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Studies on the freshwater and anadromous fishes of the Yukon River within Canada

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STUDIES ON THE
FRESHWATER AND ANADROMOUS FISHES
OF THE
YUKON RIVER WITHIN CANADA

By:

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ABSTRACT

Characteristics of the adult chinook and chum salmon populations of the Yukon River within Canada are described. Significant differences were found between the composition of the catch and the composition of the escapement in terms of sex and length. It is hypothesized that any change in the fishery from wheels to gillnet will result in greater catch of larger size fish and also of females. Such a change may have severe consequences on the reproductive capacity of the populations.

Ten fish populations, other than adult salmon, are described for an area from Tatchun Creek to Fort Selkirk. Salmon is the most abundant fish, with longnose sucker, Arctic grayling and slimy sculpin occurring in this order. Growth data are presented for some species. In general, the growth of fish in the Yukon River is slower than that in tributary streams and other waterways of the territory.

The predictive value of pre-determining the location of salmon spawning habitat based on pinpointing areas that are ice-free and/or have ground water intrusion was nil. Areas of salmon spawning were found by observing spawners. The areas are classified into five groups. Main stem water temperatures and transparencies are given. It is postulated that any change in the water temperature and, particularly water level in the main stem of the Yukon River, may have serious detrimental effects on salmon spawning and reproduction.

Historically, the fish resources of the Yukon River system were of tremendous value to the native, explorer, farmer and developer. The salmon is the most important fish today with an estimated 10,000 - 20,000 taken annually in the commercial, subsistence and domestic fisheries.

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INTRODUCTION

The purpose of this report is to provide a comprehensive evaluation of baseline information on the fish resources, both freshwater and anadromous, in the Yukon River within Canadian jurisdiction. The report presents the findings of the 1975 program for the study areas between Fort Selkirk and Tatchun Creek and near Dawson City, incorporates data collected in 1974 and 1973 during salmon tagging programs for comparison purposes and presents historical catch statistics and timing of salmon migrations in the Dawson City area from 1930 to 1950.

The Yukon River is the fifth largest waterway in North America. The upper drainage arise in the boundary area of British Columbia and Yukon Territory. The river flows north and west, approximately 1,900 miles, through the Yukon Territory and Alaska to enter the Bering Sea. That segment of the Yukon River within Canada lies between 1,400 and 1,900 miles upstream of the Bering Sea (Figure 1). The report is directed to this section of the Yukon River. The most important northern tributary system to the Yukon River, namely the Porcupine River, lies almost entirely north of the Arctic Circle. This system was studied from 1971 to 1975 in connection with the MacKenzie Valley Pipeline, and several reports have been submitted on that program (Appendix A). The only data from the Porcupine River referred to in this report are the abundance and fork lengths of chum salmon in the Fishing Branch River, a headwater tributary of the Porcupine River.

The Yukon River and adjacent lands have in the past, and will continue to serve in various ways toward the economic development of the Yukon Territory. For example, generation of hydro power, gold from

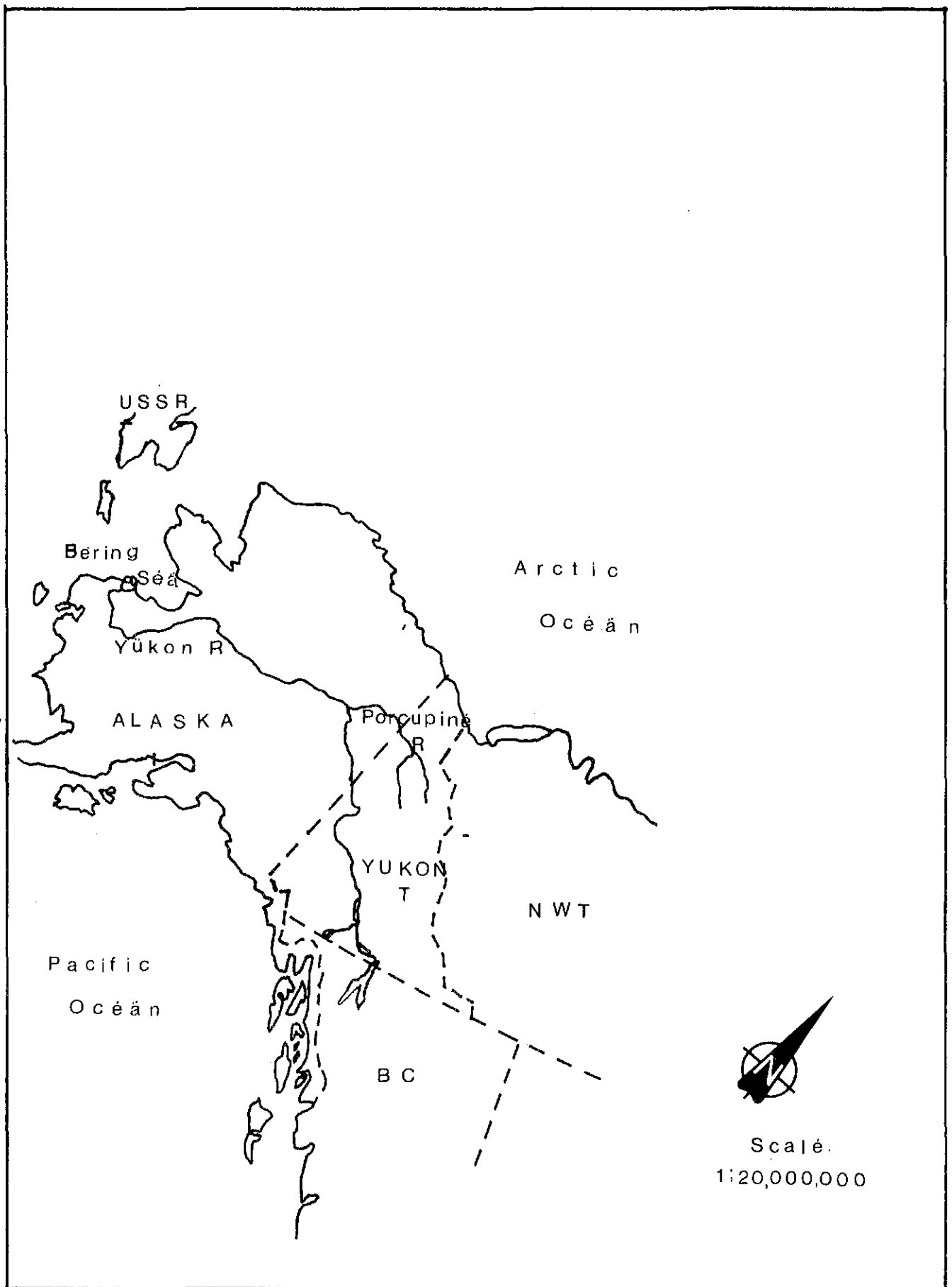


Fig. 1: Site map of the Yukon River.

historically important and newly discovered stream beds, and mining and smelting of ore, are but a few activities that may affect this main waterway. In addition, conflicts may arise from greater demands for salmon for commercial and recreational activities. In anticipation of environmental concerns arising from one or more of these developmental or operational activities and foreseeing a greater regulatory need, it is imperative that more detailed knowledge of the fishes be compiled. In response to these future needs, the Fisheries and Marine Service commenced a continuing program in 1972 to collect information that hopefully will serve as the basis for good resource management.

The overall objective of the Fisheries Service programs is to more accurately assess the aquatic resources in the Yukon River. To accomplish this, the following sub-objectives have been identified:

- (1) to determine species composition and absolute or relative abundance of the fish stocks;
- (2) to collect baseline information on the fish populations; sex and size composition, growth, sexual maturity, diets and migration routes and timings;
- (3) to identify biological critical areas, particularly those associated with spawning, overwintering and rearing;
- (4) to assess resource use;
- (5) to measure some physical and chemical parameters of the aquatic environment and relate these to productivity.

As a first step in this long-range plan, an inventory of resources was initiated in 1972 in the Teslin and Carmacks areas. Secondly, the abundance, distribution and timing of salmon were studied in 1973 and 1974 at, and upstream from, Dawson City. The published reports include: Northern B.C. & Yukon Division (1973), Walker et al (1974), Sweitzer (1974), and Brock (1976). In 1975, a more detailed study on all fish species within the Yukon River was carried out. However, special emphasis was directed to salmon in terms of composition

of the commercial catch near Dawson, composition of the escapement near Whitehorse and location of mainstream spawning grounds between Fort Selkirk and Tatchun Creek.

II

ADULT SALMON POPULATIONS

INTRODUCTION

The salmon of the Yukon River have long been important for commercial, subsistence and/or domestic uses. The extent of the fisheries is described under Resource Use. There is interest in increasing the commercial catch substantially. Further, sport fishing is becoming more intense and will add further stress to the resource. Consequently, one purpose of this study is to identify the various components or races (race is defined as a group of fish which utilize a common environment and participate in a common gene pool) of the salmon populations and determine their current and potential levels of utilization. The second purpose is to increase knowledge on the biological critical areas of the salmon in fresh water. In this way, good regulatory management can be maintained in the fisheries and better protection provided with environmental concerns that may arise.

The studies by Sweitzer (1974) and Brock (1976) provided the first firm information on magnitudes of population passing Dawson City. The 1975 field activities were carried out to measure the sex, length and age structures of the catch at Dawson City and also of the escapement or spawning stock upstream of Dawson City. Also, effort was directed to identify spawning populations between Tatchun Creek and Fort Selkirk and upstream of Lake Laberge. Total coverage of the Yukon watershed within Canada was not possible because of limitations in funds for transportation, available time and personnel resources.

STATE OF KNOWLEDGE

Chinook Salmon:

The magnitude of the chinook salmon population entering the Dawson City area has been estimated as follows:

1973	29,000	Sweitzer, 1973
1974	20,000	Brock, 1976

The population is probably slightly greater than these figures indicate in that the tagged group was very largely represented by small size fish. This resulted from the use of fishwheels to capture fish for tagging. (This is discussed in detail later in the paper.) Nevertheless, the above figures are the most reliable values that are available.

A count of chinook salmon at the fish passage facilities of the Whitehorse hydro facility has been obtained since 1959 and provides knowledge of the run spawning upstream of this point. These annual counts represent the only consistent data on chinook salmon escapement in Canadian waters. It must be kept in mind, however, that this population may be adversely affected by the Whitehorse hydro facility and consequently not reflect the trend of escapement of the Yukon River chinook salmon population in Canada as a whole. The population has decreased from 1,000-2,000 to 200-500 in the period 1959-1975.

Detailed information on this run is presented by Brown et al, 1976.

The abundance of chinook salmon on the spawning grounds has been estimated for a varying number of areas since 1959; however, the same streams have not necessarily been surveyed each year. Also, the number of spawners has been estimated for sections of spawning streams to provide indices of abundance. The time of survey and light and water conditions have varied widely, and these factors strongly influence the accuracy of the estimates; therefore, the data may not be valuable except

in a very gross way. In other words, good quantitative data on spawning stocks is lacking, exclusive of that above Whitehorse. However, spawning ground surveys have been most valuable in obtaining a distributional picture of chinook salmon spawning in tributary waters. This has been identified with 50 tributary streams (Fig. 2). Main stream spawning (Yukon River) had been acknowledged but was of unknown quantity. A spawning population was found at Ingersol Island in 1973; however, attempts to quantify it in 1974 and 1975 failed.

A measure of time of entry of adult salmon into Canadian waters is provided by catch records for a fishwheel located at Fortymile in the period 1933 - 1950. Notes accompanying the data do not indicate what factors outside of run size may have affected the catch such as effort, debris load, water level, and water transparency. The catches made in a wheel to obtain fish for tagging in 1973 and 1974 provide information on timing for these years.

The data shows that the 5 percent and 95 percent limits of migration have on the average occurred on July 17 and August 7 respectively (Table 1). Considerable variability exists around these dates; for example, the 5 percent migration level varied from July 8 to July 23 and the 95 percent level from July 29 to August 15. The 50 percent point of migration occurred within the period of July 14 to August 3, with July 23 being the average date. On a superficial basis, i.e., without statistical treatment, there is no apparent cyclic pattern in the time of appearance at Dawson-Fortymile (Appendix Table B). At the Whitehorse fishway, the date of 50 percent migration ranges from August 9 to August 19, with a mean date of August 13. Time of spawning generally occurs in the latter half of August and the first half of September.

Chum Salmon:

The chum salmon population migrating through the Dawson City area has been measured as:

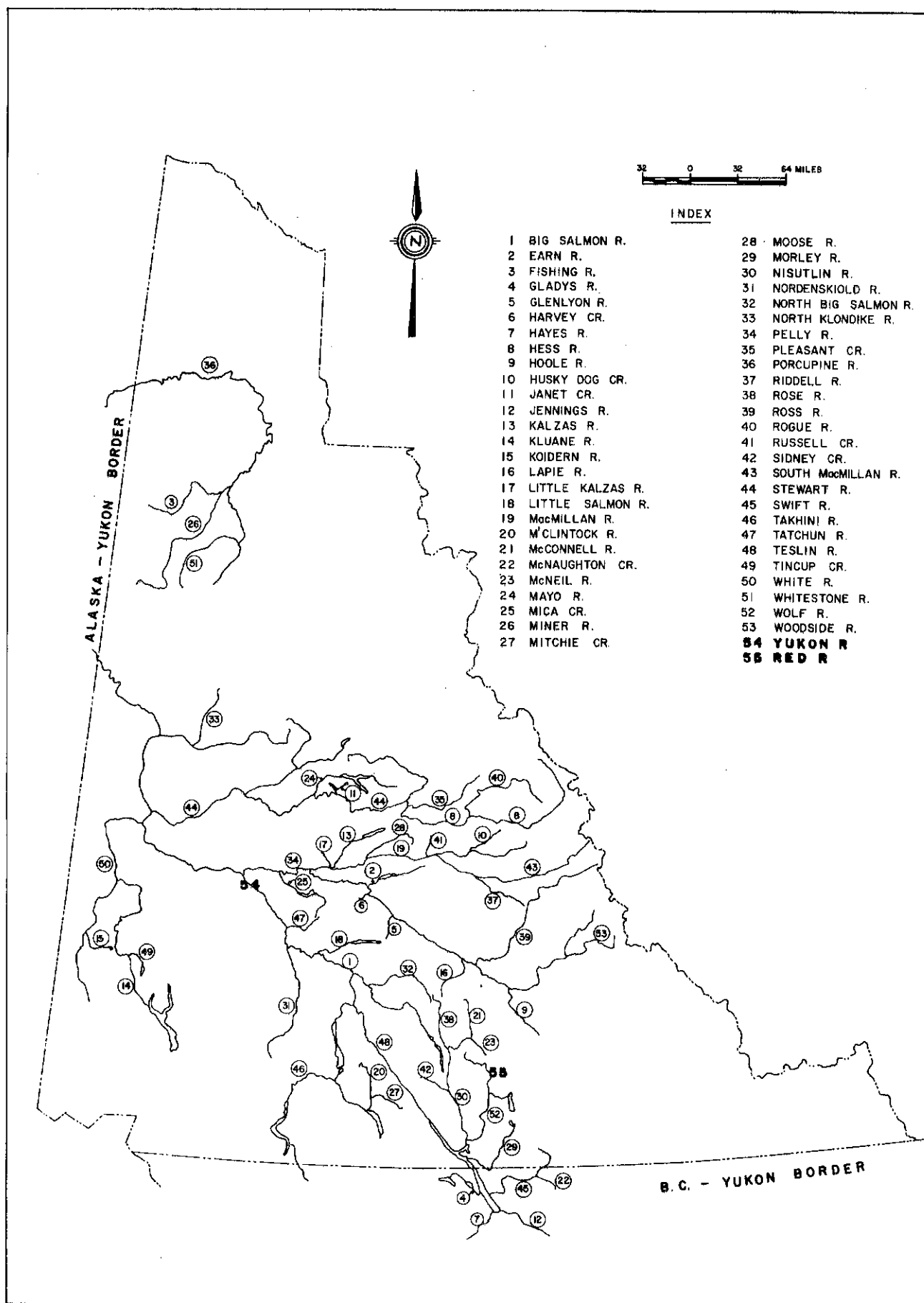


Fig. 2. Streams having spawning populations of salmon in the upper Yukon River system.

Table I. Dates of occurrence at the 5 percent, 50 percent and 95 percent limits of migration for chinook salmon in the Dawson City-Forty Mile area, 1933-1950 and 1973-1974.

Year	5%	50%	95%	Peaks
1933	July 18	July 26	Aug. 9	July 23
1934	July 12	July 20	Aug. 2	July 15
1935	July 15	July 20	July 31	July 18
1936	July 9	July 21	Aug. 11	July 27
1937	July 19	Aug. 3	Aug. 9	July 29
1938	July 15	July 26	Aug. 12	July 24
1939	July 19	July 25	Aug. 7	July 22
1940	July 10	July 18	July 29	July 18
1941	July 10	July 20	Aug. 2	July 18
1942	July 8	July 14	July 25	July 11
1943	July 17	July 23	Aug. 8	July 20-21
1944	July 17	July 23	Aug. 9	July 22
1945	July 16	July 23	Aug. 9	July 22
1946	July 14	July 21	Aug. 3	July 18
1947	July 17	July 27	Aug. 7	July 28
1948	July 23	July 28	Aug. 6	July 26
1949	July 23	Aug. 2	Aug. 9	Aug. 5
1950	July 13	July 22	Aug. 5	July 15
1973	July 19	Aug. 1	Aug. 15	July 28&29
1974	July 13	July 25	Aug. 5	July 24&27

1973	40,000	Sweitzer, 1974
1974	30,000	Brock, 1976

There is good reason to believe that chum salmon in 1975 were far more numerous than in the previous two years, but unfortunately, no reliable estimate can be placed on their abundance. (The fishery on chum salmon operates on the basis of need, mood of the people and also the weather; consequently, the effort varies significantly from year-to-year. Therefore, the catch does not provide an index of abundance.)

Population estimates of spawning chum salmon in the Fishing Branch River, Porcupine River system were: (1973) 16,000 (1974) 32,000 and (1975) 353,000 (Elson, 1975). If the chum salmon population in the main Yukon River follows the same pattern as that in the Porcupine River, the abundance at Dawson City in 1975 would have been in the order of 300,000 - 400,000. A four-year cycle appears to exist in the Porcupine River population, and it is not unrealistic to consider the same pattern for the chum salmon passing Dawson City.

The spawning distribution of chum salmon is not as well known as that for chinook salmon. Sweitzer (1974) netted relatively good numbers in the White River where the only known spawning area is Kluane River. He also netted relatively good numbers in the Yukon River at Carmacks; however, the only known spawning streams above this point are the Little Salmon and Teslin Rivers. Spawning in the Stewart and Pelly Rivers is sparse based on 1973 netting results.

Chum salmon migrate through the Dawson City area from late August to late September, or approximately five weeks later than chinook salmon. There is very little overlapping of the two salmon species in times of occurrence.

During fishing operations in 1973 and 1974 to obtain fish for tagging, the chum salmon catches at the 5 percent, 50 percent and 95 percent limits were as follows (Dawson City):

	5%	50%	95%	Source
1973	Aug. 25	Sept. 5	Sept. 25	Sweitzer, 1974
1974	Aug. 24	Sept. 10	Sept. 29	Brock, 1976

Chum salmon do not migrate through the Whitehorse fishway, and data on catches made in the subsistence fisheries is not sufficient to provide information on timing. In 1973 a gillnet operated by fisheries personnel, 20 river miles upstream of Carmacks (278 mi. upstream of Dawson), caught 338 chums with the following timing: 5 percent - Sept. 18; 50 percent - Sept. 28; 95 percent - Oct. 16.

Chum salmon spawning allegedly occurs from mid-September to early November. The relatively long period of spawning is probably related to the great variability in habitat selected for reproduction. This is given in some detail later in the report.

METHODS OF 1975 SURVEY

In 1975, the commercial fishery was sampled at Dawson City for chinook salmon from July 18 to August 9. Totals of 632 wheel-caught and 322 net-caught fish were examined for sex and length (tip of snout to fork of tail). Scale samples were removed from 215 wheel and 102 net-caught chinook salmon.

A search for spawning chinook salmon was carried out from August 18 to September 18 in a 56 mile distance between Tatchun Creek and Fort Selkirk, 226 and 282 miles respectively downstream of Whitehorse. Simultaneous surveys were conducted throughout the Whitehorse area upstream of the outlet of Lake Laberge (Mi. 58). The chum salmon spawner study was confined to the former described area (Fig. 3). Observation from boats was the principal method employed to locate and estimate main-stream spawner populations. Usually, two or three boats were utilized on each daily survey within a search area. Information on "rollers" (roller is a fish which surfaced briefly), live spawners and dead spawners were noted on navigation maps with a length scale of approximately one inch to one mile but with the river width exaggerated¹. Although effort was

¹Yukon channel charts.

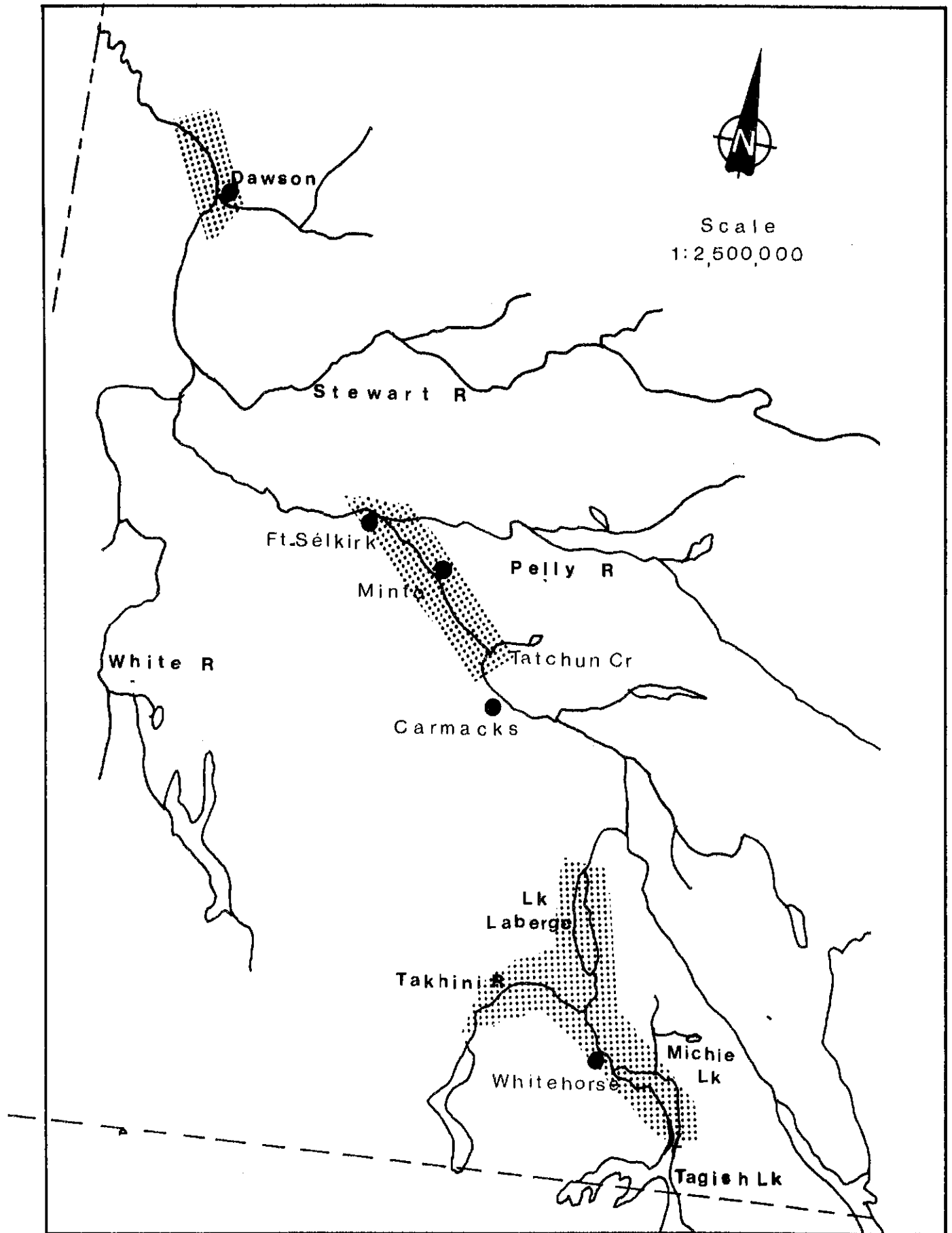


Fig. 3: Study areas of the Yukon River in 1975.

made throughout the study area, those areas which had been identified beforehand as potential spawning areas, i.e., they were open during the winter and/or had clear water flows (see Chapter IV for more detail) or had the physical attributes of a salmon spawning area, received the greater emphasis. However, gillnets were drifted in known and suspected spawning areas to capture spawners (loose sex products, eroded tail) for information on sex and length. This method was not generally effective in catching fish and does not appear in the results.

