

AYK REGION
YUKON STATE/FED REPORT #4

YUKON RIVER ANADROMOUS FISH INVESTIGATIONS
ANNUAL TECHNICAL REPORT, 1970

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ABSTRACT

A king and chum salmon population estimate was conducted in the Yukon River during 1970. Experiments indicated fishwheels were ineffective in capturing suitable numbers of king salmon for tag-recovery studies and justified suspension of this phase of the project. Although accurate population estimates were not attainable, calculations based on a simple Peterson type estimate produced a total run of 226,740 kings and 3,175,824 summer chums.

Sample data indicated the age and sex composition of the entire king salmon run to consist of 3_2 (0.3%), 4_2 (23.5%), 5_2 (40.8%), 6_2 (31.0%) and 7_2 (4.4%) fish. Males dominated females by 3:1. The chum salmon catch was comprised of age 3_1 (1.2%), 4_1 (93.5%) and 5_1 (5.3%) fish with a nearly 1:1 sex ratio.

Subsistence catches of salmon were below the previous nine year average. Project emphasis will now be directed toward monitoring magnitude plus sex and age composition in tributary streams.

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INTRODUCTION

The Yukon River (Figures 1-4) receives large runs of king and chum salmon which are utilized for both commercial and subsistence purposes. Although the exact sizes of these salmon runs have not been determined, it is believed the Yukon River is the greatest single king and chum salmon producing system in Alaska.

Management of this valuable natural resource is based upon effective regulation of the fishery to allow for optimum escapement and harvest of the remaining run. To achieve effective management, accurate assessments of the total sizes of the salmon runs need to be known. On the Yukon River, no methods are presently available to supply this valuable population data.

Estimates of the annual adult spawning runs can be calculated using tag and recovery data in conjunction with commercial and subsistence catch statistics. Ensuing run sizes will in turn be appraised from parental run data. The advance estimates, even though tentative because of many variables, will enable more effective management through sound regulations.

During 1970, studies were conducted in the Yukon River to evaluate methods of determining the magnitude plus sex and age composition of the king and chum salmon runs. Experiments tested the feasibility of utilizing fishwheels to capture migrating adult salmon in sufficient numbers for tag and recovery studies. Additional investigations were designed to provide information on migration patterns, run timing and escapement parameters.

FIGURE 1. Yukon River map.

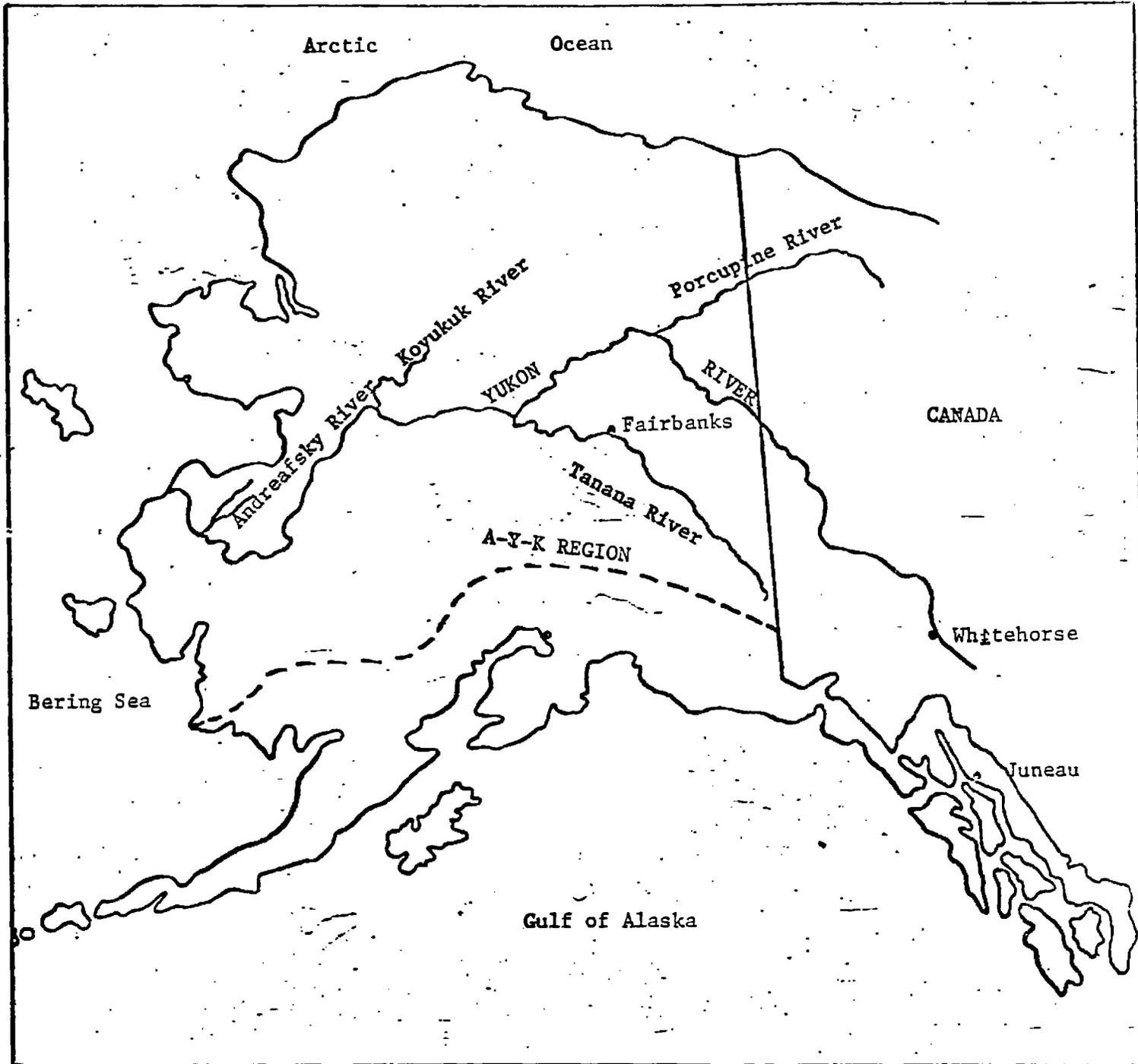


FIGURE 2. Lower Yukon River map.

