SUBSISTENCE HARVEST OF PACIFIC SALMON IN THE YUKON RIVER DRAINAGE, ALASKA, 1986 WITH AN HISTORICAL REVIEW

by

Linda K. Brannian

and

Dennis G. Gnath

Fishery Research Bulletin No. 88-03

Alaska Department of Fish and Game
Division of Commercial Fisheries
Juneau, Alaska 99802

May 1988

The Fishery Research Bulletin Series was established in 1987, replacing the Informational Leaflet Series. This new series represents a change in name rather than substance. The series continues to be comprised of divisional publications in which completed studies or data sets have been compiled, analyzed, and interpreted consistent with current scientific standards and methodologies. While most reports in the series are highly technical and intended for use primarily by fishery professionals and technically oriented fishing industry representatives, some nontechnical or generalized reports of special importance and application may be included. Most data presented are final. Publications in this series have received several editorial reviews and usually two *blind* peer reviews refereed by the division's editor and have been determined to be consistent with the division's publication policies and standards.

AUTHORS

Linda K. Brannian is Region III Biometrician for the Alaska Department of Fish and Game, Division of Commercial Fisheries, 333 Raspberry Rd, Anchorage, AK 99518.

Dennis G. Gnath is a Fishery Biologist I for the Alaska Department of Fish and Game, Division of Commercial Fisheries, 1300 College Rd, Fairbanks, AK 99701.

ACKNOWLEDGMENTS

Many people contributed toward the collection and reduction of the subsistence survey data used in this report. In particular, we would like to thank Dan Bergstrom, Fred Andersen, Craig Whitmore, Dave Ramey, Bill Williams, Clarence Alexander, Peter Cleary and Elizabeth Andrews for their supervisory and data collection efforts. Critical review of this manuscript by Bill Arvey, Dan Bergstrom, Fred Andersen, Larry Buklis and Elizabeth Andrews is gratefully acknowledged. We would also like to thank Bob Walker and Elizabeth Andrews from Subsistence Division for ideas and the use of their data base of Commercial Fisheries Division data for verification of historical catch and effort data.

PROJECT SPONSORSHIP

This investigation was financed under Cooperative Agreement No. NA-85-ABH-0050 U/S Canada Agreement related to negotiations over Yukon River transboundary salmon.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF TABLES (Continued)

LIST OF FIGURES

LIST OF FIGURES (Continued)

LIST OF APPENDICES

ABSTRACT

Comprehensive surveys to census subsistence catches within the Alaska portion of the Yukon River drainage have been conducted annually by the Alaska Department of Fish and Game since 1961. In 1986, full funding was available to survey the subsistence catch in 38 villages, measure the precision of the estimated harvest and investigate the accuracy of the estimate. The estimated Alaska subsistence harvest and approximate 95% confidence intervals were 45,238 $\pm$ 1,023 chinook salmon (*Oncorhynchus tshawytscha*), 290,815 $\pm$ 14,006 summer chum salmon (*O. keta*), 164,043 $\pm$ 6,880 fall chum salmon and 34,468 $\pm$ 3,436 coho salmon (*O. kisutch*). No significant difference was found in the mean catch of chinook salmon between in-season and postseason surveys for any individual village with greater than three participants, though a greater number of the known fishing families were successfully interviewed for harvest data during the postseason survey. Daily monitoring of catch and effort by staff living in two villages throughout the fishing season compared well with the postseason survey results.

KEY WORDS: Chinook salmon, chum salmon, coho salmon, subsistence fishing, personal use fisheries, Yukon River

INTRODUCTION

Fish resources in the Alaska portion of the Yukon River drainage are harvested and utilized for personal consumption and dog food by people in more than 40 communities. Because subsistence use of fishery resources preceded other uses and has cultural significance, it is the intent of the Alaska Legislature that traditional subsistence fisheries be given the highest priority so long as maintenance of fish stocks on a sustained-yield basis is not jeopardized (ADF&G 1986). Pacific salmon (*Oncorhynchus*) are utilized by commercial, sport, and subsistence fisherman throughout the drainage. The implementation of the State of Alaska's subsistence use priority and control of total exploitation for stock conservation requires subsistence fishery data on species composition, harvest levels, geographic fishing patterns, and methods of harvest in addition to similar data for the commercial and sport fisheries.

The major salmon stocks of the Yukon River drainage are fully utilized. Any decline in stock abundance or proposals for increased harvests by one group requires a reallocation by the regulatory authority. The Alaska Board of Fisheries in 1985 and 1986 considered intensive conservation measures to reverse the decline of the fall chum salmon (*O. keta*) stocks in the Yukon River and proposed changes in the management of the directed commercial and subsistence fisheries. Subsistence harvest information is also being used in treaty negotiations with the Canadian government over allocation of Yukon River salmon. Similarly, the new subsistence law made effective 1 June 1986 requires the Alaska Board of Fisheries to determine those salmon stocks traditionally used for subsistence purposes by rural residents and will require the most precise harvest information which can be provided (Andrews 1986). It is therefore important to estimate the past and future subsistence harvests on an annual basis and understand the precision and accuracy of the estimates.

This report presents an estimate of the subsistence salmon harvest in the Alaska portion of the Yukon River drainage for 1986, along with measures of accuracy and precision. This is the first time the estimation procedure used for expanding annual survey results since 1983 has been documented. Unfortunately the methodology for expansion of earlier survey results was never published and was lost with changing personnel. Historic subsistence catch and effort data, however, are presented with particular emphasis on the summer harvest of salmon. Historically, winter subsistence catches of fish were not well documented and surveys were not designed to monitor these catches on a drainagewide basis. Therefore, no winter catch estimates are presented. However, these tend to be non-salmon and of a lesser but unknown magnitude.

Description of The Survey Area

The Yukon River (Figure 1) is the largest river in Alaska and is the fifth largest drainage in North America draining approximately 35% of the state's land mass. The river originates in British Columbia, Canada within 48 km of the Gulf of Alaska, and flows over 3,700 km to its mouth on the Bering Sea

draining an area of approximately 855,000 km^2. The study area addressed in this report is limited to that portion of the Yukon River which flows within Alaska.

The Alaska portion of the Yukon River drainage has been divided into six commercial fishing districts, five along the main stem Yukon River from the mouth to the U.S.-Canada border and the sixth in the main stem Tanana River. Districts 1-3 are referred to as the "Lower Yukon" and Districts 4-6 as the "Upper Yukon". Subsistence catches have been summarized by district to facilitate run reconstruction.

The survey area includes more than 30 communities along the main stem Yukon River and more than 15 communities on significant tributaries of the Yukon River such as the Innoko, Koyukuk, Tanana, Chandalar, and Black Rivers. There are approximately 10- to 15-thousand Eskimo and Athabascan Indian people living in the area, the majority residing in the 45 surveyed communities (ADF&G 1985). The region's population experiences a moderate increase during the fishing season as a result of visiting commercial fishermen, relatives, and friends. Only villages within the Yukon River drainage and the coastal villages near the mouth will be discussed in this report. Yukon River salmon also comprise some unknown proportion of coastal village's mixed stock subsistence catches north and south of the Yukon River delta.

Description of the Subsistence Fishery

Four species of salmon, chinook (*O. tshawytscha*), chum (a summer and fall run), coho (*O. kisutch*), and to a much lesser extent, pink salmon (*O. gorbuscha*) are harvested from June through October for subsistence purposes. In addition, several species of whitefish (Coregonus*), inconnu* (Stenodus leucichthys), northern pike (*Esox lucius*), Arctic grayling (*Thymallus arcticus*), burbot (*Lota lota*), two char species (*Salvelinus*), Alaska blackfish (*Dallia pectoralis*), saffron cod (*Eleginus gracilis*), Arctic lamprey (*Lampetra japonica*), and other fishes are also harvested for subsistence purposes and contribute significantly to the diets of the fishing communities (Wolfe 1982). Discussion of these non-salmon species is limited because harvest data obtained in 1986 could not be easily compared with that collected previously.

Salmon remain the largest portion of the total subsistence harvest for most subsistence households (Wolfe 1982). At the outset of the fishing season, many subsistence fishermen leave their winter communities and reorganize into a number of summer camps stretched along the banks of the region's major rivers, sloughs, and tributaries. These camps serve as the base of operation for the summer's fishing activities. The remaining subsistence fishermen operate from their year-round residence.

Subsistence fishing in the survey area is often not an individual effort but the activity of extended family groups. The group, or "fishing family" is commonly related by ties of kinship; it cooperates during the summer in the harvesting, cutting, drying, smoking, and storing of salmon. The fishing family often includes a limited entry permit holder for that commercial fishery who fishes for both commercial and subsistence purposes. Because

commercial fishermen may retain any portion of their harvest for subsistence use, clear distinction between commercial and subsistence user groups is often difficult.

Yukon River subsistence salmon fisheries often share common fishing time restrictions with commercial fisheries. Prior to 1961 fishing time restrictions were not imposed and subsistence fishing could occur seven days a week. In the Lower Yukon River commercial fishing for chinook salmon was allowed 4.5 days per week until quotas were met. Fixed quotas were replaced in 1961 by a system of scheduled weekly fishing periods, and for the first time subsistence fishing for chinook salmon was permitted only during open commercial periods. Beginning in 1965 subsistence fishing for fall chum salmon was also tied to the schedule of commercial openings and closures (Wolfe 1982).

Beginning in 1961 the time allowed for subsistence fishing has progressively shortened once the commercial fishing season is opened because of reduced commercial fishing time. In the Lower Yukon, subsistence fishing for chinook salmon decreased from 7 days per week to 4 days per week in 1961, to 3 days in 1974, and is currently approximately 2 days per week (scheduled by emergency order). Beginning in 1983 additional time for subsistence fishing was allowed during specially scheduled fishing periods every other weekend during the chinook and summer chum season and every weekend during the fall chum season in order to offset the reduction in commercial fishing time. Subsistence fishing time is unrestricted up to 24 h before the season's first scheduled commercial fishing period and 24 h following the last scheduled period.

Commercial fishing in the Upper Yukon after 1960 was allowed 7 days per week until a fixed quota was met. Subsistence fishing time was unrestricted until 1975 when commercial fishing time was reduced to 5 days per week and subsistence fishing was allowed only during open commercial fishing periods. Further reduction to 4 days per week was made in some districts and subdistricts in 1979. Currently, subsistence fishing time is unregulated up to 24 hours before the first scheduled commercial fishing period and 24 hours after the season's closure. During the commercial fishing season subsistence fishing is allowed only during commercial fishing periods. If the commercial fishery closes for longer than 5 days within the season, subsistence fishing is allowed daily except for a 48-hour weekly closure which is scheduled for varying time periods in Districts 4-6.

Fishing gear types historically used on the river included fish wheels, weirs, fish traps, dip nets, beach seines, set gill nets, and drift gill nets. Currently, fish wheels, set and drift gill nets are the most commonly used methods to capture salmon (Wolfe 1981, Marcotte 1982). The choice of fishing gear differs regionally with fishermen using gill nets in the lower river below Anvik and the rest of the drainage using a mixture of fish wheels and gill nets. In Districts 1-3 only set and drift gill nets and beach seines may be operated, except that in District 1, after July 19, a special set net only coastal area has been established which is closed to the use of drift gill nets and beach seines. Currently set gill nets are heavily utilized by fishermen from the coastal villages of Kotlik and Sheldon's Point, while drift gill nets are the dominant gear types used by fishermen from villages in District 2. In District 4-6 only set gill nets and fish

wheels may be operated. However, beginning in 1983 fishing with drift gill nets was allowed in District 4 over a 183 km stretch of river from Stink Creek, 48 km south from Kaltag, upriver to Cone Point, midway between Koyukuk and Galena (Huntington 1981, Marcotte 1982).

Fish wheels are generally more efficient than nets for some species and areas, yielding higher catch per unit effort (CPUE) in the Upper Yukon River. In District 5 fish wheels account for a higher chinook CPUE than set gill nets. In District 6 fish wheels are a more efficient gear type for harvesting chum and coho salmon.

Objectives

The primary objective of the Yukon River subsistence survey is to provide an estimate of subsistence effort (number of families participating) and harvest by species, village, and district for the Alaska portion of the Yukon River drainage. In 1986 additional objectives were included: (1) the evaluation of methods for estimating Yukon River drainage subsistence effort and harvests, the precision, and accuracy of the estimated catch, and (2) the summarization and interpretation of the historical subsistence survey data.

METHODS

History of Subsistence Survey Methods

Comprehensive surveys to census subsistence salmon catches within the Yukon River drainage were initiated by the Alaska Department of Fish and Game, (ADF&G), Division of Commercial Fisheries in 1961. A survey to estimate subsistence catch of all salmon species was made by two technicians traveling by boat from the Yukon River mouth upstream to Dawson City, Yukon Territory, Canada. In addition, the survey covered the Tanana River from the mouth upstream to Nenana. The surveyors obtained subsistence catch data by counting fish on drying racks, in smokehouses, in bundles stored within caches, and estimating numbers stored in barrels and kegs. Catch data were also obtained through personal interviews with fishing families living along the river. Harvest estimates were expanded by the estimated percent of the village's fishing families not surveyed in order to derive an estimate of total annual subsistence harvest for each village. Catches from villages not surveyed were reported by responsible individuals to whom survey forms were mailed (ADF&G 1963).

Subsistence catch calendars were issued to fishing families living along the Yukon River in 1963 and possibly as early as 1962 [R. Regnart, ADF&G (retired), personal communication]. Fishermen were encouraged to use these calendars to record their daily subsistence catches. Some of these were returned to the department postseason or shown to department personnel during surveys, contributing to the accuracy of subsistence catch data collected.

The catch calendar in conjunction with actual counts of harvested salmon and postseason interviews were employed through the 1970s. By the early 1980s emphasis shifted to the catch calendar and postseason interviews. The catch calendar method of data collection was discontinued in 1984 because the number of calendars returned in recent years did not justify the cost. As an alternative, postal questionnaires were mailed to persons not contacted during village postseason interview visits (ADF&G 1984).

The primary objective of the annual survey during the early years was to document the chinook salmon subsistence harvest. Subsistence catches were categorized and recorded as numbers of chinook salmon and "other" or "small" salmon. Survey methods were modified in 1977 to include a better accounting of all harvested salmon species. This was accomplished by revising the subsistence survey forms so that more specific information could be gathered (ADF&G 1977).

Surveys from 1961-78 were conducted in late July and early August, and were normally completed for the Lower Yukon villages by mid-August. From 1979-86 surveys were conducted from late August to early September in order to obtain more complete fall chum and coho catch data. In general, Upper Yukon surveys from 1961-77 were conducted in late August or September and were too early to obtain complete harvest data of coho and chum salmon. Since 1977 surveys in the Upper Yukon have been conducted later (late September to mid-November). Koyukuk village surveys were also conducted in late August. Survey dates were too early for complete fall chum and coho salmon catch data prior to 1978.

Subsistence survey coverage of Alaska villages using personal interviews, catch calendars, and/or postseason postal questionnaires from 1979-86 has been largely complete. The only villages not consistently surveyed over the period include the Upper Yukon villages of Minto (no survey in 1979), Chalkyitsik (no surveys from 1979-85), and Shageluk (no surveys from 1977-78 and 1982-85). Total catch per village surveyed was expanded to include estimated catch by fishing families not contacted that year. Villages not surveyed in a given year were not included in the total drainage catch. The number of large- and small-mesh gill nets, and fish wheels owned per fishing family have been collected annually since surveys began. This was an attempt to describe the mixture of gears being used at least once in the summer harvest of salmon though no estimate of the frequency of use of each unit of gear was made. Auxiliary information on number of dogs (since 1967), number of snow machines (1967-82) and number of people per fishing family (1963-66) has been collected.

Subsistence permits are used in some areas to assess and restrict the harvest. Permits are currently required in three areas within the Upper Yukon River drainage: (1) the Tanana River drainage upstream of the Wood River confluence (river km 1,430) since 1970; (2) the Yukon River between Hess Creek (river km 1,266) and Dall River (river km 1,346) since 1974 (ADF&G 1974) and (3) the Yukon River between the upstream mouth of Twenty-two Mile Slough (river km 1,650) and the US-Canada international border since 1979 (ADF&G 1979). A catch limit of five chinook and 75 chum and coho salmon combined was in place prior to 1982, for the Tanana River permit area. Limits were changed in 1982 to 10 chinook salmon and 75 summer chum salmon and 75 fall chum and coho salmon combined.

The Division of Subsistence was created within the Department of Fish and Game by the Alaska Legislature with enactment of Chapter 151 of the 1978 Alaska Sessions Laws (AS 16.65.251). The collection of information on all aspects of subsistence and its role in the lives of the residents of Alaska has been a primary mission of the Subsistence Division. However, annual estimates of subsistence harvests on a drainage or regional basis has continued to be the responsibility of the Commercial Fisheries Division. Generally, Subsistence Division research has consisted of intensive case studies over a one-year or several-year time span in selected villages in which detailed information throughout the harvest period is collected. The Subsistence Division monitored catches in Russian Mission in 1984 and Holy Cross in 1985.

Annual surveys to estimate subsistence catch and effort have also been conducted by the Canadian Department of Fisheries and Oceans in the Canadian portion of the Yukon River drainage since 1962. Subsistence data have been collected using a combination of multiple in-season and postseason personal interviews and returned catch cards (Seigel and McKenzie 1985).

