

YUKON RIVER TECHNICAL REPORT:

1986

prepared by

**The Joint Canada/United States
Yukon River Technical Committee**

September 23-25, 1986

000621

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1.0 Introduction

David Colson and John Davis, the respective heads of the U.S. and Canadian delegations to the Yukon River Negotiations, directed members of the Joint Canada/U.S. Yukon River Technical Committee to address the following issues:

1. Summarize the operation of commercial, subsistence, domestic and Indian food fisheries in 1986. Describe management actions and the results of these actions. Exchange copies of in-season regulation changes.
2. Present in-river catch and effort statistics for chinook, fall chum, summer chum, and coho salmon by user group and management area for 1986.
3. Determine the status of Yukon River chinook and fall chum salmon stocks and in-river harvest rates by user group. Present estimates of escapement by spawning area and describe the method(s) used to determine escapement. Describe the age, sex and size composition of chinook and fall chum salmon in the harvest and the escapement.
4. Describe the operation and catch by species in 1986 of marine fisheries known, or thought to harvest Yukon River salmon.
5. Present statistics of fishery production in 1986 including average weight of fish in the catch, use of the catch (eg. roe, canned, frozen product) and economic value of the catch.
6. Describe results of 1986 biological programs including:
 - sonars
 - weirs
 - test fisheries
 - tag and recovery operations
 - subsistence fishery surveys
 - chinook stream life studies
 - chinook and fall chum salmon stock identification studies
7. Discuss forecasts of the size of returning Yukon River chinook and fall chum salmon stocks in 1987.
8. Attempt to further resolve differences between the United States and Canada in chinook and fall chum salmon escapement targets for the Yukon River.
9. Canada is to respond to the United States Research Proposal concerning Yukon River salmon presented at the last meeting of the Technical Committee.
10. Describe 1986 enhancement activities including egg takes, number of fry released, number marked and any information on returns from previous enhancement operations.

The results of discussion on each item, excluding items 8 and 9 are contained in this technical report. Time and data limitations did not permit consideration of items 8 and 9. The Technical Committee recommends these be dealt with in a separate meeting where they would form the focus of the discussion.

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Members of the Joint Canada/U.S. Yukon River Technical Committee (Table 1) met in Nanaimo on September 23-25, 1986. In dealing with the issues described above the Committee realized that several had been discussed and reported in their entirety in the Briefing Report on the Status of Salmon Stocks, Fisheries and Management Programs in the Yukon River which was prepared in April of 1985 and in the Yukon River Technical Report: 1985, prepared in October of the same year. In such instances, only brief mention is made of these issues in this report and the reader is referred to the Briefing Report and previous Technical Report for more details.

The Technical Report contains the most current estimates for catch and escapement of salmon in the Yukon River. The reader should be aware however, that at this time all 1986 chinook and summer chum salmon statistics are preliminary in nature and those for fall chum and coho salmon are incomplete. Fall chum salmon fisheries generally continue through early October and escapement surveys are generally not completed before early November. Final 1986 catch and escapement statistics for all species of Yukon River salmon will be available by March, 1987.

Table 1. Members of the Joint Canada/US Yukon River Technical Committee.

=====

Alaska Department of Fish & Game

Ron Regnart (co-chair)
Linda Brannian
Larry Buklis
Craig Whitmore
Bill Arvey
Fred Andersen (absent)

United States Fish Wildlife Service

Dick Marshall
Rod Simmons (absent)

National Marine Fisheries Service (U.S)

Aven Anderson (absent)

Department of Fisheries & Oceans (Canada)

Mike Henderson (co-chair)
Sandy Johnston
Robin Harrison
Gord Zealand
Terry Beacham (absent)

Yukon Territorial Government

Mark Hoffman (absent)

=====

2.0 1986 Commercial Fishery - Alaska

In 1986 a total of 1,280,545 salmon was commercially harvested in Alaska. The catch was composed of 99,918 chinook, 1,133,372 chum (993,353 summer chum, and 140,019 fall chum), and 47,255 coho salmon (Table 2). The ex-vessel value was \$6.2 million (Appendix 1). The chum salmon catch was above the most recent 5-year average while the coho salmon catch was the third largest in history.

2.1 Chinook Salmon

Sustained yield fishery management for chinook salmon is achieved through the use of emergency order to establish fishing seasons, fishing periods, and gillnet mesh size restrictions. The commercial season is opened in the lower river when increasing subsistence and/or test net catches have occurred over a 7 to 10 day period. The escapement of this segment of the run past the lower river commercial fishery is thought to provide for increased escapement of chinook salmon bound for upper river spawning areas in Alaska and Canada which are subjected to intensive fishing effort along the entire length of the river. A more conservative management strategy was adopted for the 1986 season as new information resulting from the analysis of 1982-1985 U.S/Canada catch allocations based on SPA and escapements indicated that some chinook salmon stocks have repeatedly undergone increased exploitation resulting in less than optimum escapements. Therefore, it was determined that the midpoint of the guideline harvest range of 60,000-120,000 for the District 1 and 2 fishery should not be exceeded unless a very strong run could be substantiated.

Late ice breakup in the lower river delayed the chinook salmon migration, and the chinook salmon directed commercial fishing season in Districts 1 and 2 did not open until June 19-21, the second latest in the history of the fishery. Run timing was compressed with 79,525 chinook salmon taken with unrestricted mesh size gillnets (chinook salmon directed) in Districts 1 and 2 between June 19 and July 7. Additionally, between June 14 and July 4 with gillnets restricted to 6 inch (15.2 cm) maximum mesh size (chum salmon directed) an additional 12,809 chinook salmon were harvested. Eight unrestricted mesh size fishing periods (192 hours) were allowed in Districts 1 and 2. These fishing periods were spread further over time than prior years, providing greater opportunity for chinook salmon escapement. A harvest of 92,334 chinook salmon were taken by the end of the chinook salmon directed fishing season by all mesh sizes. An additional 2,498 chinook salmon was taken in the lower Yukon with restricted mesh size gillnets after the chinook salmon directed fishery. The incidental harvest of chinook salmon after July 4 and 8 in Districts 1 and 2 respectively was approximately 50% lower than the recent 5 year average catch during the same time period. The run was judged average or slightly better than average in magnitude based on in-season lower Yukon test fishing and acoustical enumeration data. In the upper Yukon area commercial harvests were managed toward the midpoints of guideline harvest ranges with a total of 4,185 chinook salmon taken.

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Table 2. Alaskan commercial catch of Yukon River salmon in 1986.

District Subdistrict	No. of Fishermen		Summer Chum			Fall Chum			Total Salmon		
	Chinook		Chum	Roe (lbs)	Equivalent Chum 1/ 381,127	Chum	Roe (lbs)	Equivalent Chum	Coho	Salmon	Roe (lbs)
1	444	52,993	381,127	0	380,739 381,127	59,352	0	59,352	24,824	518,296	0
2	259	41,839	288,427	0	287,818 288,427	51,307	0	51,307	21,197	402,770	0
Subtotal		94,832	669,554	0	668,557 669,554	110,659	0	110,659	46,021	921,066	0
3	18	901	442	0	403 442	2,793	0	2,793	793	4,929	0
Total Lower Yukon	627	95,733	669,996	0	668,960 669,996	113,452	0	113,452	46,814	925,995	0
4 A	60	11	0	237,049	237,049	0	0	0	0	237,060	237,049
4 B, C	22	491	300	32,689	32,989	2,045	0	2,045	0	35,525	32,689
5 A, B, C	27	2,369	690	0	690	20,710	395	21,105	0	24,164	395
5 D	3	364	0	0	0	1,343	0	1,343	0	1,707	0
6	27	950	50,483	2,146	52,629	1,892	182	2,074	441	56,094	2,328
Total Upper Yukon	132	4,185	51,473	271,884	323,357	25,990	557	26,567	441	354,550	272,461
Total Yukon Area	804	99,918	721,469	271,884	993,353	139,442	577	140,019	47,255	1,280,545	272,461
5 Year Average 1981 - 1985		139,132	-	-	845,310	-	-	298,244	42,757	1,139,499	-

1/ "Equivalent chums" includes numbers of fish converted from roe sales (e.g. one pound of chum salmon eggs equals one chum salmon).

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2.2 Summer Chum Salmon

The summer chum salmon run was exceptionally strong, with run timing similar to that of the chinook salmon run. Special chum salmon directed fishing periods in Districts 1 and 2 were initiated prior to and between chinook salmon directed fishing periods. Additionally, summer chum salmon directed fishing periods occurred after the chinook salmon directed season, resulting in a total District 1 and 2 harvest of 669,554 summer chum salmon. Summer chum salmon directed fishing periods occurred between June 14 and July 15 during 12 periods for 192 hours of fishing time. An additional 442 summer chum salmon were captured in District 3 during the unrestricted mesh size season resulting in a total lower Yukon area summer chum salmon harvest of 669,996. This was the fourth highest harvest for this area in history. In District 4 a record 269,738 pounds of summer chum salmon roe was sold by fishermen. In District 6 (Tanana River) the third highest harvest on record of 52,629 summer chum salmon was taken.

