

1979 Stock Status, Description of
Fishery and Management of
Yukon River Fall Chum Salmon

Prepared for staff review
by Michael Geiger and Fred Andersen
Yukon Area Management Biologists

Alaska Department of Fish and Game
Division of Commercial Fisheries
Anchorage and Fairbanks

11

STOCK STATUS, DESCRIPTION OF FISHERY AND MANAGEMENT
OF YUKON RIVER FALL CHUM SALMON

Introduction

Chum salmon are the most abundant salmon species within the Yukon River drainage and are found throughout the system. The chum salmon population is composed of two major components, the summer and fall runs.

Summer chums are characterized by: earlier run timing (entry to the Yukon occurs early June-mid July) rapid sexual maturation in freshwater and smaller body size (6-7 lbs). Summer run chums spawn primarily in run-off streams in the lower 500 miles of the drainage although small populations can be found in the Yukon upstream of the Tanana River confluence (mile 700) and in tributaries of the Tanana River. Major summer chum spawning streams include the Andreafsky, Anvik, Nulato and Rodo rivers, several tributaries to the Koyukuk and the Salcha and Chena rivers in the Tanana drainage (Figure 1).

Fall chums are distinguished by their later run timing (mid-July to late August) larger body size (7.5-9 lbs) bright silvery appearance and smaller population. With possible minor exceptions, fall chums spawn exclusively in the upper portion of the drainage in spring fed streams and sloughs which normally remain ice free during winter months. Major spawning areas include the Chandalar, Sheenjek and Fishing Branch rivers in the Porcupine drainage and various streams in the Yukon Territory. In the Tanana drainage spawning areas include the Toklat, Bearpaw and Delta Rivers and several spring fed sloughs along the south bank of the Tanana (Figure 2).

Fall chums are further characterized by their unpredictable pattern of entry into the Yukon. Generally in mid to late July (normally accompanied

by strong on-shore winds) fall chums enter the river in tightly integrated schools, the duration of which seldom exceed two or three days. Often several days pass with no detectable in-migration, followed by another sudden surge of fish. These dramatic peaks are thought to represent separate stocks or spawning populations.

Fall chums exhibit tremendous variation in abundance; estimates of total run size range from 833,000 in 1975 to 314,000 in 1976.

Commercial and Subsistence Fisheries

Documented commercial catches of fall chums in the Yukon area date back to 1961, when 43,000 were taken in subdistrict 1 (Tables 1 and 2). The fishery continued at low levels through 1968 (61-68 average 36,000). Since that time, the fishing has experienced rapid growth in terms of catch, numbers of participating fishermen, processing capability and demand on available resources. Until 1974, the majority of the commercial catch was made in the lower 60 miles of the river with little or no reported harvest in the upper-Yukon.

Historically and currently, the use of fall chums for subsistence purposes in the lower portion of the drainage has been at low levels. In contrast, between 60% and 75% of the subsistence chum harvest (upstream of the Koyukuk Confluence) is taken from the fall run. Estimates of recent fall chum subsistence catches range from 73,000 to 96,000 and the recent five year average is 89,000.

In response to increasing demand by fishermen and processors in the upper Yukon, the Alaska Board of Fish and Game, at its December 1973 meeting, established a district wide commercial quota of 250,000 fall chums. In addition, they established three new subdistricts in the upper river area and allocated 50,000 fish to these newly created areas. Sound biological information regarding the status and distribution of

spawning populations was not available at that time. As a result, the 250,000 fall chum quota was based more on historical catches than on biological considerations. Allocation was based in a general way on geographic distribution of fishing effort rather than on size and distribution of spawning stocks.

Since 1974, overall demand and competition for fall chums between user groups has become intense. During the 74-78 period, the commercial catch averaged 239,000 and total utilization is estimated to exceed 330,000 per year.

