AYK REGION
YUKON SALMON ESCAPEMENT
REPORT #22

ENUMERATION OF FALL CHUM SALMON BY SIDE-SCANNING SONAR IN THE SHEENJEK RIVER IN 1983

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ABSTRACT

A total of 45,733 fall chum salmon was enumerated in the Sheenjek River by side-scanning sonar from August 29 through September 24, 1983. Fifty-percent run passage occurred on September 14. A pattern was observed in hourly chum salmon sonar counts, with greatest movement occurring during hours of darkness or suppressed light. River level and surface water temperatures were measured daily.

Age composition data obtained from gillnet samples indicated that age 4_1 (87%) fish dominated the 1983 Sheenjek River fall chum salmon spawning escapement. The male-to-female ratio was 1.00:0.82. Mean size at age data are presented for Sheenjek and Fishing Branch River fall chum salmon, and escapement trends to the Porcupine River drainage are discussed.

SHEENJEK RIVER SONAR

Introduction

Fall chum salmon escapement to the Sheenjek River was measured by hydroacoustic techniques for the third consecutive field season in 1983. The Sheenjek River heads in the Davidson Mountains of the eastern Brooks Range and flows south approximately 250 miles to its confluence with the Porcupine River, approximately 45 miles upstream of the village of Fort Yukon. Upwelling ground water comprises a significant proportion of the river flow volume, especially in winter.

Yukon River fall chum salmon are larger, spawn later, and are less abundant than their counterpart, summer chum salmon. They primarily spawn in the upper Yukon River drainage (upstream of the village of Tanana) in spring-fed tributaries which usually remain ice free during the winter.

Fall chum salmon are in great demand commercially and are harvested in all Yukon River fishing districts. No commercial fishing is permitted in the Porcupine River drainage. The majority of commercial catches are presently made in the lower river, downstream of the village of Anvik. However, their value as a subsistence item is far greater throughout the upper Yukon River drainage upstream of the village of Koyukuk.

Prior to 1981, comprehensive enumeration studies on fall chum salmon in the Yukon River drainage, apart from aerial assessment of selected tributaries since the early 1970's, were limited to only two streams. Abundance, timing, and distribution information on spawning populations in the Delta River (Tanana River drainage) was collected from 1973 through 1978 during the construction period of the Trans-Alaska Pipeline (Dinneford 1978). The Canadian Fisheries Service operated a weir on the Fishing Branch River (Porcupine River drainage) from 1972 through 1975 to enumerate fall chum salmon spawning populations (Elson 1976). Since 1981, abundance and timing data on Sheenjek River fall chum salmon escapements have been collected annually. This report presents results of the 1983 studies. Results obtained in 1981 and 1982 can be found in Barton (1982, 1983a).

Objectives

Objectives of the 1983 Sheenjek River fall chum salmon study were to determine timing and magnitude of adult salmon escapements in this stream and to collect salmon age-sex-size information on sampled portions of the escapement. The following specific objectives were identified:

1. Install a single side-scanning sonar unit and partial adult salmon weir to count upstream migrants;

2. Collect samples from the escapement with gillnets to examine species composition and age-sex-size characteristics;

3. Monitor selected climatological and hydrological parameters at the sonar site for use as baseline reference data.

Methods

Salmon were enumerated with a single side-scanning sonar counter developed by the Hydrodynamics Division of Bendix Corporation. A 1977-model counter was used in 1983, whereas a 1981-model counter was used in the 2 preceding years. Site location was the same in all 3 years, approximately 6 river miles upstream of the river mouth (Figure 1).

Methods of collecting daily hydrological, climatological, and salmon age-sex-size data were consistent each year. Likewise, sonar installation, operation, and calibration procedures were the same, as well as weir construction. All methods and procedures are described by Barton (1983a). Important differences between the 1977- and 1981-model sonar counters are described by Barton (1983b).

An aerial survey of the Sheenjek River was flown on September 21 to enumerate chum salmon and examine their distribution within the river.

Results and Discussion

Timing: A total of 393 chum salmon was counted from 1601 hours through midnight on August 29, 1983, indicating that salmon were already present in the Sheenjek River prior to commencement of sonar operations (Table 1). The August 29 count was subsequently expanded to 1,345 chum salmon, based on average percent passage for the next 3 days from 0001 to 1600 hours (71%). Sonar counting began on August 31 in 1981 and 1982, and in both years chum salmon were reported to have been present in the Sheenjek River (at least in the lower portion) for up to 2 weeks prior to sonar installation. It is likely that a similar situation existed in 1983 in view of the August 29 count; however, no aerial survey was flown upstream of the sonar site on that date.

Sonar counts did not exceed 1,200 per day prior to September 7, after which they ranged from about 1,600 to 2,800 per day through September 18. The peak daily count was made on September 22 (3,803 fish) when 8.3% of the sonar-estimated escapement was counted (Figure 2). A moderate decline in daily counts was observed from September 22 through 24, when river icing conditions required project termination. Approximately 1,100 salmon passed the sonar site on the last day of operation, indicating that the project terminated prior to the end of the fall chum salmon run.

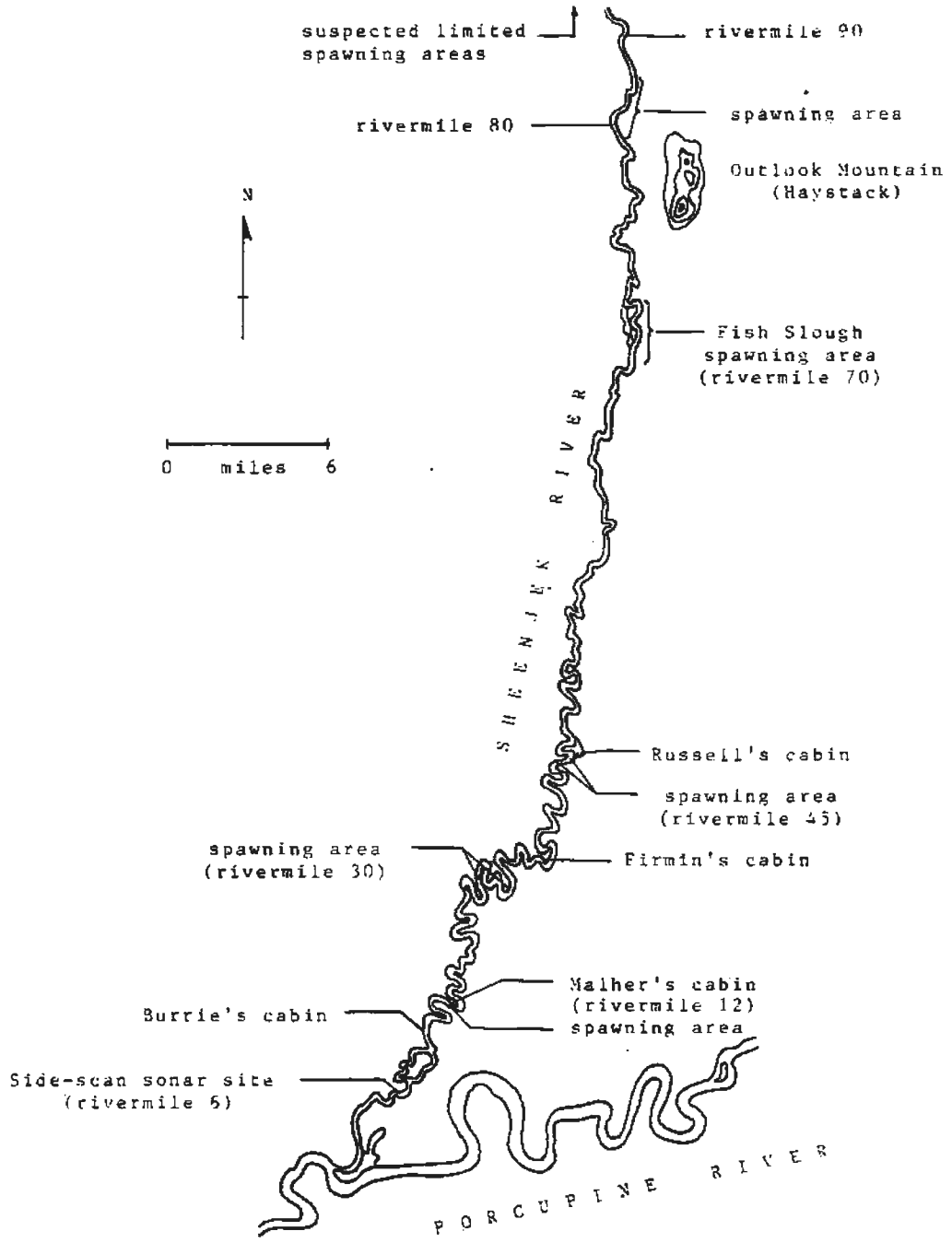

Figure 1. Sheenjek River sonar counting site and important fall chum salmon spawning areas.