2.3 Fall Chum Salmon

In anticipation of a poor return of fall chum salmon, regulation changes were made prior to the season and a more conservative management plan was adopted consisting of decreased harvest guidelines, shorter fishing periods and a season closure. The fishing season in the lower Yukon area was closed by regulation effective July 15. The mid-season closure was necessary to afford increased protection for the early run segment of the fall chum salmon run and to gain information in assessment of the run strength to determine if the run size was adequate to support a commercial fishery. During the approximate three week closure substantial numbers of fall chum salmon entered the river as indicated by monitoring of test fishing and subsistence catch data, and hydroacoustic enumeration data. The fishing season was re-opened August 4-10 in Districts 1, 2, and 3 with fishing periods individually announced to provide for management flexibility based on continued monitoring of run strength. Most fishing periods were shortened (6 - 24 hour duration) and took place twice weekly through August 24, when the season was closed. The fall chum salmon harvest in the lower Yukon area was 113,452, slightly in excess of the reduced guideline harvest range of 0 to 110,000 which was established for the 1986 season in anticipation of a poor return. In-season lower Yukon test fishing and hydroacoustical data indicated the early segment of the fall chum salmon run was above average in magnitude and the later portion of the run was near average in magnitude. In the upper Yukon area the fall chum salmon harvest was 26,567. The total Alaskan harvest of fall chum salmon was 140,019, which is 53% below the recent 5-year average.

2.4 Coho Salmon

Test fishing in the lower Yukon area indicated the coho salmon run was below average in strength while hydroacoustic enumeration indicated the run was average or better in strength. Below average catch weights and observations of fish passing through gillnets suggest the test net index may have been low. Coho salmon, which exhibit later run timing, are taken incidental to the more abundant fall chum salmon. The

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fishery management plan in effect for the 1986 season directed the fall harvest toward the latter portion of the the fall chum salmon run resulting in the harvest of 46,814 coho salmon in the lower Yukon area. An additional 441 coho salmon were harvested in the upper Yukon area.

3.0 1986 Commercial Fishery - Canada

As of September 11, 1986, the Canadian Yukon River commercial fishery had harvested 15,001 salmon consisting of 10,797 chinook salmon and 4,204 fall chum salmon (Table 3). Since the chum salmon fishery is still in progress, final catch figures are not yet available. The preliminary harvest information suggests an average chinook salmon catch and the potential for an above average chum salmon catch.

3.1 Chinook Salmon

The pre-season expectation was for an average to above average return of chinook salmon based on above average brood year escapements. The management plan developed for the 1986 season was designed to conserve early run upper Pelly spawning stocks which have been depressed in recent years. Limited tagging information has indicated that these stocks tend to migrate through the commercial fishing area early in the season. Accordingly, the normal fishing time was reduced by three days per week prior to July 15. The area from the mouth of the Sixty Mile River (approximately 60 km upstream from Dawson City) downstream to the US/Canada border was open two days per week whereas the area upstream from the Sixty Mile to Tatchun Creek was open three days per week. This action resulted in a greatly reduced fishing effort in the early season; in fact, no commercial fishing occurred prior to July 12. Commencing July 19, the lower fishing district resumed a normal 5-day/week opening and the upper fishing area was open six days per week.

The preliminary total Canadian harvest was 10,797 chinook salmon which is similar in magnitude to the recent 5-year (i.e. 1981-85) average of 10,500. Peak catches were recorded in the last two weeks of July indicating that run timing was average. In total, 31 commercial fishing licenses were issued in 1986, although the maximum number of fishermen fishing in any one week was twenty-two. This was less than last year's peak fishing effort of twenty-nine fishermen.

The restrictions imposed in the early season fishing periods in addition to a lower peak fishing effort resulted in a 30% reduction in the Canadian commercial harvest rate from the 1985 level. Preliminary analysis of the 1986 DFO chinook salmon tagging study indicated a Canadian commercial harvest rate of approximately 28.9% compared to 42.6% in 1985.

3.2 Fall Chum Salmon

In anticipation of a poor chum salmon return, the preseason management plan in 1986 was to reduce the weekly fishing times during the chum salmon season by one day/week. In-season, a vastly reduced fishing effort and a much greater than expected return removed the necessity of following this plan. Fishing times therefore remained at 5 days/week in the lower fishing area and 6 days/week in the upper district.

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Table 3. Commercial catch of chinook and fall chum salmon through Sept. 11th 1986 from the Canadian portion of the Yukon River

Date	Chinook	Fall Chum	No. of Fishermen
July 12	14		
13	133		
14	90		
Weekly Total	237		7
July 19	398		
20	978		
21	916		
22	1279		
23	830		
24	570		
Weekly Total	4971		17
July 26	318		
27	1016		
28	1033		
29	800		
30	669		
31	520		
Weekly Total	4356		22
August 2	22	4	
3	146		
4	162	2	
5	116	3	
6	104	2	
7	129	2	
Weekly Total	679	13	18
August 9	2		
10	89	1	
11	50	1	
12	59	2	
13	48		
14	74		
Weekly Total	322	8	18
August 16			
17	42	2	
18	40	4	
19	35	5	
20	26	5	
21	31	7	
Weekly Total	174	23	4

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Table.3 (cont'd)

Date	Chinook	Fall Chum	No. of Fishermen
August 23			
24	3	6	
25	16	24	
26	12	50	
27	5	65	
28	4	73	
Weekly Total	40	218	4
August 30	4	200	
31		21	
Sept 01	4	294	
02	2	425	
03	1	452	
04	3	360	
Weekly Total	14	1752	9
Sept 06			
07		222	
08	3	515	
09		502	
10		515	
11	1	436	
Weekly Total	4	2190	7
TOTAL	<u>10,797</u>	<u>4,204</u>	

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To September 11 the commercial catch in Canada approximated 4,204. Although this is slightly ahead of last year's catch to September 14 of 3,561 chum salmon, the total catch this year is expected to be below the 1981-85 average of 22,200. In-season data from Alaskan fisheries suggests the run to be a week to two weeks early.

4.0 1986 Subsistence, Domestic, Indian Food and Sport Fisheries

4.1 Alaska

Subsistence fishery surveys, described in Section 7.1.3, are currently in progress and harvest data are not yet available. Preliminary harvest data should be available by November 1986.

Sport fishery surveys described in Section 7.1.4 are currently in progress and harvest data are not yet available.

4.2 Canada

The food fish monitoring program initiated in 1985 was continued in 1986. Although still in progress, preliminary catch data have been compiled for chinook salmon which indicates an estimated total catch of 8,615 chinook. This represents an above average harvest (i.e. 1981-85 average = 6,867). Catch estimates for specific regions are as follows:

Carmacks	3,150
Pelly/Fort Selkirk	2,550
Teslin	875
Mayo	800
Dawson	580
Ross River	360
Old Crow	300
TOTAL	8,615

Catch data for the subsistence catch of fall chum salmon is still being collected.

A total of nine domestic licences have been issued which allow fishermen to catch salmon with gillnets or fishwheels for personal use. The preliminary estimated chinook salmon catch is 300, however, the figure will require updating once the season ends.

The sport fishery in the Yukon Territory is estimated to have taken 200 chinook salmon in 1986.

5.0 Status of Stocks

Documentation of total Yukon River salmon escapement has not been possible in the past due to the vast size of the drainage, turbid water conditions, and funding limitations. Total population estimates for major portions of the drainage were attempted at two locations on the mainstem Yukon River in 1986: at river mile 120, near Pilot Station, using hydroacoustic counters and just above the US/Canada border using tag and recapture techniques. This was the second consecutive year for the sonar enumeration program, and fourth out of the last five years for the tagging program.

Most available stock specific escapement information in 1986, as in previous years, was obtained by aerial surveys of selected index streams, although ground and boat surveys, weirs, counting towers, sonar counters, a tag and recapture study, and the Whitehorse Dam fishway have also provided escapement estimates. Comprehensive data are only available for chinook and summer chum salmon. Fall chum and coho salmon escapement enumeration is still in progress at this time.

Poor weather along with high and turbid water conditions precluded surveys of many spawning areas in 1986. Accuracy and comparability of surveys that were conducted were often affected by the poor survey conditions. Counts obtained in some cases are minimal estimates due to the conditions and/or timing of the survey. Plans to conduct multiple surveys of known major spawning areas and to document new spawning areas were not possible. It is not known at this time what the effect of flood conditions at time of spawning in several Tanana River drainage streams will have on production from the 1986 brood year.

5.1 Chinook Salmon

The strength of the chinook salmon escapement in 1986 was variable between spawning areas in the Alaskan and Canadian portions of the Yukon River drainage. Escapements were generally above average in Alaska and only average at best in Canada, as had been the case in 1985. This was in spite of protection of the first segment of the run in the lower river fishery and the conservative management strategies in both countries.