1986 Survey Methods

Postseason Survey

Estimation of the 1986 subsistence harvest in the Alaska portion of the Yukon River drainage was based on a postseason survey comprising of a combined program of permit monitoring, postal surveys and fisherman interviews in all communities involved in subsistence fishing. These methods were similar to those used since 1983. The postseason survey began with personal interviews of participants in subsistence fishing in those communities chosen for sampling. Postal surveys were then mailed to all known households not contacted in sampled villages and previously unsampled communities. Harvest data of permit recipients were required 10 days after the permits expiration date.

Thirty-eight villages with historically documented subsistence catches were surveyed for the postseason survey. Catches of those fishermen obtaining subsistence permits were reported by resident community and district in which fishing occurred. Because many fishermen obtaining permits travel to their fishing location, their city of residence may not be located geographically in that district. For example, harvest data from permitees of the Yukon River between Hess Creek and the Dall River were reported using the local name Fairbanks Fish Camp (F.C.) referring to the general borough of residency for those fishermen though Fairbanks does not border this area of District 5. The harvest taken by Tok residents holding permits for the Yukon River upstream of Twenty-Two Mile Slough was reported in District 5. Permit data from residents of Fairbanks, North Pole and Salcha for the Tanana River upstream of Wood River were pooled and reported as Fairbanks in District 6.

An accurate list of all known heads of families who subsistence fish was essential to the postseason survey. This was accomplished by updating the list of fishing families contacted in previous years by the Subsistence and Commercial Fisheries Divisions. Such lists have been maintained in computer

files since 1980 and were updated annually based on contacts made during the latest survey or as information concerning deaths or family transfers became known. Where possible the list was verified by community officials or knowledgeable individuals for each area. Furthermore in the Lower Yukon every household in a village was contacted, and, in effect, the list was re-created and verified each year. The list consisted of a contact person and address for each household known to subsistence fish for salmon regardless of whether or not they actually fished in 1986. In areas where permits are issued the list of fishing families was simply a list of those people who received permits in 1986. Lists for the Lower and Upper Yukon were maintained in separate Lotus 1-2-3 worksheets in the respective area offices of Emmonak and Fairbanks.

The postseason survey was timed to document the total salmon harvest soon after the subsistence fishing season ended for all species in order to maximize participant recall of their total salmon catch. Postseason surveys in the Lower Yukon were conducted between 23 August and 5 September. Anyone not interviewed at that time received a postal questionnaire by 10 September. Upper Yukon River postseason surveys were conducted from 15 October through 14 November. Postal surveys were mailed by 30 November to those not contacted. Where permits were issued to allow fishing, the harvest data requested on the permit was required to be returned within 10 days of the expiration date. In general, fishing data from permits were received by 30 November.

Personal interviews were conducted systematically on a village by village basis during the postseason surveys. Upon arrival in a village, the city office or village police were contacted and the purpose and methods of the survey were explained. An attempt was initially made to contact and categorize each person on the computer listing as to the following:

1. fished as determined from an interview
2. fished as determined from others though not interviewed
3. did not fish as determined from an interview
4. did not fish as determined from others though not interviewed
5. can not determine whether they fished or not.
6. name should be removed from the list (e.g. if the family has moved).

Names were also added to the list at this time if the contact for the household changed or if additional families were found to have fished in 1986.

During the personal interview catch was recorded by species, including separate records for summer and fall run chum salmon, whitefish, and inconnu. Fishing methods and the amount of gear owned and used at least once during the season were recorded as numbers of large- or small-mesh gill nets or number of fish wheels. Numbers of dogs per household were also recorded because a significant proportion of the chum salmon harvest is used for dog food. Similar information was requested on the postal surveys (Appendix A.1) and permits (Appendix A.2).

To estimate the number of fishing families in villages for which fishing status could not be actually determined for all names on the master list, the number of fishing families (F_k) for village k was estimated as follows:

$$F_k = \sum_{i=1}^{2} f_{jk} + f_{5k}p_k$$

where:

f_{1k} = number of families that fished and were surveyed for catch and effort data
f_{2k} = number of families that fished but were not directly surveyed
f_{3k} = number of families that indicated they did not fish during the survey
f_{4k} = number of families that did not fish but were not directly surveyed
f_{5k} = number of families for which it is not known whether they fished or not
p_k = the proportion that fished of the total for which fishing status is known

and $p_k = (f_{1k} + f_{2k}) / \sum_{i=1}^{4} f_{jk}$

No correction was made for non-response bias arising from differences in participation and level of harvest between those who did and those who did not return postal questionnaires. It was assumed that data collected during personal interviews or from returned permits would accurately estimate the proportion p_k because it was hypothesized that very few people who did not fish would return postal surveys. The number of fishing families in each village was the sum of the number of known fishermen, whether or not catch and effort data were collected (f_{1k},f_{2k}), plus an estimate of the number of fishing families among those (f_{5k}) for which the fishing status was unknown. The best available estimate of the later was based on the proportion p_k.

The variance for the number of fishing families was estimated by:

$$Var(F_k) = f_{5k}^2 \, Var(p_k)$$

where the variance of p_k (Snedecor and Cochran 1980) was estimated by:

$$Var(p_k) = (f_{5k} / \sum_{i=1}^{5} f_{jk}) \, p_k \, (1-p_k) / (\sum_{i=1}^{4} f_{jk}-1)$$

The average village catch ($\bar{C}_k$) was estimated by fish species, summer and fall chum salmon run, and by the whitefish genus from the catch per household (C_{ik}) data collected through personal interviews, returned postal surveys and permits. Mean village catch per fishing family was estimated by:

$$\bar{C}_k = \sum_{i=1}^{f_{1k}} C_{jk} / f_{1k}$$

and its variance includes a finite population correction factor (fpc_k) of all known families that were determined to have fished in 1986:

$$Var(\bar{C}_k) = (fpc_k) \sum_{i=1}^{f_{1k}} (C_{ik}-\bar{C}_k)^2 / (f_{1k}-1)\, f_{1k}$$

where:

$$fpc_k = (f_{2k} + f_{5k}) / (f_{1k} + f_{2k} + f_{5k})$$

The estimated harvest for each village (C_k) became the product of the mean catch per family and the number of fishing families:

$$C_k = F_k \bar{C}_k$$

and its variance was estimated as:

$$Var(C_k) = F_k^2\, Var(\bar{C}_k) + \bar{C}_k^2\, Var(F_k) - Var(\bar{C}_k)Var(F_k)$$

Village catch and effort estimates and their variances were summed across villages for district subtotals and across districts for drainagewide totals. Village catches were considered strata and the drainagewide variance was then the sum of the variance of village catches.

Comparisons of catches among villages were made using the Kruskal-Wallis test (Conover 1980) for each species and district separately. Approximate p-values of the Kruskal-Wallis test were based on the chi-square distribution. All tests were made at the a = 0.05 level of significance. Comparisons of the proportion reported not to have fished in 1986 between survey response type (personal interview and postal survey) were made using the chi-square test on a 2x2 contingency table.

In-season Survey

The in-season survey was designed to assess the chinook salmon harvest soon after active fishing for this species ended, but before fishermen harvested fall chum or coho salmon. Fourteen Upper Yukon River villages which previously accounted for the greatest chinook harvests were selected for personal interviews. The survey was conducted in early August and lasted 1 month. Personal interviews were conducted in a similar manner to the postseason surveys, as was the estimation of the number of fishing families and harvest. During the in-season survey an attempt was made to contact all households in these villages in order to correct and expand the list of fishing families to accurately reflect those families who generally subsistence fish.

Harvest estimates were also made by two department staff each residing in a village throughout the fishing season who were able to verify daily catches for comparison to postseason surveys that rely on participants recall. The postseason survey was conducted by different staff members in a manner consistent with other villages. Comparisons within villages between the in-season survey (and season long monitoring) with the postseason survey were used to assess the accuracy of the postseason survey method.

RESULTS AND DISCUSSION

Overall 78% of those known to subsistence fish were surveyed for catch data. Seven-hundred and eighteen fishing families were interviewed, and 202 postal surveys and 373 permits were returned (Table 1). Of those interviewed 21% responded that they did not fish in 1986 compared to only 7% of those returning postal questionnaires. This was a significant difference (0.05) between respondence types (personal interview or postal questionnaire) in percent not fishing (Chi-square test, $p<0.05$, $df=1$). As a result only personal interview data were used to estimate village-specific numbers of fishing and non-fishing families where fishing status was not actually determined. Fishing status could not be determined for 12.5% of the 1,542 names on the fishing family list. Any non-response bias due to differences in participation of those for which fishing status was unknown was believed to be minor. Also, there was no evidence that fishing status information obtained about a family from friends or neighbors was incorrect.

The mean catch per fishing family varied by village and run of salmon (Table 2). The mean catch of chinook salmon per fishing family along the main stem Yukon River increased from 15 chinook salmon in Alakanuk to 283 in Rampart. The mean summer chum catch per fishing family was largest in District 4 with an average catch of 2,810 in Anvik. The mean fall chum catch per fishing family was largest in District 5 with 954 in Tanana. The mean coho catch per fishing family was largest in District 6 with 435 in Nenana. In general the mean catch of summer chum salmon was smaller than the mean fall chum catch in Districts 5 and 6 and larger in Districts 1 through 4. The mean catch per fishing family was similar for fall chum and coho salmon in villages of Districts 1 through 3. Standard deviations were generally quite large and increased directly with mean catch. The standard error for the mean catch was adjusted for a finite population and was quite small (Table 3). The width of the resulting 95% confidence interval was also small.

The sample mean is the most common summary statistic, though if the underlying distribution is not symmetric it may not be the preferred statistic to describe central tendency. The mean can be sensitive to a few extremely large or small values and in that case the median may be the better statistic to describe a "typical" fishing family or at least to state the level of catch for which half the village caught greater and half caught fewer. The distribution of catch per fishing family by district is presented for chinook, summer chum, fall chum and coho salmon in Figures 2-9. They were found to be very skewed with numerous zero catches and a few extremely large values. Village median catch (Table 4) was consistently smaller than its mean catch and the magnitude of the difference depended on the degree to which the catch distribution was skewed. Note that the number of small and zero catches resulted in a median coho catch of zero for most Yukon River villages.

The subsistence fishery is regulated in-season by district to compliment commercial fisheries management. The subsistence survey was designed to stratify by village for data collection and further summarize and analyze harvest data on a district level. As data were summarized and analyzed by district a question arose: were there any underlying similarities in subsistence use patterns among villages within a district or was the grouping

by district mere convenience? If villages within a district shared a common mean catch per fishing family, subsampling within a district could be undertaken under conditions of restricted funding. Chinook catches by household differed significantly among villages for Districts 1, 2, 4, and 5 (Kruskal-Wallis tests, $p<0.05$, df= 3, 4, 10, and 8 respectively). In District 6 permit data from Fairbanks were omitted because harvest limits artificially limit variability and could not be compared to village fishermen without such limits. For the other villages in District 6 catches were not significantly different for any salmon category (Kruskal-Wallis test, $p>0.05$, df= 2). The fall chum salmon catch per fishing family was not significantly different within Districts 2, 3, 4 (Kruskal-Wallis tests, $p>0.05$, df= 4,1,10 respectively) and the p-values for Districts 1 and 5 were 0.049 and 0.034 respectively (Kruskal-Wallis test, df= 3, 8). Summer chum and coho salmon catches were significantly different within all districts (Kruskal-Wallis test, $p<0.05$, df= 3,4,1,8 for Districts 1-3,5 respectively), except coho salmon in District 4 (Kruskal-Wallis test, $p>0.05$, df=10). Significantly different catches within a district could be attributed to stock availability, personal preferences or gear type differences.

1986 Village, District and Drainage Harvest and Gear Totals

In 1986 the Yukon River subsistence harvest and number of fishing families participating was estimated from pooling postseason survey data from personal interviews, returned postal questionnaires, and returned permits. The drainage total salmon harvest in Alaska and its approximate 95% confidence interval was 45,238 ($\pm$1,023) chinook salmon, 290,815 ($\pm$14,006) summer chum salmon, 164,043 ($\pm$6,880) fall chum salmon and 34,468 ($\pm$3,436) coho salmon (Table 5). Due to the completeness of the survey the resulting harvest estimates were very precise as measured by the width of the confidence interval. The approximate 95% confidence interval was plus or minus 4% for chinook salmon, 9% for summer chum salmon, 8% for fall chum salmon and 20% for coho salmon. Precision as measured by the width of the confidence interval only reflects the complete coverage of the survey and does not address the accuracy of participants recall of their harvest or the appropriateness of the stratification of each village into possible fishing and non-fishing families. For comparison, the 1981-85 average subsistence harvests in the Alaskan portion of the Yukon River drainage was 37,905 chinook salmon, 240,543 summer chum salmon, 180,069 fall chum salmon, and 32,456 coho salmon.

The largest subsistence catch for chinook salmon occurred in District 5 (15,912 fish), summer chum salmon harvest was largest in District 4 (139,342 fish), and the harvest of coho salmon was largest in District 6 (Table 5). Small catches of pink salmon, whitefish and inconnu were also reported (Table 6).

Drainagewide, the largest village subsistence harvests were 3,083 chinook salmon in Fort Yukon, 41,581 summer chum salmon in Anvik, 32,049 fall chum salmon in Tanana and 10,090 coho salmon in Nenana (Table 7). The standard deviations were again quite small resulting from the high level of coverage of the 1986 survey and the resulting small finite population correction

factor. If all fishing families in a village were surveyed the standard deviation would be zero.

Throughout the drainage both large- and small-mesh gill nets were used to target either chinook or chum salmon (Table 8) though more fishermen owned small-mesh gill nets (1,001) than large-mesh (638). A total of 201 fish wheels were used in the Upper Yukon Districts 4-6. Two-thirds of the fishermen with fish wheels also owned gill nets. There was a total of 1.6 units of gear per estimated fishing family. The number of dogs per fishing family was also collected in 1986. Drainagewide a total of 5,519 dogs were reported of which a major portion is thought to be fed on salmon.

Comparison of 1986 In-season and Postseason Surveys

The in-season survey was conducted from 6 to 21 August in 14 villages to estimate the chinook subsistence harvest. In all villages fewer families were contacted in-season (Table 9) than during the postseason survey which included the follow up postal questionnaire. No significant difference (0.05) between surveys was found in the mean village catch per fishing family from villages where greater than three families were contacted in-season (Table 9). For the three villages with three or less fishing families sampled during one survey, either the assumption of equal variances was not fulfilled (F-max test, $p<0.05$, df=2,2) and a t-test was not conducted (towns of Beaver and Circle), or the difference between mean catches of 300% (town of Venetie) was found to be significantly different (Table 10). Few degrees of freedom and large standard deviations led to the result that large differences (43.8% and 79.7%, respectively) between mean catches from the two surveys in Minto and Manley were not significantly different (t-test, t=0.87, 0.74, df=15,13). In other words, though the reported mean catches differed greatly between surveys they were not significantly different due in part to the small number interviewed and the great variation in reported catches. The difference between the in-season and postseason estimates of the mean chinook catch per fishing family ranged from 1.1% in Nenana to 300% in Venetie.

As a result of conducting two Commercial Fisheries Division surveys in the same village a number of fishermen were interviewed twice. Differences were found in these participant's in-season and postseason responses (Table 10). The greatest discrepancy occurred in Nulato where mean catch reported from 7 fishermen interviewed twice was 35% higher in the postseason survey. This could have resulted from continued fishing after the 7 August in-season survey or memory error. In general the greatest differences occurred between the surveys of downriver villages of Kaltag, Nulato, and Galena.

In 1986, season-long monitoring of salmon subsistence catches occurred in the villages of Hughes on the Koyukuk River and Fort Yukon in District 5. In Hughes, the number of fishing families varied by only one between the estimate made by a local resident who had been contracted to monitor catches from July through August and the postseason survey conducted by a different department employee. Reported catches were likewise very similar between surveys (Table 11). A Subsistence Division employee monitored catches in Fort Yukon. Twenty-one families with established fish camps or who could otherwise be consistently contacted were chosen for monitoring (E. Andrews,

ADF&G, personal communication). In contrast, during the postseason survey an attempt was made to contact everyone on the computer list. A total of 50 people had previously been listed for Fort Yukon, of which fishing status of only 5 was unresolved. A total of 14 families who had fished were directly interviewed in the postseason survey, 10 returned postal surveys indicating that they had fished, and 4 families were otherwise known to have fished through contact with friends, relatives, or neighbors. In summary, 28 families were determined to have fished, and 3 of the 5 unknowns were estimated to have fished. The estimate of mean catch was from 53 chinook salmon per family based on the 21 non-randomly chosen fishing families monitored in-season by Subsistence Division to 101 chinook salmon for the Commercial Fisheries Division postseason survey. For the Subsistence Division survey, local residents did not differentiate between fall and summer chum salmon and did not report any coho catch. The mean chum catch per family was greater for the 21 families monitored in-season (507) than for the postseason survey estimate (386).

Comparison of Historic Commercial and Subsistence Division Survey Results

The detailed, season-long approach by the Division of Subsistence to the collection of effort and harvest data has generally supported the results achieved by the Division of Commercial Fisheries through postseason interviews, postal surveys and permits. The Commercial Fisheries Division estimate of the number of fishing families in Kaltag, Nulato, Koyukuk, Galena and Ruby was in close agreement with that documented by Subsistence Division (Huntington 1981).

