YUKON RIVER JOINT TECHNICAL COMMITTEE REPORT

Prepared by

THE JOINT UNITED STATES/CANADA
YUKON RIVER TECHNICAL COMMITTEE

February 24-25, 1993

Anchorage, Alaska

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1.0 INTRODUCTION

The chief negotiators for the United States and Canadian delegations to the Yukon River salmon treaty negotiations directed the Joint Technical Committee (JTC) to meet and address the subject areas described in this report. The JTC met in Anchorage on 24-25 February 1993. A core group participated throughout the meeting, while other staff attended as agenda items pertaining to them were taken up. The meeting was attended at various times by the following persons:

Canadian Department of Fisheries and Oceans
- Ken Wilson (co-chair)
- Ian Boyce
- Sandy Johnston

Alaska Department of Fish and Game
- Larry Buklis (co-chair)
- Louis Barton
- Jeff Bromaghin
- Penny Crane
- Dan Huttunen
- Tom Kron
- Dave Mesiar
- Gene Sandone
- Paul Skvorc

United States Fish and Wildlife Service
- Steve Klein
- Rod Simmons
- Bill Spearman

National Marine Fisheries Service
- Dick Wilmot

2.0 CHINOOK AND CHUM SALMON RUN OUTLOOKS FOR 1993

2.1 Alaska

2.1.1 Chinook Salmon

Total inriver run size of Yukon River chinook salmon cannot be estimated at this time because total escapement within the Alaskan portion of the drainage is not known. Consequently, inriver run projections are subjective, being based solely upon a qualitative review of brood year escapement data collected on selected key index streams and age composition data.

The majority of chinook salmon returning to the Yukon River are 6-year-old fish, although age 5 and 7 fish make a significant contribution to the run. It is anticipated that the return of 5-year-old fish in 1993 will be at least average in magnitude based on good parent year escapements to most areas in 1988 and an average proportion of 4-year-old fish observed in the 1992 return. Similarly,

the return of 7-year-old fish in 1993 (1986 year class) is also expected to be good, as the return of that year class in 1991 as 5-year-old fish and in 1992 as 6-year-old fish was above average. However, spawning ground escapements in 1987, the primary brood year for 1993 (age 6 fish), were judged to be below average in magnitude in Canada, below average in the Tanana River in Alaska, and generally above average in the lower river area. Additionally, the lower than normal contribution of the 1987 brood year to the 1992 Alaskan commercial harvest indicates that survival and production for this brood year is likely below average. Overall, it is anticipated that the 1993 return of chinook salmon to the Alaskan portion of the Yukon River drainage will be slightly below average in magnitude. The anticipated 1993 Alaskan commercial harvest is 86,000-97,000 chinook salmon.

2.1.2 Summer Chum Salmon

Yukon River summer chum salmon return primarily as 4-year-old fish, although substantial numbers of 5-year-old fish can occur in some years. The return of 4-year-old fish in 1993 will depend upon production from the 1989 brood year and survival of the resulting cohort. Although the Anvik River summer chum escapement objective of >500,000 fish was achieved in 1989, poor aerial survey conditions prevailed, severely limiting escapement observations on most other summer chum salmon streams. However, it appeared that escapements of non-Anvik summer chum stocks were below average in 1989, continuing a trend of lower than desired escapements in non-Anvik stocks in recent years. Therefore, a below average return of 4-year-old fish is anticipated from the 1989 brood year. Additionally, because of the poor return from the 1988 brood year in 1992 the 5-year-old component of the run in 1993 is also expected to be below average. In summary, based upon evaluation of brood year data and assuming average survival, it is expected that the Yukon River summer chum salmon return in 1993 will be below average in strength and driven by the Anvik River component. The commercial harvest of this species is anticipated to be 400,000-800,000 fish. However, due to the mixed stock nature of the fishery, conservative management actions may be necessary to assure adequate escapements for non-Anvik River stocks.

2.1.3 Fall Chum Salmon

Estimates of total run size for Yukon River fall chum salmon have been made annually for a significant historical period. Unlike the other salmon species, field projects on fall chums are implemented to estimate total spawning abundance for many of the major spawning areas. Thus, a more quantitative approach is feasible in making run projections, being based upon a review of brood year escapement levels, age composition data, and estimated return per spawner rates.