Chinook salmon escapements to spawning areas in the Alaskan portion of the Yukon River drainage (Table 4) achieved escapement objectives in all areas for which objectives have been established (Table 5). The escapement index for the Andreafsky River (both forks combined) of 5,112 chinook salmon is the largest ever recorded. The Anvik River aerial survey count of 1,118 chinook salmon was about average, while 2,947 fish were counted in the Nulato River (both forks combined). Historical survey data are sporadic for the Gisasa River, in the Koyukuk River drainage, but 1,346 chinook salmon were counted by aerial survey in 1986. Escapement objectives were achieved in the Chena and Salcha Rivers, the major producers in the Tanana River drainage.

In contrast to the situation in the Alaskan portion of the drainage, 1986 salmon chinook salmon escapements throughout the Yukon Territory (Table 6) were generally below average and well below desired levels. A total of 557 was counted through the Whitehorse fishway compared to the average count (1981-1985) of 899 fish. The Big Salmon River aerial count of 745 made between Big Salmon Lake and Souch Creek while late, was below the 1981-85 average of 1,110. However, the 1986 weir count of 1,816 on this system was considerably higher than the partial count of 456 in 1985. The Nisutlin River aerial count of 459 chinook salmon between Sidney Creek to Hundred Mile Creek was approximately half the recent average. The relatively poor escapements noted in individual streams are consistent with the low total escapement estimate computed from the mainstem Yukon River tag and recapture program. The 1986 total escapement upstream of Dawson was slightly improved over the 1985 level but still below the optimum level.

5.2 Summer Chum Salmon

Summer chum salmon escapements were strong in 1986, meeting or exceeding escapement objectives in all areas for which objectives have been established. A single aerial survey of the Andreafsky River was flown before peak of spawning, and escapement objectives were already achieved. The counting tower project estimated a season total of 167,614 summer chum salmon in the East Fork of the Andreafsky River, second only to the 1982 escapement since total season estimates have been obtained beginning in 1981. Sonar estimated escapement of 1,189,602 summer chum salmon in the Anvik River was second only to the 1981 escapement since total season estimates have been obtained beginning in 1972, and was 2.4 times the escapement objective.

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Table 4. Yukon River chinook and summer chum salmon escapement indices and population counts conducted by ADF&G, 1986.^a

Stream (Drainage)	Date	Survey Rating	Chinook	Summer Chum
<u>Alaska Streams</u>				
<u>Andreafsky River</u>				
East Fork Counting Tower ^b	6/25-7/14		(1,530)	167,614
East Fork Aerial Survey	7/14	Fair	1,954	(83,931)
West Fork	7/14	Fair	3,158	99,373
<u>Anvik River</u>				
Soner Count ^c	6/21-7/15			1,189,602
Aerial Survey	7/28	Good	1,118	
<u>Nulato River Mainstem</u>				
North Fork	7/12+22	Fair	27	5,295
South Fork	7/12+22	Fair	1,425	42,122
		Fair	1,522	16,848
<u>Koyukuk River Drainage</u>				
Gisasa River	7/12+22	Fair-Good	1,346	12,114
Henshaw Creek	7/28	Fair	561	2,475
Middle Fork Koyukuk	7/29	Fair	49	
Bettles River	7/29	Good		5
South Fork Koyukuk	7/28+29	Fair-Good	556	1,576
Jim River	7/28+29	Fair-Good	238	869
<u>Melozitna River</u>				
Melozi Hot Springs Creek	7/22	Fair	5	2,958
Fox Creek	7/12	Fair		90
Tozitna River	7/28	Good	222	1,778
Bear Creek Foot Survey	7/11	Good		56
Chandalar River	7/29	Poor	19	
<u>Tanana River Drainage</u>				
Barton Creek	7/27	Poor	5	
Chatanika River	8/09	Fair	79	190
Seventeen Mile S1 Boat Survey	8/02	Good	306	72
Clear Creek Weir	7/06-8/05		168	79
Chena River	8/04	Poor-Fair	2,031	1,509
Bear Creek	8/11	Fair	6	
Salcha River	8/04	Good	3,368	8,028
<u>Yukon Territory Streams</u>				
Big Salmon River (Big Salmon Lake to South Creek)	8/21	Poor-Fair	745	
Nisutlin River (Sidney Cr-100 Mi.C)	8/15	Poor	459	
Wolf River	8/21	Poor-Fair	271	

^a Peak aerial survey counts of live fish and carcasses combined unless noted otherwise. Survey counts are only indices of abundance and are not total season escapement counts. Survey counts are for the entire area surveyed within a stream, which may exceed index areas defined for some streams. Data in parentheses not included in totals.

^b Project terminated on 7/14 due to budget cuts. Count of 152,730 summer chum salmon through 7/14 was expanded to total season estimate of 167,614 fish based on the historic escapement timing pattern at this site after 7/14. Chinook salmon counts could not be expanded due to lack of historical data on that species.

^c Project terminated on 7/15 due to budget cuts. Count of 1,085,750 summer

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Table 5. Yukon River (Alaska) escapement index objectives for chinook and chum salmon.

	Escapement Objective ¹	
	Minimum	Optimum
<u>CHINOOK SALMON</u>		
Andreafsky River		
East Fork	1,100	1,600
West Fork	700	1,000
Anvik River (Mainstream Yellow River to McDonald Creek)	300	500
Nulato River		
North Fork		500
South Fork		500
Gisasa River		650
Chena River (Flood Control Dam to Middle Fork)	1,000	1,700
Salcha River	1,500	3,500
<u>SUMMER CHUM SALMON</u>		
Andreafsky River		
East Fork	76,000	109,000
West Fork	62,000	116,000
Anvik River (Mainstem Goblet Creek to McDonald Cr.) Sonar	209,000	356,000 487,000 ²
Nulato River		
North Fork	37,000	53,000
Hoqatza River		
Clear Creek	5,000	8,000
Caribou Creek	5,000	9,000
Salcha River		3,500
<u>FALL CHUM SALMON</u>		
Upper Tanana River Drainage		
Delta River		15,800 ³
Bluff Cabin Slough		10,400 ³
Upper Toklat River	000636	44,000 ³
Sheenjok River		40,500 ³

¹ Escapement objectives in numbers of fish are preliminary and are subject to change as additional data becomes available. Unless otherwise indicated, escapement objectives are based on aerial survey index estimates which do not represent total escapement, but do reflect annual spawner abundance trends when using standard survey methods under acceptable survey conditions.

² Optimum number calculated from escapement-return relationships.

Table 6. Canadian Yukon River chinook salmon escapement index counts conducted by DFO, 1986 ^a

Stream	Index Area	Date Day/Month	Live	Carcasses	Total	Conditions
Tatchun Cr	Tatchun Lk-Yukon R.	23/8	154	1	155	Good
S. McQuesten	McQueston Lk-Hwy	17/8	0	0	0	Good
N. McQuesten	Sprague Crk-Mouth	17/8	0	0	0	Good
Ross R.	Prevost Cany-Lewis Lk.	18/8	70	2	72	Poor-Fair
Tincup Crk	Tincup Lk-Kluane R.	18/8	223	5	228	Good
Nisutlin R.	Sidney Crk-100 Mi.Cr.	20/8	303	139	442	Fair-Good
Big Salmon	Quiet Lk-Sandy Lk	26/8	0	0	0	Good
	Sandy Lk-Big Salmon Lk		0	0	0	
	Big Salmon Lk-weir		177	53	230	
	Weir-N. Big Salmon		39	43	82	
South Big Salmon		27/8	0	0	0	
Little Salmon R.	Little Salmon Lake-Yukon River	27/8	9	45	54	Poor late
Blind Crk	at bridge	29/8	5	0	5	
Takhini R.	Kusawa-Mendenhall	29/8	203	0	203	Poor-Fair
	Mendenhall Hwy		5	8	13	
Klondike R.	N. Fork	11/8	10	0	10	Fair (fixed wing)

^a All surveys conducted by helicopter unless otherwise noted.

5.3 Fall Chum Salmon

Test fishing indices and mainstem Yukon River sonar counts indicated that fall chum salmon run strength in 1986 was average or better in magnitude. Preliminary escapement data are only available from the Sheenjek and Chandalar River sonar projects, and from the Fishing Branch River weir project. A total of 51,100 fall chum salmon have been counted in the Sheenjek River through September 23, 56,800 in the Chandalar River through September 27, and 25,500 in the Fishing Branch River through September 16. Catches of fall chum salmon in the tagging fishwheels on the mainstem Yukon River in Canada are ahead of 1985 levels through September 24, suggesting a relatively strong migration into the Canadian portion of the drainage in 1986. These data are incomplete at this time and will be adjusted on a post season basis. There is some concern over the strength of the Tanana River return given very poor parent year escapements in 1982 and the poor performance of a very limited commercial fishery in the Tanana River in 1986. Escapement data are not yet available for any Tanana River spawning areas.