Forty fish were netted and tagged with surveyor ribbon at one site in the Ingersol Islands to obtain a tagged : untagged ratio for enumeration purposes. Insufficient returns were obtained, however, on which to make reliable estimates. Wherever possible, dead fish were recovered by gaff for identification of sex and measurement of length. Tatchun, McGregor, McCabe, VonWilczek and Big Creek were walked in the period August 20 to September 5. Tatchun Creek was surveyed four times and all other streams on one occasion.

At Whitehorse, 39 chinook salmon had sonic tags inserted into the esophagus-stomach region at the time of passage through the fishway to obtain electronic evidence of salmon distribution upstream of the dam. Up to this time, Michie Creek was the only documented spawning area. The delicate nature of the musculature demanded that the tags be inserted in the throat only to a point where the tag was barely visible. If these precautions were not taken, the tag punctured the muscle tissue and entered the body cavity. At least one death was known to occur following this occurrence. Because of the risk of causing death, male fish only were selected for tag insertion. Details of the study based at Whitehorse are given by Brown (1976).

One recording monitoring device was placed in the Tagish River from August 20 to September 10 to check for migration of fish into this stream. A portable monitor was utilized occasionally to locate tagged fish in the Yukon River between Marsh and Schwatka Lakes. A survey was conducted by helicopter on the Michie-McClintock system on September 4

to obtain a count of spawners. Surveys were made by watercraft at the outlet of Lake Laberge and on the Takhini River.

Chum salmon were identified to sex and measured for length at Dawson in the periods of September 12 and September 22 - September 27. Samples sizes were 65 wheel-caught and 246 gillnet-caught fish. A total of 65 scales were removed for age determination.

Chum salmon spawners were sought from Fort Selkirk to Tatchun Creek in the period September 29 to October 7 utilizing watercraft. Aerial observations were made in the same area on October 17 and October 23 by fixed wing and helicopter aircraft respectively, to obtain counts of spawners and gauge the distribution of spawning. The fixed wing flight was made at 200 to 500 feet and 85 to 90 knots. Particular attention was given to side channels where out-flows of groundwater were observed during June, 1975, and/or where spawning had been reported previously.

RESULTS

Chinook Salmon

Sex, length and age composition

In 1975, male fish predominated in the Yukon fisheries, occurring at 93 percent. The high percentage of male fish in the catch was also seen upstream at Fort Selkirk where one net had 98 percent male fish in the catch. At the Whitehorse fishway, 495 river miles upstream of Dawson fishery, the male fish were far less dominant; here they represented 54 percent of the population. This pattern of high occurrence of males in the fisheries to a much reduced occurrence at Whitehorse was also observed in 1973. In dead recovery on or near the spawning grounds, female fish were overall more abundant than male fish (Table II). This may have been due to the tendency of females to stay on or near the place of spawning until death.

TABLE II

Percentage of males in samples of chinook salmon in 1973 and 1975.

<u>LOCATION</u>	1973		1975	
	<u>Sample size</u>	<u>% Male</u>	<u>Sample size</u>	<u>% Male</u>
Dawson fishery	455	86	954	93
Upstream				
Fort Selkirk (GN)			55	98
Carmacks (GN)	730	85		
Pelly & Stewart (GN)	233	72		
Whitehorse fishway	224	52	312	54
Spawning grounds				
Yukon R. mi. 269-272			30	43
Yukon R. mi. 241-268			30	67
Yukon R. mi. 235-240			33	51
Takhini River			16	50
Tatchun Creek			70	33
L. Salmon			7	43
			186	45

GN = gillnet.

SD = spawning ground dead

A dominance of males in the population can be expected. The shorter ocean residence of male fish favours higher survival at time of entry to the Yukon River because of lesser natural and ocean fishing mortalities. Another factor for the higher occurrence of males in the catch may be that the male fish is generally smaller, and smaller fish may seek river-side waters for upstream travel and thus be more vulnerable to shore-based gear such as wheels and gillnets than the larger fish.

The amount of data available for individual mesh size is too limited for use. Other workers have demonstrated a direct relationship between mesh size and length of fish--the larger the mesh, the larger the size of fish caught. Most importantly, to the Yukon fisheries, the larger mesh size because it catches larger fish, increases the opportunity to capture female chinooks. A significant increase in the use of large mesh size nets may result in an increase in the fishing rate of female fish and thus put the population in jeopardy by removal of the important egg-bearing fish. Sufficient data does not exist in the 1975 study to illustrate this point; however, information collected two years earlier during the operation of a net with multi-mesh sizes by Fisheries personnel at Carmacks had the following results:

<u>Mesh size</u>	<u>Sample size</u>	<u>% Males</u>
4-1/2"	44	93
5-1/2"	30	77
6-1/2"	28	50

In the Dawson fishery in 1975, male chinook demonstrated much greater variance in length than did female fish. For example, 95 percent of the lengths of males appeared in the range of 52 to 90cm, whereas, those for females at 75 to 100cm. This great difference in length range between the sexes was also seen in 1973 (Sweitzer, 1974). Within the specified ranges, the male population showed two size modes up to 85cm and a scattering above this point (Fig. 4).

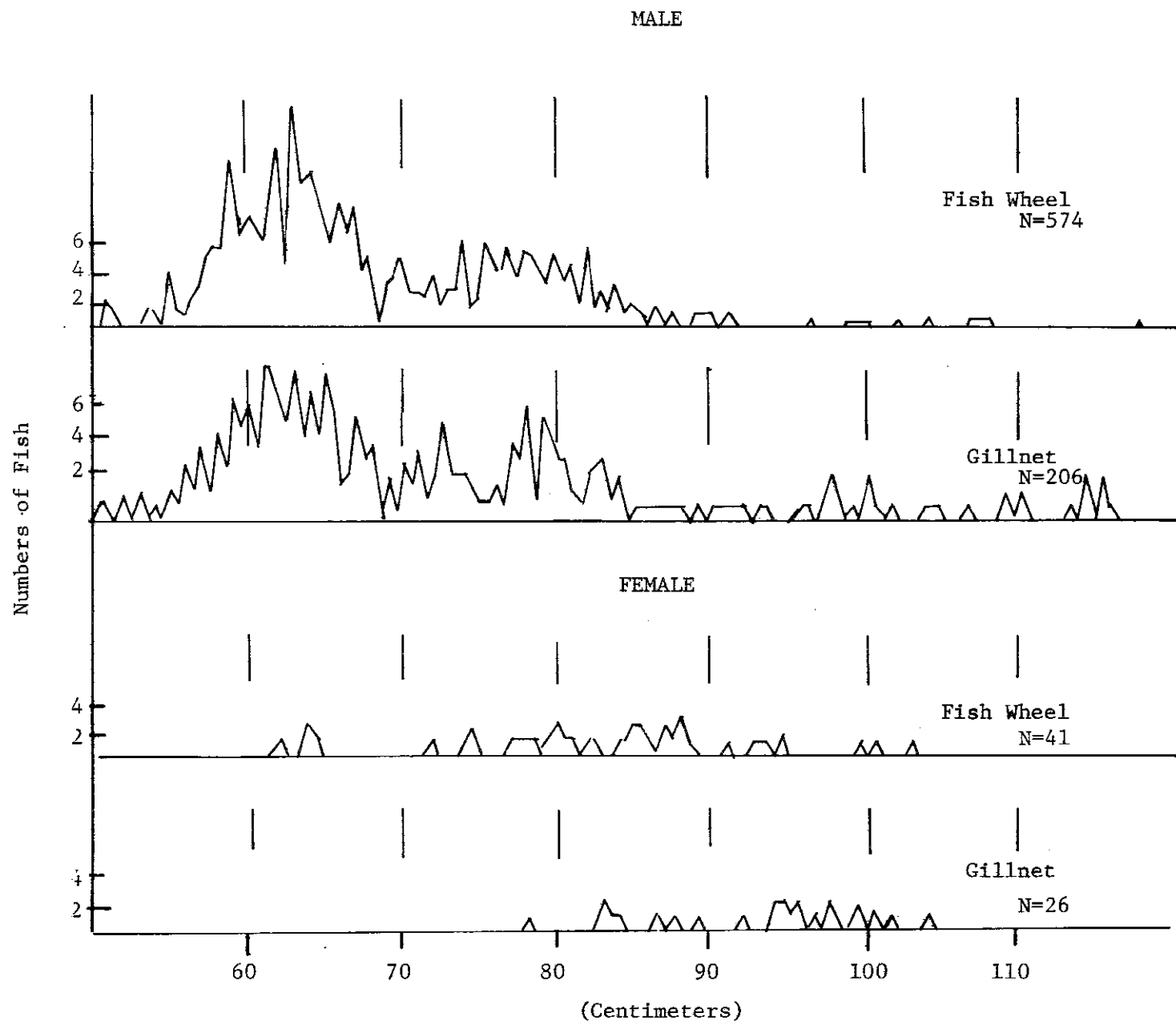


Fig. 4. Lengths of male and female chinook salmon caught in fishwheels and gillnets at Dawson City in 1975.

The fishwheel currently accounts for approximately three-quarters of the catch made within 40 miles of Dawson City. The other method of capture is the gillnet, the mesh sizes of which generally range from 4-1/2 inches to 7 inches, stretched measure. Greater use of the gillnet, particularly larger mesh sizes, is being given consideration by fishermen in order to harvest larger size fish.

A comparison of the lengths of male chinook salmon sampled from the two types of fishing gear in 1975 shows similarity in that the two major length groups appeared in the catches of both gear in about the same proportion. However, the data also shows that the gillnet sample contained a slightly higher proportion of large fish, i.e., > 90cm., than did the wheel sample (Fig. 4). In the case of female fish, the sample caught by fishwheel definitely contained smaller fish than that for gillnet.

The length structure of the male fish during migration at Dawson City in 1975 showed differences in length with time. The larger males were most abundant at the beginning of the run and decreased in relative abundance as the season progressed. On the other hand, the small size group which was virtually absent at the start of migration, increased in abundance with time (Fig. 5). Small sample sizes precludes an examination on the female fish.

This demonstrates that in order to obtain representative measurements of the run, sampling should be carried out over the full time of migration, or at least several times during the run.

When the study of length is extended to the escapement, the same large range for the male and small range for the female fish is seen. However, there exists significant differences between the various samples in the escapement. A casual examination of the lengths indicate that spawners in small size streams such as Tatchun Creek, Michie Creek¹

¹The data for Michie Creek is that taken on fish at the Whitehorse fishway. Michie Creek has long been recognized as the principal spawning area for these fish.

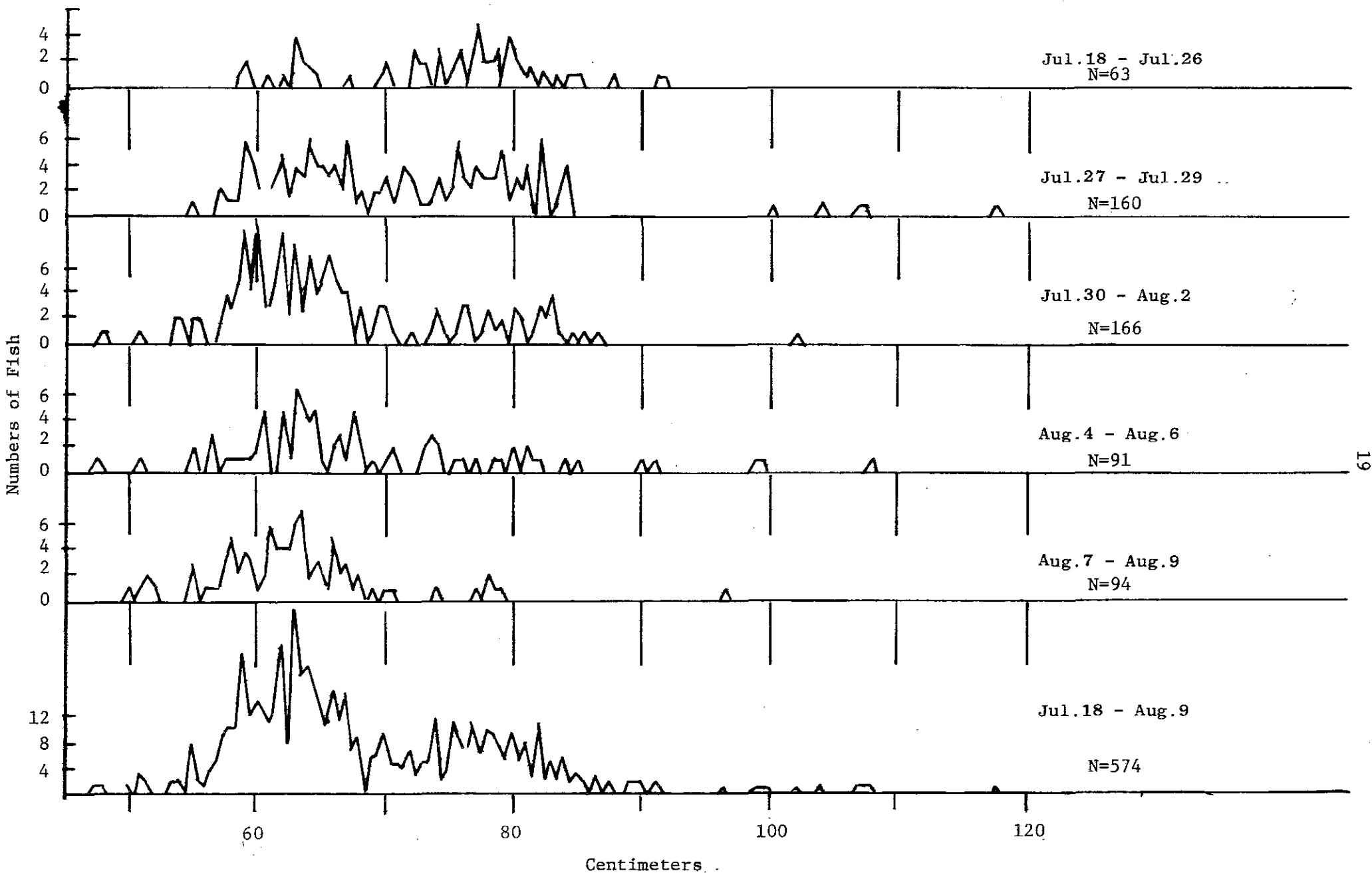


Fig. 5. Lengths of male chinook salmon caught by fishwheel at different periods in 1975.

and Little Salmon River were smaller on the average than those in the large bodies of water such as Yukon and Takhini Rivers. This difference is well seen when the length data are pooled as shown in Fig. 6.

A further significant point is that the lengths of fish sampled in the catch differ from those appearing in the escapement. The escapement fish exhibit a higher size range and on the average are larger than those in the catch (Fig. 7).

Interesting, male fish in the escapement have the dominant length grouping in the order of 700 to 900 mm whereas this group was of second importance in the fishery sample.

The data indicates the fishery to be highly selective toward small size chinooks. The small size fish have not yet been found in the escapement. To identify the source of the small size fish, more extensive spawning ground work, with particular emphasis on sampling for sex and length, is required.

The age of the Yukon River chinook salmon ranges from IV to VII. This is interpreted as four years and seven years, respectively, from egg deposition to adult return. The male fish are usually dominant in ages IV or V. Age VI is of second importance at best. A small representation appears in age VII. The female fish, on the other hand, are largely age VI.

It is not possible to provide a reliable summary on the annual percentage occurrence of age groups for the whole population because of lack of information on the actual occurrence of the size (age) groups.

Spawning Distribution, Abundance and Grounds.

The seasonal cumulative counts of live and dead chinook salmon in the Yukon River from Tatchun Creek to Fort Selkirk amounted to 72 and 98 respectively (Table III). Fish were not seen on redds. The live count represents "rollers" observed August 28 and later. It was thought

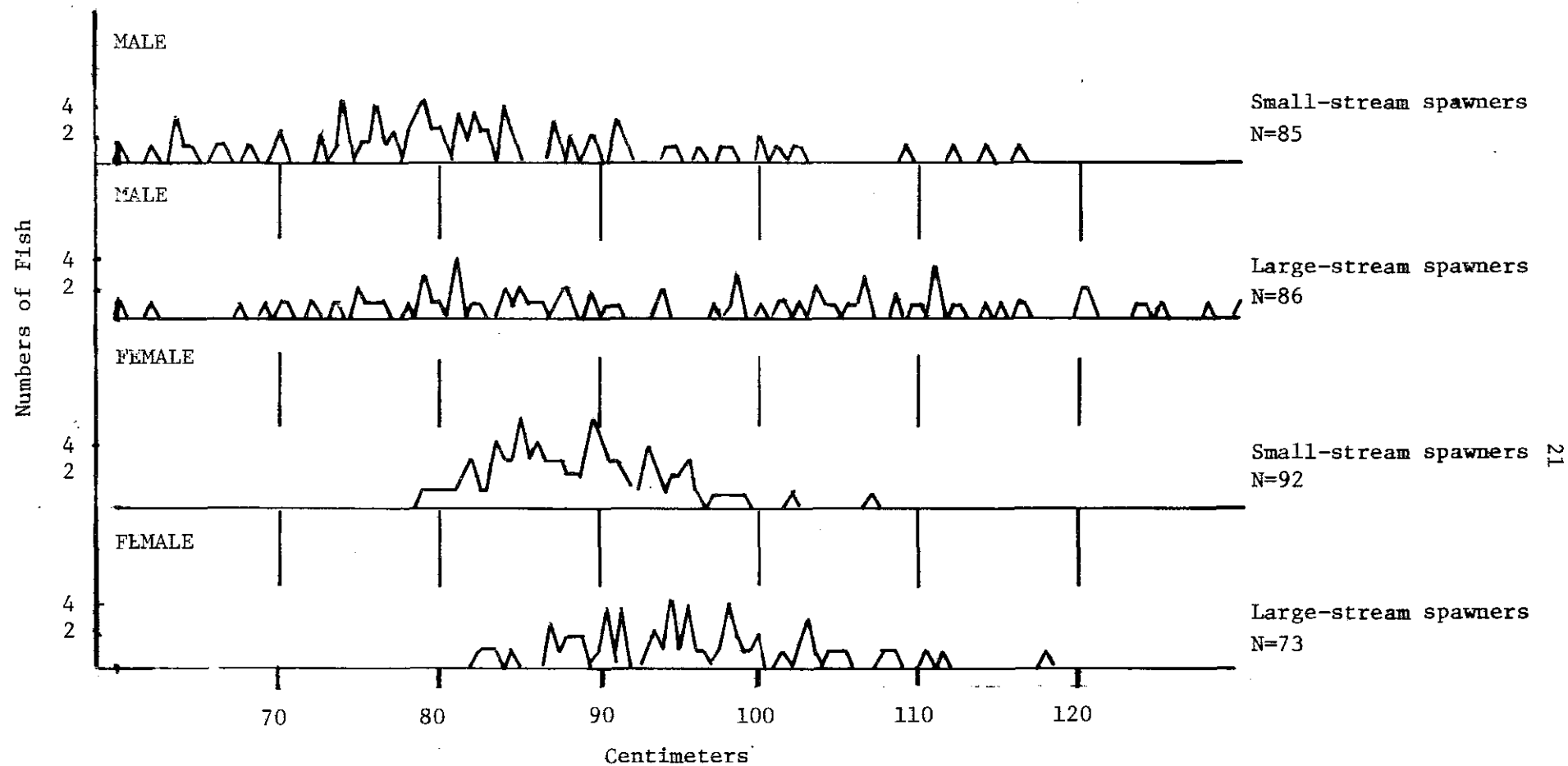


Fig. 6. Lengths of male and female chinook salmon in two components of the escapement in 1975.

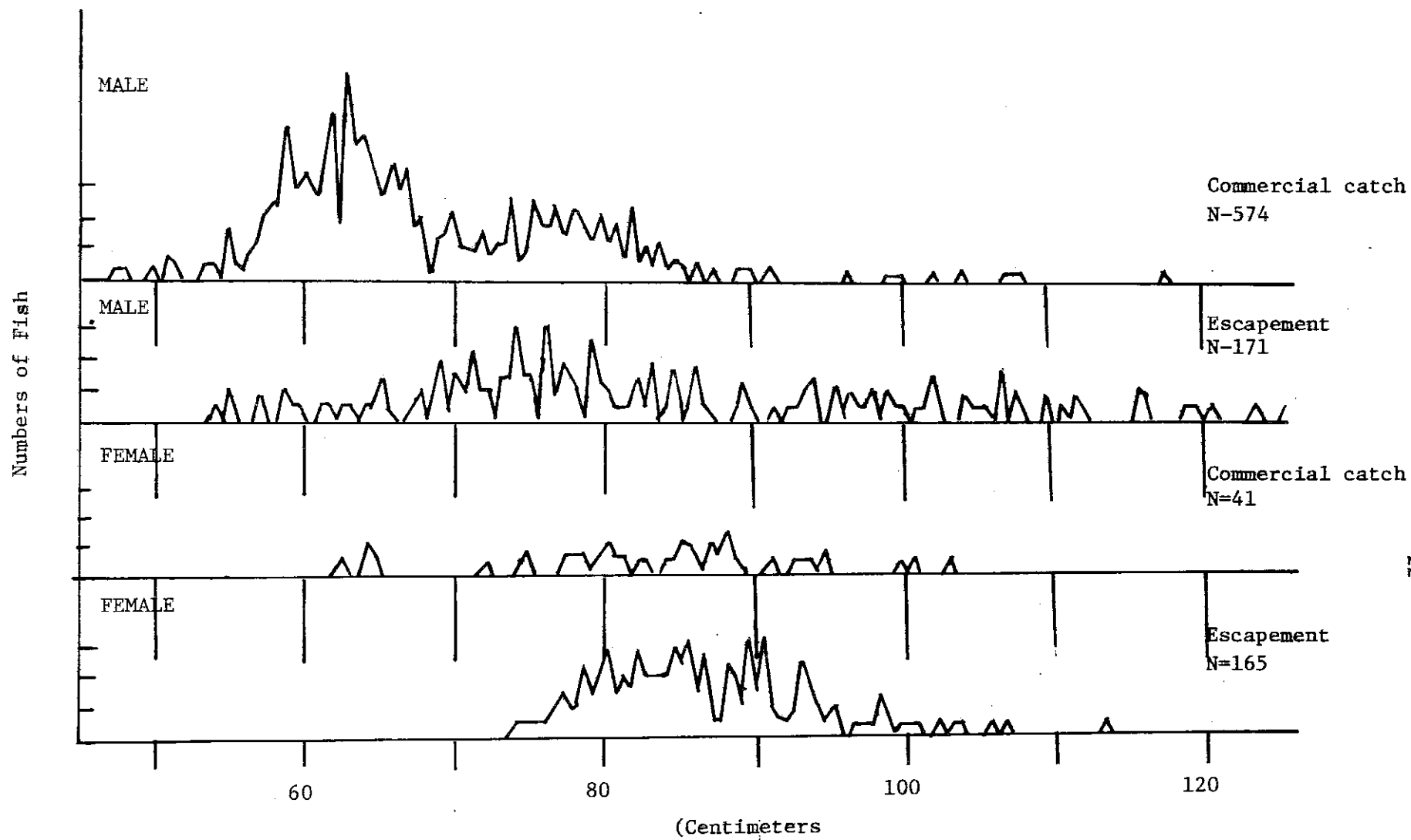


Fig. 7. Lengths of chinook salmon in the commercial catch and escapement in 1975.

TABLE III. Seasonal counts of chinook salmon in the Yukon River from Tatchun Creek to Fort Selkirk in 1975.

	<u>Live¹</u>	<u>Dead</u>
Mi. 226-228	0	0
228-230	0	0
230-232	0	0
232-234	2	5
234-236	3	7
236-238	2	21
238-240	2	1
240-242	2	4
242-244	1	0
244-246	1	0
246-248	1	3
248-250	0	2
250-252	0	2
252-254	4	3
254-256	3	3
256-258	1	1
258-260	0	1
260-262	1	1
262-264	0	1
264-266	0	0
266-268	2	10
268-270	36	16
270-272	10	8
272-274	1	7
274-276	0	0
276-278	0	1
278-280	0	1
280-282	0	0
	<u>72</u>	<u>98</u>

¹Visuals Aug. 28 and later.

that fish would be occupying redds by that time. The distribution of sightings on live fish and the locations of dead fish suggests two principal areas of spawning; namely, miles 234 - 238 (Yukon Crossing) and miles 268 - 272 (Hells Gate Slough) (Fig. 8). Smaller populations appeared to have spawned at miles 232 - 236, miles 240 - 242, miles 252 - 256, and 266 - 268 (Devils Crossing)¹.

