary

Appendix Table 12. Fall chum salmon escapement counts for selected spawning areas in the Yukon River drainage, 1974–1991.

Year	Upper Toklat River[a]	Delta River[b]	Chandalar River[c]	Sheenjek River[c]	Fishing Branch River[c]	Canada Mainstem Tagging Estimate[f]
1974	43,484	5,915	–	89,966 [d]	32,525 [g]	–
1975	90,984	3,734 [h]	–	173,371 [d]	353,282 [g]	–
1976	53,882	6,312 [h]	–	26,354 [d]	36,584	–
1977	36,462	16,876 [h]	–	45,544 [d]	88,400	–
1978	37,057	11,136	–	32,449 [d]	40,800	–
1979	179,627	8,355	–	91,372 [d]	119,898	–
1980	26,373	5,137	–	28,933 [d]	55,268	–
1981	15,775	23,508	–	74,560 [d]	57,386 [i]	–
1982	3,601	4,235	–	31,421	15,901	31,958
1983	20,807	7,705	–	49,392	27,200	90,875
1984	16,511	12,411	–	27,130	15,150	56,633 [j]
1985	22,805	17,276 [h]	–	152,768	56,100 [g]	62,010
1986	18,903	6,703 [h]	59,313	83,197	31,173 [g]	87,990
1987	22,141	21,180	52,416	140,086	48,956 [g]	80,776
1988	13,324	18,024	33,619	41,073	23,597 [g]	36,786
1989	30,447	21,342 [h]	69,161	101,748 [m]	43,834 [g]	35,750
1990	33,672	8,992 [h]	78,631	65,721	27,000 [n]	51,735
1991 [k]	13,197	25,000 [h]	–	88,890	37,733 [g]	76,447
E.O.[p]	> 33,000	> 11,000	–	> 64,000	50,000 – 120,000	> 80,000

[a] Total escapement estimates using Delta River migratory time density curve and percentage of live salmon present by survey date in upper Toklat River area.
[b] Total escapement estimates made from migratory time density curve (see Barton 1986), unless otherwise indicated.
[c] Sonar estimate.
[d] Total escapement estimates using sonar to aerial survey expansion facor of 2.221, unless otherwise indicated.
[e] Total escapement estimates using weir to aerial survey expansion factor of 2.72, unless otherwise indicated.
[f] Excludes Fishing Branch River escapment (estimated border passage minus Canadian removal).
[g] Weir estimate.
[h] Population estimate from replicate foot surveys and stream life data.
[i] 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.
[j] Escapement estimate based on mark–recapture program unavailable. Estimate based on assumed average exploitation rate.
[k] Preliminary
[m] Includes a passage estimate of 20,000 salmon prior to initation of sonar monitoring operations.
[n] Weir was not operated. Total escapement estimate using weir to aerial survey expansion factor of 3.57. Survey was conducted approximately 2 weeks late. Therefore, a more reasonable escapement would be between 30,000 and 40,000 salmon
[p] Interim escapement objective.

Appendix Table 13. Coho salmon escapement for selected spawning areas in the Yukon River drainage, 1972–1991.[a]

Year	Nenana River Drainage				Delta Clearwater River[c,d]	Clearwater Lake and Outlet	Richardson Clearwater River
	Lost Slough	Clear Creek	Wood Creek[b]	17–Mile Slough			
1972	–	–	–	–	630	417	454 [e]
1973	–	–	–	–	3,322	551 [c]	375 [c]
1974	1,388	–	–	27	3,954	560	652 [c]
1975	943	–	–	956	5,100	1,575 [c,d]	4 [e]
1976	118	13	–	281	1,920	1,500 [c,d]	80 [e]
1977	524	–	310 [f]	1,167	4,793	730 [c,d]	327
1978	350	–	300 [f]	466	4,798	570 [c,d]	–
1979	227	–	–	1,987	8,970	1,015 [c,d]	372
1980	499	–	1,603 [f]	592	3,946	1,545 [c,d]	611
1981	274	–	849 [g]	1,005	8,563 [h]	459 [e]	550
1982	–	–	1,436 [g]	–	8,365 [h]	–	–
1983	766	–	1,044 [g]	103	8,019 [h]	253	88
1984	2,677	2,600 [b,d]	8,805 [g]	–	11,061	1,368	428
1985	1,584	–	3,775 [g]	2,081	6,842 [e]	750	–
1986	794	605 [b,d]	1,664 [g]	218 [b,d]	10,857	3,577	146 [e]
1987	2,511	–	2,450 [g]	3,802	22,300	4,225 [c,d]	–
1988	348	–	2,046 [g]	–	21,600	825 [c,d]	–
1989	–	–	412 [g]	824 [e]	11,000	1,600 [c,d]	483
1990	688	–	–	15 [e]	8,325	2,375 [c,d]	–
1991 [j]	564	–	–	52	23,900	3,150 [c,d]	–

[a] Only peak counts presented. Survey rating is fair to good, unless otherwise noted.
[b] Surveyed by F.R.E.D.
[c] Surveyed by Sport Fish Division.
[d] Boat survey.
[e] Poor survey.
[f] Foot survey.
[g] Weir count.
[h] Population estimate.
[j] Preliminary

ATTACHMENT II. STATUS OF MARINE FISHERIES WHICH MAY INTERCEPT YUKON RIVER ORIGIN SALMON

ATTACHMENT II

Status of Commercial Marine Fisheries That Intercept Some Salmon Originating in the Yukon River System.

A. Introduction.

Salmon originating in the Yukon River system migrate as juveniles out of the river and into the Bering Sea. The distribution of Yukon River salmon in the ocean is only partly understood, but evidence from tagging studies and the analysis of scale patterns show that these salmon spread throughout the Bering Sea, some move considerably south of the Aleutian Island chain into the Gulf of Alaska and North Pacific Ocean, and some move into the Chukchi Sea. Eight commercial fisheries take place in these waters, and some of them are likely to catch some Yukon River Salmon.

In 1991, five of these commercial fisheries undoubtedly caught some Yukon salmon: (1) high-seas salmon gillnet fisheries in the North Pacific Ocean and the Bering Sea by Japan; (2) high-seas squid gillnet fisheries in the North Pacific Ocean by Japan, the Republic of Korea, and the Republic of China (Taiwan); (3) the groundfish trawl fishery by many nations in the international waters area of the Bering Sea ("the Doughnut Hole"); (4) the groundfish trawl fisheries of the United States in the Gulf of Alaska and Bering Sea, (5) the purse seine and gill net salmon fisheries of the U.S. in the Unimak and Shumagin Islands area (known as the "False Pass" fisheries).

