YUKON RIVER SALMON SEASON REVIEW FOR 1993 AND TECHNICAL COMMITTEE REPORT

Prepared by

THE UNITED STATES/CANADA
YUKON RIVER JOINT 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 Yukon River Joint Technical Committee (JTC) to address the subject areas described in this report. The JTC met in Whitehorse on 17 and 18 November 1993. The meeting was attended by the following persons:

Canadian Department of Fisheries and Oceans
- Ken Wilson (co-chair)
- Sandy Johnston
- Gordon Zealand
- Ian Boyce
- Jane Wilson
- Siegi Kriegl
- Jacques Jobin

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

United States Fish and Wildlife Service
- Steve Klein
- Monty Millard

National Marine Fisheries Service
- Aven Andersen

This report is organized into six sections and two attachments. The various sections summarize the 1993 fishing season in the Yukon River drainage, the status of the spawning stocks, and selected project activities. Attachment I provides an update of historical Yukon River salmon catch and escapement data in graphic and tabular form. Note that the Alaska commercial catch information in Attachment I is in numbers of salmon, with roe sales converted to the number of salmon estimated to have been caught to produce the reported roe sales. Attachment II provides information on marine fisheries.

2.0 1993 COMMERCIAL FISHERY - ALASKA

Preliminary estimates of commercial sales total 190,072 salmon and 24,976 pounds of unprocessed salmon roe for the Alaskan portion of the Yukon River drainage (Figure 1) in 1993. Note that this review of the 1993 commercial fishing season in the Alaska portion of the Yukon River drainage is in terms of numbers of salmon sold in the round and pounds of salmon roe sold. Total sales were composed of 93,550 chinook and 96,522 summer chum salmon sold in the round (Table 1). Roe sales by species totalled 2,014 pounds for chinook

and 22,962 pounds for summer chum. Due to very weak runs, commercial fisheries for fall chum and coho salmon were not opened in 1993. With regards to fish sold in the round, the chinook salmon catch was 11% below the 1988-92 average and the summer chum salmon catch was 84% below average (Table 2). Roe sales were 87% below the 1988-92 average for summer chum salmon. Roe sales data were not available for chinook salmon prior to 1990, therefore historical comparisons are not yet meaningful. For fall chum and coho salmon, the 1988-92 average commercial sales were 153,799 fall chum in the round, 10,224 pounds of fall chum salmon roe, and 63,788 coho salmon in the round.

Yukon River fishermen in Alaska received an estimated $5.4 million for their catch in 1993, approximately 47% below the recent 5-year average of $10.2 million. Five buyer-processors and two catcher-sellers operated in the Lower Yukon Area, and 11 buyer-processors and 13 catcher-sellers operated in the Upper Yukon Area of Alaska.

Lower Yukon fishermen received an average landed price per pound of $2.70 for chinook salmon and $0.38 for summer chum salmon. Upper Yukon commercial fishermen received an estimated per-pound average price of $1.06 for chinook salmon, $5.52 for chinook salmon roe, $0.35 for summer chum salmon, and $8.53 for summer chum salmon roe.

2.1 Chinook Salmon

The 1993 preseason outlook for the overall Yukon River chinook salmon run was for a slightly below average run based on parent year escapements. The lower Yukon River was generally free of ice by 19 May. Chinook salmon migratory timing in the lower river was earlier than normal and similar to run timing in 1988. The first chinook salmon catches were reported on 26 May near Sheldon's Point by a subsistence fisherman. The ADF&G test fishing project recorded the first chinook salmon catches on 28 May. Chinook salmon entered the river primarily through the south and middle mouths.

The Yukon River sonar project at Pilot Station has been estimating daily salmon passage by species annually since 1986, except for 1992, when the project was operated for experimental purposes only. Beginning in 1993, new sonar equipment was used that provides greater insonification range and eliminates attenuation problems, thereby reducing biases that may have affected prior year estimates. The new equipment was field tested using standard targets and was verified to perform very well. A total passage estimate of 137,000 chinook salmon was estimated for 1993. Comparative data from the 8.5 inch mesh size set gill net test fishery in the lower river indicated an average abundance of chinook salmon in 1993, and that approximately half of the run had entered the river by 18 June. Test fishing catches of chinook salmon in the 5.5 inch mesh size gill nets were the second highest

on record. This may indicate above average abundance of age-4 and age-5 chinook salmon.

The commercial fishing season was opened after approximately eleven days of increasing subsistence and test fishery catches, although the plan was for seven to ten days, because the test fishing catches of chinook salmon increased slowly until 11 June. The chinook salmon directed fishery with unrestricted mesh size gill nets in the lower river was opened on a staggered basis: 14 June in District 1, 16 June in District 2, and 20 June in District 3. The first two periods in Districts 1 and 2 were 12 hours in duration. In an effort to spread out the harvest in order to achieve adequate spawning escapements throughout the drainage, unrestricted mesh size fishing periods were reduced to 6 hours duration beginning with the third period in District 1 on 21 June. In addition, the third period in District 2 was delayed from 23 until 25 June. A single 6-hour period with gill nets restricted to six inch maximum mesh size was allowed in the lower river on 24 June in District 1. Typically, the peak of the summer chum salmon run occurs by the end of June. However, in 1993 the summer chum salmon run was late and weak, with the mid-portion of the run being protracted. By 25 June there was concern that the summer chum run was very weak, and no additional summer chum directed periods were allowed. Because of the poor summer chum salmon run the remainder of the commercial fishing season in the lower river consisted of 6-hour unrestricted mesh size fishing periods. This strategy was utilized to allow additional harvest of chinook salmon while providing protection for summer chum salmon. The last commercial fishing period occurred on 1 July. On 7 July the lower river commercial fishing season was closed.

The total harvest of 86,579 chinook salmon for Districts 1 and 2 combined was 4% below the midpoint of the guideline harvest range of 60,000 to 120,000 chinook salmon. A total of 84,377 chinook salmon were harvested during unrestricted mesh size fishing periods in Districts 1 and 2, and 2,202 chinook salmon were harvested during the single restricted mesh size fishing period in District 1. The average weight of chinook salmon harvested during unrestricted mesh size periods was 20.7 pounds, and for the restricted mesh size period it was 15.8 pounds. Age-6 fish accounted for 49% to 71% of the chinook salmon catch during unrestricted mesh size fishing periods in Districts 1 and 2. Age-6 chinook accounted for 42% of the commercial harvest during the only restricted mesh size fishing period. Sex composition in the overall District 1 and 2 harvest was nearly 1 male:1 female.

In District 3, five unrestricted mesh size fishing periods (two 12-hour and three 6-hour) were allowed. A total of 1,501 chinook salmon were harvested in District 3, which was 17% below the low end of the guideline harvest range of 1,800 to 2,200 chinook salmon. Only six permit holders fished in District 3, which was about one-third of the normal level.

In District 4, the chinook salmon harvest is typically taken incidental to the directed summer chum salmon fishery, and virtually all of the District 4 chinook salmon commercial harvest is taken in Subdistricts 4-B and 4-C. Given the very poor run of summer chum salmon in 1993, fishing periods were greatly reduced in number and duration. The total District 4 sale of 1,349 chinook salmon and 701 pounds of chinook salmon roe was below the low end of the guideline harvest range for the district of 2,250 to 2,850 chinook salmon.

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 36-hour and one 24-hour) occurred in Subdistricts 5-A, 5-B, and 5-C with a total harvest of 2,608 chinook salmon, which was at the midpoint of the guideline harvest range of 2,400 to 2,800 chinook salmon for this portion of the district. Two fishing periods (one 48-hour and one 36-hour) were allowed in Subdistrict 5-D with a harvest of 400 chinook salmon, which was the midpoint of the guideline harvest range of 300 to 500 chinook salmon for this portion of the district.

In District 6, the chinook salmon harvest is typically taken incidental to the directed summer chum salmon fishery. Given the chinook and summer chum salmon escapement information available from new counting-tower projects on the Chena and Salcha Rivers in the Tanana River drainage, and the overall very poor run of summer chum salmon, commercial harvest was allowed to exceed the guideline harvest range of 600 to 800 chinook salmon in the Tanana River, but no summer chum salmon directed fishing periods were allowed. The first 42-hour fishing period occurred on 12-14 July, and 666 chinook salmon and 880 pounds of chinook roe were sold. A second 42-hour commercial fishing period was allowed on 19-21 July, and an additional 447 chinook salmon and 433 pounds of chinook roe were sold during that second period. Commercial sales totalled 1,113 chinook salmon and 1,313 pounds of chinook salmon roe in District 6 for the season.

2.2 Summer Chum Salmon

The 1993 preseason outlook for the overall Yukon River summer chum salmon run was for a below average to average run based on parent year escapements. Summer chum migratory timing appeared to be late overall, due to the mid-portion of the run being protracted. The ADF&G test fishing project recorded the first summer chum salmon catches on 28 May. Summer chum entered the lower river primarily through the south and middle mouths.

The Yukon River sonar project at Pilot Station provided a total

passage estimate of 950,000 summer chum salmon in 1993. This passage estimate is similar to the low levels estimated in 1987 and 1990, although it should be noted that improved equipment was used in 1993. Comparative data from the set gill net test fishery in the lower river also indicated a poor run of summer chum salmon, and that approximately half of the run had entered the river by 27 June.

Typically, the peak of the summer chum salmon run occurs by the end of June in the lower river. A single summer chum salmon directed commercial fishing period with gill nets restricted to six inch maximum mesh size was allowed on 24 June in District 1. This period was scheduled based upon the decreased abundance of chinook salmon, the cumulative harvest of chinook salmon to date, and anticipated increase in summer chum salmon abundance historically observed during late June. However, summer chum salmon abundance decreased after 25 June. The overall abundance of summer chum salmon continued to be assessed as weak through the end of the run based upon Pilot Station sonar and lower river test fishing data. No additional restricted mesh size commercial fishing periods were allowed in the lower river for the season. The contribution of age-4 fish in test and commercial fishery samples was much lower than expected in 1993, and coupled with the poor overall run strength, this indicates a failure of the age-4 return of summer chum salmon. Commercial fishery harvest was reduced to a level well below the low end of the guideline harvest range as a result.

The total commercial summer chum salmon harvest in Districts 1 and 2 combined was 92,991 fish, which was only 37% of the low end of the guideline harvest range of 251,000 to 755,000 summer chum salmon. A total of 47,488 summer chum were harvested during unrestricted mesh size fishing periods in Districts 1 and 2, and 45,503 summer chums were harvested in the one restricted mesh size fishing period. Summer chum salmon commercial harvests were dominated by age-5 fish, which comprised 47% to 69% of the catch in unrestricted mesh size fishing periods and 52% of the catch in the one restricted mesh size period.

There were no restricted mesh size fishing periods in District 3. A total of 463 summer chum salmon was sold from the five unrestricted mesh size fishing periods in District 3. The harvest was well below the low end of the guideline harvest range of 6,000 to 19,000 summer chum.

In Subdistrict 4-A, only two commercial fishing periods were allowed, one 12-hour period on 11-12 July and one 9-hour period on 14-15 July. Commercial sales totalled 20,485 pounds of summer chum salmon roe, which was well below the low end of the guideline harvest range of 61,000 to 183,000 pounds of summer chum salmon roe for this portion of the district. In Subdistricts 4-B and 4-C there were four fishing periods, the first and last of which were for 24 hours each and the second and third of which were for 48

hours each. Commercial fishermen in Subdistricts 4-B and 4-C sold 27 summer chum salmon and 1,962 pounds of summer chum roe, which was well below the low end of the guideline harvest range of 16,000 to 47,000 summer chum salmon for this portion of the district.

In District 5, summer chum salmon are typically caught incidentally to the chinook salmon fishery. In 1993, no summer chum salmon or summer chum salmon roe was sold in District 5.

In District 6, there were only two 42-hour commercial fishing periods in 1993. These periods occurred on 12-14 July and 19-21 July, and were targeted primarily at chinook salmon. A total of 3,041 summer chum salmon and 515 pounds of summer chum roe were sold, which is well below the low end of the guideline harvest range of 13,000 to 38,000 summer chum salmon for District 6.

2.3 Fall Chum and Coho Salmon

A below average run of fall chum salmon was expected in 1993. The ADF&G outlook was for a total run of 734,000 fall chum salmon, composed of approximately 85% age-4 fish and 15% other ages, mostly 5 year olds. The age-5 expectation for 1993 included a shortfall anticipated based upon harsh winter conditions in 1988/89 and the poor showing of age-4 fish in 1992. The fishery management plan for Alaska had identified a commercial guideline harvest range of 78,000 to 113,000 fall chum salmon, taking into account spawning escapement needs and other Yukon River fisheries.

The inseason assessment was that the total Yukon River fall chum salmon run was substantially weaker than expected, on the order of 300,000 to 350,000 fish. Age-4 fish only accounted for about 63% of the overall run based on sampling from the lower river test fishery, indicating that there was an unexpected failure in production of 4 year old fish from the 1989 parent year. Run timing into the lower river appeared to be normal. There were three major pulses of fall chum salmon entry, which occurred on 24-26 July, 2-4 August, and 14-16 August. The passage estimate at the Pilot Station sonar project from 19 July through 31 August was 295,000 fall chum salmon and 40,000 coho salmon. The passage estimates for both species were the lowest since the project became operational in 1986. The 95% confidence interval on the fall chum salmon estimate, taking into account an estimate for passage after project termination based upon prior year operations into early to mid-September, was 275,000 to 341,000 fall chums. The parent year (1989) passage estimate was in excess of 600,000 fall chum salmon.

Near the midpoint of the run on 8 August, the cumulative test fishing CPUE for fall chum salmon was below the average for the 1980-92 period through that date. The Pilot Station passage estimate was only 148,000 fall chums through 8 August. In addition, test fishing age composition data indicated an age-4

production failure. Based upon these run indicators, ADF&G announced on 9 August that the fall commercial fishing season would not be opened. A commercial fishery for coho salmon was not possible because of the overlap in run timing with fall chum salmon and the poor run of coho salmon.

As the fall chum run progressed it became clearer that further conservation actions, beyond not opening the commercial fishery, would be necessary to protect fall chum salmon for spawning escapement needs. Sport fishing for fall chum salmon was closed on 16 August and the personal use fishery was closed on 22 August. The subsistence fishery throughout the Yukon River drainage in Alaska was restricted to 48 hours per week beginning the week of 16 August. In response to the assessment of a continued poor run insufficient to meet spawning escapement needs, the Yukon River subsistence salmon fishery in Alaska was closed effective 3 September. The subsistence fishery was reopened on a staggered basis to allow some harvest of coho salmon and non-salmon species beginning 17 September in the lower Yukon River and 27 September in the upper Yukon River.

3.0 1993 COMMERCIAL FISHERY - CANADA

The management plans for the Canadian chinook and chum salmon fisheries on the Yukon River in 1993 were formulated to generally reflect the understandings reached as of the most recent round of the Yukon Salmon Treaty Negotiations (YSTN) which were held in Whitehorse, during the week of 9 November 1992. Accordingly, the guideline harvest ranges, and the border and spawning escapement goals for upper Yukon chinook and chum salmon, tentatively agreed to in the YSTN, provided the foundation for the 1993 management plans.

A preliminary total of 18,112 salmon including 10,350 chinook salmon and 7,762 chum salmon was harvested in the 1993 Canadian Yukon River commercial fishery (Table 3). The chinook catch was 7% below the recent chinook cycle average (1987-1992) catch of 11,163 chinook and the chum catch, the lowest since 1978, was 68% below the recent cycle average (1989-1992) of 23,767 chum.

A total of 30 commercial licenses was issued in 1993. This was the same number of participants as in 1992 as was the maximum number of commercial fishers active during any one week of the chinook salmon run - 17 fishers. During the chum season, the highest number of fishers present in any one opening was 13 fishers. Most of the commercial chinook harvest was taken by gill nets set in eddies; only two fish wheels were in use during the chinook season. However, during the chum season, more than 30% of the catch was estimated to have been taken in fish wheels. There has been a recent increase in the use of fish wheels during the chum season from three in 1990, to nine in 1991 and ten fish wheels in 1992 and

1993.

3.1 Chinook Salmon

With the preseason expectation of a total run size of about 118,300 Canadian-origin mainstem Yukon River chinook salmon in 1993, which was considered to be below average, the elements of the chinook management plan adopted for 1993 included:

i) a minimum escapement goal of 18,000 chinook as per the stabilization plan developed within the YSTN;

ii) a total upper Yukon guideline harvest range for all users of 16,800 to 19,800 chinook salmon which was the range tentatively agreed to in the YSTN;

iii) a commercial guideline harvest range of 9,100 to 12,100 chinook with a preseason target of 9,900 chinook. Based on the preseason forecast for a below average return, it was expected the catch would fall within the lower half of the range; and

iv) a one day per week fishery for the initial two weeks of the season, followed by a three day opening subject to run assessments. The duration of subsequent fishing periods was to be determined inseason based on run strength and harvest guidelines.

The 1993 chinook salmon fishing plan was similar to the plan in the previous year with the exception of a 500 fish increase in the commercial guideline harvest range which reflected changes in the recent cycle average catch in non-commercial fisheries.

The commercial fishery opened on Monday 28 June 1993 (statistical week 27) for 24 hours after the presence of chinook salmon had been determined by the DFO tagging fish wheels located just upstream of the international border. The first chinook was caught in the fish wheels on 23 June, the earliest date on record and in stark contrast to 1992 when the first fish did not appear until 14 July, one of the latest dates on record. Interestingly, chinook were not reported in Eagle, Alaska, until 25 June, even though it is situated several kilometres downstream from the DFO fish wheels.

The catch in the initial opening of the commercial fishery consisted of 34 chinook for 4 fishers, and the one day opening in the succeeding week, 5-6 July, netted 170 chinook with 10 fishers participating.

Consistent with the management plan, fishing time was extended to three days exactly two weeks after the run had begun. The official beginning date of the run was determined to be 27 June through the

examination of the trend in the three-day moving average of the catch of chinook salmon in the DFO fish wheels early in the season. The commercial catch during the 11-14 July opening, statistical week 29, was slightly above average and the catch-per-unit-effort (CPUE) was approximately 5% above the recent cycle average. The cumulative catch through week 29 was 1,985 chinook, 143 fish below the guideline to that point in the season. Cumulative commercial guideline harvests were established for each week during the fishing season based on historical run timing and the 1993 commercial harvest objective for the season.

The first inseason forecasts of the border escapement were made at the end of week 29 ranging from 42,700 chinook based on inseason mark-recapture data (MRD) expanded by historical timing, to 46,900 chinook based on current year CPUE applied to linear regression analyses (LRA) of historical weekly cumulative CPUE and corresponding annual border escapement estimates. As a result of these forecasts being in excess of 37,800 chinook, which was the upper end of the U.S. border escapement management goal range, the season commercial target catch was increased to 11,350 chinook, i.e. the three-quarter point in the overall Canadian commercial guideline harvest range.

The resulting increased guideline harvest combined with the above average CPUE observed in the fishery through week 29, prompted an increase in fishing time to four days from 18-22 July (statistical week 30). The peak commercial catch and CPUE (26% above average) of the season occurred this opening, approximately ten days later than the peak catches observed at the DFO fish wheels. The week ended with the cumulative catch being 330 chinook below the weekly guideline cumulative catch of 5,469 chinook; updated forecasts of border escapement ranged from 41,000 chinook (MRD) to 46,400 chinook (LRA).

The relatively consistent forecast range in week 30 compared to the previous week was the basis of the decision to increase the commercial season target to 11,800 chinook, which was the 90% point in the overall commercial guideline harvest range. This target remained in effect to calculate weekly guideline harvests during the following two weeks, weeks 31 and 32. The CPUE remained above average in week 31 during the four day opening from 25-29 July, however CPUE declined to below average levels in the succeeding four-day opening.

In consideration of a higher than normal number of jacks reportedly tagged at the DFO fish wheels during late July and early August and concern about the potential impact this might have on decreasing the forecast, the commercial season target was decreased to the midpoint of the commercial guideline harvest range, 10,600 chinook, for the remainder of the season commencing statistical week 33. The ensuing reduction in the guideline harvest and the below average CPUE in the previous week, prompted a reduction in fishing

time to three days, 8-11 August (statistical week 33); this was essentially the last week of the chinook season. Further reductions in fishing time followed over the next two weeks, to two days in week 34, then one day in week 35 as the chinook run dropped off and chum abundance started to build. Fishing effort during this period dropped to one to three fishers, and the opening day of each week's fishery was switched to Monday at the request of fishers. The final inseason forecast of the border escapement was approximately 40,900 chinook; this was the adjusted estimate, i.e. adjusted downwards, to account for the above average number of jacks tagged.

The total commercial chinook catch of 10,350 fish was well within the guideline harvest range of 9,100 to 12,100 chinook. Approximately 97% of the catch was harvested in the lower fishing area, i.e. downstream from the Sixty Mile River. For comparison, the recent six-year average commercial catch is 11,163 chinook (1987 to 1992); 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. The preliminary postseason estimate of the border escapement indicated a Canadian commercial harvest rate of 24% on chinook salmon in 1993, compared to a cycle average harvest rate of 27% (1987-1992). Comparisons of the average commercial chinook CPUE with previous years indicated the run was about average in both magnitude and timing. However, the combined DFO fish wheel catches were 12% below the 1985-1992 average. Run timing at the wheels appeared to be earlier and more protracted than normal, with a strong early run component. The combined catch peaked towards the end of the first week in July, two weeks after the first fish was caught.

3.2 Fall Chum Salmon

The chum salmon run to the upper Yukon was expected to be well below average in 1993 due to the poor spawning escapement of 35,750 chum in 1989, one of the lowest escapements on record. Production of five-year-olds was also expected to be below average since the 1988 escapement of 36,786 chum salmon, was only marginally better than the 1989 escapement. As a result of the poor run outlook, the 1993 chum salmon management plan was developed to address both the conservation concern for the 1993 return, and the objectives of the three cycle rebuilding plan that had been tentatively agreed to in the YSTN. Accordingly, the plan included the following components:

i) an escapement goal of 50,500 upper Yukon chum salmon. This goal, developed by the Canada/U.S. Joint Technical Committee, represented the number of spawners required to rebuild the 1989 brood escapement of 35,750 chum to the long term goal of at least 80,000 spawners in three cycles;

ii) a guideline harvest range for all Canadian upper Yukon

fisheries of 23,600 to 32,600 chum as agreed to within the YSTN;

iii) a commercial guideline harvest range of 21,300 to 30,300 chum salmon with a preseason target of 21,800 chum, near the lower end of the range in view of a below average expected return. The preseason target was derived from the lower end of the U.S. border escapement management range of 74,600 to 112,600 chum that had been established in the YSTN, minus the 1993 escapement goal and the previous cycle average non-commercial harvest of approximately 2,200 chum. Given the expectation for a substantially below average run size, it was emphasized that conservation actions could preclude the achievement of the preseason target, albeit near the lower end of the guideline harvest range; and

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

Fishing time was reduced to one day per week during the third week of August as chinook abundance declined and the chum run slowly began to build. The catch of chum salmon during this week, statistical week 35, was below average and effort was relatively light with three fishers landing an average of 31 chum each, roughly one half the normal catch rate.

In statistical week 36, fishing time was increased to two days commencing 30 August. DFO fish wheel catches in the preceding week had been variable and fluctuated from above to below average. The commercial CPUE for this week was 21% below average (for statistical week 36) and the average catch per day of 470 chum was 9% below the previous ten-year average.

As a result of the below average catch in week 36, and indications from the Alaskan portion of the drainage that the chum return was poor, the fishing time was not increased in week 37 as would normally have occurred. Instead, a cautious approach was adopted. The fishery opened 6 September and closed after two days despite a marked increase in daily catches in the DFO fish wheels from 55 chum on 4 September (average for this date), to 111 chum on 8 September (63% above average for this date). The cumulative commercial chum catch through the end of this opening was 3,744 fish, which was approximately 4,100 chum, or 52%, below the guideline harvest to this point of the season, based on a seasonal harvest objective of 21,300 chum, i.e. the lower end of the commercial guideline harvest range. As during the chinook season, weekly harvest guidelines were developed based on the target catch for the season and historical run timing. The CPUE in the commercial fishery increased to 102 chum/fisher/day in week 37 but was still 16% below average for this week. This was in contrast to

the trend observed at the DFO fish wheels where the cumulative catch through the end of week 37, i.e. 11 September, was 1,081 chum, slightly above the 1985-92 average of 1,058 chum.

Through week 37, preliminary results from tag recovery efforts in the chum fishery indicated that approximately 50% of the tags applied were being recaptured. This was higher than expected given the restrictions in fishing time that had been imposed thus far in the season. In light of the higher than normal tag recovery rate and below average CPUE in the fishery, fishing time was reduced to one day in statistical week 38, 13-14 September; this marked a 75% reduction over the fishing time normally allowed for this week. In addition, consultations with Alaskan managers indicated there had been no improvement in the stock status indicators elsewhere in the drainage in Alaska. The commercial fishery CPUE increased to 175 chum/fisher/day which was close to the average for statistical week 38 of 180 chum/fisher/day. However, DFO fish wheel catches showed a precipitous decline from a peak combined catch of 116 chum on 11 September which continued through 19 September when only 23 chum were caught.

The decline in the DFO fish wheel catches in mid-September was not entirely unexpected and was consistent with general run timing information produced by the Pilot Station sonar program conducted by ADF&G approximately 200 km upstream from the river mouth. Sonar data suggested there was a final compressed pulse of fish of relatively significant magnitude yet to appear and it was preceded by a period of very low fish abundance. Reports from fishery managers and processors in Alaska indicated that the last pulse of fish was just starting to appear in the upper river fishing areas in the Alaskan portion of the drainage.

The first official forecast of the border escapement was made in week 38 on 16 September after the fishery had closed and preliminary catch and tag recovery data had been compiled. The forecast developed at this time predicted a total border escapement of 26,000 to 73,400 chum. This range constituted the 95% confidence interval around a point estimate of 40,300 chum. The prediction had a wide range due to the variability in historical run timing which was used to expand the mark-recapture population estimate of 14,200 to 17,500 through 10 September into a forecast for the entire season. For example, on average, 39% of the chum run had passed the tagging site by 10 September, however, the 95% confidence interval around this average timing value was 24% to 54%.

As a result of the initial forecast in week 38, fishing time was limited to one day in statistical week 39 from 20-21 September to allow a minimal tag recovery effort to continue for run assessment purposes. The CPUE of 210 chum/fisher/day during this opening was the highest of the season and was 21% above average. The run forecast was updated to include the catch and tag recovery data

collected during this opening and it increased only marginally over the previous week's forecast, to 44,400 chum salmon with a 95% confidence interval of 32,600 to 64,200 fish.

DFO fish wheel catches had increased momentarily to average levels on 21 September but started to drop off once again and expectations of a strong final pulse of fish began to fade. This was corroborated by updated information from ADF&G which indicated the presence of a fairly strong final showing of chum salmon in the Sheenjek River. It seemed unlikely that a strong final pulse would appear in both the Porcupine and upper Yukon systems given the depressed nature of the overall return in 1993. In addition, there was no indication of increasing run strength in preliminary data being collected at the developmental sonar project at Eagle during the week of 20 September.

As a result of the poor run outlook that was confirmed by the forecast in statistical week 38 and the indications that the final pulse of fish would be weaker than anticipated, a decision was made to close the fishery for the season effective 21 September. This was the earliest closing date of the fishery on record.

The total commercial chum harvest of 7,762 fish was 64% below the lower end of the commercial guideline harvest range of 21,300 to 30,300 chum. For comparison, the recent four-year cycle average catch was 23,767 (1989-1992) ranging from 17,549 chum in 1989 to 31,404 chum salmon in 1991. Based on preliminary tag recovery data, the harvest rate in the commercial fishery was approximately 18%, compared to the 1989-1992 cycle average of 30%.

Total fishing effort during the chum season (from week 35 on) was 70 boat-days in 1993, 72% below the 1987-1992 average of approximately 248 boat-days. The total number of days fished during this period, i.e. after week 35, was the lowest on record, 7 days compared to the 1987-1992 average of 23.5 days.

The run strength based on cumulative commercial fishery CPUE was about 8% below average whereas the cumulative DFO fish wheel catch was 28% below the previous cycle average. The mark-recapture estimate, as discussed in Section 6.2.2 of this report, was about 48% below average. Run timing in the commercial fishery was unimodal and appeared to be one week later than normal, whereas the timing at the DFO fish wheels was bi-modal and appeared to be about average.

4.0 1993 SUBSISTENCE, PERSONAL USE, ABORIGINAL, DOMESTIC, AND SPORT 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 were contacted by mail. Analysis of 1993 subsistence harvest data will not be completed for several months. However, due to the weak summer chum salmon run, the very weak fall chum and coho salmon runs, and the subsistence fishery restrictions and closures implemented during the fall season in the Yukon River drainage in Alaska for conservation purposes, subsistence salmon harvest for 1993 is anticipated to be below average.

Data for 1992 were not available for inclusion in the November 1992 JTC report, and are therefore summarized here. Estimates of the 1992 subsistence harvest in the Alaska portion of the Yukon River drainage totalled approximately 47,000 chinook, 142,000 summer chum, 108,000 fall chum, and 52,000 coho salmon. These estimates do not include commercially caught summer chum salmon retained for subsistence purposes in District 4.

4.1.2 Personal Use Fishery

Regulations adopted by the Alaska Board of Fisheries in February 1993 require salmon fishermen in that portion of the Tanana River drainage included in the Fairbanks Non-Subsistence Area to obtain a personal use permit. Additionally, in the subdistrict adjacent to the Fairbanks area, Subdistrict 6-C, there is a personal use fishery harvest limit of 750 chinook salmon, 5,000 summer chum salmon, and 5,200 fall chum and coho salmon combined. Due to the very weak fall chum and coho salmon runs, the personal use fishery was closed on 22 August for conservation purposes. Compilation of the personal use harvest data for 1993 has not yet been completed.

4.1.3 Sport Fishery

Approximately ninety percent of the sport fishing effort in the Alaskan portion of the Yukon River drainage occurs in the Tanana River drainage, mostly along the road system. Only a small portion of the effort is directed toward anadromous salmon, although 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. Overall Yukon River drainage sport harvest estimates for recent years have averaged about 1,000 chinook salmon, 1,200 chum salmon, and 1,600 coho salmon. It is estimated that most of these harvests have occurred within the Tanana River drainage. Harvest information for 1993 is not yet available. However, it is expected that the salmon sport harvest for 1993 will be well below average due to closures imposed during the fall season in the entire Yukon River drainage in Alaska for conservation purposes.

4.2 Canada

4.2.1 Aboriginal Fishery

Prior to the 1993 season, final estimates of the salmon harvest in the 1992 Aboriginal fishery were made. These are reported here since they have not been reported in earlier JTC reports.

The 1992 total chinook catch was estimated to be 6,449 fish which included 100 taken in the Porcupine River and an estimated 6,339 taken the upper Yukon River drainage. The latter was based on chinook catch statistics collected from two index areas in 1992, i.e. Dawson and Teslin, expanded by the average proportion the combined index catch represented of the total harvest in 1989 and 1990 when complete surveys were conducted. The estimated chinook harvest in 1992 was 15% below the previous six-year cycle average of 7,487 chinook.

The catch of chum salmon in 1992 included 169 chum taken in the upper Yukon area and 1,935 harvested in the Porcupine River. These catch estimates were based on interviews with First Nations members engaged in the chum fishery in 1992. By way of explanation, it is important to note that record cold temperatures early in the 1992 chum season lead to reduced participation in the chum fishery. For comparison, the previous four-year cycle average catch was 2,614 chum salmon in the upper Yukon Aboriginal fishery, and 1,992 in the Aboriginal fishery in the Porcupine River.

Coho catches in Canada are generally limited to the Porcupine drainage where they are taken in the Old Crow fishery. A total of 495 coho was caught in 1992 compared to the 1988-1991 average of 434 coho.

A comprehensive survey of the Aboriginal fishery was conducted in 1993. Catch statistics were collected from participants through inseason and/or postseason interviews. The preliminary estimate of the total chinook catch is 5,690 fish comprised of 5,556 chinook

taken in the upper Yukon area and 134 chinook harvested in the Porcupine River. The previous six-year average catches in these areas were 7,108 chinook and 200 chinook, respectively.

The preliminary estimate of the 1993 chum salmon harvest is 5,655 fish including 4,590 chum caught in the upper Yukon area and 1,065 chum harvested in the Porcupine River. Catches in these areas have averaged 2,186 chum and 2,208, respectively, over the previous four-year period. The above average chum catch in the upper Yukon in 1993 was the result of the reduced opportunity to catch fish required for personal use in the commercial fishery. As a result, some Aboriginal fishers who also fish commercially, expended greater effort in the Aboriginal fishery than in previous years. Also, weather conditions in the fall of 1993 were pleasant and did not impede fishing efforts, as has happened in some previous years.