Of the five tributary streams examined in the area from Tatchun Creek to Fort Selkirk, only Tatchun Creek had chinook salmon (Table IV). The abundance and distribution of spawners in Tatchun Creek is given in Fig. 9.

In looking at chinook salmon from the outlet of Lake Laberge and upstream of that area, the highest count of spawners was obtained in Takhini River (Table V). Michie Creek was second with 35 observed, and this figure is extrapolated to 105 based on results of counts made by aircraft and foot survey for one section of stream on the same date in which a 1:3 ratio was established. Takhini River and Michie Creek have long been recognized as salmon spawning areas. Two other areas are suspected as serving as spawning areas; these are the section of the Yukon River from the outlet of Marsh Lake to Schwatka Lake and the Tagish system. The electronic monitoring apparatus confirmed the presence of tagged fish in the Yukon River below Marsh Lake and in Tagish River in 1975. The tape removed from the Tagish River monitor has yet to be interpreted, therefore no measurement of number of contacts is available.

Time of Spawning

The first dead in the Yukon River were counted on August 28, and dead were seen up to and including the final day of survey on September 8. Peak spawning may have occurred in the last part of August and the first 10 days of September. Chinook salmon were present in Tatchun Creek at the time of the first survey on August 20 and as

¹Lack of knowledge on the precise location of chinook spawning areas precluded making measurements on same. "Rollers" appeared consistently in waters of 4' to 8' in depth with moderate flows and having a ripply but unbroken water surface.

TABLE IV. Counts of chinook salmon in tributary streams from Tatchun Creek to Fort Selkirk in 1975.

Place	Date	Live	Dead	Remarks
Tatchun Creek	Aug. 20	91	0	
	Aug. 27	166	9	spawning at height
	Aug. 30	112 4	21	(Err.)
	Sept. 5	19	40	
McCabe Creek	Aug. 21	0	0	practically no water
McGregor Cr.	Aug. 22	0	0	
Von Wilczek Cr.	Aug. 24	0	0	bed dry in some areas
Big Creek	Aug. 24	0	0	

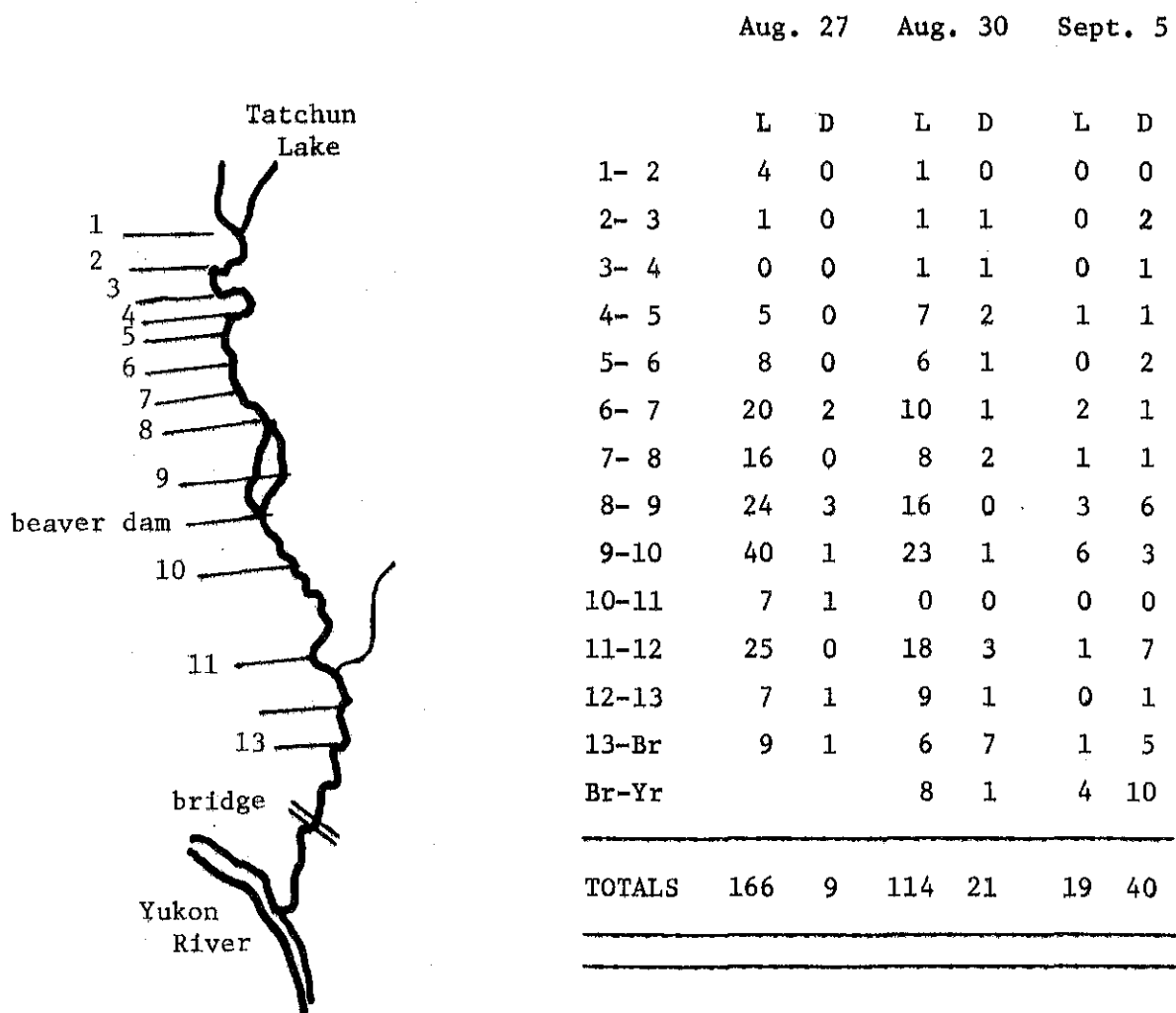


Fig. 9. Distribution and abundance of chinook salmon in Tatchun Creek in 1975.

TABLE V. Counts of chinook salmon from the outlet of Lake Laberge to Tagish River in 1975.

Place	Date	Live	Dead
Takhini River	Aug. 26	30	1
	Aug. 29	165	0
	Sept. 15	0	18
Schwatka Lake - - Marsh Lake ¹	Aug. 24	1	0
	Aug. 28	5	0
	Sept. 4	2	0
	Sept. 5	1	0
	Sept. 10	0	0
Tagish River ²	Aug. 16	P	0
	Aug. 24	P	0
	Aug. 27	P	0
	Aug. 29	P	0
	Sept. 3	0	0
	Sept. 8	0	0
Michie Creek	Sept. 5	35*	0
Outlet of Lake Laberge	Sept. 2	4	0
Outlet of Lake Tagish	Sept. 20	0	0
TOTALS		243	19

¹Portable electronic monitor.

²Stream-side electronic monitor.

^PElectronic monitor triggered indicating presence of tag.

*Stream population estimate at 100 fish based on land and air survey of select section.

late as September 5, the last survey. Peak of spawning appeared to be in progress on August 27, coinciding with the time of maximum count.

CHUM SALMON

Sex, length and age composition.

Adequate sampling in 1975 was obtained on net-caught fish only. In this group, males represented 79 percent of the sample. A small sample of wheel-caught fish was 55 percent males (Table VI). In each of the previous two years, males represented 52 percent of the wheel-caught fish. No measurements were obtained on the escapement in 1975.

The large difference in sex composition between wheel-caught and net-caught fish is due to the selective action of the gillnet. The sex composition of gillnets is determined by the mesh size of the net and the length composition of the population. In reference to mesh size, there exists an inverse relationship between mesh size and occurrence of males. For example, the following measurements were obtained at Dawson City in 1975:

Mesh size	Sample size	% Males
4-1/2"	77	96
5"	89	87
6"	83	54

The same pattern was demonstrated in the nets operated by Fisheries personnel at Carmacks in 1973 with the following results:

Mesh size	Sample size	% Males
4-1/2"	94	54
5-1/2"	162	38

The lengths of male chum salmon at the 95 percent level in 1975 were in the range of 630 - 735 and those for female at 610 - 710 mm. Compared to the two previous years, the length range in 1975 was

TABLE VI. Percentage of male chum salmon in 1973 and 1975.

Location	Gear	1973		1975	
		Sample size	% ♂	Sample size	% ♂
Dawson	fishwheel	1019	52	65	55
	gillnet	-	-	249	79
Carmacks	gillnet	323	53	-	-

lesser in each sex with a higher proportion of larger fish. This may indicate the dominance of a single age group in 1975 (Fig. 10).

The lengths of the chum salmon in the sample taken at Dawson are similar to those obtained on chum salmon in the Fishing Branch River* (Fig. II), and this may suggest that the Yukon chum populations are homogeneous in length (and age) composition. If this is true, the entire population may be working in the same four-year cycle throughout the Yukon River system within the Yukon Territory.

The ages of chum salmon cannot be determined from scales removed in the Yukon Territory because absorption of the scale has proceeded to varying advanced degrees. However, on the basis of samples taken in Alaska where age interpretation is possible, the ages of Yukon chum salmon appear to be principally IV (e.g., Age IV = four years from egg deposition to adult return) with some III and V fish. This, of course, fits into the four-year cycle postulated for the population.

Spawning distribution, abundance and grounds.

A total of 16,992 sightings were made on chums as follows:

Date(s) of survey	Method	Live	Dead	Total
Sep.30-Oct.7	Boat	6,119	213	6,332
Oct. 17	fixed wing a/c	2,989		2,989
Oct. 23	helicopter a/c	5,998	1,673	7,671
	TOTALS	15,106	1,886	16,992

Seasonal estimates/counts are given in Table VII by locality.

Chum salmon spawners appeared to be present in a multitude of localities within the study area, however concentrations were greatest at ten sites. The highest count of spawners at any one site was 1,750, and this was made at mile 243 (Chum Slough #1) on October 17. The counts at mile 243 were consistently high throughout the program. Counting at this locality was enhanced by water conditions in that the shallowness of

*data from Elson (1976).

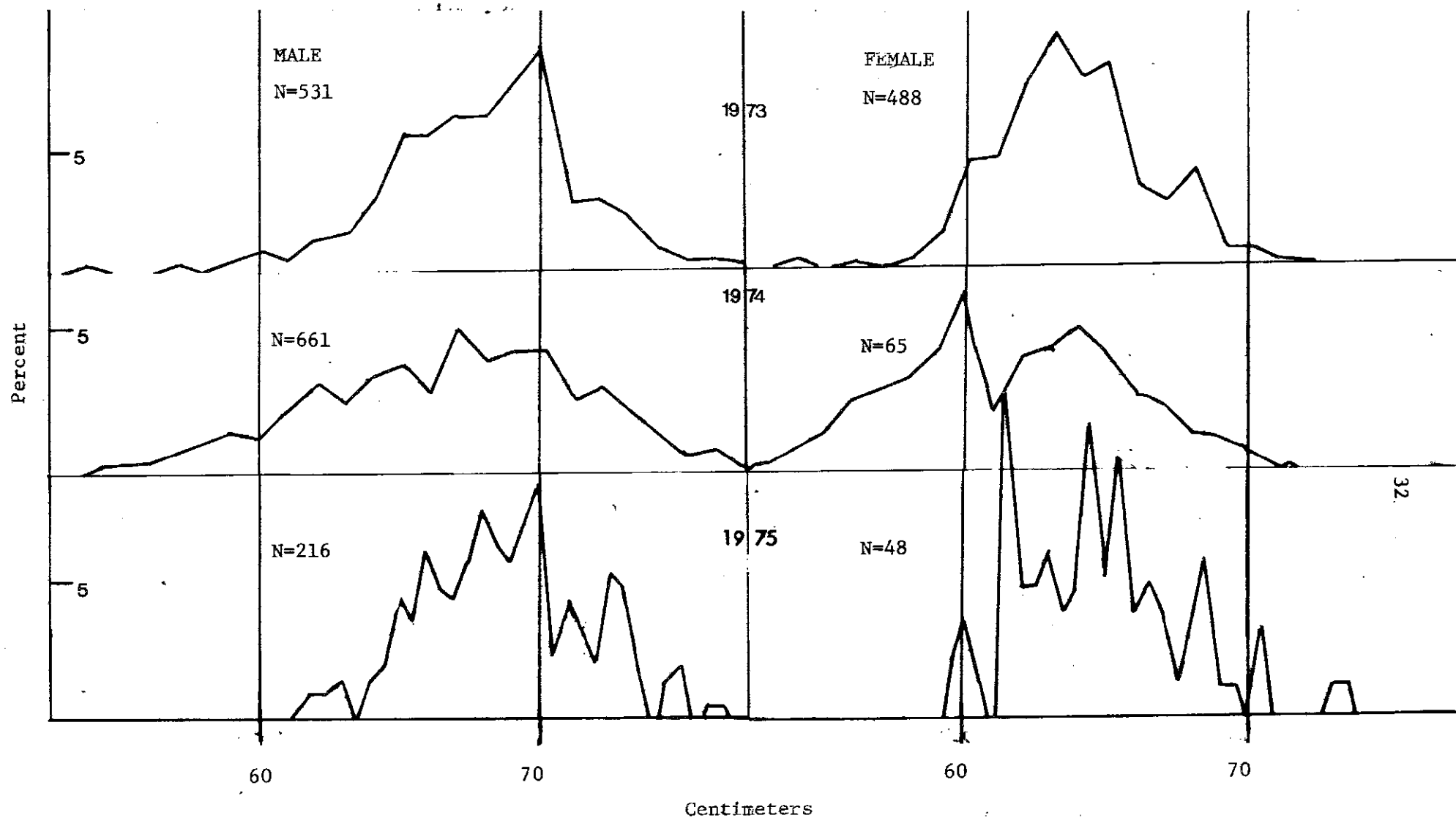


Fig. 10. Lengths of chum salmon caught at Dawson City in 1973-1975.

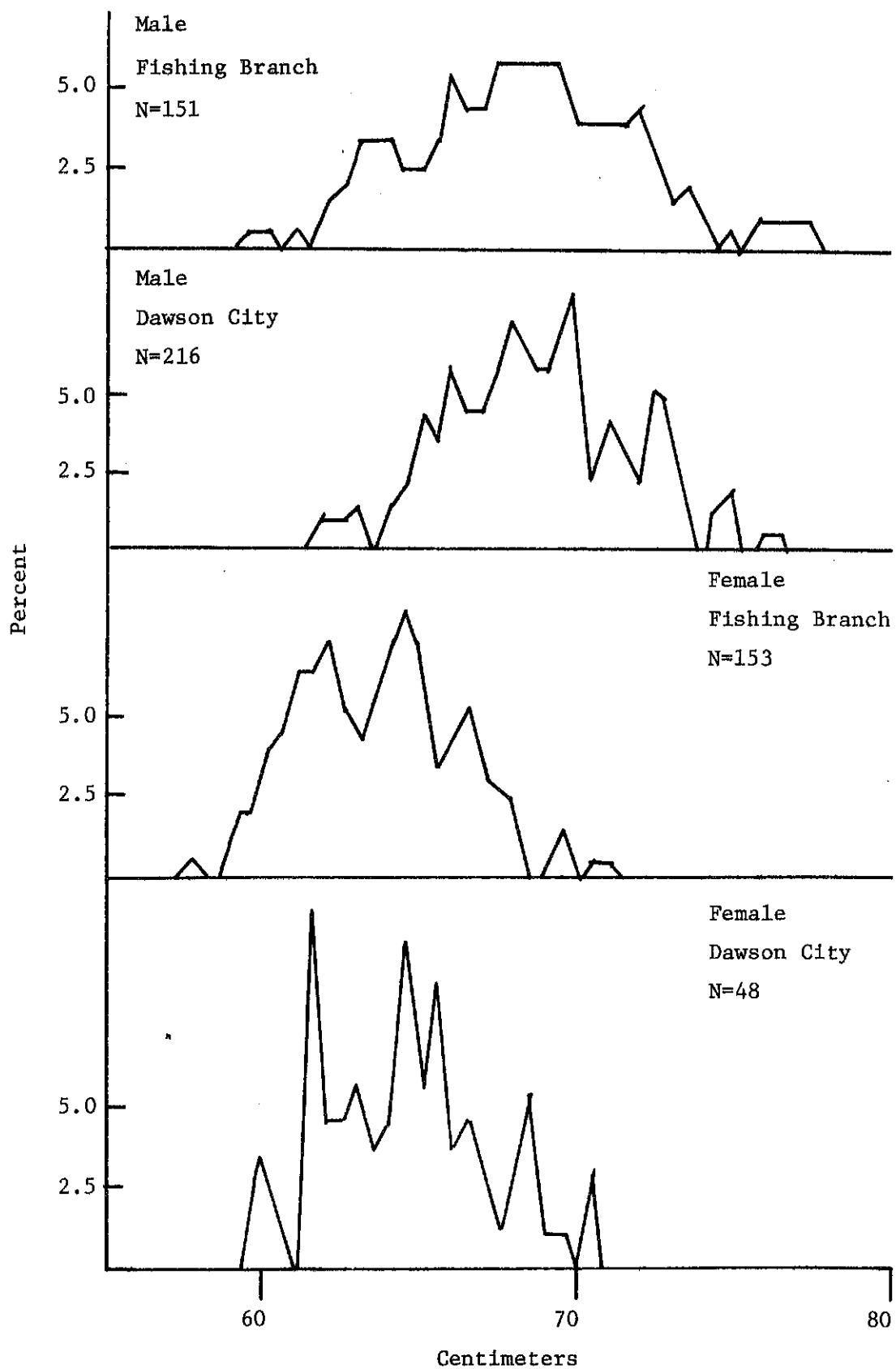


Fig. 11. Lengths of chum salmon at Dawson City and Fishing Branch River, 1975.

TABLE VII. Counts of chum salmon in the Yukon River from Tatchun Creek to Fort Selkirk in 1975.

	Sept. 30-Oct. 4		Oct. 6-Oct. 7*		Oct. 17		Oct. 23	
	Live	Dead	Live	Dead	Live	Dead	Live	Dead
Mi. 226-228	0	0	0	0	0		30	10
228-230	0	0	0	0	0		0	1
230-232	0	0	0	0	0		0	1
232-234	120	0	374	2	50		461	301 *
234-236	0	0	0	0	0		8	5
236-238	156	P	763	2	6		480	130 * Yukon Crossing
238-240	18	0	22	0	0		0	5
240-242	0	0	0	0	0		0	4
242-244	700	2	1187	4	1750**		1036	273 *
244-246	0	0	0	0	0		0	0
246-248	0	0	0	0	0	NOT COUNTED	0	0
248-250	10	0	10	0	0		213	30
250-252	0	0	234	0	75		170	2 *
252-254	2	0	18	0	0		0	7
254-256	1	0	6	0	3		46	10
256-258	0	0	0	0	0		5	4
258-260	0	2	0	0	0		92	16
260-262	120	8	0	0	55		875	180 *
262-264	478	0	359	23	45		630	332 * McGinty Slough
264-266	0	0	0	0	0		0	0
266-268	31	1	0	0	5		2	9
268-270	577	58	682	108***	1000		885	250 * Blanshards Slough
270-272	205	1	0	0	0		190	61 *
272-274	0	0	0	0	0		560	30 *
274-276	1	1	0	0	0		0	0
276-278	41	1	0	0	0		290	5 *
278-280	4	0	0	0	0		0	0
280-282	0	0	0	0	0		0	0
282-284	0	0	0	0	0		25	7
	2464	74	3655	139	2989		5998	1673

*Maximum count in period.

**Mean value of range.

***Bear kill.

P
Present

the flow and the clarity of the water combined to make observation relatively easy. Heavy spawning was also found at mile 237 and mile 269, however, water conditions did not permit observation on the extent of spawning in these two localities. Spawning at these sites may have well exceeded that at mile 243, but this will not be known until better methods of locating fish are developed. Spawning distribution is shown in Fig. 12.

Areas of spawning for chum salmon varied considerably in physical properties and water temperature. There appeared to be five kinds of spawning areas:

1. Main river cutbank spawning area -

This type of area was associated with an exposed gravel bank on the outside curve of the river. The bank was not under active erosion by stream flow; however, gravel recruitment to the spawning area was taking place by slippage of gravel arising from the digging activity of fish. The current was moderate. Spawning occurred both upstream and downstream of the main point of contact of current with the slope, but not at the main point, e.g., Mile 237.

2. Main river riffle spawning area -

The periphery of gravel bars in the main stream was utilized by a relatively large number of spawners. Gravel and stream velocity and depth appeared average for salmon spawning. eg, Mile 262 (err.)

3. Side channel spawning area -

The side channel is open at both ends. However, a log jam exists at the upper end. Water is fed from a deep pool in the main stream through and under the logs into the channel. Also, groundwater enters the channel to mix with the stream flow. Gravel is a dominant part of the substrate, e.g., Mile 268.5 and Mile 271.5.

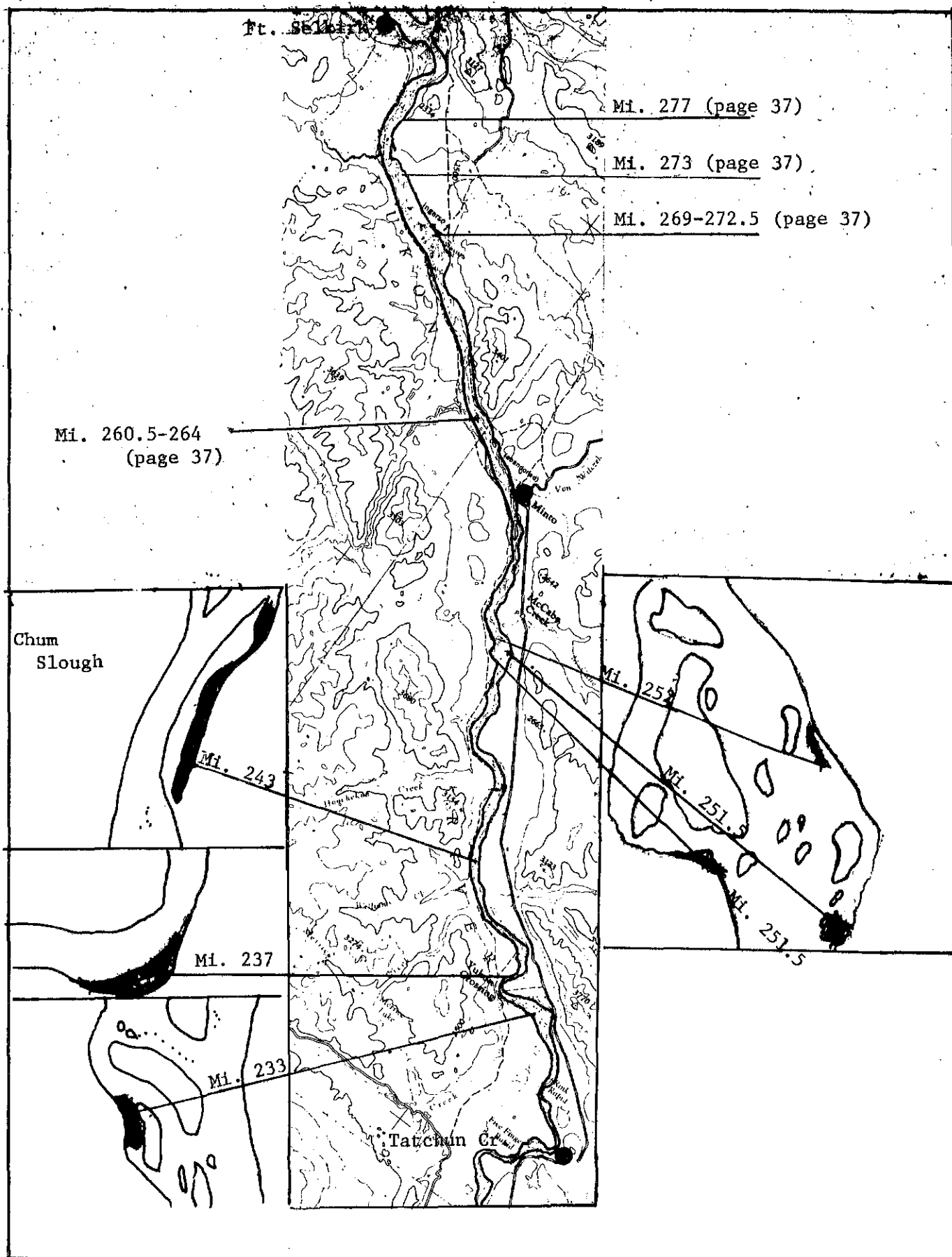


Fig. 12. Principal chum salmon spawning areas in the Yukon River in 1975.