Fall chums are harvested with set and drift gillnets in subdistricts 1, 2 & 3 (mile 0-306) and in subdistricts 4, 5 & 6 with fishwheels and to a lesser extent, set gillnets. Current regulations provide for the management of the fishery based primarily on weekly fishing periods. In subdistricts 1 & 2, fishing is allowed 2 days per week (after July 15) in subdistrict 3, 3 days per week and in the upriver areas, 4 days per week.

At the December, 1978 Fisheries Board session, regulations were adopted ^{which replaced} replacing the quota system with flexible guideline harvest levels and re-allocated 30,000 fall chums from the lower river to section 4-B of subdistrict 4. The 200,000 quota which had been in effect for subdistricts 1, 2 & 3 was substituted by a guideline harvest level of 120-220,000. For the upper Yukon, guideline harvest levels are: subdistrict 4; 10-40,000, subdistrict 5; 10-40,000 and subdistrict 6; 7,500-22,500.

In years when the fall run is of average magnitude, the Yukon area commercial harvest should ^{appropriate} appropriate 235,000. If the run is substantially below or above average, the commercial catch would likely be at the lower (147,500) or upper (322,500) end of the range.

The Board also reduced fishing time to help minimize the possibility of overharvesting smaller stocks (esp. early run segments) and to spread out the harvest over a greater portion of the total run.

The commercial fishing effort is spread over 1,400 river miles and includes approximately 900 commercial fishermen. Of these, approximately 180 (20%) fish in subdistricts 4, 5 & 6 and the remaining 720 register for the lower Yukon. Comparative average catch and income data for the period 1974-78 are presented in Table 3.

Table 4 presents available fall chum escapement data for the years 1972-79. Not all areas are surveyed on a yearly basis and accuracy of abundance is dependent of weather and water conditions and the experience of the observer. It is important to note that this information has been accrued coincidentally with the development of the fishery and that at this point it is not possible to detect the impact of the fishery on population trends.

Management Problems

The overall objective of the Yukon area salmon management program is to manage the fishery on a sustained yield basis. Attainment of this goal however is made difficult by a number of factors.

Because the fall chum salmon commercial fishery has only recently developed and because escapements have been monitored only since 1972, there is a lack of adequate information on which to evaluate effects of the fishery. On an in-season basis, judging effects of removal is made more difficult by the fact that most of the harvest occurs several hundred miles and several weeks from the spawning grounds. Because of the mixed stock nature of this fishery, it is difficult to insure that individual stocks are being harvested at levels commensurate with run size.

Management tools such as C.P.U.E. data are not well suited to this fishery because of the erratic pattern of entry to the river and the fact that fishing is allowed only two days per week in areas where the largest harvest occurs. For example, in the past, fishery openings have often coincided with two or three surges of fish passing through the mouth. Analysis of C.P.U.E. data in this instance would indicate a much stronger run than was actually the case. Conversely, openings could occur between peaks of in-migration and C.P.U.E. analysis could indicate a poor returns when in fact the opposite is true.

Test fishing with set gillnets is probably a better indication of in-season run magnitude, but this too is beset with problems. At present, test netting is carried out (since 1977 only) near Emmonak (south mouth) and daily and cumulative records used for comparison with previous years data. It is likely though that, because of a recent change in fishing sites and yearly physical changes (year to year erosion etc.) in any one site, test data is not truly comparable. In addition, in some years substantial numbers of fall chums enter the river through the middle or north mouth of the Yukon, invalidating comparison of timing and magnitude with other years. This is thought to have occurred during 1979.

Sound management of the fishery is further complicated by the fact that large amounts of fish and roe are entering commercial channels in the upper Yukon area and doubt is cast on the accuracy of commercial and subsistence catch information.

Again, the lack of accumulated biological information precludes meaningful analysis of the success or failure of existing regulations and management strategies. It is not unlikely though, that fishing mortality in some years ('76, '77, '78) may exceed the reproductive

capacity of some upper-Yukon stocks. It is apparent also that Toklat stocks in the Tanana drainage could sustain a larger harvest in some years.