4.2.2 Domestic Fishery

A total of 243 chinook salmon was taken in the domestic fishery in 1993 compared to a previous six-year cycle average of 294 chinook. No chum catches were reported.

4.2.3 Sport Fishery

As in previous years, no sport fishery harvest data was collected in 1993. 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

The overall Yukon River chinook salmon run was considered average to slightly above average in 1993. The sonar passage estimate of 137,000 chinook salmon at Pilot Station was in the upper half of the range of historical estimates since 1986. However, this passage estimate may not be directly comparable to prior years due to the use of improved equipment in 1993. All chinook salmon index streams were successfully surveyed. Chinook salmon escapement goals were achieved in all eight Alaskan streams for which goals have been established.

Chinook salmon escapements in the lower Yukon River drainage were characterized by counts obtained for the Andreafsky and Anvik Rivers. A total of 5,855 and 2,765 chinook salmon were counted by

aerial survey in the East and West Fork Andreafsky Rivers, respectively. While the West Fork count was the third highest on record, the East Fork count was the highest on record. Minimum aerial survey escapement goals for these streams are 1,500 and 1,400 chinook salmon, respectively. In the Anvik River a total of 1,526 chinook salmon were counted under fair to poor aerial survey conditions in the index area from Yellow River to McDonald Creek, the second highest on record. The minimum aerial survey escapement goal for that index area is 500 chinook.

Minimum aerial survey escapement goals are 800 chinook for the North Fork Nulato River, 500 for the South Fork Nulato River, and 600 for the Gisasa River. Aerial survey counts of 1,844 and 1,181 chinook salmon were obtained for the North and South Fork of the Nulato River, respectively, under good survey conditions. Similar to the Andreafsky River, the North Fork count was the highest on record while the South Fork count was the third highest on record. A total of 1,573 chinook salmon were counted on a good aerial survey of the Gisasa River, the second highest on record.

Aerial surveys of the Chena and Salcha Rivers indicated that excellent chinook salmon escapements were also achieved in the Tanana River drainage. A fair survey of the Chena River flown on 25 July resulted in a count of 2,660 chinook salmon in the index area from Moose Creek Dam to the Middle Fork, the highest on record. A fair survey of the Salcha River index area from the Trans-Alaska Pipeline to Caribou Creek resulted in a count of 3,562 chinook salmon, third highest on record. Minimum aerial survey escapement goals are 1,700 chinook for the Chena River and 2,500 chinook for the Salcha River. Counting tower escapement estimates of 12,241 chinook for the Chena River and 10,007 chinook for the Salcha River were higher than any of the prior year escapement population estimates for these rivers, although the prior population estimates were obtained by mark and recapture.

Although no chinook salmon escapement goals have been established for other Alaskan streams, observations made on selected spawning tributaries in the upper Koyukuk River as well as in the Tozitna River indicated escapements to have been at least average in magnitude. Chinook salmon aerial survey counts were 330 in Henshaw Creek, 421 in the South Fork Koyukuk and Jim Rivers, and 389 in the Tozitna River.

5.1.2 Canada

Areas surveyed for chinook spawning escapement in 1993 included the Little Salmon River, Big Salmon River, Ross River, Wolf River, Nisutlin River, and Tatchun Creek. With the exception of surveys on the Ross and Wolf rivers, index counts were below average (Appendix Table 10).

The Ross River index count was 30% above the previous cycle average and the Wolf River count was 15% above average.

The Big Salmon count was 49% below the 1987-1992 average; survey results were 45% below average for the Little Salmon index, 21% below average for the Tatchun index, and 17% below average for the Nisutlin index.

Survey conditions for all surveys were rated "good". However, the timing of the surveys relative to peak spawning varied between surveys. The surveys of Little Salmon, Big Salmon, and Tatchun index areas appeared to be slightly early since very few carcasses were observed. The other surveys, seemed to be at peak spawning.

The preliminary mark-recapture estimate of the total chinook spawning escapement for the Canadian portion of the upper Yukon drainage was approximately 28,578 chinook salmon. Results of the DFO tagging programme are discussed in greater detail in Section 6.2.2 of this report.

5.2 Summer Chum Salmon

Although a below average summer chum salmon run was expected for the Yukon River in 1993, the run materialized even weaker than projected, apparently due to a very poor return of age-4 fish. With the exception of the Anvik River, spawning escapements were extremely poor throughout the Yukon River drainage. Only in the Anvik River was the escapement goal achieved. A sonar-estimated escapement of 518,000 summer chums for the period 19 June to 25 July achieved the goal of >500,000 for the Anvik River, and represented approximately 55% of the total passage estimate of summer chum salmon at Pilot Station of 950,000.

An aerial survey of the Andreafsky River flown on 11 July under excellent survey conditions resulted in counts of 10,935 summer chums on the East Fork and 9,111 on the West Fork. Although this survey was flown prior to peak of spawning, the survey counts were well below the minimum aerial survey escapement goals of 109,000 for the East Fork and 116,000 for the West Fork. Similar observations were made for summer chum salmon stocks spawning in tributaries upstream of the Anvik River. Less than 13,200 summer chums were counted by aerial survey in the North and South Fork Nulato River combined. The minimum aerial survey escapement goal for the North Fork alone is 53,000 summer chums. A goal has not been set for the South Fork. Low numbers of summer chum salmon were also observed by aerial survey in the Koyukuk River drainage, such as 1,573 in the Gisasa River, 1,773 in Henshaw Creek, and 124 in the South Fork Koyukuk and Jim Rivers.

Summer chum salmon escapements were also poor to the Tanana River drainage as evidenced by aerial survey results from the Chena and

Salcha Rivers. Although no aerial surveys were flown during periods of peak summer chum spawning in these systems, passage estimates from new counting towers on each river during the period 1 July through 7 August were only 5,400 summer chum in the Chena River and 5,800 summer chum in the Salcha River.

5.3 Fall Chum Salmon

5.3.1 Alaska

The sonar project at Pilot Station estimated a total passage of 295,000 fall chum salmon through the end of August in 1993, the lowest sonar passage estimate on record. This passage estimate was only 40% of the preseason projected run size of 734,000 fish.

The Sheenjek River sonar estimate of 43,000 fall chum salmon for the period 8 August through 28 September was 33% below the escapement goal minimum of 64,000. The project operated for 52 days in 1993, whereas the next longest running operations were 47 days in 1991 and 43 days in 1992. The primary parent year (1989) spawning escapement estimate was 99,000 fall chums.

Tanana River fall chum salmon escapements are evaluated primarily by counts conducted in the Toklat River and Delta River. The preliminary total escapement estimate for the Toklat River is approximately 26,500 fall chum salmon based upon ground surveys conducted in late October. This is 20% below the escapement goal minimum of 33,000 fall chum salmon for the Toklat River. Preliminary information from multiple ground surveys of the Delta River indicates that the escapement goal of greater than 11,000 fall chum salmon has been achieved. Approximately 17,400 fall chum salmon were counted on a ground survey of the Delta River on 4 November. The total escapement population estimate will be somewhat larger than this peak survey count, but that estimate will not be available for the Delta River prior to the end of November.

5.3.2 Canada

Aerial surveys of chum salmon escapement index areas were conducted on the Koidern, Kluane, mainstem Yukon, Teslin and Fishing Branch rivers in 1993. With the exception of the Teslin River index, all counts were below the respective previous cycle averages (Appendix Table 12).

No chum salmon were observed in the Koidern River this year; surveys counts for this system have shown a serious decline in abundance from counts of 1,300 chum in 1984 and 1,195 chum in 1985. The 1989-1992 average for this system is 25 chum.

The Kluane River count was 18% below the previous cycle average

(excluding 1990 when the survey rating was "poor"). The mainstem Yukon aerial survey, delayed slightly due to inclement weather conditions, was 34% below average. The Donjek index area was also flown, however there was only 15 fish sighted compared to 125 chum observed last year.

In contrast to these results, the Teslin River count of 555 chum salmon was similar to the previous cycle average of 552 chum salmon.

Two aerial surveys were conducted on the Fishing Branch River to further examine the relationship between aerial counts and known weir counts. The first survey was flown on 30 September and was given a fair-poor rating. The aerial count was 15.8% of the weir count at the time the survey was flown, and 10.8% of the final weir count of 28,798 chum. Survey conditions were better for the second survey which was flown on 17 October, and the resulting corresponding percentages were 16.2% and 15.5%, respectively. Results of the Fishing Branch weir programme are presented in Section 6 of this report.

The preliminary mark-recapture estimate of the total chum spawning escapement for the Canadian portion of the upper Yukon drainage was approximately 29,938 fish. Preliminary results of the DFO tagging programme are discussed in greater detail in Section 6.2.2 of this report.

5.4 Coho Salmon

The sonar project at Pilot Station estimated a total passage of 40,000 coho salmon through the end of August in 1993, the lowest sonar passage estimate on record. Passage estimates of coho salmon at the Pilot Station sonar project are not complete run assessments due to termination of the project each year prior to conclusion of the coho salmon migration. Coho salmon spawning 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 only escapement goal established for coho salmon thus far is for the Delta Clearwater River, which is a minimum of 9,000 coho salmon. That goal was reached in 1993 based upon a boat survey count of 10,875 coho salmon on 21 October. Additionally, 3,525 coho salmon were counted in the outlet to Clearwater Lake by boat survey on 29 October. That is the second highest estimate on record for that area and is more than double the most recent five year average of 1,590 cohos. However, it appears that coho salmon spawning escapements in other portions of the Tanana River drainage were below average. Coho salmon aerial survey counts in the Nenana River drainage were 240 in Lost Slough, 581 in Seventeen Mile Slough, and 419 in the mainstem Nenana River upstream of the Teklanika River. Only 138 coho salmon were counted

by ground survey of Geiger Creek in the Toklat River drainage, 33% below the recent 5-year average of 207 cohos.

6.0 PROJECT SUMMARIES

6.1 Alaska

Operational methods for most projects remained similar to what has been described in prior years. Results are incorporated in the fishery and stock status portions of this report, and are reported in the tables of catch and escapement data. For these reasons, the following projects conducted by ADF&G in 1993 will not be discussed in further detail here: Anvik River and Sheenjek River sonar projects, lower Yukon River test fishing with set and drift gill nets, Tanana River test fishing with fish wheels, commercial fishery monitoring, subsistence harvest surveys, aerial and ground surveys of salmon escapements, and sampling of fishery catches and escapements for age-sex-length data. However, several projects warrant further discussion here since they are either new or retain a significant research and development character. These projects are: (1) Yukon River salmon stock identification research conducted by ADF&G and USFWS, (2) the Yukon River sonar project at Pilot Station conducted by ADF&G, (3) the Yukon River border sonar project at Eagle conducted by ADF&G and USFWS, (4) the Chena and Salcha River escapement counting tower projects conducted by ADF&G, (5) Yukon River salmon restoration and enhancement planning conducted by ADF&G, and (6) a Toklat River fall chum salmon restoration feasibility study conducted by ADF&G.

6.1.1 Salmon Stock Identification

A combined analysis using scale patterns, age compositions, and geographic distribution of catches and escapements is used by ADF&G on an annual basis to estimate stock composition of chinook salmon in Yukon River fishery harvests. DFO contributes scale samples from the tagging project fish wheels in Canada for use as the standard for the upper run stock. Data have not yet been analyzed for 1993. Prior year analyses, revised to reflect final harvest estimates, have provided the following estimates of stock composition for the total Yukon River drainage chinook salmon harvest (commercial and non-commercial harvests in Alaska and Canada combined):

Year	Lower Run Stock	Middle Run Stock	Upper Run Stock
1982	15%	23%	62%
1983	12%	39%	49%
1984	29%	36%	35%
1985	31%	20%	49%
1986	26%	6%	68%
1987	17%	19%	64%
1988	27%	12%	61%
1989	26%	16%	58%
1990	19%	22%	59%
1991	26%	28%	46%
1992	18%	23%	59%

Note that the lower and middle run stocks spawn in the Alaska portion of the drainage, and the upper run stock spawns in the Canadian portion of the drainage.

Genetic stock identification (GSI) research on Yukon River salmon was initiated with a small scale feasibility study on chum salmon in the mid-1980's by DFO. In 1987 this research was taken up by the USFWS and expanded to include chinook salmon, with ADF&G providing support for field sampling. In recent years this research has been conducted by both the USFWS and ADF&G.

A progress report by the USFWS for the 1987-1990 spawning stock baseline and District 1 commercial and test fishery sampling was completed in 1992. Lab analysis for the 1991 samples has been concluded, and a completion report for the 1991 data should be available in the spring of 1994.

Sampling of the District 1 commercial and test fisheries was suspended beginning in 1992 in order to collect additional spawning stock samples for improving the baseline. This should provide for improved accuracy of fishery sample analyses in the future. Lab analysis of baseline samples collected by ADF&G and the USFWS in 1992 has been concluded. In addition to baseline sampling, the USFWS sampled fall chum salmon from the subsistence fishery near the village of Tanana in 1992. Preliminary analysis for a subset (about one-quarter) of the Tanana fishery samples has been concluded, and a report will be completed after baseline samples collected by ADF&G are incorporated.

Sampling of chum salmon spawning stocks was conducted at various locations throughout the Yukon River drainage in 1993 to continue to improve the baseline. ADF&G sampled chum salmon from the Andreafsky River, Sheenjek River, Toklat River, mainstem Tanana River, and from several tributaries of the Anvik River. The USFWS sampled chum salmon from the Koyukuk and Innoko River drainages. In 1993, 83 electrophoretic samples were collected by DFO from mainstem chum salmon spawning areas near the mouth of the Pelly River. Only 13 chum samples were obtained from the Donjek River; a higher number was not collected due to the low number of chum salmon in the sampling location.

The ADF&G lab will be responsible for analysis of all baseline samples collected in the Alaska portion of the Yukon River drainage by both ADF&G and the USFWS in 1993. The USFWS lab will be responsible for analysis of the baseline sample collected from the mainstem Yukon River in Canada by DFO in 1993.

6.1.2 Yukon River Sonar

The Yukon River sonar project at Pilot Station has been estimating the daily upstream passage of chinook, summer chum, fall chum, and coho salmon annually since 1986, except for 1992, when the project was operated for experimental purposes only. Sonar equipment is used to estimate fish passage, and test fishing with drift gill nets is used to estimate species composition of those passage estimates. Beginning in 1993, new sonar equipment was used that provides greater insonification range and eliminates attenuation problems, thereby reducing biases that may have affected prior year estimates. The new equipment was field tested using standard targets and was verified to perform very well. Data collected in 1993 proved to be valuable in assessing salmon run strength and timing for fisheries management purposes.

The salmon passage estimates at Pilot Station are based upon a sampling design in which sonar equipment is operated for 7.5 hours each day. On four occasions in August 1993 the equipment was operated 24 hours per day. The resulting 24-hour and expanded 7.5-hour estimates were not significantly different. The two methods provided daily passage estimates that were within 3% to 12 % of each other, and the sum of the passage estimates for the four days was within 5% between the two methods. The 24-hour estimates were slightly but consistently lower than the expanded 7.5-hour estimates. This is likely the result of the 6 hours of test fishing daily. The 24-hour schedule overlaps with the test fishing schedule and the 7.5-hour schedule does not.

The current estimates of annual fish passage since 1986, rounded to the nearest one thousand fish for each species category, are as follows:

Yr	Chinook	S. Chum	F. Chum	Coho	Other Fish[a]
86	169,000	1,933,000	583,000	210,000	1,414,000
87	116,000	826,000	596,000	228,000	104,000
88	121,000	1,773,000	424,000	263,000	817,000
89	92,000	1,604,000	606,000	169,000	324,000
90	156,000	931,000	546,000[d]	241,000[d]	327,000[d,e]
91	76,000	1,233,000	597,000[f]	71,000[f]	351,000[f,e]
92[b]	-	-	-	-	-
93[c]	137,000	950,000	295,000	40,000	368,000[e]

[a] "Other Fish" may include pink salmon (which are substantially more abundant in even-numbered years), whitefish, sheefish, northern pike, and other species.

[b] Project did not operate for estimation of salmon passage in 1992.

[c] Data for 1993 are preliminary and subject to further analysis and revision. New sonar equipment was used beginning in 1993 that provides greater insonification range and eliminates attenuation problems, thereby reducing biases that may have affected prior year estimates.

[d] Includes an estimate of fish passage offshore beyond the range of side-looking shore based sonar beams based upon down-looking sonar transects conducted across the width of the river and onshore gill net test fishing data.

[e] Does not include fish passing within the first few meters near shore on the left (south) bank.

[f] Includes an estimate of fish passage offshore beyond the range of side-looking shore based sonar beams based upon down-looking sonar transects conducted across the width of the river and offshore gill net test fishing data.

6.1.3 Yukon River Border Sonar

The 1993 season was the second year of field research and development for the Yukon River border sonar project by ADF&G and USFWS personnel, with a DFO staff member participating for a one week period. Activities at the project site near Eagle, Alaska, began on 6 July in 1993. Camp deployment was completed on 11 July, after which time support personnel arrived and sonar equipment was deployed, with some delays encountered due to "bugs" in system hardware and software. Primary sonar objectives accomplished for this field season included detecting standard targets, refining inseason calibration procedures, and collecting acoustic data on fish targets at the existing sonar site. Sonar data were collected continuously from 15 July through 23 September. Test gill netting, which began in mid-July, was suspended in early September. Personnel from ADF&G and USFWS are currently processing project data.

6.1.4 Chena and Salcha River Escapement Counting Towers

Inseason assessment of chinook and summer chum salmon escapement in the Tanana River drainage was improved in 1993 as compared to prior years through the operation of counting towers on the Chena and Salcha Rivers by the Sport Fish Division of ADF&G. Viewing platforms were the Richardson Highway bridge across the Salcha River and the flood control dam on the Chena River. Water levels were low and visibility was good during July resulting in exceptionally good counting conditions for chinook salmon in each river. However, counting was terminated on 8 August on both rivers due to poor visibility from rain and high water. Thus, abundance estimates for summer chum salmon are considered somewhat conservative.

The 1993 counting projects provided escapement estimates of 12,241 chinook and 5,400 summer chum salmon in the Chena River. Escapement estimates for the Salcha River were 10,007 chinook and 5,809 summer chum salmon. The estimates for chinook salmon in 1993 were higher than any of the prior year escapement population estimates for these rivers, although the prior population estimates were obtained by mark and recapture. The only prior mark and recapture effort for summer chum salmon in these rivers was in 1992.

6.1.5 Salmon Restoration and Enhancement Planning

The State of Alaska has provided funding to ADF&G to undertake a salmon restoration and enhancement planning process for the U.S. portion of the Yukon River drainage. This is a process involving user groups, various government agencies, and other interested parties with the goal of developing a comprehensive plan for the U.S. portion of the Yukon River drainage. The intent of the plan is to define goals and objectives, provide reference information on the stocks and fisheries, identify potential opportunities and concerns, recommend appropriate procedures, and evaluate priorities. ADF&G has entered into a cooperative agreement with the Yukon River Drainage Fisheries Association (YRDFA) on the planning process and has begun the first phase of that process. The plan is scheduled to be completed in the summer of 1995.

6.1.6 Toklat River Fall Chum Restoration Feasibility Study

There has been ongoing concern regarding the status of the Toklat River fall chum salmon stock. Spawning escapements to the Toklat River have not met the minimum escapement goal for most recent years despite conservative fishery management actions. As a result, there is growing public interest in investigating restoration options for this stock. ADF&G is undertaking a feasibility analysis to provide information useful for future

planning. Fall chum salmon have been sampled from the Toklat River for genetic analysis and disease screening. A small experimental egg-take was conducted in 1992 to test field logistics under the challenging Interior winter conditions that occur at the location and time when these fish spawn. On 15 October 1992, 130,500 fall chum salmon eggs were collected from the Toklat River. Mortalities were kept to a minimum by making use of fish for both the egg-take and sampling objectives to the extent possible. Incubation was carried out at the Clear Hatchery facility. All of the resulting 92,000 fry were coded wire tagged, fin-clipped, and released back into the Toklat River on 19 May 1993. Recovery of the marked fish at adult return is expected to provide statistically significant information on their contribution to proximal fisheries. Results from the various components of this study should significantly improve our information base for this stock.

Some additional funding was provided for this project in 1993. ADF&G has obtained additional incubators and raceways for the Clear Hatchery facility and completed the second Toklat River fall chum salmon egg-take on 14-15 October 1993. A total of 208,200 fall chum salmon eggs were collected, and the intent is that all resulting fry will be marked for release in the spring of 1994. Similar to the 1992 operations, sampling for genetics and disease screening occurred in conjunction with the egg-take. Consistent with the YRDFA proposal for the Toklat River study, a technical evaluation of the Toklat River spawning grounds habitat is being planned.

6.2 Canada

6.2.1 Upper Yukon River Salmon Test Fishing (Yukon Territory)

As in previous years, 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 is to capture salmon for the mark-recapture programme, consistency in the site selection and fishing time since 1982 does provide the opportunity for some inter-annual and inseason comparisons. However, because historical fish wheel catches are poorly correlated with estimates of border escapement, fish wheel data is used cautiously until inseason forecasts are developed based on mark-recapture data.

Fish wheel catches reflected a protracted chinook run in 1993 with a strong early component. The first fish was caught on 23 June. On average, the first chinook salmon is caught in the White Rock fish wheel on 4 July; in the Sheep Rock fish wheel, on 3 July. The peak catch (both fish wheels combined) occurred on 8 July, more than two weeks earlier than normal. The timing curve for both fish wheels was bimodal with a weaker peak occurring in late July. The combined cumulative catch was 1,241 chinook, 12% below the 1985-

1991 average catch of 1,403 chinook salmon (note: 1992 was excluded from the average since only one fish wheel was in operation for most of the chinook season).

Unlike 1992, when inclement weather conditions forced an early shut-down of the fish wheels, this year the DFO fish wheels operated into mid-October. Two distinct peaks were observed in the catches with a stronger early peak on 11 September and a weaker peak on 21 September. Run timing appeared to be about average and the total catch of 2,018 chum was 28% below the 1985-92 average of 2,786 fish.

6.2.2 Upper River Yukon 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 live-captured 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 where intensive weekly/daily catch monitoring is conducted.

The preliminary chinook salmon border population estimate is 45,027 fish (95% C.I. = 39,739 to 50,990). Of this number, approximately 28,578 chinook are estimated to have reached the various spawning grounds. Comparative population and spawning escapement estimates from DFO mark-recapture studies for 1982 through 1993 are summarized below:

Year	Border Escap't M/R Estimate	Total Upper Yukon Cdn. CK catch	Estimated Spawning Escap't
1982	36,598	16,808	19,790
1983	47,741	18,752	28,989
1984	no tagging	16,295	27,616*
1985	29,881	19,151	10,730
1986	36,479	20,064	16,415
1987	30,823	17,563	13,260
1988	44,445	21,327	23,118
1989	42,620	17,419	25,201
1990	56,679	18,980	37,699
1991	41,187	20,444	20,743
1992	43,300	17,803	25,497
Average	**40,975	18,601	**22,642
1993***	45,027	16,449	28,578

Notes: * estimate based on expansion of aerial surveys;
** excludes 1984
*** preliminary only

The preliminary population estimate of Yukon River chum salmon migrating into Canada (excluding the Porcupine River) in 1993 is 42,290 fish (95% C.I. = 33,782 to 46,434). At this time, 29,938 chum are estimated to have reached the various spawning grounds. The escapement goal for 1993 was 50,500. For comparison, population and spawning escapement estimates from DFO mark-recapture studies on Yukon chum salmon from 1982 through 1993 are as follows:

Year	Border Escap't M/R Estimate	Total Upper Yukon Cdn. CM Catch	Estimated Spawning Escap't
1982	47,049	15,091	31,958
1983	118,365	27,490	90,875
1984	no tagging	25,267	56,633*
1985	99,775	37,765	62,010
1986	101,826	13,836	87,990
1987	125,121	44,345	80,776
1988	69,280	32,494	36,786
1989	55,861	20,111	35,750
1990	82,967	31,212	51,755
1991	112,303	33,842	78,461
1992	67,962	18,745	49,217
Average	**88,051	27,291	**60,201
1993***	42,290	12,352	29,938

Notes: * estimates bases on assumed commercial harvest rate
** excludes 1984
*** preliminary only

6.2.3 Whitehorse Rapids Fishway Chinook Enumeration

A total of 668 chinook salmon (284 females and 384 males) was enumerated at the Whitehorse Rapids Fishway in 1993, 15% below the 1987-1992 cycle average of 785 chinook. Despite the early run timing observed at the fish wheels, timing at the Fishway was average. Although the first chinook did arrive a few days early in 1993 (24 July), significant numbers (more than 10 fish per day) were not observed until 6 August. The mid-point of the run was 16 August while the peak daily count occurred on 14 August; the average for both of these events is 15 August.

This year, a total of 288 adipose-clipped fish was counted comprising 43% of the total fishway count. Of the adipose-clipped fish, 118 were female and 170 were male. The proportion of adipose-clipped males estimated to be jacks was 17.6%. This compares with a jack percentage of 30.8% for non-adipose-clipped males.

Translation of adipose-clipped fish into hatchery contribution estimates is dependent upon age analysis since the proportion of

released fish which are clipped varies annually (see below). Age composition has been quite variable since sampling commenced in 1984. Scale analysis of 38 chinook used for hatchery brood-stock in 1992 provided the following age composition: 15.8% age-six; 65.8% age-five; 15.8% age-four; and 2.6% age-three salmon. Based on these results and the proportion of fry adipose clipped in each of the brood years, it was estimated that 72% of the run was of hatchery origin in 1992. Similar analyses for previous years indicates a dramatic increase in the contribution of hatchery chinook since 1988 when the first returns were noted. However, only counts after 1990 include all age classes (to age seven) from hatchery production. The following summarizes contribution estimates as well as noting the percentages of hatchery releases which were adipose-clipped since hatchery releases commenced:

Year	Est'd (%) Hatchery Contribution to Fishway Count	% of fry Adipose Clipped
1985	0	76.6
1986	0	92.0
1987	0	86.0
1988	15.1	43.8
1989	19.4	56.5
1990	23.8	89.4
1991	48.9	64.0
1992	72.0	37.8
1993	N/A	34.2*
Note: *		* preliminary

In 1993, accounting for hatchery brood stock (see section 6.2.4) and mortalities noted in the fishway (6 female, 1 male), the total naturally spawning population was 189 females and 294 males.

6.2.4 Whitehorse Hatchery Operations

From a total of 493,764 fertilized eggs on inventory in September 1992, 441,455 fry were released in June 1993 for an egg-to-fry survival of 89%. Approximately 150,000 coded-wire tagged juveniles were released in equal proportions at three different sites, namely Michie Creek, Wolf Creek and below the Whitehorse Dam. The remainder of the fry were released untagged into Michie Creek.

The brood stock consisted of 89 females and 67 males, of which 28

females and 16 males had adipose clips. The fertilization rate was approximately 97%, while percent survival from fertilization to the eyed stage was 99%. The number of eggs currently being incubated is 341,000.

6.2.5 Michie Creek Weir and Juvenile Study

A weir to enumerate chinook salmon was operated in 1993 on Michie Creek, which is the primary location for release of fry reared at Whitehorse Rapids Hatchery. The primary objective of this programme is to determine what proportion of the chinook salmon which pass through the Whitehorse fishway spawn in Michie Creek. Michie Creek is a tributary of the McClintock River which joins the Yukon River approximately 50 km (31 miles) upstream of the Whitehorse Fishway.

A total of 284 adults, including 126 females, 157 males and 1 of unknown sex, was enumerated at the weir. The total represents 56% of the Whitehorse Fishway count, minus hatchery brood stock and mortalities. The total count included 54 jacks (34% of the males compared to 25% at the Fishway), while the percentage of fish displaying adipose clips was the same as that observed at the Whitehorse Fishway (43%).

In concert with the weir project, a fry trapping programme commenced in 1993 to examine relationships between hatchery and indigenous fry. Results are not yet available.

6.2.6 Fishing Branch River Chum Salmon Weir

A weir to enumerate chum salmon escapements to the Fishing Branch River (Porcupine drainage) has operated in the following years: 1972-1975; 1985-1989; 1991-1993. Weir counts have ranged from approximately 16,000 in 1973 to 353,300 in 1975; escapement estimates since the early 1970's have shown a general downward trend. As in 1991 and 1992, the 1993 Fishing Branch River chum enumeration programme was managed co-operatively between DFO and the Vuntut Gwitchin First Nation of Old Crow.

The total count in 1993 was 28,798 chum salmon compared to the principle brood year escapements of 23,597 chum in 1988 and 43,834 chum in 1989. Approximately 54% of the chum salmon counted were female. As in 1992, the run was not impacted by the chum commercial fishery in Alaska since the commercial fishery was closed.

Age analysis is not yet available for the 1993 escapement. However a very strong 5-year old component was observed in 1992, comprising approximately 80% of the run compared to 44% in 1991.

The following table presents the weir counts since 1985 for comparative purposes:

Year	Period of Weir Operation	Total Count	Approx. % Female
1985	Sep 06 - Oct 20	56,016	56%
1986	Sep 01 - Oct 19	31,723	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	no weir	35,000*	
1991	Sep 01 - Oct 15	37,733	59%
1992	Aug 30 - Oct 18	22,517	54%
1985-92 Average		37,422	55%
1993	Aug 31 - Oct 25	28,798	54%
* Note : estimated by aerial survey expansion			

6.2.7 Community Development and Education Programme

As part of a community education and public demonstration programme, three incubation boxes are in operation in the following locations: McIntyre Creek, Whitehorse; Mayo River; and North Klondike River. The objectives of the incubation box programme include: development, education and demonstration of remote/isolated small scale incubation systems; production of sufficient numbers of fry in specific locations for coded-wire tag releases; and provision of local schools with a supply of eyed eggs for small (50-100 egg capacity) classroom incubators.

The McIntyre box, with a capacity of 120,000 eggs, is located in Whitehorse on a groundwater supply which flows into McIntyre Creek. The box was installed in October 1989, and operated the first year incubating chum salmon eggs taken from Kluane River stock. Approximately 35,000 unmarked chum fry were released back into a side slough of the Kluane River in the spring of 1990 by school children from Whitehorse and Haines Junction. In the fall of 1990, chinook eggs from the Takhini River were incubated in the McIntyre box and the resultant 20,000 fry were reared, coded-wire tagged and released in Flat Creek, a tributary of the Takhini River, in September of 1991. Takhini River chinook eggs were again incubated from September 1991 through the spring of 1992, and a total of

37,000 fry was reared over the summer and released in Flat Creek in mid-June 1992. Approximately 30,000 of these fry were coded-wire tagged with half tags. The egg-take programme using Takhini River stocks was repeated in September of 1992 and 58,500 coded-wire tagged fry were released into Flat Creek in August 1993. Currently, 85,000 eggs of Takhini River origin are being incubated.

The first Mayo River incubation box, with a capacity of 60,000 eggs, was installed in the summer of 1991 on a groundwater supply adjacent to the Mayo hydro plant (approximately 10 km from the town of Mayo). A second, 60,000 egg capacity box was installed in the summer of 1992. In late summer of 1991, approximately 14,000 eggs were taken from Mayo River chinook salmon in the vicinity of the power house, and incubated over the winter. A total of 13,000 fry were produced and these were released unmarked back into the Mayo River in the spring of 1992. The 1992 egg-take totalled 78,000 eggs, again from Mayo River chinook salmon near the power house. These fry were raised in rearing tanks, installed in 1992; however, problems in water flows resulted in the loss of these fry just prior to coded-wire tagging. No brood-stock were captured in 1993 and as a result, the incubation box is vacant until next season. This project was originally conducted by the Mayo District Renewable Resource Council with technical support from DFO. Current management is the responsibility of the Stewart Valley Salmon for the Future Society. This society also undertook the construction of an adult weir on the Mayo River which operated as a carcass weir in 1993. A total of 105 chinook carcasses was recovered this year. The long term objective of this program is to enumerate adult migrating chinook salmon and to monitor adult returns from the incubation boxes.