Assuming average survival, and using average maturity schedules together with predicted return per spawner rates which are likely to result from the various escapements observed from 1987-1990, the 1993 return projection for all Yukon River fall chum salmon stocks combined would be approximately 814,000 fish. However, given that production from the 1988 brood year (age-5 fish in 1993) is expected to be lower than normal based upon the inordinately low percentage of

4-year-old fish which returned in 1992, the overall projection for 1993 has been adjusted downwards to 734,000 fall chum salmon.

The fishery management strategy in 1993 will be to commercially harvest at a lower level than the overall strength of the Yukon River fall chum salmon run would indicate, in consideration of Toklat River and Canadian bound fall chum salmon rebuilding efforts. The 1993 commercial harvest in Alaska is expected to range from approximately 78,000 to 113,000 fall chum salmon, which is in the lower end of the overall guideline harvest range for the Alaska commercial fishery.

2.2 Canada

2.2.1 Chinook Salmon

The 1993 expected total run size of Canadian upper Yukon chinook salmon is 118,000 fish, which constitutes a below average run size. For comparison, the Canadian upper Yukon chinook run size averaged approximately 129,000 fish during the previous six year cycle (1987 to 1992). The 1993 run outlook is based on escapement data for 1986 through 1988, calculated returns per spawner for the individual brood year escapements based on the spawner-recruitment relationship for the 1977 to 1985 brood years, and the average age composition. The interim escapement objective range for the Canadian upper Yukon (excluding the Porcupine) is 33,000 to 43,000 chinook. As indicated below, the escapement in the principal brood year of the 1993 run was well below this escapement objective range and the stabilization objective of 18,000 chinook.

In order to examine the relationship between escapement and production, returns were reconstructed for the 1977 to 1985 brood years. The year 1977 was chosen as the first data set since stock identification data from scale patterns analysis is only available for Yukon River chinook salmon since 1982; progeny from 1977 would have returned in significant numbers beginning in 1982. Escapements for 1977 and 1978 were estimated by expanding a cumulative four-area escapement index (Tatchun Creek, Big Salmon River, Nisutlin River, and the non-hatchery returns to the Whitehorse Fishway) by the average proportion the index represented of the total escapement estimates derived from DFO mark-recapture studies in 1982-83 and 1985-89 (i.e. 0.111). Escapements for 1979-81 and 1984 were estimated in a similar manner except that a five-area index was used which included the four-area index streams plus the Wolf River index counts. Mark-recapture results were used to estimate the escapement in 1982, 1983, and 1985 through 1992.

The total return from each brood year escapement was estimated by apportioning the total annual run sizes in the principal return years by the average age composition. On average, the majority of adult chinook return at six years of age (64%) with significant numbers returning at age seven (17%) and age five (15%). Annual run sizes were reconstructed from ADF&G scale patterns data and DFO tagging results.

The relationship between the natural logarithm of the return per spawner (R/S) and number of spawners (S) for the 1977 to 1985 brood years is described as

follows:

$$Ln(R/S)=2.637-0.0375(S); \quad [1]$$

where: S = # spawners (in thousands),
R = returns.

The correlation coefficient (r^2) of this regression is 0.83 and the relationship is significant ($p<0.005$).

Based on equation [I] and the average age composition, the estimated returns from the principal brood years in 1993 are as follows:

Brood Year	Esc.	Calc'd Ln(R/S)	Calc'd R/S	Est'd Prod'n	1993 Return
1986	16,415	2.022	7.553	123,977	20,952
1987	13,210	2.142	8.517	112,513	72,233
1988	23,118	1.771	5.874	135,794	20,233
Sub-total (accounts for 96% of the return)					113,419
Total Expected Run Size in 1993					**118,145**

The method used to forecast the 1993 return is significantly different from that used through 1991, when a fixed rate of return of three to four adults per spawner was used. Using the former method, a run size of approximately 45,000 chinook would be expected in 1993 using a constant rate of return of four adults/spawner. In the approach adopted for the 1993 forecast, the expected returns per spawner vary for each brood year, and are significantly greater than the previously used constants. This new forecast method should be viewed with some caution until its accuracy is demonstrated.