Table 1. Sheenjek River daily and cumulative sonar counts from August 29 through September 24, 1983.

Date	Sonar count			
	Daily	Percent	Cumulative	Percent
8/29	1,345[a]	2.9	1,345	2.9
8/30	1,055	2.3	2,400	5.2
8/31	1,015	2.2	3,415	7.4
9/1	727	1.6	4,142	9.0
9/2	627	1.4	4,769	10.4
9/3	987	2.2	5,756	12.6
9/4	704	1.5	6,460	14.1
9/5	1,110	2.4	7,570	16.5
9/6	1,155	2.5	8,725	19.0
9/7	2,444	5.4	11,169	24.4
9/8	1,663	3.6	12,832	28.0
9/9	1,941	4.3	14,773	32.3
9/10	1,601	3.5	16,374	35.8
9/11	1,802	3.9	18,176	39.7
9/12	1,797	3.9	19,973	43.6
9/13	2,330	5.1	22,303	48.7
9/14	2,119	4.6	24,422	53.4
9/15	1,770	3.9	26,192	57.3
9/16	2,782	6.1	28,974	63.4
9/17	2,128	4.6	31,102	68.0
9/18	1,770	3.9	32,872	71.9
9/19	1,297	2.8	34,169	74.7
9/20	1,137	2.5	35,306	77.2
9/21	3,225	7.1	38,531	84.3
9/22	3,803	8.3	42,334	92.6
9/23	2,274	4.9	44,608	97.5
9/24	1,125[b]	2.5	45,773	100.0

[a] Actual count was 393 from 1601-2400 hours. Count was expanded to 1,345 based on average percentages of salmon counted on 8/30, 8/31, and 9/1 from 0001-1600 hours.

[b] Actual count was 394 from 0001-0459 hours. Count was expanded to 1,125 based on average percentages of salmon counted on 9/21, 9/22, and 9/23 from 0500-2400 hours.

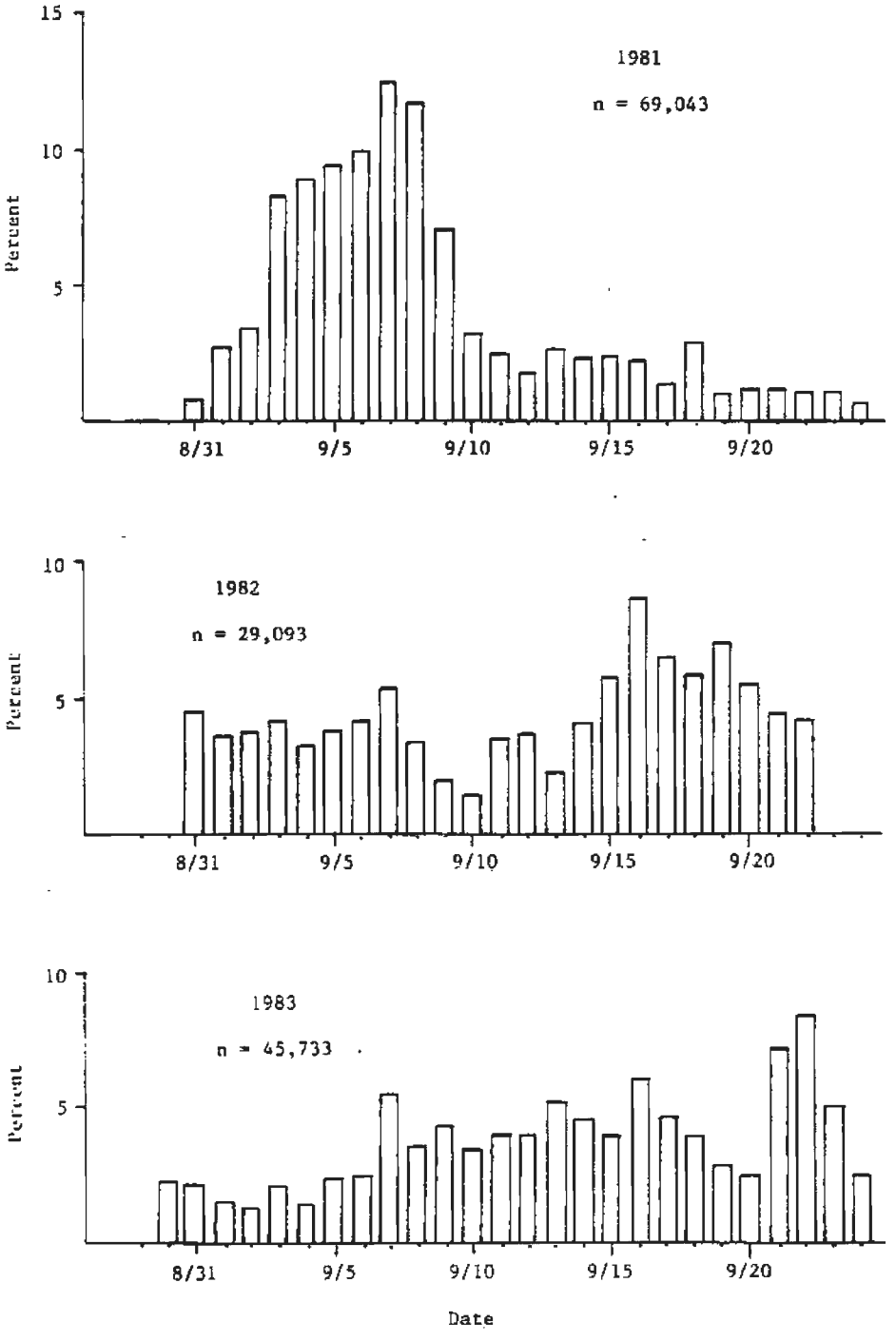

Figure 2. Sheenjek River fall chum salmon sonar counts by date, 1981-1983.

The date of 50% run passage indicates that timing of the 1983 fall chum salmon run to the Sheenjek River was similar to that of 1982. In both years, 50% of the sonar-estimated escapement had passed the site by September 14. The corresponding date in 1981 occurred on September 7. Sonar was operational in all 3 years for approximately the same period (August 29 through September 24) (Figure 3).

Surface water temperatures at the sonar site in 1983 ranged from 49°F on August 30 to 32°F on September 25, averaging 42.2°F for duration of the project (Figure 4). The average temperature in 1983 was slightly (0.3°F) warmer than in 1981 but 1.6°F colder than in 1982. Warmer temperatures in 1982 were no doubt a result of high water flood conditions in that year.

Distinct diel patterns in salmon movement were observed in 1983. In general, chum salmon held or rested in shallow water along gravel bars and slough areas during daylight hours. Upstream migration commenced with the onset of darkness and continued through hours of suppressed light, decreasing rapidly in the early morning hours (Figure 5). This was particularly the case early in the season. As counting progressed into late September, daily upstream movement began progressively earlier and continued progressively later. This behavior may have been a result of decreasing daylight throughout the month of September. A similar pattern was observed in 1981 and 1982.