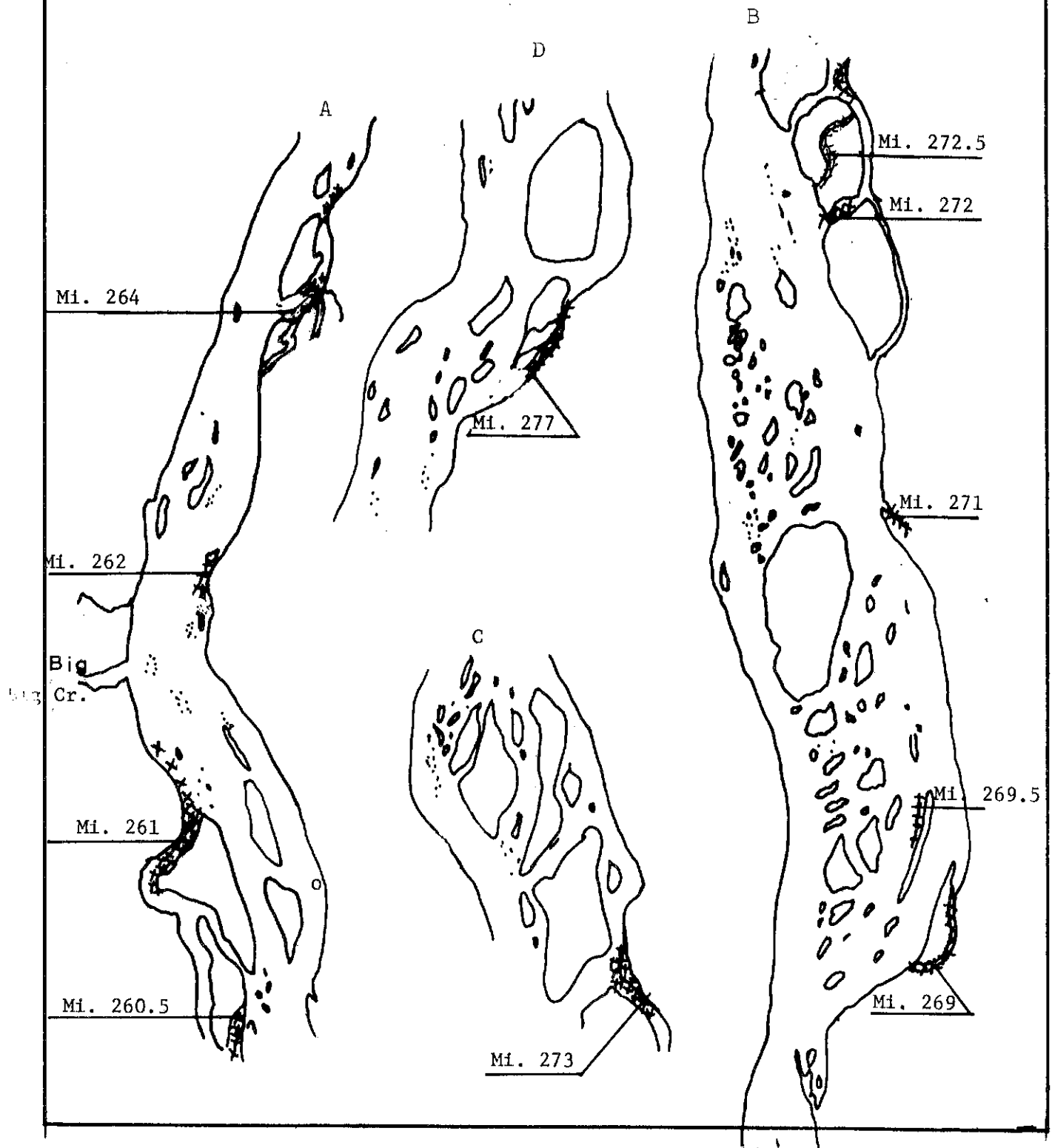


Fig. 12 (cont'd). Principal chum salmon spawning in the Yukon River in 1975.

4. Slough spawning area -

The slough is open to the Yukon River at the bottom end only; the top end is sealed by logs, debris and gravel. The flow appears to arise from main stream water which passes through the gravel to enter the slough (water table source) and also from groundwater. A good example of this type of spawning area is seen at Mile 249³ (chum slough #1). This body of water lies on the east side of the Yukon River and is a major spawning area for chum salmon. The wetted portion, in early June, varied from 100' wide and 2' deep, immediately upstream of the confluence with the Yukon River, to zero in a distance of three-quarters of a mile. The substrate is mostly gravel. Several small inflows of groundwater are apparent. Stream temperatures varied from 9.5°C at or close to point(s) of inflow to 12.5°C short distances downstream of these points. The great variation in water temperature would account for the extended period of chum spawning that allegedly occurs in this area.

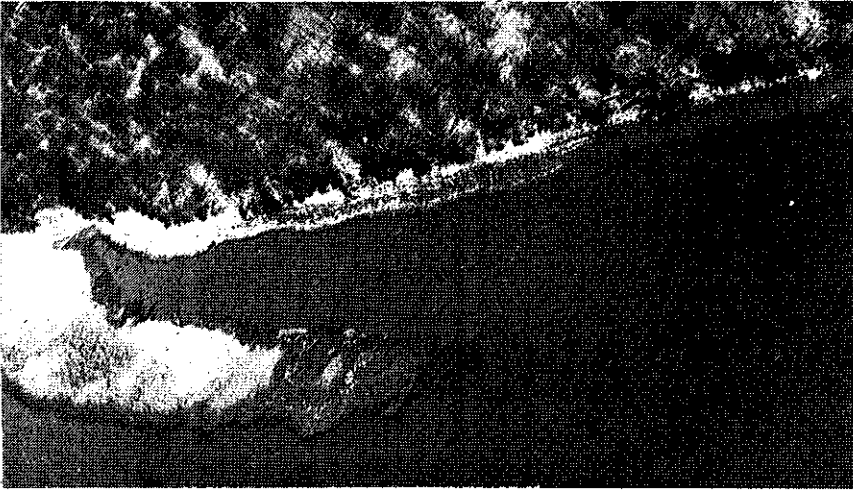
5. Combination side channel and slough spawning area -

This type of spawning area has characteristics common to channel and slough types named above, e.g., Mile 233.5 and Mile 261.

Photos of spawning areas appear in Plates 1-9.

Time of Spawning

Spawning was well underway on October 1, the first date of survey, and appeared to be at a higher level on October 23, the last date of survey. The span of spawning was in the order of September 25 - November 5 (estimated).

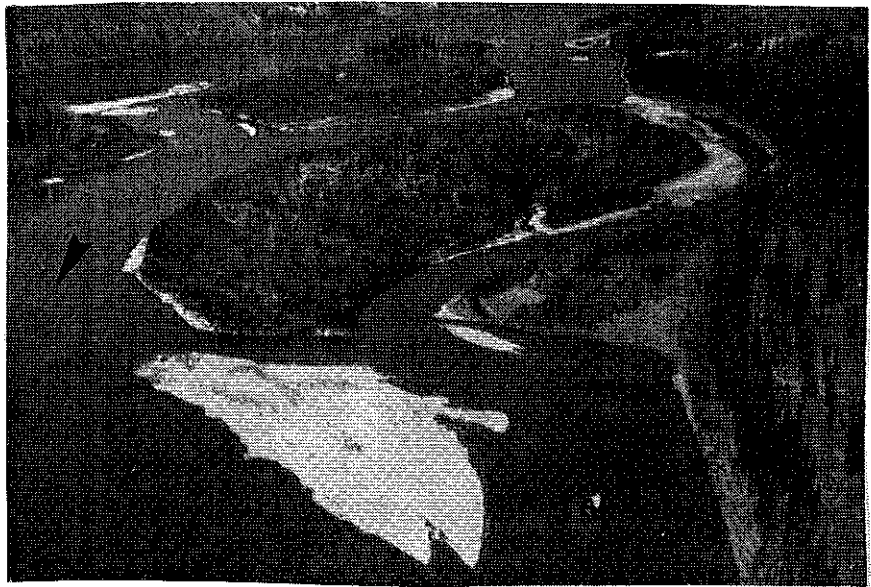


Mile 225.5, minor chum salmon spawning area, ground water source adjacent to main river (same as Mile 260.5).

◊

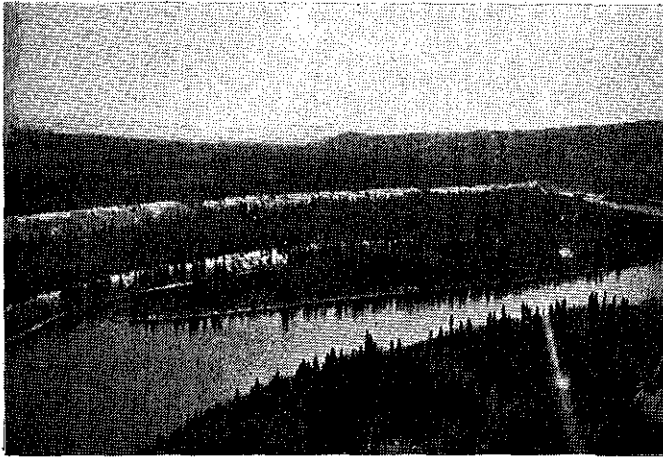
Mile 233, major chum salmon spawning area, side channel type.

◊



Mile 235 (Yukon Crossing), chinook and chum salmon spawning areas.

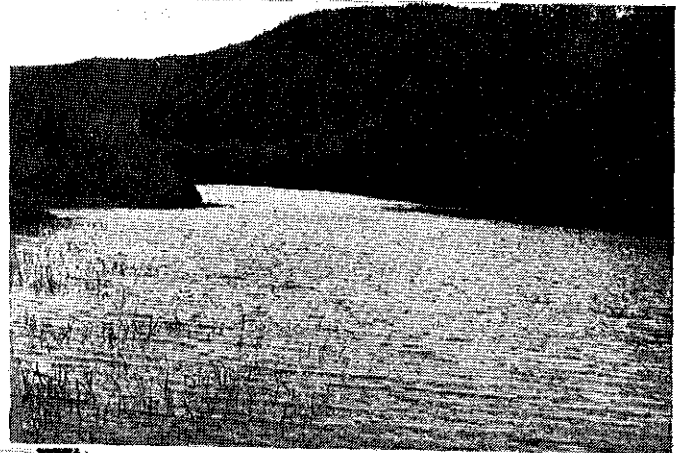
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Mile 243, major chum
salmon spawning area,
slough habitat.

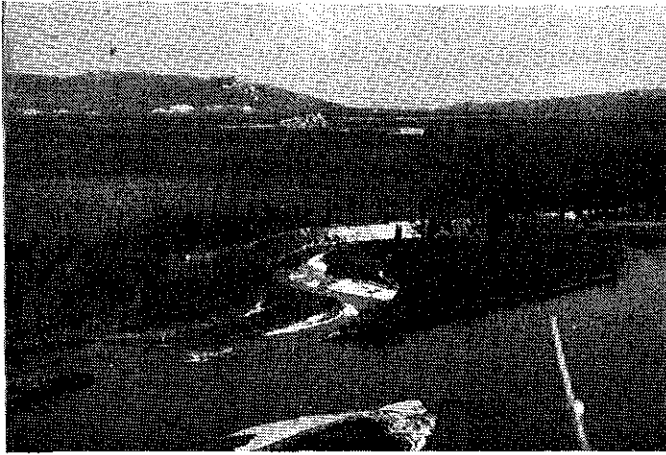


Entrance to
chum slough.



Upper sections of chum
slough at sources of
ground water.





Minor Spawning Areas

Looking upstream at
channel.



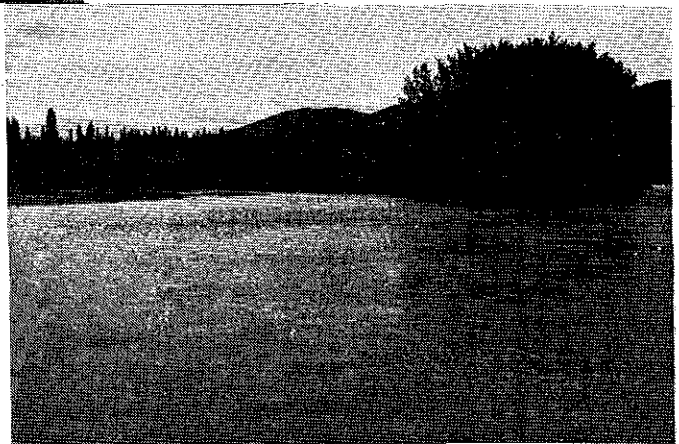
Top end looking
downstream.



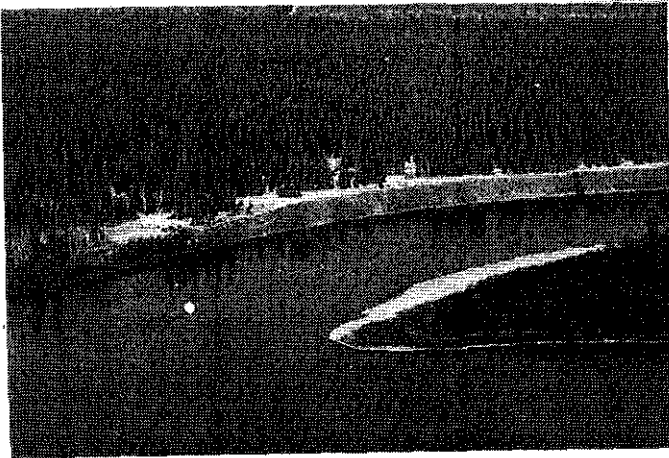
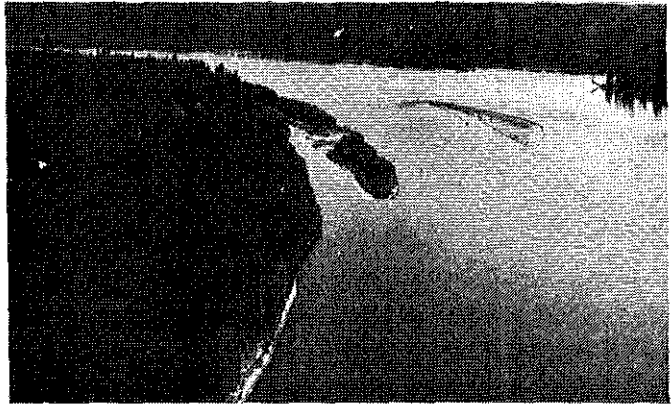
Looking upstream at
bank spawning area.



Looking upstream into
channel, gillnet
station P on right.



Mile 255.
Gillnet station K.
◻



Mile 257 (Minto)
◻

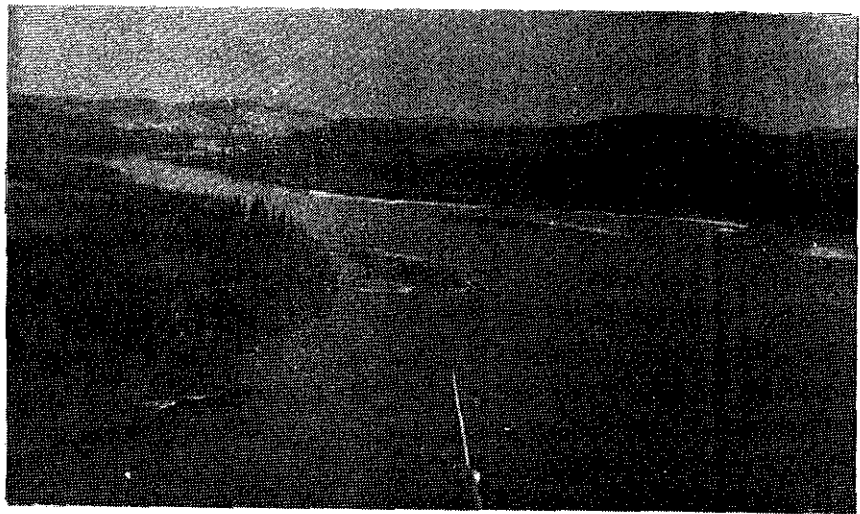


Mile 261, major chum
salmon spawning area.

◁

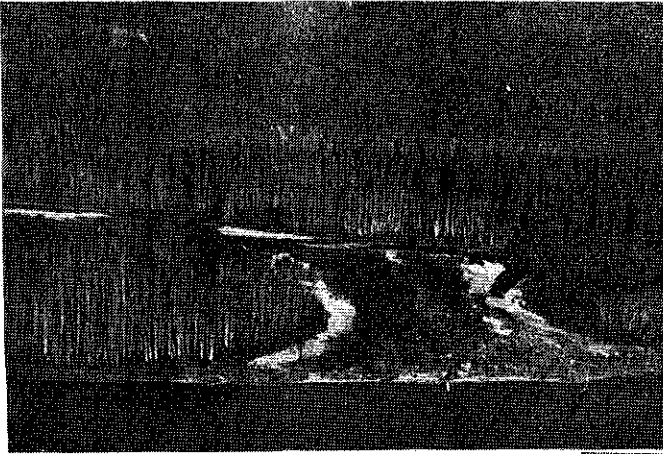
Mile 262,
Looking upstream.

▷



Mile 262, Big Creek
entering Yukon River.

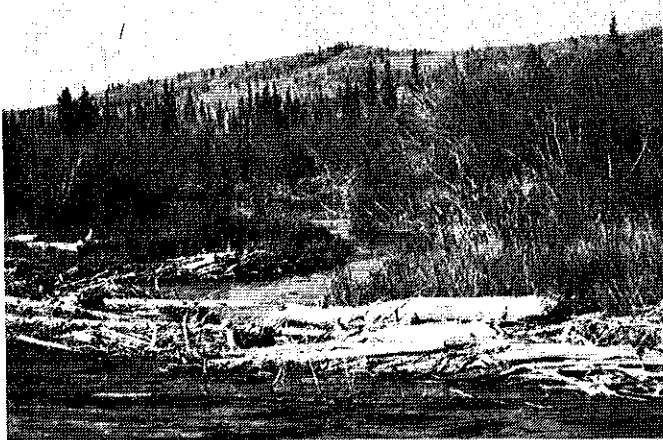
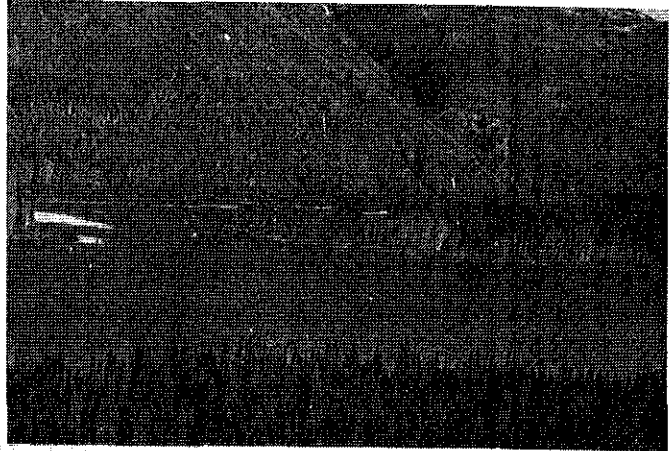
◁



Mile 264, major chum salmon
spawning area, side channel
type, top end.



Mile 264 -
bottom end.

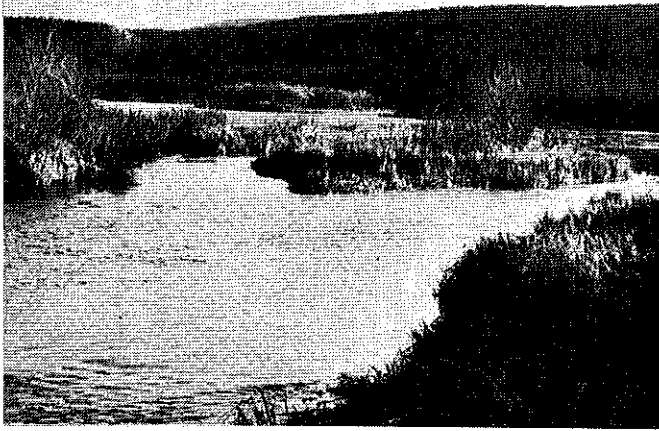


Mile 269.



Mile 269.



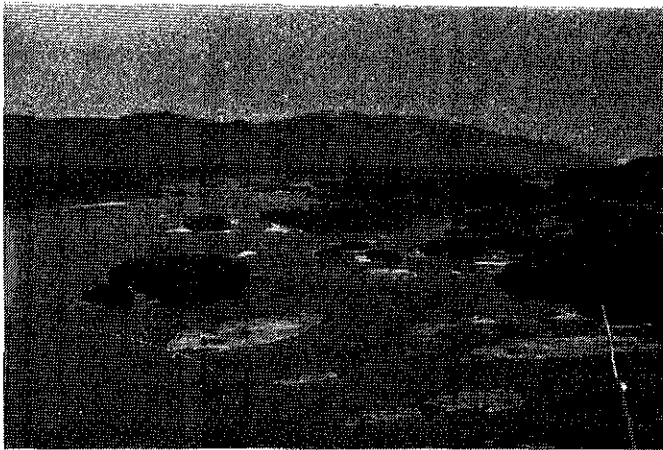
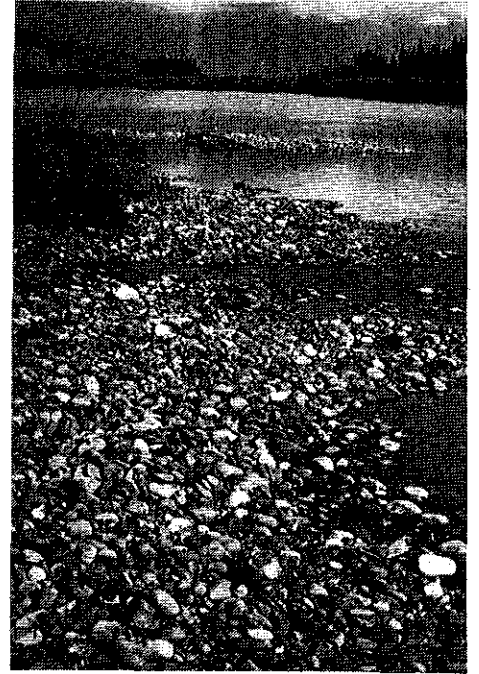


Mile 269.

Chum salmon spawning
at Mile 269.



Mile 269.5 - gravel beds on island
 side of major chinook salmon spawning
 area.



Mile 273 - looking upstream
 at Ingersol Islands area;
 main channel on right and
 salmon spawning areas on
 left.

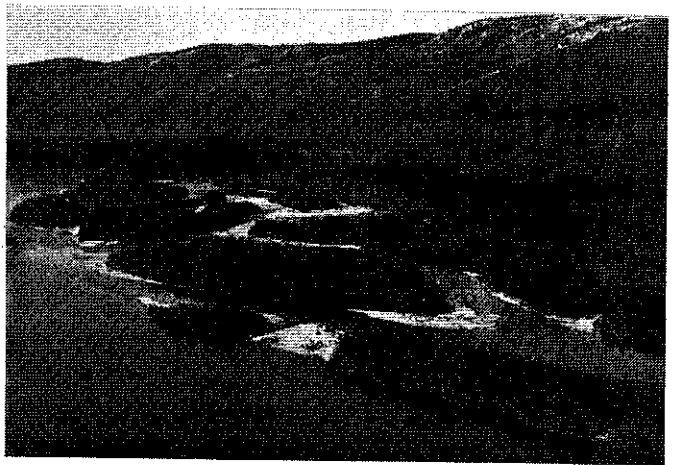


Plate 9 : Salmon spawning areas at Mile 277.

III

FISH POPULATIONS, OTHER THAN ADULT SALMON,
FROM TATCHUN CREEK TO FORT SELKIRK

INTRODUCTION

This part of the report describes studies, excluding those related to adult salmon, carried out from Tatchun Creek to Fort Selkirk, 226 and 282 river miles respectively from Whitehorse in 1975.

This area of the Yukon River was selected for study for several reasons: i) it is close or central to potential hydro power sites at Five Fingers and Wolverine Creek and to potential mining and smelting areas immediately east of Minto; ii) it is upstream of three major tributaries, and this drastically reduces operational and sampling problems associated with high water and excessive debris when sampling the main stream; iii) it has road access for much of its distance; and iv) it is centrally located between work areas at Whitehorse and Dawson City.

This part of the program was designed to provide information on the kinds of fish present (exclusive of adult salmon), abundance, size and activity and habit preference. Sexual maturity, age and diet are additional factors on which some information is provided. These kinds of information will assist to broaden the information base on the various fish species and ultimately determine their habitat needs and role in the resource picture.