The North Klondike River incubation box is located on a small stream which flows into a side slough of the North Klondike River. This project is currently being conducted by the Dawson First Nation and the Yukon River Commercial Fishers' Association (YRCFA) with technical assistance from DFO. The box, with a capacity of 60,000 eggs, was first installed in 1989. All eggs destined for this incubation box are first incubated in a moist air incubator for about 1.5 months in a school in Dawson City. Initial testing of the incubator was accomplished using chum salmon eggs taken from the mainstem Yukon in the Minto Landing area. Approximately 11,000 unmarked fry were produced from the first year's operation and these were released unmarked back into the Yukon River at Minto. In 1990, attempts to obtain eggs from North Klondike chinook failed due to unavailability of brood stock. As a result, 43,000 chinook eggs were obtained from Tatchun Creek and incubated over the winter of 1990/1991. A total of 30,400 marked fry was released back into Tatchun Creek in 1991. Problems were again encountered in obtaining eggs from North Klondike chinook in 1991. Alternate plans were implemented to incubate 69,300 Tatchun Creek eggs and 30,000 eggs donated by the YRCFA from chinook caught in the mainstem Yukon downstream of the 40-Mile River. Approximately

31,000 marked fry were released back into Tatchun Creek in August of 1992, and only 1,500 fry survived from the Yukon mainstem egg-take; these were released into a pothole lake south of Whitehorse. In 1992, 25,000 North Klondike chinook eggs and 15,000 Tatchun chinook eggs were placed in the North Klondike box. The following summer, 20,900 North Klondike fry (20,400 of which were coded-wire tagged) were released into the same system. Low egg survival, due in part to brood stock problems, resulted in only 5,000 of the Tatchun fry being released. Currently, 30,965 eggs from Tatchun Creek chinook and 3,635 eggs from North Klondike River chinook are being incubated.

In conjunction with the Yukon Department of Education, DFO has developed a classroom educational unit entitled "Salmon in the Classroom." This project, undertaken initially in 1989, involves a Yukon adaptation of the "Salmonids in the Classroom" package which was developed previously in British Columbia. As part of the programme, classroom incubators (100 egg capacity) have been distributed to most schools in the Yukon. The classroom incubators are supplied with eyed eggs from the incubation boxes (described above) or from local spawning areas. Fry resulting from the programme are transported back to the stream of origin and released by school children in the spring.

6.2.8 Restoration and Enhancement Planning in Canada

Canadian Advisors met on May 27, 1993 to discuss strategies for restoration and enhancement of Yukon River salmon in Canada.

Given the wild nature of the Yukon River and its salmon stocks, and the substantial risks associated with large scale enhancement through artificial propagation, it was recommended that large scale enhancement activities involving artificial propagation not be developed in the Yukon.

It was also recommended that projects be evaluated by the Yukon Panel or a committee of the Panel based on guidelines established under the Treaty. These guidelines should incorporate the following three priorities for funding projects under the Restoration and Enhancement fund: a) restoring habitat and wild stocks; b) enhancing habitat; and c) enhancing wild stocks.

Canada plans to develop a proposed Restoration and Enhancement Strategy for review by the Advisors that addresses:

1) Rebuilding goals and objectives for wild stock and habitat management. Rebuilding goals will be based on an assessment of stock health and spawning and rearing habitat capacity. First Nations will be consulted for input regarding historical stock distribution and abundance.

2) Research requirements for chinook and chum salmon including life history and habitat requirements.

3) Transplant, genetic and fish culture guidelines developed for DFO's Salmonid Enhancement Program and ADF&G's Commercial Fisheries Management and Development Division.

4) Consultation with the public, Aboriginal people, and industry representatives.

Based on the assessment work and rebuilding goals, a list of Restoration and Enhancement opportunities will be developed and ranked. This list will be included in a Restoration and Enhancement strategy proposal.

FIGURES AND TABLES

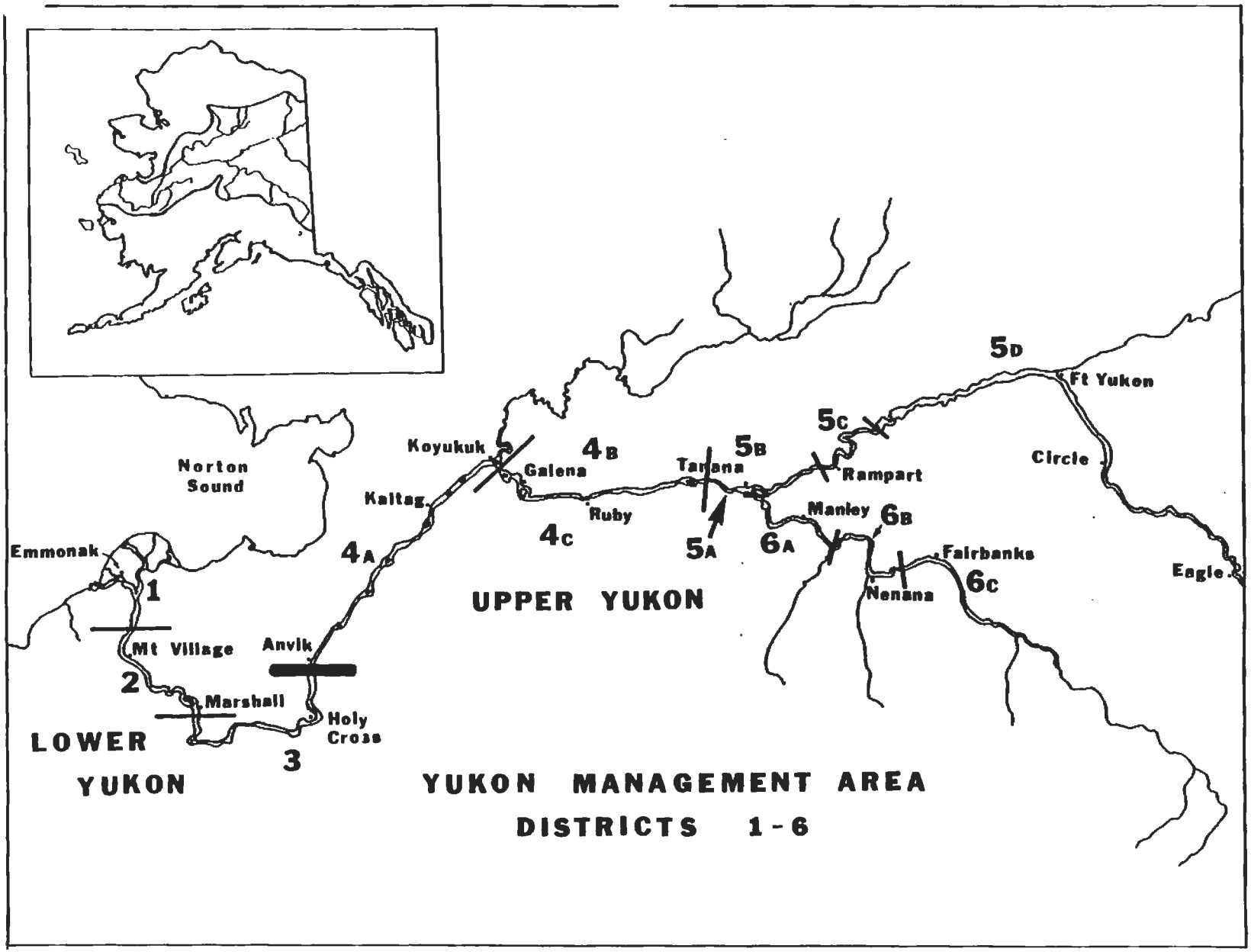


Figure 1. Map of the Alaskan portion of the Yukon River, showing fishing district boundaries.

Table 1. Preliminary estimates of commercial sales of salmon and salmon roe in the Alaska portion of the Yukon River drainage, 1993. 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	448	49,286	–	73,659	–	0	–	0	–	122,945	–
2	238	37,293	–	19,332	–	0	–	0	–	56,625	–
Subtotal	680	86,579	–	92,991	–	0	–	0	–	179,570	–
3	6	1,501	–	463	–	0	–	0	–	1,964	–
Total Lower Yukon	682	88,080	–	93,454	–	0	–	0	–	181,534	–
4–A	53	0	0	0	20,485	0	0	0	0	0	20,485
4–B,C	23	1,349	701	27	1,962	0	0	0	0	1,376	2,663
Subtotal District 4	75	1,349	701	27	22,447	0	0	0	0	1,376	23,148
5–A,B,C	27	2,608	0	0	0	0	0	0	0	2,608	0
5–D	3	400	0	0	0	0	0	0	0	400	0
Subtotal District 5	30	3,008	0	0	0	0	0	0	0	3,008	0
District 6	18	1,113	1,313	3,041	515	0	0	0	0	4,154	1,828
Total Upper Yukon	123	5,470	2,014	3,068	22,962	0	0	0	0	8,538	24,976
Total Yukon Area	805	93,550	2,014	96,522	22,962	0	0	0	0	190,072	24,976

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

Table 2. Commercial sales of salmon and salmon roe in the Alaska portion of the Yukon River drainage, 1961–1993. a

Year	Chinook		Summer Chum		Fall Chum		Coho	
	Numbers	Roe	Numbers	Roe	Numbers	Roe	Numbers	Roe
1961	119,664	–	0	–	42,461	–	2,855	–
1962	94,734	–	0	–	53,116	–	22,926	–
1963	117,048	–	0	–	0	–	5,572	–
1964	93,587	–	0	–	8,347	–	2,446	–
1965	118,098	–	0	–	23,317	–	350	–
1966	93,315	–	0	–	71,045	–	19,254	–
1967	129,656	–	10,935	–	38,274	–	11,047	–
1968	106,526	–	14,470	–	52,925	–	13,303	–
1969	91,027	–	61,966	–	131,310	–	15,093	–
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	156,706	–	1,003,556	189,068	466,451	11,285	23,651	–
1982	123,174	–	460,167	152,819	224,187	805	36,895	–
1983	146,904	–	742,463	149,999	302,598	5,064	13,157	–
1984	118,815	–	586,375	167,224	207,938	2,328	81,826	–
1985	145,476	–	514,900	248,625	267,302	2,525	57,521	–
1986	99,268	–	719,234	271,691	138,688	577	47,162	–
1987	133,558	–	439,854	121,968	0	0	0	–
1988	100,364	–	1,148,650	256,535	133,320	3,227	86,187	–
1989	104,198	–	955,656	288,549	266,206	14,749	81,548	–
1990	95,247	1,731	303,858	109,376	122,894	10,944	41,470	4,042
1991	106,416	3,829	349,113	141,976	230,852	19,395	103,180	4,299
1992	120,245	3,164	332,313	112,996	15,721	2,806	6,556	1,680
1993 b	93,550	2,014	96,522	22,962	0	0	0	0
1988–92 Avg	105,294	–	617,918	181,886	153,799	10,224	63,788	–

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

b Data for 1993 are preliminary.

Table 3. Canadian weekly commercial catches of chinook and chum salmon in the Yukon River in 1993.

Statistical Week	Week Ending	Start Date	Finish Date	Days Fished	Number Fishing	Boat* Days	Chinook Salmon	Chum Salmon
27	03–Jul	28–Jun	29–Jun	1	7	7.0	34	0
28	10–Jul	05–Jul	06–Jul	1	10	10.0	170	0
29	17–Jul	11–Jul	14–Jul	3	15	45.0	1781	0
30	24–Jul	18–Jul	22–Jul	4	17	68.0	3154	3
31	31–Jul	25–Jul	29–Jul	4	17	68.0	2971	10
32	07–Aug	01–Aug	05–Aug	4	17	68.0	1444	9
33	14–Aug	08–Aug	11–Aug	3	11	33.0	407	16
34	21–Aug	16–Aug	18–Aug	2	1	2.0	15	9
35	28–Aug	23–Aug	24–Aug	1	3	3.0	4	93
36	04–Sep	30–Aug	01–Sep	2	10	20.0	6	946
37	11–Sep	06–Sep	08–Sep	2	13	26.0	2	2656
38	18–Sep	13–Sep	14–Sep	1	11	11.0	0	1925
39	25–Sep	20–Sep	21–Sep	1	10	10.0	0	2095
40	02–Oct	closed						
Dawson area subtotal				29		371.0	9988	7762
Upriver subtotal							362	0
Total Commercial Harvest							**10350**	**7762**

ATTACHMENT I
HISTORICAL YUKON RIVER SALMON CATCH AND ESCAPEMENT DATA

Appendix Table 1. Alaskan and Canadian total utilization of Yukon River chinook, chum, and coho salmon, 1903–1993.

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

–continued–

Appendix Table 1. (page 2 of 2).

Year	Alaska[a,b]			Canada[c]			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	11,789	17,169	140,086	496,376	636,462
1966	104,887	309,502	414,389	4,452	13,192	17,644	109,339	322,694	432,033
1967	146,104	352,397	498,501	5,150	16,961	22,111	151,254	369,358	520,612
1968	118,632	270,818	389,450	5,042	11,633	16,675	123,674	282,451	406,125
1969	105,027	424,399	529,426	2,624	7,776	10,400	107,651	432,175	539,826
1970	93,019	585,760	678,779	4,663	3,711	8,374	97,682	589,471	687,153
1971	136,191	547,448	683,639	6,447	16,911	23,358	142,638	564,359	706,997
1972	113,098	461,617	574,715	5,729	7,532	13,261	118,827	469,149	587,976
1973	99,670	779,158	878,828	4,522	10,135	14,657	104,192	789,293	893,485
1974	118,053	1,229,678	1,347,731	5,631	11,646	17,277	123,684	1,241,324	1,365,008
1975	76,883	1,307,037	1,383,920	6,000	20,600	26,600	82,883	1,327,637	1,410,520
1976	105,582	1,026,908	1,132,490	5,025	5,200	10,225	110,607	1,032,108	1,142,715
1977	114,338	1,090,330	1,204,668	7,527	12,479	20,006	121,865	1,102,809	1,224,674
1978	129,465	1,631,479	1,760,944	5,881	9,566	15,447	135,346	1,641,045	1,776,391
1979	159,232	1,631,072	1,790,304	10,375	22,084	32,459	169,607	1,653,156	1,822,763
1980	197,665	1,730,893	1,928,558	22,846	23,718[d]	46,564	220,511	1,754,611	1,975,122
1981	188,477	2,097,826	2,286,303	18,109	22,781[d]	40,890	206,586	2,120,607	2,327,193
1982	152,808	1,265,360	1,418,168	17,208	16,091[d]	33,299	170,016	1,281,451	1,451,467
1983	198,436	1,678,380	1,876,816	18,952	29,490[d]	48,442	217,388	1,707,870	1,925,258
1984	162,683	1,547,270	1,709,953	16,795	29,767[d]	46,562	179,478	1,577,037	1,756,515
1985	187,327	1,657,176	1,844,503	19,301	41,515[d]	60,816	206,628	1,698,691	1,905,319
1986	146,004	1,757,290	1,903,294	20,364	14,793[d]	35,157	166,368	1,772,083	1,938,451
1987	188,386	1,244,884	1,433,270	17,614	44,786[d]	62,400	206,000	1,289,670	1,495,670
1988	148,979	2,313,931	2,462,910	21,427	33,915[d]	55,342	170,406	2,347,846	2,518,252
1989	157,824	2,272,375	2,430,199	17,944	23,490[d]	41,434	175,768	2,295,865	2,471,633
1990	150,351	1,047,979	1,198,330	19,238	34,302[d]	53,540	169,589	1,082,281	1,251,870
1991	153,499	1,321,534	1,475,033	20,607	35,653[d]	56,260	174,106	1,357,187	1,531,293
1992[f]	169,641	878,869	1,048,510	17,893	21,175[d]	39,068	187,534	900,044	1,087,578
1993[f,g]	95,682	141,985	237,667	16,583	13,417	30,000	112,265	155,402	267,667

[a] Catch in number of salmon. Includes estimated number of salmon harvested for the commercial production of salmon roe.
[b] Commercial, subsistence, personal-use, and sport catches combined.
[c] Catch in number of salmon. Commercial, Aboriginal, domestic, and sport catches combined.
[d] Includes the Old Crow Aboriginal fishery harvest of coho salmon.
[f] Preliminary.
[g] Does not include Alaskan subsistence, personal-use and sport fish harvests. These harvest numbers are unavailable at this time.

Appendix Table 2. Alaskan and Canadian total utilization of Yukon River chinook and fall chum salmon, 1961–1993.

	Chinook			Fall Chum		
Year	Canada[a]	Alaska[b,c]	Total	Canada[a]	Alaska[b,c]	Total
1961	13,246	141,152	154,398	9,076	144,233	153,309
1962	13,937	105,844	119,781	9,436	140,401	149,837
1963	10,077	141,910	151,987	27,696	99,031 [d]	126,727
1964	7,408	109,818	117,226	12,187	128,707	140,894
1965	5,380	134,706	140,086	11,789	135,600	147,389
1966	4,452	104,887	109,339	13,192	122,548	135,740
1967	5,150	146,104	151,254	16,961	107,018	123,979
1968	5,042	118,632	123,674	11,633	97,552	109,185
1969	2,624	105,027	107,651	7,776	183,373	191,149
1970	4,663	93,019	97,682	3,711	265,096	268,807
1971	6,447	136,191	142,638	16,911	246,756	263,667
1972	5,729	113,098	118,827	7,532	188,178	195,710
1973	4,522	99,670	104,192	10,135	285,760	295,895
1974	5,631	118,053	123,684	11,646	383,552	395,198
1975	6,000	76,883	82,883	20,600	361,600	382,200
1976	5,025	105,582	110,607	5,200	228,717	233,917
1977	7,527	114,338	121,865	12,479	340,757	353,236
1978	5,881	129,465	135,346	9,566	331,250	340,816
1979	10,375	159,232	169,607	22,084	593,293	615,377
1980	22,846	197,665	220,511	22,218	466,087	488,305
1981	18,109	188,477	206,586	22,281	654,976	677,257
1982	17,208	152,808	170,016	16,091	357,084	373,175
1983	18,952	198,436	217,388	29,490	495,526	525,016
1984	16,795	162,683	179,478	29,267	383,055	412,322
1985	19,301	187,327	206,628	41,265	474,216	515,481
1986	20,364	146,004	166,368	14,493	303,485	317,978
1987	17,614	188,386	206,000	44,480	361,663 [d]	406,143
1988	21,427	148,979	170,406	33,565	320,666	354,231
1989	17,944	157,824	175,768	23,020	511,225	534,245
1990	19,238	150,351	169,589	33,622	321,059	354,681
1991	20,607	153,499	174,106	35,418	403,738	439,156
1992 [f]	17,893	169,641	187,534	20,680	128,237 [g]	148,917
1993 [f]	16,583	95,682 [h]	112,265	13,417	0 [d,h]	13,417
Average						
1961–82	8,513	126,935	135,447	13,645	266,435	280,080
1983–87	18,605	176,567	195,172	31,799	403,589	435,388
1988–92	19,422	156,059	175,481	29,261	336,985	366,246

[a] Catch in number of salmon. Includes commercial, Aboriginal, domestic, and sport catches combined.
[b] Catch in number of salmon. Includes estimated number of salmon harvested for the commercial production of salmon roe. (See 1990 Yukon Area AMR.)
[c] Commercial, subsistence, personal–use, and sport catches combined.
[d] Commercial fishery did not operate.
[f] Preliminary.
[g] Commercial fishery operated only in District 6, the Tanana River.
[h] Includes only commercial catch numbers. Subsistence, personal–use, and sport fish harvest numbers are unavailable at this time.

Appendix Table 3. Alaskan catch of Yukon River chinook salmon, 1961–1993.

Year	Estimated Subsistence Use[a]	Harvest			
		Subsistence[b]	Commercial[c]	Sport[d]	Total
1961	21,488	21,488	119,664		141,152
1962	11,110	11,110	94,734		105,844
1963	24,862	24,862	117,048		141,910
1964	16,231	16,231	93,587		109,818
1965	16,608	16,608	118,098		134,706
1966	11,572	11,572	93,315		104,887
1967	16,448	16,448	129,656		146,104
1968	12,106	12,106	106,526		118,632
1969	14,000	14,000	91,027		105,027
1970	13,874	13,874	79,145		93,019
1971	25,684	25,684	110,507		136,191
1972	20,258	20,258	92,840		113,098
1973	24,317	24,317	75,353		99,670
1974	19,964	19,964	98,089		118,053
1975	13,045	13,045	63,838		76,883
1976	17,806	17,806	87,776		105,582
1977	17,581	17,581	96,757		114,338
1978	30,297	30,297	99,168		129,465
1979	31,005	31,005	127,673	554	159,232
1980	42,724	42,724	153,985	956	197,665
1981	29,690	29,690	158,018	769	188,477
1982	28,158	28,158	123,644	1,006	152,808
1983	49,478	49,478	147,910	1,048	198,436
1984	42,428	42,428	119,904	351	162,683
1985	39,771	39,771	146,188	1,368	187,327
1986	45,238	45,238	99,970	796	146,004
1987	53,124	53,124	134,760[f]	502	188,386
1988	46,590	46,590	101,445	944	148,979
1989	51,280	51,280	105,491	1,053	157,824
1990	52,512	52,099	97,708	544	150,351
1991	47,159	45,621	107,105	773	153,499
1992[g]	48,003	47,077	122,133	431	169,641
1993[g]	[h]	[h]	95,682	[h]	95,682[j]
Average					
1961–82	20,856	20,856	105,929	821	126,935
1983–87	46,008	46,008	129,746	813	176,567
1988–92	49,109	48,533	106,776	749	156,059

[a] Includes salmon harvested solely for subsistence, plus an estimate of the number of salmon carcasses harvested for the commercial production of salmon roe and used for subsistence. These data are only available since 1990.
[b] Includes salmon harvested solely for subsistence and personal use.
[c] Includes ADF&G test fish sales, fish sold in the round, and estimated numbers of female salmon commercially harvested for the commercial production of salmon roe. (See 1990 Yukon Area AMR).
[d] Sport fish harvest for the Alaskan portion of the Yukon River drainage. The majority of this harvest is believed to have been taken within the Tanana River drainage. (See 1992 Yukon Area AMR).
[f] Includes 653 and 2,136 chinook salmon illegally sold in District 5 and 6 (Tanana River), respectively.
[g] Preliminary.
[h] Data are unavailable at this time.
[j] Includes commercial catches only.

Appendix Table 4. Canadian catch of Yukon River chinook salmon, 1961–1993.[a]

Year	Mainstem Yukon River Harvest						Porcupine River Aboriginal Fishery Harvest	Total Canadian Harvest
	Commercial	Domestic	Aboriginal Fishery	Sport[b]	Combined Non–Commercial	Total		
1961	3,446		9,300		9,300	12,746	500	13,246
1962	4,037		9,300		9,300	13,337	600	13,937
1963	2,283		7,750		7,750	10,033	44	10,077
1964	3,208		4,124		4,124	7,332	76	7,408
1965	2,265		3,021		3,021	5,286	94	5,380
1966	1,942		2,445		2,445	4,387	65	4,452
1967	2,187		2,920		2,920	5,107	43	5,150
1968	2,212		2,800		2,800	5,012	30	5,042
1969	1,640		957		957	2,597	27	2,624
1970	2,611		2,044		2,044	4,655	8	4,663
1971	3,178		3,260		3,260	6,438	9	6,447
1972	1,769		3,960		3,960	5,729		5,729
1973	2,199		2,319		2,319	4,518	4	4,522
1974	1,808	406	3,342		3,748	5,556	75	5,631
1975	3,000	400	2,500		2,900	5,900	100	6,000
1976	3,500	500	1,000		1,500	5,000	25	5,025
1977	4,720	531	2,247		2,778	7,498	29	7,527
1978	2,975	421	2,485		2,906	5,881		5,881
1979	6,175	1,200	3,000		4,200	10,375		10,375
1980	9,500	3,500	7,546	300	11,346	20,846	2,000	22,846
1981	8,593	237	8,879	300	9,416	18,009	100	18,109
1982	8,640	435	7,433	300	8,168	16,808	400	17,208
1983	13,027	400	5,025	300	5,725	18,752	200	18,952
1984	9,885	260	5,850	300	6,410	16,295	500	16,795
1985	12,573	478	5,800	300	6,578	19,151	150	19,301
1986	10,797	342	8,625	300	9,267	20,064	300	20,364
1987	10,864	330	6,069	300	6,699	17,563	51	17,614
1988	13,217	282	7,178	650	8,110	21,327	100	21,427
1989	9,789	400	6,930	300	7,630	17,419	525	17,944
1990	11,324	247	7,109	300	7,656	18,980	258	19,238
1991	10,906	227	9,011	300	9,538	20,444	163	20,607
1992	10,877	277	6,339	300	6,916	17,793	100	17,893
1993[c]	10,350	243	5,556	300	6,099	16,449	134	16,583
Average								
1961–82	3,722	848	4,211	300	4,598	8,320	223	8,513
1983–87	11,429	362	6,274	300	6,936	18,365	240	18,605
1988–92	11,223	287	7,313	370	7,970	19,193	229	19,422

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

Appendix Table 5. Alaska catch of Yukon River summer chum salmon, 1961–1993.

Year	Estimated Subsistence Use[a]	Harvest			
		Subsistence[b]	Commercial[c]	Sport[d]	Total
1961	305,317 [f]	305,317 [f]	0		305,317
1962	261,856 [f]	261,856 [f]	0		261,856
1963	297,094 [f]	297,094 [f]	0		297,094
1964	361,080 [f]	361,080 [f]	0		361,080
1965	336,848 [f]	336,848 [f]	0		336,848
1966	154,508 [f]	154,508 [f]	0		154,508
1967	206,233 [f]	206,233 [f]	10,935		217,168
1968	133,880 [f]	133,880 [f]	14,470		148,350
1969	156,191 [f]	156,191 [f]	61,966		218,157
1970	166,504 [f]	166,504 [f]	137,006		303,510
1971	171,487 [f]	171,487 [f]	100,090		271,577
1972	108,006 [f]	108,006 [f]	135,668		243,674
1973	161,012 [f]	161,012 [f]	285,509		446,521
1974	227,811 [f]	227,811 [f]	589,892		817,703
1975	211,888 [f]	211,888 [f]	710,295		922,183
1976	186,872 [f]	186,872 [f]	600,894		787,766
1977	159,502	159,502	534,875		694,377
1978	197,144	188,303	1,077,987		1,266,290
1979	196,187	191,287	819,533		1,010,820
1980	272,398	167,705	1,067,715	483	1,235,903
1981	208,284	117,629	1,279,701	612	1,397,942
1982	260,969	117,413	717,013	780	835,206
1983	240,386	149,180	995,469	990	1,145,639
1984	230,747	166,630	866,040	585	1,033,255
1985	264,828	157,744	934,013	1,267	1,093,024
1986	290,825	182,337	1,188,850	895	1,372,082
1987	275,914	174,940	622,541	846	798,327
1988	311,724	202,914	1,620,269	1,037	1,824,220
1989	249,582	168,849	1,463,195	2,103	1,634,147
1990	201,839 [g]	117,811	513,906	472	632,189
1991	275,673 [g]	118,509	651,206	1,037	770,752
1992 [h]	231,853 [g]	142,192	545,544	1,308	689,044
1993 [h]	[j]	[j]	141,985	[j]	141,985 [k]
Average					
1961–82	215,503	199,474	370,161	625	569,720
1983–87	260,540	166,166	921,383	917	1,088,465
1988–92	254,134	150,055	958,824	1,191	1,110,070

[a] Includes salmon harvested solely for subsistence, plus an estimate of the number of salmon carcasses harvested for the commercial production of salmon roe and used for subsistence.
[b] Includes salmon harvested solely for subsistence.
[c] Includes ADF&G test fish sales, fish sold in the round, plus an estimate of the number of salmon commercially harvested for the commercial production of salmon roe. (See 1990 Yukon Area AMR.)
[d] Sport fish harvest for the Alaskan portion of the Yukon River drainage. The majority of this harvest is believed to have been taken within the Tanana River drainage.
[f] Catches of summer chum salmon estimated for 1961–1976 since catches other than chinook salmon were not differentiated by species.
[g] Subsistence harvest plus estimated number of summer chum salmon fed to dogs by District 4 subsistence fishing households.
[h] Preliminary.
[j] Data are unavailable at this time.
[k] Includes commercial catches only.

Appendix Table 6. Alaska catch of Yukon River fall chum salmon, 1961–1993.

Year	Estimated Subsistence Use[a]	Harvest		
		Subsistence[b]	Commercial[c]	Total[d]
1961	101,772 [f,g]	101,772 [f,g]	42,461	144,233
1962	87,285 [f,g]	87,285 [f,g]	53,116	140,401
1963	99,031 [f,g]	99,031 [f,g]	0	99,031
1964	120,360 [f,g]	120,360 [f,g]	8,347	128,707
1965	112,283 [f,g]	112,283 [f,g]	23,317	135,600
1966	51,503 [f,g]	51,503 [f,g]	71,045	122,548
1967	68,744 [f,g]	68,744 [f,g]	38,274	107,018
1968	44,627 [f,g]	44,627 [f,g]	52,925	97,552
1969	52,063 [f,g]	52,063 [f,g]	131,310	183,373
1970	55,501 [f,g]	55,501 [f,g]	209,595	265,096
1971	57,162 [f,g]	57,162 [f,g]	189,594	246,756
1972	36,002 [f,g]	36,002 [f,g]	152,176	188,178
1973	53,670 [f,g]	53,670 [f,g]	232,090	285,760
1974	93,776 [f,g]	93,776 [f,g]	289,776	383,552
1975	86,591 [f,g]	86,591 [f,g]	275,009	361,600
1976	72,327 [f,g]	72,327 [f,g]	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 [h]	0	361,663
1988	159,703	156,476	164,190	320,666
1989	224,046	209,297	301,928	511,225
1990	188,941	177,658	143,401	321,059
1991	168,990	145,624	258,114	403,738
1992 [j]	111,109	107,808	20,429 [k]	128,237
1993 [j]	[m]	[m]	0	0 [n]
Average				
1961–82	95,353	93,253	173,182	266,435
1983–87	219,986	217,887	185,702	403,589
1988–92	170,558	159,373	177,612	336,985

[a] Includes salmon harvested solely for subsistence, plus an estimate of the number of salmon carcasses harvested for the commercial production of salmon roe and used for subsistence.
[b] Includes salmon harvested solely for subsistence.
[c] Includes ADF&G test fish sales, fish sold in the round, plus an estimate of the number of female salmon commercially harvested for the commercial production of salmon roe. (See 1990 Yukon Area AMR).
[d] Does not include sport–fish harvest. The majority of the sport–fish harvest is believed to be taken in the Tanana River drainage. Sport fish division does not separate the chum salmon harvest into summer or fall chum salmon. The majority of this harvest is believed to be summer chum salmon.
[f] Catches of fall chum salmon estimated for 1961–1976 since catches other than chinook salmon were not differentiated by species.
[g] Minimum estimates of fall chum salmon for 1961–1978 because surveys were conducted prior to the end of the fishing season.
[h] Includes an estimated 95,768 and 119,168 fall chum salmon illegally sold in Districts 5 and 6 (Tanana River), respectively.
[j] Preliminary.
[k] Commercial fishery operated only in District 6, the Tanana River.
[m] Data are unavailable at this time.
[n] Includes commercial catches only.

Appendix Table 7. Canadian catch of Yukon River fall chum salmon 1961–1993.[a]

Year	Mainstem Yukon River Harvest					Porcupine River Aboriginal Fishery Harvest	Total Canadian Harvest
	Commercial	Domestic	Aboriginal Fishery	Combined Non–Commercial	Total		
1961	3,276		3,800	3,800	7,076	2,000	9,076
1962	936		6,500	6,500	7,436	2,000	9,436
1963	2,196		5,500	5,500	7,696	20,000	27,696
1964	1,929		4,200	4,200	6,129	6,058	12,187
1965	2,071		2,183	2,183	4,254	7,535	11,789
1966	3,157		1,430	1,430	4,587	8,605	13,192
1967	3,343		1,850	1,850	5,193	11,768	16,961
1968	453		1,180	1,180	1,633	10,000	11,633
1969	2,279		2,120	2,120	4,399	3,377	7,776
1970	2,479		612	612	3,091	620	3,711
1971	1,761		150	150	1,911	15,000	16,911
1972	2,532		0	0	2,532	5,000	7,532
1973	2,806		1,129	1,129	3,935	6,200	10,135
1974	2,544	466	1,636	2,102	4,646	7,000	11,646
1975	2,500	4,600	2,500	7,100	9,600	11,000	20,600
1976	1,000	1,000	100	1,100	2,100	3,100	5,200
1977	3,990	1,499	1,430	2,929	6,919	5,560	12,479
1978	3,356	728	482	1,210	4,566	5,000	9,566
1979	9,084	2,000	11,000	13,000	22,084		22,084
1980	9,000	4,000	3,218	7,218	16,218	6,000	22,218
1981	15,260	1,611	2,410	4,021	19,281	3,000	22,281
1982	11,312	683	3,096	3,779	15,091	1,000	16,091
1983	25,990	300	1,200	1,500	27,490	2,000	29,490
1984	22,932	535	1,800	2,335	25,267	4,000	29,267
1985	35,746	279	1,740	2,019	37,765	3,500	41,265
1986	11,464	222	2,150	2,372	13,836	657	14,493
1987	40,591	132	3,622	3,754	44,345	135	44,480
1988	30,263	349	1,882	2,231	32,494	1,071	33,565
1989	17,549	100	2,462	2,562	20,111	2,909	23,020
1990	27,537	0	3,675	3,675	31,212	2,410	33,622
1991	31,404	0	2,438	2,438	33,842	1,576	35,418
1992	18,576	0	169	169	18,745	1,935	20,680
1993 [b]	7,762	0	4,590	4,590	12,352	1,065	13,417
Average							
1961–82	3,967	1,843	2,569	3,323	7,290	6,658	13,645
1983–87	27,345	294	2,102	2,396	29,741	2,058	31,799
1988–92	25,066	90	2,125	2,215	27,281	1,980	29,261

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

001327

Appendix Table 8. Alaska catch of Yukon River coho salmon, 1961–1993.

