

# Informational Leaflet 86

## STIKINE RIVER RED SALMON STUDIES

By:

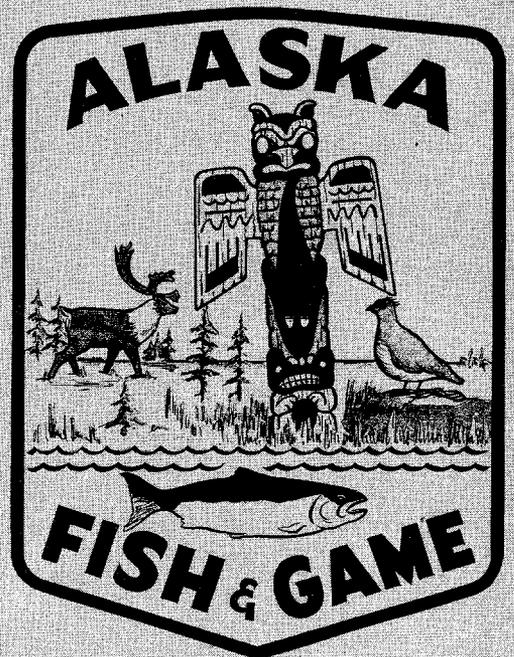
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## TABLE OF CONTENTS

INTRODUCTION .....	1
COMMERCIAL FISHERY .....	2
PERSONAL USE FISHERY .....	3
MANAGEMENT OF THE COMMERCIAL FISHERY .....	6
STIKINE RIVER INVESTIGATIONS .....	6
TAHLTAN LAKE PROJECT .....	7
MAGNITUDE AND TIMING OF ESCAPEMENT .....	7
THE 1965 TAHLTAN LANDSLIDE .....	17
AGE COMPOSITION OF THE RUN .....	17
BASIS FOR PREDICTION .....	20
SUMMARY .....	20

## STIKINE RIVER RED SALMON STUDIES

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### INTRODUCTION

One of the first salmon canneries in Southeastern Alaska was built at the mouth of the Stikine River in 1887. Cannery production at this time was composed almost exclusively of red salmon. An early source lists the 1896 Stikine harvest at 30,000 fish (Moser, 1899). Reliable catch records are available since 1938 and are listed in Figure 1 of this report.

The Stikine red salmon fishery presently yields an annual harvest of approximately 20,000 fish, a minor production when compared to the great red salmon fisheries of Alaska. Southeastern Alaska's limited red salmon production, however, is dependent on such relatively small fisheries.

A decline in the number of red salmon available to the Stikine fishery is obvious. Overharvest is no doubt the major cause of this trend. Natural factors, however, have also contributed to the decline. This report reviews briefly the history of the Stikine River red salmon run, discusses some of the known factors contributing to its decline, and describes the measures being attempted to maintain and possibly enhance this run.