The Subsistence Division monitored catches in Russian Mission in 1984 and Holy Cross in 1985, during which time the Division of Commercial Fisheries sent postseason postal questionnaires. The Division of Commercial Fisheries then expanded the average catch from returned questionnaires by the previous 5-year average number of fishing families obtained from village surveys. Only for Russian Mission in 1985 was there close agreement (within 13%) in estimates of total catch between the season-long monitoring (in-season) and the postseason surveys for summer chum salmon and coho salmon (D.J. Bergstrom, ADF&G, personal communication). Greater discrepancies in Russian Mission (45%) and Holy Cross (18%) were found between estimates of the chinook harvests. The greatest discrepancy between the postseason and in-season surveys was a 70% difference in the 1985 fall chum catch in Holy Cross (Table 12). The number of fishing families as determined by Subsistence Division staff also agreed closely (within 4 families) with the computer list of fishing families maintained from the previous year. Catch estimates for these two villages in the years for which comparison surveys were conducted trended well with estimates made for the period 1980-86. Only coho salmon documentation may have been a problem in Holy Cross. Claims have been made that Commercial Fisheries Division grossly undercounts subsistence catches. These comparisons with season-long monitoring did not find consistent undercounting, but in general catches were lower than the postseason estimate. It was hoped that if positive and negative errors occur they would cancel when village catches are summarized for district totals.

Historic Subsistence Harvest Levels and Distribution

Subsistence catches have been estimated since 1961 for chinook salmon and all other salmon pooled and reported as "small" salmon (Figure 10). Beginning in 1977, there has been separate accounting for summer and fall run chum salmon and coho salmon. Subsistence catches have been reported since 1961 in the Department's annual management report series. Total Alaskan Yukon River catches of chinook salmon have ranged from 10,994 in 1962 to 49,478 in 1983 (Table 13). The summer chum salmon harvest has increased steadily from 159,502 in 1977 to 264,828 in 1985. Similarly, estimates of the fall chum subsistence harvest have increased, from 82,771 in 1977 to more than 233,347 in 1979. The fall chum salmon harvest since 1979 has ranged between 130- to 200-thousand salmon. Coho salmon catches have ranged from 7,787 in 1978 to 49,020 in 1984. Subsistence catches of all species appear to have been depressed from the mid 1960s through 1977 (Figure 10). Thereafter catches have increased steadily through the 1980s, returning to levels of the early 1960s for "small" salmon and establishing record harvests of chinook salmon. The lower catches of "small" salmon seen in the mid-1960s through mid-1970s may have been due to the decreased use of dog teams for transportation and resulting in lower demand for the "small" salmon as dog food. Increased catches since the mid-1970s of all fish could be partially attributed to the resurgence in the number of dog teams as well as an overall increase of the human population along the entire river. Also, the commercial fishery for summer chum salmon roe in District 4 since 1980 has greatly increased that district's subsistence catch as fishermen attempt to use the surplus carcasses.

The number of fishing families has varied greatly between the period 1963-1976 and 1978-1986. The mean drainagewide number of fishing families doubled from 554 (1963-1976) to 1,076 (1978-1986). This increase began in 1978 when catch and numbers of families fishing were expanded to represent those not contacted but estimated to have fished. Catch data prior to 1978 were also expanded. Number of fishing families may not have been expanded and may reflect only those contacted, for the years 1963-1977 (F.M. Andersen and E.F. Andrews, ADF&G, personal communication).

It is necessary to predict future levels of subsistence fishing in order to insure adequate escapement and priority use of Yukon River fisheries resources for subsistence purposes. Unlike the commercial fishery, there is very little in-season reporting of subsistence catches. Harvest estimates are often not available until mid-winter. Therefore, it becomes necessary to anticipate future utilization levels, distribution, and timing of the subsistence harvest based on historical catch trends throughout the drainage.

Chinook Salmon

The most dramatic and steady long term increase in subsistence harvest has been for chinook salmon (Figure 11). Increased catches have been observed in all districts and the average annual harvest has doubled from 16,883 chinook salmon for the period of 1961-72 to 33,182 for 1973-86. There has also been some change in the distribution of catch. The proportion taken in District 6

has increased over time converging with that taken in District 1 through 4. The proportion of total harvest taken in District 5 increased from 11% in 1975 to 46% in 1981 (Table 14).

Summer Chum Salmon

The subsistence harvest of summer chum salmon in the Yukon River has increased from 159,502 fish in 1977 to 290,825 in 1986. The increased catch is most evident in District 4 (Figure 12) which has consistently comprised more than 40% of Alaska's Yukon River subsistence harvest of summer chum salmon.

The yearly fluctuation in drainage-wide catch was, in most part, due to variation in the level of harvest in District 4. In comparison both harvest or proportion of total harvest changed little for the other districts. The next highest proportion of drainage-wide catch was taken in District 5 and varied inversely to District 4 (Table 14).

Fall Chum Salmon

In 1979, the subsistence harvest of fall chum salmon in the Yukon River, Alaska doubled over previous levels (Figure 13). Catches averaged 183 thousand since then, ranging from 133- to 233-thousand.

There has been some change in the distribution of catches throughout the drainage. The proportion taken in District 6 declined from 1977 through 1981 and the proportion taken in Districts 5 and 4 increased (Figure 13). The greatest proportion of the catch has been taken in District 5, averaging 52% of total for the period 1977-86 (Table 14). District 3 takes the smallest harvest averaging only 2 percent for the period 1977-86.

Coho Salmon

Reported subsistence harvest of coho salmon increased substantially since 1977 (Figure 14). The 1982-86 average of 35,109 fish was over double the previous 5-year average of 15,056 (1977-81). Much of the increase occurred in Districts 5 and 6. While the observed increase in coho harvest may have partially resulted from fisherman beginning to differentiate coho salmon from fall chum salmon in their subsistence catches, most of the increase in recent years has been attributed to increasing run sizes. Both test fishing and commercial catch rates also indicate improved coho salmon run strength (D. Bergstrom, ADF&G, personal communication).

The distribution of the coho salmon catch across districts has varied annually. The proportion caught in District 1 has declined over the last 5 years, while District 6 has increased (Figure 14). On average for the 1977-86 period, District 6 took the largest proportion (36%) and District 3 the smallest (<2%) (Table 14).

Accuracy of the Postseason Subsistence Survey

It is difficult to conclude on the accuracy of the Commercial Fisheries Division postseason subsistence survey. It was hypothesized that the postseason estimate of the chinook salmon harvest might not be accurate due to the time elapsed between actual fishing and the survey. An in-season survey was conducted in order to better document the chinook harvest directly after the early season. No significant difference in mean catches of chinook salmon between in-season and postseason surveys was detected. Therefore we can not conclude that the time elapsing between the two surveys affected the accuracy of the postseason estimates of mean catch per fishing family. A difference may exist which was not detected due to the large variances in part associated with the small sample size. In addition inaccuracies introduced by mis-reporting either accidentally or on purpose could bias the in-season and postseason survey in the same direction. Yet there is no evidence of purposeful mis-reporting in any one direction (over or under reporting), and it was assumed that accidental over or under-reporting would cancel on a village or district wide basis. There was close agreement in the harvest estimates given by fishermen interviewed during both surveys. The in-season survey will not be continued because fewer fishermen are contacted which reduces the overall coverage and resulting precision of the total harvest estimate, and since the postseason estimate of mean chinook catch appears adequate.

A further attempt to evaluate the accuracy of the postseason survey was made by comparing it with season long monitoring of catches in Hughes and Fort Yukon. The postseason harvest estimate was very accurate in Hughes. A comparison could not be made due to the sample design for Fort Yukon. It was thought that the difference between the monitoring in Fort Yukon and the postseason survey was, in part, due to the time span for which staff were active in Fort Yukon and the non-random choice of monitored fishermen. It may be more appropriate to evaluate the accuracy of the postseason survey based on the 1986 results in Hughes and historical comparisons in Russian Mission and Holy Cross. Anytime the Department monitors harvest in a village, fishermen may become more aware of the magnitude of their catch, and similar accuracy can not be assumed for other villages. Yet differences of from 10% (Russian Mission, summer chum harvest) to -70% (Holy Cross, fall chum harvest) were detected between in-season and postseason survey results. The large reporting errors using postal surveys to estimate fall chum salmon and chinook salmon harvests in Russian Mission and Holy Cross emphasizes the need to utilize catch calendars to improve fishermen's records and or memories for detail catch data. The question of poor accuracy for some species/year/village combinations completely overshadows the small variance and good precision of the estimate resulting from the high coverage of the survey.

LITERATURE CITED

ADF&G (Alaska Department of Fish and Game). 1963. 1963 annual report Arctic-Yukon-Kuskokwim area. Division of Commercial Fisheries, (Region 3 unpublished report), Anchorage.

ADF&G (Alaska Department of Fish and Game). 1974. Annual management report 1974 Yukon Area. Division of Commercial Fisheries, (Region 3 unpublished report), Anchorage.

ADF&G (Alaska Department of Fish and Game). 1977. Annual management report 1977 Yukon Area. Division of Commercial Fisheries, (Region 3 unpublished report), Anchorage.

ADF&G (Alaska Department of Fish and Game). 1979. Annual management report 1979 Yukon Area. Division of Commercial Fisheries, (Region 3 unpublished report), Anchorage.

ADF&G (Alaska Department of Fish and Game). 1984. Annual management report 1984 Yukon Area. Division of Commercial Fisheries, (Region 3 unpublished report), Anchorage.

ADF&G (Alaska Department of Fish and Game). 1985. Annual management report 1985 Yukon Area. Division of Commercial Fisheries, (Region 3 unpublished report), Anchorage.

ADF&G (Alaska Department of Fish and Game). 1986. Commercial and subsistence fishing regulations, 1986 edition. Division of Commercial Fisheries, Juneau.

Andrews, E.F. 1986. Yukon and Kuskokwim Rivers subsistence salmon research design, Part 2 catch report verification---Yukon River 1986. Alaska Department of Fish and Game, Division of Subsistence, (Unpublished report), Fairbanks.

Conover, W.J. 1980. Practical non parametric statistics. John Wiley and Sons, Inc. New York.

Huntington, C.C. 1981. Issue paper on subsistence king salmon drift gillnetting Yukon Area Subdistrict 4-A (proposal #463). Alaska Department of Fish and Game, Division of Subsistence, Technical Paper 17, Juneau.

Marcotte, J.R. 1982. The king salmon drift net fishery on the middle Yukon: an overview and study of the 1982 season. Alaska Department of Fish and Game, Division of Subsistence, Technical Paper 18, Juneau.

Seigel, N., and J. McKenzie. 1985. A summary of the Indian Food Fishery in District Ten (Yukon and Northern British Columbia) 1985. Department of Fisheries and Oceans, Pacific Region Field Services Branch, Whitehorse, Yukon Territory, Canada.

LITERATURE CITED (Continued)

Snedecor, G.W., and W.G. Cochran. 1980. Statistical methods. Iowa State University Press, Ames.

Wolfe, R.J. 1981. Norton Sound/Yukon delta sociocultural systems baseline analysis. Alaska Department of Fish and Game, Division of Subsistence, Technical Paper 59, Juneau.

Wolfe, R.J. 1982. The subsistence salmon fishery of the lower Yukon River. Alaska Department of Fish and Game, Division of Subsistence, Technical Paper 60, Juneau.

TABLES AND FIGURES

Table 1. Number of households interviewed, received postal surveys or permits for the collection of subsistence harvest data postseason throughout the Yukon River drainage, Alaska, 1986.

District/ Area	Village	Inclusive Survey Date	Families on Computer List	Percent[a] Contacted	Number Contacted by					Number of[b] Unknown Fishing Status
					Personal Interview	Postal Survey		Permits		
						Sent	Returned	Issued	Returned	
1	Sheldon's Pt.	8/28	20	75	14	6	1	0	0	3
	Alakanuk	8/23-8/27	85	78	59	26	7	0	0	18
	Emmonak	8/30	80	43	27	53	7	0	0	18
	Kotlik	8/24-8/26	54	89	48	6	0	0	0	1
2	Mt. Village	9/4	87	72	51	36	12	0	0	21
	Pitka's Pt.	9/6	13	85	10	3	1	0	0	2
	St. Mary's	8/31-9/5	63	87	40	23	15	0	0	7
	Pilot Station	9/1	54	74	30	24	10	0	0	10
	Marshall	9/2	58	69	31	27	9	0	0	16
3	Russian Mission	9/3	26	88	16	10	7	0	0	1
	Holy Cross	9/5	29	72	15	14	6	0	0	7
4	Anvik	Mail	20	65	6	14	7	0	0	3
	Shageluk	10/15	13	100	12	1	1	0	0	0
	Grayling	10/15	28	89	18	10	7	0	0	2
	Kaltag	10/20	24	96	19	5	4	0	0	1
	Nulato	10/21	38	87	22	16	11	0	0	3
	Koyukuk	10/23	19	100	17	2	2	0	0	0
	Galena	10/20-10/24	33	97	22	11	10	0	0	0
	Ruby	10/24	26	85	15	11	7	0	0	0
Koyukuk R.	Huslia	10/22	20	100	15	5	5	0	0	0
	Hughes	10/22	15	93	14	1	0	0	0	0
	Allakaket	10/22	25	100	18	7	7	0	0	0
5	Tanana	10/28	37	81	18	19	12	0	0	7
	Rampart	11/3	13	100	13	0	0	0	0	0
	Fairbanks F.C.	Mail	63	73	0	0	0	63	46	14
	Stevens Village	11/3	30	90	16	14	6	18	18	2
	Beaver	11/3	10	90	8	2	1	0	0	1
	Fort Yukon	11/5-11/7	50	82	30	20	11	0	0	5
	Circle	11/3	15	93	7	8	7	12	9	1
	Central	11/3	4	100	0	4	3	3	2	1
	Eagle	11/12-11/14	64	89	44	20	11	24	22	6
	Tok	Mail	3	100	0	0	0	3	3	0
Chandarlar R.	Venetie	11/5	14	100	14	0	0	0	0	0
Black R.	Chalkyitsik	11/5	12	75	9	3	0	0	0	3
6	Manley	10/30-10/31	16	75	8	8	4	0	0	1
	Minto	10/30	23	74	16	7	1	0	0	2
	Nenana	Mail	35	74	16	19	10	0	0	9
	Fairbanks[c]	Mail	257	91	0	0	0	257	235	22
	North Pole	Mail	53	92	0	0	0	53	49	4
	Salcha	Mail	13	85	0	0	0	13	11	2
Totals			1,542	78	718	435	202	446	373	193

[a] Some fishing families were interviewed and subseqently returned permits.
[b] Does not include those who were not contacted but for which fishing status was determined from contact with relatives or neighbors.
[c] Data from Fairbanks, North Pole and Salcha are pooled and reported as Fairbanks.

Table 2. Number of families fishing, their mean subsistence catch, and standard deviation by village in the Yukon River drainage, Alaska, 1986.

District	Village	Number Sampled[a] for Harvest Data	Catch in Number of Salmon[b]							
			Chinook		Summer Chum		Fall Chum		Coho	
			Mean	SD	Mean	SD	Mean	SD	Mean	SD
1	Sheldon's Pt.	12	38	29	309	195	17	31	15	29
	Alakanuk	53	15	19	168	102	30	49	23	37
	Emmonak	30	24	40	187	159	21	62	13	32
	Kotlik	44	26	34	208	179	25	53	3	10
2	Mt. Village	57	17	28	146	130	38	72	11	19
	Pitka's Pt.	9	26	28	186	101	15	24	7	17
	St. Mary's	53	24	28	218	221	88	345	80	342
	Pilot Station	33	32	47	175	278	37	76	34	60
	Marshall	39	36	23	132	159	64	86	36	46
3	Russian Mission	22	76	83	137	122	28	33	30	54
	Holy Cross	20	94	84	90	150	43	61	4	11
4	Anvik	9	65	85	2,810	3,630	62	57	20	49
	Shageluk	11	5	5	610	215	34	50	16	37
	Grayling	20	82	109	1,570	2,303	187	275	38	90
	Kaltag	20	52	53	1,184	2,324	97	125	11	26
	Nulato	25	65	89	368	690	63	76	2	10
	Koyukuk	15	38	78	417	1,273	146	260	10	26
	Galena	24	42	53	265	635	193	420	19	48
	Ruby	19	66	102	415	734	374	440	18	27
Koyukuk R.	Huslia	16	5	8	657	970	51	79	2	8
	Hughes	13	21	34	520	871	102	177	0	0
	Allakaket	21	27	48	425	679	42	91	1	3
5	Tanana	27	50	67	346	439	954	1,340	140	294
	Rampart	6	283	163	242	273	658	1,588	18	40
	Fairbanks F.C.	34	37	46	29	64	246	685	15	56
	Stevens Village	15	168	109	184	359	245	322	4	13
	Beaver	7	91	181	0	0	429	787	16	37
	Fort Yukon	24	101	119	107	191	279	506	4	13
	Circle	12	161	268	22	38	287	274	3	10
	Central	3	62	78	61	53	0	0	0	0
	Eagle	33	50	60	12	56	434	559	0	1
	Tok	3	27	27	24	41	0	0	0	0
Chandalar R.	Venetie	8	4	12	0	0	399	335	0	0
Black R.	Chalkyitsik	5	0	0	0	0	230	342	1	2
6	Manley	10	59	105	57	123	560	729	51	127
	Minto	10	32	34	146	315	50	97	97	175
	Nenana	15	90	134	466	1,265	685	954	435	850
	Fairbanks	193	3	5	19	26	13	23	8	17

[a] Represents only those who reported catches. Data from personal interviews, postal surveys and returned permits pooled.
[b] Mean catch is reported to the nearest whole fish.