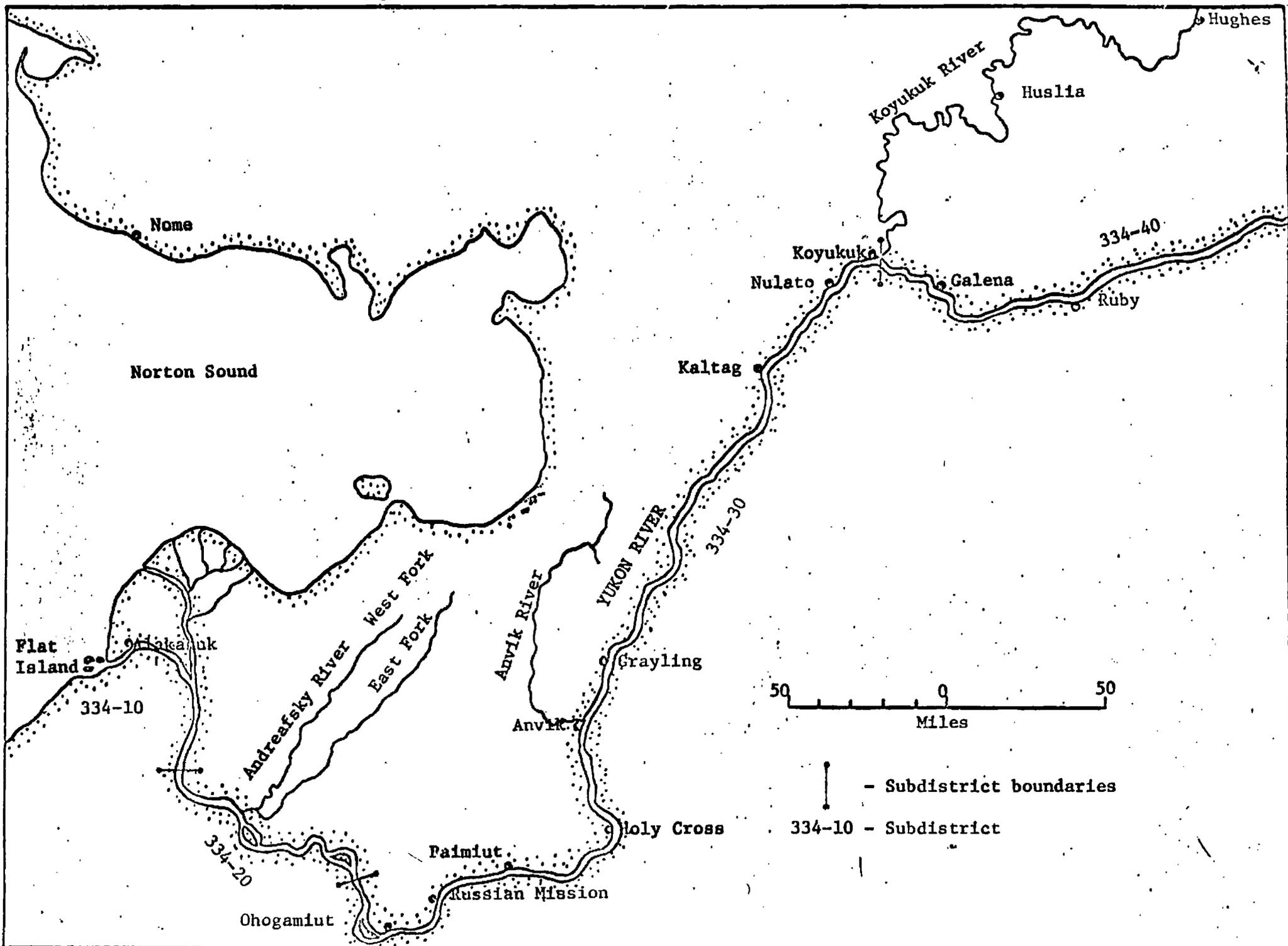
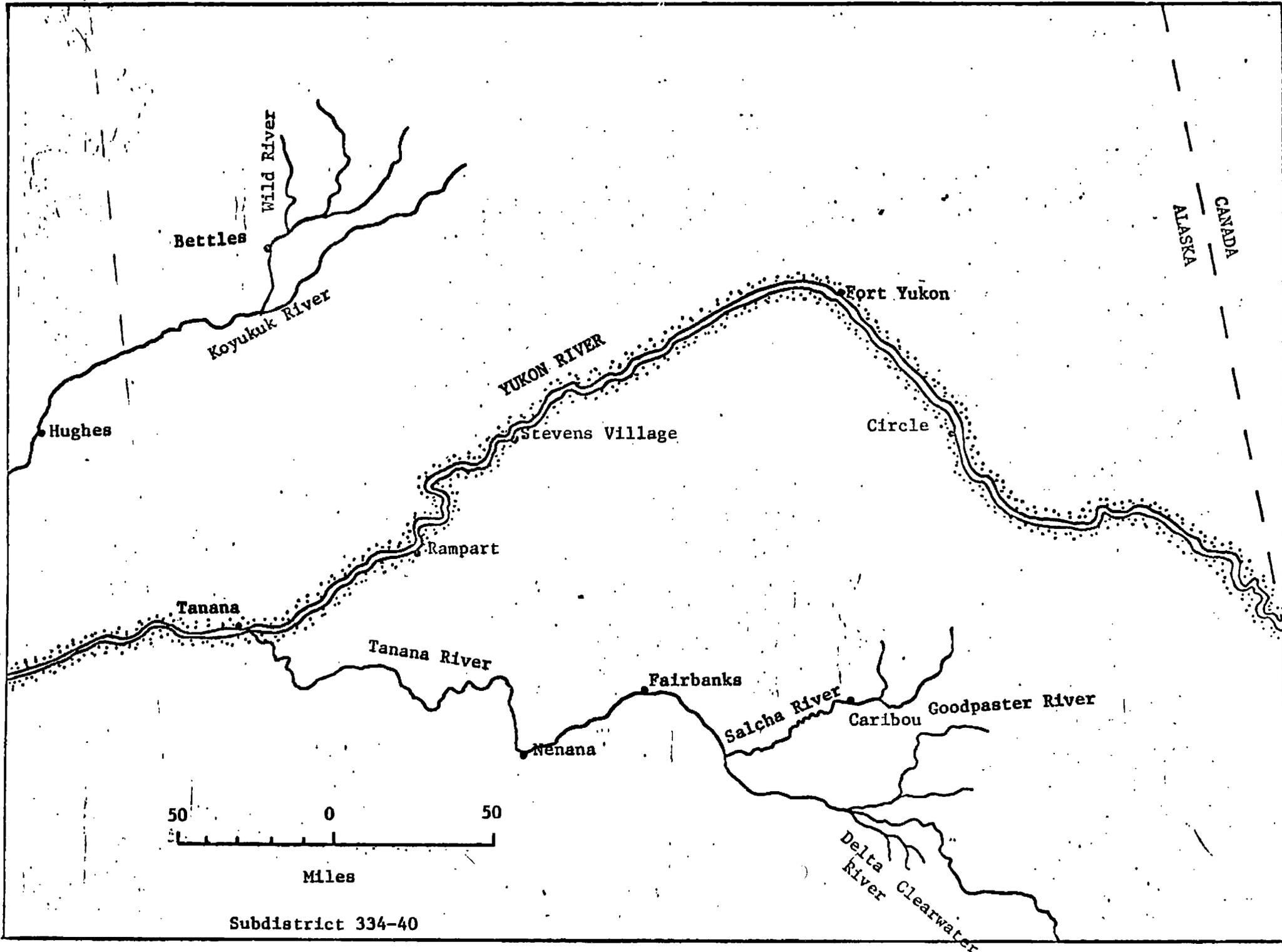
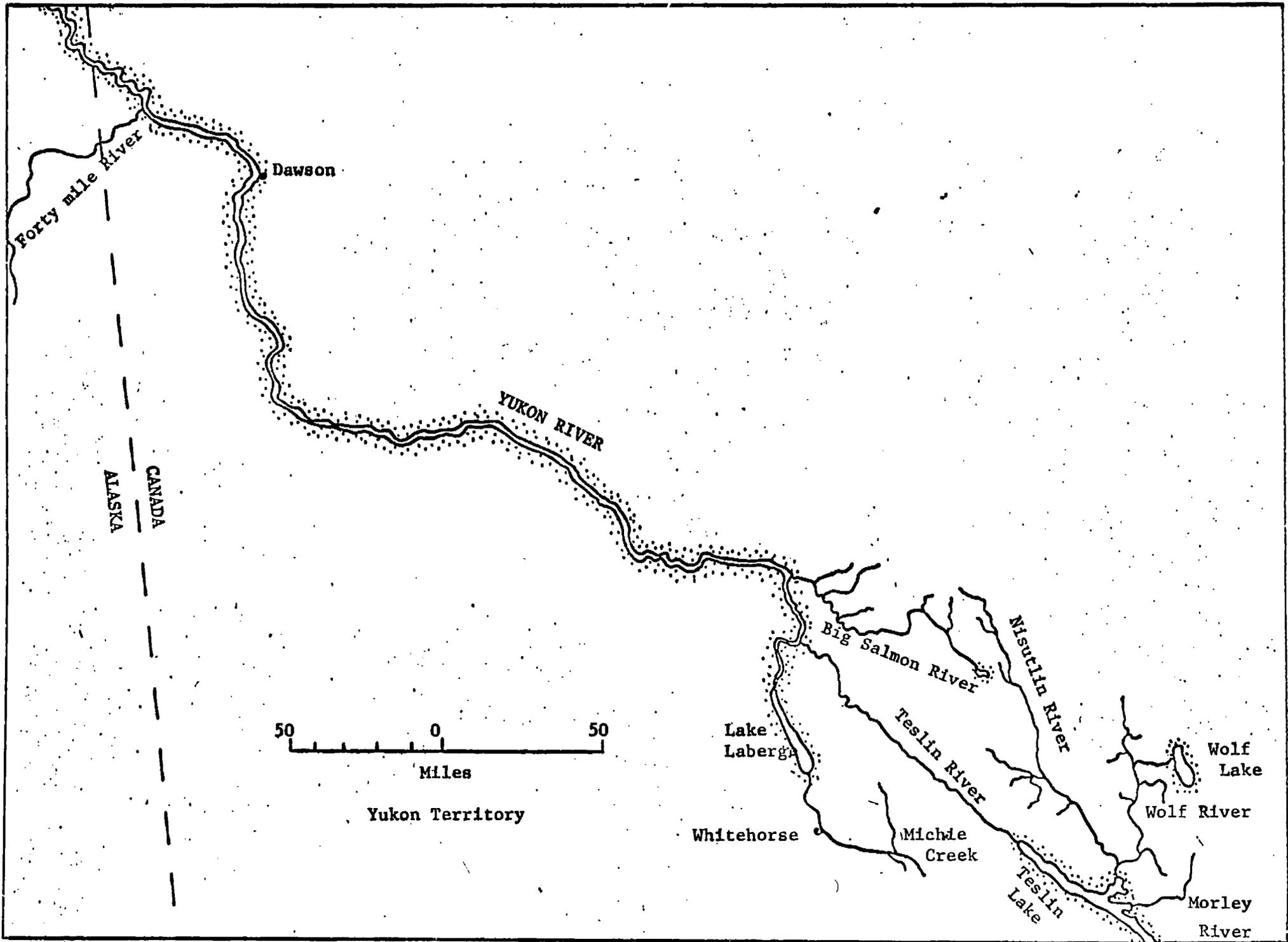


FIGURE 3. Mid-Yukon River map.



Subdistrict 334-40

FIGURE 4. Upper Yukon River map.



METHODS AND MATERIALS

Tagging

Set gill nets of 5-1/2 and 8-1/2 inch stretched mesh nylon webbing with standard floats and weighted with a lead line were used to capture salmon. Each net was approximately 25 fathoms long by 3-1/2 fathoms deep. Nets were fished in areas of little current with one end attached to the river bank and the other end anchored offshore in deeper water.

Fishwheels constructed of native spruce logs and cut lumber were also fished for salmon on an experimental basis. All fishwheels contained three baskets, each 12 feet long and 11 feet wide with a 6 foot deep scoop covered with 2 inch square mesh nylon seine webbing. Panels of canvas, 11 feet by 3 feet, were attached to the bottom outside edge of each basket as a means of increasing water resistance to speed up rotation of the wheel. Adjustable axle supports allowed fishing depth to be increased or decreased with fluctuating water levels. The fishwheels were anchored to shore with a single 1/2 inch diameter wire rope. Two boom logs held the fishwheels offshore in the current. Fish leads were installed from the mid-section of the fishwheel platforms to shore. The leads extended from the river bottom to just above the surface of the water. Rotation speed of the wheels equaled 3 to 4 revolutions per minute. Basket depth was adjusted to fish approximately one foot above the river bottom. Captured fish were automatically deposited into a live box by means of a simple chute arrangement.

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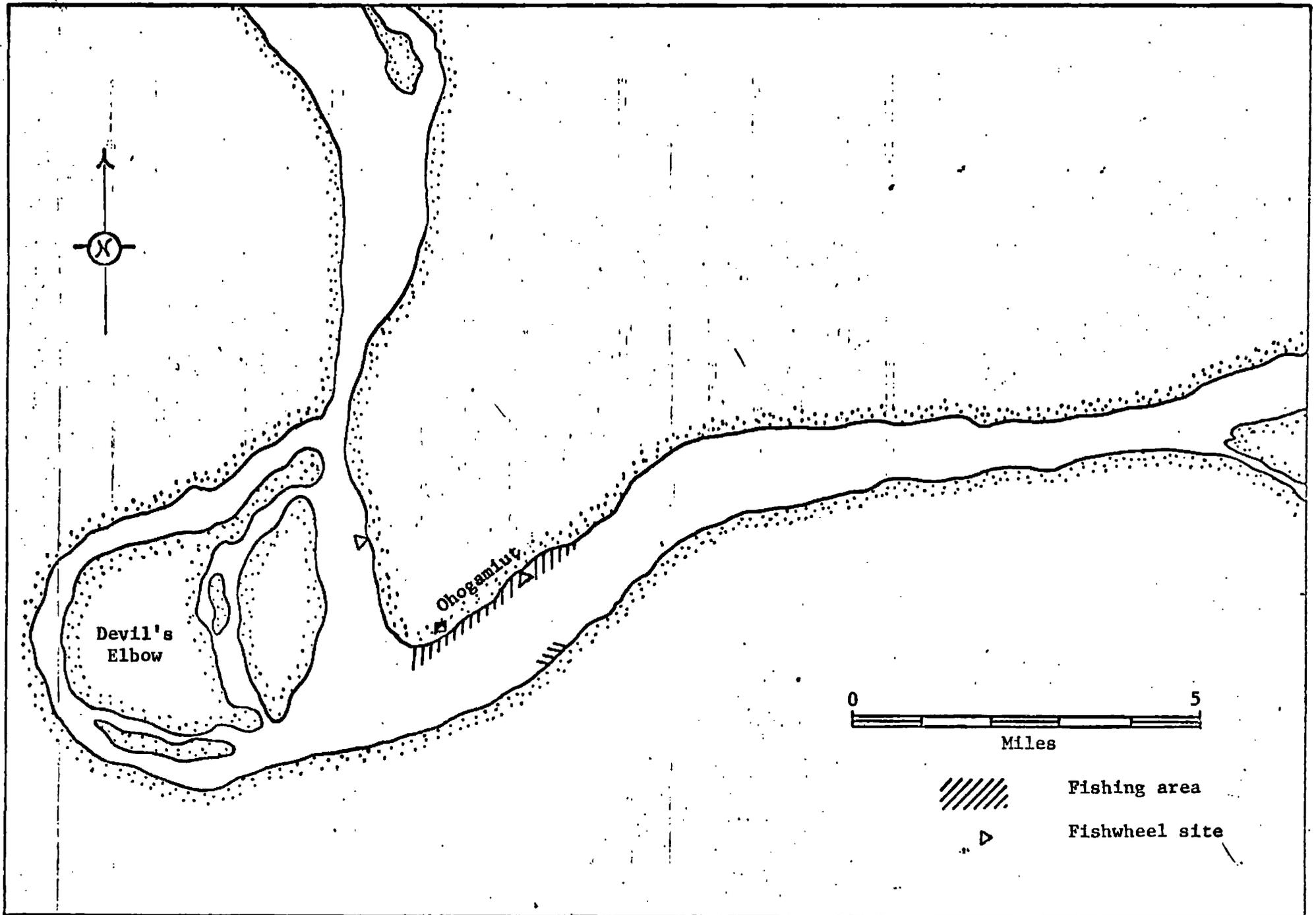
Tagging operations were conducted in an area within 5 miles up and downriver of the old village site of Ohogamiut (River Mile 185). Tagging was done from two fishwheels and a single gill net by a two man crew. The total tagging site crew consisted of 6 men. Gear was fished as continuous as possible and checked approximately every 3 hours to decrease fish mortality. Fishing sites were located on both sides of the river (Figure 5).