2.2.2 Fall Chum Salmon

On average, 73% of Canadian upper Yukon adult chum salmon are four years old and 24% are five years old. This suggests that the major portion of the 1993 fall chum run should originate from the 1989 escapement of 35,750 chum salmon, which was the lowest escapement on record and was 55% below the escapement objective of >80,000 chum salmon. Additional returns can be expected from the 1988 escapement of 36,786 chum, however this was also a poor escapement.

Assuming an average productivity of 2.5 adults per spawner, which is used in the Canada/U.S. joint Canadian upper Yukon chum rebuilding model, the brood year escapement estimates and average age composition data suggest a total run of approximately 90,000 Canadian upper Yukon chum in 1993 (excluding Porcupine River production).

Although there are insufficient stock identification data for Yukon River chum salmon from which to estimate annual run sizes, estimates have been made to qualify the 1993 outlook, based on the following assumptions:

i) 30% to 50% of the U.S. catch of fall chum is composed of Canadian origin fish;

ii) the U.S. harvests Canadian-origin stocks in the same ratio as: upper Yukon border escapement-to-Porcupine border escapement; and,

iii) the Porcupine stock consists of the Old Crow catch plus the Fishing Branch River escapement.

Using these assumptions, the recent four-year cycle average (1989-1992) total return of Canadian upper Yukon chum salmon is estimated to have been in the range of 152,000 to 200,000 fish. The forecast of 90,000 Canadian upper Yukon chum salmon for 1993 is therefore well below average. It should be emphasized that chum salmon stocks in the Canadian upper Yukon appear to have been depressed in recent years, and therefore recent averages probably do not represent healthy stock levels.

For management purposes in 1993, the JTC recommends a target spawning escapement of 50,500 fall chum salmon for the mainstem Yukon River drainage in Canada. This is consistent with the proposed three cycle rebuilding plan for this stock agreed to in the Canada/U.S. Yukon River salmon negotiations.

The chum salmon run to the Canadian portion of the Porcupine River drainage in 1993 should originate primarily from the 1989 escapement. The escapement through the Fishing Branch River weir in 1989 was 43,834 chum, which is above the recent cycle average (1989 to 1992) of about 35,000, but below the lower end of the interim escapement objective range of 50,000 to 120,000 chum salmon for the Fishing Branch River. The total run size in 1993 is expected to be approximately 97,000 chum salmon based on an assumed productivity of 2.5 returns per spawner, and the average age composition. The stock size is estimated to have averaged 74,000 to 99,000 fish over the 1989 to 1992 four-year cycle (based on the assumptions previously described). The 1993 forecast is therefore about average. However, it is unlikely recent escapements represent healthy stock levels since the escapement objective range has not been met.

3.0 PROJECT UPDATES AND PLANS FOR 1993

3.1 Toklat River Fall Chum Restoration Feasibility Study

There has been ongoing concern regarding the status of the Toklat River fall chum salmon stock. Despite conservative fisheries management actions in recent years, the 33,000 fall chum salmon minimum spawning escapement objective for the Toklat River has been achieved only once since 1979. As a result, there is growing public interest in investigating restoration options for this stock. The Yukon River Drainage Fisheries Association (YRDFA) proposed a 9-year "Toklat River Fall Chum Salmon Stock Rebuilding and Restoration Pilot Study" in 1992. That study proposal includes supplemental production scaled to target the minimum desired

spawning escapement, a technical evaluation of the spawning grounds and escapement objective, an evaluation of tagged fish in the fishery, improved estimates of wild fry production and adult returns, and an evaluation of the migration patterns of Toklat River fall chum salmon.

Funding has not been provided to date to initiate the YRDFA proposal. ADF&G initiated a small-scale study in 1992 to provide information useful for assessing feasibility in future planning. The plan for this research project includes an experimental egg take, incubation, rearing, marking, imprinting, and release, as well as detailed genetic and fish disease screening, genetic risk assessment relative to the YRDFA proposal, and a preliminary assessment of the wild chum salmon fry outmigration.