Table 3. Number of fishing families, their mean subsistence catch, its standard error, and the upper and lower bounds of a 95% confidence interval by village and salmon category in the Yukon River drainage, Alaska, 1986.

		Catch in Number of Salmon[b]															
			Chinook				Summer Chum				Fall Chum				Coho			
District	Village	N[a]	Mean	SE	UCB	LCB[c]	Mean	SE	UCB	LCB	Mean	SE	UCB	LCB	Mean	SE	UCB	LCB
1	Sheldon's Pt.	12	38	4.2	47	29	309	28.2	371	247	17	4.4	27	7	15	4.2	24	6
	Alakanuk	53	15	1.3	18	12	168	7.0	182	154	30	3.4	37	23	23	2.5	28	18
	Emmonak	30	24	4.8	34	14	187	19.2	226	148	21	7.5	36	6	13	3.8	21	5
	Kotlik	44	26	1.0	28	24	208	5.4	219	197	25	1.6	28	22	3	0.3	4	2
2	Mt. Village	57	17	2.0	21	13	146	9.2	165	127	38	5.1	48	28	11	1.4	14	8
	Pitka's Pt.	9	26	3.9	35	17	186	14.3	219	153	15	3.4	23	7	7	2.4	13	1
	St. Mary's	53	24	1.3	27	21	218	10.4	239	197	88	16.2	121	55	80	16.0	112	48
	Pilot Station	33	32	4.5	41	23	175	26.4	229	121	37	7.2	52	22	34	5.7	46	22
	Marshall	39	36	2.0	40	32	132	13.7	160	104	64	7.5	79	49	36	3.9	44	28
3	Russian Mission	22	76	3.7	84	68	137	5.4	148	126	28	1.5	31	25	30	2.4	35	25
	Holy Cross	20	94	9.5	114	74	90	17.1	126	54	43	7.0	58	28	4	1.3	7	1
4	Anvik	9	65	18.7	108	22	2810	800.4	4656	964	62	12.6	91	33	20	10.9	45	-5
	Shageluk	11	5	0.0	5	5	610	0.0	610	610	34	0.0	34	34	16	0.0	16	16
	Grayling	20	82	8.8	100	64	1570	186.0	1959	1181	187	22.2	233	141	38	7.3	53	23
	Kaltag	20	52	2.6	57	47	1184	113.4	1421	947	97	6.1	110	84	11	1.3	14	8
	Nulato	25	65	6.6	79	51	368	51.2	474	262	63	5.6	75	51	2	0.7	3	1
	Koyukuk	15	38	0.0	38	38	417	0.0	417	417	146	0.0	146	146	10	0.0	10	10
	Galena	24	42	2.1	46	38	265	25.9	319	211	193	17.2	229	157	19	2.0	23	15
	Ruby	19	66	0.0	66	66	415	0.0	415	415	374	0.0	374	374	18	0.0	18	18
Koyukuk R.	Huslia	16	5	0.0	5	5	657	0.0	657	657	51	0.0	51	51	2	0.0	2	2
	Hughes	13	21	2.5	26	16	520	64.5	661	379	102	13.1	131	73	0	0.0	0	0
	Allakaket	21	27	0.0	27	27	425	0.0	425	425	42	0.0	42	42	1	0.0	1	1
5	Tanana	27	50	5.9	62	38	346	38.3	425	267	954	117.0	1195	713	140	25.6	193	87
	Rampart	6	283	0.0	283	283	242	0.0	242	242	658	0.0	658	658	18	0.0	18	18
	Fairbanks F.C.	34	37	4.6	46	28	29	6.4	42	16	246	67.8	384	108	15	5.5	26	4
	Stevens Village	15	168	11.5	193	143	184	37.9	265	103	245	33.9	318	172	4	1.4	7	1
	Beaver	7	91	24.2	150	32	0	0.0	0	0	429	105.1	686	172	16	5.0	28	4
	Fort Yukon	24	101	12.6	127	75	107	20.4	149	65	279	53.9	391	167	4	1.4	7	1
	Circle	12	161	21.5	208	114	22	3.1	29	15	287	21.9	335	239	3	0.8	5	1
	Central	3	62	22.5	159	-35	61	15.3	127	-5	0	0.0	0	0	0	0.0	0	0
	Eagle	33	50	4.4	59	41	12	4.1	20	4	434	40.7	517	351	0	0.1	0	-0
	Tok	3	27	13.2	84	-30	24	19.8	109	-61	0	0.0	0	0	0	0.0	0	0
Chandalar R.	Venetie	8	4	0.0	4	4	0	0.0	0	0	399	0.0	399	399	0	0.0	0	0
Black R.	Chalkyitsik	5	0	0.0	0	0	0	0.0	0	0	230	98.7	490	-30	1	0.5	2	-0
6	Manley	10	59	10.0	82	36	57	11.7	83	31	560	69.5	717	403	51	12.1	78	24
	Minto	10	32	4.3	42	22	146	40.6	238	54	50	12.5	78	22	97	22.6	148	46
	Nenana	15	90	21.2	135	45	466	200.0	895	37	685	150.8	1008	362	435	134.4	723	147
	Fairbanks	193	3	0.1	3	3	19	0.7	20	18	13	0.6	14	12	8	0.4	9	7

[a] Represents only those who reported catches. Data from postseason personal interviews, postal surveys and returned permits pooled.
[b] Mean catch is reported to the nearest whole fish.
[c] UCB, LCB are the upper (UCB) and lower (LCB) bounds of a 95% confidence interval.

Table 4. Number of families fishing and their median subsistence catch by village in the Yukon River drainage, Alaska, 1986.

District	Village	Number Sampled[a] for Harvest Data	Median Catch in Number of Salmon[b]			
			Chinook	Summer Chum	Fall Chum	Coho
1	Sheldon's Pt.	12	26	288	0	0
	Alakanuk	53	8	150	3	0
	Emmonak	30	11	140	0	0
	Kotlik	44	17	161	0	0
2	Mt. Village	57	12	120	6	0
	Pitka's Pt.	9	18	160	0	0
	St. Mary's	53	15	180	3	15
	Pilot Station	33	20	85	0	9
	Marshall	39	33	65	35	20
3	Russian Mission	22	65	88	12	2
	Holy Cross	20	73	14	20	0
4	Anvik	9	50	1,500	30	0
	Shageluk	11	4	300	0	0
	Grayling	20	39	675	55	0
	Kaltag	20	35	200	55	0
	Nulato	25	30	75	40	0
	Koyukuk	15	10	50	60	0
	Galena	24	19	40	23	0
	Ruby	19	28	45	150	6
Koyukuk R.	Huslia	16	1	125	25	0
	Hughes	13	10	200	25	0
	Allakaket	21	6	200	0	0
5	Tanana	27	20	250	350	0
	Rampart	6	300	200	0	0
	Fairbanks F.C.	34	24	10	0	0
	Stevens Village	15	200	0	100	0
	Beaver	7	30	0	0	0
	Fort Yukon	24	48	0	55	0
	Circle	12	68	2	243	0
	Central	3	34	83	0	0
	Eagle	33	31	0	160	0
	Tok	3	12	0	0	0
Chandalar R.	Venetie	8	0	0	388	0
Black R.	Chalkyitsik	5	0	0	50	0
6	Manley	10	5	13	0	0
	Minto	10	23	0	0	0
	Nenana	15	50	75	25	0
	Fairbanks	193	0	6	0	0

[a] Represents only those who reported catches. Data from postseason personal interviews, postal surveys and returned permits pooled.

[b] Median catch is reported to the nearest whole fish.

Table 5. Estimated district/area subsistence catch, its standard deviation, and number of subsistence fishing families in the Yukon River drainage, Alaska, 1986.

District/Area	Numbers of Fishing Families	Numbers of Salmon							
		Chinook		Summer Chum		Fall Chum		Coho	
		Total	SD	Total	SD	Total	SD	Total	SD
1	206	5,275	253	38,854	1,135	9,000	430	2,725	255
2	249	6,483	293	41,496	1,705	13,483	1,167	9,140	1,020
3	50	4,252	268	5,528	472	1,785	189	781	66
Lower Yukon Total	505	16,010	470	85,878	2,102	24,268	1,258	12,646	1,053
4	157	8,642	395	139,342	12,906	23,388	715	2,585	237
Koyukuk River	51	941	35	26,720	904	3,108	184	46	0
5	200	15,912	641	21,833	1,605	83,398	5,654	5,862	904
Chandalar/Black R.	15	32	0	0	0	4,726	627	8	3
6 (Tanana R.)	256	3,701	507	17,042	4,669	25,155	3,583	13,321	3,135
Upper Yukon Total	679	29,228	908	204,937	13,847	139,775	6,764	21,822	3,271
Lower 95% C.I.[a]		43,233		263,363		150,559		27,733	
Total	1,184	45,238	1,023	290,815	14,006	164,043	6,880	34,468	3,436
Upper 95% C.I.		47,243		318,267		177,527		41,203	

[a] C.I. = Confidence interval based on a normal statistic of 1.96. The precision implied by the width of this confidence interval does not take into account the accuracy of a fisherman's recalled harvest.

Table 6. Estimated subsistence harvest of pink salmon, whitefish, and inconnu by village in the Yukon River drainage, Alaska, 1986.

District	Village	Catch in Numbers of Fish		
		Pink Salmon	Whitefish	Inconnu
1	Sheldon's Pt.	0	662	916
	Alakanuk	0	1,539	1,158
	Emmonak	0	1,161	838
	Kotlik	246	160	407
2	Mt. Village	0	1,452	697
	Pitka's Pt.	0	239	160
	St. Mary's	0	962	243
	Pilot Station	0	3,857	2,171
	Marshall	0	3,633	721
3	Russian Mission	0	268	180
	Holy Cross	0	279	127
4	Anvik	0	181	352
	Shageluk	788	308	88
	Grayling	0	1,039	425
	Kaltag	0	610	49
	Nulato	0	419	93
	Koyukuk	0	349	87
	Huslia	0	1,565	149
	Hughes	0	309	162
	Allakaket	0	1,641	398
	Galena	0	3,275	325
	Ruby	0	900	190
5	Tanana	0	9,960	3,230
	Rampart	0	100	60
	Fairbanks F.C.	0	361	146
	Stevens Village	0	408	71
	Beaver	0	100	55
	Fort Yukon	0	2,899	566
	Circle	0	79	11
	Central	0	1	3
	Venetie	0	0	0
	Chalkyitsik	0	1,473	440
	Eagle	0	843	156
	Tok	0	3	2
6	Manley	0	593	85
	Minto	0	0	1
	Nenana	0	433	226
	Fairbanks	0	60	12
	North Pole	0	1	0
	Salcha	0	0	0
Totals		1,034	42,122	15,000

Table 7. Estimated total subsistence catch, its standard deviation, and number of subsistence fishing families in the Yukon River drainage, Alaska, 1986.

District/ Area	Village	Fishing Families		Catch in Number of Salmon							
				Chinook		Summer Chum		Fall Chum		Coho	
		Number	SD	Total	SD	Total	SD	Total	SD	Total	SD
1	Sheldon's Pt.	15	0.3	592	65	4,755	437	259	68	237	60
	Alakanuk	67	1	1,027	87	11,280	480	2,030	230	1,518	171
	Emmonak	75	0.8	1,754	223	12,618	895	2,746	349	732	179
	Kotlik	49	0	1,902	49	10,201	257	3,965	76	238	15
2	Mt. Village	78	0.8	1,367	158	11,468	728	2,947	399	828	106
	Pitka's Pt.	11	0.3	274	42	1,973	153	156	37	71	25
	St. Mary's	60	0.2	1,443	79	13,013	618	5,245	965	4,761	957
	Pilot Station	45	0.7	1,452	202	7,870	1,189	1,663	323	1,514	257
	Marshall	55	0.5	1,947	109	7,172	748	3,472	406	1,966	215
3	Russian Mission	23	0	1,747	85	3,136	124	637	34	679	56
	Holy Cross	27	0.5	2,505	254	2,392	455	1,148	186	102	34
4	Anvik	15	0.5	959	277	41,581	11,874	913	187	296	161
	Shageluk	11	0	53	0	6,710	0	370	0	173	0
	Grayling	23	0.2	1,837	197	35,284	4,181	4,204	500	860	164
	Kaltag	21	0.1	1,080	54	24,667	2,363	2,024	128	229	27
	Nulato	28	0.3	1,835	186	10,349	1,441	1,762	159	69	21
	Koyukuk	15	0	569	0	6,250	0	2,195	0	154	0
	Galena	25	0	1,046	54	6,618	648	4,819	429	465	49
	Ruby	19	0	1,263	0	7,883	0	7,101	0	339	0
Koyukuk R.	Huslia	16	0	82	0	10,506	0	808	0	31	0
	Hughes	14	0	296	35	7,280	904	1,422	184	0	0
	Allakaket	21	0	563	0	8,934	0	878	0	15	0
5	Tanana	34	0.4	1,672	198	11,646	1,289	32,049	3,935	4,691	862
	Rampart	6	0	1,700	0	1,450	0	3,950	0	110	0
	Fairbanks F.C.	48	0.8	1,762	217	1,382	303	11,708	3,227	709	264
	Stevens Village	17	0.2	2,839	195	3,116	640	4,150	574	67	23
	Beaver	8	0.2	708	188	0	0	3,321	815	124	39
	Fort Yukon	31	0.4	3,083	388	3,264	625	8,543	1,654	118	42
	Circle	13	0.2	2,047	273	275	39	3,650	279	37	10
	Central	3	0	186	0	184	0	0	0	0	0
	Eagle	37	0.4	1,833	162	445	150	16,027	1,506	6	2
	Tok	3	0	82	0	71	0	0	0	0	0
Chandalar R.	Venetie	8	0	32	0	0	0	3,193	0	0	0
Black R.	Chalkyitsik	7	0.5	0	0	0	0	1,533	627	8	3
6	Manley	11	0.1	621	105	604	124	5,905	734	538	127
	Minto	11	0.2	350	47	1,587	443	545	137	1,058	246
	Nenana	23	0.2	2,093	493	10,827	4,644	15,902	3,502	10,090	3,121
	Fairbanks	211	0.6	637	25	4,024	139	2,803	127	1,635	90

Table 8. Estimated number of subsistence fishing families, gear owned, and number of dogs per village in the Yukon River drainage, Alaska, 1986.[a]

District/ Area	Village	Fishing Families	Gill Nets[b]		Fish Wheels	Dogs
			Large Mesh	Small Mesh		
1	Sheldon's Pt.	15	10	17	0	59
	Alakanuk	67	27	96	0	188
	Emmonak	75	30	50	0	103
	Kotlik	49	19	49	0	170
2	Mt. Village	78	40	78	0	219
	Pitka's Pt.	11	7	11	0	77
	St. Mary's	60	36	64	0	379
	Pilot Station	45	23	47	0	97
	Marshall	55	40	56	0	379
3	Russian Mission	23	21	23	0	108
	Holy Cross	27	27	13	0	66
4	Anvik	15	16	10	7	92
	Shageluk	11	1	11	0	104
	Grayling	23	19	20	10	183
	Kaltag	21	17	9	13	163
	Nulato	28	19	16	15	128
	Koyukuk	15	8	13	1	49
	Galena	25	20	10	6	139
	Ruby	19	2	8	11	220
Koyukuk R.	Huslia	16	4	17	1	158
	Hughes	14	1	14	0	78
	Allakaket	21	10	27	0	191
5	Tanana	34	20	15	31	686
	Rampart	6	7	2	2	68
	Fairbanks F.C.	48	50	27	10	90
	Stevens Village	17	20	9	6	106
	Beaver	8	7	1	1	54
	Fort Yukon	31	24	15	18	216
	Circle	13	7	10	10	95
	Central	3	3	2	0	3
	Eagle	37	30	34	7	230
	Tok	3	2	1	0	0
Chandalar R.	Venetie	8	0	8	0	87
Black R.	Chalkyitsik	7	0	7	0	11
6	Manley	11	8	5	7	127
	Minto	11	7	4	2	72
	Nenana	23	12	14	17	324
	Fairbanks	211	44	188	26	0
Total		1,184	638	1,001	201	5,519

[a] Survey interviews and questionnaires asked for the number of nets and fish wheels owned and used at least once during the fishing season.

[b] Large-mesh gill nets are generally larger than 6 in mesh and small-mesh nets are less.

Table 9. Mean reported chinook salmon subsistence catch and number reporting by village for in-season (August) and postseason (October-November) surveys, 1986.