### COMMERCIAL FISHERY

The red salmon fishery near the mouth of the Stikine River is limited

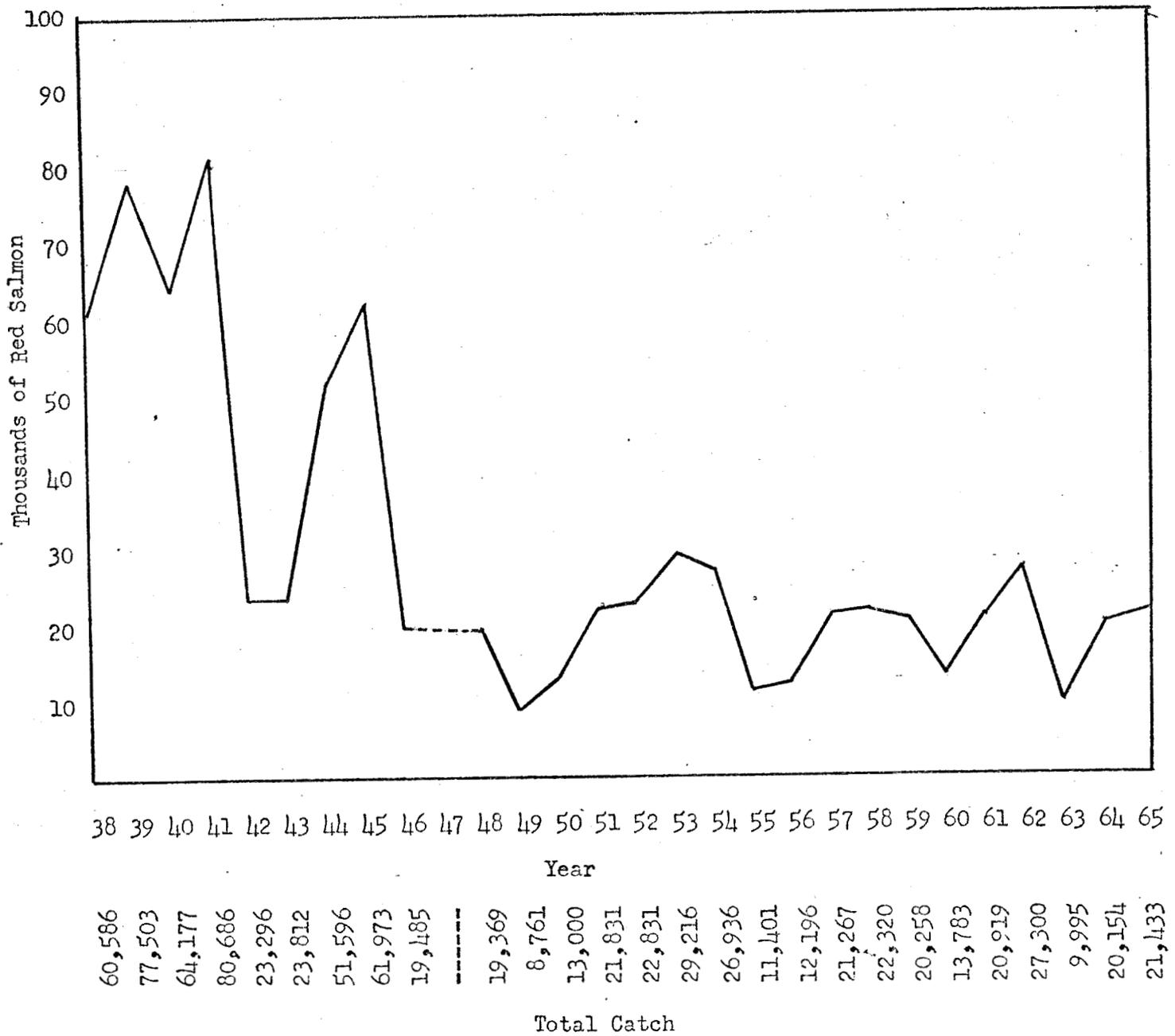


Figure 1. Annual commercial catch of Stikine red salmon from 1938 through 1965

to drift gillnets although many refinements in both gear and vessels have been incorporated during the history of this fishery.

The transition from cotton nets fished from open skiffs to nearly transparent synthetic gear fished from power reels on highly mobile diesel boats has made comparison of fishing effort difficult. The number of landings was used as a unit of fishing effort for several years, but because of an increasing number of boats packing ice and delivering only once a week, a boat-week figure is now used. A boat selling daily on the grounds to a tender is given the same weight as a boat selling once a week. Table 1 and Figure 2 show this effort figure and the catch per unit of effort figure since 1954.

Gillnetting in the Stikine District opens by regulation on approximately May 1 for spring run king salmon. Red salmon first appear in the catch by early June peaking in abundance in early July. Pink and chum salmon make up the bulk of the catch during July and August and coho are the predominant species throughout September. Although originally established to harvest red salmon, this fishery has become increasingly dependent on the other species of salmon during recent years. Red salmon is still considered the gillnetter's "money fish", and is the most sought after of the species entering the Stikine River.

#### PERSONAL USE FISHERY

A portion of the Stikine red salmon run is harvested for personal use by the Indian residents of Telegraph Creek, British Columbia. It has been estimated that approximately 8,000 sockeyes were taken annually during the forties.<sup>1</sup>

In recent years fishing intensity has decreased, partly due to scarcity of fish but probably more so because of a decline in the use of sled dogs and the demand for large amounts of dog food. A survey conducted by the Alaska Department of Fish and Game in 1960 indicated a personal use harvest of nearly 2,000 red salmon for that season.