METHODS

The studies were carried out in the following periods: May 21 - July 14, August 17 - September 12 and September 30 - October 2. The

activities of the last two periods coincided with those for adult salmon and consequently, the effort was much reduced from that of the first period.

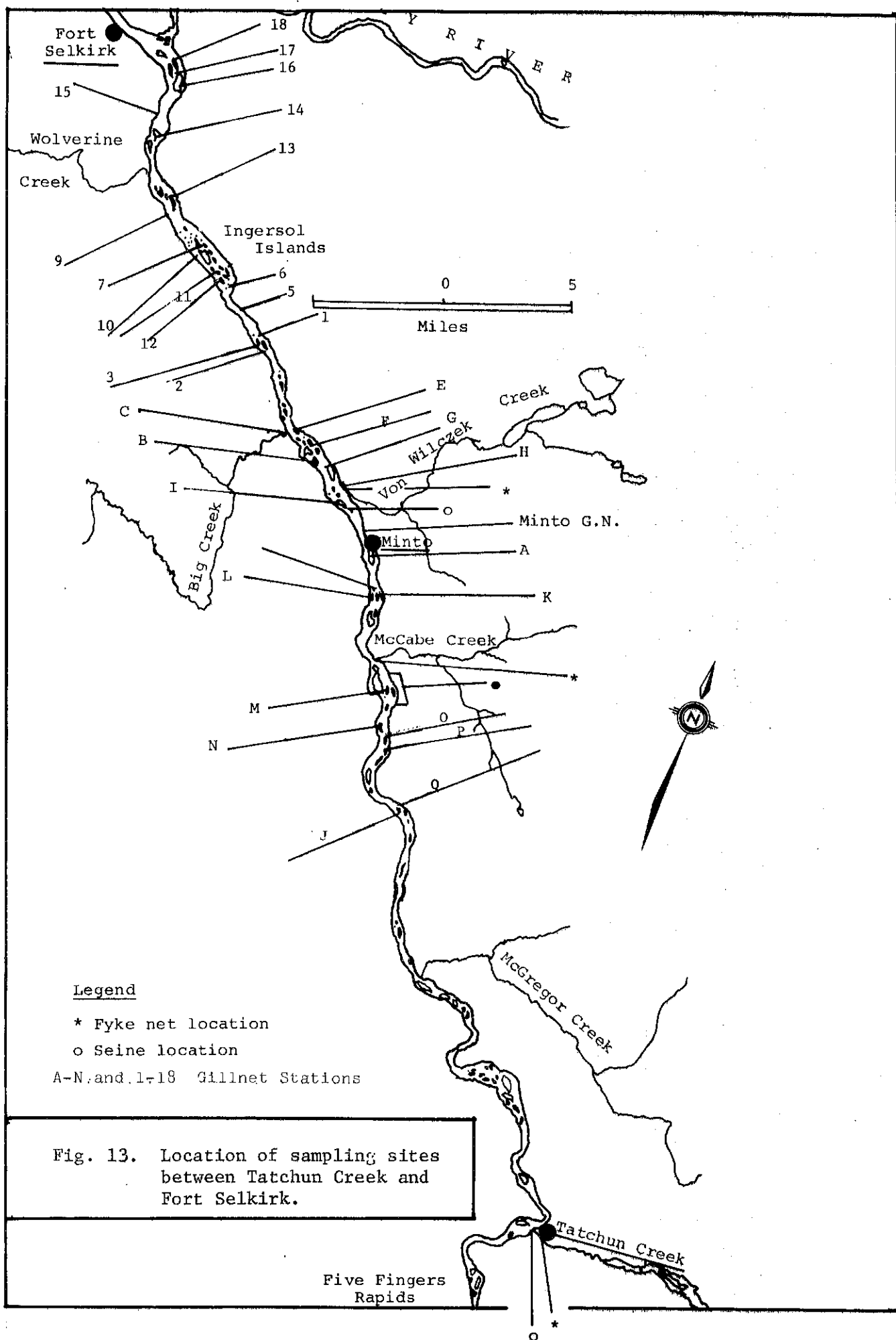
Samples of fish were obtained by gillnet, seine, fyke net, incline plane trap and converging throat trap. Sampling locations are shown in Fig. 13.

Gillnet mesh sizes were 1", 2", 2-1/2", 3" and 4". Sizes 1" - 3" were monofilament. The meshes were fished in two ways: In one instance, meshes 1", 2", 3" and 4" were put together into a panel, the outside dimensions of which were 100' x 8'. The other way was to fish a mesh size by itself. In this case, the net measured 50' x 8'. Panel nets were fished at a total of 13 sites and single mesh nets at an additional 24 sites (Fig. 13). A maximum of 24 locations were fished weekly in the period June 6 - June 26. The effort was reduced in terms of sampling locations to one-half or less commencing June 25. Fishing effort per mesh size in terms of net days was:

	May 23-June 19	Aug. 18-Aug. 26	Total Effort
1"	26	4	30
2"	35	8	43
2-1/2"	16	2	18
3"	34	6	40
4"	26	4	30
	<hr/>	<hr/>	<hr/>
	137	24	161 net days

Seines measured up to 50' x 6' and were made of one inch stretched mesh with bunts of smaller size mesh. Seining was found to be most practical on gravel bars and in sloughs. The operation was carried out at wading depths. The effort was as follows:

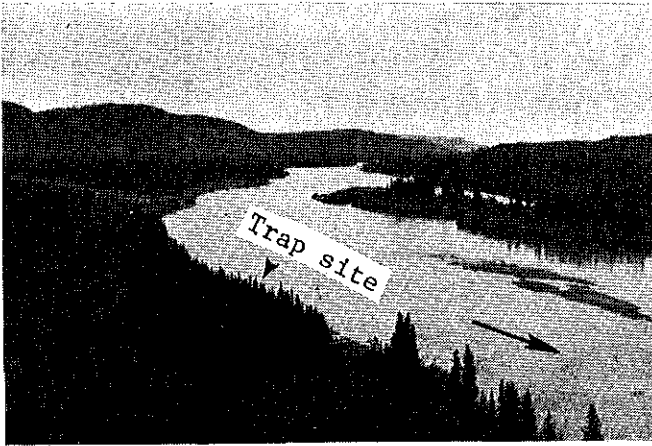
May 24 - June 11	20 hauls (approximate)
Aug 18 - Sept 12	55 hauls (approximate)



Approximately three-quarters of the effort was carried out within one mile of Minto, the remainder in the vicinity of Chum Slough #1 and Ingersol Islands.

Three throat fyke nets with 4' x 4' front openings, 1" and 1/2" mesh, were utilized to test for downstream migration. The fyke net could not be operated in the Yukon River because of immediate clogging arising from sticks, debris and roots. However, the gear was utilized without undue problems in four tributary streams in the period May 24 - July 14 as follows: Tatchun Creek, 31 nights; McCabe Creek, 7 nights; VonWilczek Creek, 4 nights; and Big Creek, 2 nights. In Tatchun Creek, the net was fished at the time of minimum light (2300 - 0200); in all other instances, because of travel requirements, the gear was operated for approximately 24 hours per set. In all instances, the fyke net was immediately upstream of the streams' confluence with the Yukon River but out of range of backup water from the Yukon River.

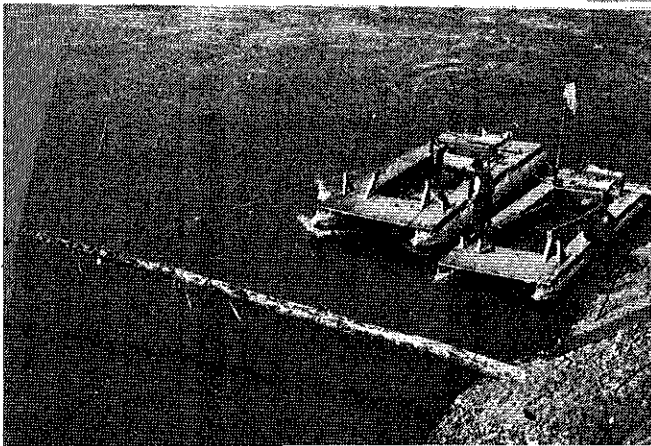
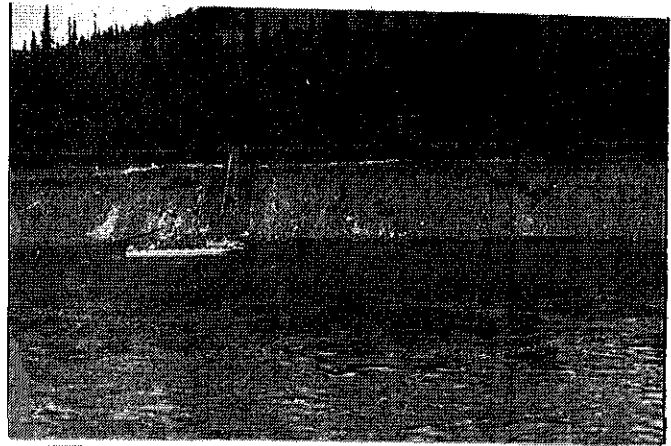
One unit each of inclining and converging throat traps was fished side-by-side (Plate 10) in the Yukon River from May 20 to June 20 to measure downstream migration. The front entrance to each trap measured 4' x 4'. In the inclined plane traps, the floor closed to within one inch of the top of the trap over a distance of 12'. During fishing, the water entering the live box section was 4' wide and regulated to a depth of approximately two inches. In the converging throat trap, all sides closed inward to form an entrance to the live box measuring 8" vertical and 9" horizontal. This was accomplished in a distance of 10" 4". In both traps, the screening material from the trap entrance to the live box entrance was flat, expanded metal with openings of 15/16" x 5/16". A double live box arrangement was incorporated with each trap to increase holding capacity and reduce mortality to fish. The screening material on the traps was hardware cloth, four mesh/inch. Details of design are shown in Figs. 14 and 15. (The converging throat trap shown in Fig. 15 was modified to support two live boxes as shown for the incline plane trap.) The inclined plane trap was situated closest



Study area at Mile 258
(Minto).



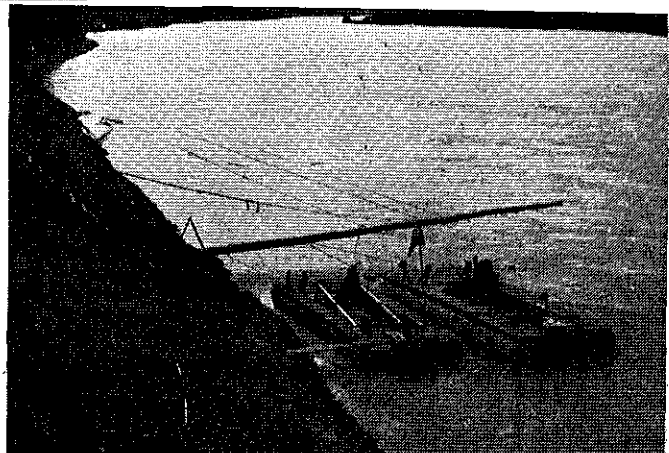
Trap site at base of
river bank.



Looking downstream at
traps in fishing
position.



Looking upstream at
traps in fishing
position.



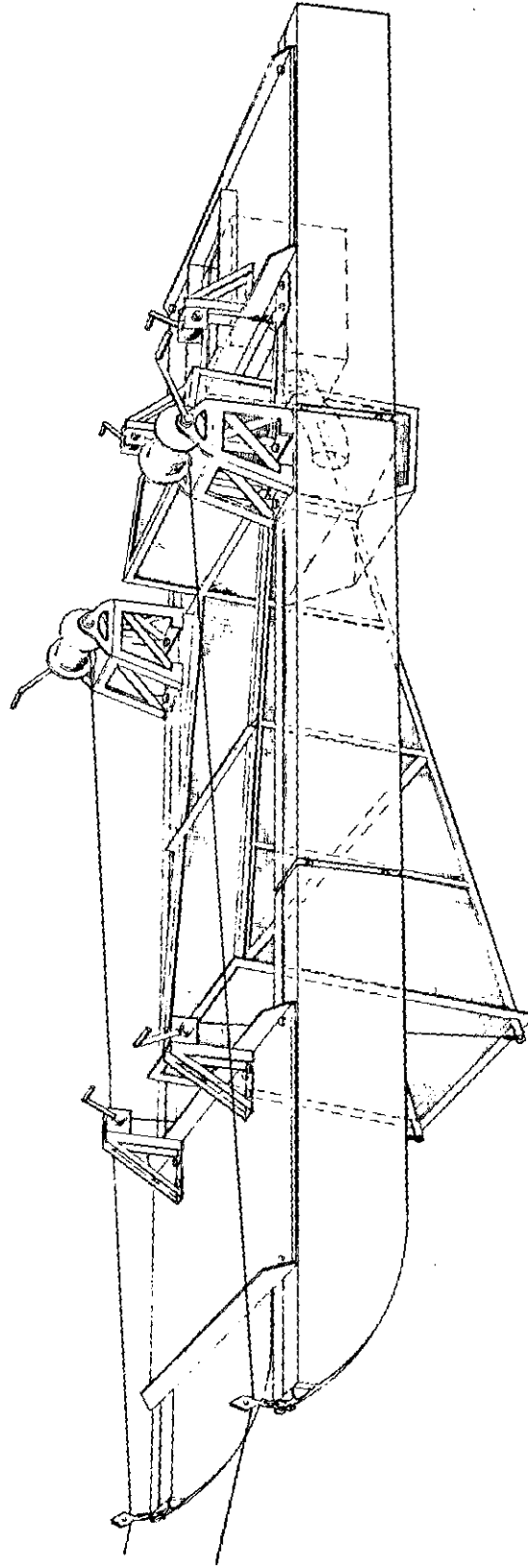


Fig. 14. Incline Plane Trap.

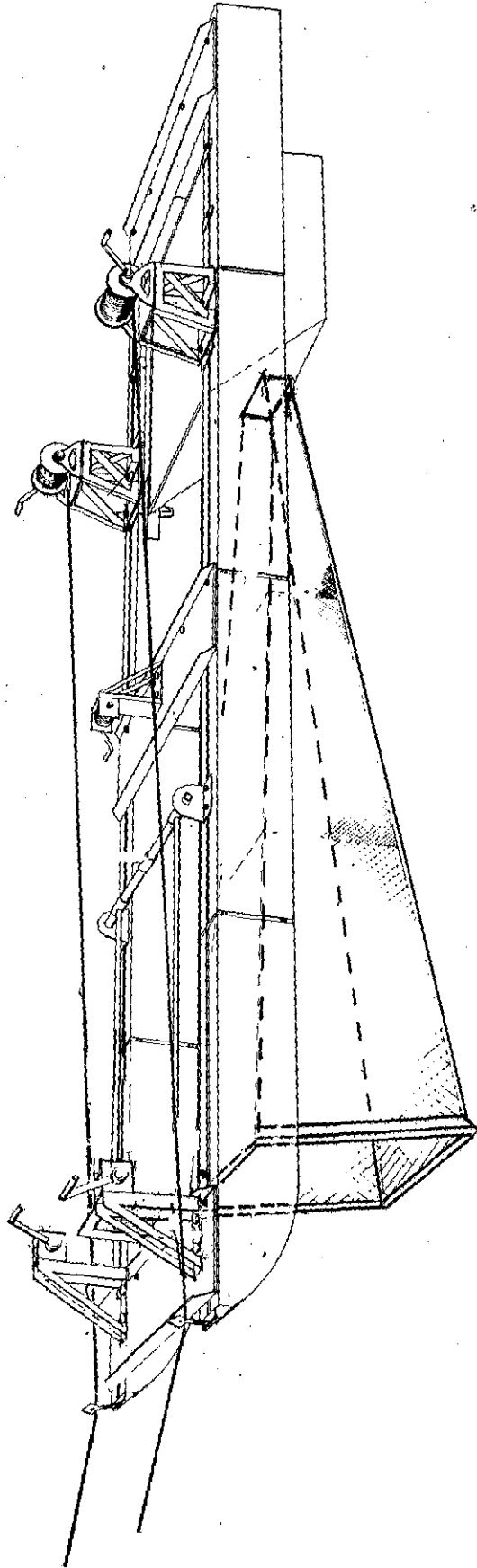


Fig. 15. Converging Throat Trap.

to the shore. Both traps fished the full depth of flow (3' - 4') at their location. The fishing site was located at Minto on a steep gravel slope. The surface velocity at this point was in the order of 6.6 ft. per second. The traps were fished continuously when possible, however, effort was reduced to as low as one-half hour for each four-hour period when the debris load was high. The outside edge of the converging throat trap was situated at a maximum distance of 28 feet from the shore. Generally, the traps were situated within 20 feet of the stream bank.

A total of 2,284 fish were identified to species during the study. Length was measured as the distance from tip of snout to fork of tail.

Scales were removed from some fish for age determination. The interpretation of scale for age was made by technical support personnel in Vancouver, utilizing standard techniques.

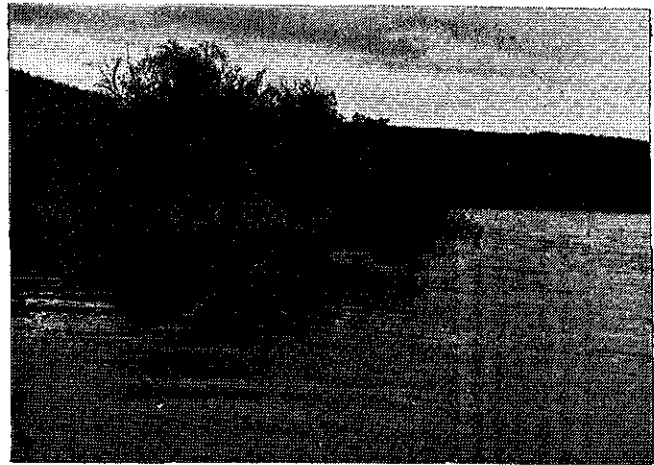
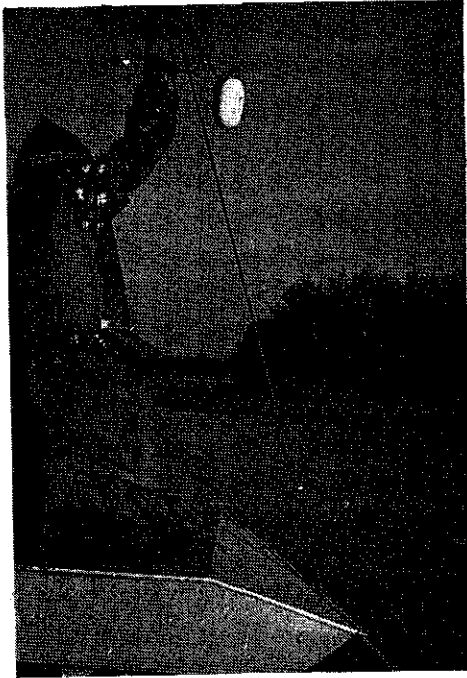
Sexual maturity was determined by examination of gonads. If the gonads were ripe, or if they appeared to have released sperm recently, they were called mature (M) or spent (S), respectively. Very small gonads were termed immature (I).

Stomach contents, when taken, were identified to family and the abundance grossly estimated.

Sampling effort was as follows:

	Length	Scales	Maturity	Stomach
Coregonidae	143	3	92	103
Salmonidae (juvenile)	799	--	--	--
Thymallidae	249	17	61	62
Esoxidae	62	--	47	49
Catastomidae	362	--	46	--
Other	242	--	--	3
TOTALS	1,857	20	246	217

Various operations are shown in Plate 11.



Gillnet at Station 14 (Mi. 276) [△]

Setting Gillnet. [△]

Sampling chinook salmon. [△]

Fyke net in Big Creek. [△]



RESULTS

A total of 12 species, representing six families was identified in the study area (Appendix C).

In assessing relative abundance of the various species, the selectivity of the gear for size particularly, must be kept in mind. For example, the gillnets caught fish 200mm in length or greater, whereas the seine, fyke net, incline plane and converging throat traps largely captured fish < 200mm. Therefore, size composition of the populations was one major factor affecting the occurrence of species in the samples. Other factors affecting capture besides real abundance, may be choice of the fish for current, water depth (fish inhabiting deep and/or fast water are probably less vulnerable to capture than those in slow and/or slow water), migration activity (those migrating are probably more likely to be caught than those holding) and preference for habitat (shoreline residents will be captured more frequently than offshore fish). The relative frequency of capture is given in Table VIII.

In all categories, Pacific salmon is the most abundant fish in the Yukon River. Longnose sucker, arctic grayling and slimy sculpin occur next in that order.

Juvenile Salmon

The salmon are represented by two species; namely, chinook and chum. However, the species were not readily recognizable in the fry stage until mid-June, therefore, the length data on salmon fry to that time are grouped.

The juveniles of both chinook and chum salmon emerge from the stream bed in May. The newly emerged young (fry) of chinook salmon seek territory to feed and grow. They remain in the watershed for one year then migrate to the ocean as smolts. Chum salmon, on the other hand, move seaward as fry immediately following emergence from the gravel.

Minto Area

TABLE VIII. Occurrence of species by sampling technique in the Yukon River in 1975.

Common Name	Scientific Name	Gn	Se	Fn	Ip	Ct
Inconnu		**				
Humpback whitefish		**	P	P		
Least cisco		*				P
Round whitefish		*	*	P		
Arctic grayling		***	*	*		P
Chinook salmon smolts			***	***	*	***
Chinook salmon fry			***	***	****	*
Chum salmon fry						
Northern pike		**				P
Longnose sucker		***	**	*	**	***
Burbot					P	*
Slimy sculpin			*	P	*	***
Arctic lamprey				P	**	*
Sample size		312	1085	369	359	167

Gn = gillnet

Se = seine

Fn = fyke net

Ip = incline plane trap

Ct = converging throat trap

<2% = P

2-10 = *

10-20 = **

20-40 = ***

40-60 = ****

>60 = *****

The lengths of salmon fry in the Yukon River during May and early June were in the range of 30 - 42mm (5 percent and 95 percent limits); mean lengths of samples ranged from 37 - 40mm (Fig. 16). By mid-September, the maximum length of chinook salmon fry was 91mm. The September sample appeared to be bimodal with peak values at 80 and 70mm. This relates closely to a sample taken on August 28, 1973, at Carmacks in which the sample appeared to be bimodal with peak values at 81 and 72mm. If future work should prove this bimodality to be fact, it would be valuable to relate the bimodality to the racial composition of the stock.

Chinook salmon fry were found migrating from Tatchun Creek. (The lack of chum salmon spawning in Tatchun Creek assures that the salmon fry were chinook.) Fry were captured in May and up to July 14, although at the latter date, the catch was only three. Chinook fry may move out from Tatchun Creek during the full summer, but only further study will determine their life pattern in tributary streams. Significantly, perhaps, was that the Tatchun Creek fry were much greater in length than the Yukon River fry. For example, Tatchun fry averaged 62mm in length on June 30 compared to 42mm for those in the Yukon River. The lengths of juvenile chinooks in Tatchun Creek are given in Fig. 17.