Village	Date	Fishing[a] Families Sampled	Number of Chinook Salmon		Percent Difference[b] From Postseason Reported Mean Catch	Statistic	
			Mean Catch	SD		t	F
Kaltag	8/6	17	54	50.8	-3.8	0.12	1.10
	10/20	20	52	53.2			
Nulato	8/7	12	83	90.7	-27.7	0.57	1.03
	10/21	25	65	89.2			
Galena	8/5-8/8	15	38	46.5	9.5	-0.24	1.28
	10/20-10/24	24	42	52.6			
Ruby	8/8	11	50	66.8	24.2	-0.46	2.33
	10/24	19	66	101.9			
Tanana	8/11	14	54	63	-8.0	0.18	1.14
	10/28	27	50	67.3			
Rampart	8/15	5	340	96.2	-20.1	0.68	2.88
	11/3	6	283	163.3			
Stevens Village	8/15	9	187	112.1	-11.3	0.41	1.06
	11/3	15	168	109			
Beaver	8/15	3	35	13.6	61.5	[c]	177.32
	11/3	7	91	181.1			
Circle	8/20	3	64	37.8	60.2	[c]	50.38
	11/3	12	161	268.3			
Venetie	8/20	2	16	22.6	-300.0	1.15	4.00
	11/5	8	4	11.3			
Eagle	8/19	16	52	60.3	-4.0	0.11	1.00
	11/12-11/14	33	50	60.2			
Manley	8/13	5	106	136.7	-79.7	0.74	1.70
	10/30-10/31	10	59	104.8			
Minto	8/29	7	46	30.9	-43.8	0.87	1.18
	10/30	10	32	33.6			
Nenana	8/21	9	89	79.3	1.1	-0.02	2.86
	Mail	15	90	134.2			
Total In-season		128	78.0		-6.0		
Total Postseason		231	73.6				

[a] Fishing families sampled during the in-season survey or the postseason survey (interviews and postal questionnaires combined).

[b] Percent difference was (Postseason - In-season)/Postseason

[c] A significant difference (0.05) was found between the variances and a t statistic was not calculated.

Table 10. In-season (August) chinook salmon subsistence catch reports compared to postseason (October-November) survey reports by the same fishermen, 1986

Village	Inclusive Survey Date	Number of Fishermen Interviewed Twice	Mean Reported Catch	SD	Percent Difference[a] From Postseason Mean Catch
Kaltag	8/6	14	55	53	-20
	10/20		46	42	
Nulato	8/7	7	79	103	35
	10/21		121	127	
Galena	8/5-8/8	10	34	37	19
	10/23		42	59	
Ruby	8/8	8	58	77	9
	10/24		64	74	
Tanana	8/11	11	53	68	9
	10/28		58	68	
Rampart	8/15	5	340	96	0
	11/3		340	96	
Steven's Village	8/15	6	147	114	-8
	11/3		136	99	
Beaver	8/15	3	35	14	0
	11/3		35	14	
Circle	8/20	1	20		0
	11/3		20		
Eagle	8/19	5	52	61	5
	11/10-11/11		55	59	
Venetie	8/20	1	32		0
	11/5		32		
Manley	8/13	2	15	21	0
	10/30		15	21	
Minto	8/29	6	51	30	0
	10/30		51	30	
Total In-season		79	76		4
Total Postseason			79		

[a] Percent difference was (Postseason - In-season)/Postseason

Table 11. In-season subsistence harvest survey results compared to the Division of Commercial Fisheries' postseason survey, 1986.

Village	Inclusive Survey Date	Number of Fishing Families	Catch in Number of Salmon									
			Chinook		Summer Chum		Fall Chum		Chum Total		Coho	
			Mean	Total	Mean	Total	Mean	Total	Mean	Total	Mean	Total
Hughes	7/10-9/25	15	21	309	529	7,936	93	1,389				
	10/22	14	21	296	520	7,280	102	1,422				
Fort Yukon	7/1-10/30	21	53	1,122					507	10,654		
	Expanded In-season	31		1,656[a]					507	15,727[a]		
	11/5-11/7	31	101	3,083	107	3,264	279	8,543	386	11,807	4	117

[a] Harvest estimates expanded for the number of fishing families determined for postseason survey (5-7 November)

Table 12 Subsistence harvest and number of fishing families as collected throughout the season by a Division of Subsistence resident monitor and the Division of Commercial Fisheries' postseason mail survey.

Village	Inclusive Survey Date	Number of[a] Fishing Families	Catch in Number of Salmon									
			Chinook		Summer Chum		Fall Chum		Coho		Pink	
			Mean	Total	Mean	Total	Mean	Total	Mean	Total	Mean	Total
Russian Mission	July-August 1984	22	88	1,938	101	2,227	39	860	34	740	23	502
	Postseason 1984	21	64	1,338	118	2,482	29	617	31	653	0	0
	Percent Error[b]			-45		10		-39		-13		
Holy Cross	July-August 1985	20	89	1,775	90	1,797	79	1,578	0	0		
		22		1,953		1,977		1,736				
	Postseason 1985[c]	22	108	2,368	85	1,870	47	1,024	5	100		
	Percent Error[b]			18		-6		-70				

[a] The number of fishing families for postseason surveys represents the previous five year average.
[b] Percent Error = (Postseason - In-season)/Postseason
[c] Harvest estimate expanded for the number of fishing families determined by Subsistence Division but not contacted.

Table 13. Alaska Yukon River subsistence catch, 1961-1985.

Year	Catch in Number of Salmon[a]				
	Chinook	Summer Chum	Fall Chum	Coho	Small Salmon
1961	21,463				405,357
1962	10,994				347,244
1963	24,607				392,780
1964	15,668				479,124
1965	16,325				446,297
1966	11,361				206,011
1967	16,383				274,977
1968	11,987				178,507
1969	13,972				208,254
1970	13,874				222,005
1971	25,511				228,649
1972	20,458				144,008
1973	24,403				212,337
1974	19,912				315,198
1975	12,896				287,299
1976	17,806				259,197
1977	17,567	159,502	82,771	16,333	258,606
1978	30,297	197,144	94,867	7,787	299,798
1979	31,005	196,187	233,347	9,794	439,328
1980	42,724	272,398	172,657	20,158	465,213
1981	29,690	205,783	188,375	21,208	415,366
1982	28,158	260,969	132,897	35,894	429,760
1983	49,478	240,386	192,928	23,895	457,209
1984	42,428	230,747	174,823	49,020	454,590
1985	39,771	264,828	206,472	32,264	503,564
Average (1981-1985)	37,905	240,543	179,099	32,456	452,098
Average (1977-1985)	34,569	225,327	164,349	24,039	413,715

[a] Subsistence catch was not separated by run of chum or coho salmon before 1977 and was reported as "small" salmon.

Table 14. Subsistence catch in number of salmon expressed as percent of total yearly harvest by district for each major salmon group harvested in the Yukon River drainage, Alaska, 1977-1986.

Percent of Total Chinook Catch

District	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	Mean(77-86)
1	4.3	17.7	9.5	8.7	7.9	8.5	13.1	11.3	8.0	11.9	10.1
2	9.7	13.4	14.0	8.8	12.3	7.7	18.9	17.5	9.0	14.6	12.6
3	14.8	13.1	10.7	11.4	13.8	12.3	10.2	10.7	8.7	9.6	11.5
4	26.7	16.7	22.0	25.0	13.1	15.4	17.2	15.3	16.1	19.5	18.7
5	35.5	35.0	39.4	41.8	45.7	47.1	34.9	36.5	39.1	35.9	39.1
6	9.0	4.1	4.4	4.4	7.2	9.0	5.6	8.8	19.1	8.4	8.0

Percent of Total Summer Chum Catch

District	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	Mean(77-86)
1	10.13	17.82	10.27	6.73	6.31	7.75	11.44	14.28	10.54	14.71	11.0
2	14.79	12.50	14.80	5.76	7.93	7.75	12.70	13.55	8.57	15.71	11.4
3	4.60	0.98	1.87	1.37	2.75	2.45	2.14	3.69	1.60	2.09	2.4
4	48.64	49.78	53.93	78.43	61.66	74.38	51.63	40.90	56.96	52.76	56.9
5	17.51	12.13	15.19	3.62	15.24	4.11	11.10	15.82	11.68	8.27	11.5
6	4.34	6.79	3.94	4.09	6.11	3.55	10.99	11.76	10.66	6.45	6.9

Percent of Total Fall Chum Catch

District	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	Mean(77-86)
1	6.5	0.4	7.0	4.5	8.6	7.7	4.6	5.5	6.5	5.8	5.7
2	7.6	1.4	6.5	7.6	6.5	7.3	5.8	7.0	5.7	8.6	6.4
3	0.6	0.3	1.1	1.4	1.6	1.3	1.6	1.4	1.1	1.1	1.2
4	8.5	9.6	14.9	10.6	9.9	14.1	15.9	14.2	11.3	15.0	12.4
5	38.0	54.4	47.5	45.0	58.5	54.6	54.3	58.0	57.3	53.4	52.1
6	38.8	33.9	23.0	30.7	14.8	15.0	17.9	14.0	18.1	16.1	22.2

Percent of Total Coho Chum Catch

District	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	Mean(77-86)
1	15.0	14.7	32.5	9.7	18.0	31.5	15.3	12.5	10.1	7.9	16.7
2	26.5	7.7	11.6	25.8	17.8	28.8	26.0	14.5	15.1	26.6	20.0
3	2.2	2.9	0.1	0.5	2.3	1.9	3.9	1.5	1.2	2.3	1.9
4	26.7	1.9	2.6	33.3	9.6	7.3	14.7	5.0	11.5	7.5	12.0
5	4.9	12.5	6.1	3.0	8.2	9.6	10.5	36.0	25.3	17.0	13.3
6	24.7	60.5	47.1	27.7	44.1	20.9	29.6	30.4	36.7	38.7	36.0

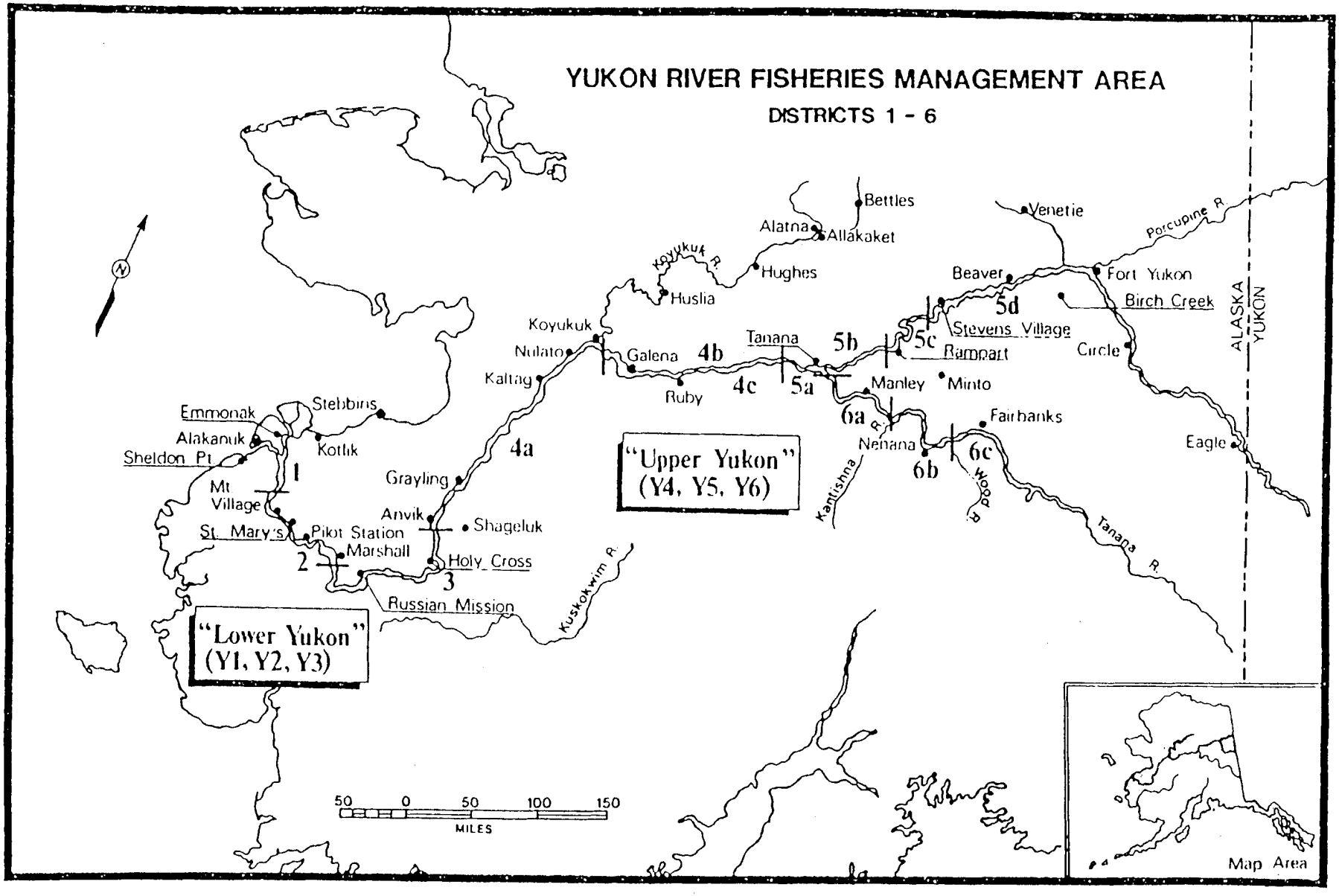

Figure 1. Villages and fishing district boundaries for the Alaska portion of the Yukon River drainage.

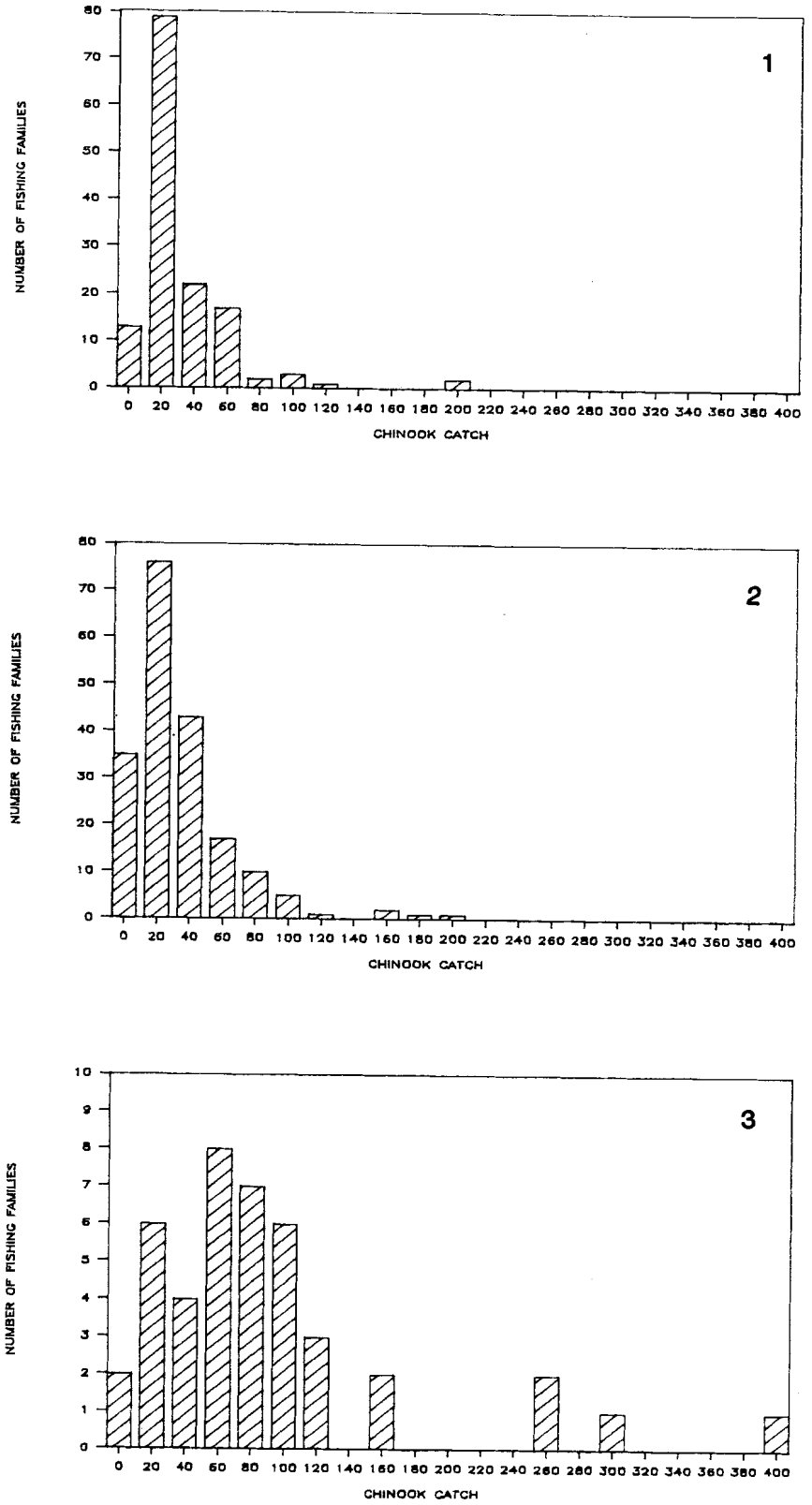

Figure 2. Histogram of 1986 chinook salmon catches in number of fish per fishing family for Districts 1 through 3 of the Yukon River, Alaska. The last bar on each graph also includes all catches greater than 400.