Approximately 130,000 eggs were collected from Toklat River fall chum salmon in October 1992, and are being incubated in an isolation module at the Clear Hatchery. The survival of these eggs to date has been good. Plans call for adipose fin-clipping and coded wire tagging (Ad-CWT) the expected 100,000 or more fry in the spring of 1993. Imprinting and release back into the Toklat River is scheduled for early May. The 100,000 or more Ad-CWT fry release is expected to be adequate to allow for a statistically valid estimate of the contributions of Toklat River fall chum salmon to harvests in proximal fisheries (Subdistricts 5A and 6A) when these fish return as adults. Further planning and analysis is required to determine whether statistically valid estimates can be expected for fisheries further downriver.

The JTC discussed thermal marking as an alternative to Ad-CWT. This technique involves exposing the fry to controlled water temperatures to induce specific banding patterns on the otoliths. This method can be applied to large numbers of fry at low cost since individual fish do not have to be handled for fin-clipping and/or coded wire tagging. However, because the returning adults do not have an external mark, a well designed sampling program is required to obtain information from the adult returns. It was noted that thermal marking is being used successfully in other areas of Alaska, including joint U.S./Canada projects in Southeast Alaska. Considering the challenges of recovering thermally marked fish and the fact that this was the first fry marking project for Yukon River fall chum salmon, it was felt that Ad-CWT was the best initial approach.

The 1992/93 research study for the Toklat River will likely be continued for the 1993/94 period. Furthermore, the Alaska Legislature is once again considering the funding proposal from the YRDFA. If that project were to be funded the associated activities would likely begin in the fall of 1993.

In October 1992 the JTC recommended that the release of Ad-CWT fall chum salmon fry in the Fishing Branch River from Fishing Branch River brood stock would be one method of learning more about the productivity of the Fishing Branch River fall chum salmon stock and its contribution to various Yukon River fisheries. As a follow-up to that recommendation, and in context with the discussion on the Toklat River study, coordination of Yukon River tag recovery efforts was discussed. Should multiple salmon tag release studies operate concurrently in the Yukon River drainage, it will be necessary to coordinate marking and recovery efforts to maximize the technical benefits from each of the projects.

3.2 Salmon Restoration and Enhancement Planning

ADF&G reviewed plans for Yukon River salmon comprehensive conservation, restoration, and enhancement planning. The State of Alaska has provided funding of $170,000 to ADF&G to undertake this planning activity for the U.S. portion of the Yukon River drainage. The plan is expected to take more than two years to complete and will be done in three phases. Phase I includes a public information and education program; Phase II includes community forums; and Phase III includes review and reporting. A cooperative agreement is being developed between ADF&G and YRDFA to implement this planning process. The process will involve consensus building for: 1) future needs and priorities for salmon fisheries management; 2) habitat protection and rehabilitation; and 3) stock rebuilding, restoration and enhancement. A regional planning team (RPT) co-chaired by ADF&G and YRDFA will oversee the planning process. The RPT will include participation by Native resource agencies, and federal land and resource agencies.

3.3 Yukon River Border Sonar

Most of the project goals outlined in the project operational plan for 1992 were successfully achieved during 1992. Before the field season began, all necessary acoustic and support equipment was purchased and transported to Eagle. Camp was constructed approximately 2 km downstream from Eagle between 5 and 14 July. Weatherport tents were erected on platforms for cooking, sleeping, and storage. In addition, Weatherport tents were built on platforms on each bank about 300 m upstream from the camp to house the sonar equipment.

Following camp construction, the sonar equipment was installed. Sound transmission into the water began on 21 July. Exact transducer locations were selected and maximum potential beam dimensions were calculated based on river bottom profiles from depth soundings at the site. Eliptical transducers were installed with nominal beamwidths of 2.5°x10° on the right bank and 7°x11° on the left bank, which nearly filled the water column outward from each bank. In all, sonar data were collected from 21 July through 2 August, and from 5 to 22 September.