Chinook salmon smolts demonstrated great variability in length. The smolts captured in the Yukon River were generally smaller than those removed from tributary streams. Range and mean values of lengths were:

		Sample	Range	Mean
Yukon River	Trap	82	66-98	77
Yukon River	Seine	48	65-100	75
Tatchun Cr.	Fyke	31	68-110	88
McCabe Cr.	"	3	not measured	
VonWilczek	"	2	88-90	89

Numbers of Fish

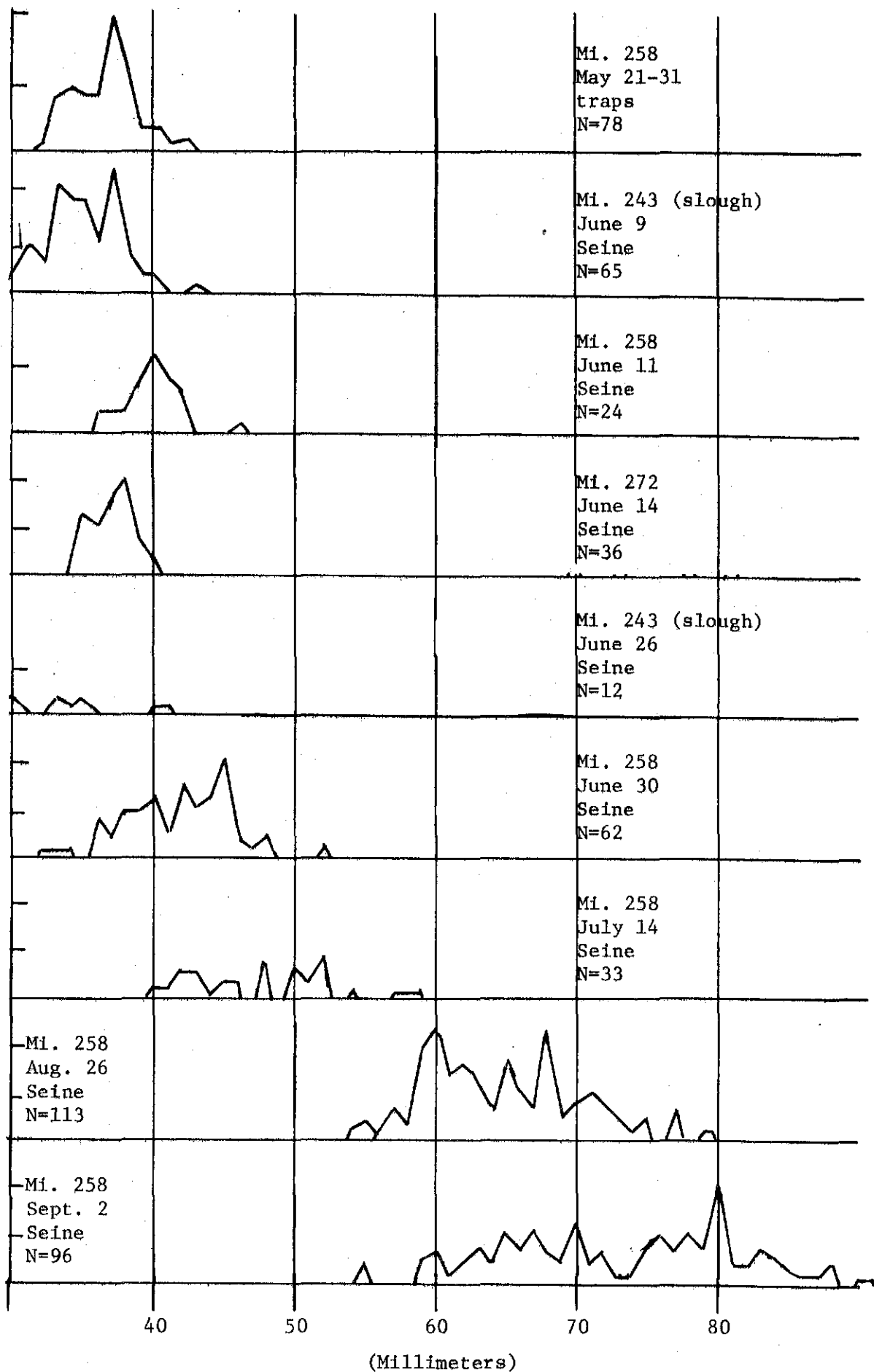


Fig. 16. Lengths of juvenile salmon in the Yukon River in 1975.

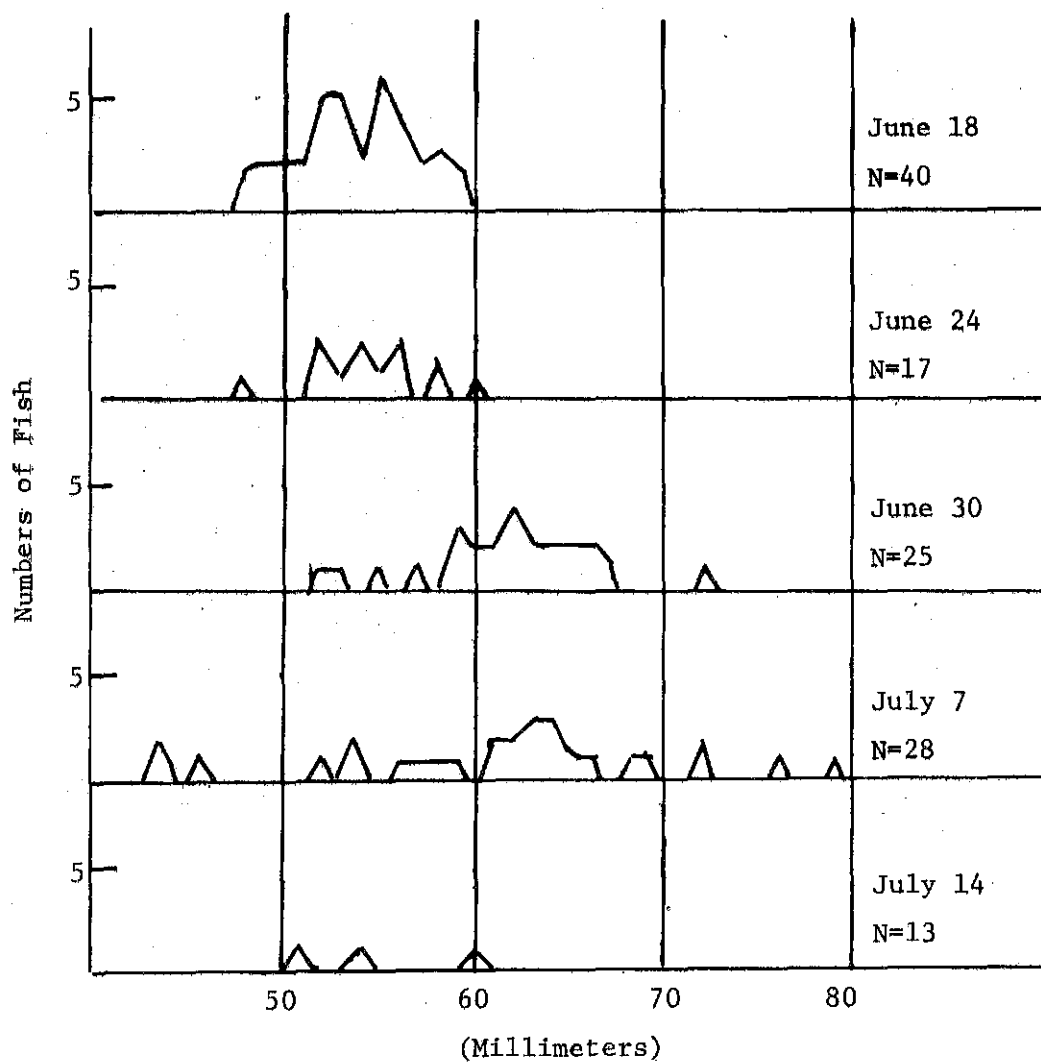


Fig. 17. Lengths of juvenile chinook salmon in Tatchun Creek in 1975.

Tatchun Creek is the only stream of the four listed above in which mature chinook salmon have been found, and it appears to offer year-round opportunities for the residence of juvenile salmon. McCabe and Von Wyncek Creeks are very small, and the latter had no flow in September 1975. Besides the lack of salmon spawning, there appears to be no opportunity for fish to overwinter in these streams. The presence of smolts in McCabe and Von Wyncek Creeks and one in Big Creek may suggest that the smolts make entry to these streams from the Yukon River very early in the melt period (April). Food may be limiting in the Yukon River, particularly near the end of winter, and smolts possibly enter streams with the onset of flows to feed. They must return to the Yukon River for downstream migration.

The time of migration of chum salmon fry cannot be defined from the data collected in 1975 because of problems in identifying them from chinook salmon. However, the fry captured in mid-June were readily recognized as chinook, therefore, the chum had obviously vacated the area prior to this date.

Chinook smolts were first observed on May 21 when five fish were caught by the traps as construction was completed. The last sample of smolts from the Yukon River was taken by seine on June 23. Trap catches suggest that peak abundance of smolts occurred in the last week of May. Catches by seine indicate the same general timing in that 100 fish were caught on May 29 and 14 fish on June 6, and lesser numbers thereafter.

Migration from tributary streams appeared to occur at approximately the same time. Dates of capture were:

	First Date	Last Date	Date max.no. present	Seasonal sample size
Tatchun Cr.	May 26	June 1	May 28	31
McCabe Cr.	June 2	June 2	June 2	3
Von Wyncek Cr.	May 28	May 28	May 28	2

It is postulated that the Yukon River is the principal residence area for juvenile chinook salmon during their one-year residence in fresh water. Overwintering may place severe strains on the fish in terms of competition for space and being subject to predation from other fishes. In 1972, stomachs of inconnu captured in late September, largely contained juvenile salmon.

Longnose Sucker

Longnose sucker appear to be the second most abundant fish in the Yukon River. The sucker is a forage fish and serves as food to many other fishes. It probably undertakes localized migrations.

At one time, the sucker was widely used for subsistence. It allegedly was the first fish available in significant numbers for capture at the time of breakup.

In 1975, the species was caught in each kind of sampling apparatus. The length composition in the total sample range from recent hatched fry at 25mm to adult fish, the largest one being 510mm. Modal values in the length data exist at 35, 65 and 350mm (Fig. 18). There is not sufficient information to indicate age. Fish measuring up to and including 300mm in length were immature; mature fish measured >355mm (Fig. 19). The mature sucker in the Yukon River is much smaller than the mature fish in the Aishihik system (modal values of 350 and 470mm respectively). This could be because either of a lower age at maturity or a slower growth rate.

The average length of suckers by mesh size was as follows:

mesh 1"	N=1	av. length 114 mm
2"	8	257
2-1/2"	24	330
3"	43	355
4"	1	383

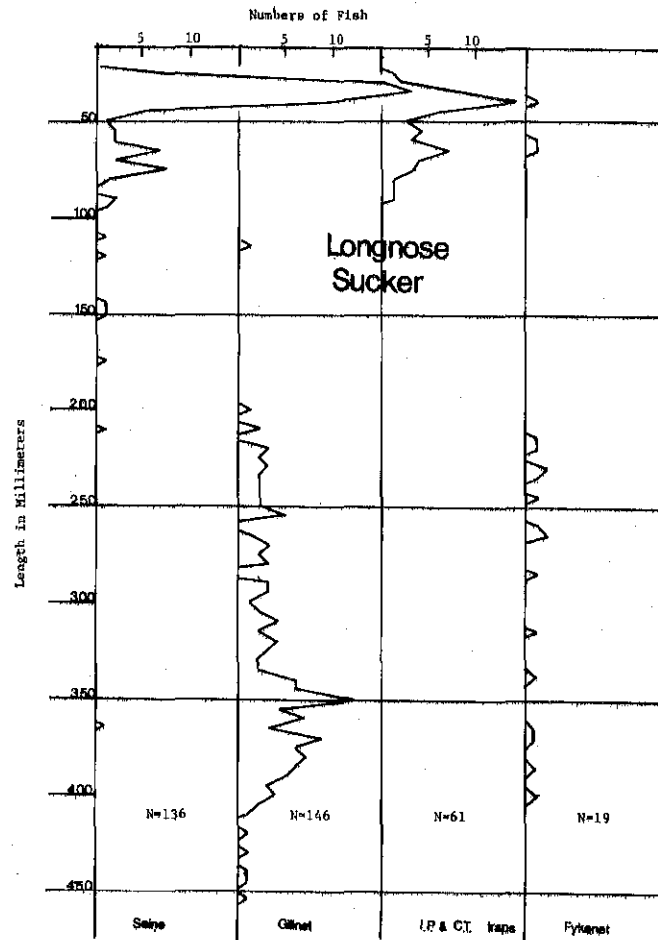


Fig. 18. Lengths of longnose suckers.

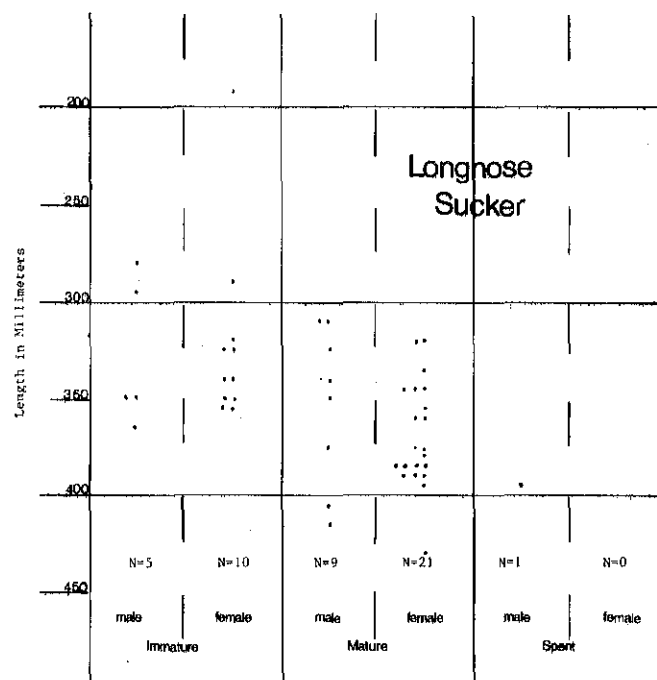


Fig. 19. Maturity of longnose suckers.

Arctic Grayling

The grayling is one of the most widely distributed fishes in the Yukon Territory, occupying both stream and lake waters. In the Yukon River, the species probably undertakes localized movements.

The length of grayling in the samples ranged between 25 and 380mm (Fig. 20). The mode at 30mm represents fry of the year; that is, the young from spring spawning. A second mode at $\approx 225 - 275$ mm represents fish four and five years old according to scale interpretation. This indicates a slower growth rate than grayling in either the Aishihik (unpublished data) or Porcupine River systems. The large majority of the sample was immature. Only three fish were classified as mature and eight as spawned out (Fig. 20); the majority of these were 290mm in length or more. More than one-half of the stomachs contained insects; a small percent had sculpins.

The lengths of grayling by gillnet mesh size is shown below:

mesh 1"	N=4	av. length 162mm
2"	29	242
2-1/2"	14	282
3"	7	313

Slimy Sculpin

This fish is probably the most widely distributed fish species in the Yukon Territory. Mostly it is a forage fish and, in turn, is eaten by most other fishes.

The sculpins in the samples ranged between 15 and 55mm in length. Two size groups were present in this range (Fig. 22). These two groups may represent two ages; namely, age 0 (fry of year) and age I (one year old). In early June, a number of unmeasured sculpin, but larger than those discussed above, had an orange edge on the dorsal fin indicating sexual maturity. It is likely the fish were spawning at this time. No other life history information is available.

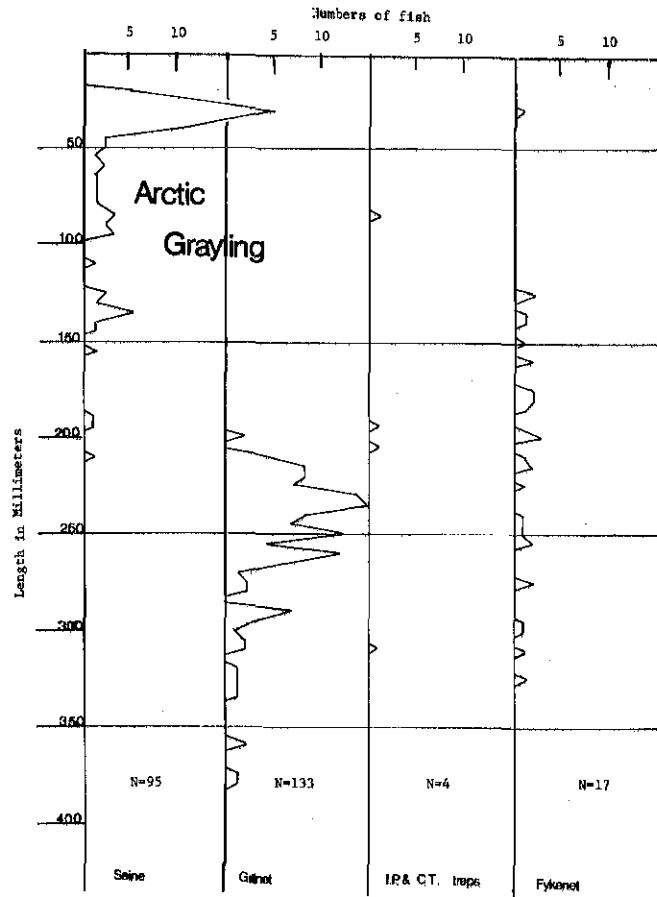


Fig. 20. Lengths of Arctic grayling

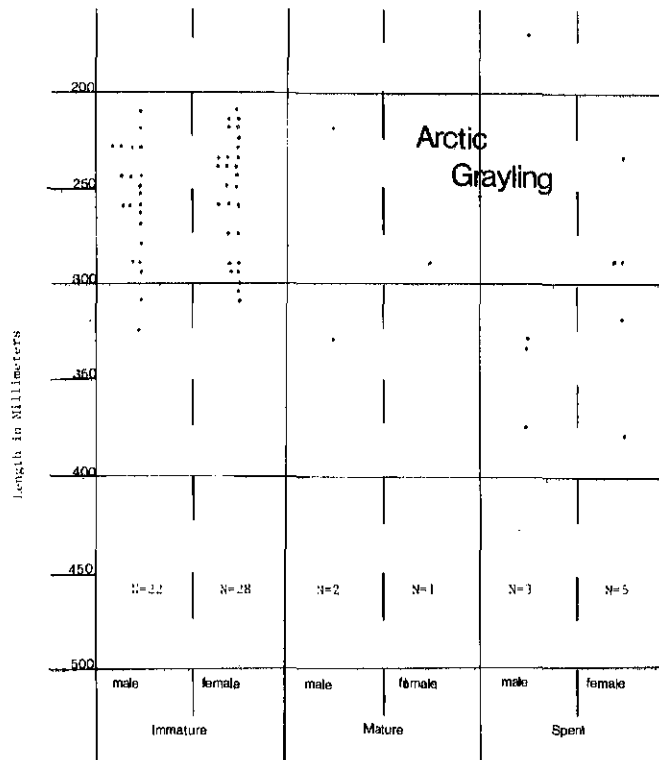


Fig. 21. Maturity of Arctic grayling

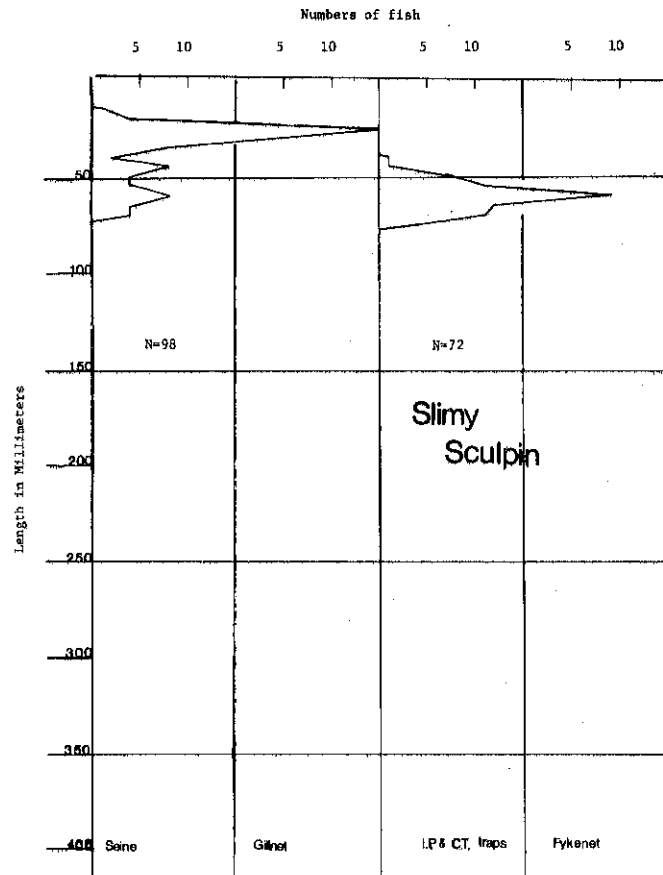


Fig. 22. Lengths of slimy sculpin.

Inconnu

The inconnu in some sub-Arctic waterways is anadromous, however it is not known if the inconnu that inhabit the waters of the Yukon River within Canada migrate as far as the Bering Sea or not. However, they are believed to travel great distances in the Yukon River. The inconnu is caught in salmon nets and wheels and forms a part of the subsistence catch.

Those sampled in 1975 were, with one exception, caught by gillnet and measured in the range 400 - 635mm (Fig. 23). There is no information on age. The majority of the sample was mature males (Fig. 24). Stomach contents were almost entirely fish.

The lengths of fish caught by mesh size were as follows:

mesh 2-1/2"	N=2	av. length 452mm
3"	8	498
4"	3	529

Humpback Whitefish

The humpback whitefish is generally a lake-dwelling species, however some members of the species appear to spend at least a part of their life cycle in streams. Migrations for spawning, feeding and overwintering are believed to be localized. Humpback whitefish are caught in salmon gear and form a small part of the subsistence catch.

The length range of captured whitefish, with one exception, was 240 - 460mm (Fig. 25). There is the suggestion of a size group at 375 - 400mm. Two scale samples indicate fish of this length to be nine years old. The majority of the larger size fish were classified as mature (Fig. 26), whereas the smaller ones were immature. Clams and snails were the major part of the diet for the spring-caught fish. Some stomachs contained fish eggs and small fish, particularly sculpin.

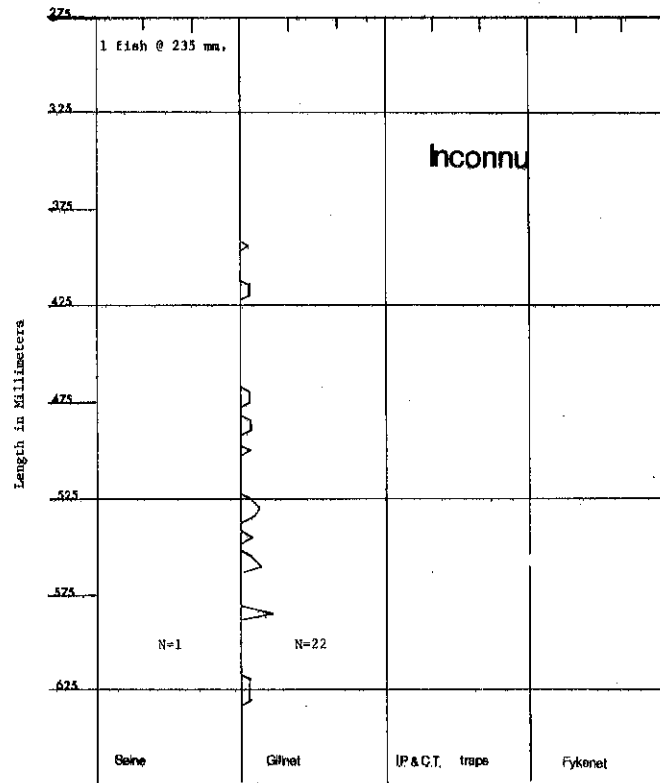


Fig. 23. Lengths of inconnu

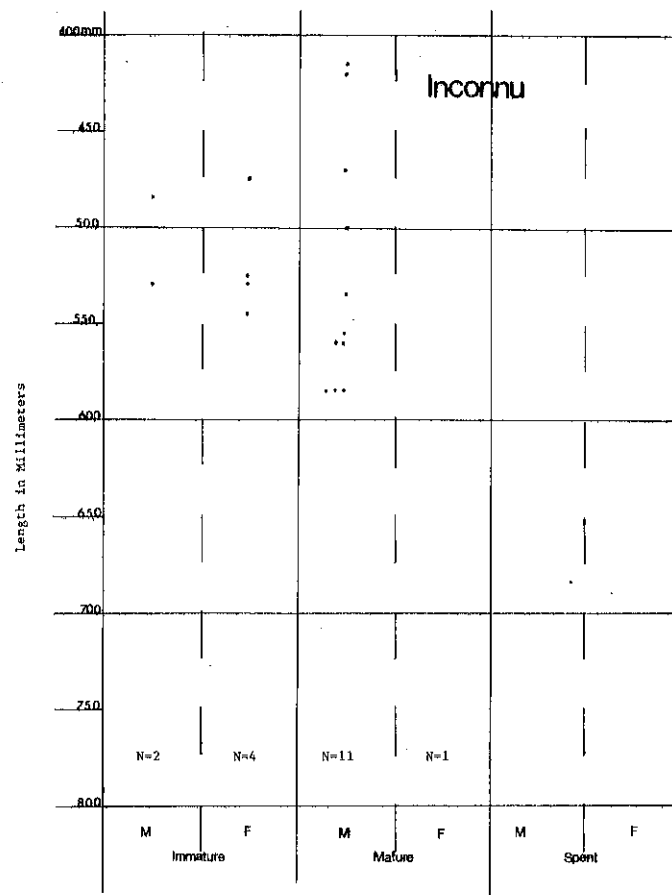


Fig. 24. Maturity of inconnu.