Three other commercial fisheries operate in marine waters where Yukon River salmon occur, but these fisheries catch few, if any, salmon and make no significant harvest of Yukon River salmon: (1) the U.S. longline fisheries for Pacific halibut, Pacific cod, and other groundfish, (2) the U.S. pot fisheries for Pacific cod and other groundfish, and for Dungeness, king, and Tanner crab, and (3) the U.S. purse seine and gillnet fisheries for Pacific herring.

Only two of these eight currently operating fisheries may retain the salmon they catch: (1) the Japanese high-seas salmon gillnet fisheries and (2) the U.S. False Pass seine and gill net fisheries. Under U.S. law and fishing regulations, U.S. fishermen are prohibited from fishing for salmon with nets seaward of a line 3 nautical miles from the coastline, and if they catch any salmon in their net fisheries for other species they must return the salmon immediately to the sea. Also, the U.S. longline and pot fisheries may not retain any salmon they catch.

When foreign vessels were fishing within the U.S. EEZ, they operated with U.S. permits and carried U.S. observers. U.S. law (the Magnuson Fishery Conservation and Management Act) and fishing regulations prohibited them from retaining any salmon they caught,

and they had to report their catch but return the salmon immediately to the sea.

Japan, the Republic of Korea, and Taiwan have imposed similar restrictions on their squid fisheries in the international waters of the North Pacific Ocean.

In all the fisheries prohibited from retaining salmon, some have done so illegally. Some gillnet vessels are known to have purposely fished illegally for and sold salmon, including, no doubt, some from the Yukon River.

The legal Japanese and U.S. salmon fisheries operate under restrictions that keep small their harvests of Yukon River salmon. The Japanese landbased and nontraditional landbased (formerly the Mothership fishery) are restricted by the amount of fishing effort, and the times and areas where they may fish; these restrictions keep their catch of Yukon River and other North American salmon to a low level. The U.S. False Pass purse seine and gill net fisheries are under restrictions on the amount and type of fishing gear, fishing times and areas, and the harvests of chum salmon.

In summary, although eight commercial fisheries currently operate in marine waters where Yukon River salmon occur, only two may legally retain salmon, and their harvests are controlled by regulations on the amount and types of fishing gear, fishing times, fishing areas, and, for the False Pass fishery, a limit on its harvest of sockeye and chum salmon. In addition, in all but the False Pass fishery, observers monitor and sample the catches and record, sample, and measure the salmon caught. The following sections provide more details on each fishery and their salmon catches.

B. Japanese High-Seas Salmon Gillnet Fisheries.

Following World War II, but particularly from 1952 until 1990, the Japanese operated two high-seas gillnet fisheries for salmon: (a) the mothership fishery in the North Pacific Ocean and the Bering Sea and (b) the land-based gillnet fishery in the North Pacific Ocean. The International North Pacific Fisheries Commission (INPFC) was established in 1953 under the International Convention for the High Seas Fisheries of the North Pacific Ocean (an agreement between the United States, Canada, and Japan). Its main purpose was to control the Japanese salmon fisheries and to ensure the protection of North American salmon stocks. In addition, a bilateral agreement between Japan and the Soviet Union controls the harvest by these fisheries of salmon originating in the Soviet Union. Figure 1 shows the specific areas planned for each fishery in 1989.

Until 1988, the Japanese mothership salmon fishery operated in parts of the United States Exclusive Economic Zone (waters from 3 to 200 miles off the coast of the United States). In 1988, a United States Superior Court order (Kokechik Fisherman's Assoc. v. Secretary of Commerce, 839 F.2d 795) prohibited the United States Department of Commerce from issuing a permit to Japan that would allow the mothership fishery to take (that is, to catch or kill or otherwise interfere with) incidentally any marine mammal, particularly fur seals. This action kept the Japanese mothership fishery out of the U.S. EEZ. The Japanese operated the mothership fishery seaward of the U.S. EEZ during 1988 and 1989 and in 1990 converted this fishery to what is now called the "nontraditional land-based salmon fishery."

The total catch of salmon by species from 1978 through 1989 by the Japanese mothership fishery are presented in Table 1, that by the Japanese land-based fishery in Table 2, and the estimated catch of Western Alaska (including Yukon River) chinook salmon by both these fisheries from 1964 through 1989 in Table 3.

In March 1990, the International North Pacific Fisheries Commission let the Japanese convert its mothership fishery to the nontraditional landbased fishery. Only Japanese fishing vessels previously licensed in the traditional high-seas mothership salmon fishery were allowed in this new fishery and fishing was restricted to two areas: Area 4-North in international waters of the Bering Sea and Area 2a in the North Pacific Ocean south of the Aleutian Islands (Figure 2). The fishing vessels had to operate as organized fleets under a fleet commander, and no harvests could be transferred at sea. At least two Japanese patrol vessels monitored the fishery. Each fishing vessel had to report to a Japanese patrol vessel when it would arrive and depart from the fishing grounds as well as report its position at a fixed time every day while the vessel was in a fishing area. Also, all vessels were required to use naval navigational satellite system devices with recording tapes. Finally, 10 percent of the vessels had to carry automatic, real-time satellite position fixing devices (transmitters).

At the time of this report (November 1991) only the salmon harvests by the nontraditional land-based fishery have been reported. This fishery harvested a total of 1,476,986 salmon, of which 44,584 were chinook salmon; 696,332, chum; 288,642, sockeye; 427,141, pink; and 34,357, coho. Although most (almost 66%) of the salmon were caught in the North Pacific Ocean (Area 2a), 52% of the chinook and 41% of the chum came from the Bering Sea (Area 4-North). The harvests for 1990 and 1991 are presented in Table 4.

C. High-Seas Squid Fisheries of Japan, Korea, and Taiwan.

In 1978, the Japanese began the high-seas driftnet fishery for neon flying squid, *Ommastrephes bartrami*, coincident with reductions in its other distant-water fisheries, particularly the reduction in its salmon mothership fishery. In 1981, Japan regulated the times and areas for squid fishing to minimize the interceptions of salmon. The regulations were designed to restrict the squid fishery to areas of warm waters (15°C [59°F] or warmer) where salmon are rarely found. Thus, the northern boundary of the squid-fishing area moves north during the year as the ocean warms and then retreats south as the ocean cools (**Figure 3**). In addition, the regulations prohibited squid fishing vessels from retaining any salmon they caught incidently in the squid fishery.