5.4 Coho Salmon

Coho salmon escapement data for 1986 are not yet available. In-season run abundance indicators provided conflicting assessments of stock strength. Test fishing indices in the lower river were the lowest since 1980, while preliminary sonar counts from the Yukon River sonar project were similar in magnitude with those from 1985, which was an average coho salmon return. Small size of fish in 1986 may account for some of the discrepancies between test fishing and sonar data. A more complete assessment of coho salmon run strength will not be possible until upriver harvest and escapement data are available.

6.0 Marine Harvest of Yukon River Salmon

6.1 High Seas Salmon Gillnet Fisheries

(Table 7)

Documentation of 1986 catches by the Japanese mothership fishery and estimates of Western Alaska (including Yukon) chinook interceptions have recently been made available. A reported total of 60,369 chinook was harvested from 06/01/86 to 07/16/86 of which 40,192 were taken within the United States 200 mile Fisheries Conservation Zone and 20,177 were taken in international waters of the central Bering Sea. The number of Western Alaska origin chinook salmon in this catch has been estimated (M. Dahlberg pers. com. September 17, 1986) to be 10,000 within the zone and 14,000 outside the zone. Comparable figures for 1984 and 1985 are included in the following table:

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Japanese Mothership Western Alaska
Chinook Salmon Interception Estimates

	<u>Inside USFCZ</u>	<u>Outside USFCZ</u>	<u>Total W. AK/ Canadian Yukon</u>	<u>Total Mothership</u>
1984	12,599	23,685	36,284	81,976
1985	12,371	12,373	24,744	45,763
1986	10,000	14,000	24,000	60,369

The 1986 harvest data for the Japanese landbased gillnet fishery are not available at this writing. Chinook salmon harvests in 1984 and 1985 were reported as 92,000 and 101,000 fish, respectively. Historic regional stock composition estimates indicate that approximately 22 percent of the total landbased fishery chinook salmon harvest is of Western Alaska Canadian Yukon origin. Western Alaska Canadian Yukon origin chinook may have therefore comprised 21,000 and 22,000 salmon of the 1984 and 1985 harvests respectively.

A new agreement was reached with Japan in 1986 that placed further restrictions on Japan's mothership and landbased fisheries in the Bering Sea and North Pacific. With respect to the landbased fishery, Japan agreed to the following provisions (Fig.1) which are effective during the 1986 season: (1) movement of the eastern boundary one degree to the west, 2) special enforcement actions including satellite vessel tracking and (3) a 3-5 year research program to determine the need for future boundary changes. Provisions agreed to for the mothership fishery include: (1) a phase out by 1988 of all directed salmon fishing in Bering Sea international waters east of 180 degrees, (2) a phase out by 1994 of all fishing in Bering Sea international water west of 180 degrees, and (3) minor changes in mothership fishery regulations within the U.S. FCZ.

The levels of interception savings for chinook and chum salmon which may be realized from the changes cannot be estimated with precision. It is clear that the greatest savings will accrue to chinook and chum salmon since sockeye salmon are harvested almost entirely within the FCZ. At the present time it appears that by 1994, interceptions of North American chum salmon, currently roughly estimated to range from 40-50 thousand salmon annually, will be completely eliminated, and chinook interception levels will decrease by an unknown but substantial amount. Estimates of Western Alaska chinook salmon interception by the mothership fishery for the 5 year period 1981 to 1985 range from 25,000 to 45,000 fish not including gillnet dropout mortality. The average for the period is about 34,000 chinook salmon. Although Yukon River origin chinook comprise a large proportion of the high seas interceptions of Western Alaska origin, the number of additional Yukon River chinook salmon that might be available for inshore harvest following the reduction will not be known until further analysis is available.

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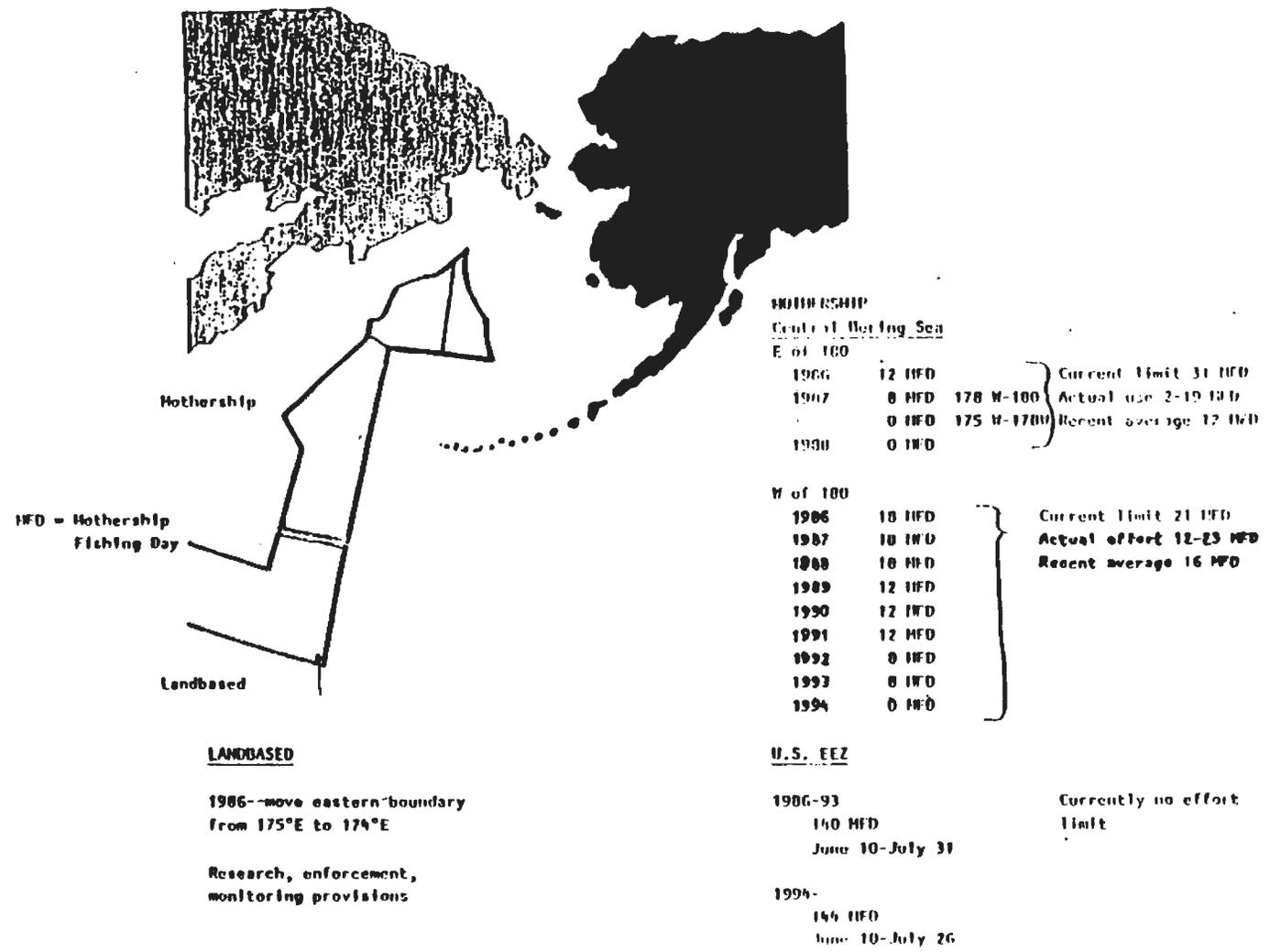


Fig. 1. Summary of changes made to the Japanese landbased and mothership gillnet fisheries in 1986.

Table 7. Total catch and estimated catch of Western Alaska (including Canadian Yukon) chinook salmon (in thousands of fish) in Japanese high seas salmon gillnet fisheries, 1964-1986 (1)

Year	Mothership (2)		Landbased		Combined	
	Total Catch	WA Catch	Total Catch	WA Catch	Total Catch	WA Catch
1964	410	179	208	40	618	219
1965	185	106	102	20	287	126
1966	208	108	118	22	326	130
1967	128	71	115	22	243	93
1968	362	244	97	18	459	262
1969	554	367	88	17	642	384
1970	437	312	148	28	585	340
1971	206	132	139	27	345	159
1972	261	189	107	20	368	209
1973	119	56	165	31	284	87
1974	361	208	188	36	549	244
1975	162	108	137	20	299	407
1976	285	117	201	42	486	159
1977	93	55	146	31	239	86
1978	105	36	210	63	315	99
1979	126	69	160	45	286	114
1980	704	416	160	22	864	438
1981	88	30	190	55	278	85
1982	107	45	165	41	272	86
1983	87	31	178	44	265	75
1984	82	36	92	21 (3)	174	57
1985	66	25	101	22 (3)	167	47
1986	60	24	(4)	(4)	(4)	(4)

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(1) Sources:

- (1) 1964-83: Rogers, Donald et al, 1984. Origins of chinook salmon in the area of Japanese Mothership Fishery, Fisheries Research Institute, University of Washington. 215 pgs.

1984-1986 WA catch estimate for mothership fishery: Mike Dahlburg, National Marine Fisheries Service, Juneau, AK.