It was also observed in 1983 that, during hours of suppressed light (i.e., late evening through early morning, when fish movement was greatest), fish crossed the sonar substrate through nearshore sectors. As daylight became more pronounced (period of day when passage rates were lowest), fish tended to cross the substrate farther from shore, primarily through the middle sectors. This behavior is illustrated in Figure 6, an analysis of sonar counts by time of day and sonar sector. The shift to offshore sectors in daylight is attributed to water clarity and fish avoidance of the aluminum counting tower, which was positioned adjacent to and downstream of the sonar transducer.

Distribution:

The occurrence of sweepers and other underwater snags determined the actual location where gillnet drifts could be made. Consequently, it was difficult to drift with equal effort to precisely compare riverbank distribution of migrating salmon. However, based upon an evaluation of catches (Figure 7), it is concluded that few adult chum salmon migrated past the sonar site undetected along the east side of the river. Similar findings were made in 1981 and 1982. This conclusion is substantiated by the fact that the majority of salmon passing over the sonar substrate were within the inshore half of the counting range, as typified by results shown in Figure 8 for September 1, 11, and 21. Very few salmon were ever counted in the outer 5 feet of the counting range.

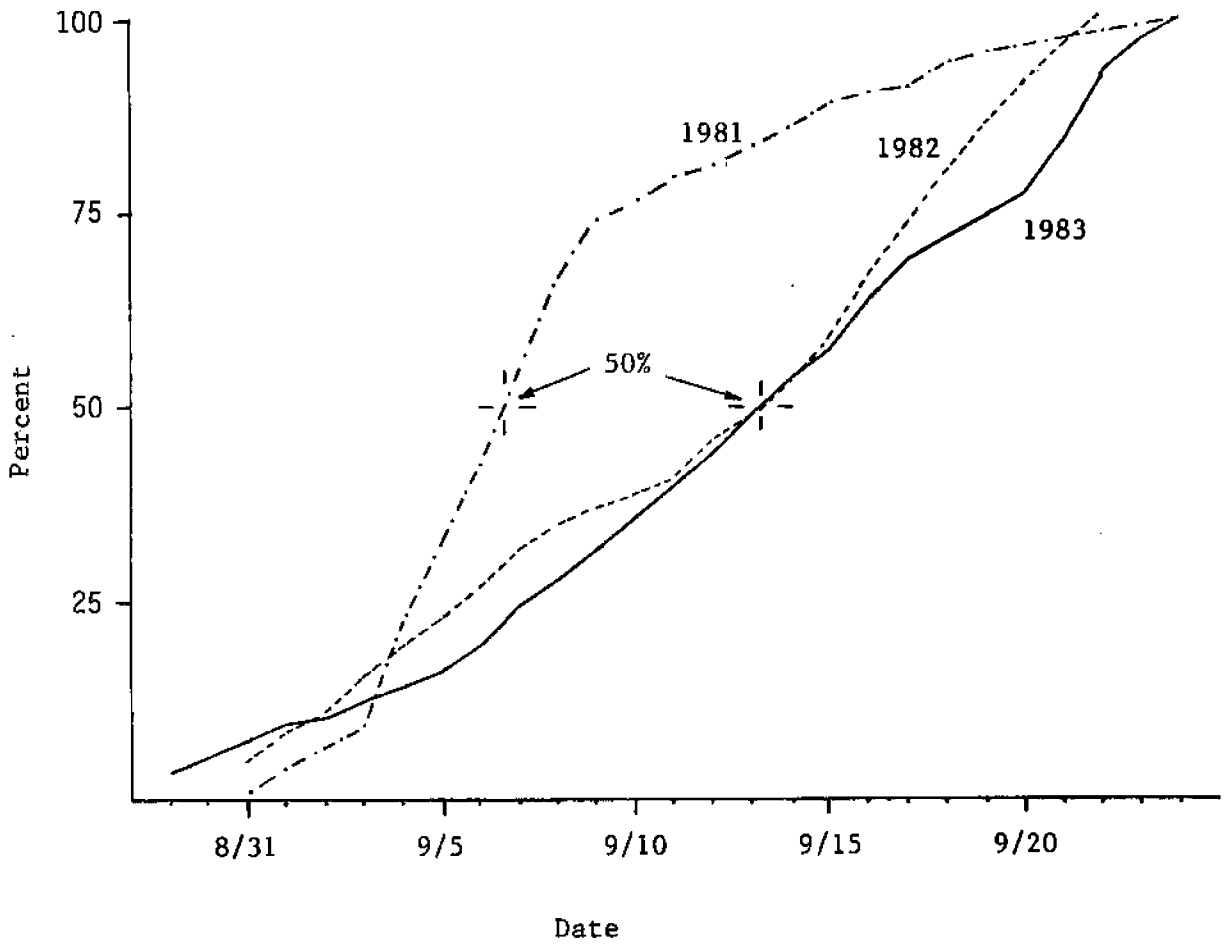

Figure 3. Cumulative percent passage of fall chum salmon at the Sheenjek River sonar site by date, 1981-1983.

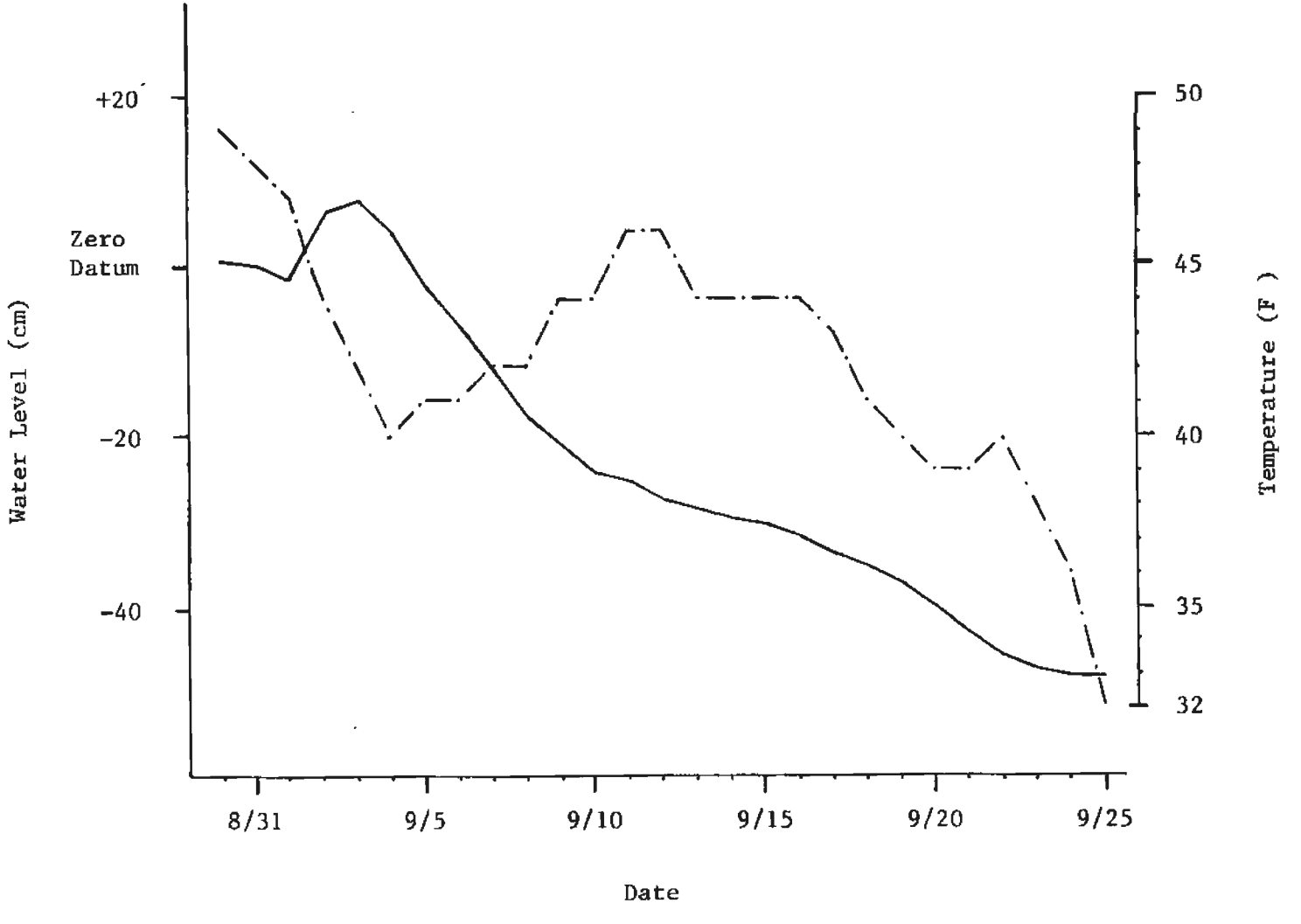

Figure 4. Daily changes in water level (solid line) and surface water temperature (broken line) at the Sheenjek River sonar site, September 1983.