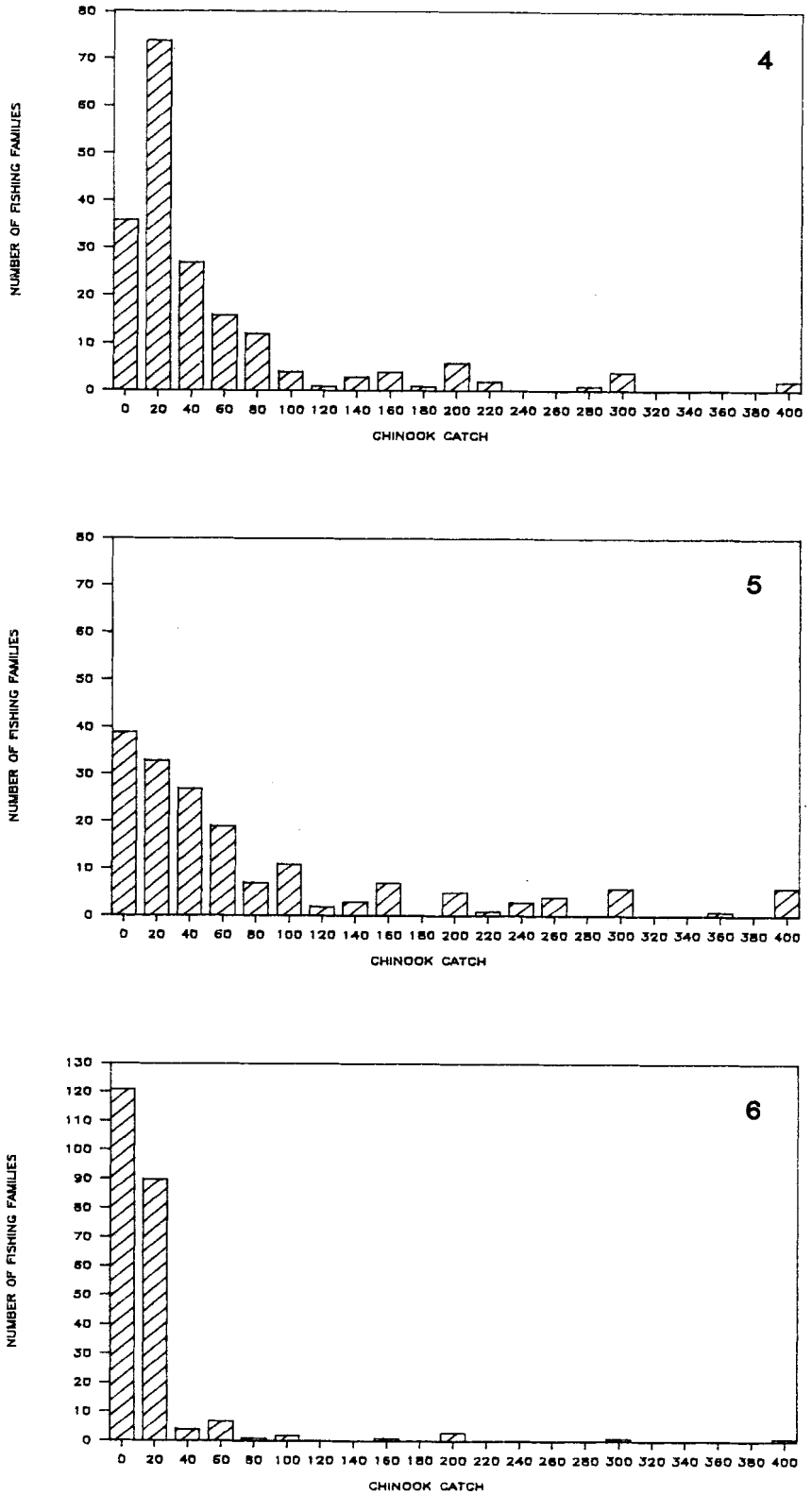

Figure 3. Histogram of 1986 chinook salmon catches in number of fish per fishing family for Districts 4 through 6 of the Yukon River, Alaska. The last bar on each graph also includes all catches greater than 400.

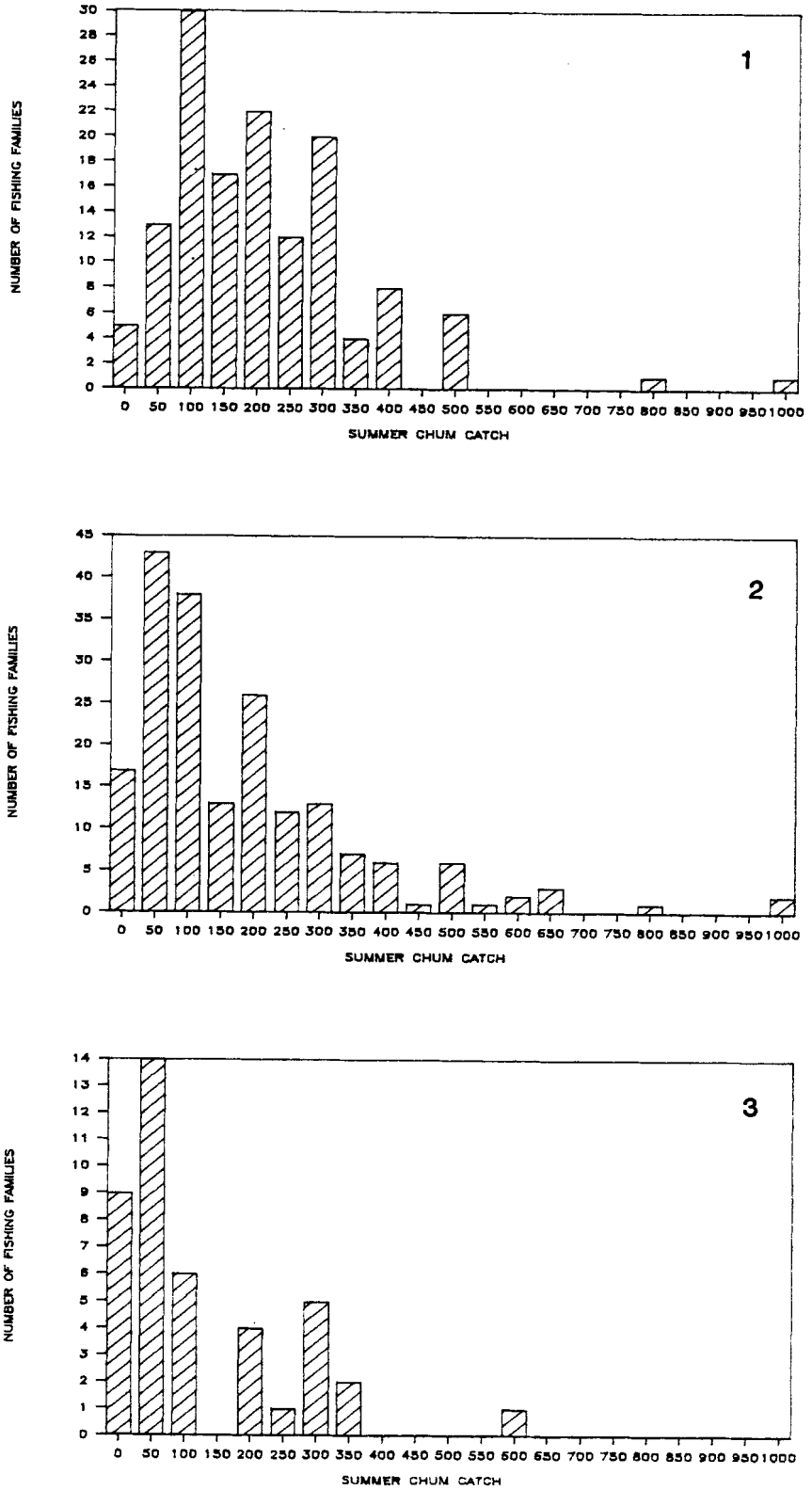

Figure 4. Histogram of 1986 summer chum salmon catches in number of fish per fishing family for Districts 1 through 3 of the Yukon River, Alaska. The last bar on each graph also includes all catches greater than 1,000.

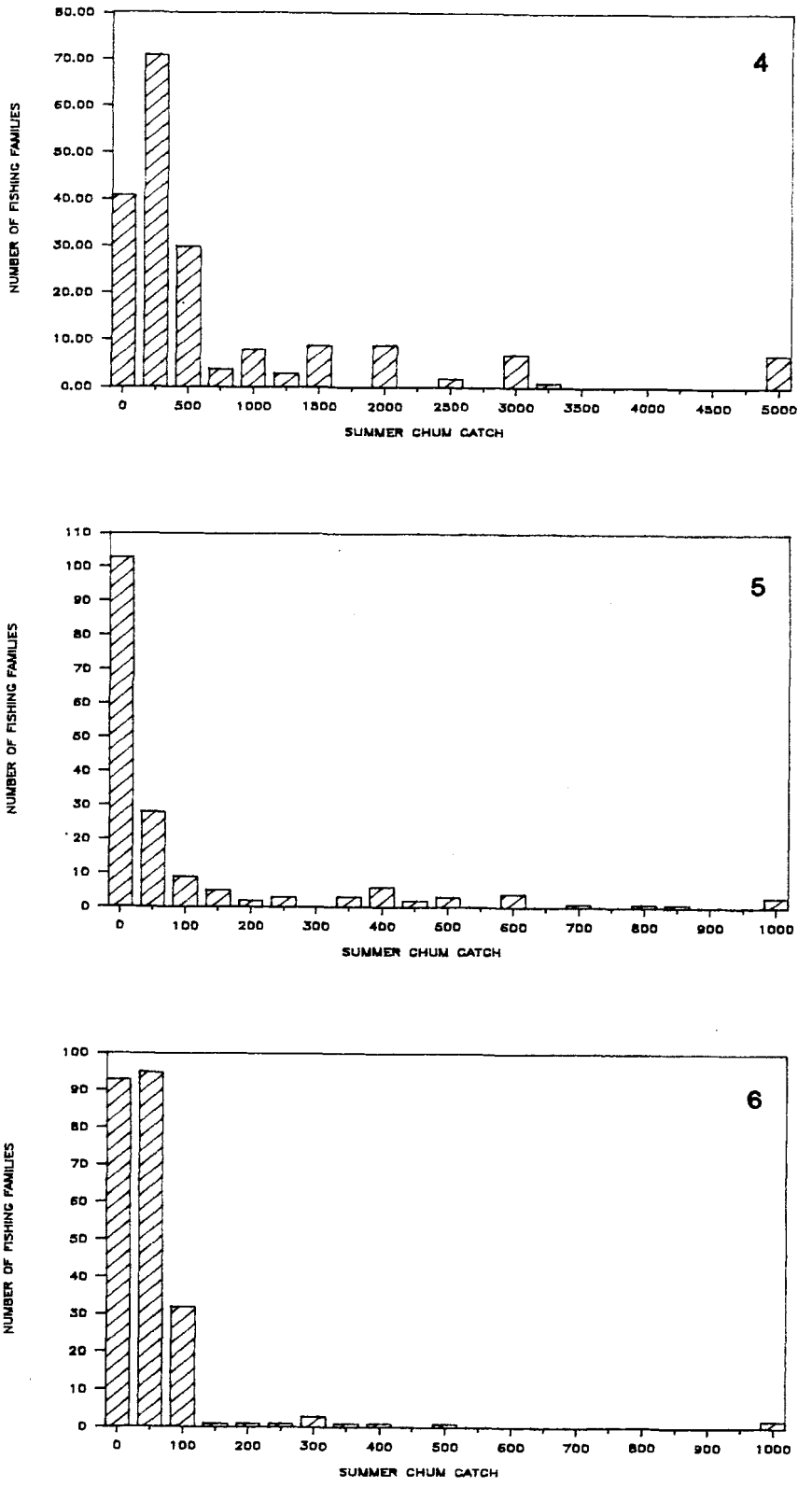

Figure 5. Histogram of 1986 summer chum salmon catches in number of fish per fishing family for Districts 4 through 6 of the Yukon River, Alaska. The last bar on each graph also includes all catches greater than 5,000 (top) or 1,000 (middle and bottom).

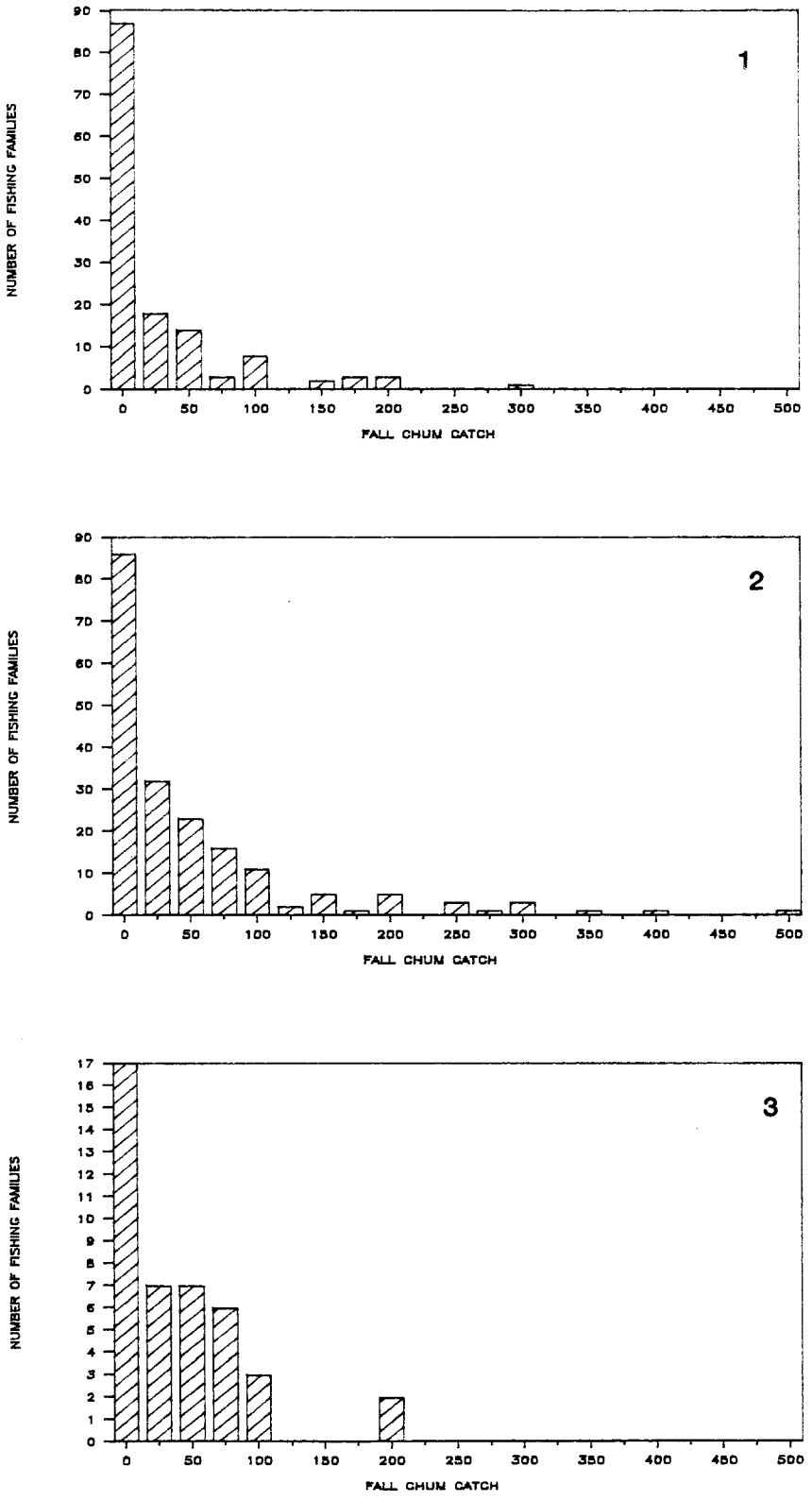

Figure 6. Histogram of 1986 fall chum salmon catches in number of fish per fishing family for Districts 1 through 3 of the Yukon River, Alaska. The last bar on each graph also includes all catches greater than 500.