Salmon were tagged with Floy FD-68B international orange anchor tags using the Dennison modified tagging gun as an applicator. Yellow spaghetti tags of flexible 1/16 inch diameter plastic tubing in 13 inch lengths affixed to stainless steel needle applicators were also used. Each tag was inscribed with a number and the legend - REWARD ADFG ANCH.

All fish were tagged through the flesh just below and at the posterior insertion of the dorsal fin. Spaghetti tags were applied with a tagging needle pierced through both sides of the fish. After insertion, the needle was removed and the two free ends of the tag were tied tightly with an overhand knot. Floy tags were self anchoring after injection with the tagging gun. Adipose fins of all tagged salmon were excised as a check against tag loss. A tagging cradle constructed of wood and canvas was used to hold the fish fairly immobile during the tagging operation.

For each tagged fish, the following information was recorded: date, tagging site, gear, tag number, species and length. External dimorphism of fish captured at the tagging site was not sufficiently

FIGURE 5. Ohogamiut fishing area, Yukon River.



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advanced to allow for accurate sex identification. Scale samples were removed from the area of the first or second scale row above the lateral line on a diagonal down from the insertion of the dorsal fin to the origin of the anal fin. All fish scales were interpreted for age and data tabulated.

For purposes of this report, a 4₂ salmon returning to spawn in 1970 would be the progeny of the 1966 run that migrated from freshwater to the ocean in the spring of 1968.

It has been impossible to determine whether a few king salmon scale samples (usually less than 10%) have one or two freshwater annuli. This cannot be resolved until adequate samples of smolt are obtained for age and size analysis.

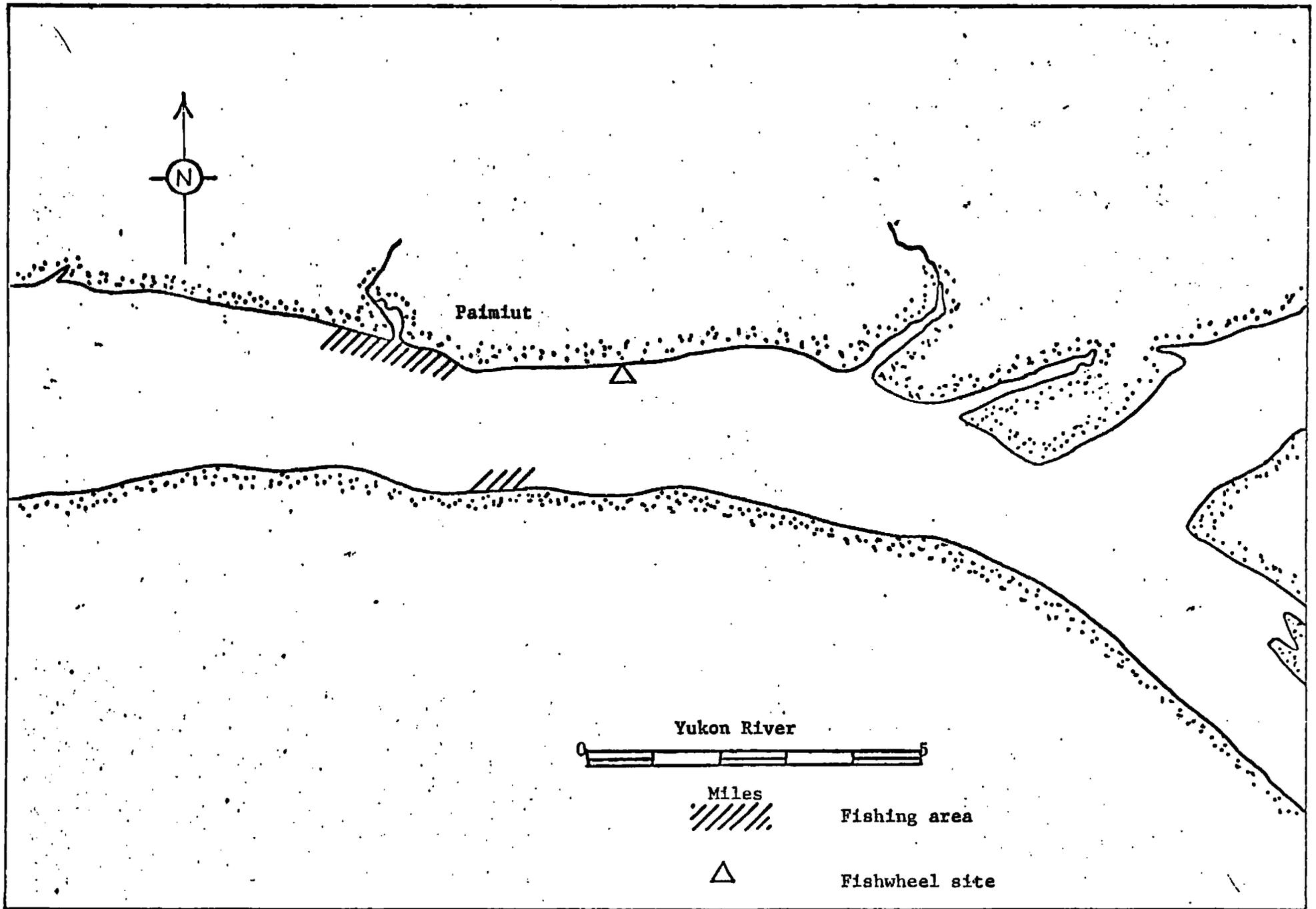
Regnart's (1962) criteria were followed for distinguishing summer and fall chum salmon.

Recovery

Recovery operations were conducted in the immediate Paimiut area (River Mile 251) by a 6 man crew. One fishwheel and up to 8 commercial gill nets of 8-1/2 inch stretch mesh 15 fathoms long were used as capture gear. Fishing sites were located on both sides of the river (Figure 6).

Recovery nets were fished at the shallow end of a large eddy and hung from tripods sunk into the river bottom. A single 25 fathom, 8-1/2 inch stretch mesh gill net was fished periodically off the south bank of the river. Fishing operations and procedures followed those outlined for the tagging site. All king salmon were sampled for age,

FIGURE 6., Paimiut rec... area, Yukon River.



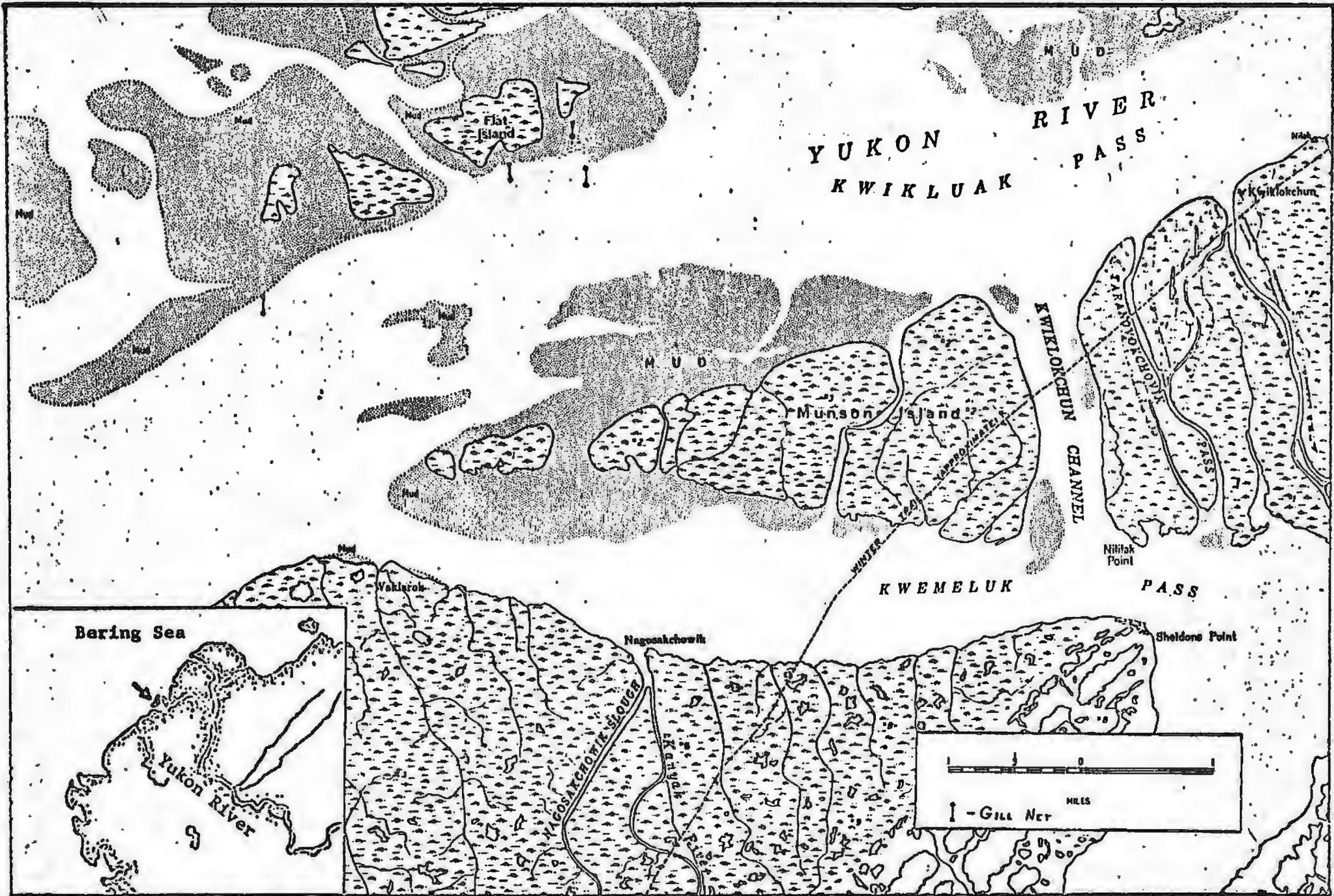
sex and size information.