Year	Estimated Subsistence Use[a]	Harvest			
		Subsistence[b]	Commercial[c]	Sport[d]	Total
1961	9,192 [f,g]	9,192 [f,g]	2,855		12,047
1962	9,480 [f,g]	9,480 [f,g]	22,926		32,406
1963	27,699 [f,g]	27,699 [f,g]	5,572		33,271
1964	12,187 [f,g]	12,187 [f,g]	2,446		14,633
1965	11,789 [f,g]	11,789 [f,g]	350		12,139
1966	13,192 [f,g]	13,192 [f,g]	19,254		32,446
1967	17,164 [f,g]	17,164 [f,g]	11,047		28,211
1968	11,613 [f,g]	11,613 [f,g]	13,303		24,916
1969	7,776 [f,g]	7,776 [f,g]	15,093		22,869
1970	3,966 [f,g]	3,966 [f,g]	13,188		17,154
1971	16,912 [f,g]	16,912 [f,g]	12,203		29,115
1972	7,532 [f,g]	7,532 [f,g]	22,233		29,765
1973	10,236 [f,g]	10,236 [f,g]	36,641		46,877
1974	11,646 [f,g]	11,646 [f,g]	16,777		28,423
1975	20,708 [f,g]	20,708 [f,g]	2,546		23,254
1976	5,241 [f,g]	5,241 [f,g]	5,184		10,425
1977	16,333 [g]	16,333 [g]	38,863		55,196
1978	7,787 [g]	7,787 [g]	26,152		33,939
1979	9,794	9,794	17,165	50	26,959
1980	20,158	20,158	8,745	67	28,903
1981	21,228	21,228	23,680	45	44,908
1982	35,894	35,894	37,176	97	73,070
1983	23,895	23,895	13,320	199	37,215
1984	49,020	49,020	81,940	831	130,960
1985	32,264	32,264	57,672	808	89,936
1986	34,468	34,468	47,255	1,535	81,723
1987	84,894	84,894 [h]	0	1,292	84,894
1988	69,138	69,138	99,907	2,420	169,045
1989	41,510	41,510	85,493	1,796	127,003
1990	51,071	47,816	46,915	1,947	94,731
1991	40,894	37,388	109,656	2,775	147,044
1992 [j]	53,403	51,980	9,608	1,701 [k]	61,588
1993 [j]	[m]	[m]	0	[m]	0 [n]
Average					
1961–82	13,979	13,979	16,064	65	30,042
1983–87	44,908	44,908	40,037	933	84,946
1988–92	51,203	49,566	70,316	2,128	119,882

[a] Includes salmon harvested solely for subsistence, plus an estimate of the number of salmon carcasses harvested for the commercial production of salmon roe and used for subsistence. These data are available only since 1990.
[b] Includes salmon harvested solely for subsistence.
[c] Includes ADF&G test fish sales, fish sold in the round, plus an estimate of the numbers of female salmon commercially harvested for the commercial production of salmon roe. (See 1990 Yukon Area AMR).
[d] Sport fish harvest for the Alaskan portion of the Yukon River drainage. The majority of this harvest is believed to have been taken within the Tanana River drainage.
[f] Catches of coho salmon estimated for 1961–1976 since catches other than chinook salmon were not differentiated by species.
[g] Minimum estimates of coho salmon for 1961–1978 because surveys were conducted prior to the end of the fishing season.
[h] Includes an estimated 5,015 and 31,276 coho salmon illegally sold in Districts 5 and 6 (Tanana River), respectively.
[j] Preliminary.
[k] Commercial fishery operated only in District 6, the Tanana River.
[m] Data are unavailable at this time.
[n] Includes commercial catches only.

Appendix Table 9. Chinook salmon escapement counts for selected spawning areas in the Alaskan portion of the Yukon River drainage, 1961–1993.[a]

	Andreafsky River		Anvik River[b]		Nulato River			Chena River			Salcha River		
Year	East Fork	West Fork	River	Index Area	North Fork[c]	South Fork	Gisasa River	Population Estimate	River	Index Area[d]	Population Estimate	River	Index Area[f]
1961	1,003		1,226		376 [g]	167	266 [g]					2,878	
1962	675 [g]	762 [g]							61 [g,h]			937	
1963									137 [g]				
1964	867	705										450	
1965		344 [g]	650 [g]									406	
1966	361	303	638									800	
1967		276 [g]	336 [g]										
1968	360	383	310 [g]									739	
1969	274 [g]	231 [g]	296 [g]									461 [g]	
1970	665	574 [g]	366						6 [g]			1,882	
1971	1,904	1,682							193 [g,h]			158 [g]	
1972	798	582 [g]	1,198						138 [g,h]			1,193	1,034
1973	825	788	613						21 [g]			391	352 [j]
1974		285	471 [g]		55 [g]	23 [g]	161		1,016 [h]	959 [h]		1,857	1,620
1975	993	301	730		123	81	385		318 [h]	262 [h]		1,055	950 [j]
1976	818	643	1,053		471	177	332		531	496		1,641	1,473
1977	2,008	1,499	1,371		286	201	255		563			1,202	1,052
1978	2,487	1,062	1,324		498	422	45 [g]		1,726			3,499	3,258
1979	1,180	1,134	1,484		1,093	414	484		1,159 [g]			4,789	4,310 [j]
1980	958 [g]	1,500	1,330	1,192	954 [g]	369 [g]	951		2,541			6,757	6,126
1981	2,146 [g]	231 [g]	807 [g]	577 [g]		791			600 [g]			1,237	1,121
1982	1,274	851					421		2,073			2,534	2,346
1983			653 [g]	376 [g]	526	480	572		2,553	2,336		1,961	1,803
1984	1,573 [g]	1,993	641 [g]	574 [g]					501	494		1,031	906
1985	1,617	2,248	1,051	720	1,600	1,180	735		2,553	2,262		2,035	1,860
1986	1,954	3,158	1,118	918	1,452	1,522	1,346	9,065	2,031	1,935		3,368	3,031 [j]
1987	1,608	3,281	1,174	879	1,145	493	731	6,404	1,312	1,209	4,771	1,698	1,671
1988	1,020	1,448	1,805	1,449	1,061	714	797	3,346	1,966	1,760	4,562	2,761	2,553
1989	1,399	1,089	442 [g]	212 [g]				2,666	1,280	1,185	3,294	2,333	2,136
1990	2,503	1,545	2,347	1,595	568 [g]	430 [g,k]	884 [g]	5,603	1,436	1,402	10,728	3,744	3,429
1991	1,938	2,544	875 [g]	625 [g]	767	1,253	1,690	3,025	1,277 [g]	1,277 [g]	5,608	2,212 [g]	1,925 [g]
1992	1,030 [g]	2,002 [g]	1,536	931	348	231	910	5,230	825 [g]	799 [g]	8,410	1,484 [g]	1,436 [g]
1993 [m]	5,855	2,765	1,720	1,526	1,844	1,181	1,573	12,247	2,943	2,660	9,998	3,636	3,562
E.O.[n]	>1,500	>1,400	>1,300 [p]	>500 [p]	>800	>500	>600			>1,700			>2,500

[a] Data obtained by aerial survey unless otherwise noted. Only peak counts are listed. Survey rating is fair to good, unless otherwise noted. Latest table revision: November 10, 1993.
[b] From 1961–1970, river count data are from aerial surveys of various segments of the mainstem Anvik River. From 1972–1979, counting tower operated; mainstem aerial survey counts below the tower were added to tower counts. From 1980–present, aerial survey counts for the river are best available minimal estimates for the entire Anvik River drainage. Index area counts are from the mainstem Anvik River between the Yellow River and McDonald Creek.
[c] Includes mainstem counts below the confluence of the North and South Forks, unless otherwise noted.
[d] Chena River index area for assessing the escapement objective is from Moose Creek Dam to Middle Fork River.
[f] Salcha River index area for assessing the escapement objective is from the TAPS crossing to Caribou Creek.
[g] Incomplete and/or poor survey conditions resulting in minimal or inaccurate counts.
[h] Boat survey.
[j] Data unavailable for index area. Calculated from historic (1972–91) average ratio of index area counts to total river counts (0.90:1.0).
[k] Manistem counts below the confluence of the North and South Forks Nulato River included in the South Fork counts.
[m] Preliminary.
[n] Interim escapement objectives. Established March, 1992
[p] Interim escapement objective for the entire Anvik River drainage is 1,300 salmon Interim escapement objective for mainstem Anvik River between the Yellow River and McDonald Creek is 500 salmon

Appendix Table 10. Chinook salmon escapement counts for selected spawning areas in the Canadian portion of the Yukon River drainage, 1961–1993.[a]

Year	Tincup Creek	Tatchun River[b]	Little Salmon River	Big Salmon River[c]	Nisutlin River[d]	Ross River[f]	Wolf River[g]	Whitehorse Fishway[h]	Canada Mainstem Tagging Estimate[j]
1961								1,068	
1962								1,500	
1963								483	
1964								595	
1965								903	
1966		7[k]						563	
1967								533	
1968			173[k]	857[k]	407[k]	104[k]		414	
1969			120	286	105			334	
1970		100		670	615		71[k]	625	
1971		130	275	275	650		750	856	
1972		80	126	415	237		13	391	
1973		99	27[k]	75[k]	36[k]			224	
1974		192		70[k]	48[k]			273	
1975		175		153[k]	249		40[k]	313	
1976		52		86[k]	102			121	
1977		150	408	316[k]	77			277	
1978		200	330	524	375			725	
1979		150	489[k]	632	713		183[k]	1,184	
1980		222	286[k]	1,436	975		377	1,383	
1981		133	670	2,411	1,626	949	395	1,555	
1982		73	403	758	578	155	104	473	19,790
1983	100	264	101[k]	540	701	43[k,n]	95	905	28,989
1984	150	153	434	1,044	832	151[k]	124	1,042	27,616[m]
1985	210	190	255	801	409	23[k]	110	508	10,730
1986	228	155	54[k]	745	459[k]	72[o]	109	557	16,415
1987	100	159	468	891	183	180[k]	35	327	13,260
1988	204	152	368	765	267	242	66	405	23,118
1989	88	100	862	1,662	695	433[p]	146	549	25,201
1990	83	643	665	1,806	652	457[k]	188	1,407	37,699
1991			326	1,040		250	201[r]	1,266	20,743
1992	73	106	494	617	241	423	110[r]	758	25,497
1993[s]		183	184	572	339	400	168[r]	668	28,578
E.O.									33,000–43,000[t]

[a] Data obtained by aerial survey unless otherwise noted. Only peak counts are listed. Survey rating is fair to good, unless otherwise noted. Latest table revision: November 24, 1993.
[b] All foot surveys except 1978 (boat survey) and 1986 (aerial survey).
[c] For 1968, 1970, and 1971 counts are from mainstem Big Salmon River. For all other years counts are from the mainstem Big Salmon River between Big Salmon Lake and the vicinity of Souch Creek.
[d] One Hundred Mile Creek to Sidney Creek.
[f] Big Timber Creek to Lewis Lake.
[g] Wolf Lake to Red River.
[h] Includes 50, 90, 292, 506, 243, 288 fin–clipped hatchery–origin salmon in 1988, 1989, 1990, 1991, 1992, and 1993, respectively.
[j] Estimated total spawning escapement excluding Porcupine River (estimated border escapement minus the Canadian catch).
[k] Incomplete and/or poor survey conditions resulting in minimal or inaccurate counts.
[m] Estimate derived by dividing the annual 5–area (Whitehorse Fishway, Big Salmon, Nisutlin, Wolf, Tatchun) count by the average proportion of the annual 5–area index count to the estimated spawning escapements from the DFO tagging study for years 1982, 1983, and 1985–1989.
[n] Information on area surveyed is unavailable.
[p] Counts are for Big Timber Creek to Sheldon Lake.
[r] Counts are for Wolf Lake to Fish Lake outlet.
[s] Preliminary.
[t] Interim escapement objective. Stabilization escapement objective for years 1990 – 1995 is 18,000 salmon.

Appendix Table 11. Summer chum salmon escapement counts for selected spawning areas in the Yukon River drainage, 1973–1993.[a]

Year	Andreafsky River			Anvik River			Nulato River							
	East Fork													
	Aerial	Sonar or Tower	West Fork	Tower & Aerial[b]	Sonar	Rodo River	South Fork	North Fork[c]	Gisasa River	Hogatza River (Clear and Caribou Crs)	Tozitna River	Chena River	Salcha River
1973	10,149 [d]		51,835	86,665 [d]								79 [d]	
1974	3,215 [d]		33,578	201,277		16,137	29,016	29,334	22,022		1,823	4,349	3,510
1975	223,485		235,954	845,485		25,335	51,215	87,280	56,904	22,355	3,512	1,670	7,573
1976	105,347		118,420	406,166		38,258	9,230 [d]	30,771	21,342	20,744	725 [d]	685	6,474
1977	112,722		63,120	262,854		16,118	11,385	58,275	2,204 [d]	10,734	761 [d]	610	677 [d]
1978	127,050		57,321	251,339		17,845	12,821	41,659	9,280 [d]	5,102	2,262	1,609	5,405
1979	66,471		43,391	81,830 [d]	280,537		1,506	35,598	10,962	14,221		1,025 [d]	3,060
1980	36,823 [d]		114,759		492,676		3,702 [d]	11,244 [d]	10,388	19,786	580	338	4,140
1981	81,555	147,312 [f]			1,486,182		14,348					3,500	8,500
1982	7,501 [d]	181,352 [f]	7,267 [d]		444,581				334 [d]	4,984 [d]	874	1,509	3,756
1983		110,608 [f]			362,912		1,263 [d]	19,749	2,356 [d]	28,141	1,604	1,097	716 [d]
1984	95,200 [d]	70,125 [f]	238,565		891,028							1,861	9,810
1985	66,146		52,750		1,080,243	24,576	10,494	19,344	13,232	22,566	1,030	1,005	3,178
1986	83,931	167,614 [g]	99,373		1,189,602		16,848	47,417	12,114		1,778	1,509	8,028
1987	6,687 [d]	45,221 [g]	35,535		455,876		4,094	7,163	2,123	5,669 [d]		333	3,657
1988	43,056	68,937 [g]	45,432		1,125,449	13,872	15,132	26,951	9,284	6,890	2,983	432	2,889 [d]
1989	21,460 [d]				636,906							714 [d]	1,574 [d]
1990	11,519 [d]		20,426 [d]		403,627	1,941 [d]	3,196 [d,h]	1,419 [d]	450 [d]	2,177 [d]	36	100 [d]	450 [d]
1991	31,886		46,657		847,772	3,977	13,150	12,491	7,003	9,947	93	10 [d]	154 [d]
1992	11,308 [d]		37,808 [d]		775,626	4,465	5,322	12,358	9,300	2,986	794	848 [d]	3,222
1993 [p]	10,935 [d]		9,111 [d]		517,969	7,867	5,486	7,698	1,581	525 [d]	970	168	212
E.O.[j]	>109,000		>116,000		>500,000 [k]			>53,000 [m]		>17,000 [n]			>3,500

[a] Data obtained by aerial survey unless otherwise noted. Only peak counts are listed. Latest table revision November 24, 1993.
[b] From 1972–1979, counting tower operated; mainstem aerial survey counts below the tower were added to tower counts.
[c] Includes mainstem counts below the confluence of the North and South Forks, unless otherwise noted.
[d] Incomplete survey and/or poor survey timing or conditions resulted in minimal or inaccurate count.
[f] Sonar count.
[g] Tower count.
[h] Mainstem counts below the confluence of the North and South Forks Nulato River included in the South Fork counts.
[j] Interim escapement objective.
[k] The Anvik River Escapement Objective was rounded upward to 500,000 from 487,000 in March, 1992.
[m] Interim escapement objective for North Fork Nulato River only.
[n] Consists of Clear and Caribou Creeks interim escapement objectives of 9,000 and 8,000, respectively.
[p] Preliminary.

Appendix Table 12. Fall chum salmon escapement counts for selected spawning areas in the Alaskan and Canadian portions of the Yukon River drainage, 1971–1993.[a]

Year	Alaska				Canada					
	Toklat River[b]	Delta River[c]	Chandalar River[d]	Sheenjek River[d,f]	Fishing Branch River[g]	Mainstem Yukon River Index[h,j]	Koidern River[h]	Kluane River[h,k]	Teslin River[h,m]	Mainstem Tagging Estimate[n]
1971					312,800					
1972					35,125 [p]			198 [r,s]		
1973					15,989 [t]	383		2,500		
1974	43,484	5,915		89,966 [u]	32,525 [t]			400		
1975	90,984	3,734 [w]		173,371 [u]	353,282 [t]	7,671		362 [s]		
1976	53,882	6,312 [w]		26,354 [u]	36,584			20		
1977	36,462	16,876 [w]		45,544 [u]	88,400			3,555		
1978	37,057	11,136		32,449 [u]	40,800			0 [s]		
1979	179,627	8,355		91,372 [u]	119,898			4,640 [s]		
1980	26,373	5,137		28,933 [u]	55,268			3,150		
1981	15,775	23,508		74,560	57,386 [x]			25,806		
1982	3,601	4,235		31,421	15,901	1,020 [y]		5,378		31,958
1983	20,807	7,705		49,392	27,200	7,560		8,578 [s]		90,875
1984	16,511	12,411		27,130	15,150	2,800 [z]	1,300	7,200	200	56,633 [aa]
1985	22,805	17,276 [w]		152,768	56,016 [t]	10,760	1,195	7,538	356	62,010
1986	18,903	6,703 [w]	59,313	83,197	31,723 [t]	825	14	16,686	213	87,990
1987	22,141	21,180	52,416	140,086	48,956 [t]	6,115	50	12,000		80,776
1988	13,324	18,024	33,619	40,866	23,597 [t]	1,550	0	6,950	140	36,786
1989	30,447	21,342 [w]	69,161	79,116 [ab]	43,834 [t]	5,320	40	3,050	210 [r]	35,750
1990	33,672	8,992 [w]	78,631	62,200 [ac]	35,000 [ad]	3,651	1	4,683	739	51,755
1991	13,197	32,905 [w]		86,496	37,733 [t]	2,426	53	11,675	468	78,461
1992	13,194	8,893 [w]		78,808	22,517 [t]	4,438	4	3,339	450	49,217
1993 [af]	26,500	17,400		43,000	28,798 [t]	2,620	0	4,610	555	29,938
E.O. [ag]	> 33,000	> 11,000		> 64,000 [ah]	50,000 – 120,000					> 80,000

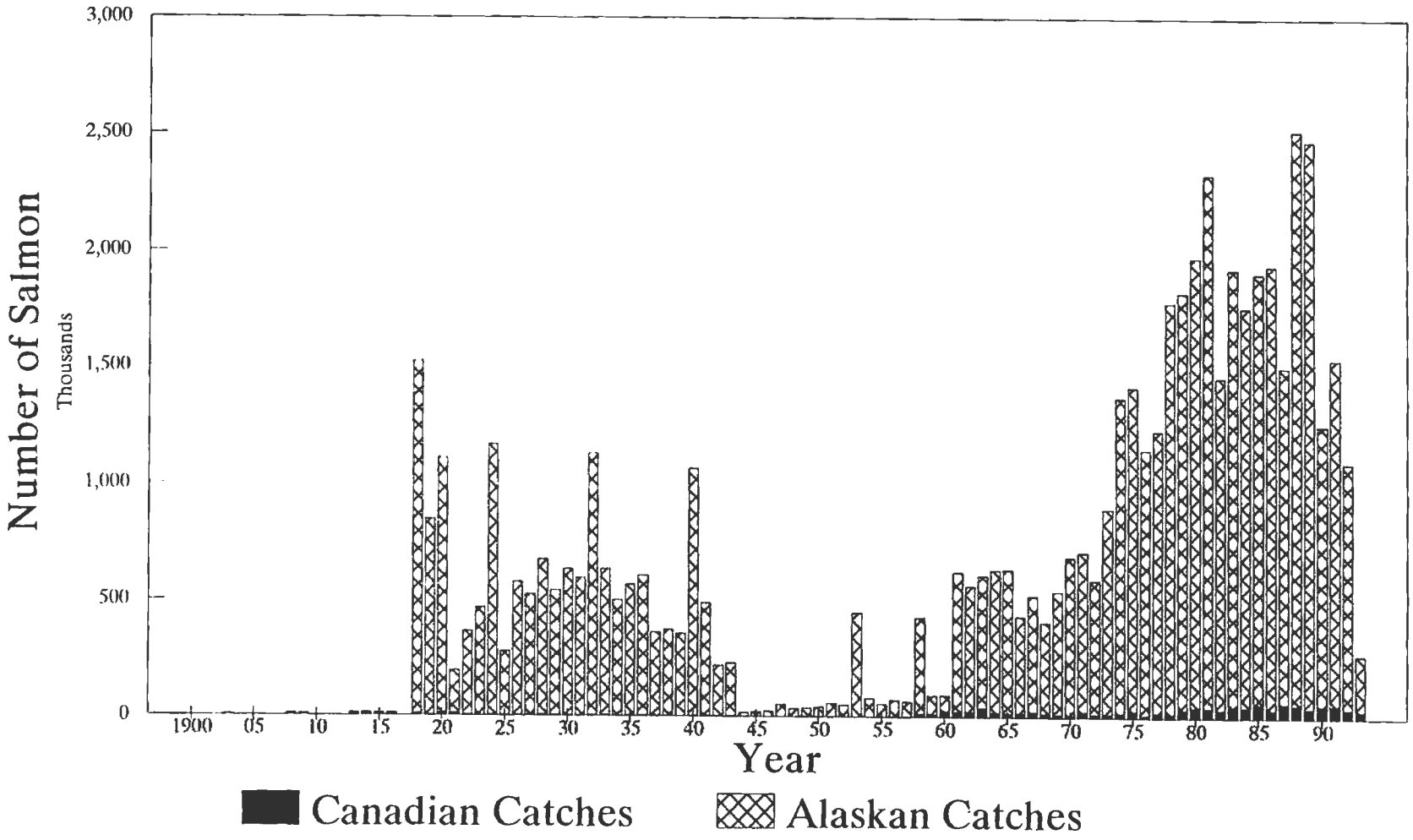
–continued–

[a] Latest table revision November 23, 1993.
[b] Total escapement estimates using Delta River migratory time density curve and percentage of live salmon present by survey date in upper Toklat River area.
[c] Total escapement estimates made from migratory time density curve (see Barton 1986), unless otherwise indicated.
[d] Side-scan sonar estimate.
[f] From 1981-1985 sonar operations were initiated between August 29 and September 2. From 1986-1990 sonar operations were initiated between August 17 and August 25. For 1991 and 1992 sonar operations were initiated on August 9.
[g] Within the Canadian Porcupine River drainage. Total escapement estimated using weir to aerial survey expansion factor of 2.72, unless otherwise indicated.
[h] Aerial survey count unless otherwise indicated.
[j] Tatchun Creek to Fort Selkirk.
[k] Duke River to end of spawning sloughs below Swede Johnston Creek.
[m] Boswell Creek area (5km below to 5km above confluence).
[n] Excludes Fishing Branch River escapement (estimated border passage minus Canadian removal).
[p] Weir installed on September 22. Estimate consists of a wier count of 17,190 after September 22, and a tagging passage estimate of 17,935 prior to weir installation.
[r] Incomplete and/or poor survey conditions resulting in minimal or inaccurate counts.
[s] Foot survey
[t] Weir count.
[u] Total escapement estimates using sonar to aerial survey expansion factor of 2.221.
[w] Population estimate from replicate foot surveys and stream life data.
[x] 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.
[y] Boat survey.
[z] Total index area not surveyed. Survey included the mainstem Yukon River between Yukon Crossing to 30 km below Fort Selkirk.
[aa] Escapement estimate based on mark-recapture program unavailable. Estimate based on assumed average exploitation rate.
[ab] Does not include a passage estimate of 20,000 salmon prior to initiation of sonar-monitoring operations.
[ac] Does not include a passage estimate of 15,550 salmon prior to initiation of sonar-monitoring operations.
[ad] Weir was not operated. Although only 7,541 chum salmon were counted on a single survey flown October 26, a population estimate of approximately 27,000 fish was made through date of survey, based upon historic average aerial-to-weir expansion of 28%. Actual population of spawners was reported by DFO as between 30,000 - 40,000 fish in view of aerial survey timing.
[af] Preliminary.
[ag] Interim escapement objective.
[ah] Based on escapement estimates for years 1974-1990.

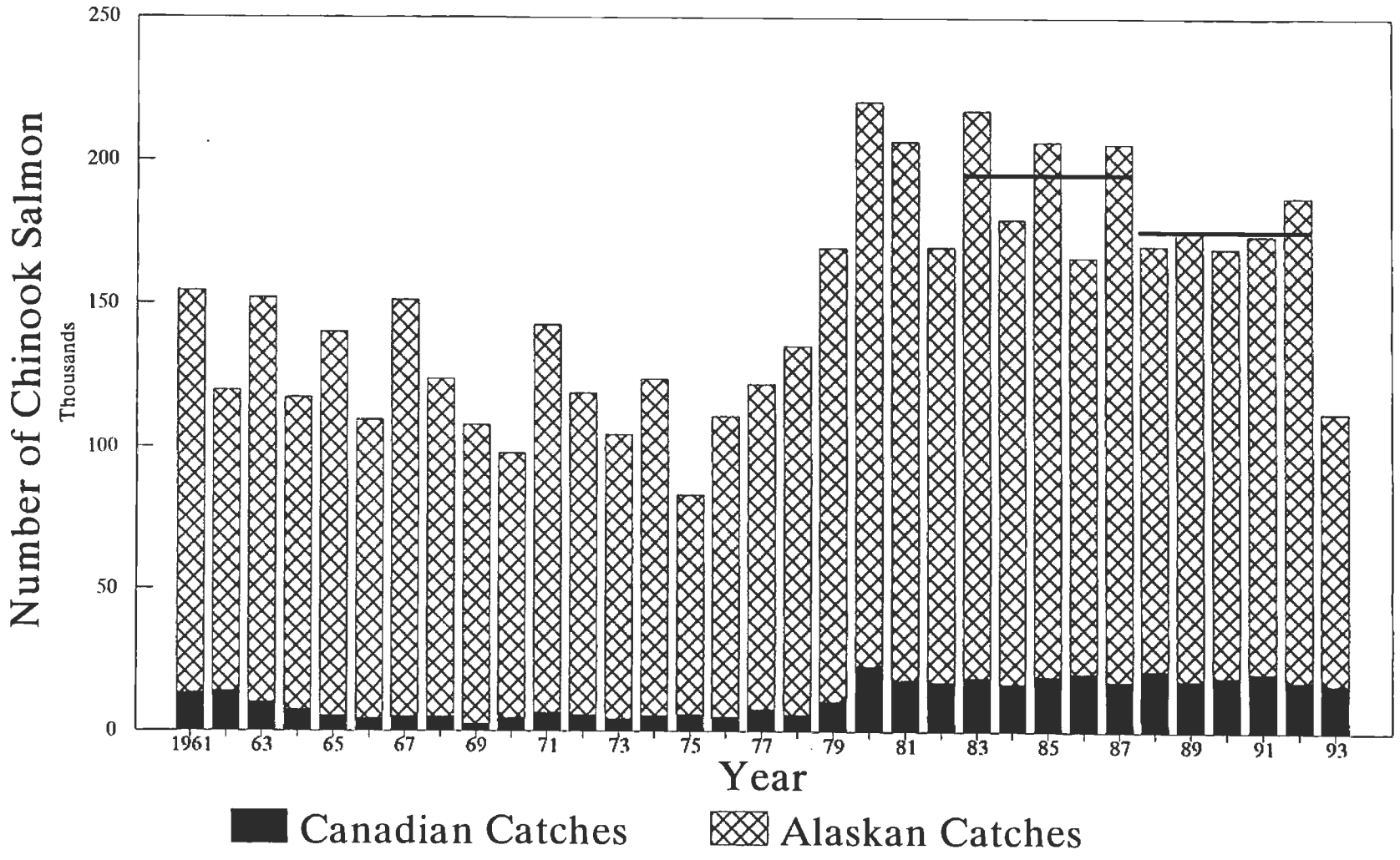
Appendix Table 13. Coho salmon escapement counts for selected spawning areas in the Yukon River drainage, 1972–1993.[a]

Year	Andreafsky River		Anvik River	Kantishna River		Nenana River Drainage				Delta Clearwater River[d,f]	Clearwater Lake and Outlet	Richardson Clearwater River
	East Fork	West Fork		Geiger Creek	Barton Creek	Lost Slough	Nenana Mainstem[b]	Wood Creek[c]	17–Mile Slough			
1972										630	417	454 [h]
1973										3,322	551 [d]	375 [d]
1974						1,388			27	3,954 [g]	560	652 [d]
1975						943			956	5,100	1,575 [d,f]	4 [h]
1976			467 [h]	25 [j]		118			281	1,920	1,500 [d,f]	80 [h]
1977			81 [h]	60		524		310 [j]	1,167	4,793	730 [d,f]	327
1978						350		300 [j]	466	4,798	570 [d,f]	
1979						227			1,987	8,970	1,015 [d,f]	372
1980				3 [j]		499		1,603 [j]	592	3,946	1,545 [d,f]	611
1981	1,657 [h]					274		849 [k,n]	1,005	8,563 [m]	459 [h]	550
1982				81 [j]				1,436 [k,n]		8,365 [m]		
1983				42 [j]		766		1,042 [k]	103	8,019 [m]	253	88
1984				20		2,677		8,826 [k]		11,061	1,368	428
1985				42		1,584		4,470 [k]	2,081	5,358	750	
1986				5 [j]	496	794		1,664 [k]	218 [c,f]	10,857	3,577	146 [h]
1987				1,175 [j]		2,511		2,387 [k]	3,802	22,300	4,225 [d,f]	
1988	1,913	830	1,203	159 [j]	437	348		2,046 [k]		21,600	825 [d,f]	
1989				155 [j]	12 [h]			412 [k]	824 [h]	11,000	1,600 [d,f]	483
1990				211 [j]		688	1,308		15 [h]	8,325	2,375 [d,f]	
1991				427 [j]	467 [h]	564	447		52	23,900	3,150 [d,f]	
1992				77 [j]	55 [h]	372			490	3,983	229 [d,f]	500 [d]
1993 [r]				138 [j]	141			666 [k,p]		10,875	3,525 [d,f]	
E.O.[s]										>9,000		

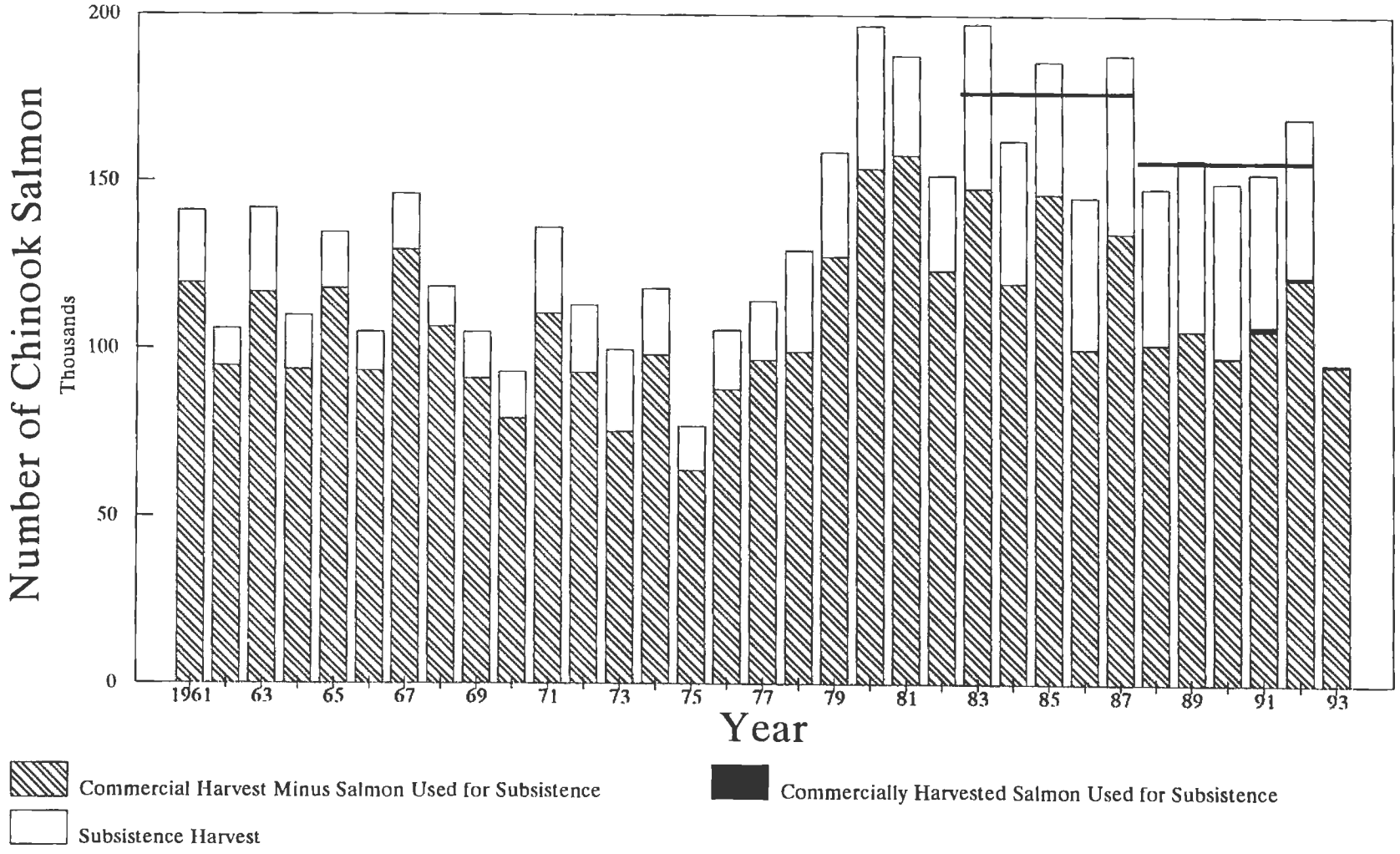
[a] Only peak counts presented. Survey rating is fair to good, unless otherwise noted. Latest table revision: November 10, 1993.
[b] Mainstem Nenana River between confluences of Lost Slough and Teklanika River.
[c] Surveyed by F.R.E.D.
[d] Surveyed by Sport Fish Division.
[f] Boat survey.
[g] Aerial survey.
[h] Poor survey.
[j] Foot survey.
[k] Weir count.
[m] Expanded estimate based on partial survey counts and historic distribution of spawners from 1977–1980.
[n] Coho weir was operated at the mouth of Clear Creek (Shores Landing).
[p] Weir project terminated on October 4. Weir normally operated until mid to late October.
[r] Preliminary.
[s] Interim escapement objective established March, 1993.