- (2) Western Alaska catches represent fish from Bristol Bay Area, Kuskokwim Area and Yukon River.

- (3) Preliminary rough estimate by ADFG.

- (4) Data not available.

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Savings of salmon that may be realized from moving the landbased boundary one degree to the west (from 175 degrees east to 174 degrees east) have not been estimated. However, it is probable that the greatest benefits will accrue to coho, chinook and perhaps chum salmon of central Alaska origin.

6.2 Foreign, Joint Venture, and U.S. Groundship Trawl Fisheries

Preliminary harvest figures for the incidental harvest of salmon by the foreign directed trawl fisheries and joint venture trawl fisheries operating in the Bering Sea in 1985 and 1986 are summarized below. Estimates for previous years are shown in Table 8.

1985 Bering Sea and Aleutians Areas

Foreign Joint Venture	10,420
Foreign Directed Trawl	10,003

These catches are substantially lower than in previous years. Species composition of the harvest is roughly estimated to consist of a majority (perhaps 80%) of chinook salmon.

1986 Bering Sea and Aleutian Areas

	Chinook	Other Salmon	Total
Foreign JV 1/	4,021	7,011	11,032
Foreign Trawl 2/	287	535	822

1/ catches through 08/23/86

2/ catches through 08/30/86

Because of the absence of observer coverage, incidental salmon harvest estimates from the domestic trawl fleet are not available.

6.3 Other Fisheries

A total of 332,000 chum salmon was harvested in June 1986 by fisheries in the Unimak and Shumagin Islands area on the south side of the Alaska Peninsula. The Alaska Board of Fisheries placed a catch ceiling of 400,000 chum salmon for the June fishery in 1986. In order to stay within the harvest ceiling, it was necessary to restrict the target sockeye salmon fishery. Final June sockeye catches for the fishery totalled half of the quota (467,000 against the 927,000 quota). Unless the chum salmon harvest ceiling is re-enacted by the Board it will not be in effect in 1987 or future years.

Previous tagging and scale patterns studies have indicated that the majority of the chum salmon harvested in this fishery in June are bound for other terminal fisheries including the Yukon River. The previous five and ten year average June harvests for the fishery are 643,000 (1981-1985) and 449,000 (1976-1985) chum salmon.

Table 8. Salmon catches in thousands of fish made in the foreign groundfish trawl fisheries, 1977-1986 (1)

Year	Foreign				Joint - Venture				Combined			
	Chinook	Chum	Other	Total	Chinook	Chum	Other	Total	Chinook	Chum	Other	Total
<u>Bering Sea - Aleutians Area</u>												
1977	-	-	-	47.8 (2)					-	-	-	47.8 (2)
1978	39.1	4.8	0.6	44.5					39.1	4.8	0.6	44.5
1979	100.4	6.1	1.2	107.7					100.4	6.1	1.2	107.7
1980	113.2	6.7	0.2	120.1	1.9	0	0	1.9	115.1	6.7	0.2	122.0
1981	36.7	6.0	0.6	43.3	0.3	0.4	0.1	0.8	37.0	6.4	0.7	44.1
1982	13.9	7.1	0.2	21.2	1.7	0.6	0.1	2.4	15.6	7.7	0.3	23.6
1983	9.8	8.2	0.2	18.2	0.5	24.0	(<.1)	24.5	10.3	32.2	0.2	42.7
1984	-	-	-	12.8 (2)	-	-	-	60.4 (2)	-	-	-	73.2 (2)(3)
1985	-	-	-	10.0 (2)	-	-	-	10.4 (2)	-	-	-	20.4 (2)
1986 (4)	0.3	-	0.5	0.8	4.0	-	7.0	11.0	4.3	-	7.5	11.8
<u>Gulf of Alaska</u>												
1977	4.8	0.5	(<.1)	5.3								
1978	-	-	-	45.6 (2)								
1979	16.9	2.9	0.6	20.4	1.0	0.1	0	1.1	17.9	3.0	0.6	21.5
1980	31.6	4.2	0.1	35.9	0.2	0	0	0.2	31.8	4.2	0.1	36.1
1981	28.6	2.0	0.3	30.9	0	0	0	.0	28.6	2.0	0.3	30.9
1982	-	-	-	5.6 (2)	-	-	-	1.4 (2)	5.9	0.9	0.2	7.0
1983	5.9	3.6	0.1	9.6	3.5	0.6	0.1	4.2	9.4	4.2	0.2	13.8
1984	11.1	0.9	-	12.0	63.2	0.6	-	63.8	74.3	1.5	-	75.8
1985	0.3	(<.1)	-	0.3	13.6	0.1	-	13.7	13.9	0.1	-	14.0
1986 (5)	-	-	-	-	18.0	-	2.2	20.2	18.0	-	22.0	20.2

(1) Sources: a) Renold E. Narita, et al. 1985. Summary data on incidental catch of salmon, National Marine Fisheries Service, Seattle, Washington, unpublished report, 34 pages.

b) Janet Smoker, National Marine Fisheries Service, Juneau, Alaska, provided some of the data (species composition).

(2) Species composition unknown.

(3) All catches for January-November.

(4) All catches through August 30 for foreign and 23 for joint venture in 1986.

(5) Longline harvest only, no trawling conducted in 1986.

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A commercial harvest of 6,261 chinook salmon was taken in coastal Norton Sound gillnet fisheries in 1986. Some Yukon River salmon are known to be intercepted in this fishery. This was substantially below the record catch of 18,000 fish taken in 1985.

7.0 1986 Project Summaries

7.1 Harvest Monitoring and Apportionment

7.1.1 Commercial Catch Monitoring

Commercial salmon catches in Alaska were monitored by ADF&G on an in-season basis by the verbal report of catches from processors required by regulation within 18 hours of the closure of any commercial fishing period, and by the subsequent computer processing of harvest sales receipts (fish tickets). Data were keypunched on microcomputers in the Emmonak field office for the lower Yukon area, and in the Fairbanks office for the upper Yukon area. Tabular summaries of catch and effort data by district and statistical area were then generated for each fishing period and for the total season to date. The verbal reports and subsequent catch data summaries allowed ADF&G managers to make timely in-season adjustment to harvest strategy in response to stock strength and performance of the fisheries. Harvest data for 1986 are presented in the fishery description section of this report.

Commercial catch data in the lower fishery district of Canada (Sixty Mile to Border) was collected on a daily basis by the Patrolman (assistant Fishery Officer) stationed in Dawson for the entire fishery season. Roughly ninety percent of the fishing effort occurs in this district. Individual catch information was compiled at the end of each fishing period to provide weekly catch and effort summaries. Sales slips were also collected on a weekly basis from Han Fisheries' processing facility in Dawson and from those fishermen who made local sales.

Catch data for the upper fishing area (Sixty Mile to Tachun Creek) was compiled from catch cards which were either mailed in to the Whitehorse office of DFO or picked up from individual fishermen by the Patrolman or Fishery Officer. Patrols in this area were conducted approximately two times per month.

7.1.2 Commercial Catch Sampling

Commercial salmon catches in Alaska were sampled for age-sex-size data at Emmonak, St. Marys, and Marshall in the lower Yukon area, and at Galena, Nenana, Fairbanks, and the Rampart to the Haul Road Bridge area in the upper Yukon area. Samples collected in District 1 (Emmonak) were processed during the field season, while those collected in the other districts are being processed at this time.

Chinook salmon harvested in the District 1 commercial fishery with unrestricted mesh size gillnets were approximately 43% age 6, 29% age 5, and 25% age 7. Fish harvested during the first three small (6" maximum) mesh fishing periods (which accounted for 84% of the total season small

mesh harvest) were approximately 50% age 5, 34% age 6, and 12% age 7. The proportion of age 6 fish in the total season commercial catch was the lowest since 1980, while the proportion of age 5 fish was higher than in recent years.

Summer chum salmon age composition was unusual in 1986, with age 5 fish predominant throughout the run. Typically 4 year old fish account for the majority of the catch for any given fishing period, increasing in relative importance as the run progresses. This year age 5 accounted for 86% of the District 1 summer chum salmon catch sample in the first commercial fishing period (6/14), and 54% in the last period (7/15). Parent year escapements were very strong in 1981 while escapements in 1982, producing age 4 fish in the 1986 return, were only average in magnitude.

Fall chum salmon test fishing catch samples indicated that the early segment of that run was composed of a greater than usual proportion of age 5 fish as well. Daily samples were between 50% and 75% age 5 during July 16-21, a period of significant fish passage. Relative age 4 contribution increased steadily thereafter. Daily test fish samples were approximately 70% age 4 when the commercial fishery was opened on August 4. Similarly, age composition of the first three commercial period catch samples was approximately 75% age 4. Samples from the last three commercial periods have not yet been aged. A more comprehensive analysis of fall chum salmon age composition in 1986 and how it compares to historical age compositions is presently being conducted. It does appear, however, that the 1981 parent year escapements, which were generally strong, made a significant contribution to the 1986 return, and that the weak escapements in 1982 resulted in a weaker than usual return of age 4 fish.