Department biologists and subsistence survey crews collected additional tag recoveries from fishermen within Alaska. In the Yukon Territory, Canadian Department of Fisheries personnel collected recovered tags. Additional tags were returned by individuals through the mail. A reward of \$1.00 was offered for each tag returned. Tag and recovery data was utilized in a simple Peterson type estimate to calculate the 1970 adult king and summer chum salmon runs.

Other Studies

Test fish gill nets of 8-1/2 and 5-1/2 inch stretch mesh were fished near Flat Island in the mouth of the Yukon River by a three man crew (Figure 7). All fish were sampled for age and sex structure. Commercial catch information was obtained from fish ticket data. Much of the subsistence fishing information was obtained from personal interviews of fishermen and direct counts of salmon. Some catches were obtained by return of special catch forms or questionnaires distributed to fishermen prior to the fishing season. Two man crews, traveling by boat, surveyed the majority of the Yukon River fisheries. Biologists traveling in single engine aircraft surveyed the remaining subsistence fisheries. The Whitehorse office of the Canadian Department of Fisheries supplied catch information for the Canadian portion of the Yukon drainage. Estimates of salmon escapements were determined by aerial surveys.

FIGURE 7. Flat Island test fishing area, Yukon River.



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A Department employee enumerated and sampled king salmon passing through the Whitehorse dam fishway from July 26 to August 21. Daily records were kept of all kings utilizing the fishladder. Approximately 17% of the run was sampled for age, sex and size information and then released unharmed. A dip net was used to capture salmon out of the fishway. An aerial survey of the major king salmon spawning systems was conducted in the Yukon Territory on August 20th.

King salmon carcasses were sampled for age, sex and size data in the Salcha River (Figure 3) during August 13 thru 15 by two Department biologists. Approximately 35 river miles below Caribou were surveyed. An inflatable rubber raft was used for transportation. Wet suits were worn to retrieve carcasses in the river. All available carcasses in various stages of decomposition were sampled.

RESULTS

King salmon

Of 492 king salmon captured at the Ohogamiut tagging site, 340 were tagged and released. Fishwheels accounted for 327 kings, 287 of which were marked. Gill nets contributed 165 king salmon to the total catch with 53 fish tagged. Data are summarized in Table 1.

Recovered tags totaled 49. The greatest number(43) of recoveries occurred in the Alaska portion of the Yukon River. A single recapture occurred at the Paimiut recovery site. One tagged king was recovered at the mouth of the Wild River, a tributary to the middle fork of the Koyukuk River(Figure 3). This is the first documented recovery for that system. Remaining recoveries(6) were made in Yukon Territory, Canada.

TABLE 1. King salmon tag-recovery summary, Ohogamiut, Yukon River, 1970.

Gear	Effort (hours)	Number captured	Percent captured	<u>Untagged</u>		<u>Tagged</u>			<u>Recovered</u>		
				Number	Percent	Number	Percent	Percent total	Number	Percent	Percent total
Fishwheel	989	327	66.5	40	12.2	287	87.8	84.4	44	15.3	89.8
Gill Net	<u>726</u>	<u>165</u>	<u>33.5</u>	<u>112</u>	67.9	<u>53</u>	32.1	<u>15.6</u>	<u>5</u>	9.4	<u>10.2</u>
Total	1,715	492	100.0	152	30.9	340	69.1	100.0	49	14.4	100.0

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The furthest recapture occurred at Dawson, a distance of 1,319 river miles from the mouth of the Yukon. The mean migration rate of recovered fish above the tagging site was 23.9 miles per day. The number and percentage distribution of king salmon tag recoveries by recovery area are summarized in Table 2.

No evidence of tag loss was observed or recorded. Fishermen reports from the Ruby-Tanana area indicated the Floy tags were firmly imbedded and all recaptured fish were in good condition.

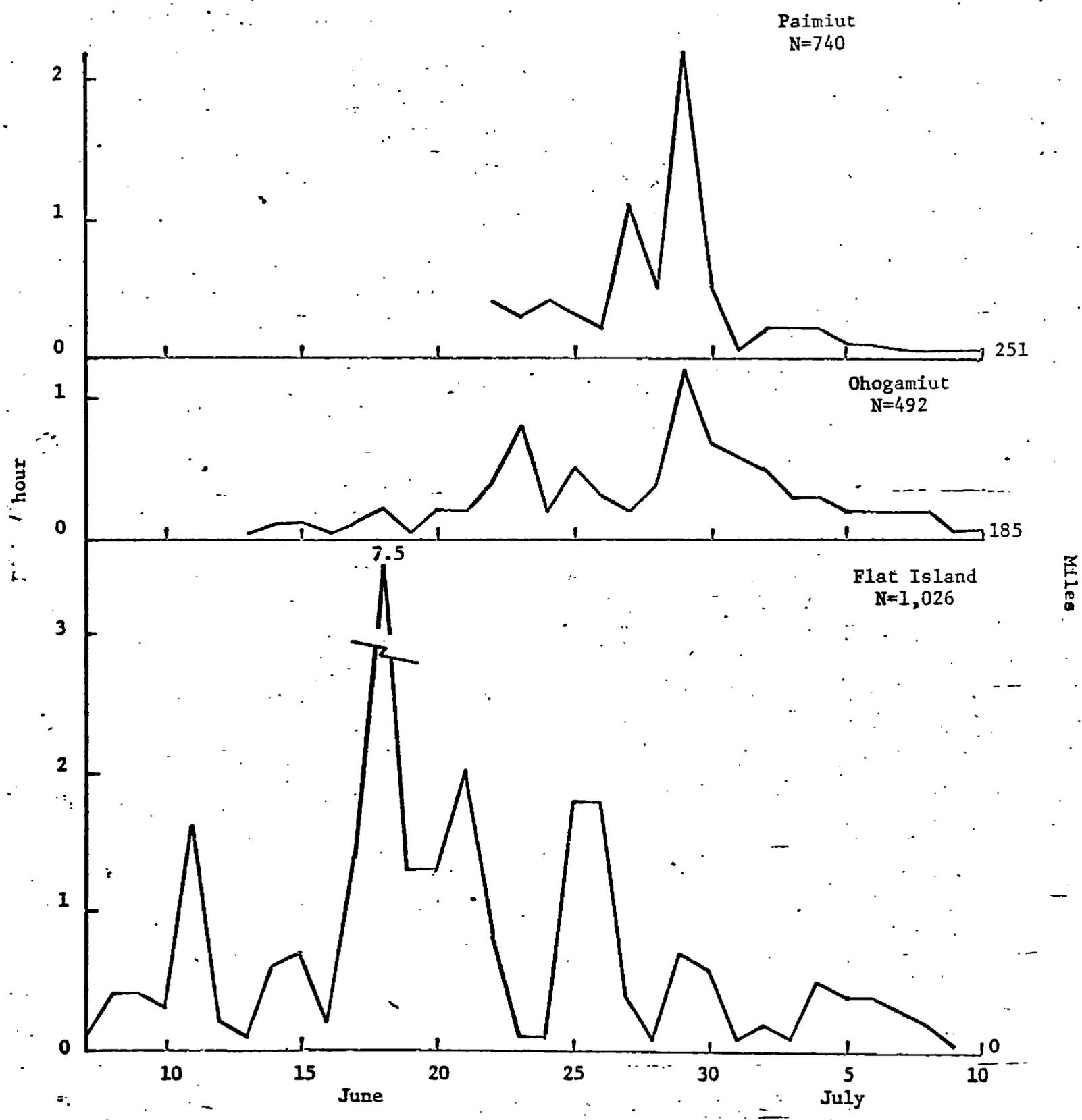
King salmon catches made at Flat Island, Ohogamiut and Paimiut are compared in Figure 8. The first recorded fish was captured June 6 at Flat Island. One notable peak of abundance occurred during June 29 in the Ohogamiut and Paimiut areas. Smaller run peaks occurred approximately five days apart between the Flat Island and Ohogamiut-Paimiut areas. Differences in the magnitude of catches between the sites reflect the tidal influence at the river's mouth and the downriver commercial catches. Catch data are presented in Appendices A-C.

An accurate population estimate was not attainable. However, a population of king salmon passing through the tagging area was calculated utilizing a simple Peterson type estimate based on upriver subsistence and commercial fishery recoveries (Appendix D). Results indicated an escapement estimate of 127,951 and a total run estimate of 226,740 king salmon.

TABLE 2. Distribution and migration rates of tagged king salmon, Yukon River, 1970.

Area of recovery	Miles from tagging site	Recoveries		Tagging dates (range)	Recovery dates (range)	Mean days out	Mean miles per day
		No.	%				
Below Ohogamiut	-	4	8.2	6/21-7/3	6/25-7/12	5.3	-
Russian Mission	28	4	8.2	6/18-29	6/25-7/5	5.8	4.8
Paimiut	66	1	2.0	7/2	7/6	4.0	16.5
Holy Cross	94	3	6.1	6/18-7/7	6/22-7/16	5.3	17.7
Nulato	299	1	2.0	7/5	7/?	?	?
Galena	345	1	2.0	7/1	7/14	13.0	26.5
Ruby	396	4	8.2	6/18-7/1	6/30-7/13	14.5	27.3
Tanana	510	4	8.2	6/18-30	7/4-25	20.5	24.9
Rampart	578	4	8.2	6/15-24	6/31-7/15	17.3	33.4
Stevens Village	662	4	8.2	6/18-7/10	?	?	?
Nenana (Tanana R.)	675	9	18.4	6/14-29	7/6-25	25.6	26.4
Fort Yukon	817	2	4.1	6/14-22	7/6-19	24.5	33.3
Circle	876	1	2.0	7/1	8/?	?	?
Mouth of Wild River (Koyukuk R.)	831	1	2.0	7/1	8/11	41.0	20.3
Mouth of Forty Mile River, Y.T.	1,084	1	2.0	6/29	8/5	37.0	29.3
Dawson, Y.T.	1,134	<u>5</u>	<u>10.2</u>	6/22-7/1	7/27-8/15	43.6	26.0
TOTAL		49	100.0	6/14-7/10	6/22-8/15	17.1	26.3

FIGURE 8. King salmon catch per unit effort at Flat Island, Ohogamiut and Paimiut, Yukon River, 1970.



A total of 3,444 kings was sampled for age and sex information throughout the run at various locations (Appendix E). Based on sample data, a weighted age and sex composition of the entire king salmon run was calculated using total catch and escapement figures. Results indicated the run consisted of 69.4 percent males and 30.6 percent females. Males dominated all age groups except for age 6₂ fish. A summary of the run composition data is presented in Table 3.

Chum salmon

Of 9,340 summer chum salmon captured at the Ohogamiut tagging site, 3,049 were tagged and released. Every third fish captured was tagged. Fishwheels accounted for 8,662 chums, 3,043 of which were marked. Gill nets of 8-1/2 inch stretched mesh contributed 678 chum salmon to the total catch with only 6 fish suitable for tagging. All untagged fish taken with gill nets suffered mortality. Tag recovery data are summarized in Table 4.