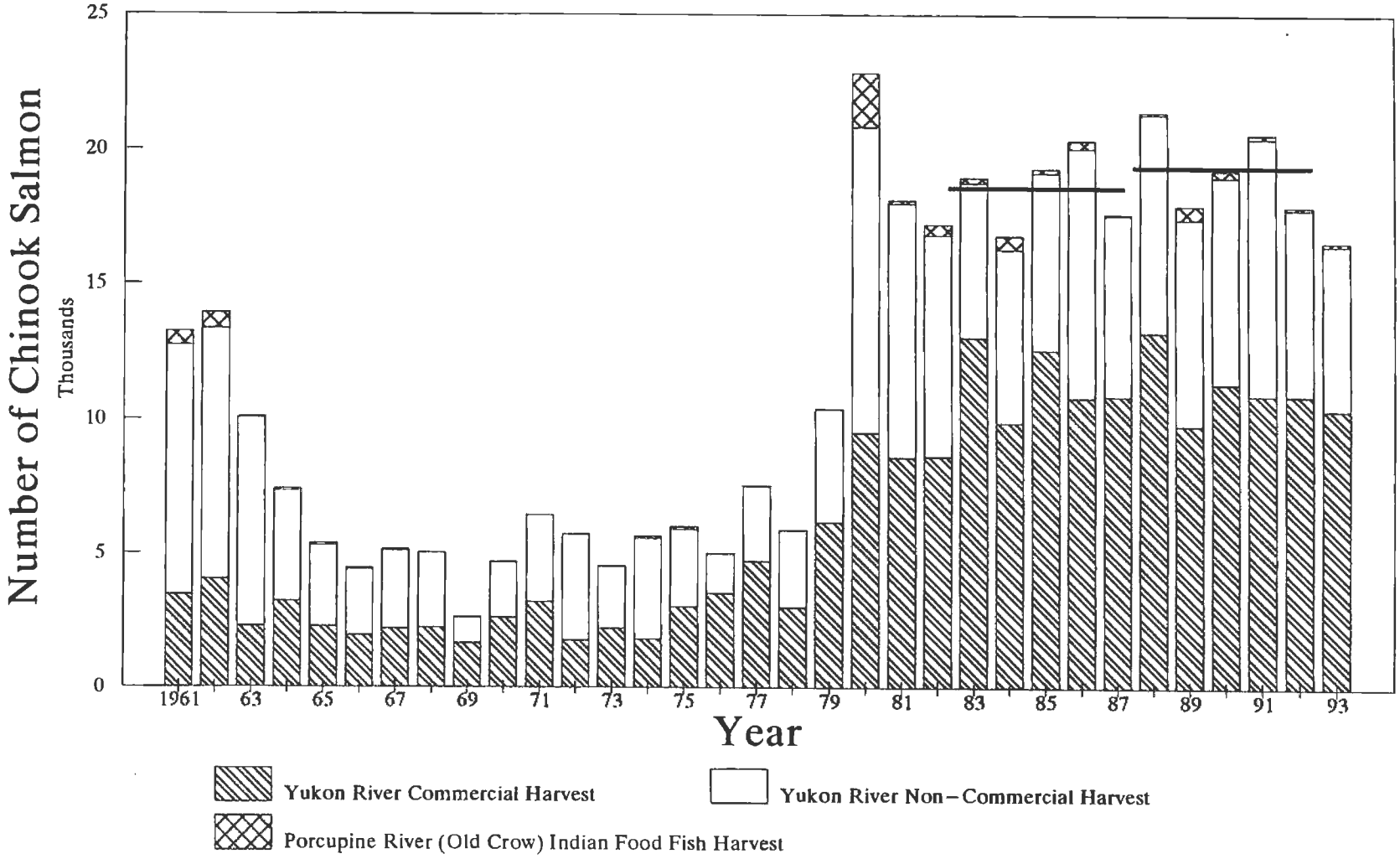
Appendix Figure 1. Total utilization of chinook, chum, and coho salmon, Yukon River, 1900–1993. The 1993 Alaskan harvest only includes commercial catch data.



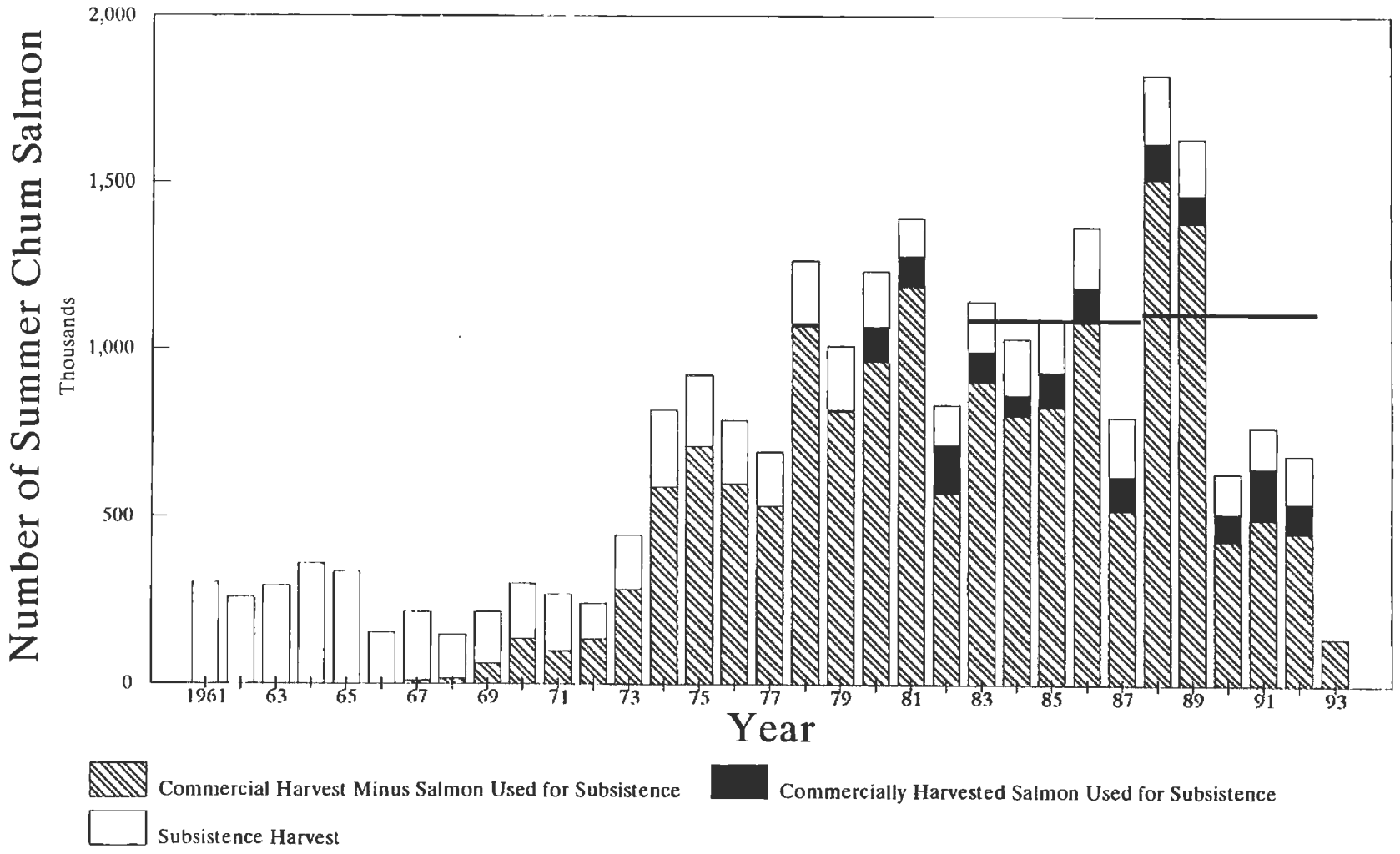
Appendix Figure 2. Total utilization of chinook salmon, Yukon River, 1961–1993. The 1993 Alaskan harvest only includes commercial catch data. Horizontal lines indicate 5–year average harvests.



Appendix Figure 3. Alaskan harvest of chinook salmon, Yukon River, 1961–1993. The 1993 harvest only includes commercial catch data. Horizontal lines indicate 5–year average harvests.



Appendix Figure 4. Canadian harvest of chinook salmon, Yukon River, 1961–1993. Horizontal lines indicate 5–year average harvests.



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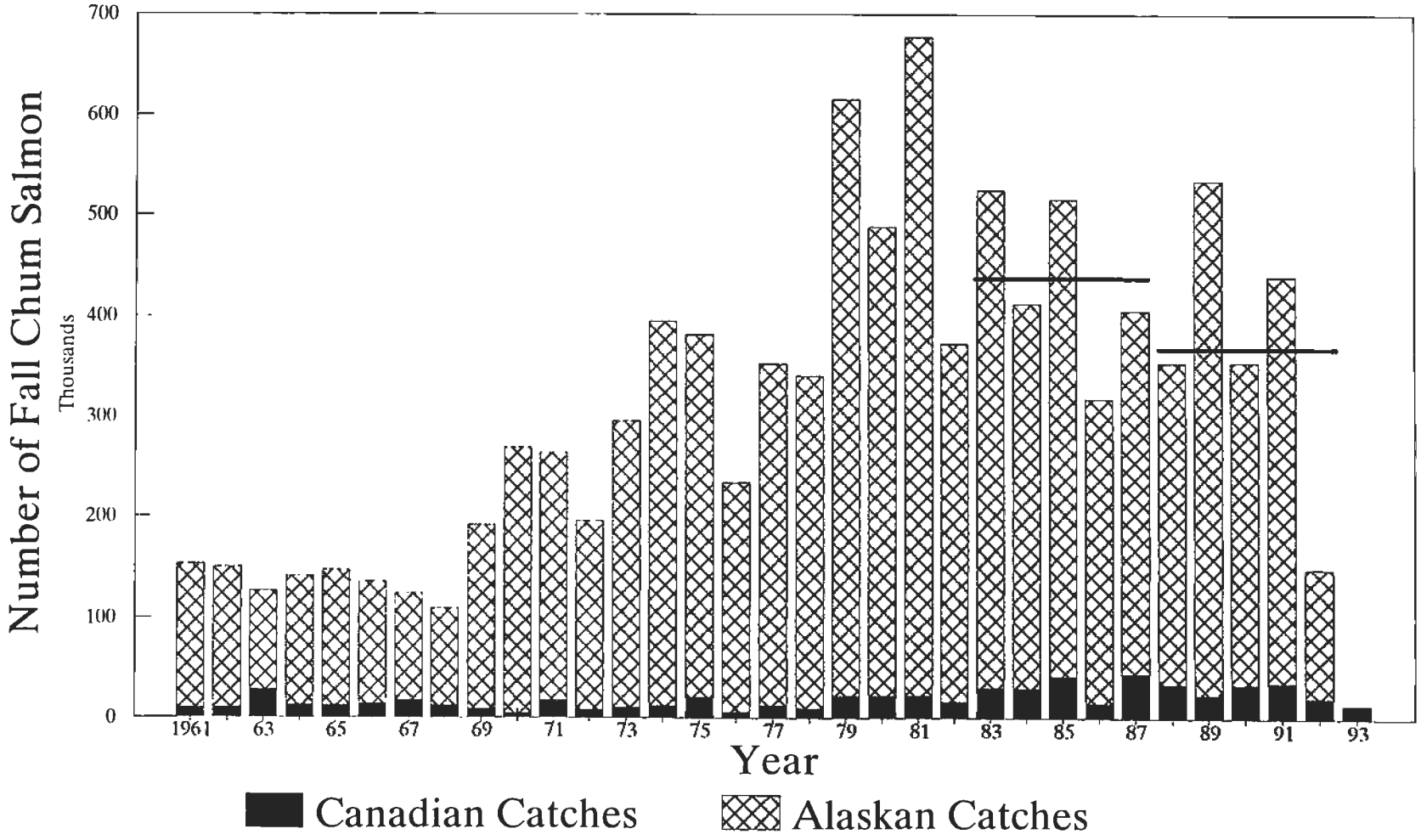
Appendix Figure 5. Alaskan harvest of summer chum salmon, Yukon River, 1961–1993. The 1993 harvest only includes commercial catch data. Horizontal lines indicate 5–year average harvests.

23–Nov–93



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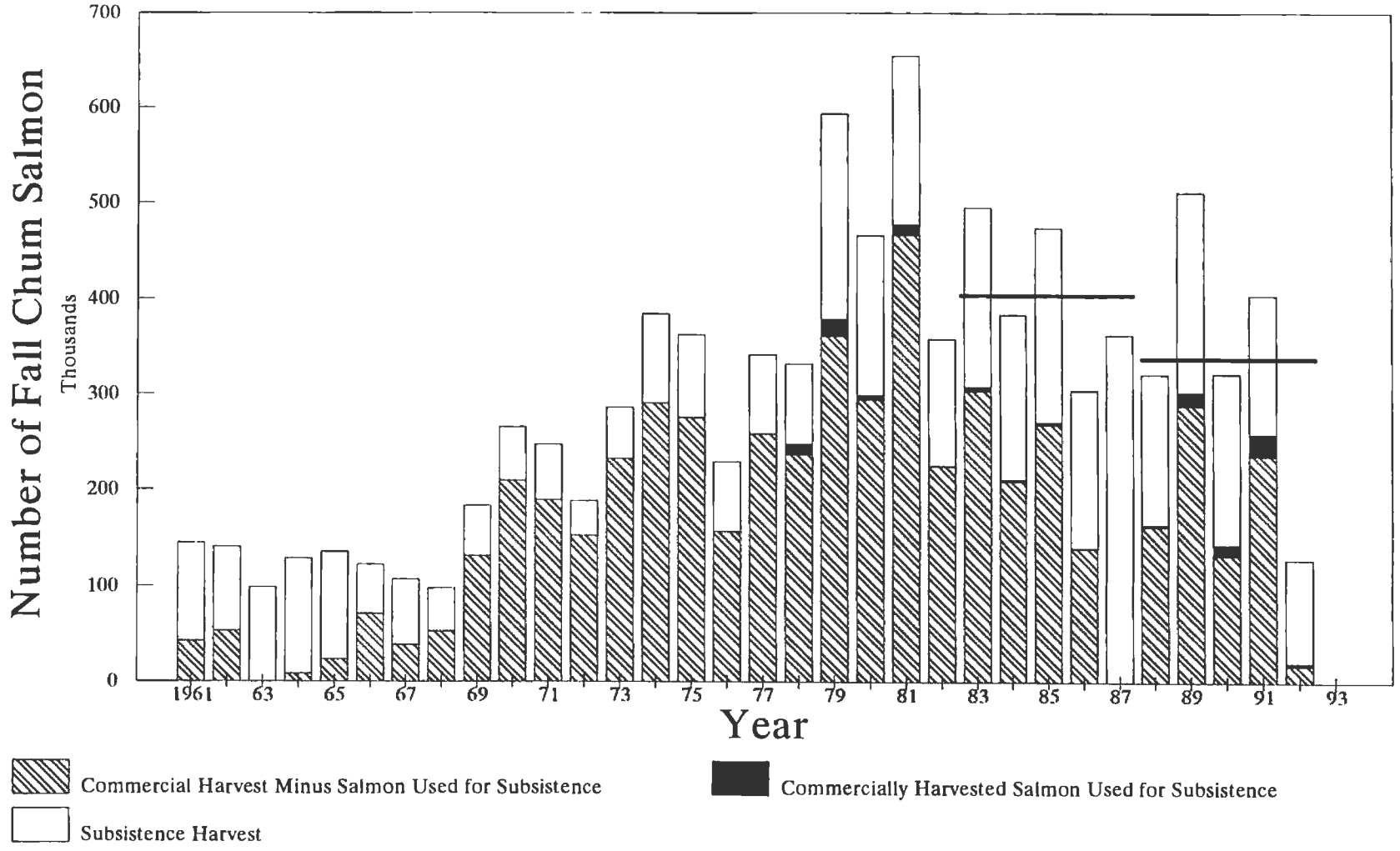
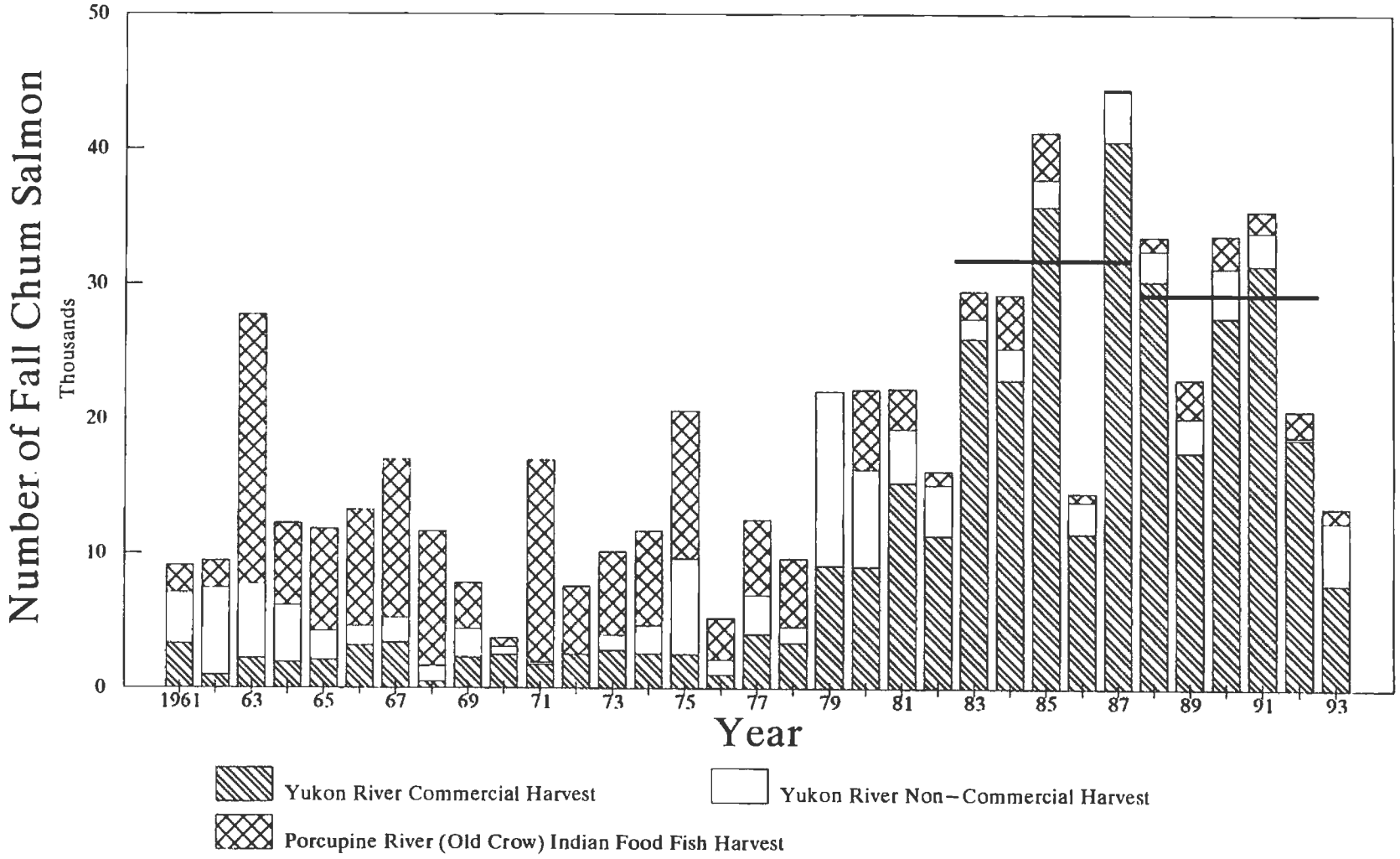
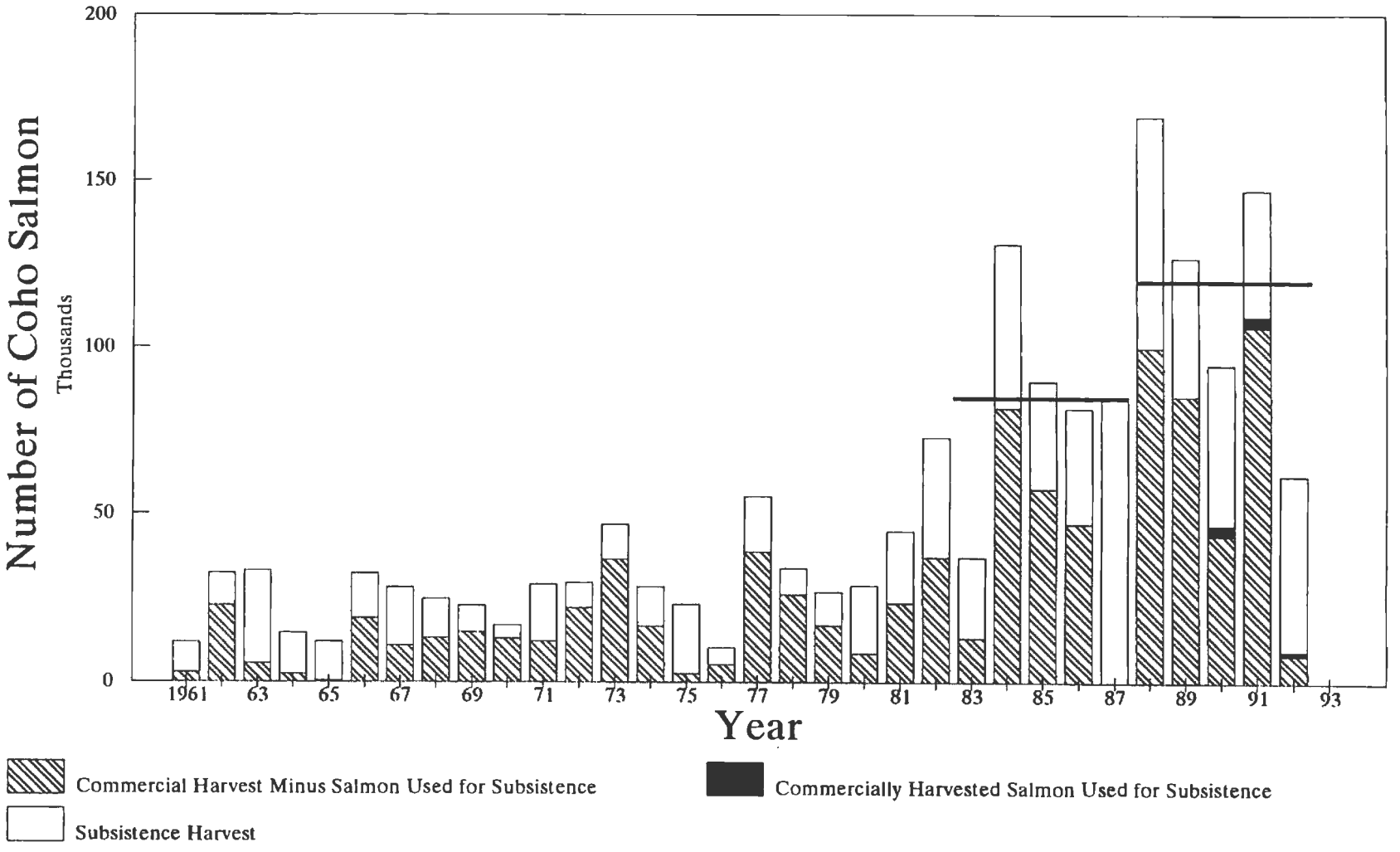
Appendix Figure 6. Total utilization of fall chum salmon, Yukon River, 1961–1993. The 1993 Alaskan harvest only includes commercial catch data. Horizontal lines indicate 5–year average harvests.



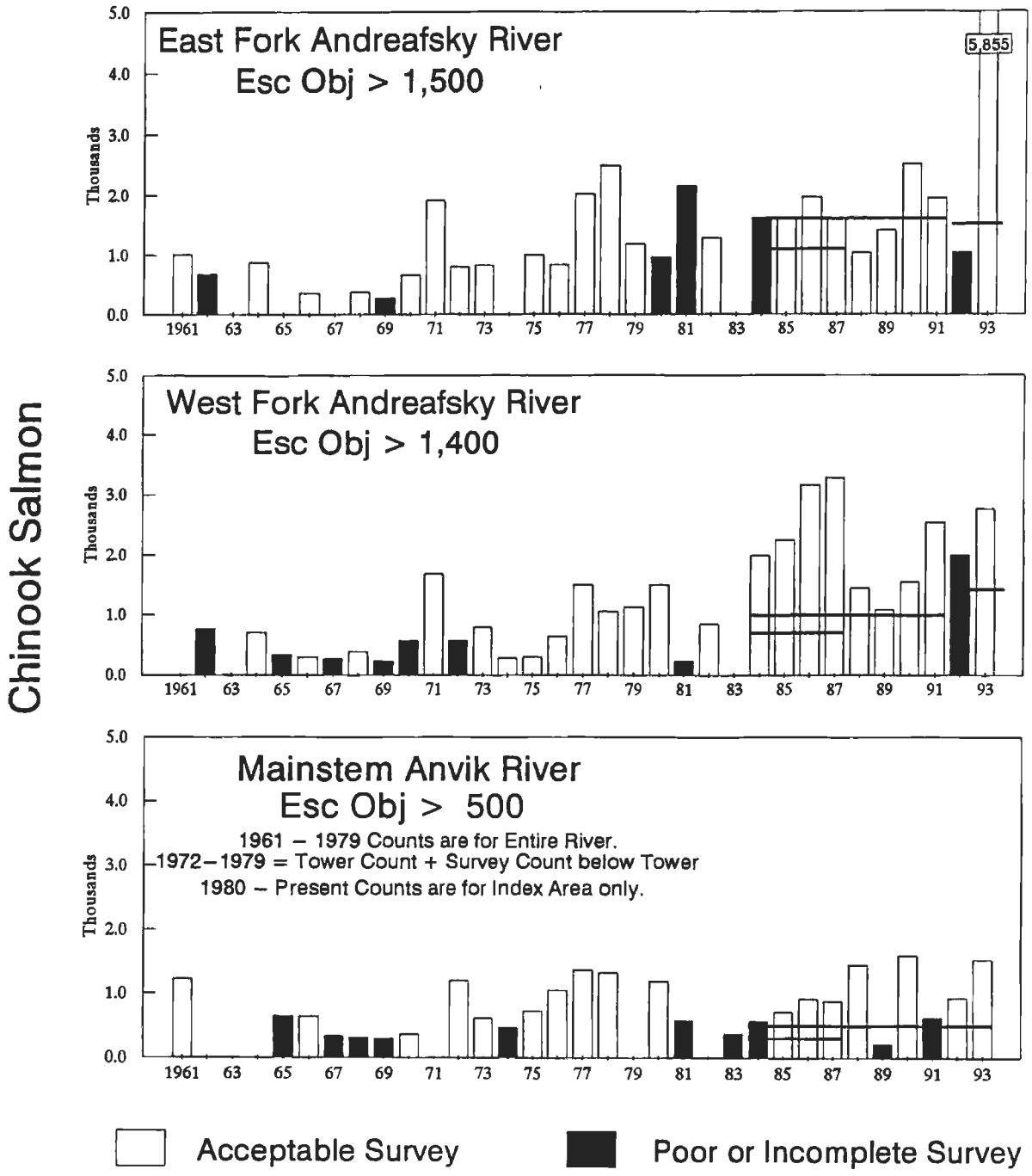
Appendix Figure 7. Alaskan harvest of fall chum salmon, Yukon River, 1961–1993. The 1993 harvest only includes commercial catch data. Horizontal lines indicate 5–year average harvests.



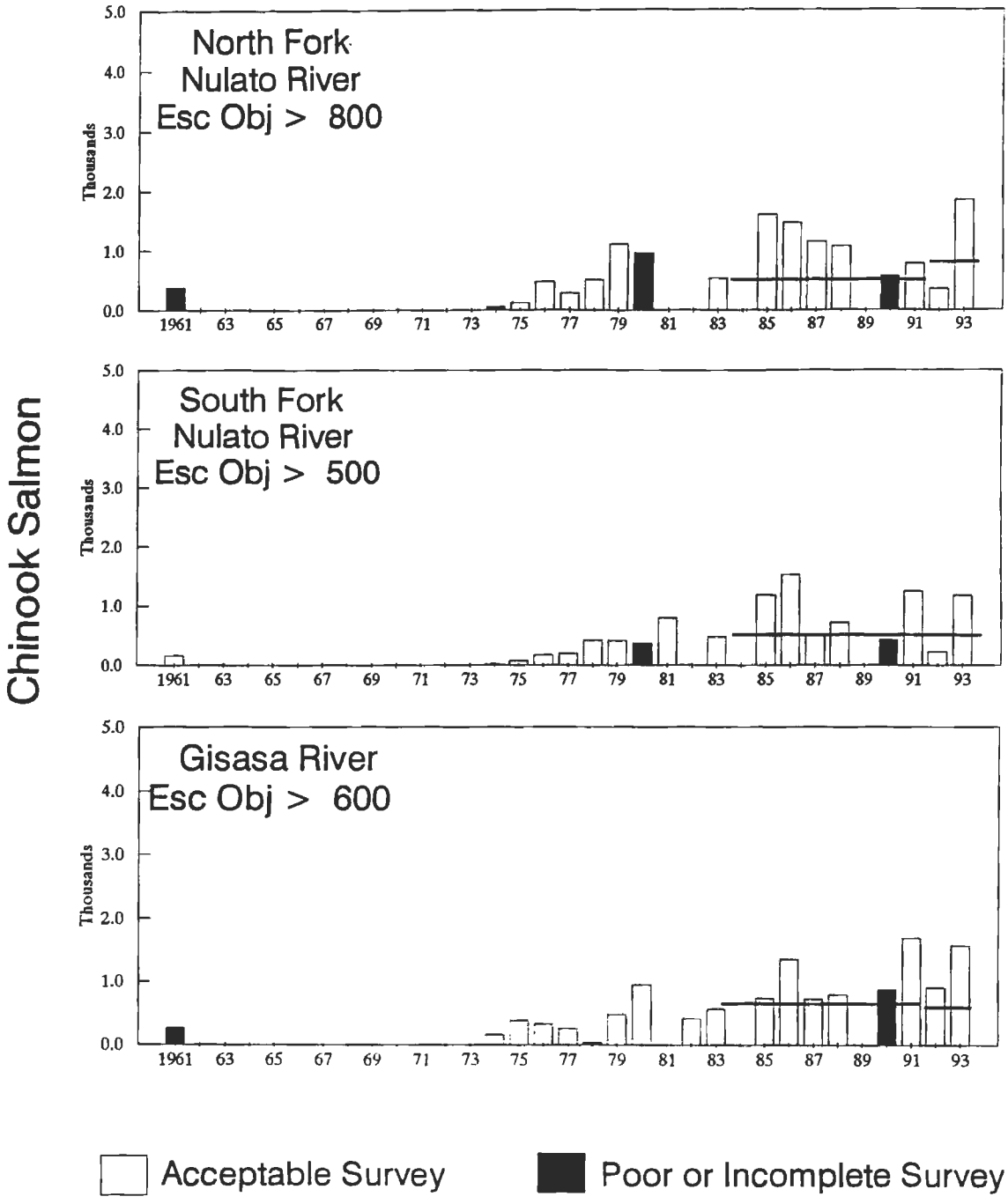
Appendix Figure 8. Canadian harvest of fall chum salmon, Yukon River, 1961–1993. Horizontal lines indicate 5–year average harvests.