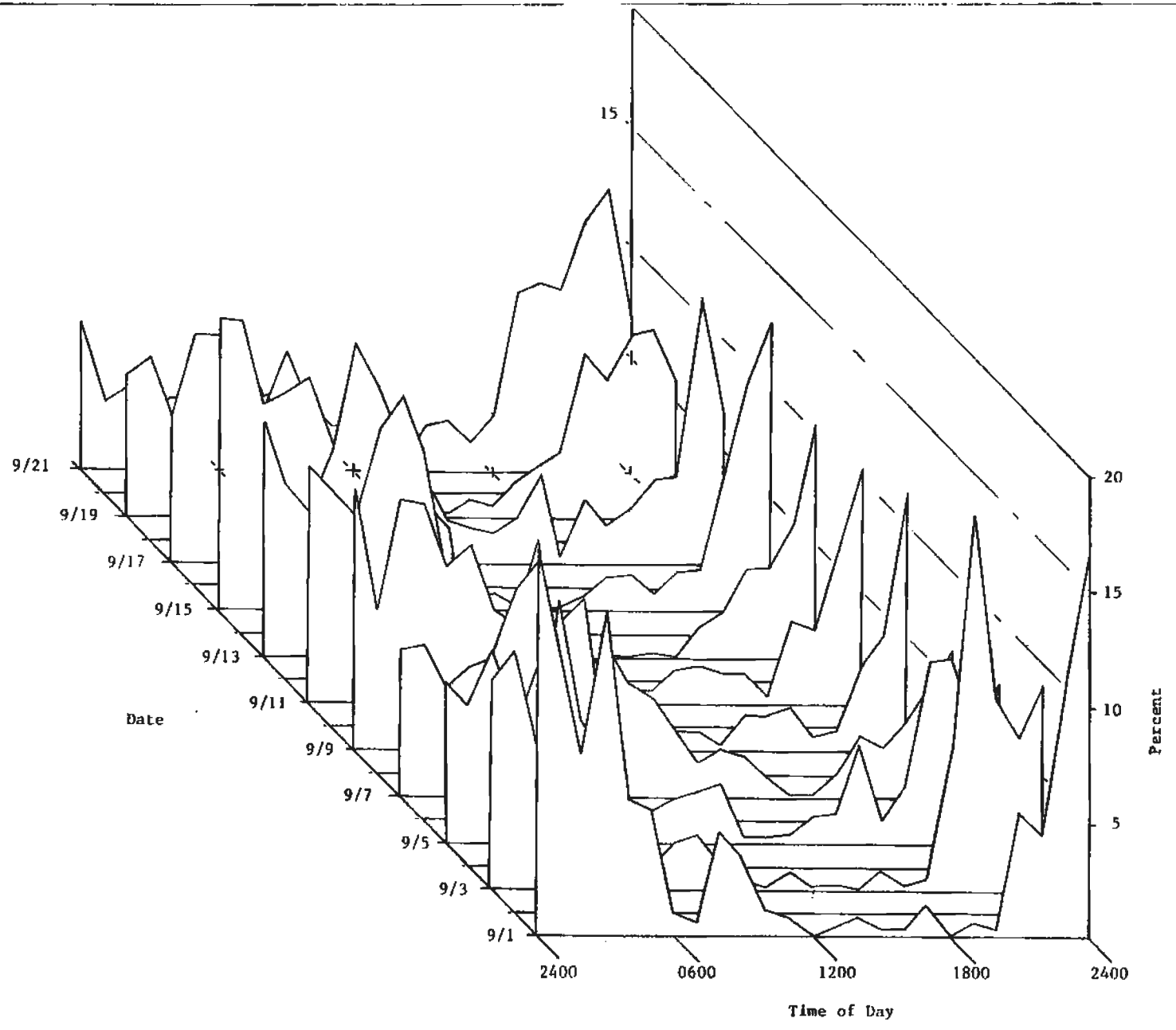

Figure 5. Migration behavior of fall chum salmon in the Sheenjek River with respect to time of day, September 1-21, 1983.

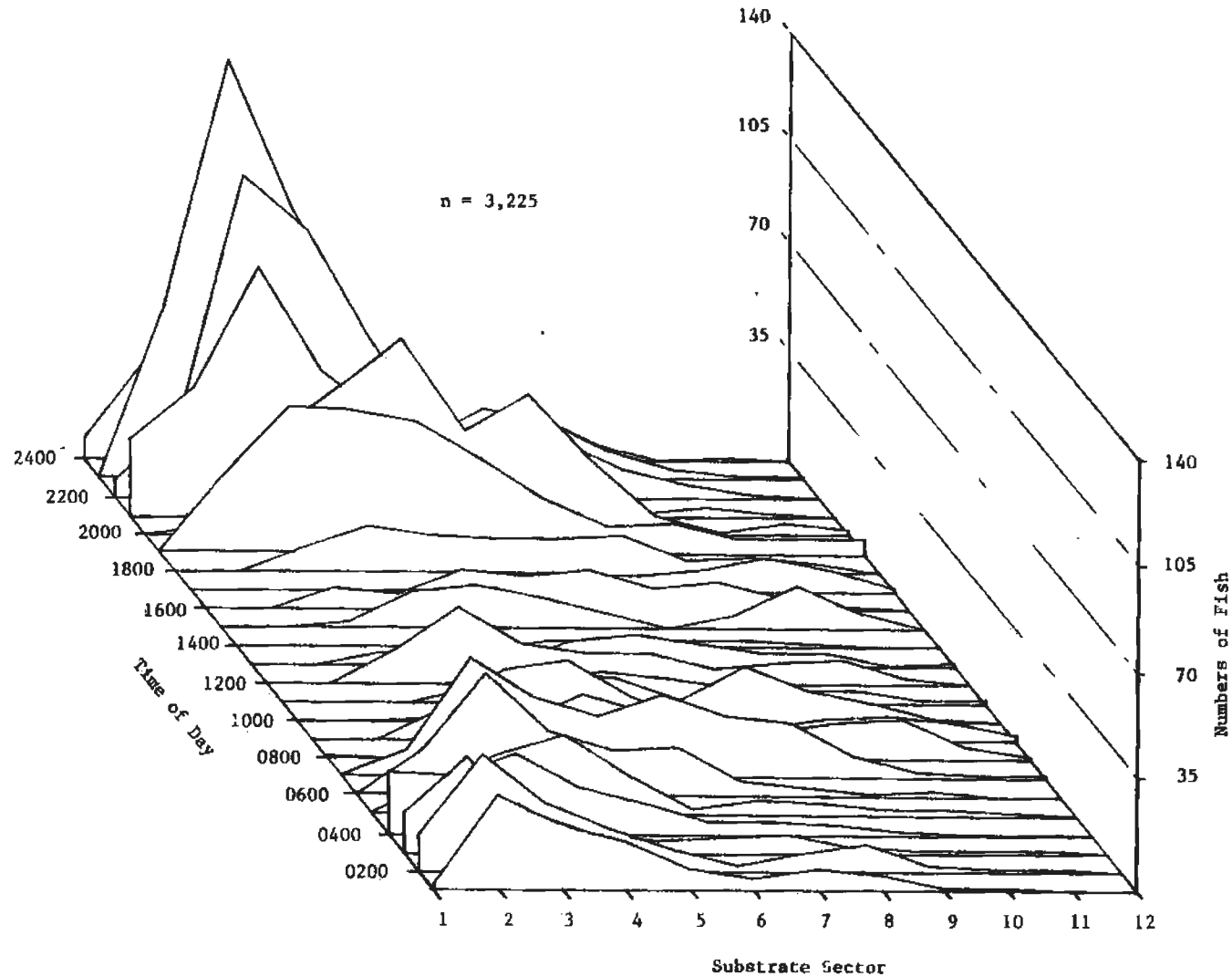

Figure 6. Spatial and temporal distribution of upstream migrating fall chum salmon in the Sheenjek River over the sonar substrate on September 21, 1983.