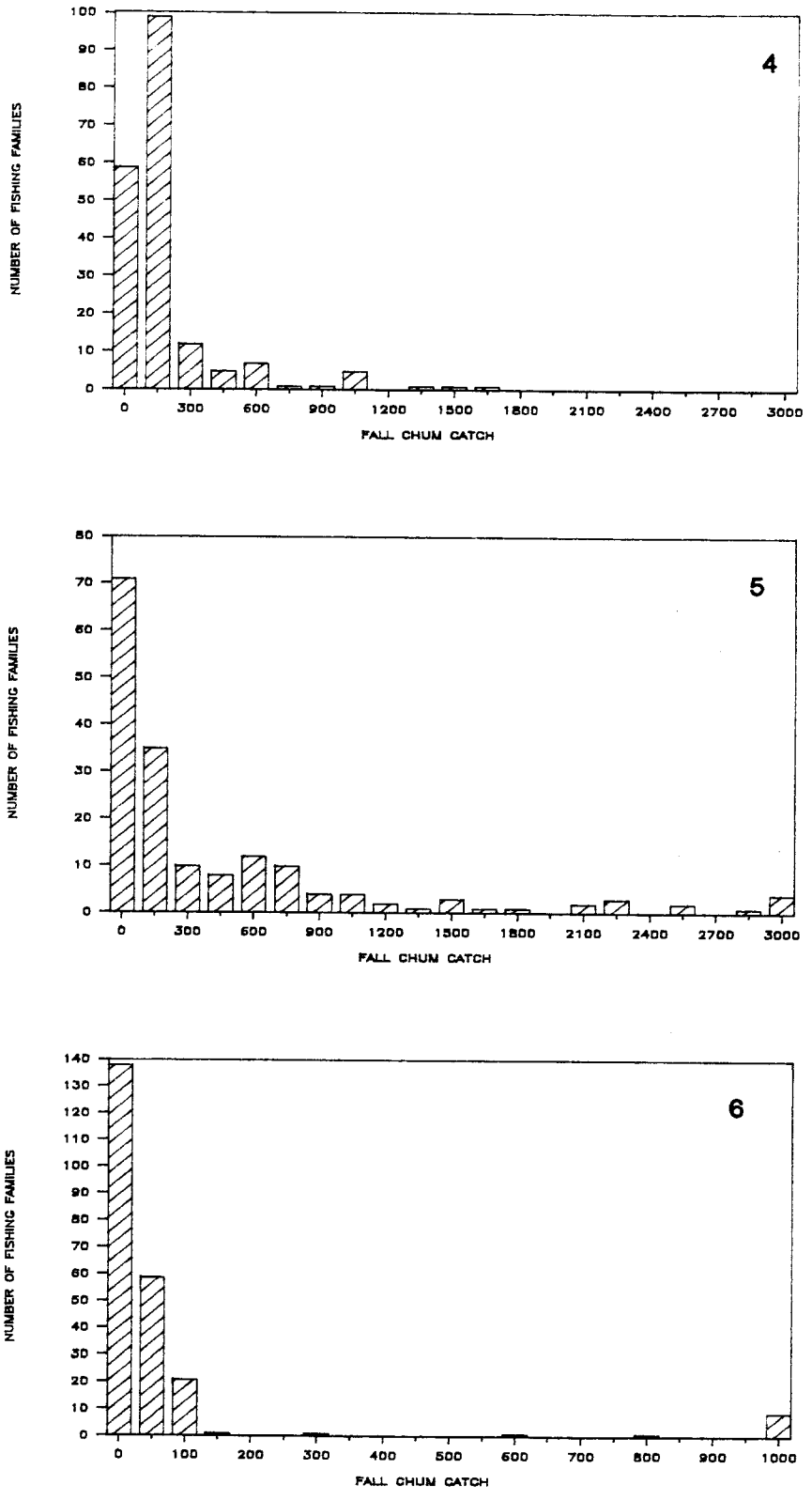

Figure 7. Histogram of 1986 fall chum salmon catches in number of fish per fishing family for Districts 4 through 6 of the Yukon River, Alaska. The last bar on each graph also includes all catches greater than 1,000 or 3,000.

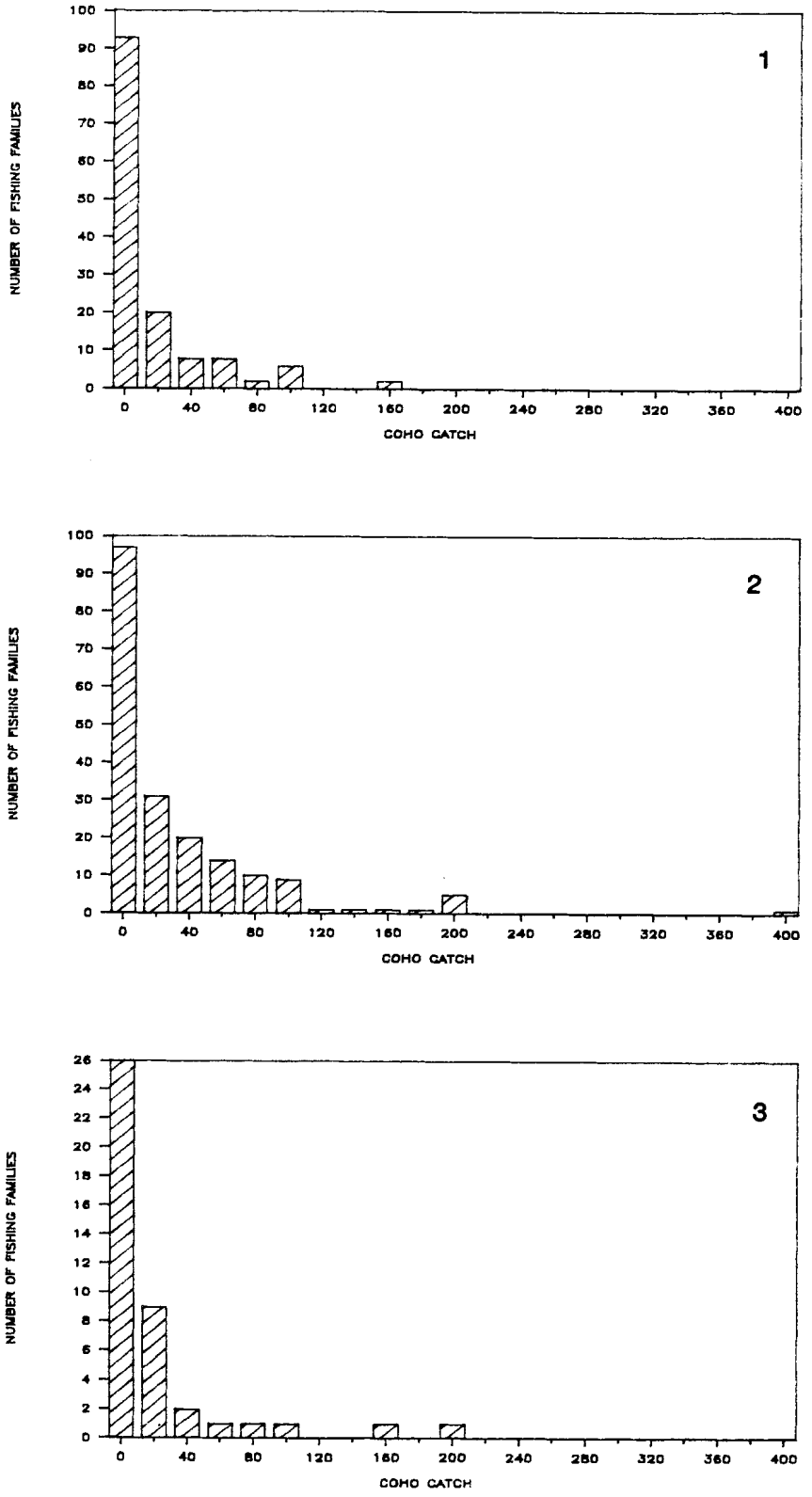

Figure 8. Histogram of 1986 coho salmon catches in number of fish per fishing family for Districts 1 through 3 of the Yukon River, Alaska. The last bar on each graph also includes all catches greater than 400.

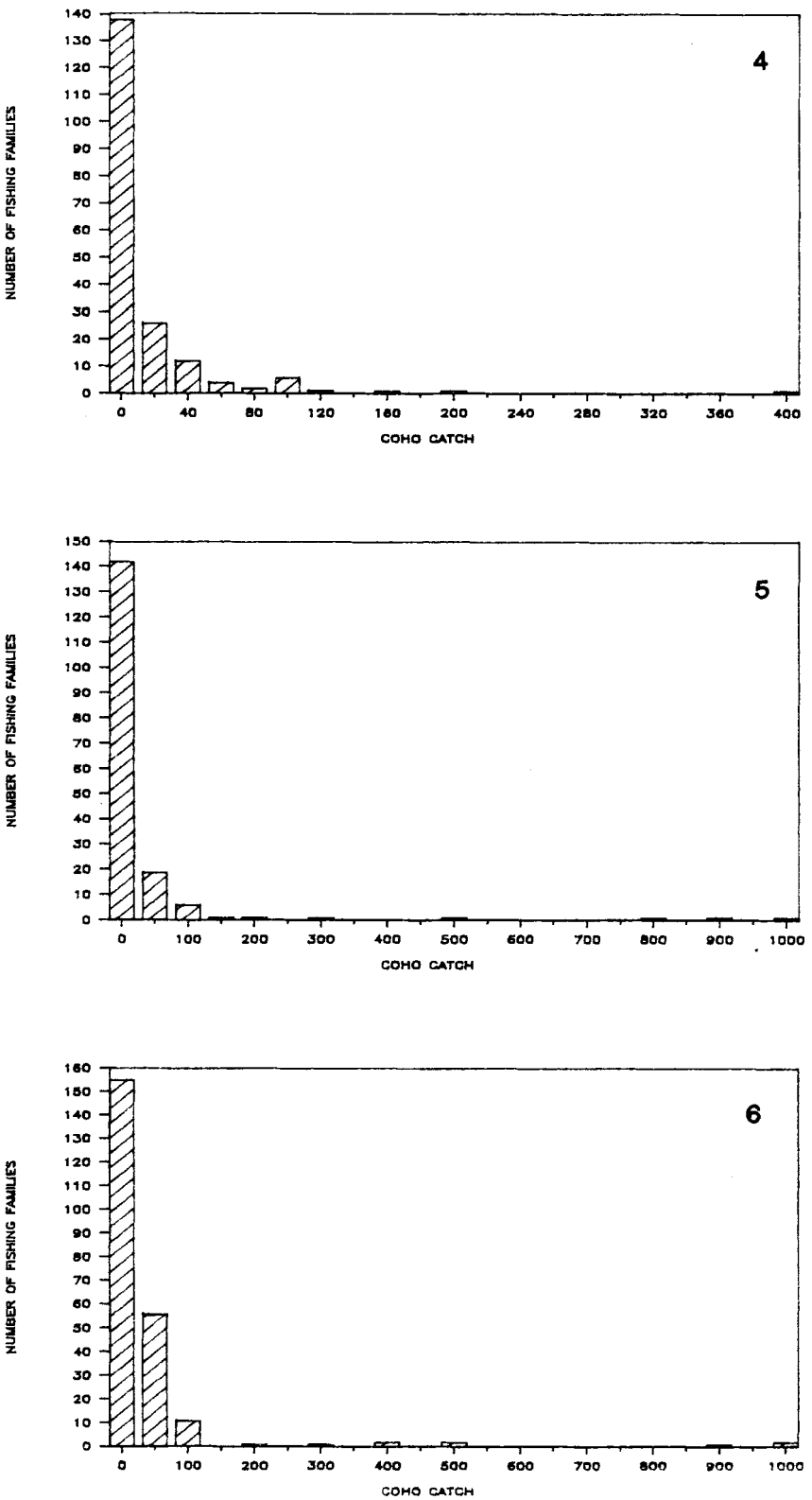

Figure 9. Histogram of 1986 coho salmon catches in number of fish per fishing family for Districts 4 through 6 of the Yukon River, Alaska. The last bar on each graph also includes all catches greater than 400 or 1,000.

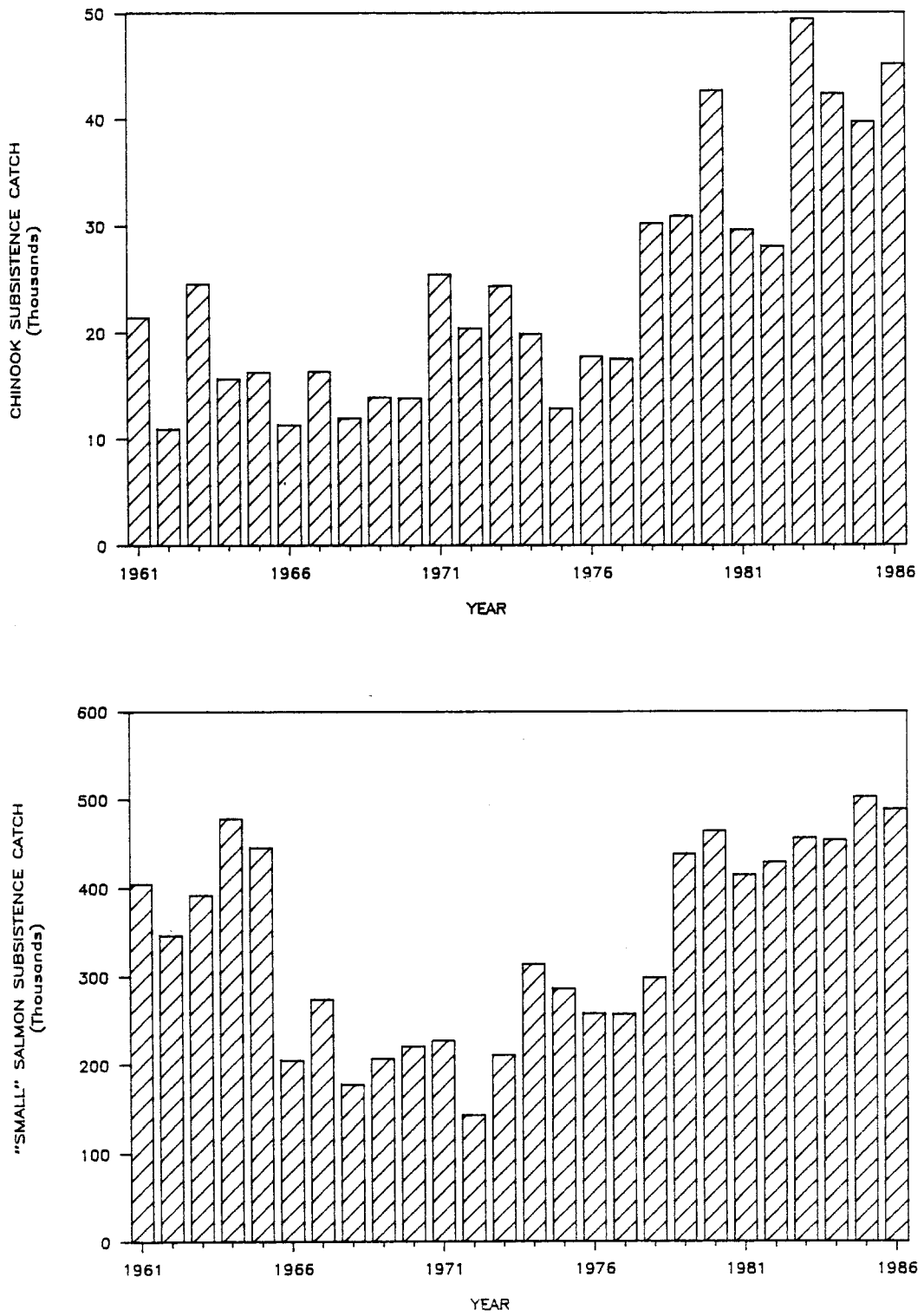

Figure 10. Chinook salmon (top) subsistence catch in the Alaska portion of the Yukon River and all other salmon pooled (bottom) in number of fish for 1961-86.

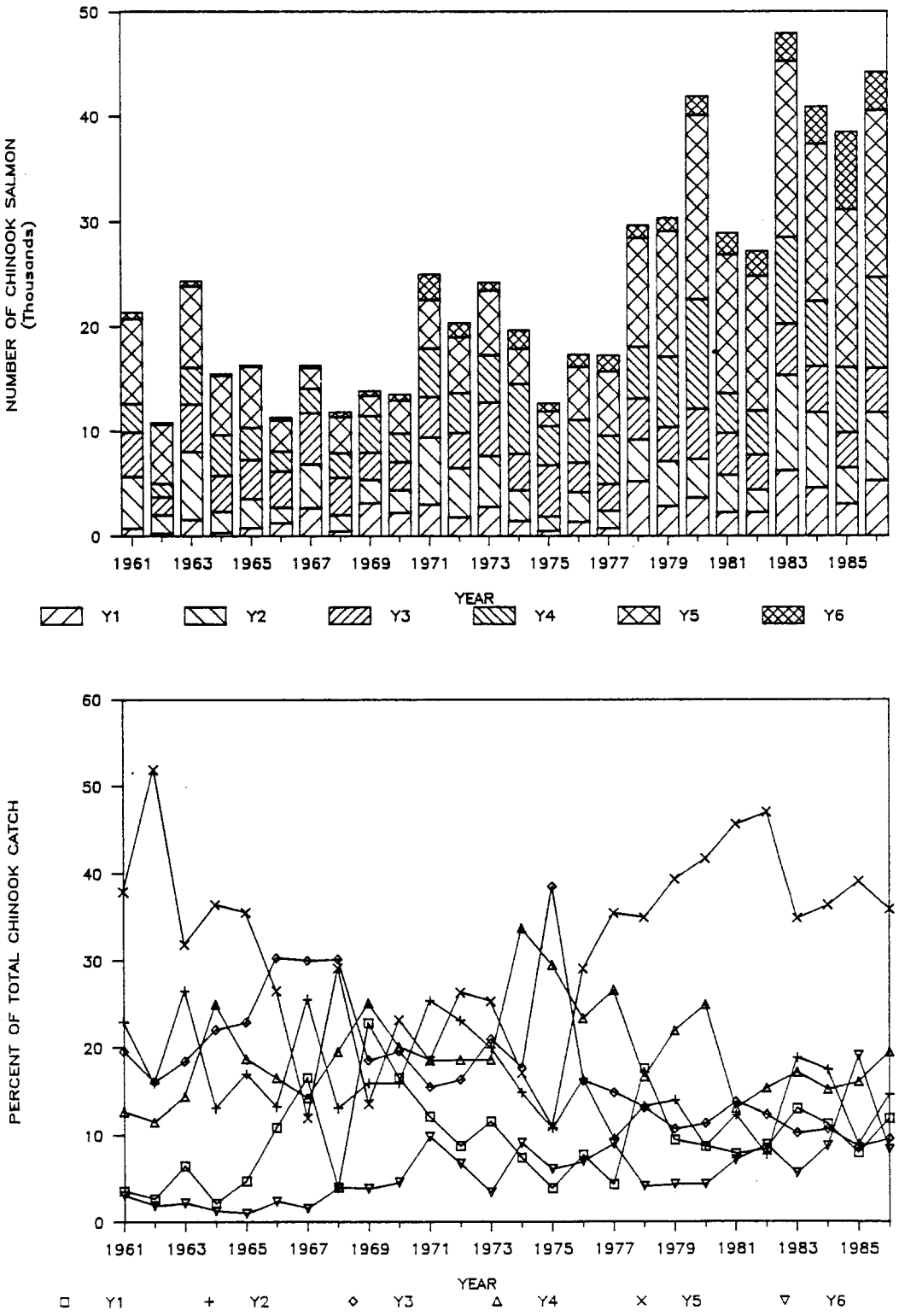

Figure 11. Chinook salmon subsistence catch by district in the Alaska portion of the Yukon River in number of fish (top) and percent of total (bottom) for 1961-86.