Additionally, allowing harvest to occur in essentially two separate fisheries raises the likelihood of a 'multiplier effect' of management error. For example, if test fishing and C.P.U.E. data indicate a stronger run than actually existed, it is possible that over harvest could occur in both fisheries before run strength could be properly evaluated. From this perspective it may be desirable to reduce harvest rates in both fisheries or allocate the bulk of the catch to one area or the other.

In addition to these physical and biological problems which hamper proper management of the fishery, there exists a large disparity between income levels of fisheries in the lower vs. upriver subdistricts. Reasons for this disparity are threefold: first, the commercial king salmon fishery evolved and for the most part has remained near the river's mouth. Secondly, fishermen in subdistricts 1, 2, and 3 are able to participate in the summer chum fishery which for reasons of stock distribution are largely unavailable upstream of the Koyukuk River confluence. Also, for reasons of flesh quality and diminished marketability, fishermen in subdistricts 4, 5, & 6 receive much lower prices for their product than do their lower river counter-parts (Table 4). Allocation problems also exist within subdistricts and constitute a major source of friction between fishermen's groups, ADF&G, and the Board of Fisheries.

Expansion of test netting programs, continued tagging, possible installation of main-stem sonar units, expanded escapement monitoring efforts and gradual accumulation of spawner/recruitment information over a period of years will eventually provide the data base necessary for sound O.S.Y. management of this fishery. In the meantime, it is essential

that existing data be reviewed and management strategies and regulations possibly modified in order that the fishery be managed on the basis of the best information available.

Management Options

Several options exist for possible improvement of fall chum fishery management by application of existing knowledge which may reduce the danger of over harvest and result in more equitable income distribution between subdistricts. Options may exist which are not presented and those listed may be considered at the exclusion or is in combination with others. It may be that some changes in management strategy could be made "in-house" but major departures from existing policy require Board sanction.

These options are presented without recommendation and with the understanding that re-analysis of existing data may be required.

1. Maintain existing overall guideline harvest level but re-allocate within or between subdistricts to equalize income.
2. Retain existing guideline harvest levels with overall reduction in harvest of early run segments in nonpeak years.
3. Allow a longer season in Y-1, 2, & 3 (in conjunction with reduced fishing time to short season closures during the early run) so that Tanana (Toklat) stocks could be harvested at a level commensurate w/run size.
4. Redescribe subdistrict boundaries (Y4) to reflect knowledge of migration habits of upper Yukon vs. Tanana River fall chums.
5. Re-allocate guideline harvest levels within Y-4 to reflect origin and size of stocks being harvested. (Separate for north and south banks). *Assumes knowledge of stock size*
6. Adjust guideline harvest levels within Y-4 or between Y-4 and lower Y-6 (possible separate Ruby - Manley GHL).

7. Stabilize lower Yukon fishery at present levels and allow any additional guideline harvest levels increases to upper Yukon during peak years.
8. Establish overall guideline harvest levels (commercial and subsistence combined).
9. Reduce guideline harvest levels to a level (which may be) more compatible w/average run size and allocate between subdistricts 4, 5, & 6.