Appendix Figure 9. Alaskan harvest of coho salmon, Yukon River, 1961–1993. The 1993 harvest only includes commercial catch data. Horizontal lines indicate 5–year average harvests.



Appendix Figure 10. **Chinook salmon escapement counts for selected spawning areas in the Alaskan portion of the Yukon River drainage, 1961–1993. Horizontal lines represent interim escapement objectives.**



Appendix Figure 10. (Page 2 of 3).

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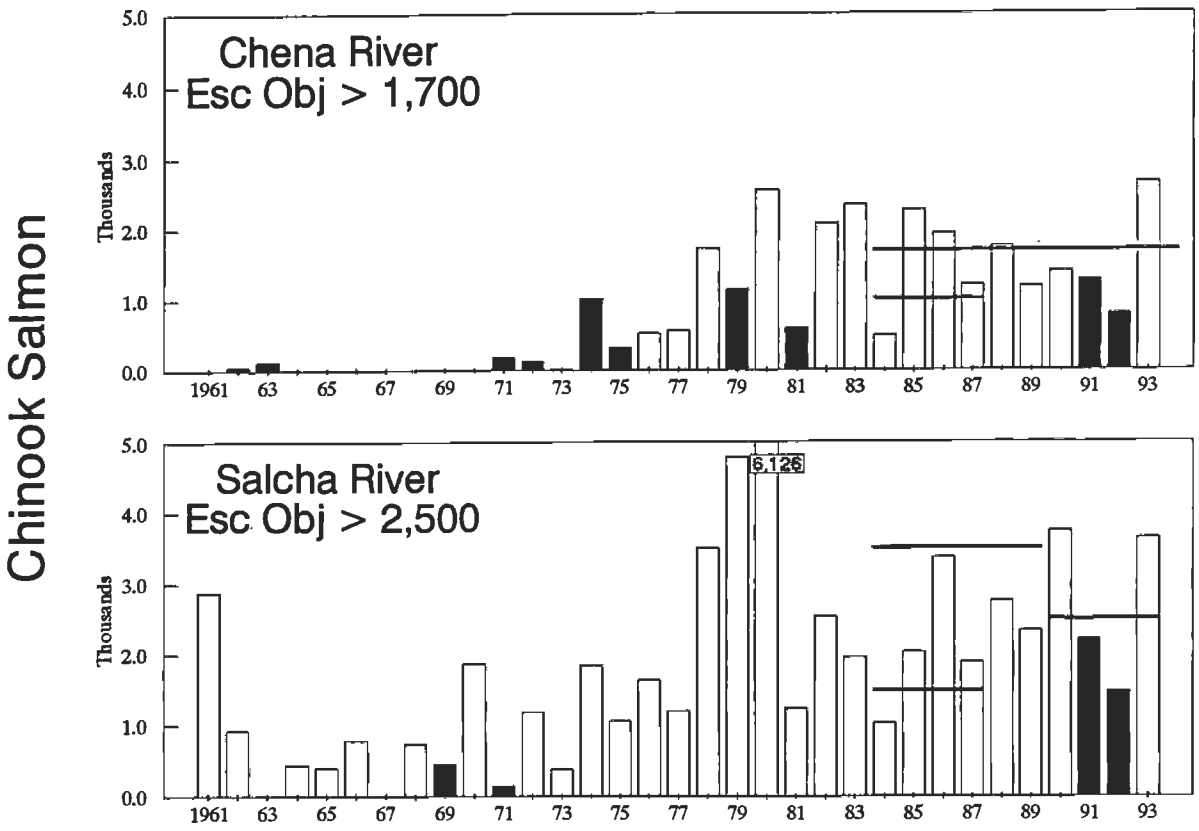
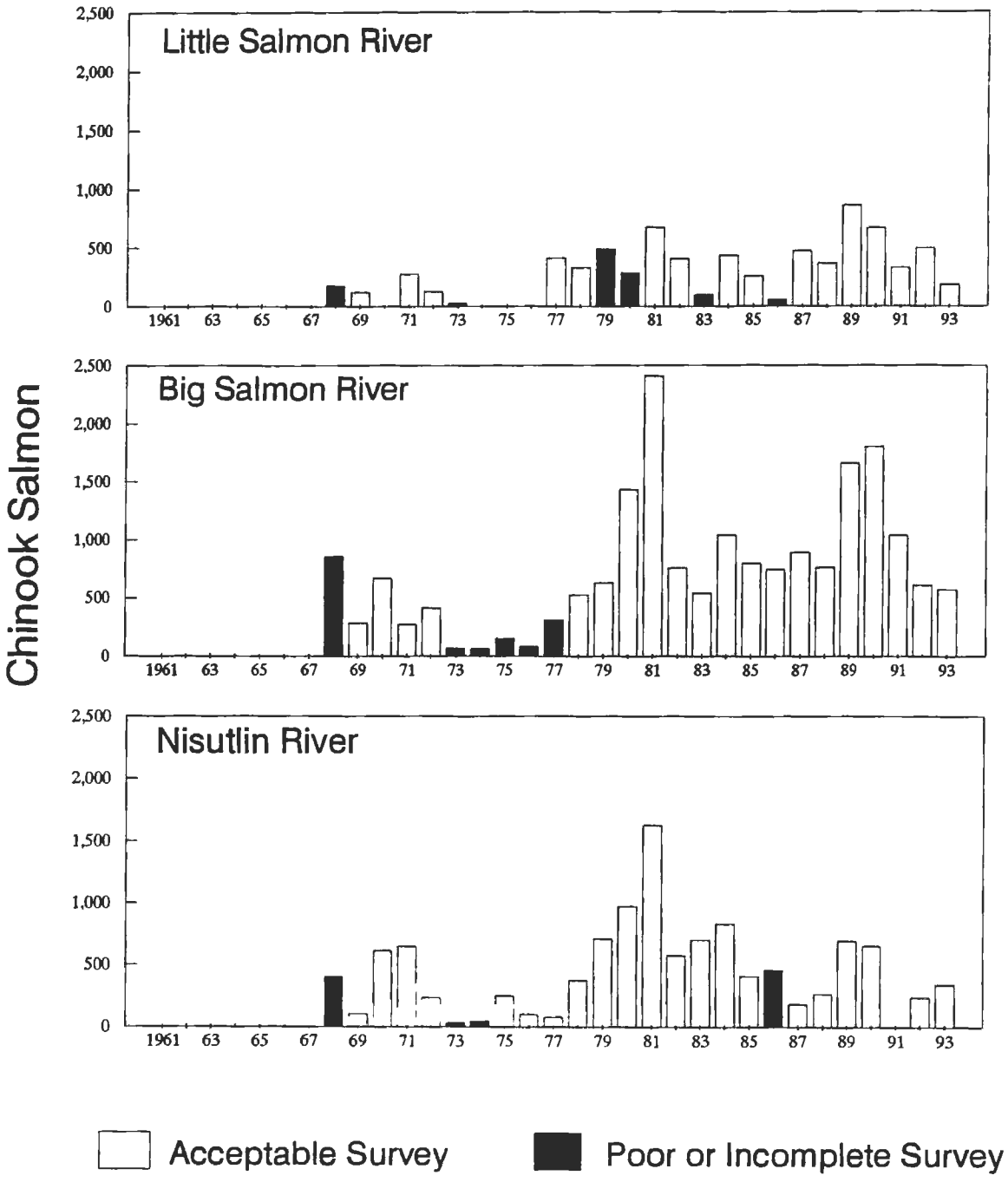
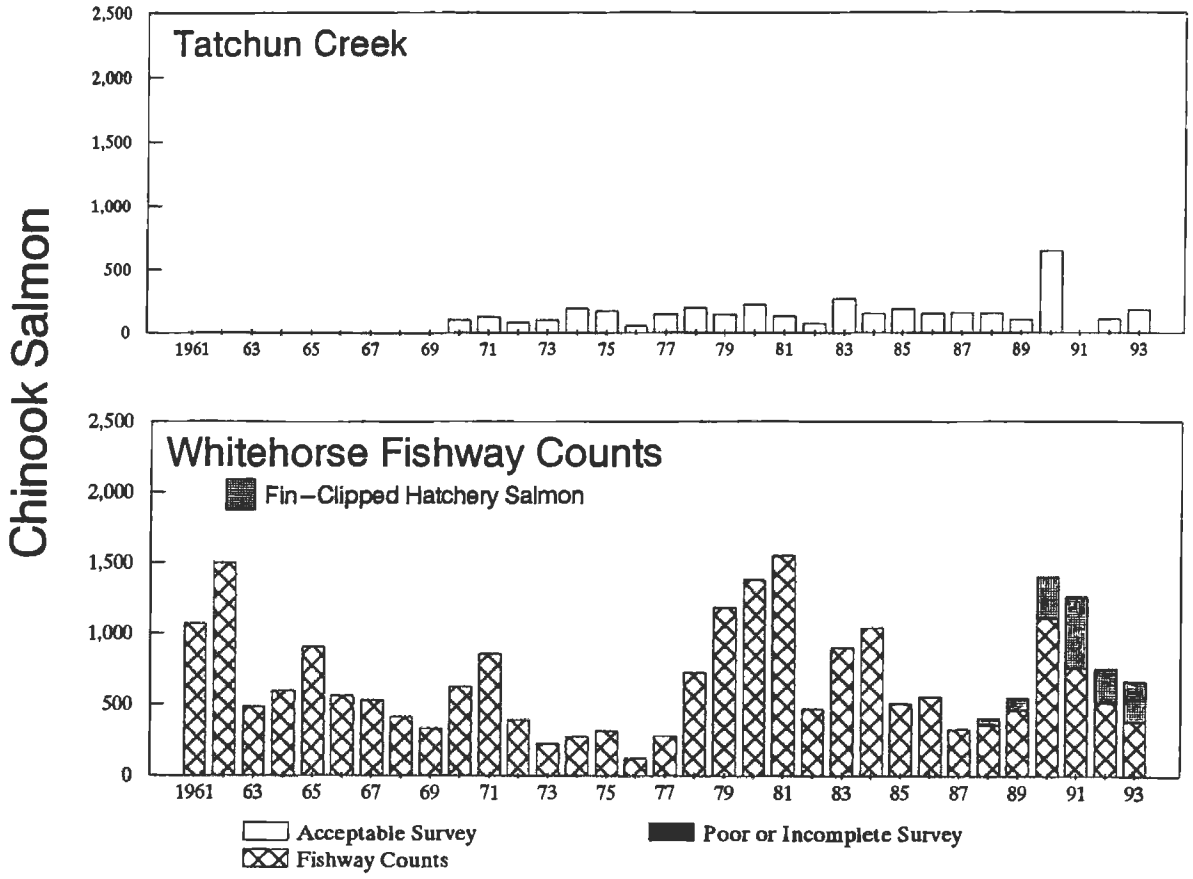
09-Nov-93



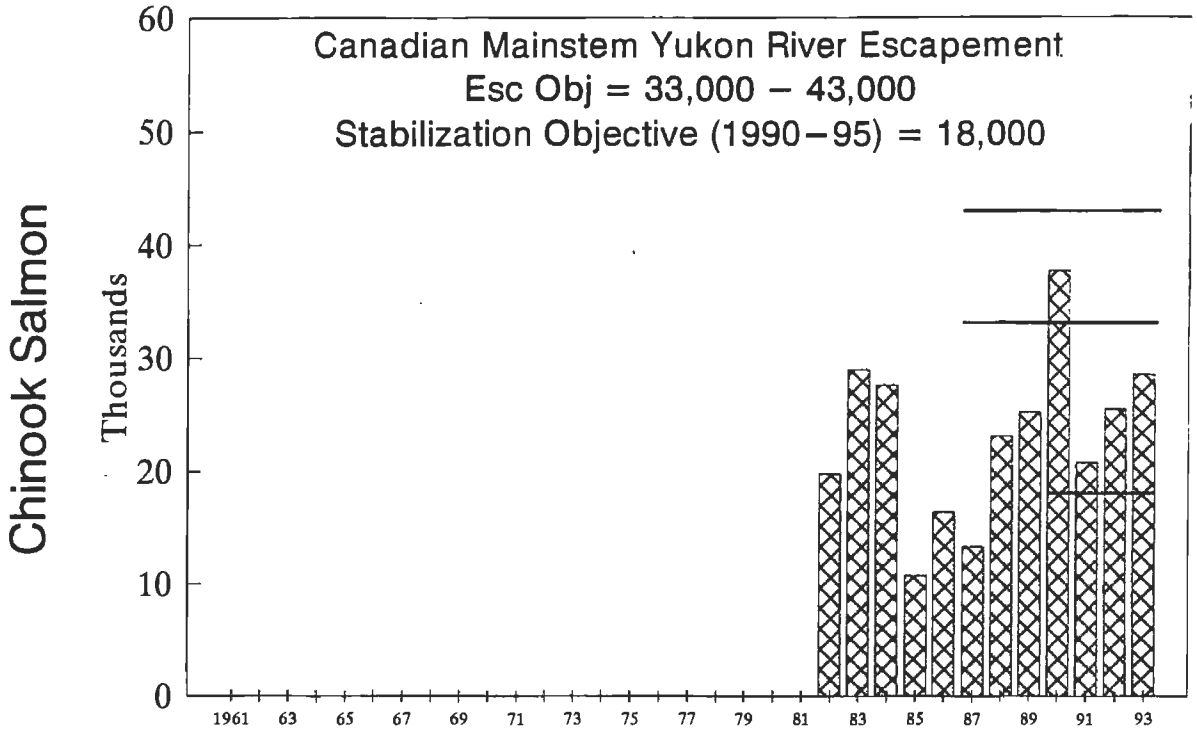
Appendix Figure 10. (Page 3 of 3).



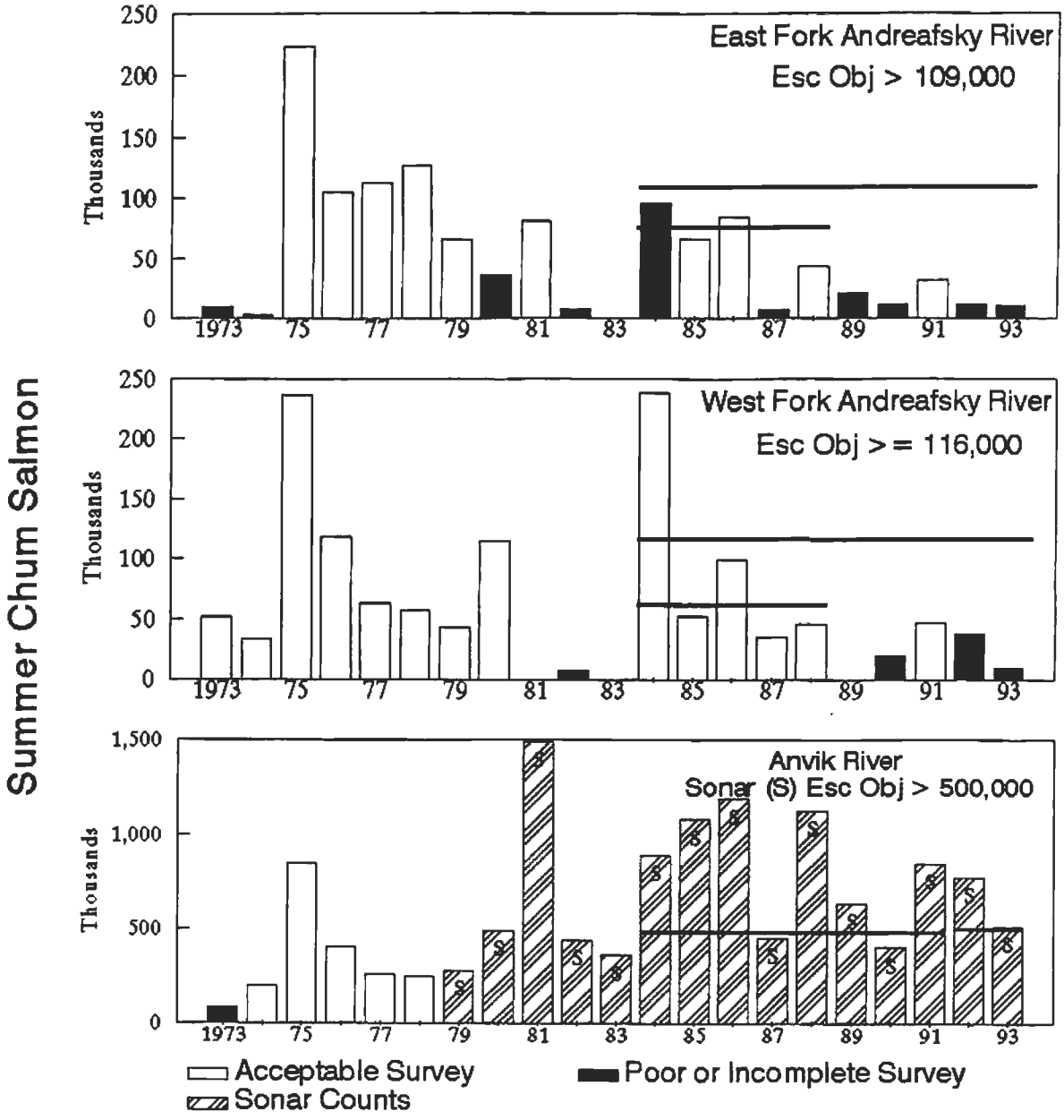
Appendix Figure 11. **Chinook salmon escapement counts for selected spawning areas in the Canadian portion of the Yukon River drainage, 1961–1993.**



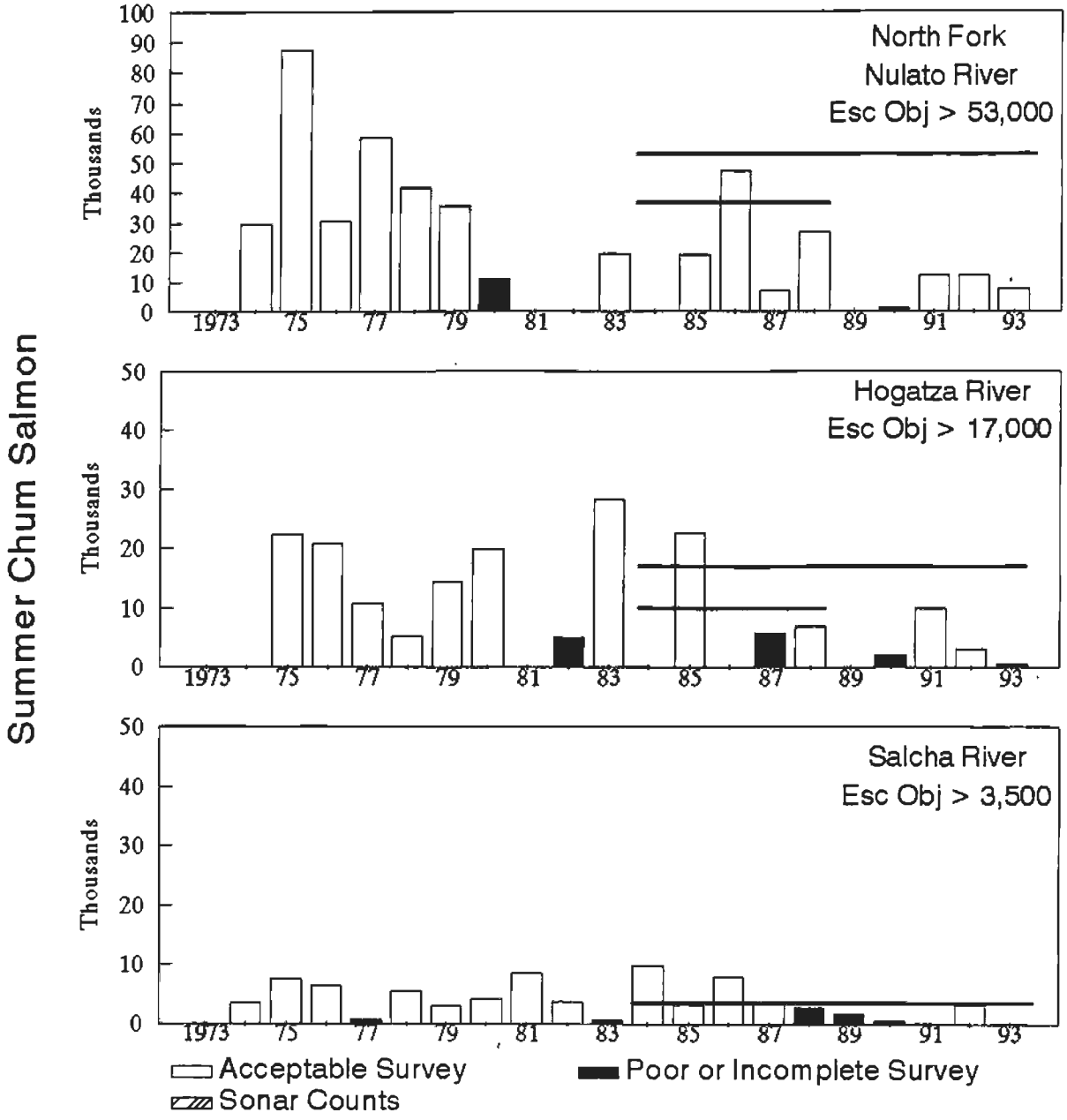
Appendix Figure 11. (page 2 of 2).



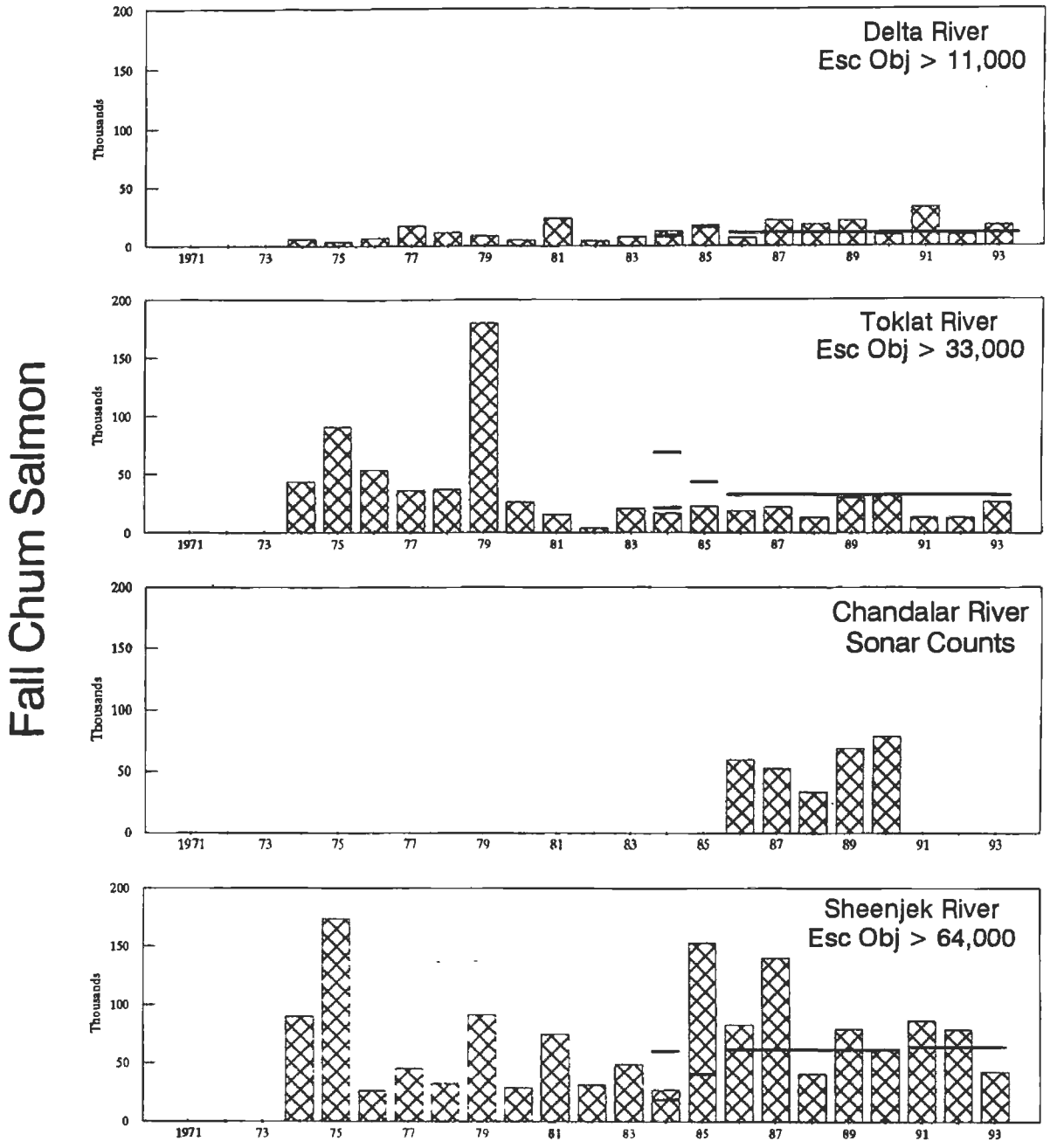
Appendix Figure 12. **Estimated total chinook salmon escapement to the Canadian portion of the mainstem Yukon River, 1982–1993. Horizontal lines represent the interim escapement objective range, 33,000–43,000 salmon, and the stabilization objective, 18,000 salmon.**



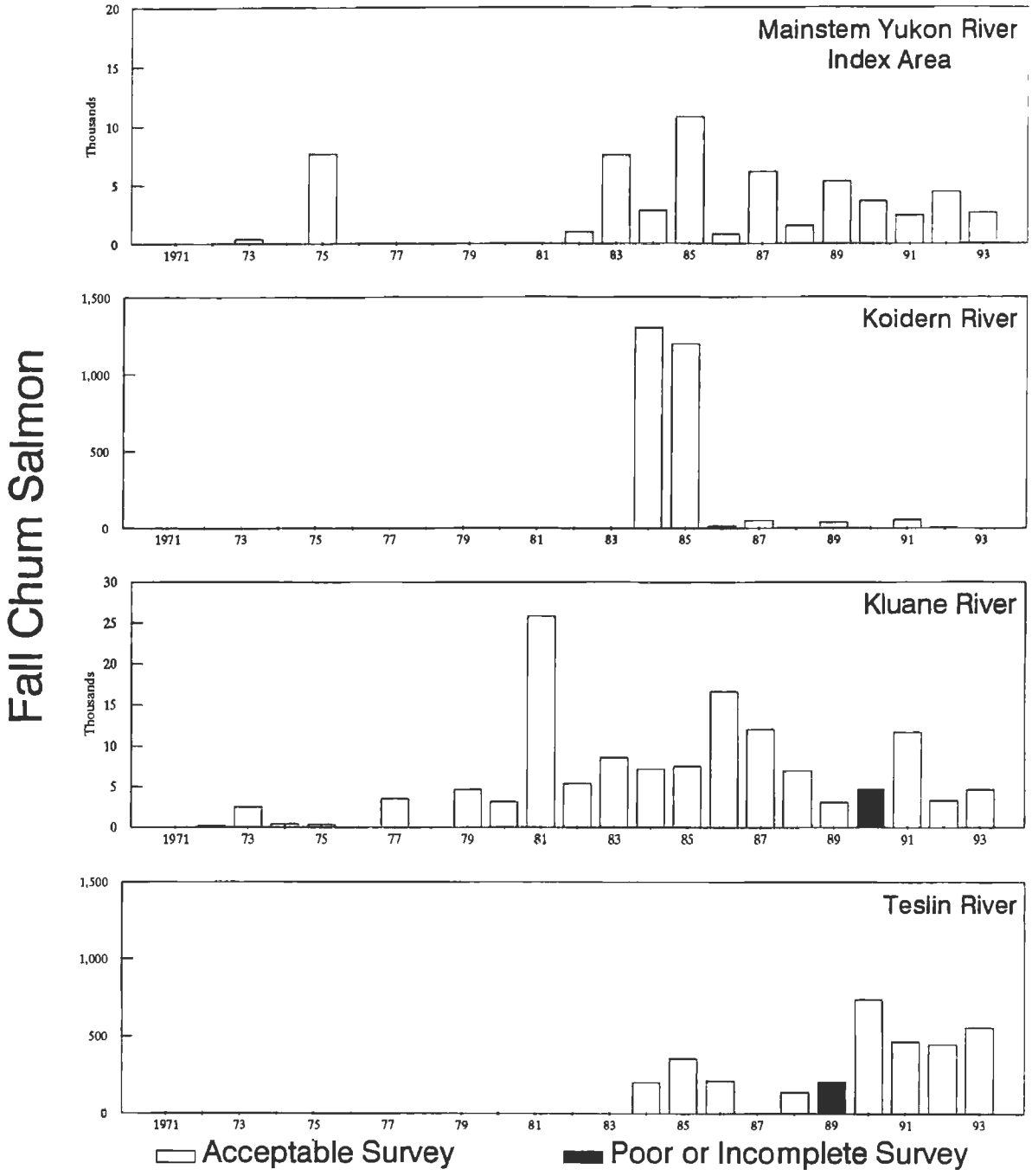
Appendix Figure 13. **Summer chum salmon escapement counts for selected spawning areas in the Yukon River drainage, 1973–1993. Horizontal lines represent interim escapement objectives.**



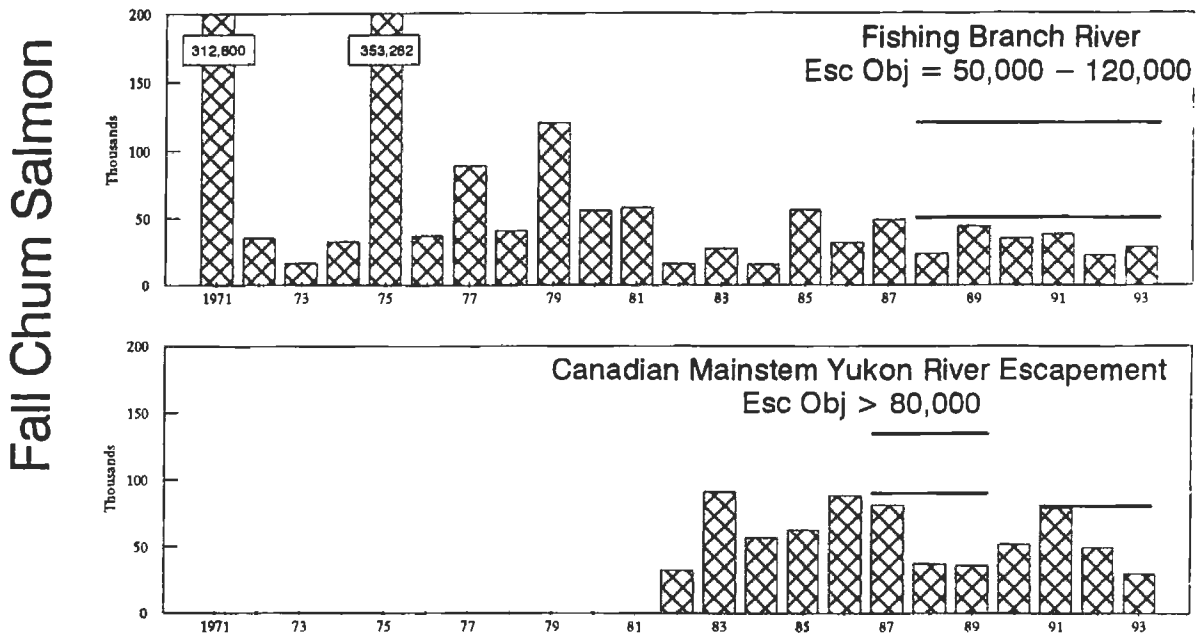
Appendix Figure 13. (page 2 of 2).