<sup>1</sup> Unpublished letter to William F. Thompson from Clinton F. Stockley dated July 10, 1949.

Table 1. Catch of red salmon per unit effort of gear in the Stikine gillnet gillnet fishery from June 17 through July 19, 1954 through 1965.

Year	Catch	Effort	Average Catch per Unit/Effort	
1954	22,494	913 (no. of landings)	25 (catch per landing)	
1955	7,487	569	"	13 "
1956	9,604	379	"	25 "
1957	20,014	455	"	44 "
1958	18,420	645	"	29 "
1959	15,027	327 (boat weeks)	45 (catch per boat/wk.)	
1960	12,030	214	"	56 "
1961	17,515	208	"	84 "
1962	22,356	283	"	79 "
1963	6,129	170	"	36 "
1964	16,985	162	"	104 "
1965	19,067	151	"	126 "

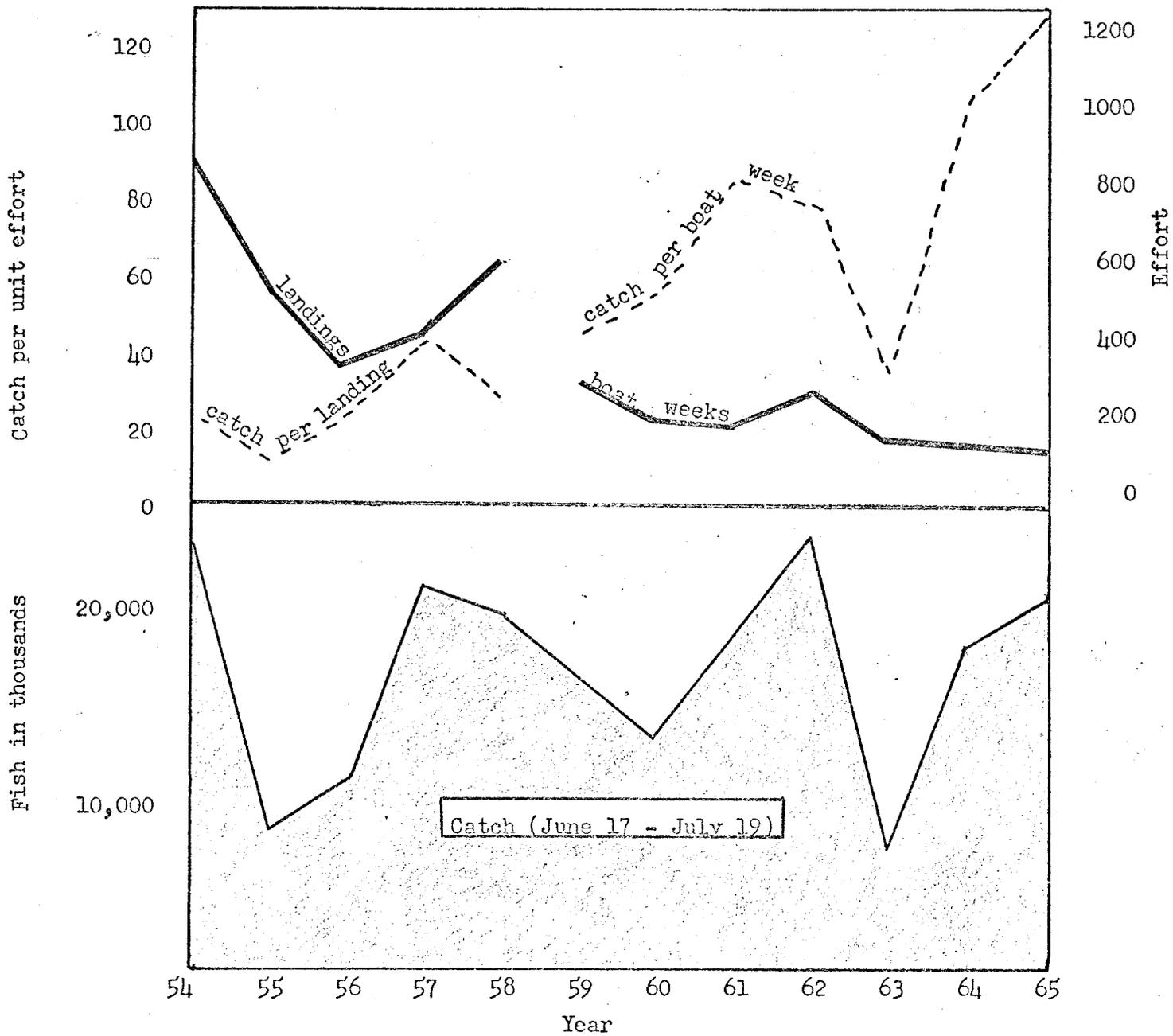


Figure 2. Annual gillnet catch of Stikine red salmon showing unit effort of gillnet gear for the period June 17 through July 19, 1954 through 1965

## MANAGEMENT OF THE COMMERCIAL FISHERY

Faced with declining salmon runs and an increasingly efficient gillnet fleet, the U.S. Bureau of Commercial Fisheries reduced the weekly fishing period in the Stikine District to three days in 1956. This basic fishing week was retained after statehood by the Alaska Board of Fish and Game. During the peak of the 1960 red salmon run when small catches indicated more restrictions were needed, only two days fishing per week was permitted. In 1962, the Board enlarged the sanctuary area at the mouth of the Stikine River by moving the fishing boundaries out beyond the tidal flats providing a much needed milling area for the Stikine runs. It is generally believed by resident fishermen that this action will contribute more to the rebuilding of the Stikine salmon runs than any previous regulatory action in the history of the fishery.

The Stikine District was designated as Regulatory District 8 in 1963 and is thus described in current regulation and statistical publications. Several restrictions on net and mesh size and fishing methods peculiar to this district are presently in effect. As these regulations are complex, are promulgated annually, and occasionally modified during the season by field announcement, they will not be discussed in this report.

The annually published regulations of the Alaska Board of Fish and Game for commercial fishing in Alaska are available upon request through the Alaska Department of Fish and Game, Juneau, Alaska. Field announcements are carried by all news media in the area effected and are also available at any Department field office.