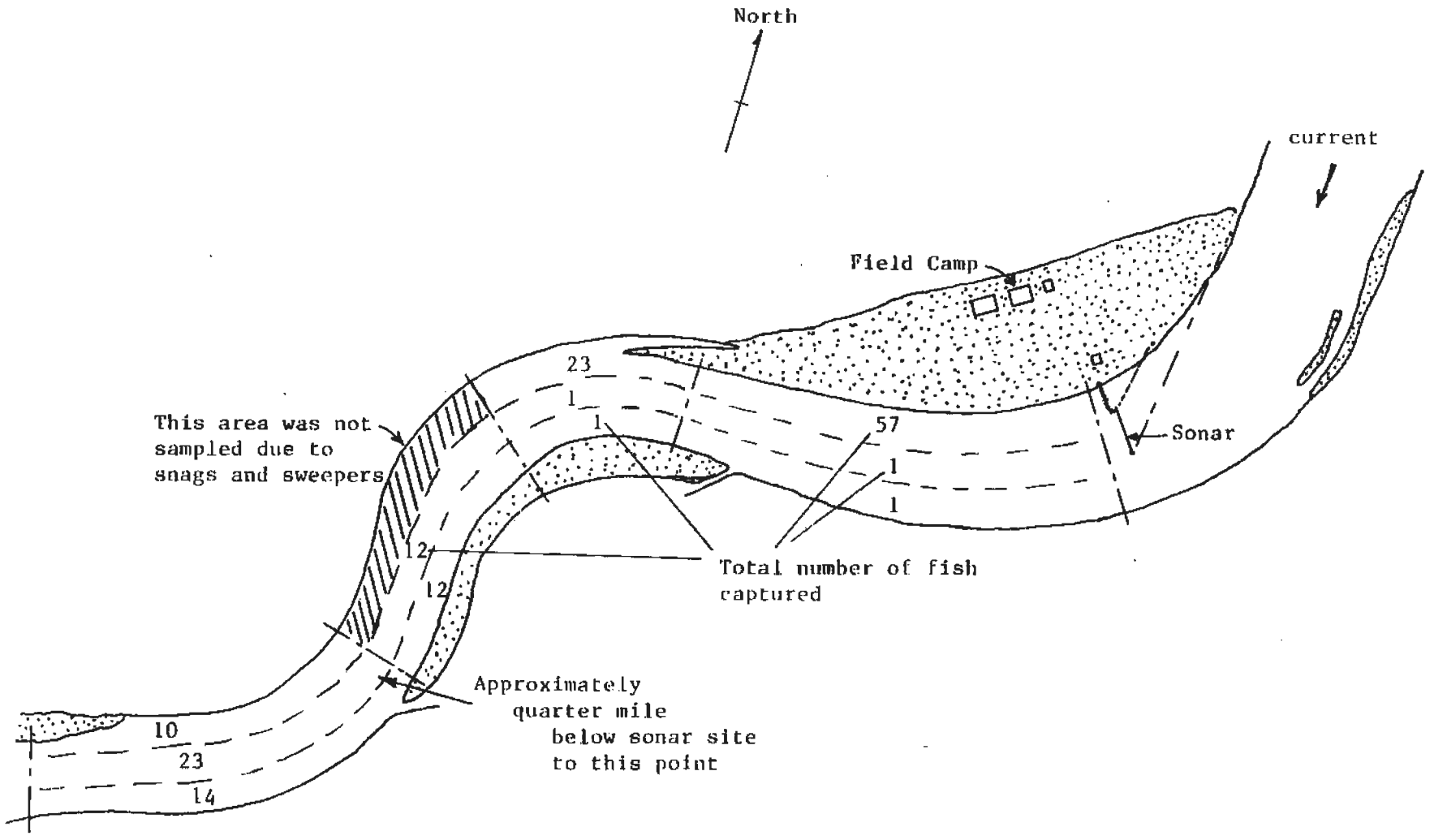

Figure 7. Sheenjek River sonar site showing location and catch of fall chum salmon from test gillnetting in September 1983.

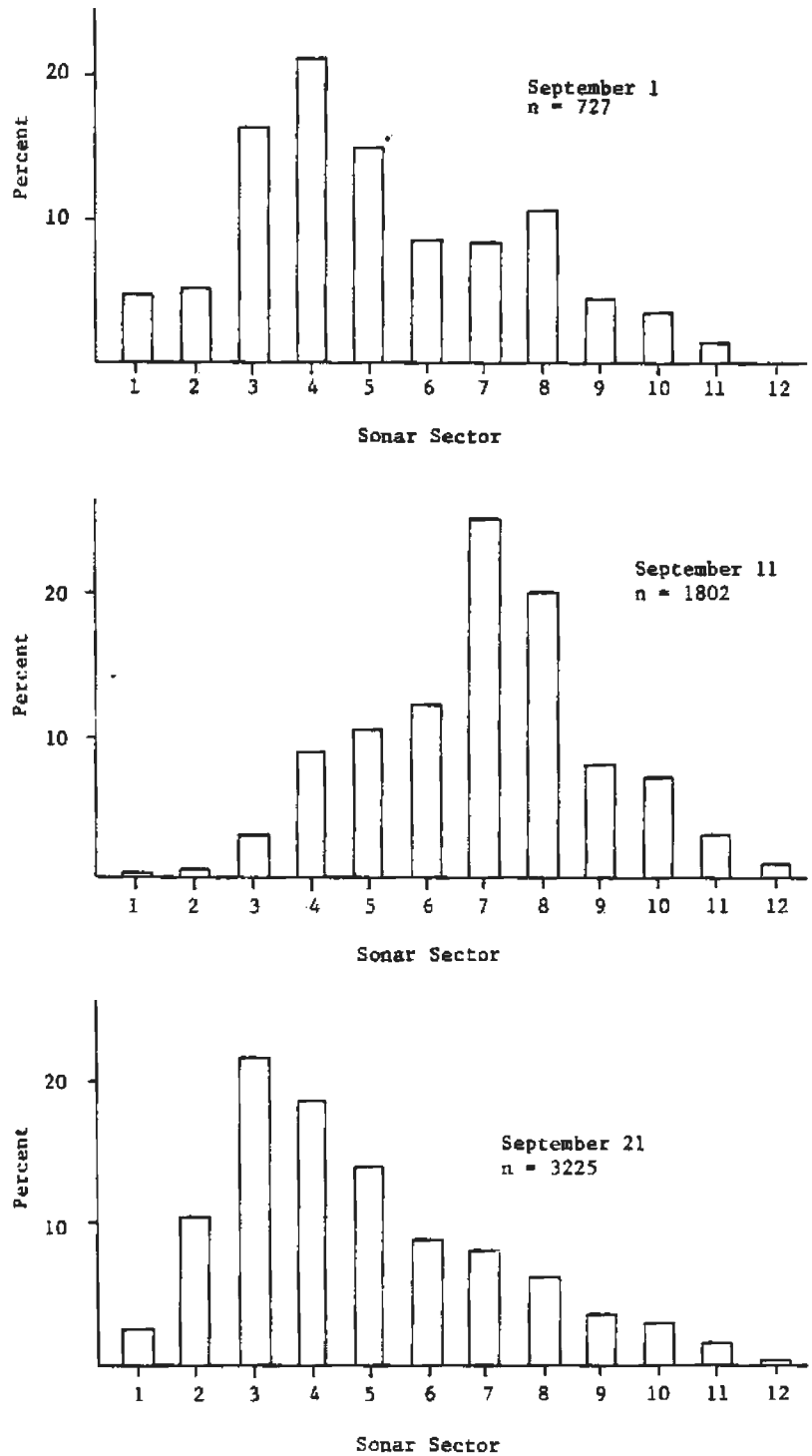

Figure 8. Distribution of chum salmon counts across the sonar substrate in the Sheenjek River for 3 days in September 1983.