Coho salmon samples have not yet been processed. Age 4 typically accounts for 70% or more of the samples collected.

Commercial salmon catches in the Canadian commercial fishery were also sampled for age-sex-size composition by DFO. During each fishery opening, a sampler assisting with the tagging program travelled upstream to sample a portion of the catch taken downstream of the Forty Mile River. Post-season analysis of this data will commence in late October.

7.1.3 Subsistence Fishery Surveys

Subsistence fishery catches in Alaska are estimated after the season by conducting interviews with fishermen in selected villages and contacting others with mail-in questionnaires. Data are compiled and expanded for those fishermen for whom catch information cannot be obtained. Funding was made available in 1986 to conduct an expanded interview program, attempting to contact subsistence fishermen in all of the major fishing communities in the area. Subsistence harvests at Hughes, on the Koyukuk River, and Fort Yukon, at the confluence of the Yukon and Porcupine Rivers, were monitored in-season to compare with later post season survey estimates. An attempt was made in the upper portion of the drainage in Alaska to conduct an early survey,

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immediately after the chinook and summer chum salmon season, and a late survey, after the fall chum and coho salmon season. In the past only a single survey was conducted after the fall season. Data are still being collected and compiled at this time.

In-season monitoring of the Canadian subsistence (Indian food fishery) was continued in 1986. Catch calendars and individual licences were distributed by hand to each fisherman early in the season. Several visits (average of four) were subsequently made to converse with fishermen and obtain catch data and retrieve spaghetti tags. Specific catch information was recovered from approximately 85% of the subsistence fishermen. Catches from the remaining 15% were estimated from interviews of associate fishermen.

7.1.4 Sport Fishery Surveys

The salmon sport fishery harvest in the Tanana River drainage is estimated each year through a postal survey of licensed fishermen. Creel censuses of the Salcha River sport fishery provide an independent method of verification. Data from these two projects are not yet available for 1986. Sport fishing harvests in 1985 were estimated to total 1,356 chinook salmon, 1,255 chum salmon, and 1,020 coho salmon.

Sport catch estimates in Canada were derived from regular enforcement patrols conducted throughout the accessible portion of the drainage.

7.1.5 Chinook Salmon Catch Apportionment

Analysis of scale patterns, age composition, and geographic distribution of 1985 Yukon River chinook salmon catches and escapements were used by ADF&G to apportion commercial and subsistence harvests to geographic region of origin. These data were not available at the April 1986 meeting of the US/Canada delegations, and are therefore briefly summarized here. Geographic contribution to total Yukon River utilization of chinook salmon was estimated at 101,542 (49.5%) upper Yukon, 63,348 (30.9%) lower Yukon, and 40,028 (19.5%) middle Yukon fish. The fraction of the Districts 1 and 2 commercial catch apportioned to the lower Yukon generally increased during the period of the analysis while the fraction apportioned to the upper Yukon generally declined. Combining the lower and middle river stock contributions into an Alaska stock grouping results in an estimate of 50.5% Alaskan origin and 49.5% Canadian origin fish in the total 1985 Yukon River chinook salmon harvest. This is similar to the results for the 1983 study. Estimated origin of total drainage chinook salmon harvest was 38% Alaskan and 62% Canadian in 1982 and 65% Alaskan and 35% Canadian in 1984.

This program was continued in 1986. Age and sex composition data were compiled in-season for District 1 and 2 catches, and results were supplied to fishery managers. Scale samples were also collected from harvests in Districts 4, 5, and 6 by ADF&G and in Yukon Territory by DFO. These data are processed after the season. Escapement scale samples were collected from all tributaries sampled in prior years as

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well as a number of scales from the Nulato, Jim, and South Fork Koyukuk River. Additional samples were collected by DFO personnel stationed at the Big Salmon River weir and at the Whitehorse fishway (brood stock carcasses for the Whitehorse Hatchery).

7.1.6 Fall Chum Salmon Catch Apportionment Feasibility Study

The feasibility of identifying stocks of fall chum salmon in mixed stock fishery catches was examined in 1986 for the second consecutive year. The protein electrophoresis study was expanded, while the scale patterns analysis (SPA) method is being employed for the first time. Data are still being collected and preliminary results are not expected until January or thereafter. ADF&G is conducting the SPA study while DFO is responsible for the electrophoresis study.

Fall chum salmon were sampled by ADF&G from test fishing catches in the Yukon River delta, and from escapements to the Sheenjek, Chandalar, Toklat, Delta, and mainstem Tanana Rivers. Each fish is sampled for age-sex-size data and for liver, heart, and muscle tissue for later electrophoresis analysis. Scales and vertebra collected for age determination will also be used in the SPA study. Catch and escapement samples collected in Yukon Territory by DFO will contribute to the SPA study of relative stock contributions.

7.2 Run Abundance Indicators

7.2.1 Lower Yukon Test Fishing

Salmon run timing, abundance, and entry patterns are indexed by ADF&G with set gillnets in the Yukon River delta. Samples are collected from test net catches during commercial fishery closures to determine age-sex-size composition of salmon escaping the commercial fishery. The project is essentially unchanged since 1980.

Chinook and summer chum salmon were indexed using 8-1/2" (≈21.6 cm) and 5-1/2" (≈14.0 cm) gillnets from June 8 through July 15. Chinook salmon run timing was relatively late. Peak catches occurred on June 18, 19, and 26, with the majority of the run passing during the period June 15-27. Overall run strength appeared to be average in magnitude, very similar to that of 1983 and 1984. Summer chum salmon run timing was early due to the strength of the age 5 component which typically dominates the first part of the run. Catches were strong from June 9 through June 27, with the peak catch occurring on June 18. Catches were consistently very weak after June 29. Overall run strength was above average, second only to that of 1981 since this program was initiated in 1980.

Fall chum and coho salmon were indexed using 6" (≈15.2 cm) gillnets from July 16 through August 28. The early segment of the fall chum salmon run was unusually strong, and was coincidental with stormy weather that typically triggers inshore movement of fall chum salmon. Peak catches occurred on July 18, 24, and August 12. Overall run magnitude was above average, second only to that of 1981 since this program was initiated in 1980. The coho salmon run was late and appeared to be weak. Significant daily catches did not occur until

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August 11, and the peak catch was on August 24. Cumulative CPUE through August 28 was the weakest since the 1980 run, which was weaker. Size of fish was small, and coho salmon may not have been captured in the 6" gillnet gear proportional to their relative abundance. Data from the Yukon River sonar project (discussed in a following section) indicated that the 1986 coho salmon run was similar to that of 1985, which was average or better in magnitude.

7.2.2 Upper Yukon Test Fishing (Alaska)

Fall chum and coho salmon run timing and abundance in the upper Yukon area has been indexed with fishwheels on the north and south bank of the Yukon River near Ruby since 1981. Tagging studies conducted from 1976 to 1978 indicated that fall chum salmon migrating along the north bank at this site were primarily bound for spawning areas in the upper Yukon and Porcupine River drainages, while those moving along the south bank were bound primarily for Tanana River drainage spawning areas.

Fishwheels were operational from August 2 through September 9 on the north bank and from August 5 through September 22 on the south bank in 1986. Peak fall chum salmon catches occurred on August 5 and 25 at the north bank site, and on August 5, September 1 and 8 at the south bank site. The early portion of the run was unusually strong on both banks, as had been documented by lower river test fishing and sonar enumeration projects. Overall the fall chum salmon run strength appeared to be above average, with north bank catches second only to those of 1983, and south bank catches the highest since the project was initiated in 1981. However, there appears to be a problem with the accuracy of the south bank catch as an indicator of Tanana River drainage stock strength given the large catches there this year and the poor performance of a very limited commercial fishery in the Tanana River. Escapement data are not available yet for the Tanana River spawning areas to fully assess this problem. Strong catches on the south bank may be due to the movement of Yukon and Porcupine River stocks along the south bank, and/or to a change in the effectiveness of the south bank site, resulting in disproportionate catches relative to Tanana River stock strength.

Test fishing is terminated well before the coho salmon migration is completed, since fall chum salmon are the target species of both the commercial and subsistence fisheries and the test fishing project. That portion of the coho salmon run documented at the fishwheel sites, however, appears to be similar in magnitude to the 1985 run and stronger than any other year since the project was initiated in 1981. Most of the coho salmon are captured at the south bank site. Tanana River stocks account for the largest known spawning populations of coho salmon in the Yukon River drainage.

7.2.3 Yukon River Sonar

Hydroacoustic counters were operated by ADF&G on the mainstem Yukon River near Pilot Station (River Mile 122) from June 9 through September 12 in 1986. Sonar counts were apportioned to species based on test fishing catches using drift gillnets of several different mesh sizes.

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This was the second consecutive year of salmon enumeration at this site, although the project was only operated from June 22 through August 26 in 1985. Expansion factors are being refined on a post season basis to generate final daily and total season population estimates by species.