Overall tag recovery totaled 129. All recoveries were made within the Alaska portion of the Yukon River. The greatest number (80) of recoveries occurred in the Russian Mission to Grayling area, however, many were taken in small tributary streams. Recoveries below the tagging site were considerably below the 50.8 percent experienced during 1969 due to improved live boxes and shorter holding periods. The Paimiut recovery site accounted for 8 recaptures. The furthest recovery was made in the Koyukuk River at Huslia, a distance of 711 miles upstream from the mouth of the Yukon (Figure 2). The mean migration rate

TABLE 3. Estimated age and sex composition of the king salmon run, Yukon River, 1970.^{1/}

Catch	Age group					Total
	3 ₂	4 ₂	5 ₂	6 ₂	7 ₂	
Males						
Sample number	10	804	1,079	407	91	2,391
Expanded-total run	680	52,831	70,970	26,755	6,122	157,358
Percent	0.3	23.3	31.3	11.8	2.7	69.4
Females						
Sample number		7	325	661	60	1,053
Expanded-total run		453	21,540	43,534	3,855	69,382
Percent		0.2	9.5	19.2	1.7	30.6
Combined sexes						
Sample number	10	811	1,404	1,068	151	3,444
Expanded-total run	680	53,284	92,510	70,289	9,977	226,740 ^{2/}
Percent	0.3	23.5	40.8	31.0	4.4	100.0

^{1/} Based on sample data - Appendix E.

^{2/} Population estimate.

Table 4. Summer chum salmon tag-recovery summary, Ohogamiut, Yukon River, 1970.

Gear	Effort (hours)	Number captured	Percent captured	<u>Untagged</u>		<u>Tagged</u>			<u>Recovered</u>		
				Number	Percent	Number	Percent	Percent total	Number	Percent	Percent total
Fishwhell	943	8,662	92.7	5,619	64.9	3,043	35.1	99.8	128	4.2	99.2
Gill net	<u>678</u>	<u>678</u>	<u>7.3</u>	<u>672</u>	99.1	<u>6</u>	0.9	<u>0.2</u>	<u>1</u>	16.7	<u>0.8</u>
Total	1,621	9,340	100.0	6,291	67.4	3,049	32.6	100.0	129	4.2	100.0

of recovered fish above the tagging site was 12.8 miles per day. In general, migration rates increased as the distance traveled upstream increased. The number and percentage distribution of chum salmon tag recoveries by recovery area are presented in Table 5.

Chum salmon catches made at Flat Island and Ohogamiut are compared in Figure 9. Paimiut data was considered unreliable due to fishwheel breakdown and inaccurate gill net records obtained from commercial fishermen (Appendix G). The first fish recorded was captured at Flat Island on June 8. A peak catch occurred on June 29 in the Ohogamiut area. Data are presented in Appendices A & F.

A population estimate of summer chum salmon passing through the tagging area was calculated utilizing a simple Peterson type estimate based on upriver subsistence and commercial fishery recoveries (Appendix H). Results indicated an escapement estimate of 2,855,658 and a total run estimate of 3,175,824 chum salmon.

The age and sex structure of the summer chum salmon run based on 1,640 fish sampled during the 1970 run is presented in Table 6. Overall sex and age composition was nearly equal for the entire run. The 3₁, 4₁ and 5₁ age groups were represented with 4₁ (93.5%) fish most abundant for both sexes. Sample data are presented in Appendix I.

Subsistence surveys

A minimum of 15,794 king salmon and 222,165 salmon of other species were taken in the Yukon district subsistence fishery during 1970.

TABLE 5. Distribution and migration rates of tagged summer chum salmon, Yukon River, 1970.

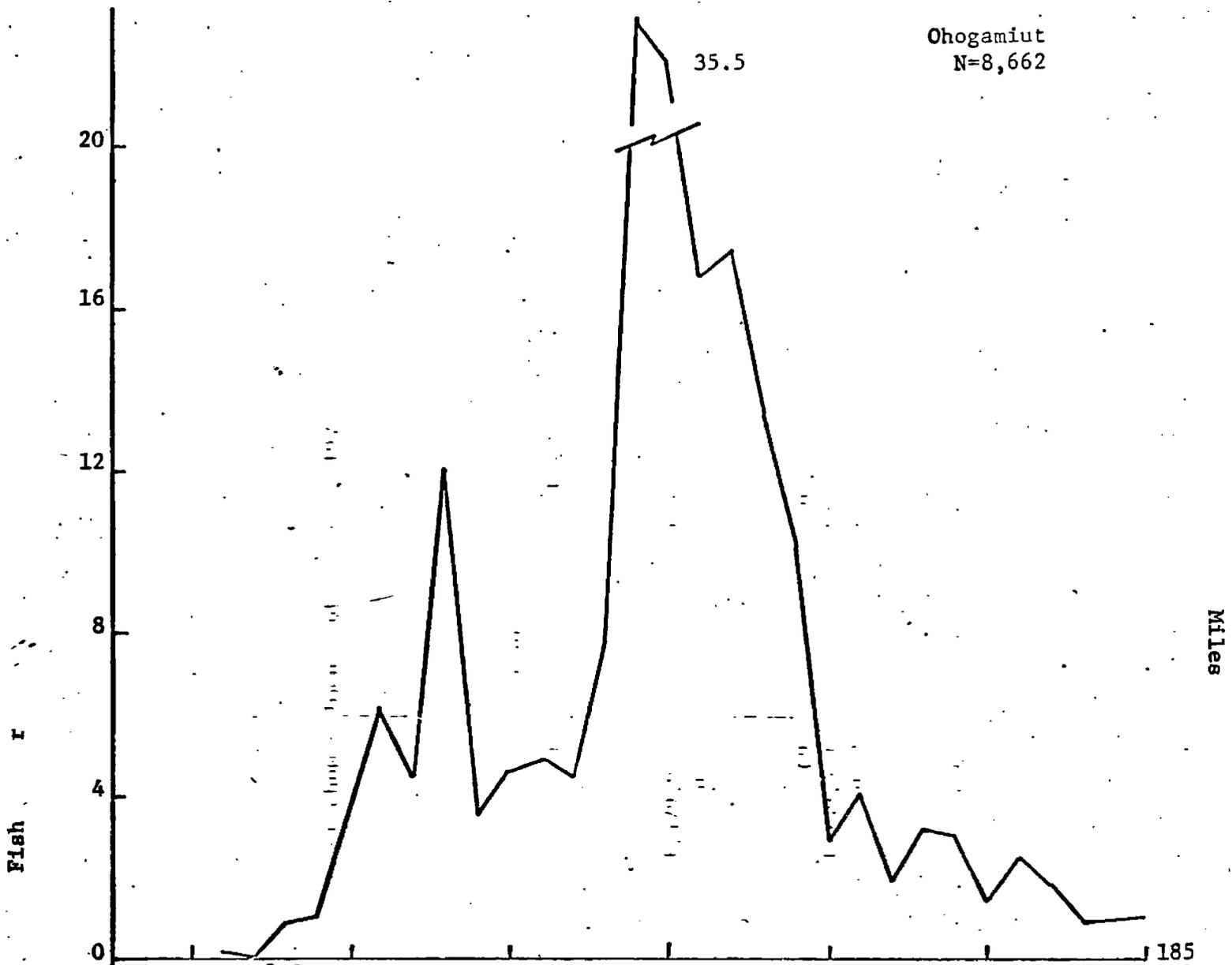
Area of recovery	Miles from tagging site	Recoveries		Tagging dates (range)	Recovery dates (range)	Mean days out	Mean miles per days
		No.	%				
Below Ohogamiut	-	18	14.0	6/21-7/8	6/25-7/21	-	-
Russian Mission	28	14	10.9	6/20-7/13	6/21-7/25	5.5	5.1
Paimiut	66	8	6.2	6/23-7/6	6/25-7/12	5.8	11.4
Holy Cross	94	8	6.2	6/22-7/3	6/27-7/29	9.5	9.9
Anvik	132	21 ^{1/}	16.3	6/16-7/3	6/21-7/20	8.6	15.3
Grayling	151	29 ^{2/}	22.5	6/19-29	6/26-8/2	22.8	6.6
Kaltag	265	8	6.2	6/18-29	6/30-7/13	10.4	25.5
Nulato	299	17	13.2	6/16-30	6/25-7/27	20.1	14.9
Koyukuk	317	4	3.1	6/21-30	7/3-15	14.7	21.6
Tanana	510	1	0.7	6/22	7/13	21.0	24.3
Huslia (Koyukuk R.)	526	1	0.7	6/16	7/7	21.0	25.0
TOTALS		129	100.0	6/16-7/13	6/21-8/2	8.6	12.8

^{1/} Many of the returns were more than likely recaptured in the Anvik River spawning areas.

^{2/} Of these, 10 returns are known taken in Blueberry Creek, a small tributary stream.

36.8

Ohogamiut
N=8,662



9.8

Flat Island
N=2,760

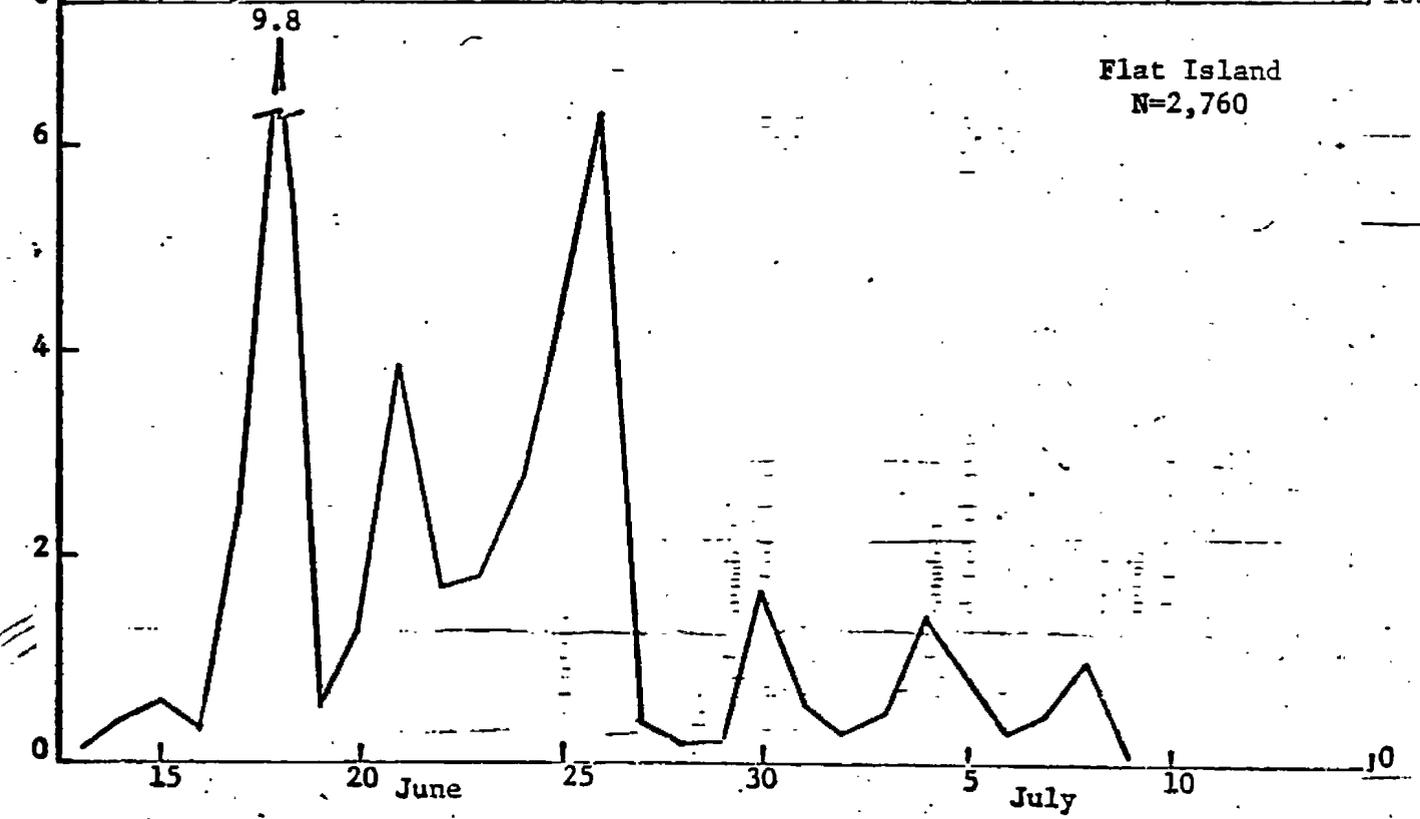


TABLE 6. Estimated age and sex composition of summer chum salmon, Yukon River, 1970^{1/}