In 1987, 478 Japanese vessels participated in the North Pacific squid fleet, with each vessel using up to 45 kilometers (28 miles) of gillnet each night for 4 to 7 months each year. In 1990, 457 Japanese vessels were licensed to fish for neon flying squid. They fished nets of up to 12 sections in length, each section comprised 90 to 170 standard tans of web (a tan is 50 meters long). Thus, the maximum length of a net was (102,000 meters long [12 x 170 x 50 = 102,000], or about 56 nautical miles long). Of the 475 vessels, small vessels (hulls 25 to 35 meters long) made 263 trips and larger vessels (hulls greater than 35 meters long) made 380 trips, for a total of 643 trips.

To ensure its squid fishermen fished legally and did not retain salmon, Japan agreed with a number of enforcement provisions. For example, all Japanese driftnet vessels operating in the North Pacific Ocean were required to carry satellite transponders that automatically transmitted their positions. Also, Japanese fishery enforcement vessels patrolled the squid fishery for 600 vessel-days (a U.S. observer was aboard one cruise of an enforcement vessel), and there were additional dockside and at-sea enforcement activities. Furthermore, U.S. Coast Guard boats patrolled the North Pacific Ocean and boarded 6 Japanese squid fishing vessels, the U.S. Coast Guard and the Canadian Maritime Forces flew 117 aerial reconnaissance missions (a Japanese observer was aboard one U.S. surveillance flight), and some of the squid fishing vessels carried scientific observers.

Observers were placed on board 75 of the Japanese squid vessels (12% of the total) in 1990. Of the 75 observers, 30 were Japanese, 10 were Canadian, and 35 were American. The observers monitored the daily operations of the vessels and recorded the number of squid and other species brought on deck entangled in the driftnets. They also recorded the number of fish and squid dropping out of the nets or shaken out by the fishermen during retrieval of the driftnet.

The squid fisheries of the Republic of Korea (South Korea) and the Republic of China (Taiwan) are similar to and operate under regulations similar to those for the Japanese squid fishery. South Korea first began harvesting flying squid with driftnets in 1979. Its fishing grounds originally were located in the western North Pacific, but the fishery soon extended eastward to 165°W. In 1990, 160 Korean vessels driftnetted for squid. Korea has implemented regulations prohibiting the retention of salmonids and has established time and area restrictions (similar to those of Japan) for its fishery (Figure 4). Taiwan's squid driftnet fishery began in 1980 and grew quickly to 150 vessels by 1984. These vessels fished for albacore and skipjack tuna as well as for neon flying squid. In 1990, 140 Taiwanese driftnet vessels fished for squid and tuna. In 1985, Taiwan adopted regulations for its squid fishery (Figure 5).

Squid fishermen operating legally under the regulations are unlikely to catch salmon destined for the Yukon River because the fisheries are supposed to take place in waters generally too warm for salmon. Nevertheless, the high-seas squid fisheries have been accused frequently of catching large numbers of salmon, and much evidence has shown that some squid fishermen and some Japanese salmon fishermen have violated the regulations.

A review of the incidental and illegal catches of salmonids in the 1990 North Pacific Driftnet Fisheries was presented at the November 1991 meeting of the International North Pacific Fisheries Commission in Tokyo, Japan. In summary, the total salmonid bycatch by the legal Japanese squid driftnet fishery was estimated to be between about 138,500 and 210,000 fish, with another 21,000 estimated to have dropped out of the driftnets during retrieval. The total estimated salmonid bycatch by the Korean squid fishery was estimated to be about 4,000 fish. Scientists were unable to estimate the total salmonid bycatch by the Taiwan squid fishery because only 2 salmon were observed by U.S. and Taiwanese observers to be caught.

The number of salmon caught by illegal driftnet fisheries is unknown because there is no way to document those catches. Scientists, however, have attempted to estimate that number by reviewing trade statistics, broker reports, and median reports; U.S. investigations of smuggling and trans-shipment of illegally caught salmon to Japan and other Southeast Asian countries; and U.S. and Canadian enforcement efforts on the high seas. Together this information shows that a substantial illegal harvest of salmon has been occurring. In 1991, for example, 165 driftnet vessels were observed operating out of the authorized fishing areas by U.S. and Canadian enforcement officials; in 1990, that number was 71. Of those observed fishing illegally in 1991, 6 were Japanese, 28 were Korean, 51 were Taiwanese, 8 were from the Peoples Republic of China, and 70 were unidentified. Overall, several million

salmon have been harvested each year for several years by these illegal fisheries.

In 1990, the United Nations General Assembly passed Resolution 44/225. This resolution banned large-scale pelagic driftnets in the South Pacific Ocean by July 1, 1991, and bans their use worldwide by June 30, 1992. One section of the resolution, however, states that a ban will not be imposed in a region or an existing ban will be removed if the fishery can show it is taking effective conservation and management measures to avoid the wasteful catch of unwanted marine mammals, fish, sea turtles, and birds. Japan, a member of the United Nations, endorsed the resolution. The Republic of Korea and the Republic of China are not members of the United Nations and are not bound by the resolution.

In a further attempt to eliminate illegal fishing for salmonids (Pacific salmon and steelhead trout, i.e., anadromous fish) in the North Pacific Ocean, the salmon producing countries of the North Pacific basin (Canada, United States, Japan, and the Soviet Union) are developing a "Convention for the Conservation of Anadromous Stocks in the North Pacific Ocean." The participating countries are expected to sign a treaty in late November or early December 1991 in Moscow, Russia. The draft treaty contains a provision that would prohibit further directed fishing for anadromous species on the high seas (that is, outside a country's 200-mile exclusive economic zone), and calls for reducing the incidental take of salmonids in other fisheries to insignificant levels.

D. Foreign Groundfish Fisheries.

In recent years, foreign fishing vessels harvested groundfish in two areas where they were likely to catch some salmon originating in the Yukon River system. The first area is the U.S. Exclusive Economic Zone (EEZ) in the Gulf of Alaska and Bering Sea. The second is an area of international waters in the Bering Sea known as the "Doughnut Hole" (see Figure 1).

The Foreign Groundfish Fisheries in the U.S. EEZ.

The directed foreign groundfish fishery in the EEZ off the coast of Alaska ended in 1985 in the Gulf of Alaska and in 1987 in the Bering Sea as the United States "Americanized" the groundfish fisheries there. While the foreign groundfish vessels operated in the U.S. EEZ, they needed to obtain a permit from the United States government, their catches were regulated, observed by U.S. observers, and reported. U.S. law (the Magnuson Fishery Conservation and Management Act) and fishing regulations prohibited them from retaining any salmon they caught. and they had to report their

catch but return the salmon immediately to the sea. **Tables 5 and 6** show the catches of salmon in these two areas from 1977 until the fisheries ended.