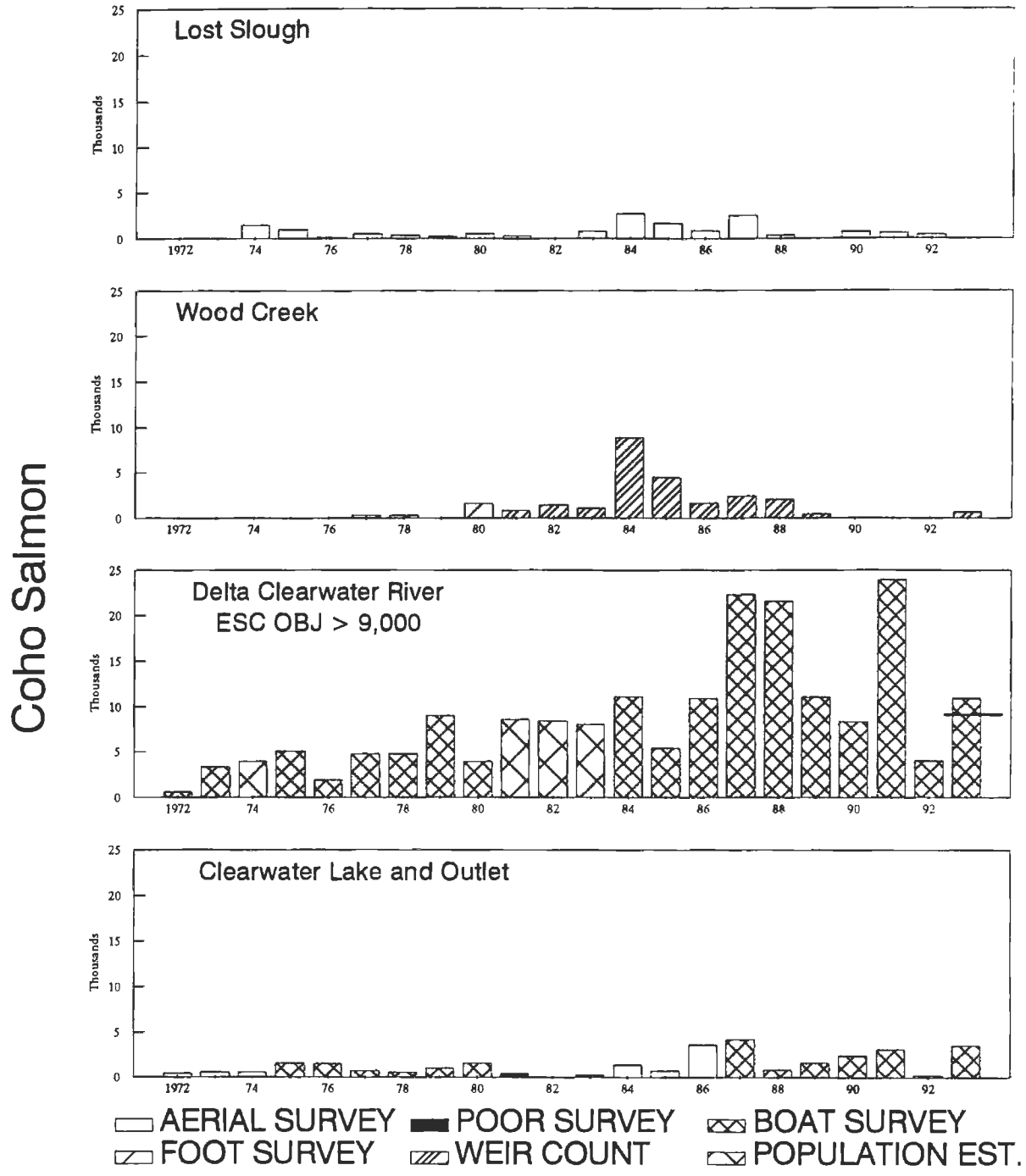
Appendix Figure 14. Fall chum salmon escapement estimates for selected spawning areas in the Alaskan portion of the Yukon River drainage, 1971–1993. Horizontal lines represent interim escapement objectives.



Appendix Figure 15. Fall chum salmon escapement counts for selected spawning areas in the Canadian portion of the Yukon River drainage, 1971–1993. Note that Y–axis scale is variable.



Appendix Figure 16. Fall chum salmon escapement estimates for spawning areas in the Canadian portion of the Yukon River drainage, 1971–1993. Horizontal lines represent interim escapement objectives.



Appendix Figure 17. Coho salmon escapement counts for selected spawning areas in the Yukon River drainage, 1972–1993. Horizontal line indicates the interim escapement objective.

ATTACHMENT II
MARINE FISHERIES INFORMATION

ATTACHMENT II. MARINE FISHERIES INFORMATION

1.0 INTRODUCTION

Yukon River salmon migrate as juveniles out of the river and into the Bering Sea. Where they go once they enter the ocean is only partly understood, but evidence from tagging studies and the analysis of scale patterns indicate that these salmon spread throughout the Bering Sea, some move considerably south of the Aleutian Island chain into the Gulf of Alaska and North Pacific Ocean, and some move north into the Chukchi Sea (Figures 1 and 2). While in the ocean, they mix with salmon stocks from Asia and elsewhere in North America. Figure 3 shows the general ocean migration patterns for immature and maturing Asian and North American chum salmon.

While in the ocean, some of these salmon are caught by commercial fisheries that take place in marine waters. In 1993, marine commercial fisheries with a bycatch that likely included some Yukon River salmon included: (1) the U.S. groundfish trawl fisheries in the Bering Sea-Aleutian Islands area and in the Gulf of Alaska, and (2) the purse seine and gill net salmon fishery in the South Alaska Peninsula ("False Pass") area. Other commercial fisheries which operate in marine waters of the Bering Sea and Gulf of Alaska where Yukon River salmon occur, but which catch few, if any, salmon include: (1) the U.S. longline fisheries for Pacific halibut, Pacific cod, and other groundfish, (2) the U.S. pot fisheries for Pacific cod and other groundfish, and Dungeness, king, and Tanner crab, and (3) the U.S. purse seine and gillnet fisheries for Pacific herring.

Until 1992, five large commercial fisheries in the ocean caught large numbers of salmon, some of which were likely Yukon River salmon. However, under international agreements, those fisheries no longer operate. They were (in order of decreasing salmon catches): (1) the Japanese high-seas mothership and land-based salmon gill net fisheries; (2) the high-seas squid gillnet fisheries in the North Pacific Ocean of Japan, the Republic of Korea, and the Republic of China (Taiwan); (3) the foreign groundfish fisheries of the Bering Sea and Gulf of Alaska, (4) the joint-venture groundfish fisheries of the Bering Sea and the Gulf of Alaska, and (5) the groundfish trawl fishery by many nations in the international waters area of the Bering Sea ("the Doughnut Hole").

As has been noted in the past, a small commercial salmon gill net fishery operates in subdistricts at various river mouths in Norton Sound, and is managed by the Alaska Department of Fish and Game and the Alaska Board of Fisheries. A small portion of the chinook and chum salmon caught in the southern subdistricts may be bound for the Yukon River. In 1993, the commercial catch of chinook and chum salmon for all of the Norton Sound subdistricts combined totaled 8,800 chinook and 34,000 chum salmon.

Chum salmon run failures were evident in 1993 across a broad region of Alaska, including the Yukon River in Alaska and Canada. While the causes for the production failures are not known, some attention has focused on the marine environment because of the broad scope of the production failures. There has been speculation as to whether marine competition among chum

salmon may be a factor, especially considering the magnitude of the chum salmon fry releases from the Japanese hatchery program. Figure 4 shows the release of chum salmon fry and the adult chum salmon returns by year since 1965 for the Japanese hatchery program. Chum salmon fry releases increased steadily until 1980, at which point they stabilized at approximately 2 billion per year. Adult chum salmon returns increased steadily until 1990, after which point they have declined. Preliminary information for 1993, not shown on this figure, indicate a return of about 50 million is likely, which is still well below the peak of nearly 70 million in 1990.

2.0 BERING SEA AND GULF OF ALASKA GROUNDFISH FISHERY

2.1 History and Management of the Groundfish Fishery

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

In general, the groundfish fisheries of the Gulf of Alaska are managed and regulated separately from those in the Bering Sea-Aleutian Islands area. Both major areas contain a number of smaller regulatory areas, which are numbered. The groundfish fisheries east of 170° west longitude and north of the Alaska Peninsula are considered to be in the Bering Sea-Aleutian Islands Area (Figure 5). The groundfish fisheries operating in waters south of the Alaska Peninsula and east of 170° west longitude are considered to be in the Gulf of Alaska Area (Figure 6).

The U.S. groundfish fishery off the coast of Alaska expanded rapidly during the last 15 years (Figure 7a). In 1977, the year after the Magnuson Act went into effect, the U.S. groundfish harvest off Alaska amounted to only 2,300 metric tons (mt, 1 mt = 2,025 pounds), or only 0.2% of the total groundfish harvest off Alaska by all nations. Most of that U.S. catch was Pacific halibut caught with hook-and-line gear.

The Magnuson Act, which claimed exclusive fishery jurisdiction by the United States of waters to a distance 200 nautical miles seaward from the coast, allowed the U.S. to gradually replace the foreign groundfish fisheries by "joint-venture" fisheries, in which U.S. fishermen caught the fish and delivered them at sea to foreign fish processing vessels. The joint-venture fishery, in turn, was replaced by an entirely U.S. fishery. Figure 7b shows how the U.S. domestic groundfish harvest gradually replaced the directed foreign and joint-venture groundfish harvests (also see Table 1). The estimated ex-vessel value of the Alaska groundfish fisheries from 1984 through 1993 by the foreign, joint-venture, and U.S. fleets is given in Table 2.

The U. S. groundfish fisheries use basically three types of fishing gear: trawls, hook-and-line, and pots. In 1993, 1,556 vessels landed groundfish caught off Alaska. Of these, 1,210 used hook-and-line gear, 272 used trawls, 117 used pots, and 10 used other gear (e.g., jigs, seine).

Table 3 summarizes the number of vessels that landed groundfish by gear type in the two areas from 1986 to 12 June 1993. Table 4 summarizes the number of vessels by length within each type of fishing gear from 1986 to 12 June 1993.

2.2 The Observer Program

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

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

The amount of observer coverage is usually related to the length of the vessel or the amount of fish processed by a shoreside plant or mothership processing vessel. Groundfish harvesting vessels having a length of 125 feet or more are required to carry observers at all times when they are participating in the fishery. Vessels with lengths between 60 through 124 feet are required to carry observers during 30 percent of their fishing days during trips when they fish more than 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 must be trained and certified. Individuals wanting to become observers should have a Bachelor's Degree in fisheries or wildlife, although individuals with an Associate in Arts Degree are considered if too few individuals with Bachelor's 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 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.

2.3 Estimated Catch of Salmon in the Groundfish Fisheries

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

NMFS scientists then use the number of salmon of each species caught in each haul sampled, the weight of groundfish caught in each haul sampled, and the total weight of groundfish harvested during the sampling period to estimate the total number of salmon of each species caught by the entire groundfish fleet. Table 5 presents a summary of the estimated numbers of chinook and other salmon caught by the U.S. groundfish fisheries from 1990 through November 1993. Table 5 indicates that the number of salmon caught by the groundfish fisheries varies considerably by species of salmon, by year, and between the Bering Sea-Aleutian Islands Area and the Gulf of Alaska. For the most part, chinook and chum salmon make up most of the catch, with coho a distant third, and sockeye and pink salmon minor components. In general, the number of salmon caught by the U.S. groundfish fishery has increased between 1990 and 1993.

In 1993, the catch of salmon in the Bering Sea-Aleutian Islands area jumped several fold, mostly because of the catch of salmon other than chinook salmon. The total estimated catch went from 30,502 in 1990, to 66,997 in 1991, and to 76,651 in 1992 (for an average during the years 1990 through 1992 of 58,050) to a high of 282,051 in 1993. The 1993 chinook salmon catch was 39,547, up from an average for the years 1990 through 1992 of 28,925. Although the NMFS Observer Program has not yet been able to determine how many of each species make up the 242,504 "other salmon species," preliminary analyses show that most are chum salmon. Most of these salmon were caught in Reporting Area 517 (see Figure 5) during the trawl fishery for walleye pollock during the period 15 August through 02 October 1993, as shown in the following table:

Reporting Area	Number of "Other Salmon"
517	202,538
509	13,536
521	6,775
519	461
523	201
513	61
518	20
TOTAL	223,592

Additional preliminary information indicates that these were fairly large chum salmon, ranging in size from 42 cm (16.5 inches) to 81 cm (32 inches), with a median size of 58 cm (23 inches). Figure 8 presents a length frequency distribution for the chum salmon measured in Reporting Areas 518 and 519 and the lower part of Reporting Area 509. Although scales were collected from those chum sampled in the catches, the scales have not been read yet, so the ages of these fish are unknown. No information is available on which stocks of chum salmon were included in these catches. In 1993, as in other years, most of the salmon were caught in the trawl fisheries, and most were caught in the midwater trawl fishery for walleye pollock, as shown in Table 6.

For several years, the North Pacific Fishery Management Council has been discussing ways to reduce the catch of salmon in the Alaska groundfish fishery. It is considering several options and will discuss the issue further at its December 1993 meeting in Seattle. Some of the options being considered include time-and-area closures to groundfish fishing, incentive programs to encourage groundfish fishermen to keep down the number of salmon they catch, and limits on the number of salmon that can be caught. The Alaska Department of Fish and Game is cooperating with the Council on this issue and is conducting analyses and providing advice.

One approach being tested now is a program requiring fishermen to clean and process (freeze) the salmon they catch and donate those salmon to a food bank. NMFS issued an experimental permit issued to Terra Marine to test this program. Four factory trawlers and 14 smaller trawlers participated. As of early November 1993, Terra Marine had provided about 48,000 pounds of salmon to the Food Lifeline Warehouse. The experiment will end in April 1994 and will be evaluated by NMFS and the North Pacific Fishery Management Council. This experimental study is the only situation where vessels operating in the groundfish fisheries off Alaska are allowed, in fact required, to retain the salmon they catch.

One of the big unanswered questions is what stocks of salmon are being caught by the U.S.

groundfish fisheries and how many of each stock. Some information comes from coded-wire tagged salmon recovered by observers. But that information only shows that certain coded-wire-tagged stocks are caught, it says nothing specific about the many stocks without coded-wire tags. Currently, NMFS and ADF&G are looking at genetic stock identification (GSI) techniques to shed more light on the question. More of the stocks in the U.S. and Canada are being defined, particularly chinook and chum salmon, and more GSI information is becoming available on the stocks in Japan and Russia, as well. In addition, NMFS observers are collecting some GSI samples from chinook salmon caught by the trawls. Nevertheless, it will be some time before estimates of stock composition may be available. Such estimates may be to various levels of stock groupings, depending upon the accuracy and precision of the method in this application.

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

A purse seine and gill net fishery targeting Bristol Bay sockeye salmon, with an incidental catch of chum salmon bound for Bristol Bay, the Arctic-Yukon-Kuskokwim region, and Asia, operates during the month of June in the South Alaska Peninsula area in the vicinity of Unimak Island and the Shumagin Islands. This fishery, known as the "False Pass" fishery, has operated since 1911, and is managed by the Alaska Department of Fish and Game and the Alaska Board of Fisheries. For management and statistical purposes, the Alaska Department of Fish and Game includes the False Pass area in Statistical Area M (Figure 9).

The 1993 management plan allocated 8.3% of the preseason forecasted Bristol Bay sockeye salmon harvest to the False Pass June fishery, which calculated to a quota of 2,899,000 sockeye salmon. The Board of Fisheries set a catch cap of 700,000 chum salmon in the June fishery and delayed the opening date to 13 June in an effort to reduce incidental chum catches. The Board of Fisheries also set a catch trigger of 400,000 chum salmon, at which point, time and area restrictions were to be imposed to control chum salmon catches.

Total catch in the False Pass June fishery in 1993 was 2,924,000 sockeye and 529,000 chum salmon. The sockeye salmon catch exceeded the sockeye quota by less than 1%, while the chum salmon catch was 24% below the cap. Table 7 summarizes historical sockeye and chum salmon catches in this fishery since 1980.

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Low, L.L. and J. D. Berger. 1993. Incidental catch of salmon in U.S. groundfish fisheries in the Bering Sea/Aleutian Islands region, Gulf of Alaska, and the Pacific Coast, 1990-1993. National Marine Fisheries Service, Seattle, Wa. October 1993.

National Marine Fisheries Service, Alaska Region. 1993. Processed Report, Weekly Summary of Statistics on the Alaska Groundfish Fishery, 24 November 1993.

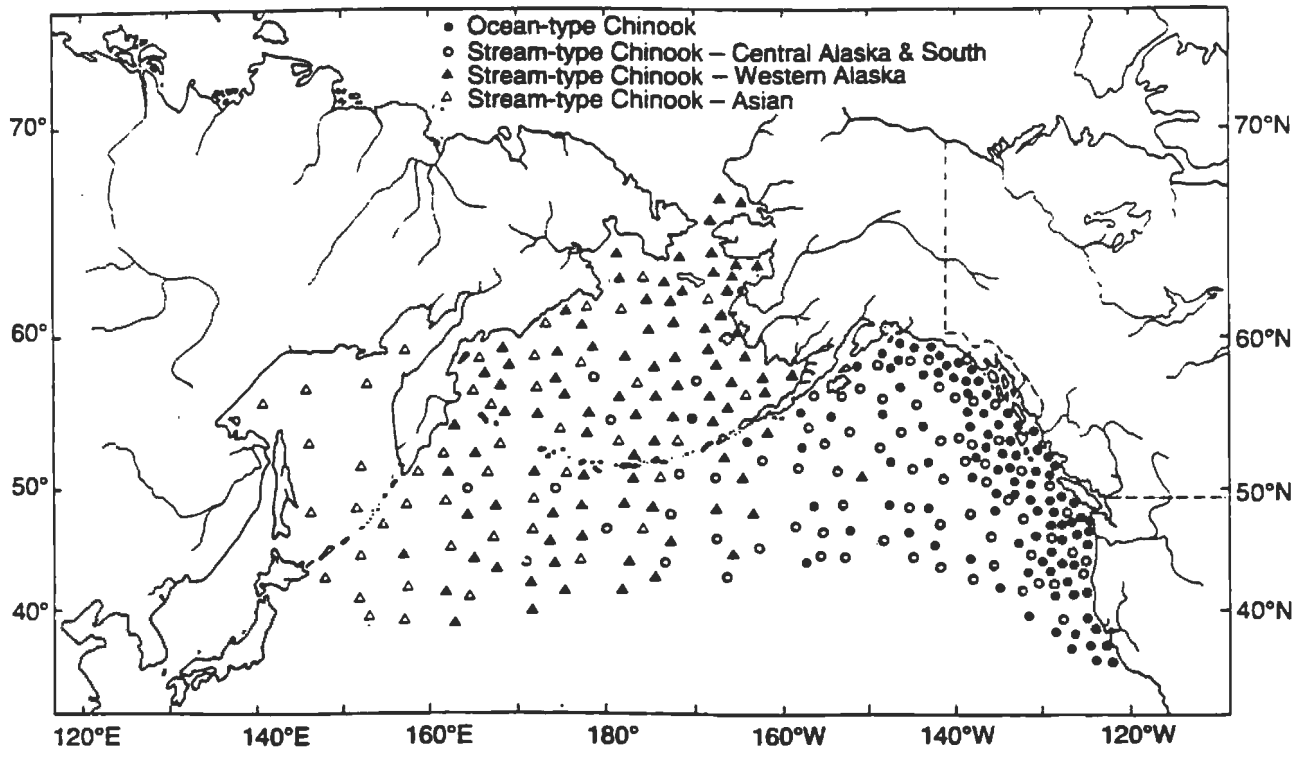


Figure 1. Ocean distribution of Asian and North American chinook salmon. Yukon River and Western Alaskan chinook salmon are indicated by the solid triangles (Groot and Margolis, 1991).

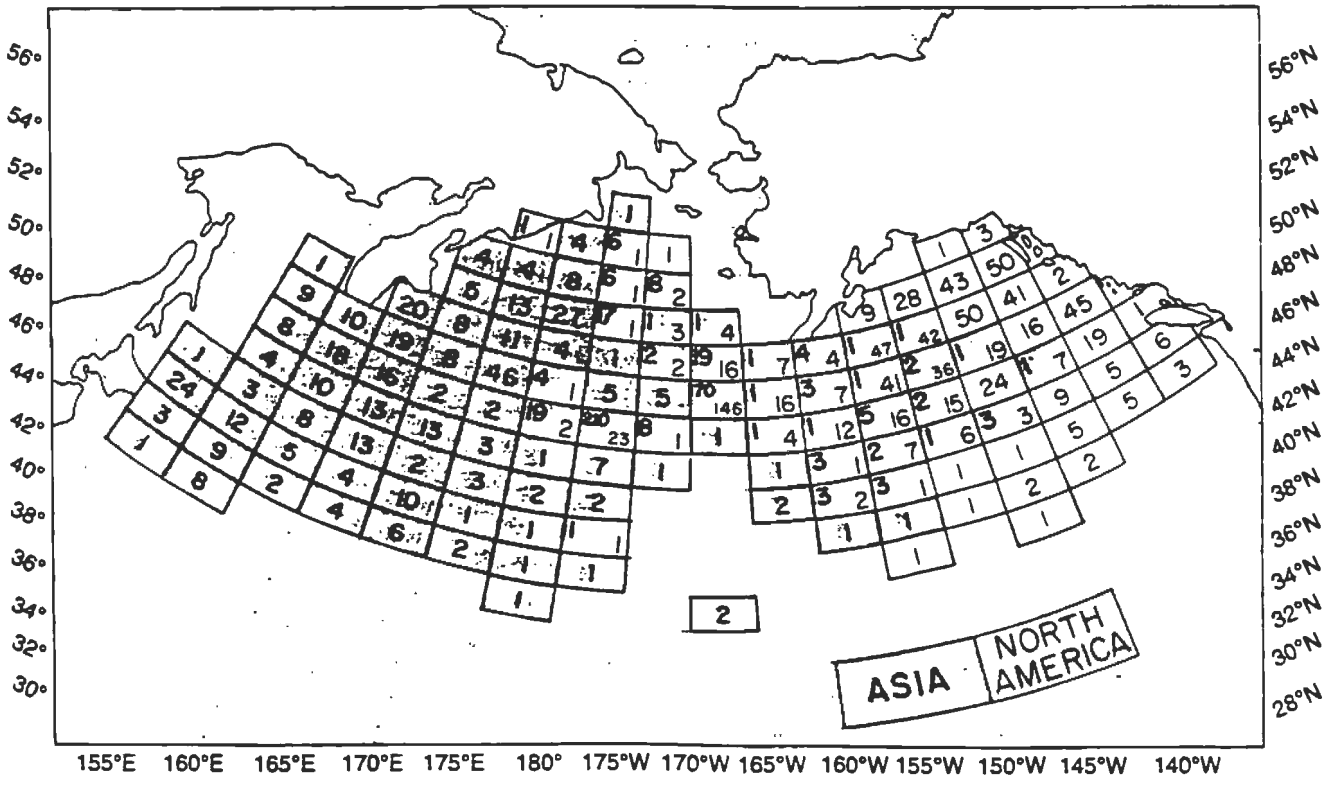
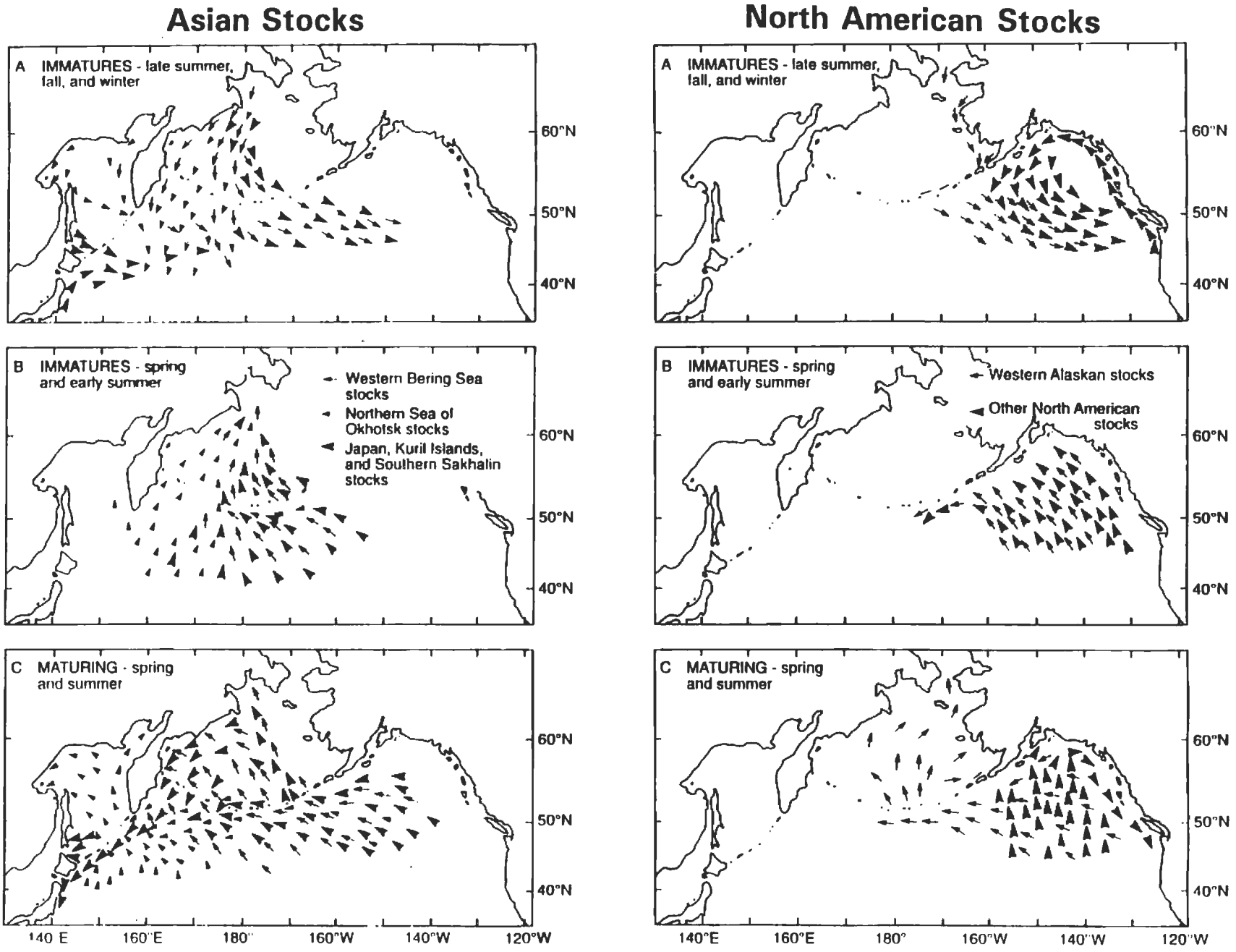


Figure 2. Oceanic distribution of Asian and North American chum salmon. Blocks show where chum salmon were tagged on the high seas (1956-1984). Shading shows where chum salmon later recovered in Asia were tagged; the unshaded areas show where chum salmon later recovered in North America were tagged. The numbers are the total number of tagged chum salmon that were recovered (Groot and Margolis, 1991).



F : 3. General migration patterns for chum sal In the right hand set of figures, the Yukon I and Western Alaska chum salmon stocks in- -ated by the small arrows (Groot and Margolis, 1

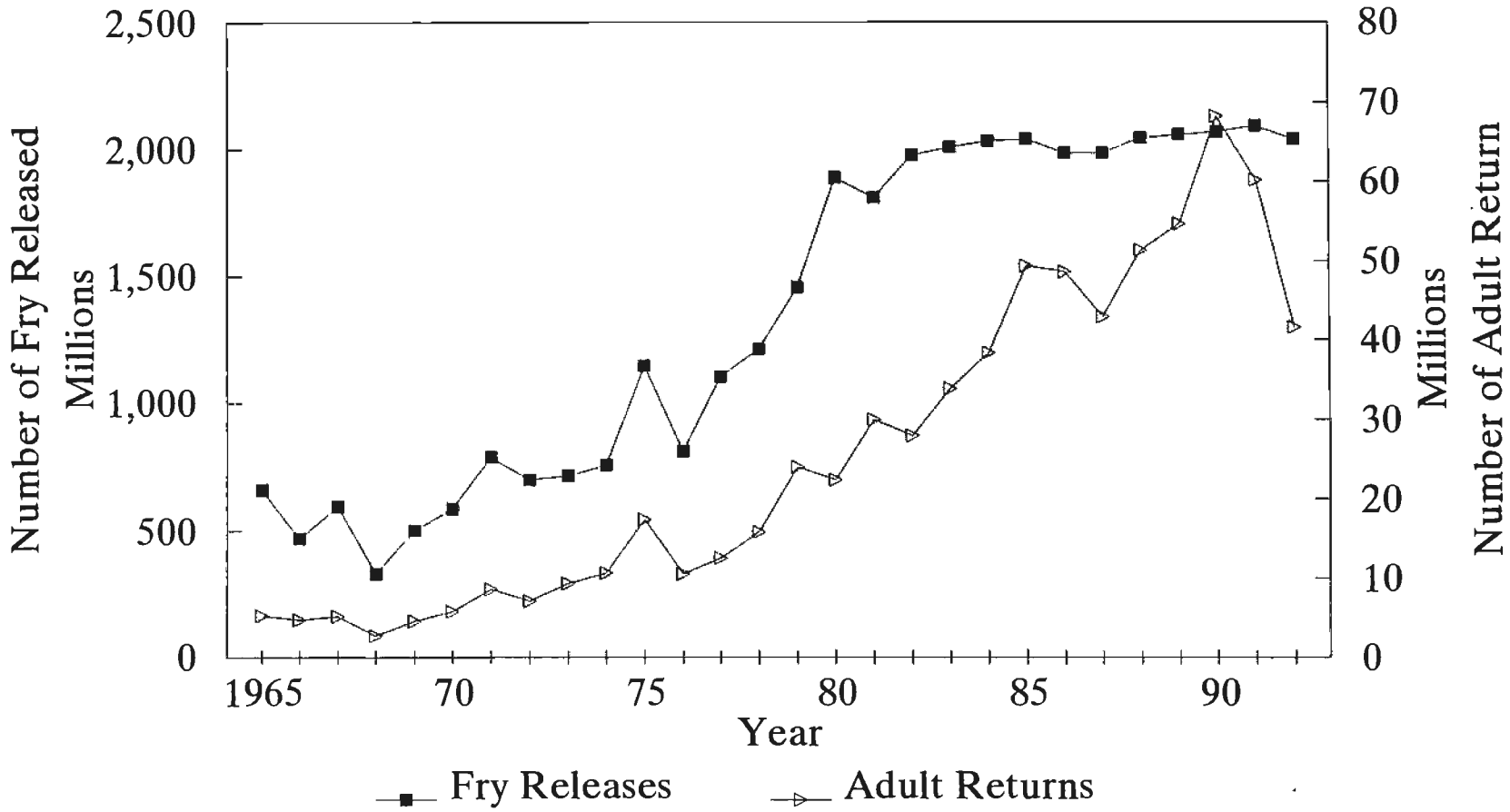


Figure 4. Japan chum salmon fry releases and adult returns, 1965–1992.