Catch	Age Group			Total
	3 ₁	4 ₁	5 ₁	
Males				
Sample number	9	765	58	832
Expanded-total run	19,055	1,479,934	111,154	1,610,143
Percent	0.6	46.6	3.5	50.7
Females				
Sample number	9	769	30	808
Expanded-total run	19,055	1,489,461	57,165	1,565,681
Percent	0.6	46.9	1.8	49.3
Combined sexes				
Sample number	18	1,534	88	1,640
Expanded-total run	38,110	2,969,395	168,319	3,175,824 ^{2/}
Percent	1.2	93.5	5.3	100.0

^{1/} Based on sample data - Appendix I.

^{2/} Population estimate.

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Catches were below the previous nine year averages of 20,251 and 337,017 fish respectively due to less dependence on subsistence fishing. The recorded subsistence catches represent minimum figures as salmon consumed prior to the surveys and catches made after the completion of surveys are not always recorded.

Salmon escapements

Approximately 30 hours were spent conducting aerial surveys of salmon spawning streams in the Yukon district during 1970. Selected streams of the Yukon and Teslin River systems were surveyed. Results are summarized in Table 7.

At the Whitehorse dam, a total of 625 king salmon was enumerated through the fishway from August 21 to 31 (Appendix J). Of these 104 were sampled for age, sex and size composition. Males were most abundant in all age groups with age 4₂ (30.8%) and 5₂ (45.2%) males dominating the sample. A 7:1 sex ratio in favor of small males was evidenced. A lack of the larger - older aged kings in the sample indicates a possible over selection of these fish by the downriver commercial fishery. Data are presented in Appendix E.

In the Salcha River, 185 king salmon carcasses were sampled for age, sex and size composition. Age 4₂ (44.9%) and 5₂ (27.0%) males were most abundant in the sample. Few females of the 6₂ and 7₂ age groups were found. The sex ratio favored males 4:1. Little evidence of bear or wolf predation was observed. Data are summarized in Appendix E.

TABLE 7. Aerial survey salmon escapement counts, Yukon district, 1970.

Stream	Date	Aerial survey rating	Kings	Pinks	Chums
Andreafsky River					
West Fork	7/26	Poor	574	32,125	91,710
East Fork	7/26	Fair	665	2,350	84,090
Total			1,239	34,475	175,800
Anvik River	7/24	Fair	368	-	232,780
Salcha River	8/2	Good	1,882	-	7,879
Goodpasture River	8/2	Fair	239	-	-
Delta Clearwater River	8/2	Good	-	-	765
Big Salmon River*	8/20	Poor	670	-	-
Nisutlin River*	8/20	Fair	737	-	-
Michie Creek*	8/20	Poor	20	-	-
Morley River*	8/20	Poor	51	-	-
Wolf River	8/20	Poor	71	-	-

*Yukon Territory, Canada.

DISCUSSION

Experiments conducted during 1970 revealed numerous problems associated with capturing suitable numbers of king salmon with fishwheels for tag-recovery studies. Foremost, fishwheel catches during 1969 (Lebida 1969), and the present study, demonstrated a selectivity of the younger age classes, specifically the 3₂ and 4₂ age groups. Site location was not a contributing factor to size selectivity as gill net catches from above and below fishing sites produced kings of all age groups. Increased wheel rotation or changed fishing position had no effect on catch efficiency. Installation of outside leads could possibly increase overall catches and decrease gear selectivity.

However, due to unfavorable water velocities, river depth and substrate conditions inherent to preferred fishwheel sites, outside leads were impossible to install. A permanent structure, such as pilings, would be damaged by river ice, be extremely expensive to install and would need considerable maintenance annually.

Maintenance of fishwheels was nearly continuous due to normal wear, structural damage by rough water and by debris accumulation. Fluctuating water levels necessitated constant relocation of fishwheels and required maximum effort by men and equipment. Smaller wheels would be impractical for king salmon since effective fishing depth would be reduced and the use of outside leads would be required.

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Chum salmon were easily captured with fishwheels in sufficient numbers and in suitable condition for tagging. All three age groups, (3₁; 4₁; 5₁) were represented in the catch in fairly equal proportions to gill net catches. No gear selectivity on size of fish was noted. Fishwheel success on chum salmon is attributed to fish abundance and migration pattern in close proximity to the river bank.

The Flat Island test fishing catch data presented in this report were affected by environmental conditions, varying fishing methods and other factors which are not necessarily related to salmon abundance. Even with these limitations, the test fishing data is thought to be the best representation of run timing and magnitude into the river.

Commercial catches are not adequate for this analysis because of gaps in the data caused by periodic closed fishing periods. Results provide important information on daily trends of abundance and timing of the salmon runs that are directly applicable toward on-the-spot management of the commercial fisheries.

One serious limitation of the study is that the Flat Island catch data cannot be used as an abundance index for the entire Yukon River run as evidenced in Figure 8. Salmon enter the Yukon River by several mouths, and the proportion of the run entering each mouth varies considerably from year to year. For example, there were 25,826 and 27,202 king salmon taken commercially in the south and middle mouths respectively during 1967 (Geiger et. al. 1967). With similar fishing effort, there were only 6,600 kings taken in the middle mouth during 1968 compared to 27,898 kings taken in the south mouth (Geiger et. al 1968).

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In 1969, south and middle mouth catches totaled 21,894 and 12,875 kings respectively (Regnart et al 1969). During 1970, the commercial catch accounted for 23,367 kings in the south mouth and 6,079 kings in the middle mouth (Regnart 1970 - in press). Another test fishing site should probably be established above the confluences of the major mouths or channels (near Fish Village) in order to establish abundance indices for the entire run.

Although population estimates were arrived at for king and summer chum salmon, they are not considered entirely valid. Many inherent problems made it difficult to completely satisfy Ricker's (1948) assumptions fundamental to a valid population estimate. Tag and recapture data were not completely free from the influence of mortalities and tag loss denoting too high an estimate. Assumptions based on the occurrence of downriver recoveries indicated an increased mortality among tagged fish and tag loss, if any, was unknown and very likely to occur. Conversely, necessary utilization of the minimum recorded subsistence catches in the calculations results in too low a population estimate. Attempts at a stratified population estimate employing fishwheels to capture younger age fish and gill nets for older age groups were discouraged by experiencing high gill net mortalities as in previous years (Lebida 1969).

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Quality of the king salmon runs, especially the spawning escapement should be of great concern to the fisheries management biologist. Age composition of the runs can be expected to vary from year to year because of differences in the survival and return of various brood year stocks. Sex ratios of any particular run, especially for king salmon, may vary from 1:1 depending on the relative abundance of the various age classes. For example, an unusually large return of age 4_2 and 5_2 king salmon could produce an overall sex ratio in favor of males. In addition it is believed a preponderance of males exists naturally in the spawning run due to an earlier age of maturity attained by many males.

The 1970 Yukon River king salmon run consisted of fish ranging from 3 to 7 years of age. Because of gear selectivity for different sized fish, the various age and sex classes were not captured in proportion to their real abundance. It has been shown that 8-1/2 inch mesh (approximate) gill nets, which are operated in the commercial fishery, are selective on age 6_2 and 7_2 females (Geiger et. al. 1968). Fish-wheel test catches indicated a selectivity of the younger age classes. Because of the intensive and selective nature of the fishery, the resultant king salmon spawning escapements were composed of a majority of males with relatively high percentage of the 4_2 and 5_2 age groups.

The optimum sex ratio for spawning king salmon is not known, but a surplus of age 3_2 - 5_2 males in the spawning escapement contributes little to run productivity. A 1:1 sex ratio, or even a majority of females on the spawning grounds would be best for maximum production.

Preliminary data obtained during the past several years indicates that differences of one or two inches in gill net mesh size can considerably alter the age, sex and size composition of the catch. The use of gill nets of a smaller mesh size would reduce the harvest of the more productive females in the older age groups and increase the harvest of the younger age groups which are predominantly males. The catch would then spread out to include some harvest of all of the available age groups.

Other considerations involving the use of smaller mesh gill nets to harvest king salmon would be the effect on the marketability of the catch, increased incidental catch of chum salmon and the possible drop-out problem associated with the larger sized king salmon.

The subsistence fishery rivals the commercial fishery as the most important utilization of salmon in the Arctic-Yukon-Kuskokwim area. Chum salmon have always been the backbone of the subsistence fishery, with most of the catch being fed to sled dogs. King salmon are reserved almost exclusively for human consumption, although substantial numbers of chum salmon are also eaten. Minor utilization of pink, coho and red salmon is made.

Increased welfare payments and more employment opportunities have resulted in a general decline in subsistence fishing effort throughout the A-Y-K area. Snow vehicles are beginning to replace sled dogs and this is expected to speed up the decline of the subsistence fishery in the future as less dog food is needed. However, based on progressing trends, an increased commercial harvest is offsetting the decline in

the subsistence catch.

The documentation of catches and associated fishery data (amount of gear, number of fishermen, etc.) by subsistence surveys may indicate relative run magnitudes, escapements and trends in the dependence on subsistence fishing. The surveys are also insurance against a large number of unreported tag recoveries by subsistence fishermen.

Aerial surveys are the most commonly used salmon escapement enumeration methods since a relatively large number of streams can be observed in a short period. However, inherently poor weather and water conditions limit accuracy. It should also be emphasized that aerial survey determination of spawning salmon is considered an estimate or index of escapement and not the actual or total number

of spawners in a stream. If aerial survey procedures are standardized and environmental conditions do not vary much, then estimates (indices) of salmon escapements made at the same stage of the run can be compared from year to year. The high count or estimate of escapement usually made at the peak of spawning is considered as the best index of the total escapement. Annual escapement indices of major streams, plus accurate commercial and subsistence catch data, are of extreme importance to the management biologist in evaluating run magnitudes of various stocks. These techniques are being applied annually in the Yukon District.