The first sonar field operation was to ensonify targets of known acoustic size. Using modified *in situ* sonar calibration procedures developed on other large rivers in Alaska, four different standard targets were suspended at various positions in the beam, and echo voltage and phase angle data were acquired. Three targets were solid spheres made from stainless steel, electrical grade copper, and lead. The fourth target was a ping pong ball. Using remote aiming devices, a procedure was used where the beam was 'swept' across the target, and data acquired at 0.2° intervals. The result was that the targets, which are small relative to the acoustic size of adult salmon, were easily detected. Further, the empirically-derived target strengths were all within one decibel of theoretical values.

Drift and set gill nets were used to catch fish present in the area of the sonar site during 1992. Set gill nets were used more often than drift gill nets. However, there were no particular problems encountered with either method of test fishing. In all, 31 chinook salmon, 708 chum salmon, and 132 resident fish were

caught during sonar-related test fishing activities, although catches were not adjusted for effort or relative efficiency. In addition to chinook salmon and chum salmon, ten resident species were caught in the test fishing nets.

Split beam acoustic data include three-space position in the beam. Preliminary results from the September operating period indicate that the majority of the fish detected passing the sonar site were bottom oriented and spread across the ensonified range. Gill net test fishing data provided no conclusive information regarding the spatial distribution of captured fish.

There is optimism that relationships will be developed for this project between acoustic target strength and size (mean length) of fish as a possible technique to separate sonar counts by species. However, the small proportion of non-salmon fish caught may render that exercise unnecessary.

Since the project is still in the developmental phase, the overall objective for the 1993 field season is to acquire a large amount of high quality acoustic and non-acoustic data on fish migrating past the sonar site. To achieve that objective, sonar data will be collected throughout the project operational period from approximately 10 July through about 20 September. Gill net test fishing activities will be conducted in support of the sonar data as necessary to obtain physical estimates of fish size (mean length) and species composition. Interagency planning regarding specific tasks and resposibilities for the 1993 season is ongoing at this time.

3.4 Yukon River Salmon Genetic Stock Identification

The JTC discussion on Yukon River salmon genetic stock identification (GSI) consisted of three subject areas. They were: 1) the status of the 1987-1991 completion report by the USFWS; 2) a review of field work conducted in 1992 and progress of laboratory analysis of the samples; and 3) plans for the 1993 field season. Each of these subject areas will be summarized here.

At the February 1992 JTC meeting Dick Wilmot, then of the USFWS, presented a progress report on Yukon River chum and chinook salmon GSI research through 1990 ("Progress Report: Genetic Stock Identification of Yukon River chum and chinook salmon, 1987 to 1990", by R.L. Wilmot, R. Everett, W.J. Spearman, and R. Baccus, USFWS, February 1992). The study provided estimates of stock composition in the District 1 commercial catch for chum and chinook salmon.

The results (Table 1) indicated that the U.S. summer chum salmon run dominated the overall chum salmon commercial catch in District 1 for each year (1987-90 average of 85.7%, with a standard deviation (SD) of 5.8%). Note that the standard deviation is a measure of the variability around an estimate. We can expect that the true value will lie within two standard deviations above or below the point estimate 95% of the time. The remainder of the chum salmon catch consisted of U.S. and Canadian fall chum stocks. Considering only the fall chum salmon run, the 1987-90 estimates averaged 59.9% U.S. stocks (SD 44.7%) and 40.1% Canadian stocks (SD 36.5%) in the District 1 commercial catch.

For chinook salmon, the estimates for 1987-90 averaged 46.8% U.S. stocks (SD 5.1%) and 53.2% Canadian stocks (SD 5.1%) in the District 1 commercial catch (Table 2). Note that the standard deviations were substantially smaller for the chinook salmon estimates than for the fall chum salmon estimates. They also agreed quite closely with scale pattern analysis (SPA) estimates for chinook salmon made by ADF&G for those same years.