Preliminary in-season sonar counts totaled approximately 1.9 million summer chum salmon, 80,000 chinook salmon, 540,000 fall chum salmon, and 250,000 coho salmon in 1986. These estimates were down 17% for summer chum salmon, up 63% for chinook salmon, and up 43% for fall chum salmon as compared to the 1985 estimates of 2.3 million, 49,000 and 377,000 fish for each of these species, respectively. Coho salmon counts totalled approximately 85,000 fish for each of the two years through August 26. The 1986 project was extended to document salmon passage during the first half of September.

7.2.4. Upper Yukon Test Fishing (Yukon Territory)

Run timing and relative abundance data were collected by DFO for both chinook and fall chum salmon from three fishwheels located near the U.S./Canada border. Fishwheel locations were identical to those used in the 1985 program. Individual and composite fishwheel catch information was compiled and comparisons with previous year's data were made. Generally the run timing of chinook salmon appeared similar to that of 1983 with 50% of the run through by July 29 (two days later than 1983). Peak fishwheel catches occurred on July 21. The total test fishery catch of approximately 2,200 chinook salmon was about 20% above that recorded in 1985. This apparent increase in abundance relative to the 1985 run is supported by preliminary tagging results.

Final assessment of the fall chum salmon return is not complete. At the time of writing, the total fishwheel catch had reached 2,700, 35% higher than 1985 catch to a similar date. Information from upper Alaskan fishing areas has suggested the run to be a week to ten days early.

7.2.5. Upper Yukon Tag and Recovery Program

A tagging program has been conducted on salmon stocks in the Canadian section of the drainage since 1982 by DFO. The objectives of the study have been to estimate the total return of chinook and fall chum salmon to Canada (excluding the Porcupine drainage) and obtain estimates of total escapement, harvest rates, migration rates and run timing. Spaghetti tags are applied to salmon live-captured in the test fishwheels and subsequent recoveries are made by the different user groups fishing upstream. Population estimates are derived from those tags recovered in the lower commercial fishing area. Analysis of the 1986 data is not yet complete, however a preliminary chinook salmon population estimate of 37,377 has been calculated. Of this number, 17,500 is estimated to have escaped to spawning grounds. For comparison, population and escapement estimates for 1982, 1983, 1985 and 1986 are as follows:

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Year	Population	Escapement
1986	37,400	17,500
1985	29,900	10,800
1983	47,700	29,500
1982	35,600	20,200

Chum salmon tagging is in progress and no preliminary estimate is available as yet. Field operations are scheduled to continue through October.

7.3 Escapement Studies

7.3.1 Andreafsky River Tower

Summer chum salmon escapement to the East Fork Andreafsky River was enumerated by ADF&G using side-scanning sonar from 1981 through 1984. Visual enumeration from counting towers was employed in 1986, and was successful due to low and clear water conditions. Fish were sampled by beach seine and carcass survey for age-sex-size data.

An expanded total 152,730 summer chum salmon, 1,530 chinook salmon, and 124,618 pink salmon was counted from June 25 through July 14. The project was terminated on July 14 due to emergency budget reductions, although significant numbers of salmon were still passing the tower site. Historical migrational timing data based on sonar counts was used to expand the summer chum salmon count to a total season estimate of 167,614 fish. Similar expansions were not possible for the chinook and pink salmon counts due to the lack of historical migrational timing data for those species at this site. The chinook and pink salmon counts are therefore only minimal estimates of total season escapement. Age composition data are not yet available.

The 1986 escapement estimate of 167,614 summer chum salmon was second only to the 1982 estimate of 181,352 fish, since total season estimates have been obtained at this site beginning in 1981.

7.3.2 Anvik River Sonar

Summer chum salmon escapement to the Anvik River has been enumerated by ADF&G using side-scanning sonar since 1979. Fish had been counted visually from towers at a site about 40 miles upriver from 1972 through 1978.

A corrected total of 1,085,750 summer chum salmon was counted from June 21 through July 15 in 1986. Fish were sampled by beach seine and carcass survey for age-sex-size data. The project was terminated on July 15 due to emergency budget reductions, although significant numbers of salmon were still passing the sonar site. Historical migrational timing data was used to expand the count to a total season estimate of 1,189,602 summer chum salmon. This estimate is second only to the 1981 estimate of approximately 1.5 million summer chum salmon, since total season estimates have been obtained beginning in 1972, and is 2.4 times the escapement objective of 487,000 fish. Age composition data are not yet available.

7.3.3 Clear Creek Weir

A weir was operated on Clear Creek, tributary of the Nenana River in the Tanana River drainage, by ADF&G to monitor chinook salmon return to the Clear Hatchery.

A total of 168 chinook salmon and 79 summer chum salmon was counted from July 6 through August 5, 1986. Sixty of the chinook salmon were taken for hatchery brood stock, while 108 were allowed to spawn. It is estimated that 36 of the chinook salmon counted at the weir had been produced by the hatchery, based on a count of 9 marked fish and a marking rate of 25% at the time of release as juveniles.

7.3.4 Chena River Chinook Salmon Tagging Study

A chinook salmon tagging study was conducted by ADF&G in the Chena River, tributary to the Tanana River, to estimate population size and stream residence time. Stream residence time is an important factor for converting aerial survey counts into total season escapement estimates.

Set gillnets (both 6-5/8" and 8-1/2" mesh) were monitored at several sites near mile 15 of the Chena River. Approximately 650 chinook salmon were tagged and released in good condition between July 8 and 20, 1986. Fish were placed in a pen until they had recovered from handling before being released. Chinook salmon could not be effectively captured for tagging during the last portion of the run due to high water caused by heavy rainfall. Fish were recovered by intensive repeated carcass surveys after July 20. Over 100 tagged chinook salmon were recovered, and additional fish were sampled for age-sex-size data. Population size and stream residence time estimates are not yet available.

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7.3.5 Sheenjek River Sonar

Fall chum salmon escapement to the Sheenjek River has been enumerated by ADF&G using side-scanning sonar counter since 1981. The sonar equipment was operational on August 17 in 1986, approximately ten days earlier than ever before. A total of 51,100 fall chum salmon was counted through September 23. This achieves the escapement objective of 40,500 fall chum salmon. Samples were collected by beach seine for age-sex-size data and electrophoresis tissues. These data have not yet been compiled.

7.3.6 Chandalar River Sonar

The U.S. Fish and Wildlife Service maintained a side-scanning sonar station on the Chandalar River in 1986 for the purpose of enumerating fall chum salmon. The station was operational on August 10. The total season count through September 27 was 56,800 fall chum salmon, significantly higher than what had been expected based upon previous aerial surveys. Peak counts occurred during the last week of August and the first week of September. Age-sex-size data and tissues for electrophoresis analysis were also obtained.

7.3.7 Whitehorse Fishway Chinook Enumeration

A total of 557 chinook salmon was enumerated at the Whitehorse Fishway in 1986 (Table 9) only 60% of the 1981-1985 average of 899. Daily counts appear in Table 9 which indicates the run was composed of 255 males and 298 females. The sex of four fish was not identified. Of this total, 113 females and 70 males were taken for hatchery brood stock. These fish were sampled for age-size-sex data. Run timing appeared average with 50% of the count being recorded by August 12. The first fish appeared on July 31 and the peak count of 63 occurred on August 14.

7.3.8 Big Salmon River Chinook Weir

This marked the second year of operation of the Big Salmon River weir (Table 10). A total of 1,816 chinook salmon was counted through the weir over the period August 1 to September 3. By comparison, the count in 1985 for the last portion of the season was only 456. However, delays in weir installation precluded complete enumeration of the early half of the 1985 run.

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Table 9. Daily and cumulative chinook salmon count by sex at the Whitehorse Fishway, 1986. (preliminary data).

Date	Males	Females	Sex Unknown.	Total Count		Cumulative %
				Daily	Cumulative	
July 31	1	0	0	1	1	0.2
Aug. 1	2	1	0	3	4	0.7
2	7	3	0	10	14	2.5
3	5	9	0	14	28	5.0
4	4	7	1	12	40	7.2
5	10	20	1	31	71	12.8
6	10	11	2	23	94	16.9
7	12	8	0	20	114	20.5
8	13	9	0	22	136	24.4
9	22	15	0	37	173	31.1
10	20	18	0	38	211	37.9
11	20	21	0	41	252	45.2
12	15	16	0	31	283	50.8
13	13	18	0	31	314	56.4
14	30	33	0	63	377	67.7
15	11	13	0	24	401	72.0
16	12	12	0	24	425	76.3
17	11	13	0	24	449	80.6
18	11	18	0	29	478	85.9
19	6	13	0	19	497	89.2
20	5	13	0	18	515	92.5
21	5	13	0	18	533	95.9
22	2	6	0	8	541	97.1
23	1	1	0	2	543	97.5
24	0	2	0	2	545	97.9
25	1	0	0	1	546	98.0
26	1	1	0	2	548	98.4
27	0	1	0	1	549	98.6
28	0	2	0	2	551	98.9
29	3	1	0	4	555	99.6
30	2	0	0	2	557	100.0
31	0	0	0	0	557	100.0
Sept. 01	0	0	0	0	557	100.0
	<u>255</u>	<u>298</u>	<u>4</u>	<u>557</u>	<u>557</u>	<u>100.0</u>

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Table 10. Daily and cumulative counts of adult chinook salmon at the Big Salmon River Weir, 1986. (preliminary data).