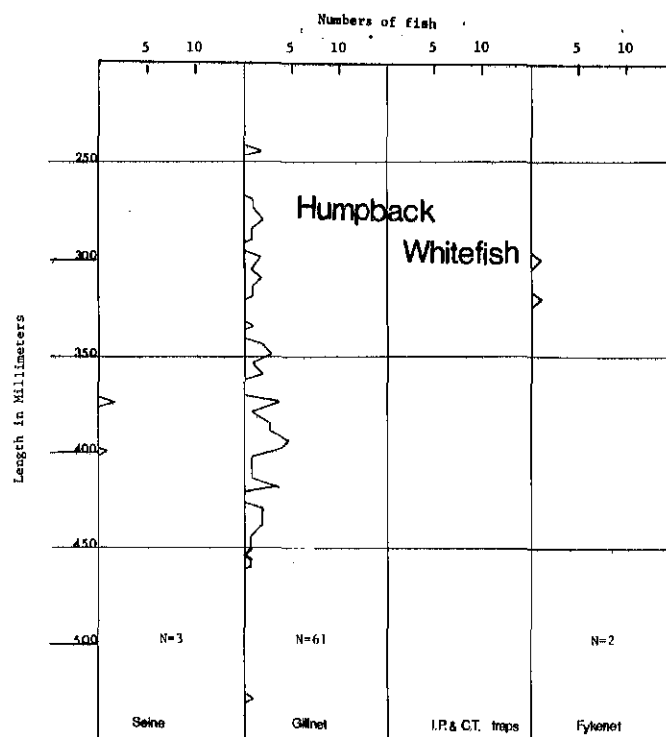


Fig. 25. Lengths of humpback whitefish.

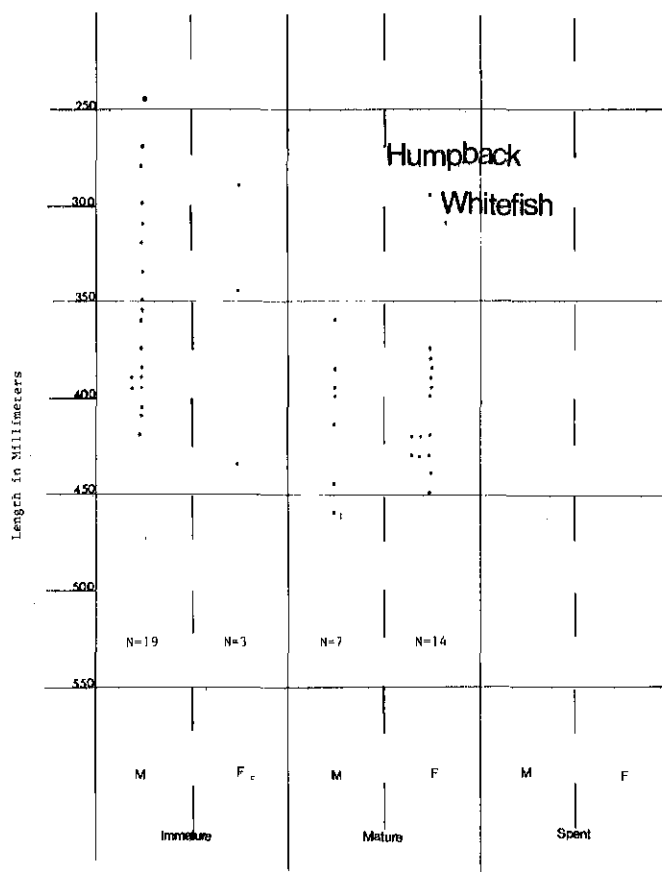


Fig. 26. Maturity of humpback whitefish.

lengths of fish by mesh size for gillnet-caught fish were as follows:

mesh 2"	N=7	av. length 324mm
2-1/2"	15	354
3"	15	399
4"	4	397

Round Whitefish

This fish is also widespread in the Yukon Territory and inhabits streams and shallow lake areas. The species probably has localized movements in the Yukon River.

The length of the sample was 48 - 480mm. A good proportion of the sample was in the 250 - 300mm range (Fig. 27). All fish greater than 300mm were found to be mature. Between 200 and 300mm, there was a mixture of mature and immature fish (Fig. 28). Vegetable matter appeared most abundantly in the stomachs. Insect larvae, debris and smaller fish were present in almost equal quantities.

Length of gillnet-caught fish by mesh size were as follows:

mesh 1"	N=2	av. length 208mm
2"	13	262
2-1/2"	9	315
3"	2	446
4"	1	435

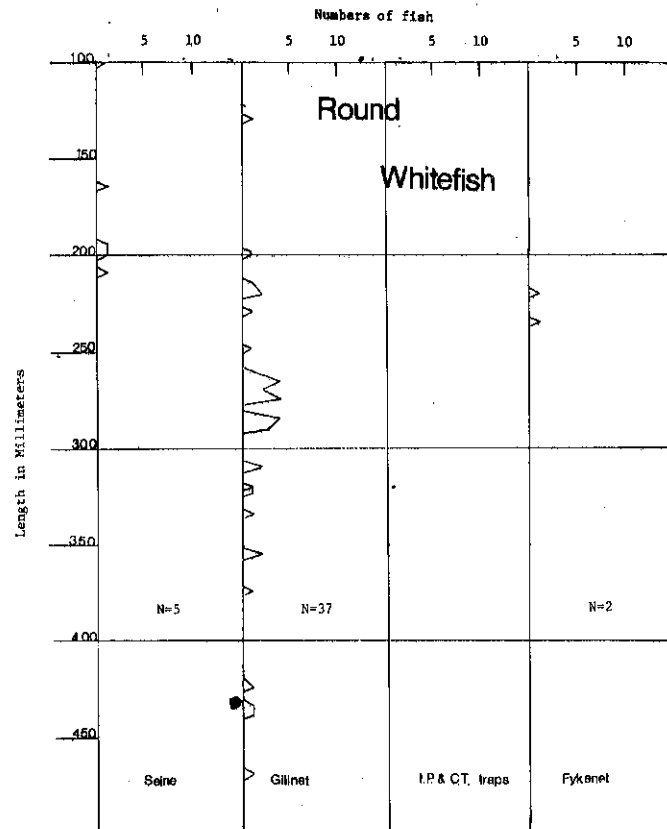


Fig. 27. Lengths of round whitefish.

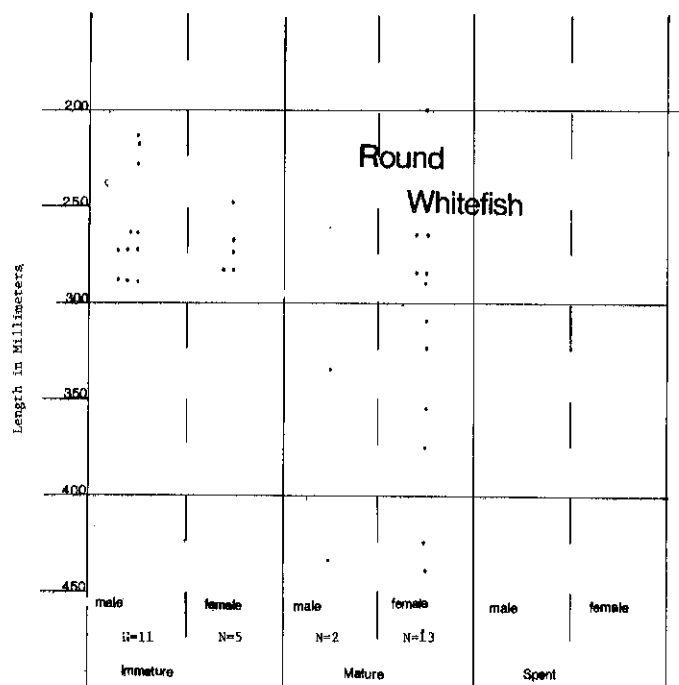


Fig. 28. Maturity of round whitefish.

Least Cisco

The cisco is the least abundant of the four white fishes in the study area. This fish is normally associated with lakes and lake outlet areas.

The length of ciscos caught in the study area were scattered in the range of 120 - 275mm (Fig. 29). Two mature males measured 240 and 275mm, and an immature at 240mm. Two mature females were recorded at 250mm.

Northern Pike

The pike is usually associated with shallow shore areas of lakes and slow weedy streams, however its presence in flowing waters is not uncommon. The species is probably localized in its movements.

The length range of pike is very great, from 250 to 840mm (Fig. 30). The sample is too small to show size groupings or indicate age. With one exception, all fish longer than 500mm were either ripe or spent (Fig. 31). Stomach contents consisted of lamprey, sucker, whitefish and juvenile salmon. On two instances, stomachs also contained ducklings.

The lengths of gillnet-caught fish were as follows:

mesh 1"	N=1	av. length 151 mm
2"	5	544
2-1/2"	4	573
3"	13	587
4"	4	733

Arctic Lamprey

This is an anadromous species reproducing in freshwater and feeding heavily in saltwater. The stage in saltwater is parasitic whereby

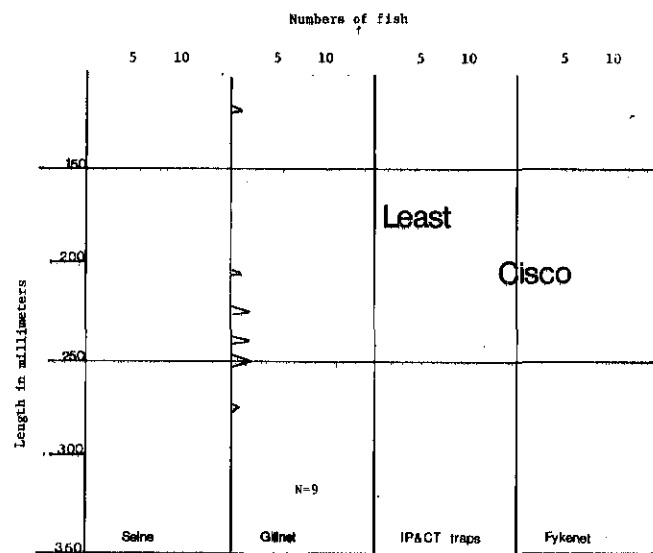


Fig. 29. Lengths of least cisco.

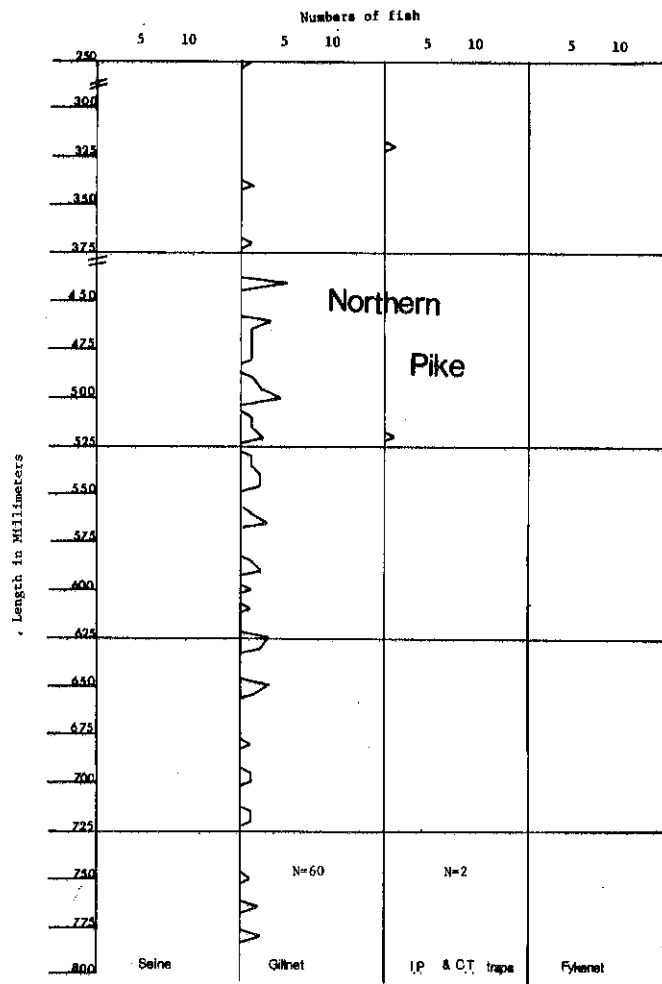


Fig. 30. Lengths of northern pike.

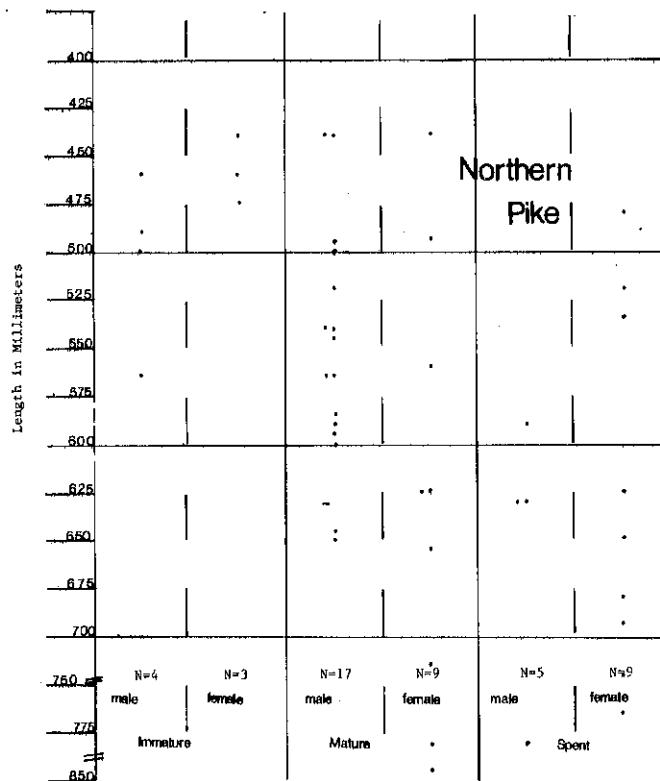


Fig. 31. Maturity of northern pike

the lamprey attaches itself to a fish. With the onset of maturity, the lamprey moves into freshwater to spawn.

The lamprey sampled in 1975 ranged in length from 95 to 175mm; within this range, two modal values exist: 100 and 150 - 160mm (Fig. 32). These modes probably represent age groups II and III. The lamprey, at these sizes, are in the juvenile form and presumably were engaged in migration toward the sea at time of capture. One adult lamprey was caught in McCabe Creek on June 30.

Lake Chub

The chub is a forage fish and probably serves as food to many other fishes. Their life history in the Yukon River is not known. They were found only in backwaters (sloughs).

Samples measured from 25 to 50mm with a mode at 35mm (Fig. 33).

Burbot

The burbot is relatively scarce and its biology is not known for the Yukon River.

The length of sampled burbot ranged from 60 to 465mm (Fig. 34). The sample is too small for further comment.

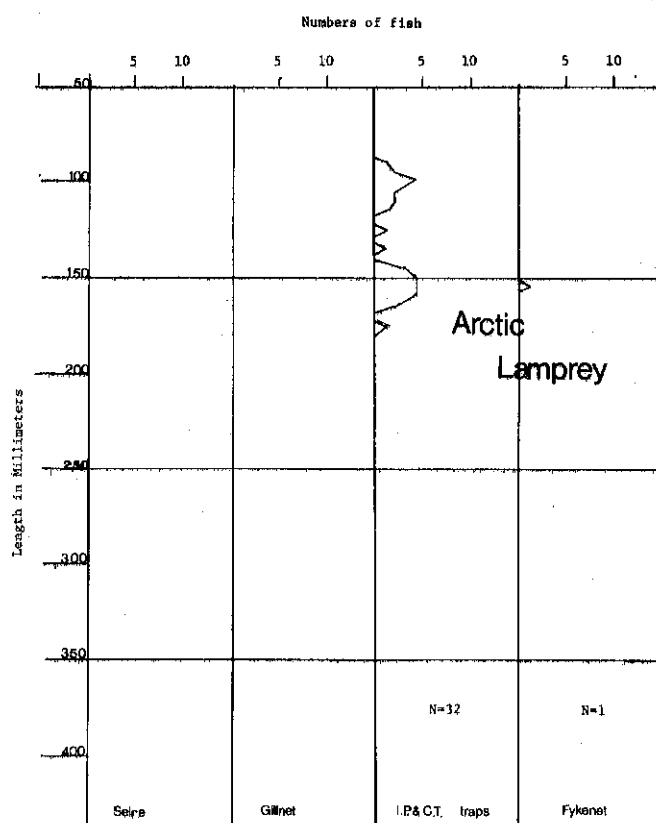


Fig. 32. Lengths of Arctic lamprey.

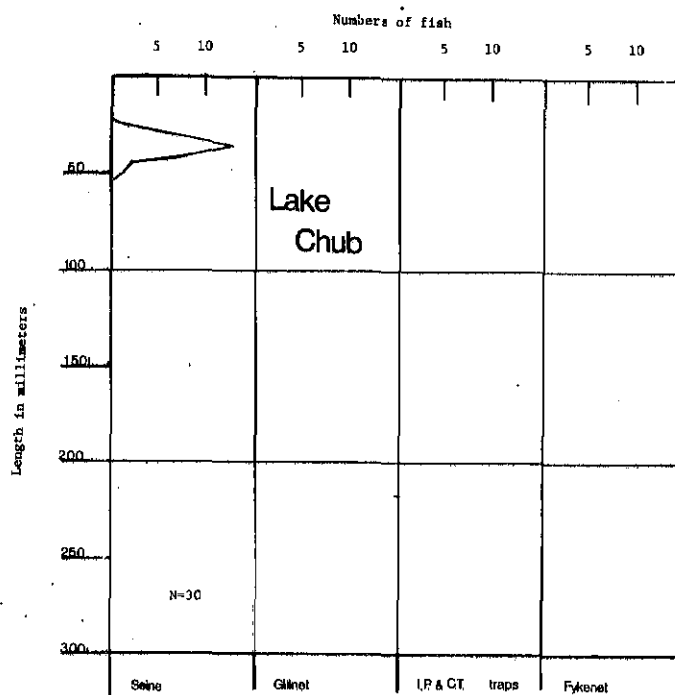


Fig. 33. Lengths of lake chub

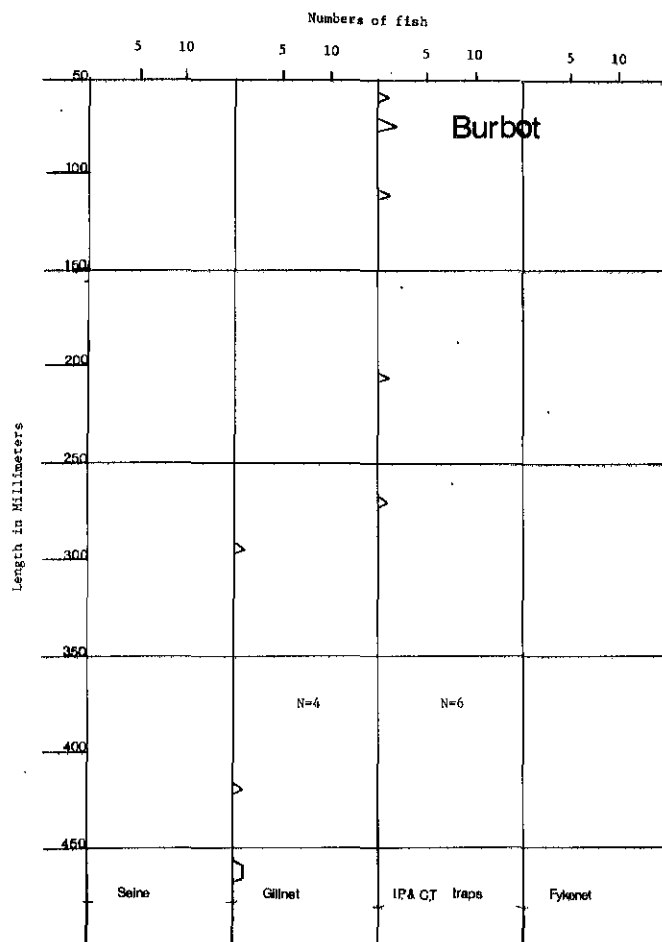


Fig. 34. Lengths of burbot

IV

OBSERVATIONS ON YUKON RIVER HABITAT

INTRODUCTION

This part of the report presents studies carried out (i) to identify potential biological sensitive (critical) areas such as those utilized for spawning; and (ii) to provide baseline information on water temperature and transparency of Yukon River flows.

In reference to (i) above, in pipeline-related studies carried out in the north Yukon during the period 1971-1974, it was established that areas which were ice-free year-round were commonly utilized by major fish populations for activities such as spawning, feeding and/or overwintering. The ice-free areas are a result of groundwater outflows. These flows are characterized by being relatively warm with a clear colouration. Consequently, the approach to locating critical areas was made through associating them with ice-free and/or clear water intrusion.

METHODS

An inventory of open-water areas in Yukon streams was commenced in 1972-1973 when Miss T. Allison of the Yukon Territorial Fish and Game Branch voluntarily plotted open-water areas in the course of flights undertaken to assess big game populations. Open-water areas were further defined on the Yukon River by Mr. R. Kendel on March 4, 1974, by aerial means. On June 5, 1975, Mr. R. Johnstone made a flight to specifically locate areas of intrusion of clear water into the Yukon River, exclusive of surface flows. The clear water was thought to be readily distinguishable from the "cloudy" main stream flow.

A further approach to the identification of potential, biologically important areas was made by boat and food survey. In these surveys, some general characteristics were looked at such as bank composition in terms of vegetation (trees, brush, moss, none), bank stability (erosion or no erosion as manifested by vegetation), water surface velocity, depth and streambed composition.

Stream temperatures were taken with pocket thermometer, and water transparency with secchi disc at frequent but non-regular times in so-termed critical areas in random fashion to obtain an overview of the situation. On the Yukon River, two stations were established for measurement of temperature and transparency. One station was located in the main channel at Minto and was operational in the periods May 5 to July 14 and August 18 to September 10. The second station was positioned one mile downstream of Dawson City and was active July 22 to August 9.

RESULTS

A total of 60 ice-flow areas were found between Tatchun Creek and Fort Selkirk. The areas were ice-free for two apparent reasons; namely, intrusion of groundwater and rapid current. Of the 17 localities identified as spawning areas and shown in Figs. 8 and 12, only five were identified beforehand as ice-free. Therefore, 12 areas were not located by the criteria of open water.

A total of 38 areas were classified as receiving groundwater. In only five instances, the interpretation coincided with areas of spawning. While it is possible to identify clear water areas in small side channels and sloughs, a problem arises in the main stem. In instances where the water is very shallow, the stream bottom becomes visible and the appearance is one of groundwater intrusion which, in fact, it isn't. A common factor destroying a relationship between groundwater presence and spawning in side channels was that of depth of flow. Very often the depth was later found to be less than that required for salmon spawning, e.g., Mile 239.

The ground survey appeared to have no more or no less success than the aerial survey in predicting spawning areas. In the end, it was necessary to seek and search out the areas of spawning when fish were on the grounds. Where water visibility was very limiting, it was useful to note the consistent presence of "rollers" (surfacing fish). However, roller activity may not provide information of sufficient accuracy to measure year-to-year variations in population magnitudes. This is particularly true for chinook salmon. Chum salmon, on the other hand, largely being stream margin spawners and appearing later in the year at a time when the water is more clear, are observable to some degree. The full extent of chum spawning was not observed however. Sounder or electric means are required to collect adequate data of sufficient accuracy to meet the objectives.

Mainstream temperatures in the Minto area increased from 6.7 - 7.2°C in the third week of May, to 13.3 - 15.0°C in mid-July. A decrease in temperature occurred from 11.1 - 10.0°C in the third week of August to 5.5 - 6.7°C in early September. At Dawson City, downstream of three major tributary systems, mid-summer water temperatures were in the order of 11.1 - 12.2°C.

Secchi disc readings of the main flow at Minto were approximately 50cm in the spring and 110cm in the fall. At Dawson City, mid-summer readings were 10cm. The conditions at Dawson City are strongly influenced by the large White River system which is of glacial origin, and hence has cool water with a high sediment load.

V -

RESOURCE USE

Historic

A literature search was conducted at the Public Archives in Ottawa in 1973 by M. Elson on the exploitation and administration of fish resources in the Yukon Territory. Pertinent information from his memorandum report and sources of information are given below:

- (1) Records of the Hudson Bay Company from posts operating with the Yukon.
- (2) Records of the Department of Fisheries concerning various topics from 1900 - 1920.
- (3) Records of the Comptroller's Office of the R.C.M.P. and its predecessors.
- (4) Records of North West Mounted Police in the Yukon Territory which are divided into three sections:
 - (a) Dawson City Letterbooks, 1899-1905;
 - (b) General Yukon Orders, 1898-1910;
 - (c) Daily Journals, 1898-1920.
- (5) Records of the Northern Administration Branch.
- (6) Records of the Anglican Church Missionary Society.
- (7) Documents of Wm. Ogilvie, Dominion Land Surveyor.
- (8) Time limitations prevented inspection of two other potential sources of information:

- (a) Records of the Department of Indian Affairs and Northern Development, 1919-1968.
- (b) Records of George Dawson, an employee of the Geological survey of Canada circa 1885 in various parts of the Yukon Territory. His observations have been published in an available G.S.C. document, but his original journals (probably the best source of any information concerning fish) have been microfilmed and can be borrowed from the National Archives, Ottawa."