During 1971, the king salmon tag-recovery project will be phased out with new emphasis directed toward monitoring escapement age and composition plus magnitude in tributary streams by use of counting towers and eventually weirs. The chum salmon tag recovery effort will continue for one more season.

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SUMMARY

King salmon

1. Of 492 king salmon captured, 340 (69.1%) were tagged and released.
2. The overall recovery rate was 14.4 percent.
3. Approximately 88 percent of all recoveries occurred in the Alaska portion of the Yukon River. One tagged fish was recaptured at the mouth of the Wild River. The furthest recovery occurred at Dawson, 1,319 river miles upstream from the mouth of the Yukon.
4. The mean migration rate of recovered fish was 23.9 miles per day.
5. The first recorded fish was captured June 6 at Flat Island with one notable peak of abundance occurring June 29 at Ohogamiut and Paimiut.
6. A population estimate was calculated based on a simple Peterson type estimate. Results indicated an escapement of 127,951 and total run estimate of 226,740 king salmon.
7. Based on sample data, the age and sex composition of the entire king salmon run was calculated.
8. Limited information indicates that the intensive and selective nature of the commercial fishery using 8-1/2 inch mesh gill nets results in spawning escapements of king salmon having an excess of males with relatively high percentages of 3₂, 4₂ and 5₂ age groups.
9. The use of gill nets of smaller mesh sizes would probably reduce the harvest of the more productive females and increase the harvest of the younger age groups which are predominantly males.
10. The tag-recovery project will be phased out with new emphasis directed toward monitoring escapement, quality and magnitude in tributary streams.

Chum salmon

1. Of 9,340 summer chum salmon captured, 3,049 (32.6%) were tagged and released.
2. Chum salmon mortality was extremely high in gill net catches indicating the unsuitability of this gear to obtain chums for tagging.
3. Overall tag recovery totaled 129 (4.2%).
4. The greatest percentage (62) of recoveries occurred in the Russian Mission to Grayling area. The furthest recovery was made in the Koyukuk River at Huslia, a distance of 711 river miles upstream from the mouth of the Yukon.
5. The mean migration rate of tagged fish was 12.8 miles per day.
6. The first recorded fish was captured June 8 at Flat Island. A peak catch occurred on June 29 in the Ohogamiut area.

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APPENDIX A

King and summer chum salmon gill net catches, Flat Island, Yukon River, 1970.

Date	<u>Kings</u>		<u>Chums</u>	
	Effort (hours)	Total catch	Effort (hours)	Total catch
6/ 6	48	4	48	0
7	48	5	48	0
8	48	20	48	1
9	48	21	48	1
10	48	16	48	0
11	48	79	54	18
12	48	11	72	9
13	48	6	72	9
14	48	27	72	28
15	48	35	72	43
16	48	11	72	19
17	76	104	100	236
18	14	105	32	315
19	24	30	24	13
20	24	32	30	38
21	40	79	64	244
22	48	39	74	124
23	48	4	70	126
24	48	42	72	196
25	48	85	72	316
26	48	85	72	454
27	48	18	72	30
28	48	7	72	14
29	48	32	72	15
30	48	27	72	117
7/ 1	48	4	72	45
2	48	11	72	24
3	42	3	66	33
4	48	24	72	104
5	48	19	72	58
6	48	18	72	21
7	48	12	72	34
8	48	10	72	71
9	<u>28</u>	<u>1</u>	<u>28</u>	<u>4</u>
Totals	1,544	1,026	2,150	2,760

APPENDIX B

King salmon catch data, Ohogamiut, Yukon River, 1970.

Date	Fishwheel			Gill net			Total catch	Recoveries		
	Effort (hours)	Tagged	Untagged	Total	Effort (hours)	Tagged			Untagged	Total
6/13	24	0	0	0	24	1	0	1	1	0
14	24	3	0	3	24	1	0	1	4	2
15	22	4	0	4	24	1	1	2	6	2
16	21	1	0	1	24	0	0	0	1	1
17	5	0	0	0	18	1	1	2	2	0
18	13	3	0	3	24	4	2	6	9	5
19	24	1	0	1	24	1	0	1	2	0
20	21	5	0	5	24	1	2	3	8	2
21	24	5	0	5	24	1	3	4	9	2
22	24	10	0	10	24	2	6	8	18	4
23	32	28	1	29	10	0	6	6	35	3
24	46	8	0	8	12	0	2	2	10	1
25	48	12	0	12	14	5	14	19	31	1
26	48	12	1	13	24	2	5	7	20	2
27	48	3	5	8	24	1	4	5	13	0
28	48	19	0	19	24	3	5	8	27	5
29	48	49	26	75	24	1	11	12	87	6
30	48	29	7	36	24	4	7	11	47	2
7/ 1	48	33	0	33	24	4	8	12	45	5
2	48	30	0	30	24	3	4	7	37	2
3	48	13	0	13	24	4	4	8	21	1
4	37	9	0	9	24	3	7	10	19	0
5	24	4	0	4	24	1	3	4	8	1
6	24	1	0	1	24	3	4	7	8	0
7	24	4	0	4	24	2	4	6	10	1
8	24	1	0	1	24	2	5	7	8	0
9	24	0	0	0	24	1	1	2	2	0
10	24	0	0	0	24	1	2	3	3	1
11	24	-	0	0	24	0	0	0	0	0
12	24	-	0	0	24	0	0	0	0	0
13	24	-	0	0	24	0	0	0	0	0
14	24	-	0	0	24	0	1	1	1	0
Totals	989	287	40	327	726	53	112	165	492	49

APPENDIX C

King salmon recovery data, Paimiut, Yukon River, 1970.

Date	Fishwheel			Total	Gill Net			Total catch
	Effort (hours)	Tagged	Untagged		Effort (hours)	Tagged	Untagged	
6/14	-	-	-	-	-	-	-	-
15	-	-	-	-	6	0	2	2
16	-	-	-	-	24	0	0	0
17	-	-	-	-	24	0	0	0
18	-	-	-	-	24	0	2	2
19	-	-	-	-	17	0	0	0
20	16	0	0	0	0	0	0	0
21	24	0	0	0	5	0	0	0
22	24	0	6	6	45	0	18	24
23	18	0	1	1	240	0	61	62
24	-	-	-	-	240	0	95	95
25	-	-	-	-	240	0	79	79
26	-	-	-	-	177	0	33	33
27	-	-	-	-	24	0	27	27
28	22	0	0	0	24	0	12	12
29	16	0	0	0	78	0	169	169
30	16	0	0	0	240	0	119	119
7/ 1	24	0	0	0	120	0	6	6
2	24	0	0	0	120	1	25	26
3	20	0	0	0	120	0	21	21
4	24	0	1	1	108	0	24	25
5	12	0	2	2	95	0	12	14
6	-	-	-	-	96	0	7	7
7	-	-	-	-	120	0	5	5
8	-	-	-	-	120	0	4	4
9	-	-	-	-	120	0	4	4
10	-	-	-	-	120	0	4	4
11	-	-	-	-	120	0	7	7
12	-	-	-	-	94	0	3	3
Totals	240	0	10	10	2,761	1	739	740

APPENDIX D

King salmon population estimate data and calculations, Yukon River, 1970.

<u>Subdistrict</u>	<u>Commercial catch</u>	<u>Subsistence catch</u>	<u>Total</u>
334-10	57,680	2,250	59,930
334-20	17,210	2,168	19,378
334-30	3,712	3,781	7,493
334-40	1,666	5,543	7,209
Yukon Territory	<u>2,575</u>	<u>2,052</u>	<u>4,627</u>
TOTAL	82,843	15,794	98,637

Test fishing catches

Ohogamiut = 152

Aerial survey escapement estimates ^{1/}

Andreafsky River = 1,239

Estimated number of kings passed tagging area

Number tagged - 340

Subdistrict 334-30, 334-40 and Yukon Territory subsistence
and commercial catches = 19,329

Number of recoveries ^{2/} = 45

Population estimate = $\frac{(340)(19,329)}{45} = 146,041$

Estimates of escapement above tagging area

Population estimate 146,041

Upriver catches -19,329

Estimated escapement 126,712

Total estimate of Yukon River king salmon run

Subdistrict 334-10 and 334-20 subsistence and commercial catch	79,308
Test fish catch	152
Aerial survey escapement estimate	1,239
Population estimate	<u>146,041</u>
TOTAL ESTIMATE OF KING SALMON RUN	226,740

^{1/} Chulinak River, a small spawning stream located downstream from the tagging site, was not surveyed.

^{2/} Does not include 4 tag recoveries made below the tagging site.

APPENDIX B

Age and sex composition of king salmon catchesamples, Yukon River, 1970.

Location	Gear	Age group					Total
		3_2	4_2	5_2	6_2	7_2	
Males							
Flat Island	G.N. - 5-1/2"		63(61.2) ^{1/}	21(20.4)	6(5.8)		90(87.4)
	G.N. - 8-1/2"	1(0.2)	61(10.7)	204(35.8)	91(15.9)	20(3.5)	377(66.1)
Alakanuk	G.N. - 8-1/2"		123(10.0)	410(33.3)	157(12.8)	33(2.7)	723(58.8)
Ohogamiut	G.N. - 8-1/2"		11(7.8)	44(32.2)	19(14.0)	4(2.7)	78(56.7)
	Fishwheel	7(2.6)	205(73.2)	55(19.6)	6(2.0)		273(97.4)
Palmiut	G.N. - 8-1/2"		80(13.1)	191(31.3)	105(17.2)	24(3.9)	400(65.6)
Nenana, Rampart & Tanana	G.N. - 5-1/2 & 8-1/2"		51(49.0)	35(33.7)	7(6.7)	1(1.0)	94(90.4)
	Fishwheel	2(1.7)	95(79.2)	22(18.3)			119(99.2)
Salcha River	(Carcasses)		83(44.9)	50(27.0)	6(3.2)	7(3.8)	146(78.9)
Whitehorse	Fishway		32(30.8)	47(45.2)	10(9.6)	2(1.9)	91(87.5)
Total		10(0.3)	804(23.3)	1,079(31.3)	407(11.8)	91(2.7)	2,391(69.4)
Percent total - males		0.4	33.6	45.1	17.1	3.8	100.0

APPENDIX E (continued)

Age and sex composition of king salmon catch samples, Yukon River, 1970.