The Foreign Groundfish Fisheries in the Doughnut Hole.

A large foreign groundfish fleet continues to operate in international waters of the Bering Sea, an area known as the "Doughnut Hole," (See **Figure 1**). These groundfish fisheries are unregulated and (generally) not monitored by scientific observers, and catches of salmon by fishermen other than U.S., Canadian, or Japanese are not strictly prohibited. The 1989 total groundfish harvest by all fisheries in this area probably exceeded 1,000,000 metric tons; in 1988, the harvest amounted to about 1,470,000 metric tons, most of which were walleye pollock. Estimates of salmon in these harvests are as high as 96 salmon per metric ton of groundfish, but the number has varied greatly by time of year and from year to year, with the highest catches being in November and December.

In November and December of 1990, U.S. observers were aboard 10 U.S. groundfish vessels in the Doughnut Hole for a total of 74 observer-days. During this period, vessels made 89 tows and landed 852 metric tons of groundfish. Pollock made up over 98% of the total catch; most of the rest were other fish and squid. Observers noted a total of 83 salmon in these catches. Chinook salmon accounted for 62.7% and the rest were chum salmon. The incidental catch rate of salmon during this study was, then, 0.097 salmon (less than one-tenth of a salmon) per metric ton of groundfish.

Discussions are underway between the U.S., Canada, the U.S.S.R., Japan, and other countries to develop some controls for the groundfish fishery in the Doughnut Hole and prohibit the catches of salmon there.

E. The United States Joint-Venture Groundfish Fishery.

The joint-venture fishery (U.S. vessels harvesting groundfish and delivering at sea to foreign processors) ended in the Gulf of Alaska in 1988 and ended in the Bering Sea in 1990. The estimated number of salmon accidentally caught by these fisheries during the years they operated are summarized in **Tables 5 and 6**. In 1989, the estimated bycatch of salmon in the Bering Sea joint-venture groundfish fishery amounted to 14,153 salmon, of which 8,612 (61%) were chinook, 39% were chum, and the rest (0.1%) were coho. The chinook salmon were 48% males, which had an average whole weight of 7.8 pounds, and 52% females, with an average weight of 8.0 pounds. The chum were 55% males, averaging 5.9 lbs, and 45% females, averaging 5.6 pounds. The coho were all males, averaging 7.4 pounds.

F. The U.S. Groundfish Fishery of the Bering Sea and Gulf of Alaska.

The U.S. groundfish fishery expanded rapidly in the EEZ off the coast of Alaska. In 1977 (the year after the U.S. claimed jurisdiction over the fisheries within 200 miles of the U.S. coast), the U.S. groundfish harvest off Alaska amounted to only 2,300 metric tons (mt), or a meager 0.2% of the total groundfish catch by all nations in this area. Since then, the U.S. harvests have doubled nearly every year to a record of 243,417 mt being reported from the Gulf of Alaska in 1990 and over 1,695,127 mt from the Bering Sea and Aleutian Island areas.

In 1991, the U.S. Government issued a total of 1737 permits for the groundfish fisheries off Alaska. Of this total, 193 were for trawlers, 880 for longliners, 75 for pot gear, and 501 for multiple gear (longlines, pots, trawls). In addition, 25 vessels were permitted only as processing vessels, 35 were permitted as support vessels, and 28 were permitted as other modes. These vessels varied greatly in size. For vessels 5 net tons or larger, the longline vessels were, on the average, the smallest at an average length of 47 feet and average weight of 26 net tons. The trawlers (catcher-processors) were the largest, averaging 213 feet long and 972 net tons.

Under U.S. law and regulations, salmon may not be retained by the U.S. groundfish fishery and must be returned to the sea. Until 1990, however, there has been little information on the accidental or incidental catch of salmon by the U.S. groundfish fishery.

In 1990, the United States began a scientific observer program for the Alaska groundfish fishery. The amount of observer coverage is related to the length of the vessel or the amount of fish processed by a shoreside plant or mothership processing vessel. Groundfish vessels having a length of 125 feet or more are required to carry observers at all times when they are participating in the fishery. Vessels with lengths between 60 through 124 feet are required to carry observers during 30 percent of their fishing days during trips when they fish more than 10 days. Vessels shorter than 60 feet do not have to carry observers unless required to do so by the Director of the NMFS Alaska Region. Mothership or Shoreside processing plants processing 1,000 metric tons (mt) or more per month are required to have 100 percent observer coverage, those processing between 500 and 1,000 mt per month are required to have 30 percent coverage, and those processing less than 500 mt per month need no observer coverage unless it was required specifically by the NMFS Regional Director.

Observers need to be trained and certified. Individuals wanting to become observers should have a Bachelor's Degree (BS or BA) in fisheries or wildlife, although individuals with an Associate in Arts Degree (AA) are considered if too few individuals

with BS or BA degrees are available. Also, other relevant experience or training might be used for qualifications in place of college degrees. Each new candidate is required to attend a 2.5-week-long training course conducted by the National Marine Fisheries Service (NMFS). Previous observers are required to take a 4-day course. Observers have to be certified by NMFS as qualified, and they can not have a financial interest in the fishery or a personal interest in the vessel or processing plant.

In addition to the observer coverage, all groundfish harvesters and processors must maintain and submit logbooks on their groundfish harvests and their catch of the prohibited species, including crabs, halibut, herring, and salmon. Finally, the North Pacific Fishery Management Council, which governs the groundfish fishery in the U.S. EEZ off Alaska, has been considering limits on the incidental catches of salmon, just as it has for crabs and halibut.

Estimated catches of chinook and other salmon during 1990 and 1991 by the U.S. groundfish fishery are presented in Table 7. In 1990, estimated catches of salmon in the groundfish fisheries of the Gulf of Alaska (GOA) amounted to 14,832 chinook and 4,668 other salmon. Highest catches were in the flatfish, Pacific cod, and walleye pollock fisheries. In 1991 (as of 13 November), the GOA trawl fishery had caught an estimated 37,545 chinook and 13,558 other salmon. In the trawl fisheries of the Bering Sea and Aleutian Islands Area (BSA), the 1990 catch of salmon amounted to 13,990 chinook and 16,661 other salmon. Highest catches were in the walleye pollock and Pacific cod fisheries. In 1991 (as of 13 November), the BSA salmon catch amounted to an estimated 37,545 chinook and 13,558 other salmon.