BROOKS RANGE

- Summer Chums
- Fall Chums
- ~~WINGS~~

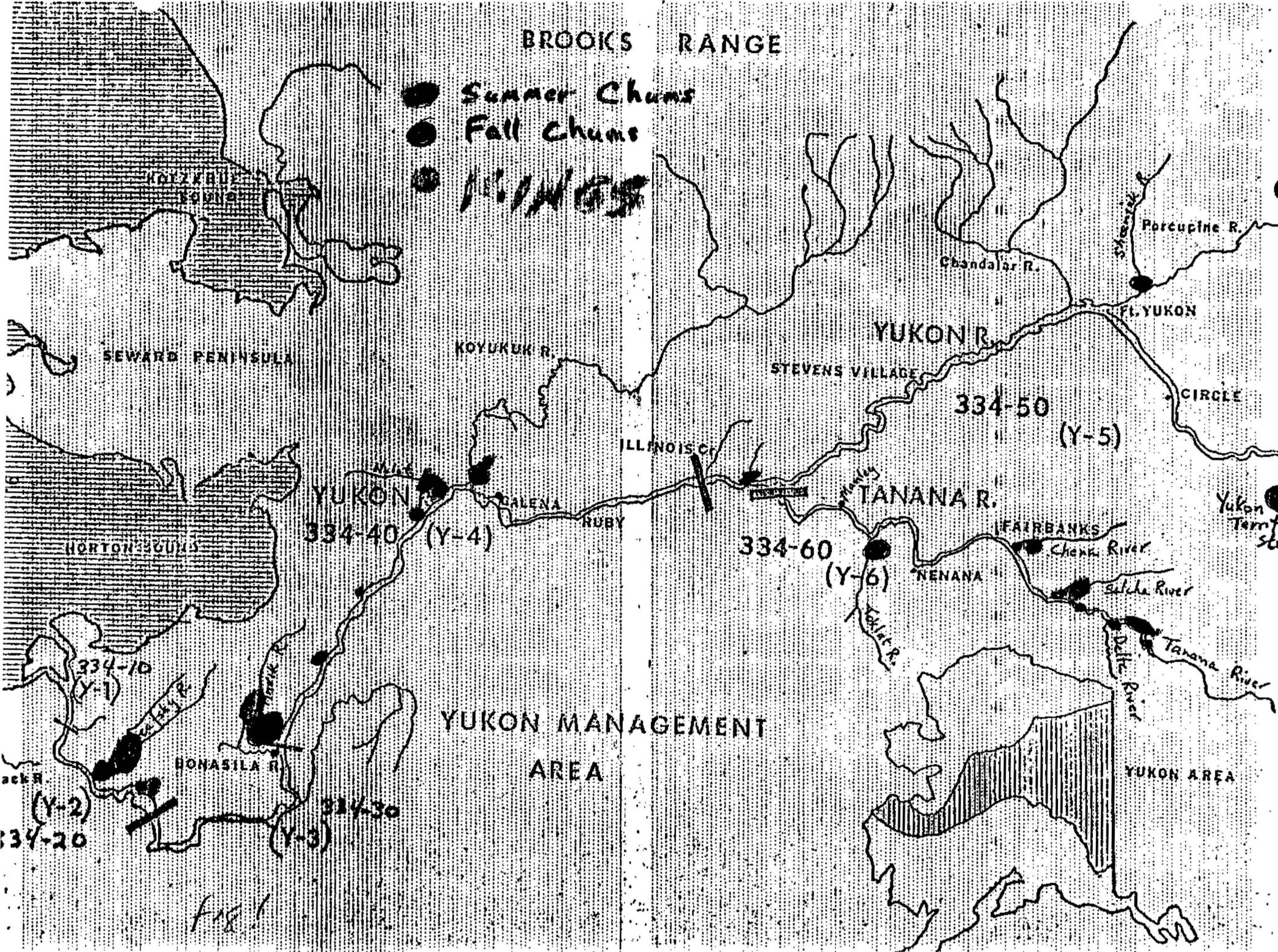


Fig 1

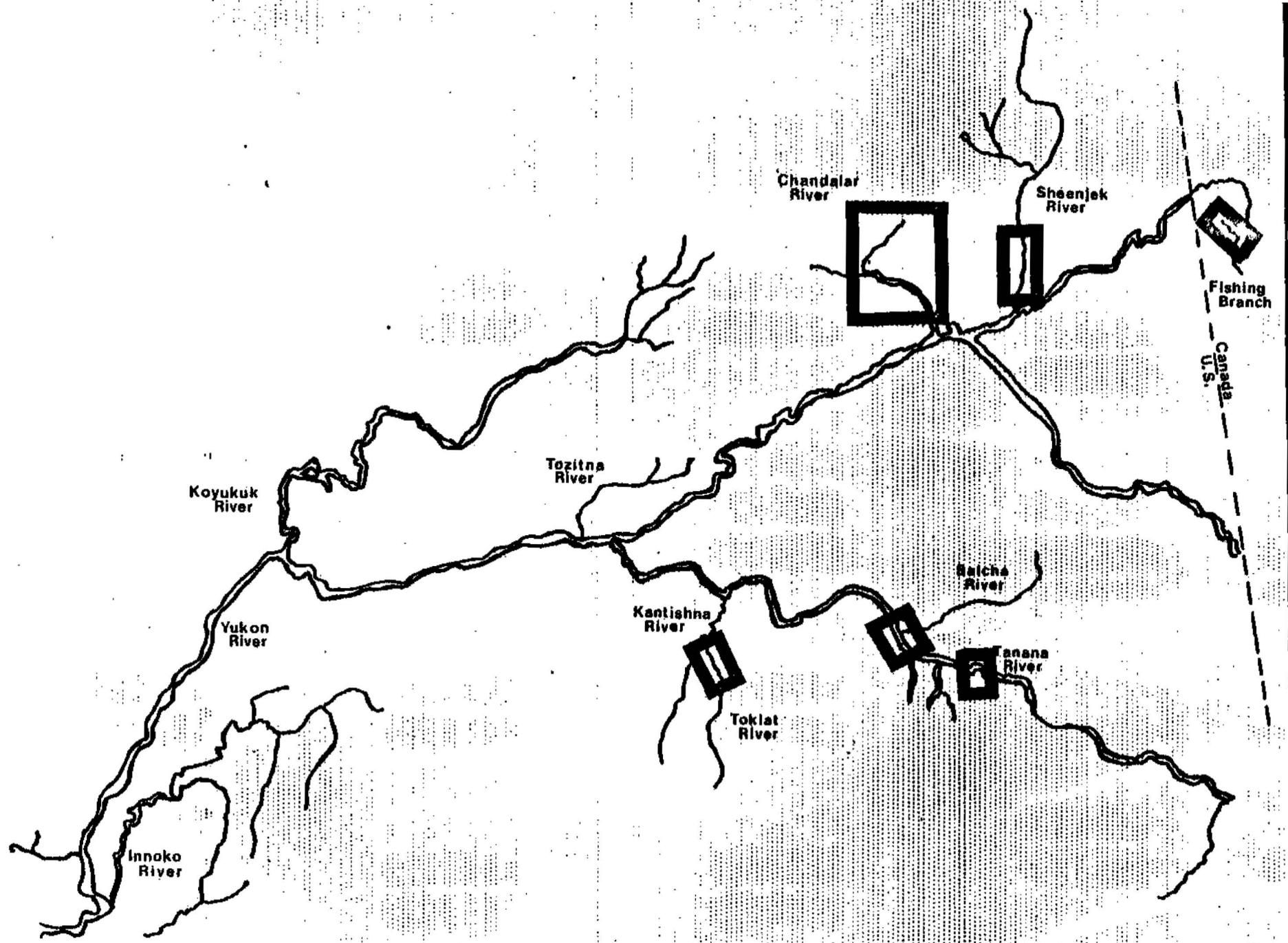


Figure 2. Upper Yukon River Drainage
Fall Chum Salmon Spawning Areas

Table 1. Commercial salmon catches, Yukon Area, 1961-1979

	<u>Kings</u>	<u>Summer Chums</u>	<u>Fall Chums</u>	<u>Total Chums</u>	<u>Coho</u>	<u>Total</u>
1961	120,260		42,577	42,577	2,855	165,692
1962	94,374		53,160	53,160	22,926	170,460
1963	116,994				5,572	122,566
1964	93,587		8,347	8,347	2,446	104,380
1965	118,098		23,317	23,317	350	141,765
1966	93,315		71,045	71,045	19,254	183,614
1967	129,706	11,179	38,274	49,453	11,047	190,206
1968	106,526	14,470	52,925	67,395	13,303	187,224
1969	90,223	60,569	131,291	191,860	14,981	297,064
1970	80,269	137,368	209,356	346,724	12,245	439,238
1971	110,507	100,090	189,594	289,684	12,203	412,394
1972	92,840	135,668	152,176	287,844	22,233	402,917
1973	75,353	285,844	232,090	517,934	36,641	629,928
1974	97,919	604,210	273,158	877,368	16,240	991,527
1975	63,740	728,156	265,156	993,312	2,346	1,059,398
1976	88,671	598,227	163,282	761,509	5,197	855,377
1977	96,414	548,958	248,739	797,697	38,021	932,132
1978	97,602	1,045,092	243,737	1,288,829	25,960	1,412,391
1979	129,049	803,500	370,762	1,165,980	17,082	2,486,373
						1,312,111