Location	Gear	Age group					Total
		3 ₂	4 ₂	5 ₂	6 ₂	7 ₂	
<u>Females</u>							
Flat Island	G.N. - 5-1/2"			6(5.8)	5(4.9)	2(1.9)	13(12.6)
	G.N. - 8-1/2"			52(9.1)	136(23.9)	5(0.9)	193(33.9)
Alakanuk	G.N. - 8-1/2"			113(9.2)	364(29.6)	30(2.4)	507(41.2)
Ohogamiut	G.N. - 8-1/2"			15(10.9)	41(29.9)	4(2.5)	60(43.3)
	Fishwheel			5(2.0)	2(0.6)		7(2.6)
Paimiut	G.N. - 8-1/2"		7(1.2)	106(17.4)	83(13.6)	14(2.3)	210(34.4)
Nenana, Rampart & Tanana	G.N. - 5-1/2 & 8-1/2"			4(3.8)	5(4.8)	1(1.0)	10(9.6)
	Fishwheel				1(0.8)		1(0.8)
Salcha River	(Carcasses)			18(9.7)	18(9.8)	3(1.6)	39(21.1)
Whitehorse	Fishway			6(5.7)	6(5.8)	1(1.0)	13(12.5)
Total			7(0.2)	325(9.5)	661(19.2)	60(1.7)	1,053(30.6)
Percent total - females			0.7	30.8	62.8	5.7	100.0

APPENDIX E (continued)

Age and sex composition of king salmon catch samples, Yukon River, 1970.

Location	Gear	Age Group					Total
		<u>3</u> ₂	<u>4</u> ₂	<u>5</u> ₂	<u>6</u> ₂	<u>7</u> ₂	
<u>Combined sexes</u>							
Flat Island	G.N. - 5-1/2"		63(61.2)	27(26.2)	11(10.7)	2(1.9)	103(100.0)
	G.N. - 8-1/2"	1(0.2)	61(10.7)	256(44.9)	227(39.8)	25(4.4)	570(100.0)
Alakanuk	G.N. - 8-1/2"		123(10.0)	523(42.5)	521(42.4)	63(5.1)	1,230(100.0)
Ohogamiut	G.N. - 8-1/2"		11(7.8)	59(43.1)	60(43.9)	8(5.2)	138(100.0)
	Fishwheel	7(2.6)	205(73.2)	60(21.6)	8(2.6)		280(100.0)
Paimiut	G.N. - 8-1/2"		87(14.3)	297(48.7)	188(30.8)	38(6.2)	610(100.0)
Nenana, Rampart & Tanana	G.N. - 5-1/2" & 8-1/2"		51(49.0)	39(37.5)	12(11.5)	2(2.0)	104(100.0)
	Fishwheel	2(1.7)	95(79.2)	22(18.3)	1(0.8)		120(100.0)
Salcha River	(Carcasses)		83(44.9)	68(36.7)	24(13.0)	10(5.4)	185(100.0)
Whitehorse	Fishway		32(30.8)	53(50.9)	16(15.4)	3(2.9)	104(100.0)
Total		<u>10(0.3)</u>	<u>811(23.5)</u>	<u>1,404(40.8)</u>	<u>1,068(31.0)</u>	<u>151(4.4)</u>	<u>3,444(100.0)</u>

1/ (%)

APPENDIX F

Summer chum salmon catch data, Ohogamiut, Yukon River, 1970.

Date	Fishwheel			Total	Gill Net			Total catch	Recoveries	
	Effort (hours)	Tagged	Untagged		Effort (hours)	Tagged	Untagged			
6/16	21	3	0	3	24	0	1	1	4	3
17	5	0	0	0	18	0	0	0	0	0
18	13	9	0	9	24	0	1	1	10	2
19	24	23	0	23	24	0	1	1	24	3
20	21	75	0	75	24	1	1	2	77	6
21	24	120	5	125	24	3	1	4	129	18
22	24	109	1	110	24	2	4	6	116	13
23	32	157	233	390	10	0	0	0	390	10
24	46	160	2	162	12	0	0	0	162	9
25	48	213	11	224	14	0	98	98	322	14
26	48	233	3	236	24	0	32	32	268	5
27	48	208	9	217	24	0	3	3	220	8
28	48	237	136	373	24	0	17	17	390	10
29	48	286	1,479	1,765	24	0	134	134	1,899	8
30	48	499	1,203	1,702	24	0	115	115	1,817	9
7/ 1	48	193	607	800	24	0	68	68	868	0
2	48	135	708	843	24	0	32	32	875	1
3	48	123	524	647	24	0	29	29	676	5
4	37	72	310	382	24	0	14	14	396	1
5	24	17	47	64	24	0	20	20	84	0
6	24	23	75	98	24	0	11	11	109	1
7	24	13	33	46	24	0	6	6	52	0
8	24	27	54	81	24	0	9	9	90	1
9	24	40	31	71	24	0	22	22	93	1
10	24	11	26	37	24	0	4	4	41	0
11	24	25	36	61	24	0	6	6	67	0
12	24	11	31	42	24	0	11	11	53	0
13	24	7	15	22	24	0	17	17	39	1
14	24	7	16	23	24	0	15	15	38	0
15	24	7	24	31	24	0	0	0	31	0
Totals	943	3,043	5,619	8,662	678	6	672	278	9,340	129

APPENDIX G

Summer chum salmon recovery data, Paimiut, Yukon River, 1970

Date	Fishwheel			Gill Net				Total catch	
	Effort (hours)	Tagged	Untagged	Total	Effort (hours)	Tagged	Untagged		Total
6/22	24	0	4	4	45	0	0	0	4
23	18	0	5	5	240	0	0	0	5
24	-	-	-	-	240	0	1	1	1
25	-	-	-	-	240	0	3	3	3
26	-	-	-	-	177	0	18	18	18
27	-	-	-	-	24	0	0	0	0
28	22	0	59	59	24	0	0	0	59
29	16	0	91	91	78	0	7	7	98
30	16	0	50	50	240	0	0	0	50
7/ 1	24	0	30	30	120	0	26	26	56
2	24	1	233	234	120	0	68	68	302
3	20	1	92	93	120	0	50	50	143
4	24	0	106	106	108	0	17	17	123
5	12	0	51	51	95	0	31	31	82
6	-	-	-	-	96	0	289	289	289
7	-	-	-	-	120	0	269	269	269
8	-	-	-	-	120	0	319	319	319
9	-	-	-	-	120	0	270	270	270
10	-	-	-	-	120	0	271	271	271
11	-	-	-	-	120	0	232	232	232
12	-	-	-	-	94	0	210	210	210
13	-	-	-	-	38	0	126	126	126
Totals	200	2	721	723	2,699	0	2,207	2,207	2,930

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Summer chum salmon population estimate data and calculations, Yukon River, 1970.

<u>Subdistrict</u>	<u>Commercial catch</u>	<u>Subsistence catch</u>	<u>Total</u>
334-10	119,747 ^{1/}	27,940	147,687
334-20	17,536 ^{2/}	30,261	47,797
334-30	0	72,484	72,484
334-40	907	45,000 ^{5/}	45,907
Yukon Territory	0	0	0
TOTAL	138,190	175,685	313,875

Test fishing catches

Ohagamiut = 6,291

Aerial survey escapement estimates ^{3/}

Andreafsky River = 175,800

Estimated number of chum passed tagging area

Number tagged = 3,049

Subdistrict 334-30, 334-40 and Yukon Territory subsistence and commercial catches = 118,391

Number of recoveries ^{4/} = 129

Population estimate = $\frac{(3,049)(118,391)}{129} = 2,798,249$

Estimates of escapement above tagging area

Population estimate 2,798,249

Upriver catches - 118,391

Estimated escapement 2,679,858

Total estimate of Yukon River chum salmon run

Subdistrict 334-10 and 334-20 subsistence and commercial catch 195,484

Test fish catch 6,291

Aerial survey escapement estimate 175,800

Population estimate 2,798,249

TOTAL ESTIMATE OF SUMMER CHUM SALMON RUN 3,175,824

^{1/} Includes catches thru July 18; after this date majority of chums assumed to be fall run.

^{2/} Includes catches thru July 3; after this date majority of chums assumed to be fall run.

^{3/} Chulinak River, a small spawning stream located downstream from the tagging site, was not surveyed.

^{4/} Does not include 21 tag recoveries made below the tagging site.

^{5/} Recorded catch totaled 90,000 of which 50% are estimated as summer chums.

Age and sex composition of summer chum salmon catch samples, Yukon River, 1970.

Location	Gear	Age group			Total
		<u>3₁</u>	<u>4₁</u>	<u>5₁</u>	
Males					
Flat Island	G.N. - 5-1/2"	5(1.3) ^{1/}	191(48.2)	16(4.0)	212(53.5)
	G.N. - 8-1/2"		91(54.5)	20(12.0)	111(66.5)
Alakanuk	G.N. - 5-1/2 & 8-1/2"	1(0.2)	218(51.8)	9(2.1)	228(54.2)
Paimiut	Fishwheel & G.N. - 8-1/2"	2(0.5)	153(35.6)	8(1.8)	163(37.9)
Nenana	Fishwheel	<u>1(0.4)</u>	<u>112(49.6)</u>	<u>5(2.2)</u>	<u>118(52.2)</u>
Total		9(0.6)	765(46.6)	58(3.5)	832(50.7)
Percent total - males		1.1	91.9	7.0	100.0
Females					
Flat Island	G.N. - 5-1/2"		170(42.9)	14(3.5)	184(46.5)
	G.N. - 8-1/2"	1(0.6)	50(29.9)	5(3.0)	56(33.5)
Alakanuk	G.N. - 5-1/2 & 8-1/2"	4(1.0)	185(43.9)	4(1.0)	193(45.8)
Paimiut	Fishwheel & G.N. - 8-1/2"	1(0.2)	261(60.7)	5(1.2)	267(62.1)
Nenana	Fishwheel	<u>3(1.3)</u>	<u>103(45.6)</u>	<u>2(0.9)</u>	<u>108(47.8)</u>
Total		9(0.6)	769(46.9)	30(1.8)	808(49.3)
Percent total - females		1.1	95.2	3.7	100.0
Combined sexes					
Flat Island	G.N. - 5-1/2"	5(1.3)	361(91.2)	30(7.5)	396(100.0)
	G.N. - 8-1/2"	1(0.6)	141(84.4)	25(15.0)	167(100.0)
Alakanuk	G.N. - 5-1/2 & 8-1/2"	5(1.2)	403(95.7)	13(3.1)	421(100.0)
Paimiut	Fishwheel & G.N. - 8-1/2"	3(0.7)	414(96.3)	13(3.0)	430(100.0)
Nenana	Fishwheel	<u>4(1.7)</u>	<u>215(95.2)</u>	<u>7(3.1)</u>	<u>226(100.0)</u>
Total		18(1.2)	1,534(93.5)	88(5.3)	1,640(100.0)

^{1/} (%).

APPENDIX J

Daily king salmon escapement counts, Whitehorse dam fishway, Yukon River, 1970.

Date	Daily count	Cumulative total
8/ 2	1	1
3	3	4
4	1	5
5	1	6
6	6	12
7	6	18
8	6	24
9	23	47
10	30	77
11	31	108
12	28	136
13	66	202
14	82	284
15	29	313
16	33	346
17	69	415
18	21	436
19	75	511
20	49	560
21	16	576
22	19	595
23	15	610
24	7	617
25	5	622
26	2	624
27	1	625
28	0	625
29	0	625
30	0	625
31	Gate opened	625 Total

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