Upstream migrants				Carcasses	
Date	Daily Count	Cumulative Count	Cumulative %	Daily Count	Cumulative Count
Aug. 1	5	5	0.0	-	
2	77	82	4.5	-	
3	152	234	12.9	-	
4	87	321	17.7	-	
5	144	465	25.6	-	
6	210	675	37.2	-	
7	163	838	46.1	-	
8	144	982	54.1	-	
9	145	1127	62.1	-	
10	135	1262	69.5	1	1
11	83	1345	74.1	5	6
12	145	1490	82.0	4	10
13	78	1568	86.3	6	16
14	53	1621	89.3	13	29
15	45	1666	91.7	18	47
16	24	1690	93.1	23	70
17	29	1719	94.7	35	105
18	19	1738	95.7	33	138
19	13	1751	96.4	35	173
20	9	1760	96.9	44	217
21	7	1767	97.3	36	253
22	15	1782	98.1	29	282
23	7	1789	98.5	25	307
24	6	1795	98.8	31	338
25	9	1804	99.3	21	359
26	3	1807	99.5	22	381
27	6	1813	99.8	8	389
28	2	1815	99.9	5	394
29	0	1815	99.9	4	398
30	0	1815	99.9	3	401
31	1	1816	100.0	3	404
Sept. 1	0	1816	100.0	7	411
2	0	1816	100.0	2	413
3	Pulled weir				

Peak migration occurred during the first two weeks of August in 1986. The peak daily count of 210 was recorded on August 6. Fifty percent of the run had passed through the weir by August 8. Daily and cumulative counts appear in Table 10.

Records of the daily number of carcasses drifting back against the weir also appear in Table 10. A peak carcass count of 4 was recorded on August 20 and fifty percent of the 413 carcasses enumerated had occurred prior to August 21. This suggests a stream residence time of approximately two weeks.

Approximately 20% of the run was sampled for age-size-sex data. Final analysis is not yet complete.

7.3.9 Fishing Branch River Chum Weir

A weir to enumerate fall chum salmon escapements to the Fishing Branch River (Porcupine drainage) was operated from 1972 to 1975. Counts during this period ranged from 16,000 to 353,000 fall chum salmon. This program was re-established in 1985 and continued in 1986. The 1985 count was 56,016 (56.3% females) during the period from September 6 to October 20. In 1986 the weir was operational on September 1, and through September 21 a total of 25,561 fall chum salmon had been enumerated. The count to this date in 1985 was 6,839 which represented 12% of the 1985 return. A minimum 750 fish will be live-sampled for age-sex-size composition.

7.3.10 Escapement Surveys

Salmon escapement abundance is indexed at selected spawning areas throughout the drainage by aerial surveys from fixed wing and/or helicopter aircraft. In Canada, same-day counts were made on the Nisutlin River using both types of aircraft to test the comparability of the two methods. The DFO helicopter count was 303 alive and 139 dead chinook salmon (total = 442), whereas the ADF&G fixed wing count was 281 live and 124 dead (total = 405). Generally poor weather and water conditions caused by heavy rainfall greatly reduced the ability to conduct reliable aerial surveys of chinook and summer chum salmon in 1986. Results from those surveys conducted to date are presented in the stock status section of this report.

Fall chum and coho salmon escapement surveys have not yet been conducted. In addition to aerial surveys intensive replicate ground surveys of several important fall chum salmon populations are planned. These include the Kluane, Toklat, Delta, and mainstem Tanana Rivers, as well as selected slough areas of the Tanana River. Samples will be collected during ground surveys for age-sex-size data and electrophoresis tissues.

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8.0 Enhancement

8.1 Clear Hatchery

Approximately 203,000 chinook; 885,000 fall chum, and 160,000 coho salmon juveniles were released from the Clear Hatchery into Tanana River drainage (Clear Creek) by ADF&G in the spring of 1986. A total of 890 chinook, 4,416 fall chum salmon and 3,696 coho salmon adult returns are expected from this release. A weir was operated on Clear Creek in 1986, and 168 adult chinook salmon were enumerated. Included in the escapement were an estimated 36 hatchery fish. A total of 209,000 chinook salmon eggs were taken in 1986 for hatchery brood stock. In addition, collection of fall chum salmon and coho salmon eggs is still in progress.

8.2 Whitehorse Hatchery

A relatively high mortality of the approximately 200,000 1985 brood chinook eggs resulted in a release of only 83,900 fry in the spring of 1986. Cause of the mortality is unclear although it occurred during the egg stage with abnormal development of the embryos being evident. One possibility is that it was related to overmaturation of the eggs. The majority of the fry were released into Michie Creek, located above the Whitehorse dam, while about 5,700 were released into Wolf Creek, another small tributary of the upper Yukon River. Coded wire tags were implanted in 77,400 of the fry released into Michie Creek.

The 1986 egg take comprised about 335,000 eggs taken from chinook salmon captured as they migrated through the fishway over the Whitehorse dam. A total of 183 chinook salmon including 113 females and 70 males, was utilized for brood stock. This total included about 60 ripe fish accidentally killed due to a sudden influx of water containing chlorine from the city water system which supplies the hatchery. A new well and plumbing system is being installed at the hatchery to prevent similar occurrences in the future.

9.0 1987 Run Outlook

9.1 Chinook Salmon

Yukon chinook returns are usually composed primarily of 6-year old fish, however, 5- and 7-year old fish also contribute to the run. Minor contributions are also made on occasion from age 3, 4, and 8 year old fish. The 1981 brood year (6-year olds in 1987) was judged above average in abundance as indicated by comparative catch and escapement data. Survival and production from the 1981 brood year is apparently good based on preliminary findings, since 5-year old chinook contributed a larger than normal percentage of the 1986 return. The return of 5-year olds (1982 brood year) is expected to be near average based on run strength and escapements in 1982. The return of 7-year olds (1980 year class) is expected to be below average as the return of this year class during 1985 as 5-year olds and 1986 as 6-year olds was below average. Evaluation of brood year run size data indicates the 1987 Yukon River chinook salmon run will be above average in magnitude. Evaluation of upper Yukon River tagging studies (1982, 1983, 1985, 1986) in relationship to index area escapement estimates indicate that the 1987 upper Yukon River escapement will be average in strength.

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9.2 Summer Chum Salmon

Yukon River chum salmon return primarily as 4-year old fish, although substantial 5-year old returns often result from good brood survival years. The return of 4-year olds in 1987 will be dependent on production from the 1983 brood year and survival of the resulting cohort. Based on available catch and escapement data, the magnitude of the 1983 summer chum salmon run was about average in abundance. The return of 4-year olds in 1987 is expected to be of similar run magnitude. The return of 5-year olds in 1987 is expected to be about average based on parent year escapements and the return of 4-year olds in 1986. In summary, based on evaluation of brood year run size data and assuming average survival, it is expected that the Yukon River summer chum salmon run in 1987 will be average in magnitude.

9.3 Fall Chum Salmon

Similar to the summer run, fall chum salmon return primarily as 4-year old fish. Escapements in 1983 (which will produce 4-year olds in 1987) were below average. The return of 5-year olds (1982 brood year) in 1987 is expected to be below average based on the return of 4-year olds in 1985. In summary, based on evaluation of brood year escapements and assuming average survival, a below average return is expected in 1987.

9.4 Coho Salmon

Four-year old fish (1983 brood year) are the dominant age class. Comprehensive escapement information for coho salmon is lacking, but escapement surveys in the Tanana River system indicated above average run strength in 1983.

Appendix 1. Value to fishermen of Yukon River salmon in 1986*.

	U.S.				Canada	
	Lower Yukon Districts 1 - 3		Upper Yukon Districts 4 - 6		Total Value	
	\$/lb	Value (1,000\$)	\$/lb	Value (1,000\$)	(1,000\$)	\$/lb Value (1,000\$)
Chinook	1.63	3,165	.89	73	3,238	.65 229 (1)
Summer Chum	.38	1,746	.22	69	1,815	- -
Fall Chum	.49	399	.14	30	429	.50 (2) 27
Chum Roe	-	-	2.08	553	553	- -
Coho	.71	212	.21	1	213	- -
Total		5,523		726	6,249	256

* U.S. fishery value in U.S. dollars, Canadian fishery value in Canadian dollars. Current exchange rate is approximately 1.35 Canadian dollars/1.0 U.S. dollar.

- (1) 95,000 lbs sold at 65¢/lb with remaining 67,000 lbs sold @ 2.50lb cleaned.
From these fish an additional 7,100 lbs of roe was sold with a first wholesale value of 5.25/lb.
- (2) Assuming an estimated catch of 12,000 with 50% going for local sales, half for dog food @ 24¢/lb. Roe processing figures are not yet available.