The Sheenjek River was estimated to be 137 feet wide at the sonar site when a depth profile was made on September 20 (Figure 9). Prior to September 20, the sonar substrate had been moved farther from shore on two occasions, due to falling water level, for a total distance of 7 feet. Thus, sampling coverage of the river's width ranged from approximately 62% subsequent to September 20 to 59% prior to that date.

Abundance: The total 1983 sonar-estimated escapement from August 29 through September 24 was 45,733 chum salmon (Table 1). The sonar estimate was based upon daily oscilloscope calibration. A total of 99 oscilloscope calibration periods, averaging 27 minutes each, occurred over a 27-day period from August 29 through September 24. This represents in excess of 44 hours of oscilloscope calibration or approximately 7% of the total number of hours the sonar unit was functional. Approximately 53% of the calibration effort was made between 2100 and 2400 hours, 27% between 2400 and 0900 hours, and 20% between 0900 and 2100 hours. Most effort was placed on periods of the day when rate of upstream migration was highest.

The 1983 sonar estimate is conservative since it is likely chum salmon were already present in the Sheenjek River prior to sonar operations, possibly for as long as 2 weeks. Further, it is reasonable to assume that more salmon passed the sonar site after termination since approximately 1,100 were counted on the last day. In any event, the 1983 sonar estimate of 45,733 fall chum salmon from August 29 through September 24 was 57% greater than the 1982 sonar-estimated escapement (29,063) and 34% smaller than the 1981 sonar-estimated escapement (69,043) for approximately the same time periods, i.e., August 31 through September 22, 1982, and August 31 through September 24, 1981.

A single aerial survey of the Sheenjek River was flown in 1983, on September 21, under fair survey conditions. Although chum salmon were observed at most major spawning areas, spawning was judged to be prior to peak activity, and many fish were observed still enroute to spawning areas. Approximately 21,000 chum salmon were observed upstream of the sonar site, representing nearly 61% of the sonar estimate (34,500) at the time this survey was made on September 21. Aerial survey observations from 1975 through 1980 indicate that peak spawning in the Sheenjek River generally occurs sometime between the last week of September and the first week of October (Barton 1982).

Age, Sex, and Size: A total of 166 chum salmon was gillnetted from September 3 through 21, 1983. The male-to-female ratio was 1.00:0.82 or 55% males and 45% females. One hundred sixty-two chum salmon were sampled for age and size composition by sex. Results from 108 readable scales (67%) revealed age 4_1 fish predominated, representing 87%. Age 3_1 and 5_1 fish accounted for 6.5% each.

The only comparative size-at-age data available from the Sheenjek River are from carcasses collected from two spawning areas in 1975 (at

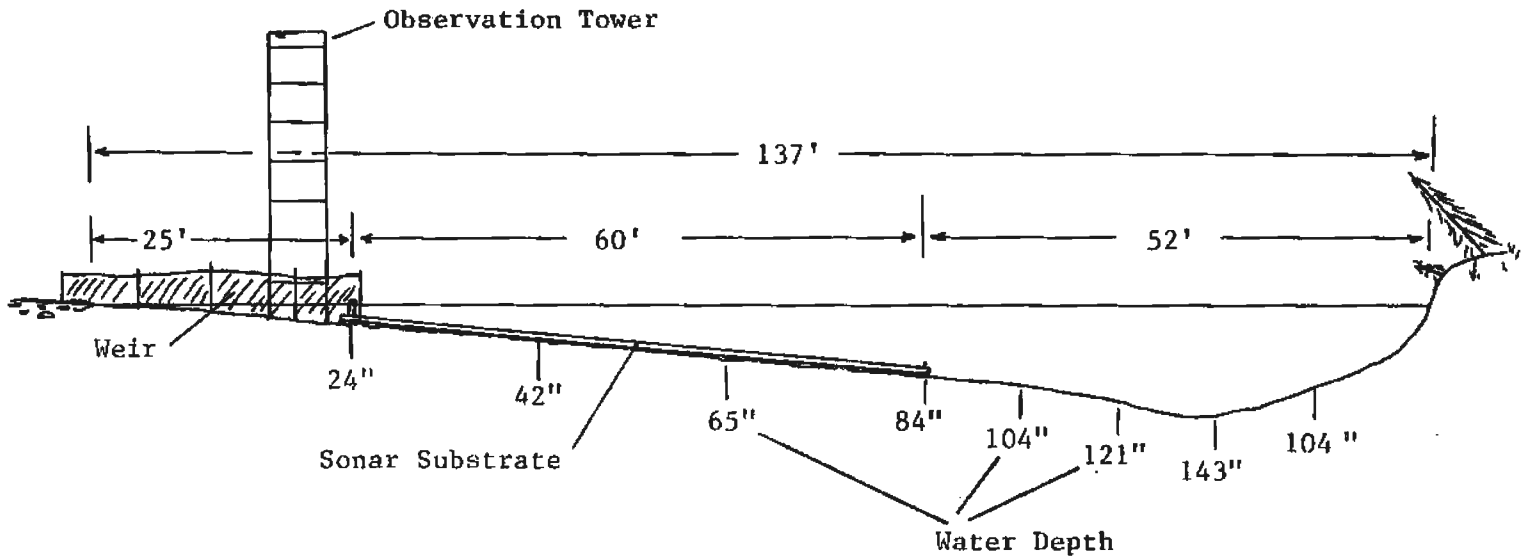

Figure 9. Depth profile of the Sheenjek River made on September 20 at the sonar site in 1983. (Upstream view.)

Russell's cabin and Fish Slough) and escapement samples collected with gillnets in 1981, 1982, and 1983 at the sonar site (Table 2). The average mean size at age was larger (in the dominant age groups) for the 1981, 1982, and 1983 gillnet samples. However, this is no doubt a function of sampling bias, with gillnets tending to select larger and older fish from the population.

Limited data on mean size at age of fall chum salmon from the Fishing Branch River are available from 1972 (Elson 1973). Original lengths of these samples collected by the Canadian Fisheries Service were measured from tip-of-snout to fork-of-tail. Mid-eye to fork-of-tail estimates for these samples (Table 2) were derived from conversion factors obtained on fall chum salmon during 1977 tagging studies at Galena and Ruby (Buklis 1981). Mean size at age for the dominant age group in that year (age 4_1 fish) more closely resembles the 1981, 1982, and 1983 Sheenjek River samples for each sex.

Remaining data on fall chum salmon size in the Porcupine River drainage consist of tip-of-snout to fork-of-tail measurements taken by the Canadian Fisheries Service from the subsistence catch at Old Crow in 1971 and spawning runs into the Fishing Branch from 1972 through 1975 (Table 3). Statistical summaries of these measurements are presented in Elson (1976). Only mean sizes were given for all ages combined for each sex. The estimated mid-eye to fork-of-tail lengths in Table 3 are also based on conversion factors presented by Buklis (1981).

Elson (1976) indicated there was a significant difference in the mean fork lengths of fish of each sex for different years and hypothesized that sampling procedures in some years may have accounted for some of the differences. The 1971 samples were collected with gillnets at Old Crow and may have been affected by gillnet size selectivity (mesh size of net not given). Elson also suggested that the 1974 small sample size could have resulted in the smaller mean fork lengths for that year.

Available age composition data from fall chum salmon escapements to the Sheenjek River are shown in Table 4. It can be seen that age 3_1 fish predominated the 1974 population (66%), reflecting a very large year class that returned predominantly in 1975. Trasky (1976) sampled fall chum salmon escapements to selected spawning areas in the Tanana River drainage in 1974, and, like the Sheenjek River samples, age 3_1 fish predominated, ranging from 73% in the Toklat River to approximately 50% in the Delta River. Evidently a very large proportion of the 1974 fall chum salmon run to the Tanana and Porcupine River systems was age 3_1 fish. In other years (from which data exist), age 4_1 and 5_1 fish predominated. Consequently, it is probable that smaller mean fork lengths reported in 1974 by Elson (1976) were a result of a high proportion of the sample being age 3_1 fish. The 1974 return was composed primarily of progeny from the 1971 brood year.