It was noted in the progress report that the GSI fishery sample data had been combined for District 1 commercial fishery samples and for test fishery samples collected during closures between commercial periods. Furthermore, samples had been combined from unrestricted and restricted mesh size fishing periods. It was anticipated that subsequent to the February 1992 JTC meeting a completion report would be prepared in which the 1987-90 sample data would be segregated by fishery type and mesh size for reanalysis, and results for 1991 would be included. However, only the 1987-90 reanalysis has been accomplished to date, primarily because the principal investigator has since transferred from the USFWS to the NMFS. Work on the project completion report through 1991 will resume shortly in a cooperative effort by the USFWS and by Dick Wilmot at NMFS. It is anticipated that a draft of this report will be prepared prior to the fall 1993 JTC meeting.

The reanalysis of the 1987-90 data using only the commercial fishery samples and separating different mesh size fishing periods, was presented to the JTC by Dick Wilmot at the February 1993 meeting. Those results for chum salmon (Table 1) continue to indicate that the U.S. summer chum salmon run dominated the chum salmon commercial catch in District 1 each year (1987-90 revised estimates averaged 87.0% with an SD of 6.5%). Considering only the fall chum salmon run, the 1987-90 revised estimates averaged 71.0% U.S. stocks (SD 46.7%) and 29.0% Canadian stocks (SD 41.6%) in the District 1 commercial catch. This was a shift in the point estimate of 11.1% from Canadian to U.S. stocks from the earlier to the more recent analysis, but the standard deviations of the estimates remain very large. For chinook salmon, very little change in the estimates resulted from the reanalysis (Table 2). The 1987-90 revised estimates averaged 45.7% U.S. stocks (SD 7.2%) and 54.3% Canadian stocks (SD 7.2%) in the District 1 commercial catch.

On the second subject area of discussion, the status of 1992 GSI research was reviewed. Given the results discussed above, efforts in 1992 were focused on improving the stock baseline sampling for chum salmon in the field, and on screening for more chum salmon gene loci in the laboratory. ADF&G collected chum salmon escapement GSI samples from the Anvik River (multiple sites), Chena River, Salcha River, Sheenjek River, Toklat River, Delta River, Bluff Cabin Slough (Tanana River drainage), and the mainstem Tanana River. The USFWS collected chum salmon escapement GSI samples from Kaltag Creek, Dakli River (Koyukuk River drainage), and the Tozitna River in Alaska, and cooperated with DFO in sampling the Kluane River, Teslin River, and mainstem Yukon River near Tatchun Creek and Big Creek in Canada. DFO provided samples from the Fishing Branch River. Laboratory analysis is currently underway by ADF&G and USFWS. In addition to these chum salmon escapement samples, two additional Yukon River salmon GSI samplings were conducted in 1992. The USFWS collected over 2,300 chum salmon mixed stock fishery samples from the District 5A subsistence fishery near Tanana Village, and ADF&G collected juvenile chinook salmon stock samples in Canada as part of a broader regional study. Laboratory analysis is not yet underway on either of those sample collections.

On the third subject area of discussion, plans were discussed for the 1993 field season. It was agreed that the priority for Yukon River salmon GSI field collections in 1993 would remain the upgrading of chum salmon stock baselines. To that end, a list of priority stocks for sampling was established for agency planning purposes. Those stocks are (in geographic order):

Andreafsky River
Innoko River
Anvik River
Koyukuk River
Toklat River
Tanana River Mainstem
Chandalar River
Sheenjek River
Black River
Yukon River Mainstem in Canada
Donjek River
Koidern River

In addition, data analysis, model simulations using expanded information from 1992 samples, and timely reporting of results are high priorities for 1993.

Table 1. Summary of the estimated contributions by stock to the Yukon River District 1 commercial chum salmon fishery in Alaska, 1987 to 1990, as presented in a February 1992 progress report (top), and in a revised analysis presented to the JTC in February 1993 (bottom). Percentages in parentheses are based on the fall chum run totals only.