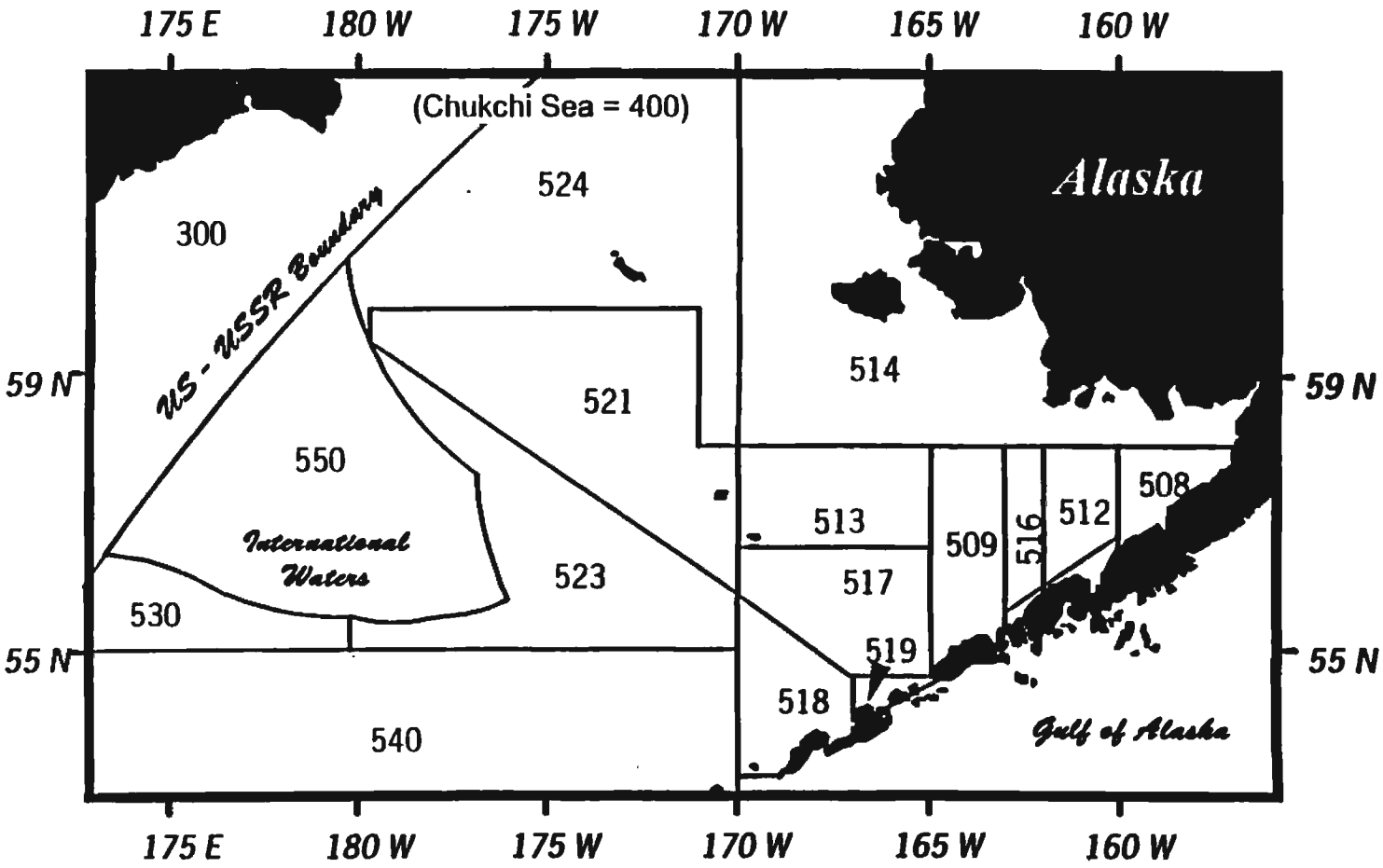


Figure 5. Reporting Areas for the 1993 U.S. Groundfish Fishery in the Bering Sea and Aleutian Islands Area.

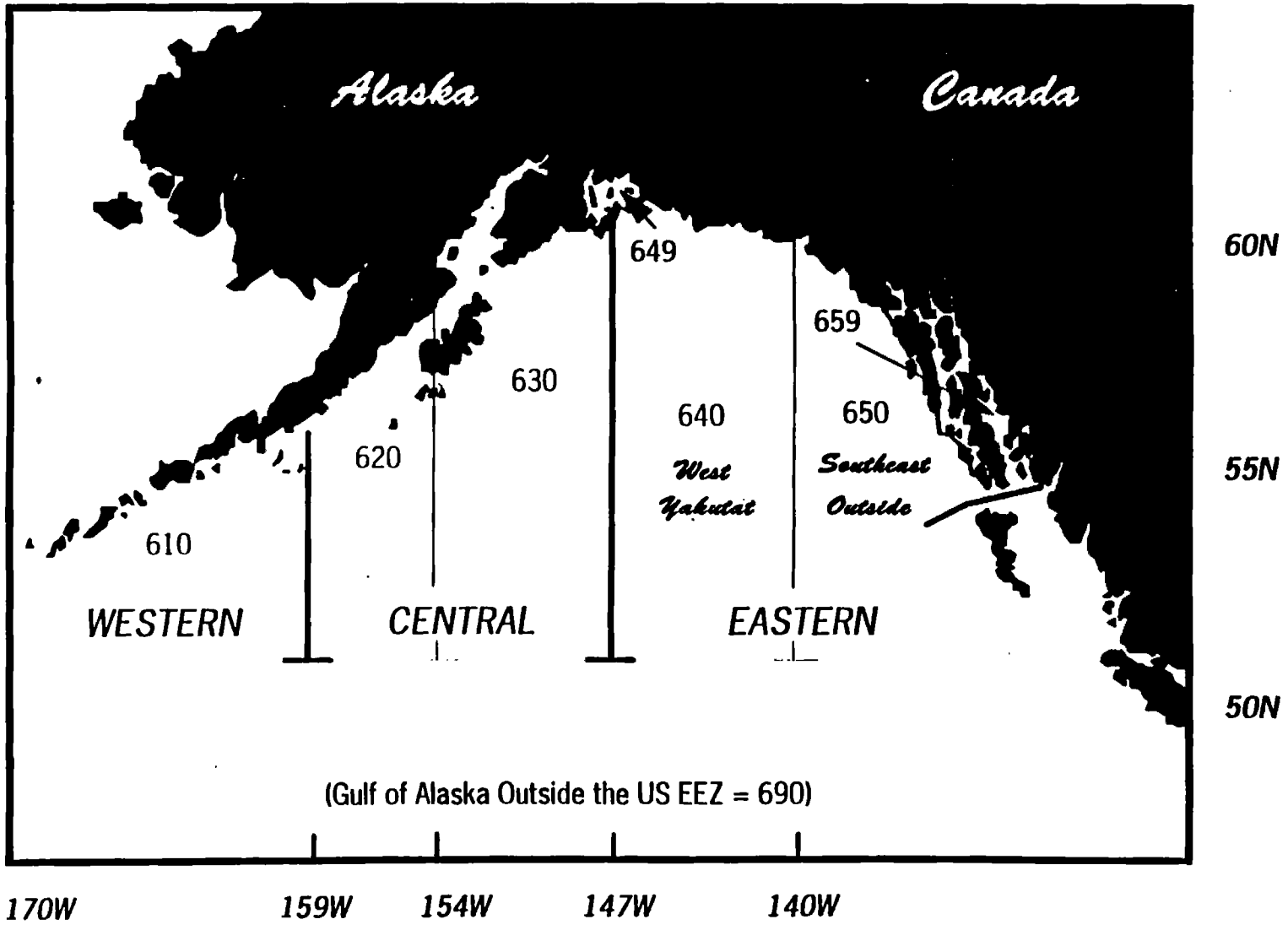


Figure 6. Reporting Areas for the 1993 U.S. Groundfish Fishery in the Gulf of Alaska.

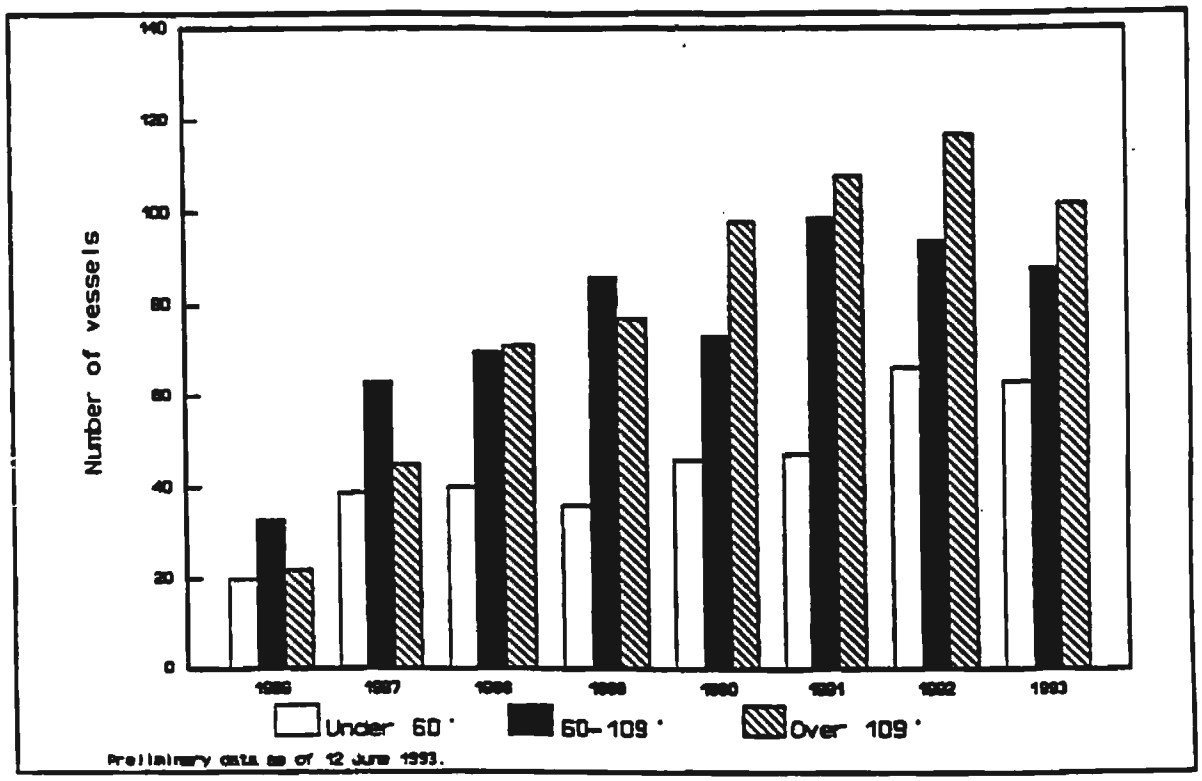


Figure 7A. Number of U.S. vessels landing groundfish caught off the Coast of Alaska from 1986 through 1993, by vessel length.

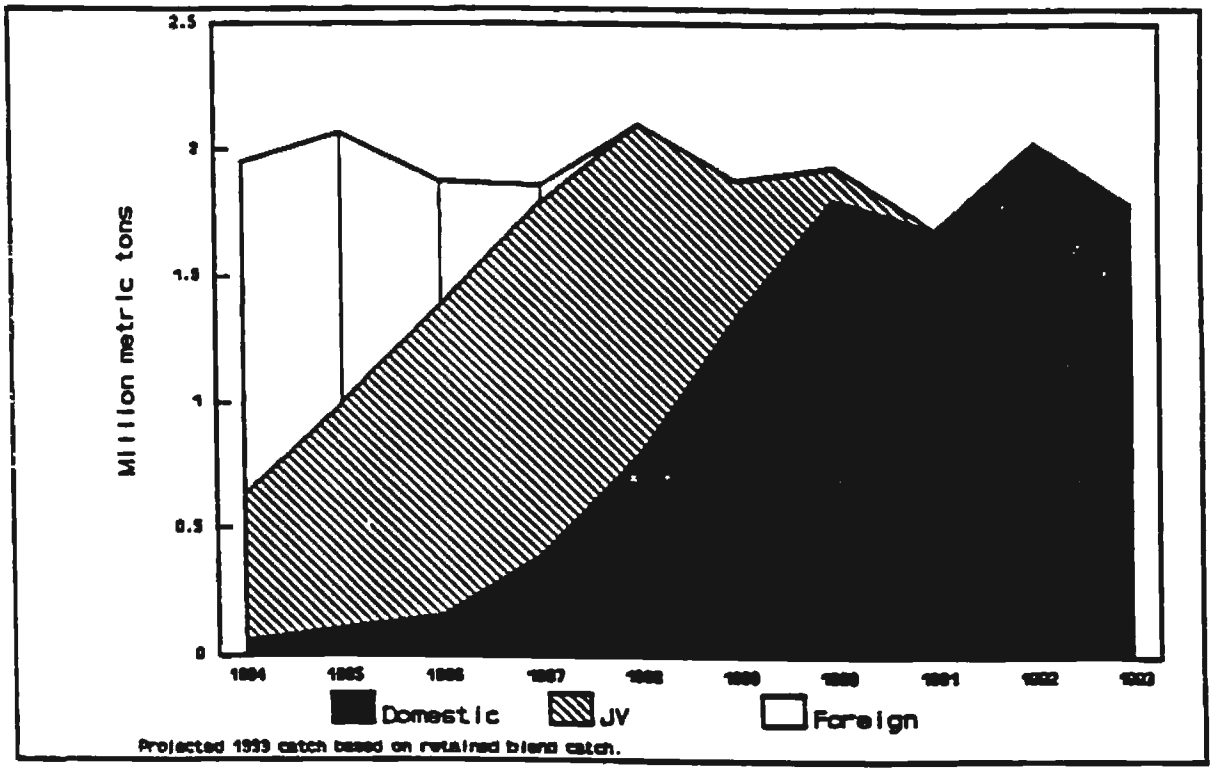


Figure 7B. Groundfish harvest off the coast of Alaska by foreign, joint-venture, and U.S. vessels, 1964 through 1993.

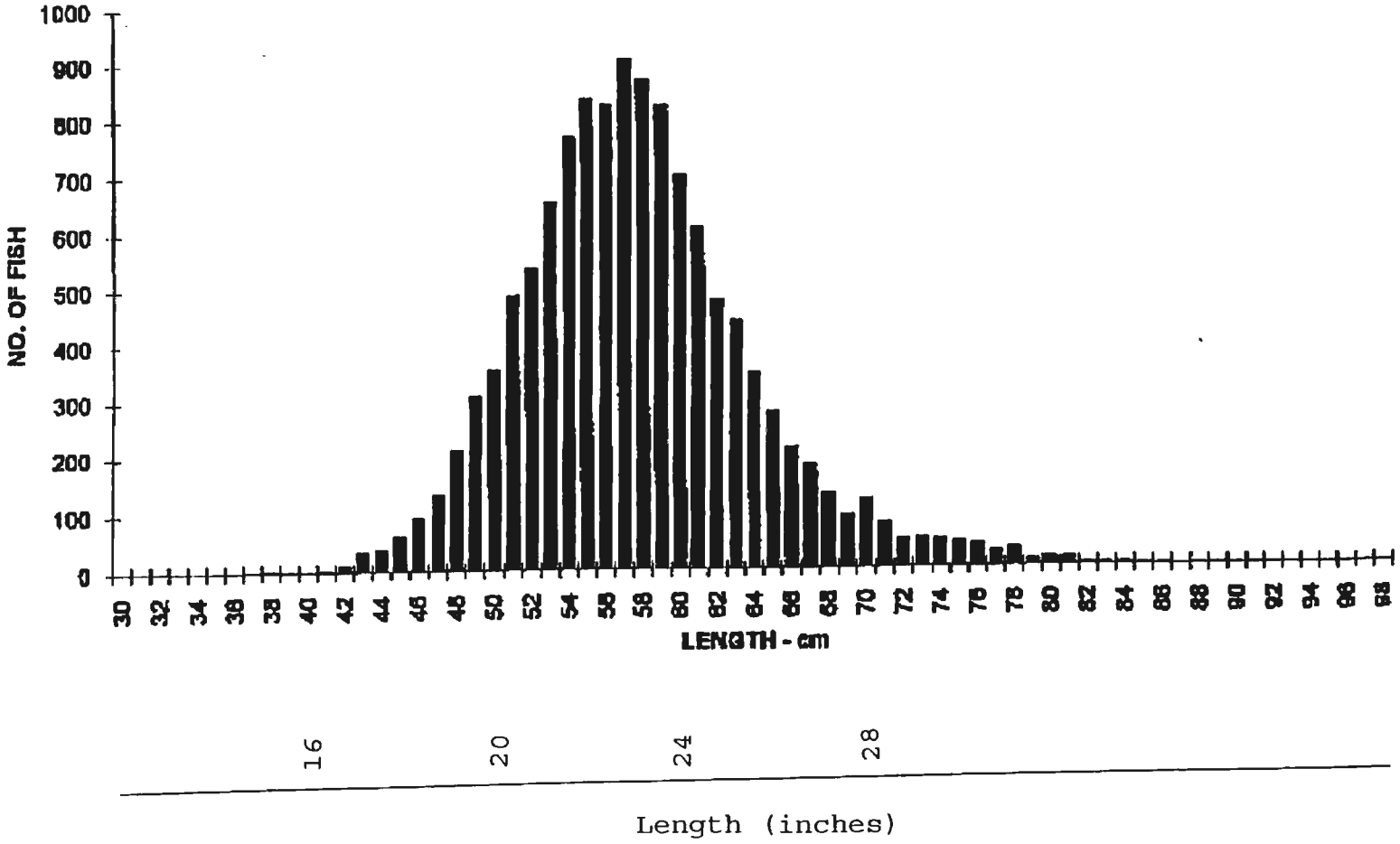


Figure 8. Length Frequency Distribution of Chum Salmon caught in Reporting Areas 518 and 519 and the lower part of 509 of the Bering Sea during the Fall 1993 Fishery for Walleye Pollock.

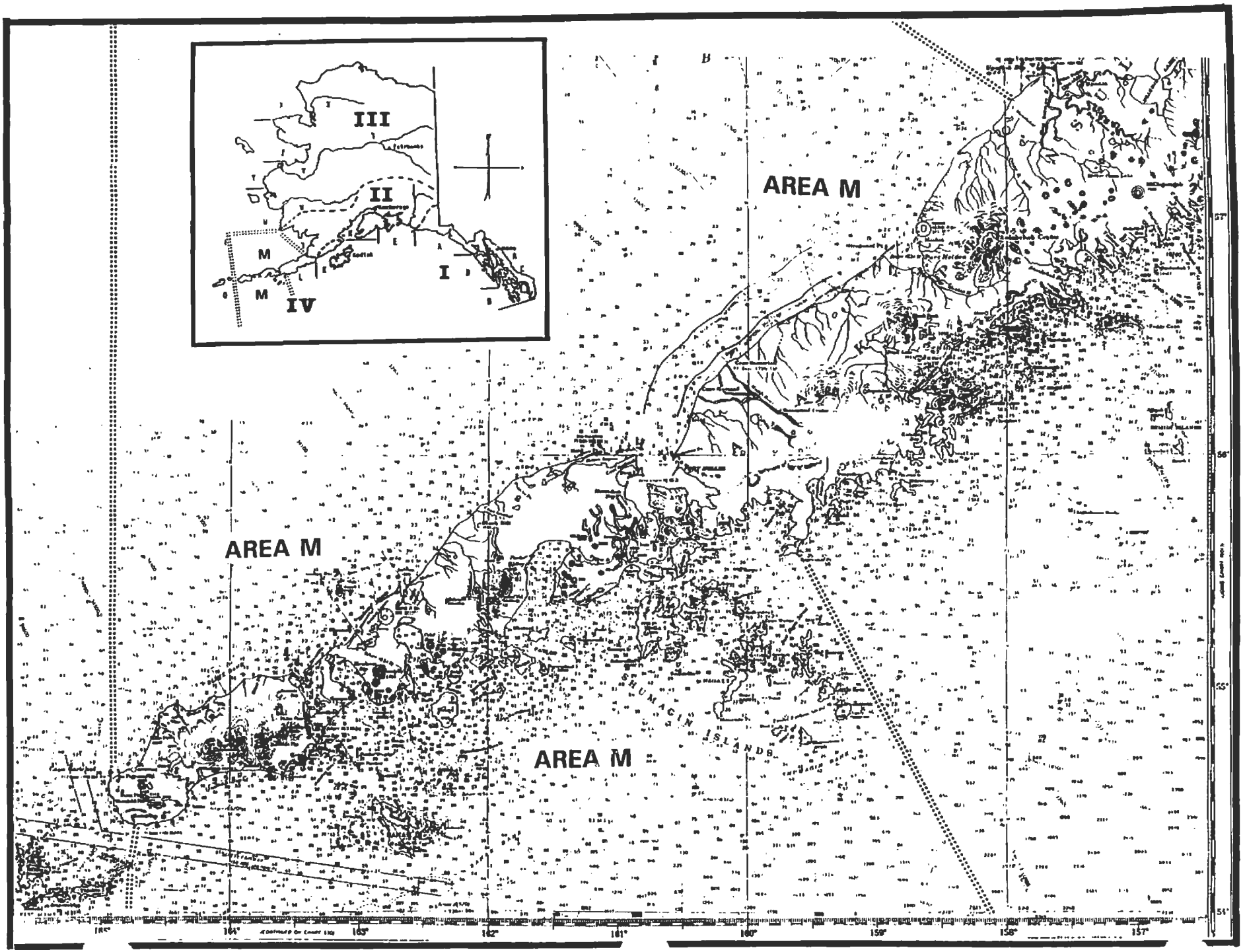


Figure The Alaska Peninsula Area for commercial sa. fishing. For statistical purposes, it is kno
Area M. The South Unimak Island and Shumagin Island area fisheries, also known as the False P.
fisheries, take place in this area.

Table 1. Groundfish harvest by the commercial foreign, joint-venture, and U.S. groundfish fisheries, 1984 through 1993 (in thousands of metric tons, round weight).

Year	Fishery: Domestic	Joint venture	Foreign	Total
Gulf of Alaska				
1984	14.8	219.6	123.7	358.1
1985	33.2	247.2	41.0	321.4
1986	61.0	65.3	15.5	141.8
1987	111.4	32.5	0.0	143.9
1988	143.8	3.8	0.0	147.6
1989	167.4	0.0	0.0	167.4
1990	219.8	0.0	0.0	219.8
1991	216.8	0.0	0.0	216.8
1992	250.7	0.0	0.0	250.7
1993*	207.8	0.0	0.0	207.8
Bering Sea/Aleutians				
1984	48.4	357.5	1,191.2	1,597.2
1985	81.5	636.4	1,033.4	1,751.3
1986	106.0	1,156.5	475.2	1,737.7
1987	295.9	1,355.4	68.7	1,720.0
1988	659.9	1,301.1	0.0	1,961.0
1989	1,185.1	531.0	0.0	1,716.1
1990	1,591.0	133.3	0.0	1,724.3
1991	1,474.3	0.0	0.0	1,474.3
1992	1,785.9	0.0	0.0	1,785.9
1993*	1,582.4	0.0	0.0	1,582.4
All Alaska				
1984	63.2	577.2	1,314.9	1,955.3
1985	114.7	883.6	1,074.4	2,072.6
1986	167.7	1,221.7	490.7	1,880.1
1987	407.3	1,388.0	68.7	1,864.0
1988	803.7	1,304.8	0.0	2,108.6
1989	1,352.6	531.0	0.0	1,883.6
1990	1,811.2	133.3	0.0	1,944.5
1991	1,691.4	0.0	0.0	1,691.4
1992	2,037.3	0.0	0.0	2,037.3
1993*	1,790.2	0.0	0.0	1,790.2

Notes: Domestic catch statistics reflect only the amounts that were landed.
* Projected catch based on retained blend catch data.

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

Table 2. Estimated ex-vessel value of the commercial foreign, joint-venture, and U.S. groundfish harvest off the coast of Alaska, 1984 through 1993 (in millions of U.S. dollars).

Year	Fishery			
	Domestic	Joint venture	Foreign	Total
	Value ($ millions)			
1984	27.6	64.6	147.2	239.4
1985	43.7	98.6	117.8	260.1
1986	65.3	143.7	59.6	268.6
1987	137.8	188.0	10.9	336.7
1988	240.0	204.6	0.0	444.6
1989	338.6	86.7	0.0	425.3
1990	447.2	27.7	0.0	474.9
1991	478.4	0.0	0.0	478.4
1992	675.1	0.0	0.0	675.1
1993*	455.1	0.0	0.0	455.1
	Percentage of total			
1984	11.5	27.0	61.5	100.0
1985	16.8	37.9	45.3	100.0
1986	24.3	53.5	22.2	100.0
1987	40.9	55.8	3.2	100.0
1988	54.0	46.0	0.0	100.0
1989	79.6	20.4	0.0	100.0
1990	94.2	5.8	0.0	100.0
1991	100.0	0.0	0.0	100.0
1992	100.0	0.0	0.0	100.0
1993*	100.0	0.0	0.0	100.0

Note: The value added by at-sea processing is not included in these estimates of ex-vessel value.
* Preliminary, based on projected blend catch data and preliminary price data.

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

Table 3. Number of U.S. vessels that landed groundfish caught off the coast of Alaska, by area and gear type, 1986 through 1993.

Gear	1986	1987	1988	1989	1990	1991	1992	1993*
Gulf of Alaska								
Hook&Line	965	1,671	1,529	1,352	1,610	1,842	1,904	1,198
Pot	21	22	46	22	103	167	234	113
Trawl	61	113	122	135	174	215	234	143
Other	7	24	15	3	34	11	16	8
All	1,036	1,784	1,669	1,494	1,833	2,100	2,215	1,372
Bering Sea/Aleutian Islands								
Hook&Line	60	121	110	78	105	196	166	62
Pot	9	11	12	5	10	41	73	8
Trawl	45	74	101	129	135	169	191	153
Other	4	1	0	1	2	1	7	1
All	111	204	220	209	248	391	402	217
All Alaska								
Hook&Line	1,356	1,704	1,549	1,363	1,636	1,902	1,948	1,210
Pot	24	31	51	26	111	204	285	117
Trawl	80	153	184	205	225	262	296	272
Other	15	25	15	4	35	12	23	10
All	1,449	1,859	1,749	1,576	1,914	2,227	2,341	1,556

Note: * Preliminary data as of 12 June 1993.

Source: National Marine Fisheries Service groundfish fish ticket, weekly processor, and blend estimates data bases, 7600 Sand Point Way N.E., BIN C15700, Seattle, WA 98115-0070.

Table 4. Number of U.S. vessels that landed groundfish caught off the coast of Alaska, by area, gear type, and vessel-length class, 1986 through 1993.

Gear/Length (feet)	1986	1987	1988	1989	1990	1991	1992	1993*
Gulf of Alaska								
Hook&Line								
< 60	835	1,476	1,370	1,196	1,409	1,624	1,648	532
60-84	89	136	114	103	131	144	144	47
85-109	15	19	14	10	15	29	37	13
110-134	4	6	7	10	13	8	23	16
135-159	1	2	0	0	3	1	8	6
160-184	1	1	4	4	5	2	9	8
> 184	0	0	0	1	5	0	2	3
Unknown	20	31	20	28	29	34	33	573
Pot								
< 60	5	10	34	17	60	111	160	84
60-84	8	4	1	1	27	42	45	24
85-109	5	3	6	2	10	10	10	3
110-134	1	1	2	0	3	1	3	0
135-159	0	0	1	0	0	1	7	1
160-184	2	1	2	1	1	0	4	0
> 184	0	1	0	0	1	0	2	0
Unknown	0	2	0	1	1	2	3	1
Trawl								
< 60	18	35	37	31	43	45	62	63
60-84	14	30	31	35	42	55	57	48
85-109	10	19	18	24	23	30	29	21
110-134	9	14	19	18	24	29	31	8
135-159	2	4	3	4	7	7	9	5
160-184	3	6	6	7	11	11	13	9
> 184	3	4	6	14	23	35	23	15
Unknown	2	1	2	2	1	3	10	9
Other								
< 60	3	21	13	3	24	8	13	2
60-84	0	0	0	0	3	1	1	1
85-109	1	0	0	0	3	0	1	0
110-134	0	0	1	0	0	0	0	0
135-159	0	0	0	0	0	0	1	1
160-184	0	0	0	0	1	0	0	0
> 184	0	0	0	0	1	0	0	0
Unknown	3	3	1	0	2	2	0	5
All Gear								
< 60	850	1,512	1,419	1,235	1,497	1,712	1,769	651
60-84	107	160	141	135	167	198	213	111
85-109	28	39	38	34	42	57	65	36
110-134	14	19	28	28	39	37	54	22
135-159	3	6	4	4	10	8	19	10
160-184	6	7	11	12	16	13	24	17
> 184	3	4	6	15	29	35	25	18
Unknown	25	37	22	31	33	40	46	585

Table 4. (Continued).

Gear/Length (feet)		1986	1987	1988	1989	1990	1991	1992	1993*
					Bering Sea/Aleutian Islands				
Hook&Line									
	< 60	25	64	57	33	43	102	66	2
	60-84	29	44	33	28	32	46	40	9
	85-109	4	5	6	3	4	10	11	8
	110-134	1	3	8	9	12	17	22	19
	135-159	1	2	1	1	2	4	9	6
	160-184	0	1	4	3	7	12	14	11
	> 184	0	0	1	1	3	1	3	3
	Unknown	0	2	0	0	2	4	1	4
Pot									
	< 60	0	2	2	1	0	2	4	1
	60-84	2	0	1	1	1	6	9	2
	85-109	2	3	4	1	2	11	23	1
	110-134	3	3	2	0	1	11	11	1
	135-159	0	1	1	0	1	2	11	2
	160-184	2	2	2	2	5	6	12	0
	> 184	0	0	0	0	0	1	2	0
	Unknown	0	0	0	0	0	2	1	1
Trawl									
	< 60	2	6	5	9	5	2	9	1
	60-84	7	10	13	19	13	26	33	19
	85-109	11	14	18	25	14	27	24	21
	110-13	12	21	28	28	30	35	39	39
	135-159	3	4	4	5	6	9	8	7
	160-184	4	6	10	9	14	14	20	15
	> 184	3	7	22	30	45	49	46	40
	Unknown	3	6	1	4	8	7	12	11
Other									
	< 60	1	0	0	0	0	0	2	0
	60-84	0	0	0	0	0	0	0	0
	85-109	2	0	0	0	1	0	0	0
	110-134	1	0	0	0	0	1	2	0
	135-159	0	0	0	0	0	0	2	0
	> 184	0	0	0	0	1	0	1	1
	Unknown	0	1	0	0	0	0	0	0
All Gear									
	< 60	38	72	63	41	47	105	80	4
	60-84	15	53	47	47	45	77	74	30
	85-109	14	22	28	28	20	45	55	30
	110-134	4	25	37	37	43	59	64	56
	135-159	6	7	6	6	9	14	28	15
	160-184	3	9	16	14	26	29	38	25
	> 184	3	7	22	31	48	51	49	42
	Unknown	28	9	1	5	10	11	14	15

Table 5. Estimated number of chinook and other salmon caught by the groundfish fisheries off the coast of Alaska, 1990 through 1993.

A. Bering Sea and Aleutian Islands Area						
Year	Chinook	Chum	Coho	Sockeye	Pink	Total
1990[a]	14,085	16,202	153	31	31	30,502
1991[a]	34,958	31,417	444	89	89	66,997
1992[a]	37,732	37,737	1,095	16	71	76,651
1993[b]	39,547	[c]	[c]	[c]	[c]	282,051

B. Gulf of Alaska						
Year	Chinook	Chum	Coho	Sockeye	Pink	Total
1990[a]	16,913	2,541	1,482	85	64	21,085
1991[a]	37,582	12,195	1,000	40	57	50,874
1992[a]	15,964	10,058	50	18	01	26,090
1993[b]	24,651	[c]	[c]	[c]	[c]	81,137

C. Total						
Year	Chinook	Chum	Coho	Sockeye	Pink	Total
1990[a]	30,998	18,743	1,635	116	95	51,587
1991[a]	72,540	43,612	1,444	129	146	117,871
1992[a]	53,696	47,795	1,145	34	71	102,741
1993[b]	64,198	[c]	[c]	[c]	[c]	363,188

[a] Source: Low, Loh-Lee and Jerald D. Berger. 1994.

[b] Data from NMFS observer reports through 20 November 1993. Report on Prohibited Species Bycatch Mortality, NMFS Alaska Region, 24 November 1993. 38 pages.

[c] Total number of salmon other than chinook estimated to be 242,504 for the Bering Sea and Aleutian Islands Area and 56,486 for the Gulf of Alaska, but how many of each species is not known yet.

Table 6. The number of chinook and other salmon caught in the Bering Sea and Aleutian Islands Area, by trawls by target species, 1993.

Fishery	Chinook	Other	Total
Pollock, Midwater	28,342	239,290	267,632
Pacific cod	6,157	132	6,289
Rock sole, etc.	105	531	636
Yellowfin sole	223	145	368
Other fish	3,543	2,334	5,877
Rockfish	1,127	72	1,199
TOTAL	39,497	242,504	282,001

Source: NMFS Alaska Region, 1993.

Table 7. Commercial harvest of sockeye salmon and chum salmon in the South Alaska Peninsula ("False Pass") June fishery, 1980-1993.

Year	Sockeye	Chum
1980	3,303,000	528,000
1981	1,825,000	575,000
1982	2,121,000	1,094,000
1983	1,961,000	784,000
1984	1,388,000	337,000
1985	1,862,000	479,000
1986	470,000	351,000
1987	793,000	443,000
1988	756,000	527,000
1989	1,745,000	456,000
1990	1,347,000	519,000
1991	1,549,000	772,000
1992	2,458,000	426,000
1993	2,924,000	529,000