"Early fur trade exploration by the Hudson Bay Company into Canada, north of the 60th parallel of latitude, was by way of the Mackenzie River. Extensions of their activities into what is now Yukon Territory were conducted from established forts on the Mackenzie or its tributaries. Access to the new territory was limited to two practicable routes: (a) from Fort Simpson via the Liard River to Frances Lake and thence into the Yukon Drainage; (b) from Peel's River Fort (on the Peel River) overland to what is now Rat River, then down the Bell River to the Porcupine and hence to the Yukon River in what is now Alaskan Territory.... It was established procedure by the expeditions to immediately establish fisheries near the site of the fort to supply food for dogs and the men. In some cases, if game (notably moose) was in short supply, the very existence of the explorers depended on fish alone. Occasionally, Indians traded a few fish at the forts, but the amounts were insignificant, the main volume being procured by the efforts of the Post fishery.

The fisheries were conducted by gillnets, which were made on site from twine. I encountered very little information on net dimensions, mesh size, float composition, etc. Whether the nets were floating or sinking is seldom clear, but from references to nets being frozen to the underside of the ice, it is probable that most were floating. In most cases, it is difficult to establish fishing effort because of the incomplete descriptions of the gear and lack of complete information regarding numbers of nets and the times they were in the water."

"Five years before the establishment of Fort Yukon, Robert Campbell in 1842 had ascended the Liard and Frances Rivers where he established a post on Frances Lake. Game was often scarce in the area, and the men often relied exclusively on their fisheries for sustenance. Catches were good at first but rapidly dwindled so that at times the men were forced to eat marten and wolverine. The whitefish were described as being of "excellent size and quality" when they were available. In late November, he reports that the whitefish are spawning, but there is little detail. Trading operations were extended with the establishment of a fort at Pelly Banks on the Pelly River north of Frances Lake. On August 15th, 1845, one "miserably poor" salmon was caught at Pelly Banks. From here a fort was established at the forks of the Lewes and Pelly Rivers in 1848 which became known as Fort Selkirk. Gillnet fisheries were immediately begun, and in the period September 12 to 22, approximately 40 "salmon trout"/day were taken. These were chum salmon. Various lake fisheries were also begun, one of these being Lake Tatlain from which 5,300 fish were taken in the fall of 1848. Most of these, I believe, were whitefish, but some were lake trout.... In 1849, a total of 1,590 salmon were taken at Fort Selkirk. An excerpt from Campbell's diary of October 22nd, reads: "late in the evening Gouche and Retza arrived from their camp at Tatlain Lake and I am truly grateful to learn that Reid has 10,000 fish staged, although he has only two nets." These fish are not specified, but I assume most are whitefish."

"In 1850, 4,000 salmon trout were taken at Fort Selkirk, the Tatlain fishery was "prospering," and Lapie Lake had produced 3,620 whitefish. In 1851, 5,000 unspecified fish were caught. This fort was abandoned in 1852."

"Involvement of the Department of Fisheries in the Yukon Territory began with the appointment of Mr. T. A. Stewart as Inspector of Fisheries for the Yukon Territory in May, 1900. In the previous year, members of the N.W.M.P. had been empowered as Fisheries Overseers, with the responsibilities of enforcing the Act respecting Fisheries and Fishing

and of issuing Fishery Licences.... Commercial fishing ventures in the Yukon at the turn of the century were essentially confined to the Dawson area and on Lake Laberge. Domestic fisheries were conducted by natives throughout the Territory using aboriginal methods, and small subsistence operations supplied groups of prospectors and surveyors. With the discovery of gold at Dawson and the tremendous influx of people to the town, fish became very important as a source of food. The Klondyke River was heavily fished for Arctic grayling in the period 1898-1910, and these fish commanded prices up to \$1.00 per pound on the Dawson market. Salmon were fished, but no concern was expressed about over-fishing them as was the case with grayling."

"In the period 1905-1913, a total of 47 commercial fishing licences (fee \$20) were issued by the Inspector at Dawson. Forty-seven domestic licences were issued in the same period (fee \$2). The main fishing effort was concentrated in the Yukon River, but some fishing occurred in the Stewart River, Mayo River, 40-mile River, Tagish Lake, Tatlain Lake, Lake Laberge, Lewes River, Thirty-mile River, Barlow Lake, Mayo Lake, Klondyke River, Tatchun Lake and Mica Creek. No information is given on the kinds or quantities of fish captured.".....

"Utilization of the Fisheries resource by the police was apparently extensive. They required large amounts of fish as dog food... A reference from the Dawson City Letterbooks of October, 1902, indicates a purchase of 16,700 pounds of dried fish at 5 cents per pound for dog food. Other detachments in the Territory required minor amounts of fish for dog food. Quantification of the total exploitation by the police is not available, but is assumed to have been substantial."

"During construction of the Alaska Highway in the second world war, several requests for exclusive fishing rights to some Yukon Lakes (notably Teslin) were received by the Northern Administration Branch. The purpose of these fishing rights was to supply fish to the construction camps, but exclusive rights were not granted. Exploitation of the fishery resource during construction of the highway may have been heavy at

localized points along the route because of both subsistence and sport fishing."

Another use of the fishery resource has been that of supplying food to the fur farm. This occurred on a relatively large scale in the 1930's when the fishes of Tagish and neighbouring lakes served as diet to the farm animals reared in the area.

In summary, the fishery resources have been of tremendous value to the native, explorer, farmer and developer in the Yukon Territory from time-to-time.

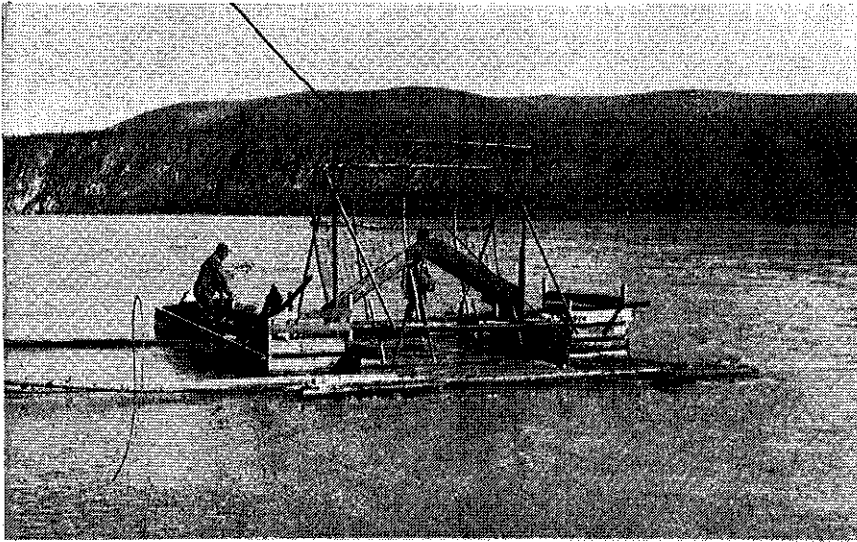
Current

The salmon are the most important fishes. The catches of salmon within Canada are in the order of 10,000 to 20,000 annually. Salmon is the only fish taken from the Yukon River for commerce. Commercial fishing is almost exclusively limited to the Dawson City area where the salmon are captured by fishwheel and gillnet. Maxima of 42 nets and 10 fishwheels have been licenced in any one year. Salmon are also taken in the Dawson City area for non-commercial purposes, but the majority of this catch is netted upstream along the Yukon River and in the lower reaches of the tributary streams for subsistence and domestic use. Approximately 75 non-commercial nets are fished annually for these needs. Recreation fishing is not yet important in the capture of salmon.

Another important fish for subsistence is the Tezra, a form of whitefish. This fish is exploited in the Pelly River, near Pelly Crossing, during the spring. Information on catch and effort have yet to be obtained for this fishery.

Inconnu, humpback and whitefish and pike are commonly caught in salmon nets and utilized for subsistence and/or for domestic purposes.

Plates 12 and 13 reflect some features of resource use.



Fishwheel along the
Yukon River.

Cleaning fish in
tributary creek.



Plate 12: Catching and processing salmon.

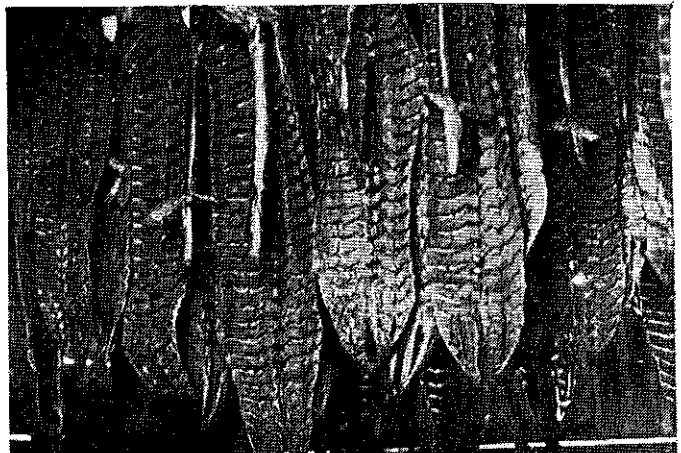
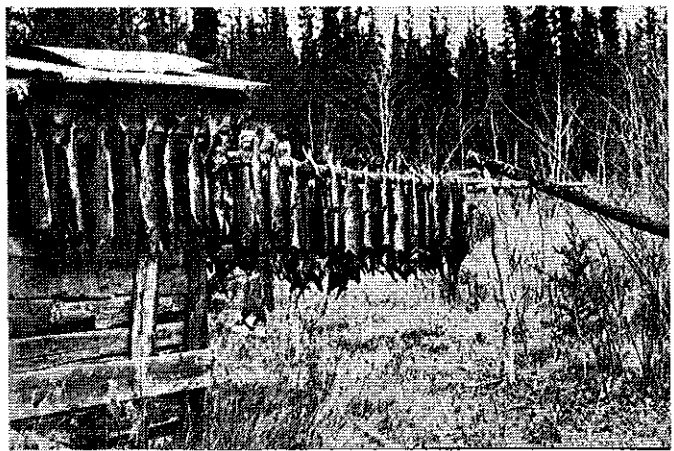
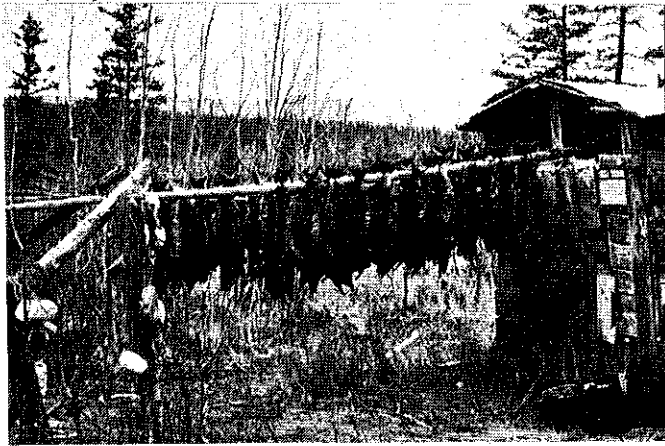


Plate 13: Fish racks along the Yukon River.

VI

DISCUSSION AND CONCLUSIONS

The most abundant fishes in the Yukon River are the salmon. The chinook salmon population at time of passage at Dawson City is in the range of 20,000 - 30,000 annually with the normal chum population at 30,000 - 40,000. However, the chum salmon may be cyclic with a large run occurring every four years. The evidence for this in the mainstem is lacking. However, subsistence fishermen in 1975 remarked on the ease of capture of chums and thought the same situation existed four years earlier. The spawning population in the Fishing Branch River, a tributary of the Porcupine system and, in turn, the Yukon River, had large populations in 1971 and 1975. The Fishing Branch and Dawson populations showed similar length-of-fish patterns in 1975, perhaps indicating a sameness in the populations. If the same cyclic pattern, both in year of occurrence and magnitude, applies to the population passing Dawson City as that in the Fishing Branch, then the 1975 chum population would have been in the order of 300,000 - 400,000.

In fishes other than salmon, the lack of adequate data on population characteristics precludes making comparison between fish from the Yukon River and those of other areas. However, there is a suggestion in the data on longnose suckers and Arctic grayling that growth is slower in the Yukon River fish and sexual maturity comes later than in other water bodies of the Yukon Territory.

The life histories of the fishes captured in the Yukon River are unknown, therefore the degree to which they are dependent upon the Yukon River for survival cannot be stated. For example, some fish may utilize the Yukon River to migrate from one tributary stream to another, or to feed at a particular time, or to spawn. On the other hand, the

fish may carry out all their functions in the Yukon River. Certainly, with salmon, all freshwater activities are concentrated in the Yukon River in some races. Chinook salmon spawning has been confirmed at Ingersol Island, Yukon Crossing and the outlet of Lake Laberge. Spawning by chum salmon was apparent at numerous localities from Tatchun Creek to Fort Selkirk in 1975, and seven of the most important areas are detailed in this report. It is highly likely that chinook and chum salmon also spawn in the Yukon River from Five Fingers to the outlet of Lake Laberge.

Spawning by other species was not found. However, the presence of mature fish with loose sex products (therefore "ripe") and the appearance of newly hatched young strongly point to mainstem spawning by other fishes. Juvenile fish of all species, particularly salmon, are present throughout the summer, therefore, the river serves as a vast feeding ground. The overwintering stage of the fishes' life has been very little studied, however the Yukon River, superficially at least, appears to offer the most opportunities for survival in terms of wetted space. In summary, the Yukon River is an all-season habitat for the fish resource.

In terms of resource use, the salmon are overwhelmingly important. They represent the only fish in the commercial business and form by far the largest part of the subsistence and domestic fish diet. In addition, the chinook salmon is becoming important in recreation fishing.

The exploitation of the chinook salmon in 1975 resulted in a catch disproportionately high in male fish (14:1; male and female respectively). This was also seen in 1973. Further, the catch of male fish was dominant in small size fish measuring around 60cm. The escapement was more equal in sex ratio and with a modal size of 70cms. Fish measuring 60cm were nearly absent. Therefore, the fisheries are either removing an entire segment of the chinook salmon population or sampling on the spawning ground is inadequate. While it is conceded that strong selective action is occurring on the chinook population, it is thought highly unlikely that an entire group of fish is being removed.

Discrepancies in measurements of pre- and post-spawner populations of chinook salmon have been encountered elsewhere. For example, on a study of the chinook salmon population in the Harrison River in 1968, the author found that the male:female ratio at the point of capture for tagging was 80:20; however, in the dead recovery the ratio was 29:71.

The large difference in sex ratio of pre- and post-spawners also extended to measurements of length. In the male fish, the smallest size group represented 75 percent of the pre-spawner sample but only 25 percent of the carcass sample.

A second case of size difference between pre- and post-spawners has been seen at Big Qualicum River. In one year, the smallest size group of male fish comprised 21 percent of the male population at a counting fence; however, on the spawning grounds, three to seven miles upstream of the fence, this same size group accounted for only 6 percent of the male carcasses.

The differences in sex composition between the samples may be related to the tendency for male fish to migrate in waters of lower velocity and shallower than female fish, and hence be more susceptible to capture. On the spawning grounds, the male spawners may wander following spawning and subsequently die remote from the spawning area, whereas female fish may protect the spawning nest to death. Differences in length may be explained by the higher tendency for dying and dead small-size fish to drift with the stream flow and hence be carried to deeper water and deposited there; therefore, they are missed in the sampling.

In any event, much more work is required to obtain representative measurements of chinook populations. As a start, the spawning populations need to be identified and sampled.

In terms of gear, the gillnet has a greater tendency to take larger fish than the wheel. A change toward heavier use of gillnets, particularly with larger size mesh, will increase the catch of female

chinook salmon. This has two advantages to the fisherman: it increases the weight of catch and provides roe which in itself has high value on the market. Increased exploitation of female chinook salmon may threaten the salmon population with extinction. Chum salmon, on the other hand, are exploited with only a slight abundance of males (52 - 55 percent).

Spawners have not been measured; therefore, a comparison of the two groups is not possible. There is, however, a positive correlation between gillnet mesh size and sex composition. Few female fish are caught in the small mesh nets; however, the relative abundance of females increases with mesh size. Therefore, any change in the fishery toward greater use of gillnets and those of large mesh size, 6 inches or greater, may result in significantly greater exploitation of female fish. Thence, the Yukon salmon fisheries must be monitored for gear use, and in gillnets the mesh size be noted along with the catch. Catch information should include sex and length for each category of gear.

The fish, being a cold-blooded animal, is in tune to its environment. Spawning, egg and larvae development and fry emergence occur at certain times of the year and under specific physical conditions; these conditions are compatible with continued productivity. Hence, major changes in the water temperature and/or water level of the Yukon River may have major detrimental consequences on the fish resources. For example, the wetted portions of side channels and sloughs are dependent upon surface water entering from the main river through, under or around log jams and/or water percolating from the main river through the gravel. A reduction in flow will affect the amount of water in these areas. Too little water will reduce depth and velocity and interground flows below those required for salmon reproduction. As is well known, salmon are very specific in their choice of spawning area and cannot readily be relocated. The danger is that a loss of spawning area may result in the loss of fish that utilize that specific area. The degree of specialization for spawning area by other fishes is not known, but there is increasing evidence, based on tagging, that grayling and longnose sucker at least are specific in place and time for spawning. If it should be that all the fishes have

environmental requirements that have come about by the trial and error process over a long period of time, then major changes in the environment will result in their loss.

The value of small tributary streams such as Von Wilczek, McCabe and McGregor Creeks to the fish resource can only be theorized. These streams appear to have flows during the summer months, May to September inclusive, and to be dry or frozen at other times. This situation would lend itself to spring spawning (grayling, longnose sucker, sculpin) and summer feeding. If the environment was changed and these activities were no longer possible in the small stream, it is not known if the fish using the stream could transfer to another area and survive.

ACKNOWLEDGEMENTS

J.A. Summers, District Conservation Officer 1963 - 1971, provided information on time of occurrence of salmon at Dawson City in earlier years and on the distribution of salmon spawners in the Upper Yukon system.

Preparation of the sampling equipment and initial implementation of the 1975 program at Minto were carried out by R. Kendel, R. Johnston, D. Kato and J. Hrenyk. R. F. Brown was responsible for the seining and fyknetting operations, and L. Steigenberger for the gillnetting activities. Persons assisting with data collection were: P. Doyle, Myran Kozak, G. Perry and G. Walker.

The commercial catch at Dawson City was sampled by P. Doyle, L. Chambers and G. Perry.

Spawning ground activities involved L. Steigenberger, R. Brown, J. Hrenyk, P. Doyle, L. Chambers, R. Kendel and R. Johnston. D. Brock and Ms. J. Schick assisted the program in logistic support.

The section on Resource Use is an abridged version of material prepared earlier by M. Elson, Northern Natural Resources Ltd.

R. Brown and G. Perry assisted in the preparation of material for this report.

Messrs. A. Gibson and G. Jones had responsibility for administration. Ms. A. Haaf kindly typed this report.

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APPENDIX A

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APPENDIX B

DAILY CATCHES OF CHINOOK SALMON BY
FISHWHEEL IN THE FORTY-MILE-DAWSON CITY
AREA IN THE PERIODS OF 1933-1950

	1933	1934	1935	1936	1937	1938	1939
July 5		7		7		3	
6		2		3		6	
7		3		5		0	
8		5		20		0	
9		5		32		3	
10	0	13		50	2	3	
11	0	26		48	2	4	
12	1	28		26	8	1	
13	0	66	27	59	16	4	
14	0	66	42	51	27	14	
15	1	109	124	40	37	12	
16	7	86	153	20	34	21	2
17	15	74	219	39	30	33	19
18	14	107	411	51	52	44	36
19	13	83	322	89	44	46	69
20	14	67	203	57	65	22	87
21	26	29	121	75	104	31	75
22	58	58	140	76	126	51	143
23	62	43	180	77	150	37	123
24	61	63	144	78	200	60	104
25	49	33	104	71	114	46	133
26	55	68	126	88	112	30	117
27	24	68	133	95	124	37	98
28	10	34	91	61	169	34	75
29	15	49	74	57	224	39	83
30	47	59	29	50	108	20	43
31	50	32	28	32	167	21	50
Aug. 1	28	40	54	32	59	15	31
2	31	14	19	33	71	33	43
3	31	22	12	31	81	48	44
4	50	15	17	26	73	31	13
5	34	8		18	60	24	37
6	9	9		25	58	21	22
7	16			25	53	11	20
8	20			29	40	12	11
9	18			20	48	17	5
10	13			10	26	12	2
11	6			19	12	16	2
12				9	11	5	2
13				6	9	10	2
14				9	8	7	0
15				11	5	5	2

APPENDIX B (CONT'D)

		1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950
July	5	4	35	9	2	2	0	1	3	0		
	6	6	23	37	3	2	0	0	4	0	1	
	7	13	32	59	2	2	0	4	3	0	0	
	8	15	48	87	7	5	1	4	3	0	1	
	9	30	48	128	2	6	1	8	5	0	1	1
	10	36	49	115	5	11	1	17	6	0	3	0
	11	79	65	159	8	10	8	29	3	0	2	60
	12	101	85	148	12	6	9	42	7	0	5	45
	13	105	87	125	4	13	5	69	17	2	5	175
	14	115	110	112	0	11	19	132	23	0	0	167
	15	133	119	58	0	15	35	149	23	8	1	173
	16	134	213	0	7	16	25	205	36	3	4	168
	17	166	408	0	46	50	31	330	100	6	2	126
	18	170	500	75	93	81	85	468	135	9	11	86
	19	166	300	144	100	137	69	402	154	10	12	94
	20	143	330	71	100	170	195	304	152	21	14	98
	21	83	364	120	94	188	132	259	193	17	7	89
	22	86	100	0	94	199	206	40	150	25	13	92
	23	68	264	66	85	188	195	272	143	34	31	80
	24	50	244	75	76	120	163	381	134	84	52	96
	25	51	263	72	47	144	147	295	185	189	56	99
	26	44	145		93	145	108	162	196	283	81	90
	27	16	153		76	90	68	153	335	165	85	112
	28	32	142		96	98	47	137	357	194	84	137
	29	8	156		63	66	26	92	101	212	95	95
	30	15	74		35	25	27	100	330	153	94	122
	31	10	40		28	56	25	120	200	144	97	130
Aug.	1	16	36		27	39	24	87	0	100	86	86
	2	9	20		14	15	37	57	132	90	114	57
	3	0	10		36	24	30	43	113	77	116	52
	4	16	12		15	10	29	15	98	75	109	48
	5		13		18	5	30	21	67	40	139	22
	6	5	26		19	45	32	20	42	33	138	25
	7		21		12	10	29	15	50	17	108	
	8	1	11		18	25	37	14	25	13	38	17
	9		29		15	20	13	4	27		29	11
	10	3	19		1	18	16	15	25		10	5
	11		26		4	7	5	20	9		5	2
	12		20		0	7	12	8	5		9	4
	13		21		3	7	7		4		9	1
	14		7		0	7	7				2	
	15		7		6	6	7				1	

APPENDIX C

CLASSIFICATION OF FISHES SAMPLED
FROM THE YUKON RIVER IN 1975

<u>Common Name</u>	<u>Scientific Name</u>	<u>Family</u>
inconnu	<i>Stenodus leucichthys</i>	(Coregonidae)
humpback whitefish	<i>Coregonus clupeaformis</i>	"
least cisco	<i>Coregonus sardinella</i>	"
round whitefish	<i>Prosopium cylindraceum</i>	"
Arctic grayling	<i>Thymallus arcticus</i>	(Thymallidae)
chinook salmon	<i>Oncorhynchus tshawytscha</i>	"
chum salmon	<i>Oncorhynchus keta</i>	"
northern pike	<i>Esox lucius</i>	(Esocidae)
longnose sucker	<i>Catostomus catostomus</i>	(Catostomidae)
burbot	<i>Lota lota</i>	(Gadidae)
slimy sculpin	<i>Cottus cognatus</i>	(Cottidae)
Arctic lamprey	<i>Lampetra japonica</i>	(Petromyzontidae)
lake chub	<i>Couesius plumbeus</i>	(Cyprinidae)