Table 2. Comparative age, sex, and size composition of fall chum salmon sampled at various sites in the Porcupine River drainage, 1972, 1975, 1981, 1982, and 1983.[a]

		Age 3_1			Age 4_1			Age 5_1			Age 6_1			Total		
				length			length			length			length			length
		n (%)	$\bar{x}$	SD	n (%)	$\bar{x}$	SD	n (%)	$\bar{x}$	SD	n (%)	$\bar{x}$	SD	n (%)	$\bar{x}$	SD
1972	Fishing Branch River[b]															
	male	1 (1.7)	610	-	20 (34.5)	620	31.8	1 (1.7)	649	-	- -	-	-	22 (37.9)	621	31.0
	female	4 (6.9)	561	-	29 (50.0)	598	23.2	3 (5.2)	614	-	- -	-	-	36 (62.1)	595	25.9
	total	5 (8.6)	571	29.3	49 (84.5)	607	29.0	4 (6.9)	623	-	- -	-	-	58 (100.0)	605	30.4
1975	Sheenjek River[c]															
	male	2 (1.0)	599	-	79 (40.1)	599	34.2	2 (1.0)	654	-	- -	-	-	83 (42.1)	601	34.7
	female	5 (2.5)	544	23.0	108 (54.8)	582	27.8	1 (0.5)	520	-	- -	-	-	114 (57.9)	581	28.7
	total	7 (3.5)	559	35.7	187 (4.9)	589	31.7	3 (1.5)	642	-	- -	-	-	197 (100.0)	589	32.8
1981	Sheenjek River[d]															
	male	2 (0.6)	547	-	139 (40.9)	620	27.5	32 (9.4)	637	42.4	1 (0.3)	620	-	174 (51.2)	622	32.4
	female	8 (2.3)	574	17.2	150 (44.1)	596	25.6	8 (2.3)	613	19.7	- -	-	-	166 (48.8)	595	25.6
	total	10 (2.9)	569	25.9	289 (85.0)	608	29.1	40 (11.8)	632	40.4	1 (0.3)	620	-	340 (100.0)	609	32.2
1982	Sheenjek River[d]															
	male	1 (1.0)	570	-	15 (14.0)	615	22.9	22 (20.0)	651	30.5	1 (1.0)	640	-	39 (35.8)	635	33.7
	female	2 (2.0)	525	-	36 (33.0)	601	22.9	32 (29.0)	621	22.0	- -	-	-	70 (64.2)	608	28.5
	total	3 (3.0)	540	-	51 (47.0)	605	24.4	54 (49.0)	633	29.8	1 (1.0)	640	-	109 (100.0)	617	33.0
1983	Sheenjek River[d]															
	male	3 (3.0)	603	44.5	52 48.0)	612	29.5	3 (3.0)	609	41.7	- -	-	-	58 (54.0)	612	30.2
	female	4 (4.0)	554	23.8	42 (39.0)	592	22.3	4 (4.0)	625	25.7	- -	-	-	50 (46.0)	592	26.5
	total	7 (7.0)	575	40.3	94 (87.0)	603	28.2	7 (7.0)	618	31.4	- -	-	-	108 (100.0)	602	30.1

[a] Age designated by Gilbert-Rich formula: total years of life in superscript; years of freshwater life in subscript. All lengths are mid-eye to fork-of-tail measurements in millimeters.

[b] Samples collected by Canadians at counting fence. Data modified from Elson (1973). Fish were initially measured from tip of snout to fork of tail; lengths shown here were converted to mid-eye to fork-of-tail estimates based upon fall chum salmon conversions derived from tagging studies in 1977 at Galena and Ruby (Buklis 1981).

[c] Carcass samples at Russell's cabin and Fish Slough areas.

[d] Samples collected with 5-7/8 inch gillnets at sonar site.

Table 3. Comparative size composition of fall chum salmon from the Sheenjek and Fishing Branch rivers.

Year	Male (all ages combined)					Female (all ages combined)				
	sample size	tip-of-snout to fork-of-tail length (mm)		mid-eye to ork-of-tail length (mm)		sample size	tip-of-snout to fork-of-tail length (mm)		mid-eye to fork-of-tail length (mm)	
		mean	SD	mean	SD		mean	SD	mean	SD
Fishing Branch River[a]										
1971	275	639.0	31.8	(574)	--	48	609.6	34.5	(561)	--
1972	226	691.3	33.5	(621)	--	435	643.3	28.2	(595)	--
1973	272	685.3	37.5	(616)	--	345	638.9	31.8	(588)	--
1974	62	634.6	53.8	(571)	--	57	598.9	46.3	(551)	--
1975	151	680.5	36.5	(612)	--	151	634.3	25.6	(584)	--
Sheenjek River[b]										
1974[c]	59	--	--	578	--	78	--	--	553	--
1975[c]	83	--	--	601	34.7	114	--	--	581	28.7
1981[d]	174	--	--	622	32.4	166	--	--	595	25.6
1982[d]	39	--	--	635	33.7	70	--	--	608	28.5
1983[d]	58	--	--	612	30.2	50	--	--	592	26.5

[a] Data modified from Elson (1976). Initial measurements were from tip of snout to fork of tail; estimated mid-eye to fork-of-tail lengths (in parentheses) are based upon fall chum salmon conversions derived from 1977 tagging studies at Galena and Ruby (Buklis 1981). The 1971 sample was taken with gillnets at Old Crow. Remaining samples were collected from spawning grounds.

[b] All samples measured from mid-eye to fork of tail.

[c] Data from carcass samples collected from Russell's cabin area and Fish Slough.

[d] Data from samples collected with 5-7/8 inch gillnets at sonar site.

Table 4. Comparative age composition (in percent) of Sheenjek River fall chum salmon spawning escapements, 1974-1983.[a]

Year	Age 3_1	Age 4_1	Age 5_1	Age 6_1	Sample size
1974	66	30	3	0	137
1975	3	95	2	1	197
1976	2	44	54	0	118
1977	11	73	16	0	178
1978	8	82	10	0	190
1979	-	-	-	-	-
1980	-	-	-	-	-
1981[b]	3	85	12	trace	340
1982[b]	3	47	50	trace	109
1983[b]	6.5	87	6.5	-	108

[a] All samples from carcasses on spawning grounds unless indicated otherwise.

[b] Escapement samples taken with 5-7/8-inch mesh gillnets in lower river.

Similarly, the larger overall mean size (shown in Table 2) by sex for combined ages in the Sheenjek River in 1982 is probably a result of the high proportion of age 5_1 fish in the population.

Escapement Trends: Barton (1983a) discussed fall chum salmon escapement trends in the Porcupine River drainage since the early 1970's based on aerial observations of escapements to the Sheenjek and Fishing Branch rivers (Figure 10). The appearance of a high abundance, 4-year cycle was manifested in the Fishing Branch River in 1971, 1975, and 1979. Although Sheenjek River escapement observations only date back to 1973, the same high abundance cycle was also observed in 1975 and 1979 in that river as well.

It can be seen that not only has the magnitude of escapements to the Sheenjek and Fishing Branch rivers been very similar in most years, but also an apparent trend of declining escapements to each river since the late 1970's has occurred. Figure 10 is based primarily upon aerial escapement observations, and no doubt poor survey conditions are reflected in some years. However, aerial escapement estimates in 1983, although higher than 1982 estimates, are still the lowest observed escapements in the high abundance cycle years for years in which data are available.