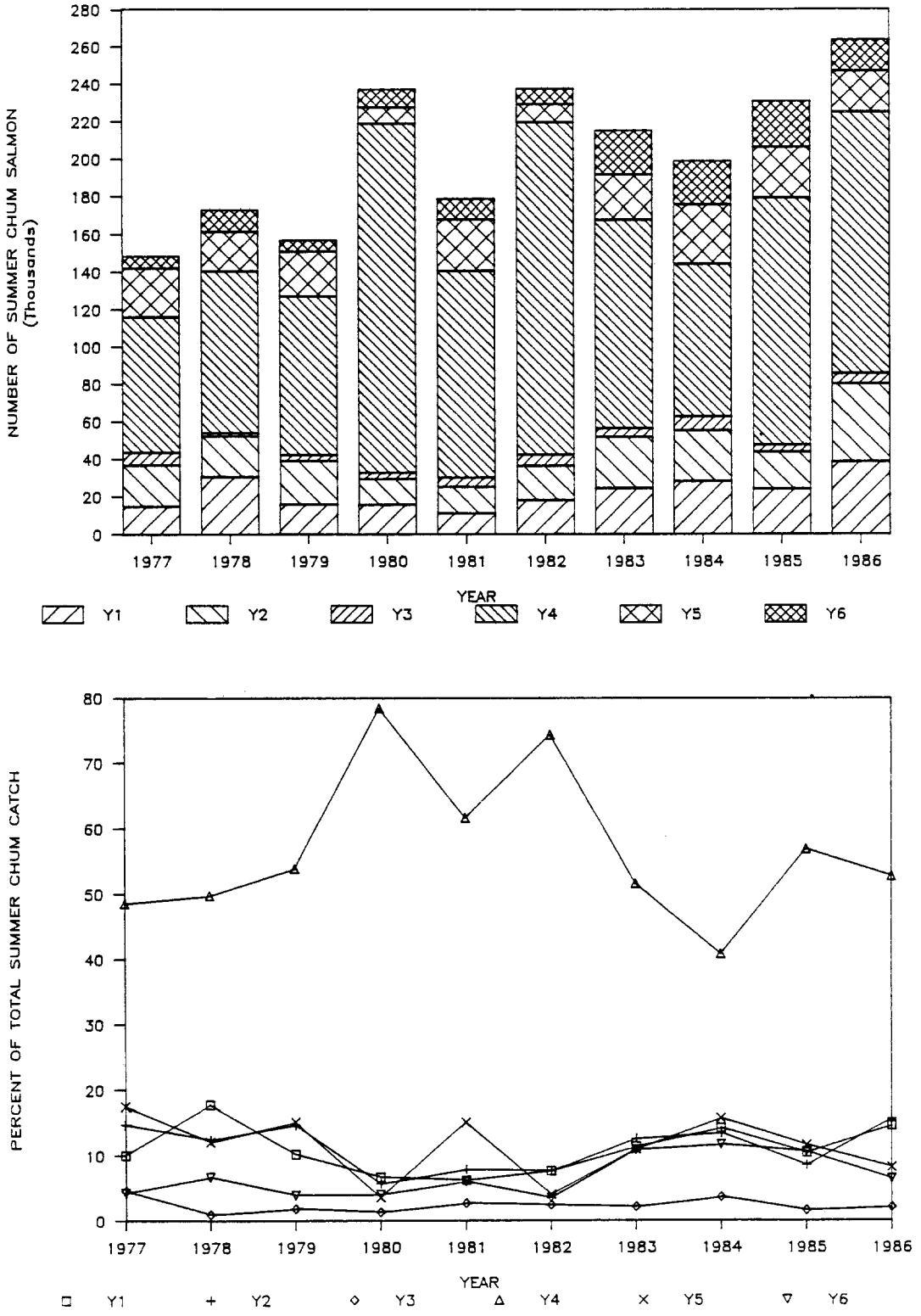

Figure 12. Summer chum salmon subsistence catch by district in the Alaska portion of the Yukon River in number of fish (top) and percent of total (bottom) for 1977-86.

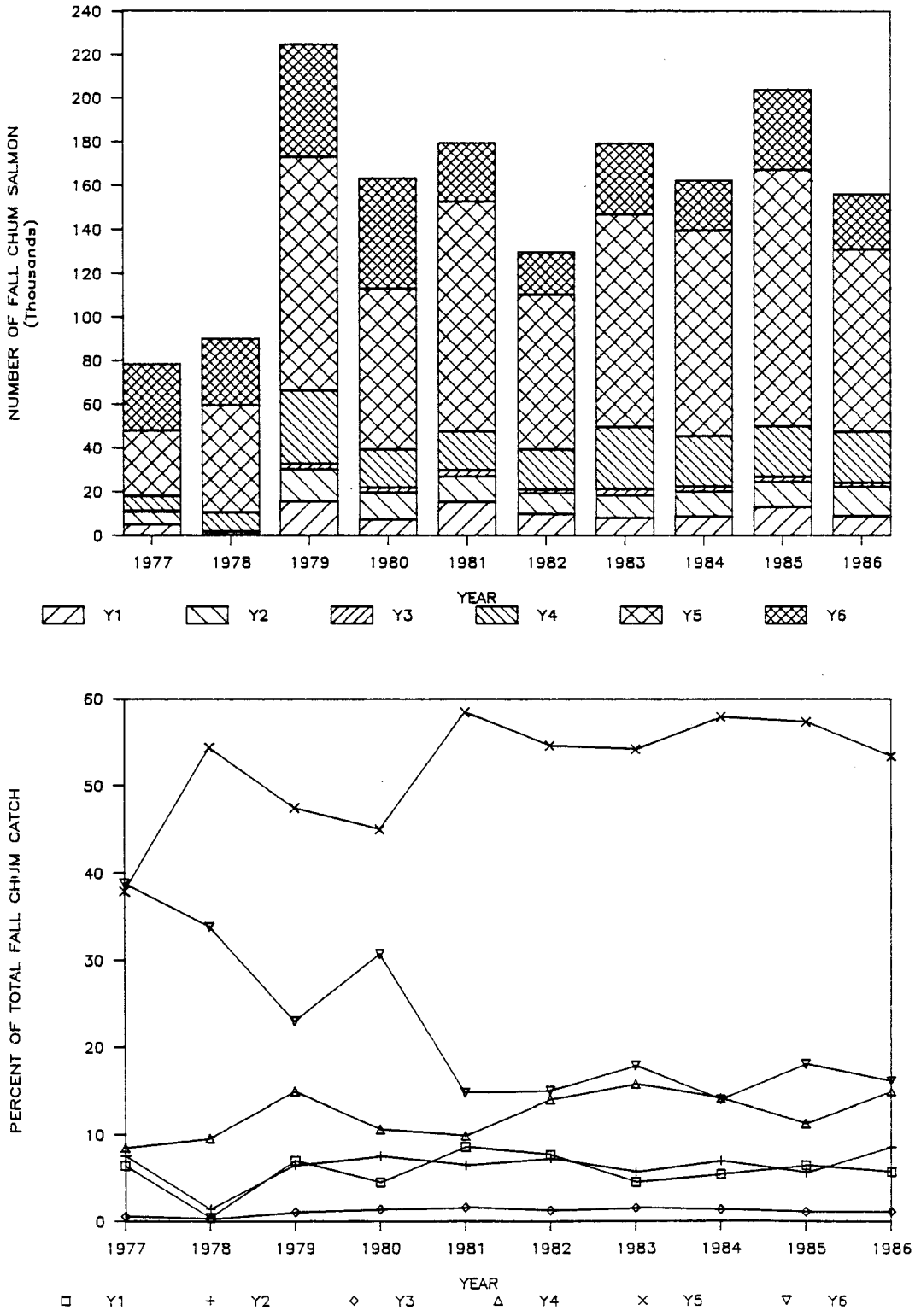

Figure 13. Fall chum salmon subsistence catch by district in the Alaska portion of the Yukon River in number of fish (top) and percent of total (bottom) for 1977-86.

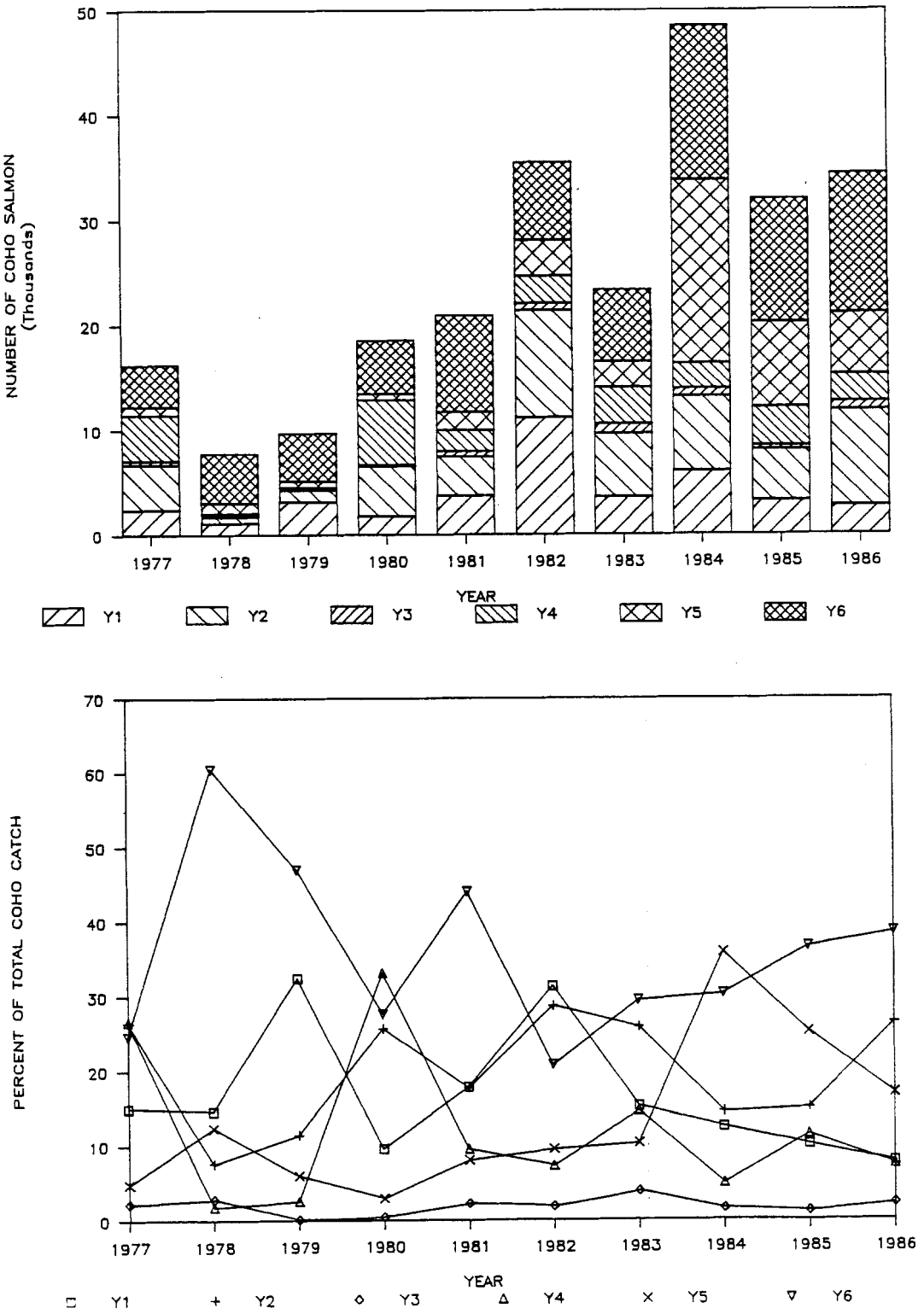

Figure 14. Coho salmon subsistence catch by district in the Alaska portion of the Yukon River in number of fish (top) and percent of total (bottom) for 1977-86.

APPENDIX A: 1986 DATA COLLECTION FORMS

Name _____

Village _____

ALASKA DEPARTMENT OF FISH AND GAME
DIVISION OF COMMERCIAL FISHERIES

Salmon Fishing Questionnaire

The Alaska Department of Fish and Game needs to know the salmon catch data for the Arctic-Yukon-Kuskokwim area. This information is required to insure adequate numbers of salmon are available for the subsistence needs of the people. Also this information may be used in treaty meetings between the U.S.A., Canada, and Japan to show that Alaskans are fully utilizing their salmon runs.

During this past fishing season, our survey crew visited your area collecting information on the local fishing effort. Since you were away or not available at the time, the survey crew was unable to visit with you. In order that we may complete our survey, will you please supply us with the needed information by answering the following questions. Just write the correct number in the space after each question.

How many people in your family?_____ How many dogs do you have?_____

How many king nets did you fish?_____

How many dog nets did you fish?_____

How many fishwheels did you fish?_____

Would you please write in the number of each kind of salmon that you or your family took this year as near as you can. Your reported catch should include fish taken for subsistence purposes only.

KING SALMON_____ DOG (Chum) SALMON_____ FALL CHUM (Silver)_____

COHO SALMON_____ SHEEFISH_____ OTHER KINDS OF FISH_____

This letter should be returned to our office by placing it in the enclosed return, stamped, addressed envelope.

We appreciate any assistance you can give to this study.

Thank you.

Fred M. Andersen

Appendix A.1 An example of the postal survey mailed to subsistence fishermen not contacted during the postseason survey.

STATE OF ALASKA
Department of Fish and Game, Division of Commercial Fisheries
1300 College Road, Fairbanks, AK 99701 (Phone: 456-4286)

SUBSISTENCF SALMON FISHING PERMIT - YUKON AREA

Name: ______________________ Phone: __________

Mailing Address: ______________________

Residence Address: ______________________

Area to be Fished: ______ District ______________________ Location

Period of Time to be Covered by Fishery: ______________ to ______________

Number of Fish Desired: Kings ______________ Chums (Dogs) ______________

Cohos (silvers) __________ Other ______________

Fishing Gear: ___ Gillnet(s) ______________ length ______________ stretch mesh size

___ Fishwheel ___ Other (specify)

Conditions of Permit:

All regulations pertaining to subsistence fishing for salmon in this area are to be observed. These regulations are published annually in the Alaska Subsistence Fishing Regulation booklet. A summary of these regulations is available from the Fairbanks office.

Fish caught for subsistence use may not be sold or allowed to enter into commercial use.

An accurate record of fish taken under authority of this permit must be kept and recorded in the appropriate spaces on the form provided on the reverse of this permit. Return the permit and form to the Alaska Department of Fish and Game, Commercial Fish Division, 1300 College Road, Fairbanks, AK 99701 within 10 days after the permit expiration date. FAILURE TO RETURN YOUR PERMIT AND CATCH FORM WILL RESULT IN YOUR NOT BEING ISSUED A PERMIT NEXT YEAR.

X ______________________

Signature of Permittee - I hereby claim the information contained on this permit is a true statement as witnessed by my signature above, and I further state that I am a resident of Alaska.

- -

TO BE COMPLETED BY ISSUING OFFICER:

The above-named person(s) is authorized to subsistence fish in the Yukon Area

District _____, Location ______________________,

from ________ to ________, using (gear) ______________________.

______________________ may be taken under authority of this permit.

______________________ ______________________
Signature of Authorizing Officer Date Issued

Permit No.: __________

Appendix A.2 An example of the permit issued to subsistence fishermen in areas requiring permits on the Yukon River.

Because the Alaska Department of Fish and Game receives federal funding, all of its public programs and activities are operated free from discrimination on the basis of race, religion, color, national origin, age, sex, or handicap. Any person who believes he or she has been discriminated against should write to:

O.E.O.
U.S. Department of the Interior
Washington, D.C. 20240