G. The U.S. Alaska Peninsula ("False Pass") Salmon Fishery.

Most of the salmon harvested 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 summarized in the November 1988 JTC report. Sockeye salmon is the target species in the June fishery, but relatively large incidental catches of chum salmon are also made. The sockeye salmon harvest is regulated gy a quota that is annually adjusted according to the Bristol Bay sockeye salmon forecast.

The Alaska Board of Fisheries was meeting in November 1991, as this report was being prepared, to consider proposals regarding management of the June fishery in the Unimak and Shumagin Islands area of the South Peninsula. Prior to the 1990 season, the Board adopted regulations that delayed the season opening until 13 June,

increased the chum salmon quota to 600,000 fish, and limited the depths of gill nets and purse seines. The purpose of these regulation changes was to allow full utilization of sockeye salmon while minimizing the impact on chum salmon.

Harvest for the 1991 June fishery was 1,549,000 sockeye salmon and 771,000 chum salmon. The chum salmon harvest was 71% greater than the 1986-1990 average of 452,000 chum salmon and was 29% greater than the harvest cap of 600,000 chum salmon.

Table 1. Salmon harvested by the Japanese mothership fishery from 1978 through 1989, by species (in thousands of salmon).

Year	Sockeye	Chum	Pink	Coho	Chinook	Total
1978	1882	3802	1853	609	105	8251
1979	2186	3277	3405	281	126	9275
1980	2412	3098	561	656	704	7431
1981	2224	2539	4094	615	88	9560
1982	1738	3217	1654	1167	107	7883
1983	1655	3081	4324	294	87	9441
1984	1597	3276	1430	786	82	7170
1985	1138	2836	2717	128	66	6885
1986	729	1925	390	65	60	3170
1987	667	1822	966	35	39	3530
1988	225	892	56	177	26	1199
1989	244	607	339	2	16	1029

Source: Mike Dahlberg, Auke Bay Fisheries Laboratory, National Marine Fisheries Service, Juneau, AK.

Table 2. Salmon harvested by the Japanese landbased gillnet fishery, 1978 through 1989, by species (in thousands of salmon).

Year	Sockeye	Chum	Pink	Coho	Chinook	Total
1978	1293	7846	3488	2512	210	15349
1979	756	2661	11189	1198	162	15968
1980	787	2697	11611	1205	160	16461
1981	859	2509	11292	1209	190	16059
1982	723	2930	11035	1201	165	16054
1983	828	2395	11308	1122	178	15831
1984	305	2214	9727	894	92	13233
1985	155	1432	9973	766	100	12427
1986	148	959	4513	483	76	6179
1987	140	936	6068	459	74	7677
1988	116	751	5083	293	47	6289
1989	102	746	5339	208	51	6448

Source: Mike Dahlberg, Auke Bay Fisheries Laboratory, National Marine Fisheries Service, Juneau, AK.

Table 3. Total catch and estimated catch of Western Alaska (including Canadian Yukon) chinook salmon (in thousands of fish) in Japanese high seas salmon gillnet fisheries, 1964-1989[a,b]

	Mothership		Landbased		Combined	
Year	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	162	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	100	22	167	47
1986	60	24	76	20[c]	137	44[c]
1987	39	20	74	NA[d]	116	NA[d]
1988	26	23	47	NA[d]	73	NA[d]
1989	16	NA[d]	51	NA[d]	67	NA[d]

[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. 215 pgs. 1984-1987 Western Alaska catch estimate for mothership fishery: Mike Dahlburg, National Marine Fisheries Service, Juneau, AK. 1988-1989 data from Mike Dahlberg.

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

[c]From 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]Data not available.

Table 4. Number of salmon of each species harvested by the Japanese nontraditional gillnet fishery in two fishing areas, 1990 and 1991.

Year	Chinook	Chum	Coho	Pink	Sockeye	Total
North Pacific (Area 2-a)						
1990	7,595	248,522	17,906	164,066	161,577	800,648
1991	21,237	411,848	34,135	280,748	236,374	974,750
Bering Sea (Area 4-N)						
1990	15,073	251,663	0	100,251	38,493	405,480
1991	23,347	384,484	222	146,393	52,268	502,236
Total of Both Areas (Area 2-a + 4-N)						
1990	22,670	501,185	17,906	264,317	200,050	1,006,128
1991	44,584	696,332	34,357	427,141	288,642	1,491,056

Table 5. Estimated incidental catches (numbers and metric tons) of Pacific salmon (*Oncorhynchus spp.*) in the foreign and joint-venture groundfish fisheries in Gulf of Alaska, 1977-1989[a].

	Foreign		Joint Venture		Total	
Year	Numbers	Tons	Numbers	Tons	Numbers	Tons
1977	5,272	19	NF[b]	NF[b]	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[d]	137	N/A
1989	NF	NF	NF	NF	NF	NF

[a]Estimates for years 1977-1988 are from Berger and Weikart, 1988, NOAA Tech. Memo. NMFS F/NWC-148. Estimates for 1988 are from the National Marine Fisheries Service, Alaska Region, Juneau, Alaska.

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

[c]NF = No fishing.

[d]N/A = Data not available.

Table 6. 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, 1977-1989[a].

	Foreign		Joint Venture		Total	
Year	Numbers	Tons	Numbers	Tons	Numbers	Tons
1977	47,840	198	NF[b]	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	13,234	54
1988	NF	NF	9,213	N/A[c]	9,213	N/A
1989	NF	NF	14,538	N/A	14,538	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 National Marine Fisheries Service, Alaska Region, Juneau, Alaska.

[b]NF = No fishing.

[c]N/A = Data not available.

Table 7. Estimated numbers of salmon caught in the United States groundfish fisheries in the Gulf of Alaska and Bering Sea (Source: NMFS, Alaska Region, Juneau, AK).