Reasons for the apparent decline, while not fully understood, may reflect increased Yukon River commercial and subsistence harvests, as well as high seas interceptions. In addition to a steady increase in the proportion of annual returns taken by the Yukon River fisheries (i.e., increased exploitation rate), there has been a marked increase in catches of chum salmon harvested in the Shumagin Islands and South Unimak fisheries since 1975. An unknown percentage of these chum salmon is known to be destined for the Yukon River, based upon various tagging studies conducted from 1956-1966 (Brannian 1983). Chum salmon catch (in thousands of fish) for the month of June made in these fisheries, as well as Yukon River catches, is shown in Table 5. The increased catch of chums salmon in both the interception and terminal fisheries, particularly within the last 4-5 years, has no doubt contributed to the recent decline in observed escapements to major spawning areas in the Yukon River drainage.

Project Application to Fishery Management

Fall chum salmon began appearing in the middle Yukon River (the area of Galena to Rampart) in mid-August 1983. Preliminary indications from the performance of the commercial fishery in the Galena-Ruby area and from subsistence catches upstream from Tanana were that the fall chum salmon run to the upper Yukon River was very weak. These data were substantiated by low Sheenjek River sonar counts through the 1st week of September.

However, by August 26, run strength improved dramatically, based on performance of these fisheries. This apparent change in run status was

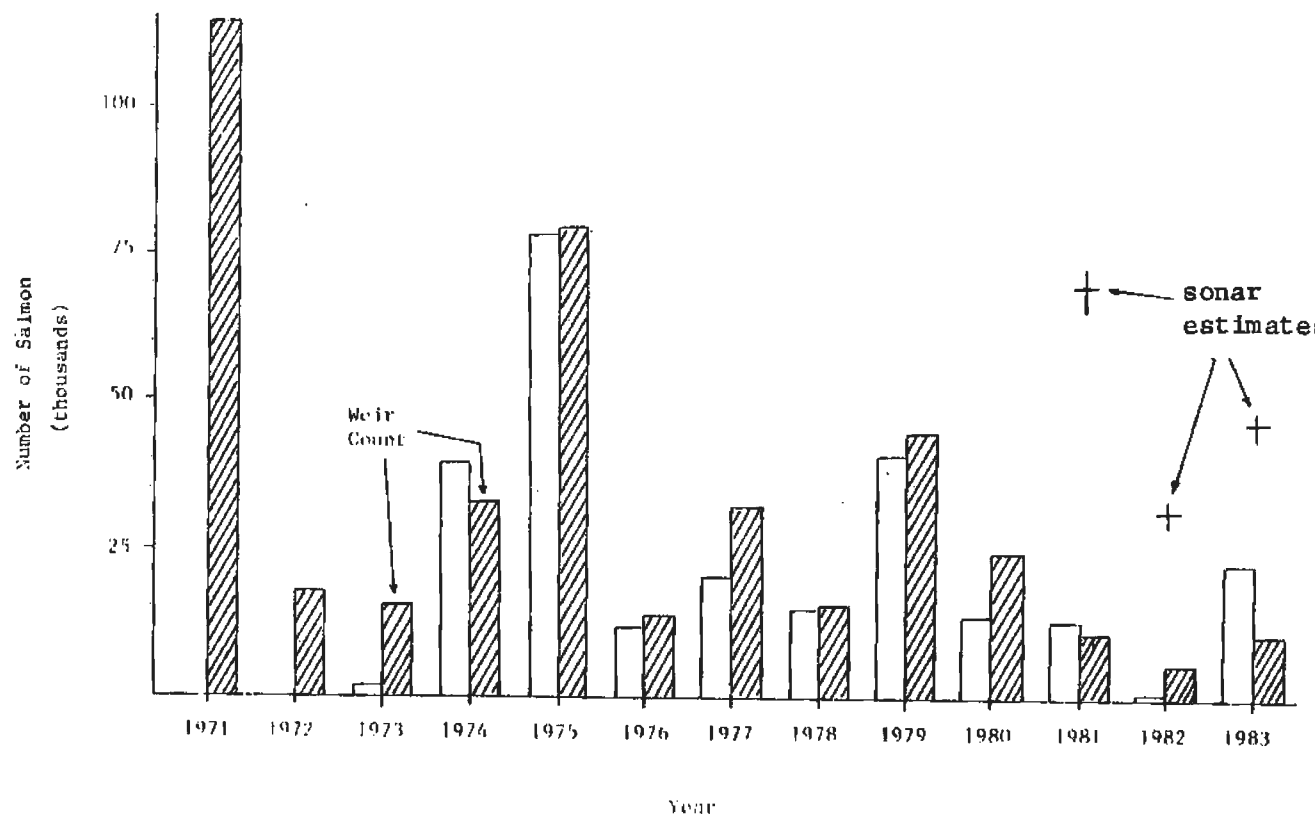

Figure 10. Observed escapements of fall chum salmon in the Sheenjek River (open bars) and Fishing Branch River (hashed bars) based upon aerial and ground surveys, 1971-1983.

Table 5. Annual Yukon River commercial and subsistence fall chum salmon catch and chum salmon harvested for the month of June in the Shumagin Islands and South Unimak fisheries, 1975-1983. (thousands of fish).

	Terminal Fisheries					Interception Fisheries			
	Commercial Fisheries			Subsistence Fisheries					
Year	Alaska	Canada	Total	Alaska plus Canada	Total	Shumagins	S. Unimak	Total	GRAND TOTAL
1975	265	3	268	96[a]	364	36	65	101	465
1976	163	1	164	77[a]	241	74	327	401	642
1977	249	4	253	91	344	22	93	115	459
1978	244	3	247	101	348	18	105	123	471
1979	263	9	372	246	618	41	64	105	723
1980	398	9	307	186	493	71	457	528	1021
1981	486	15	501	195	696	54	521	575	1271
1982	225	11	236	136	372	140	875	1015	1387
1983[b]	308	26	334	196	530	166	590	756	1286

[a] Estimated catch.
[b] Preliminary data.

born out by improved (higher) sonar counts in the Sheenjek River beginning in the 2nd week of September.

The Sheenjek River sonar project proved valuable to fishery managers in 1983. Sonar-estimated escapements were relayed daily to the area management office, and results, although not used to directly manage the fisheries, did in fact verify the suspected poor run strength early in the season and subsequent run improvement.

Summary

1. The 1983 sonar-estimated escapement to the Sheenjek River from August 29 through September 24 was 45,733 fall chum salmon. Fifty percent run passage was observed on September 14, although peak daily passage occurred on September 22.

2. Although only the west side of the river was sampled by the sonar counter, distribution of counts across the sonar substrate, together with test-fishing catch results, indicated the majority of chum salmon migrated up the west side.

3. In general, daily upstream migration of chum salmon commenced with the onset of darkness and continued through hours of suppressed light, decreasing rapidly in the early morning hours.

4. The male-to-female chum salmon ratio was 1.00:0.82 (55% males, 45% females) based on gillnet samples collected from September 3-21.

5. Test gillnet samples (n = 108) of the Sheenjek River chum salmon escapement were dominated by age 4_1 (87%) fish. Age 3_1 and 5_1 fish accounted for 6.5% each.

6. Surface water temperatures at the sonar site ranged from 49°F to 32°F, with an average of 42.2°F for the duration of the project. This average temperature was 1.6°F colder than in 1981.

7. Only a single aerial survey of the Sheenjek River could be flown in 1983 (September 21) due to unfavorable weather persisting subsequent to that date. Approximately 21,000 chum salmon were observed upstream of the sonar site, representing nearly 61% of the sonar estimate (34,500) to that date.

Conclusions

The sonar-estimated fall chum salmon escapement to the Sheenjek River in 1983 (45,733) can be considered conservative since it is likely that chum salmon were present in the river prior and subsequent to sonar operations. The 1983 sonar-estimated escapement to the Sheenjek River was greater than in 1982. However, based upon comparative aerial escapement

observations since 1973, the 1983 Sheenjek River escapement reflects the trend of declining escapements to the Porcupine River drainage by being the lowest observed in high abundance cycle years (i.e., 1975, 1979, and 1983) to this river. The most apparent reason for the decrease in fall chum salmon escapements is attributed to increased catches by both the terminal and interception fisheries. The degree to which each fishery has affected various spawning populations is not known.

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