2
Table 8. Comparative summer and fall chin salmon commercial catches, Yukon district, 1971-1978.

	SUMMER CATCHES								FALL CATCHES								TOTAL CATCHES								Total			
	Lower Yukon Area				Upper Yukon Area				Total	Lower Yukon Area				Upper Yukon Area				Total	Lower Yukon Area				Upper Yukon Area				Total	
	334-10	334-20	334-30	Sub Total	334-40	334-50	334-60	Sub Total		334-10	334-20	334-30	Sub Total	334-40	334-50	334-60	Sub Total		334-10	334-20	334-30	Sub Total	334-40	334-50		334-60		Sub Total
1	-	-	-	-	-	-	-	-	42,577	-	-	42,577	-	-	-	-	42,577	42,577	-	-	42,577	-	-	-	-	42		
2	-	-	-	-	-	-	-	-	53,160	-	-	53,160	-	-	-	-	53,160	53,160	-	-	53,160	-	-	-	-	53		
3	-	-	-	-	-	-	-	-	8,347	-	-	8,347	-	-	-	-	8,347	8,347	-	-	8,347	-	-	-	-	8		
4	-	-	-	-	-	-	-	-	22,936	-	-	22,936	-	-	-	-	22,936	22,936	-	-	22,936	-	-	-	-	23		
5	-	-	-	-	-	-	-	-	69,836	-	1,209	71,045	-	-	-	-	71,045	69,836	-	1,209	71,045	-	-	-	-	71		
6	9,697	1,425	57	11,179	-	-	-	11,179	36,451	-	1,823	38,274	-	-	-	-	38,274	46,140	1,425	1,800	49,451	-	-	-	-	49		
7	12,995	1,407	68	14,470	-	-	-	14,470	49,851	-	3,068	52,925	-	-	-	-	52,925	62,852	1,407	3,136	67,395	-	-	-	-	67		
8	55,545	5,024	-	60,569	-	-	-	60,569	128,866	-	1,722	130,588	-	-	-	-	130,588	184,411	8,024	1,722	191,157	-	-	-	-	191		
9	119,832	17,536	-	137,368	-	-	-	137,368	200,306	4,858	3,285	208,449	-	-	-	-	208,449	320,130	22,394	3,285	345,817	-	-	-	-	346		
0	93,928	6,112	50	100,090	-	-	-	100,090	188,533	-	-	188,533	-	-	-	-	188,533	282,461	6,112	50	288,623	-	-	-	-	289		
1	114,234	20,907	527	135,668	-	-	-	135,668	136,711	12,898	1,313	150,922	-	-	-	-	150,922	250,945	33,005	1,640	286,590	-	-	-	-	287		
2	221,644	63,737	463	285,844	-	-	-	285,844	173,781	45,304	-	219,085	-	-	-	-	219,085	395,427	109,041	463	504,931	-	-	-	-	517		
3	479,554	72,283	1,805	553,440	29,701	4,462	16,607	50,770	604,216	161,498	83,540	852	215,590	9,213	23,651	24,004	47,660	641,052	125,821	2,157	769,030	38,914	28,019	41,431	100,338	877		
4	835,256	99,944	-	935,200	165,169	13,137	14,650	192,956	728,156	148,459	64,646	8,890	205,714	12,552	27,207	16,582	89,441	853,716	151,810	5,590	740,915	128,721	40,344	33,333	252,397	993		
5	269,523	99,747	10,254	379,524	211,277	860	6,566	218,703	698,227	112,693	21,212	4,250	138,155	1,742	6,387	17,998	25,127	382,216	120,959	14,504	517,679	213,019	6,247	24,564	243,830	761		
6	263,395	107,057	3,469	373,911	169,969	1,163	4,326	175,047	648,958	122,577	51,394	18,851	180,422	13,996	25,695	18,428	58,317	240,739	385,972	159,051	18,310	664,333	183,565	26,848	22,956	233,264		
7	388,492	225,440	27,201	641,133	364,387	4,897	24,675	403,959	1,045,092	135,065	51,646	11,527	198,238	11,790	21,010	13,259	45,499	243,737	623,957	277,086	30,728	639,373	375,617	25,907	47,934	449,458		
8																											1,288	