A. Chinook Salmon

	Gulf of Alaska	Bering Sea and Aleutians	Total
1990	14,832	13,990	28,822
1991	37,545	37,589	75,134

B. All Salmon Except Chinook

	Gulf of Alaska	Bering Sea and Aleutians	Total
1990	4,668	16,661	21,329
1991	13,558	31,624	45,182

C. Total Salmon

	Gulf of Alaska	Bering Sea and Aleutians	Total
1990	19,500	30,651	50,151
1991	51,103	69,213	120,316

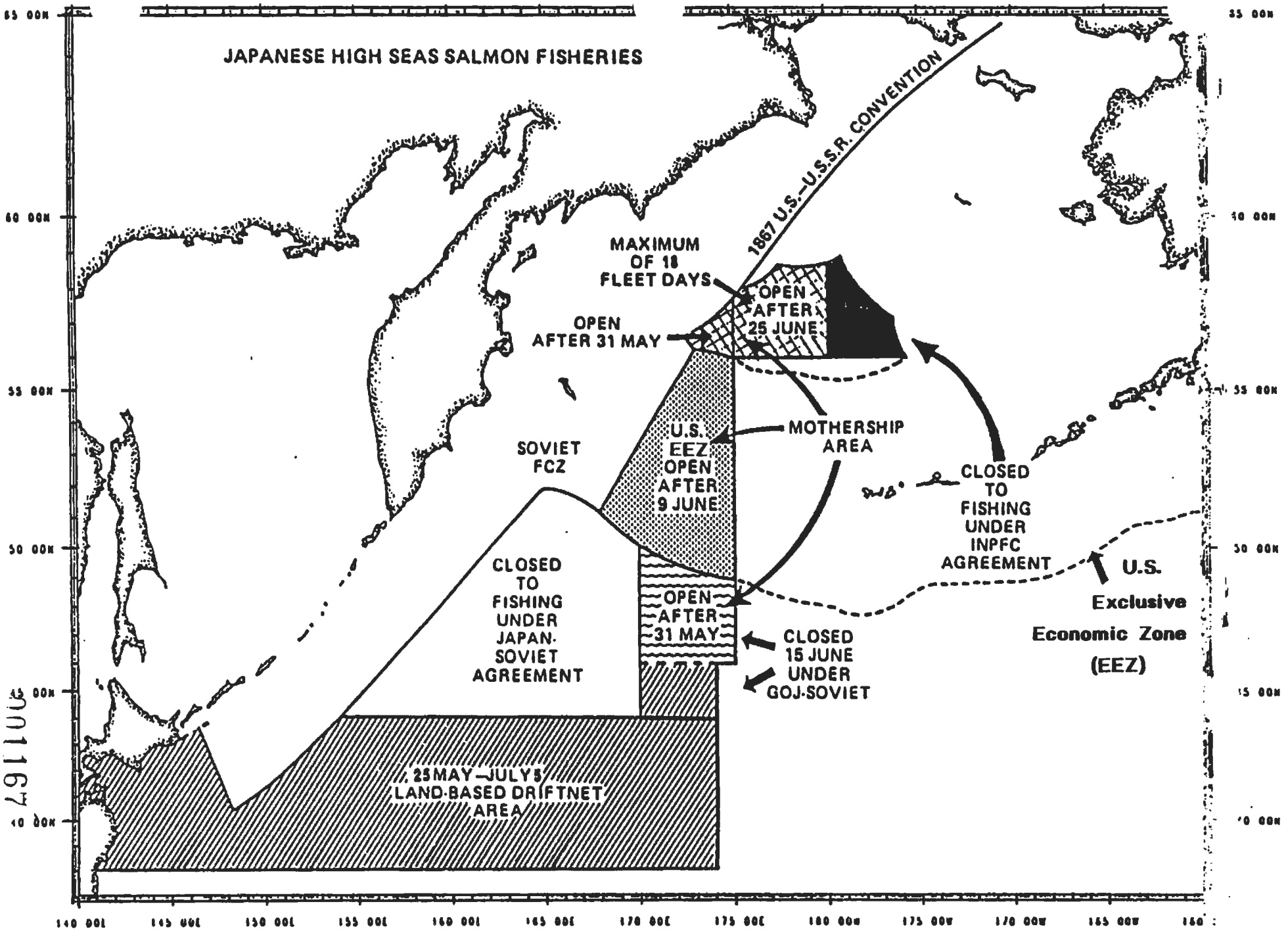
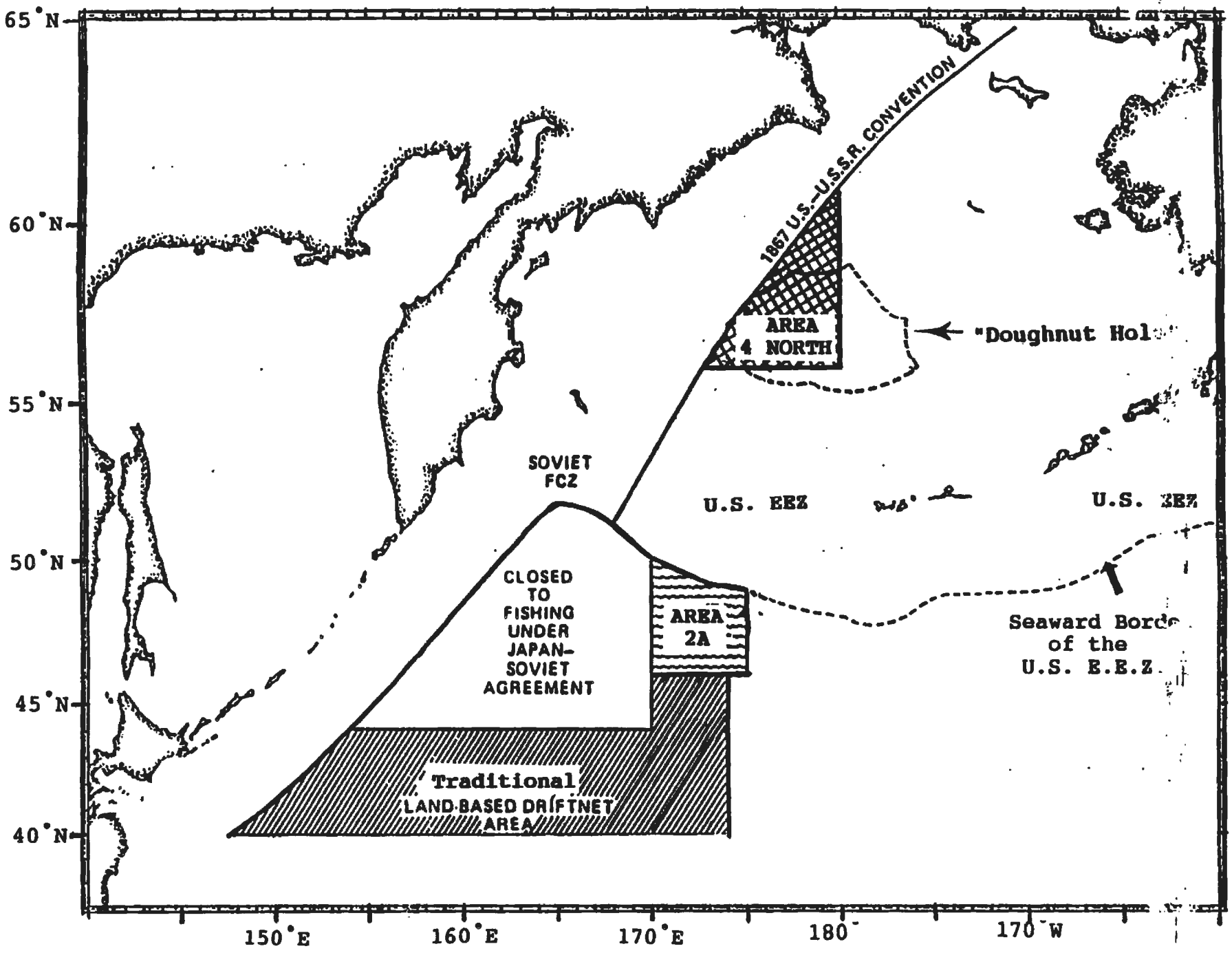