	1987				1988				1989				1990				Average			
Run	%	SD	Number	SD	%	SD	Number	SD	%	SD	Number	SD	%	SD	Number	SD	%	SD	Number	SD
February 1992 Progress Report a																				
U.S. Summer	84.5	10.0	188,335	22,382	91.0	4.7	630,581	32,207	85.2	5.6	532,705	35,299	82.0	6.0	144,606	10,516	85.7	5.8	374,055	25,102
U.S. Fall	10.6 (68.5)	7.5 (48.2)	23,689	16,670	5.7 (62.5)	4.4 (48.7)	39,155	30,497	8.4 (56.9)	6.4 (43.0)	52,760	39,867	9.8 (54.3)	6.8 (37.8)	17,195	11,953	8.6 (59.9)	5.8 (44.7)	33,200	24,748
Canada Fall	4.8 (31.5)	9.0 (57.8)	10,874	19,986	3.3 (37.5)	3.4 (37.4)	23,466	23,440	8.4 (43.1)	4.6 (31.0)	40,043	28,739	8.2 (45.7)	4.9 (27.2)	14,447	8,621	5.7 (40.1)	4.7 (36.5)	22,208	20,198
Revised Analysis b																				
U.S. Summer	81.1	10.1	150,644	18,675	91.2	5.8	632,451	40,105	86.1	5.5	538,509	34,583	79.6	9.3	140,238	16,446	87.0	6.5	365,460	27,452
U.S. Fall	13.1 (69.3)	9.0 (47.7)	24,406	16,791	6.6 (75.4)	4.9 (55.7)	45,819	33,837	9.5 (68.4)	5.7 (41.4)	59,341	35,884	14.7 (71.7)	8.9 (43.6)	25,829	15,883	9.3 (71.0)	6.1 (46.7)	38,849	25,549
Canada Fall	5.8 (30.7)	9.0 (47.3)	10,821	16,659	2.2 (24.6)	4.3 (48.5)	14,925	29,479	4.4 (31.6)	5.0 (36.0)	27,387	31,185	5.8 (28.3)	7.8 (38.0)	10,181	13,676	3.8 (29.0)	5.4 (41.6)	15,828	22,750

a "Progress Report: Genetic Stock Identification of Yukon River Chum and Chinook Salmon, 1987 to 1990", by R.L. Wilmot, R. Everett, W.J. Spearman, and R. Baccus, USWFS, February, 1992.

b A revised analysis of these data was presented at the February 1993 Yukon River JTC meeting by R.L. Wilmot. The revisions were due to separating commercial fishery and test fishery GSI sample data, and separating unrestricted mesh size and restricted mesh size commercial fishery GSI sample data in the revised analysis.

NOTE: "SD" stands for "Standard Deviation", which is a measure of the variability around an estimate. We can expect that the true value will lie within two standard deviations above or below the point estimate 95% of the time.

Table 2. Summary of the estimated contributions by stock to the Yukon River District 1 commercial chinook salmon fishery in Alaska, 1987 to 1990, as presented in a February 1992 progress report (top), and in a revised analysis presented to the JTC in February 1993 (bottom).

	1987				1988				1989				1990				Average			
Run	%	SD	Number	SD	%	SD	Number	SD	%	SD	Number	SD	%	SD	Number	SD	%	SD	Number	SD
February 1992 Progress Report a																				
U.S. Stock	38.7	5.0	29,648	3,805	47.6	5.5	27,148	3,115	55.1	4.3	28,322	2,194	49.7	5.7	25,374	2,932	46.8	5.1	27,623	3,012
Canada Stock	61.3	5.0	46,993	3,805	52.4	5.5	29,941	3,115	44.9	4.3	23,046	2,194	50.3	5.7	25,694	2,932	53.2	5.1	31,419	3,012
Revised Analysis b																				
U.S. Stock	35.4	7.7	26,412	5,774	49.3	7.8	27,303	4,319	53.0	6.4	27,635	3,321	49.7	6.7	25,380	3,421	45.7	7.2	26,685	4,209
Canada Stock	64.7	7.7	48,304	5,774	50.7	7.8	28,132	4,319	47.0	6.4	24,528	3,321	50.3	6.7	25,688	3,421	54.3	7.2	31,863	4,209

a "Progress Report: Genetic Stock Identification of Yukon River Chum and Chinook Salmon, 1987 to 1990", by R.L. Wilmot, R. Everett, W.J. Spearman, and R. Baccus, USWFS, February, 1992.

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