Includes small numbers of pink or red.

Table 3. Average catch and income data, Yukon district 1975-1979.

Subdist.	Kings	Summer Chums	Fall Chums	Coho	# Fishermen	Av. Income <u>1/</u>
1	137	753	270	29	462	\$ 5485.00
2	107	653	250	13	215	4909.00
3	110	543	352	7	39	5603.00
4A	7	3722	0	0	53	6176.00
4B	19	1011	579	1	37	3435.00
5	62	74	516	0	54	2865.00
6	20	401	498	44	40	2163.00

1/ Value of roe sales included.

Table 4. Comparative Yukon River drainage fall chum salmon aerial survey escapement estimates, 1971-1979 ^{1/}

	1971	1972	1973	1974	1975	1976	1977	1978	1979
TANANA RIVER DRAINAGE									
Bear Paw River	-	-	1,530	2,996	1,657	-	-	-	-
Toklat River drainage									
Upper Toklat River ^{3/}	-	1,000 ^{2/}	6,957	34,310	42,418	35,224	25,000	35,000	107,593
Lower Toklat River	-	-	-	-	35,867	2,000 ^{2/}	-	-	64,540
Subtotal Toklat R. drainage			6,957	34,310	78,285	37,224	25,000	35,000	172,133
Upper Tanana River drainage									
Benchmark #735 Slough	-	5,255	127 ^{2/}	1,450	-	336	1,270	1,705	2,714
Delta River	-	3,650	7,971	4,010	3,946 ^{7/}	5,526	17,925	10,051	8,125
Upper Tanana River ^{4/}	-	8,350	5,635	4,567	-	4,979	3,725	5,700	20,820
Bluff Cabin Slough	-	6,040	3,450	4,840	5,000 ^{2/}	3,197	6,491	5,340	6,875
Delta Clearwater Slough (1 Mile Slough)	-	-	1,720	1,235	745 ^{2/}	1,552	1,900	475	3,850
Subtotal Upper Tanana R. drainage		23,295	18,903	16,102	9,691	15,590	31,311	23,271	42,384
CHANDALAR RIVER	-	-	-	17,455	6,345 ^{2/}	58 ^{2/}	4,183	-	-
PORCUPINE RIVER DRAINAGE									
Sheenjok River	-	-	1,175	40,507	78,060	12,023	20,506	14,610	41,140
Fishing Branch River (Yukon Terr)	250,300,000	35,125 ^{5/}	15,987 ^{6/}	32,525 ^{6/}	353,282 ^{6/}	13,450	32,500	15,000	44,080
Subtotal Porcupine R. drainage	250-300,000	35,125	17,162	73,032	431,342	25,473	53,006	29,610	85,220
TOTAL	250-300,000	59,420	44,552	143,895	527,320	78,345	113,500	87,881	299,737

1/ All surveys rated fair-good unless rated otherwise. Only peak estimates listed.

2/ Poor or incomplete survey; very minimal and/or rough estimate.

3/ Includes following areas: Toklat River in vicinity of roadhouse, Shushana River and Geiger Creek.

4/ Richardson Highway Bridge to Blue Creek.

5/ Combined tagging population estimate and weir count.

6/ Weir count.

7/ Foot survey.