Figure 1. Proposed time and area restrictions for the 1989 Japanese high-seas salmon fisheries. A 1988 U.S. Federal Court Order, however, prevented the Mothership fishery from taking place in the U.S. EEZ.



Fi 2. Location of fishing grounds for th Nontraditional" (Areas 2A and 4-North) "Traditional" Japanese land-based mon gillnet fisheries during 1990. Loc of the area in international waters known as "The Doughnut Hole" is also shown.

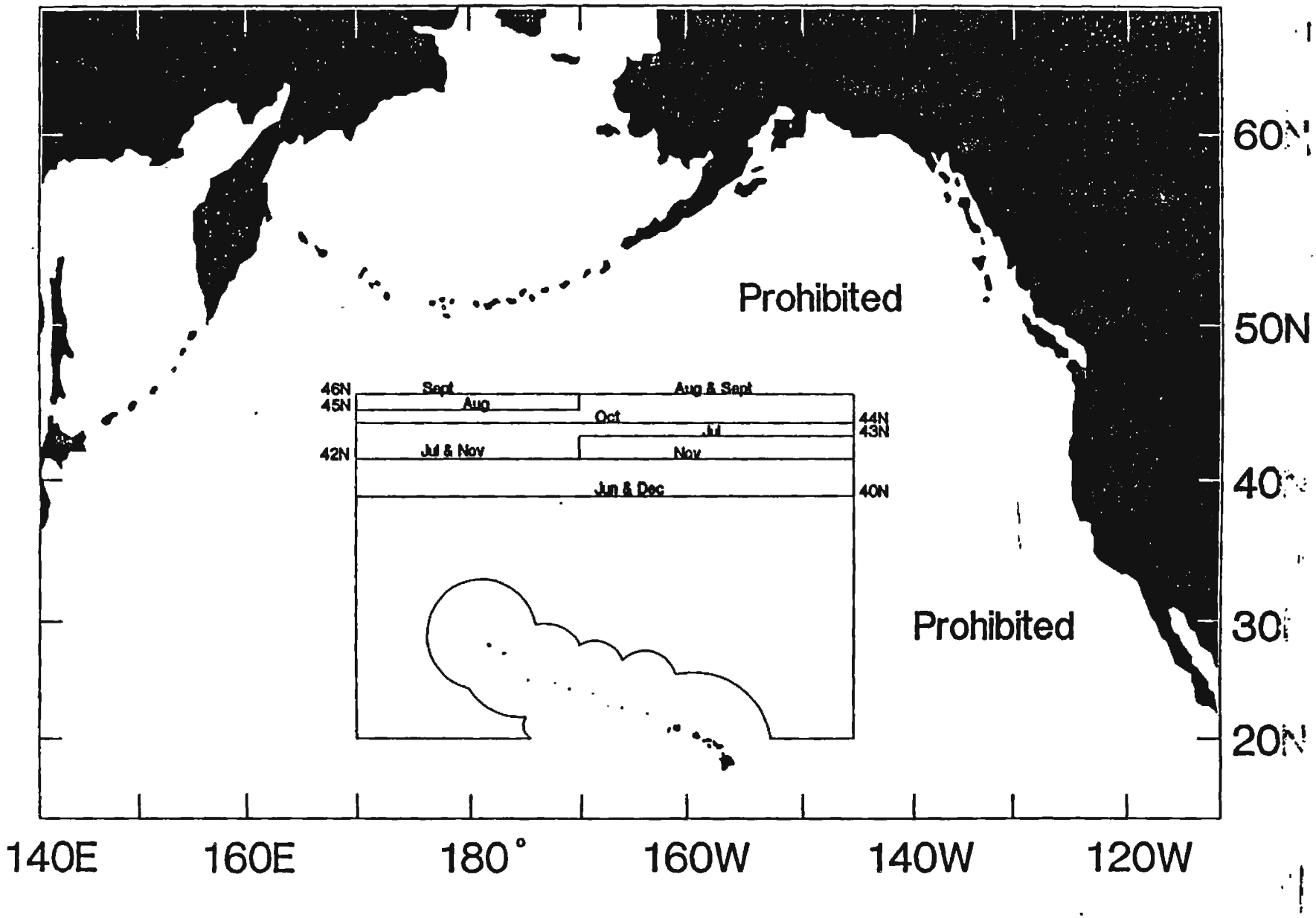


Figure 3.--Legal boundaries for the Japanese squid driftnet fishery.

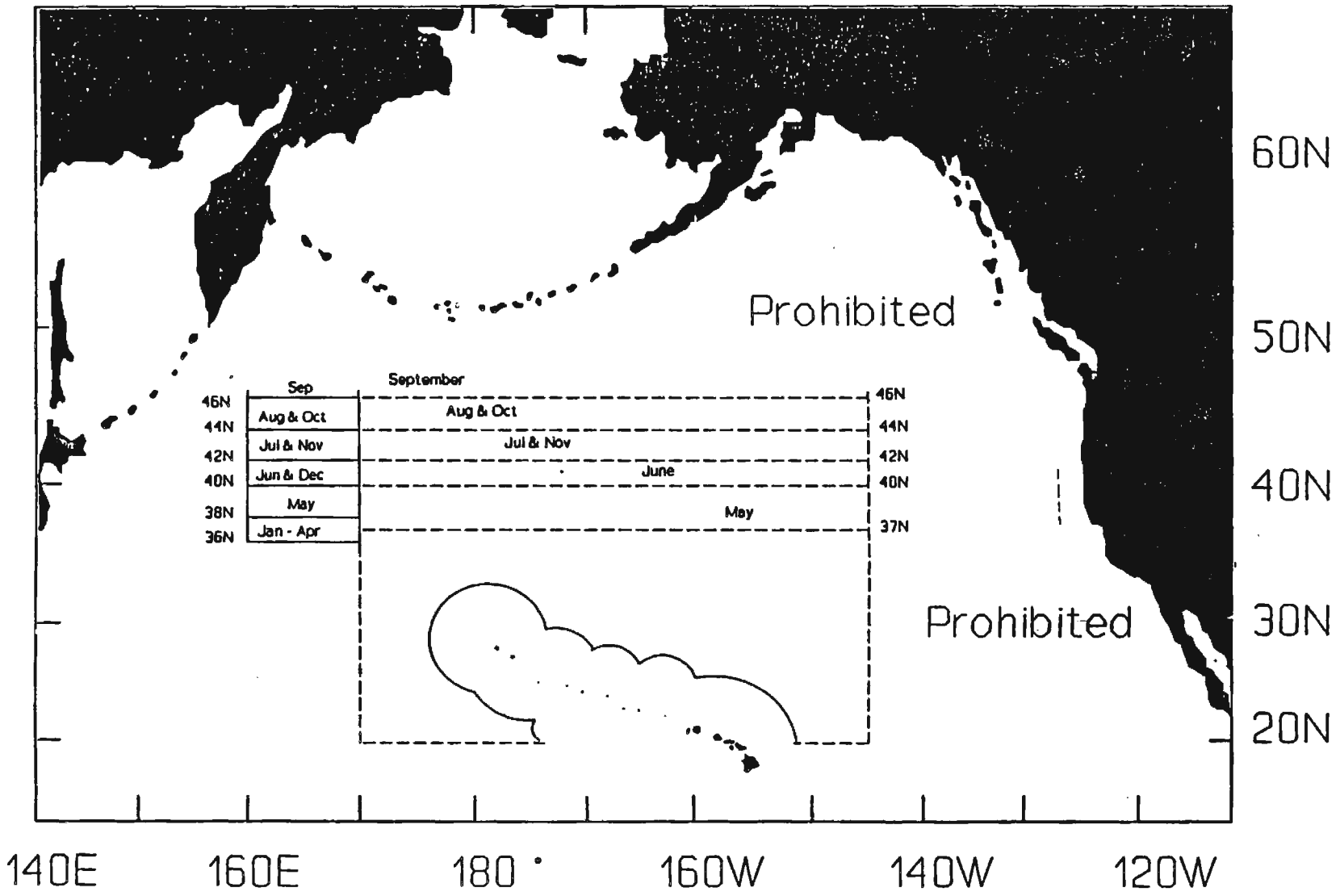


Figure 4.--Legal boundaries the ROK squid driftnet fishery.

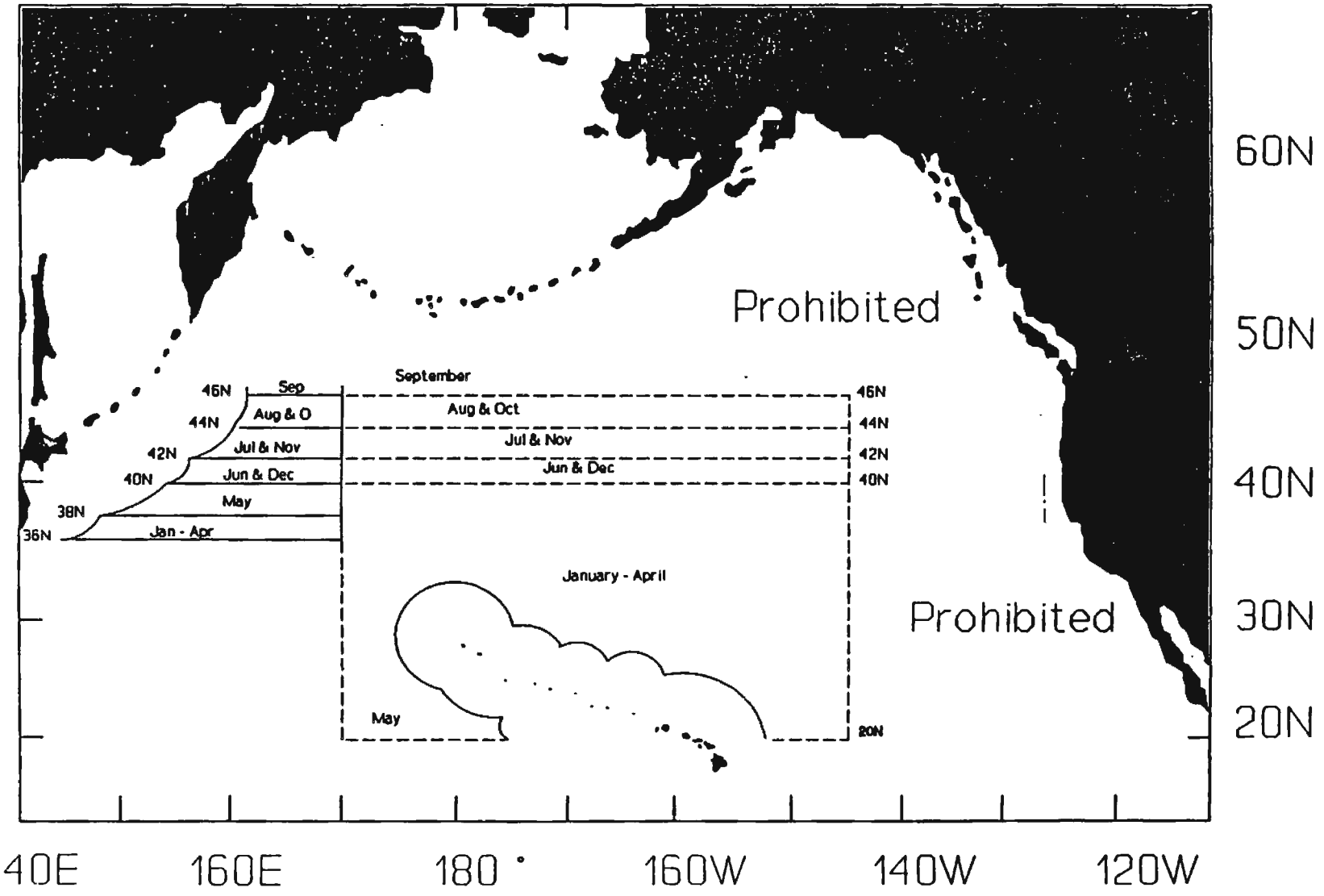


Figure 5.--Legal boundaries for the Taiwanese squid driftnet fishery.