## STIKINE RIVER INVESTIGATIONS

The first recorded survey of the Stikine River red salmon spawning areas by United States fisheries personnel is described by Dan Bates in 1949 (USFWS, Annual Report, Wrangell District, 1949). The following observation was made in describing Tahltan Lake in B.C., "the next day we flew back into the lake finding, unfortunately, a series of beaver dams located thereon from the lake's outlet to the point where the lake stream empties into the 1st Tahltan River". Bates urged further investigations in this area. In his 1950 report he again expressed alarm at the declining red run and requested that further surveys be conducted on the upper Stikine

watershed. No record of additional work is available until 1955 when the Alaska Department of Fisheries started an intensive reconnaissance of the Stikine River.

Investigations through 1958 revealed that less than a quarter of the 20,000 square miles of Stikine watershed was contributing to salmon production due to velocity blocks, (Figure 3). Ninety percent or more of the red salmon production came from Tahltan Lake located in British Columbia over 200 miles upstream from saltwater. Observations from 1956 through 1958 also indicated a serious red salmon loss during certain water stages at a partial velocity block located some twenty miles below Tahltan Lake.

This block, referred to as the Partial Block in Figure 4, coupled with the effects of low outlet flow and extensive beaver activity, resulted in near total loss of the 1958 escapement (Alaska Department of Fish and Game, 1958).

#### TAHLTAN LAKE PROJECT

In 1959, permission was obtained from the Canadian Department of Fisheries to establish a field station at Tahltan Lake for the purpose of maintaining water flows and obtaining escapement information. Through the help of funds donated by Petersburg and Wrangell fishing interests, a log and earthen water flow control dam was constructed at the lake outlet by July of that year. In addition, a screen weir was installed to enumerate adult red salmon entering the lake. Scale samples were collected and sex and length frequencies were recorded from approximately 5 percent of the escapement. The outlet stream was checked for beaver dam blockage at least once a week and adequate flow levels were maintained to ensure sufficient water for fish passage.

The Tahltan Lake project has been continued annually by the Alaska Department of Fish and Game as an integral part of the management of the Stikine River red salmon run.

#### MAGNITUDE AND TIMING OF ESCAPEMENT

The Tahltan Lake field station has been operated for seven consecutive seasons. Annual escapements are shown below and compared with

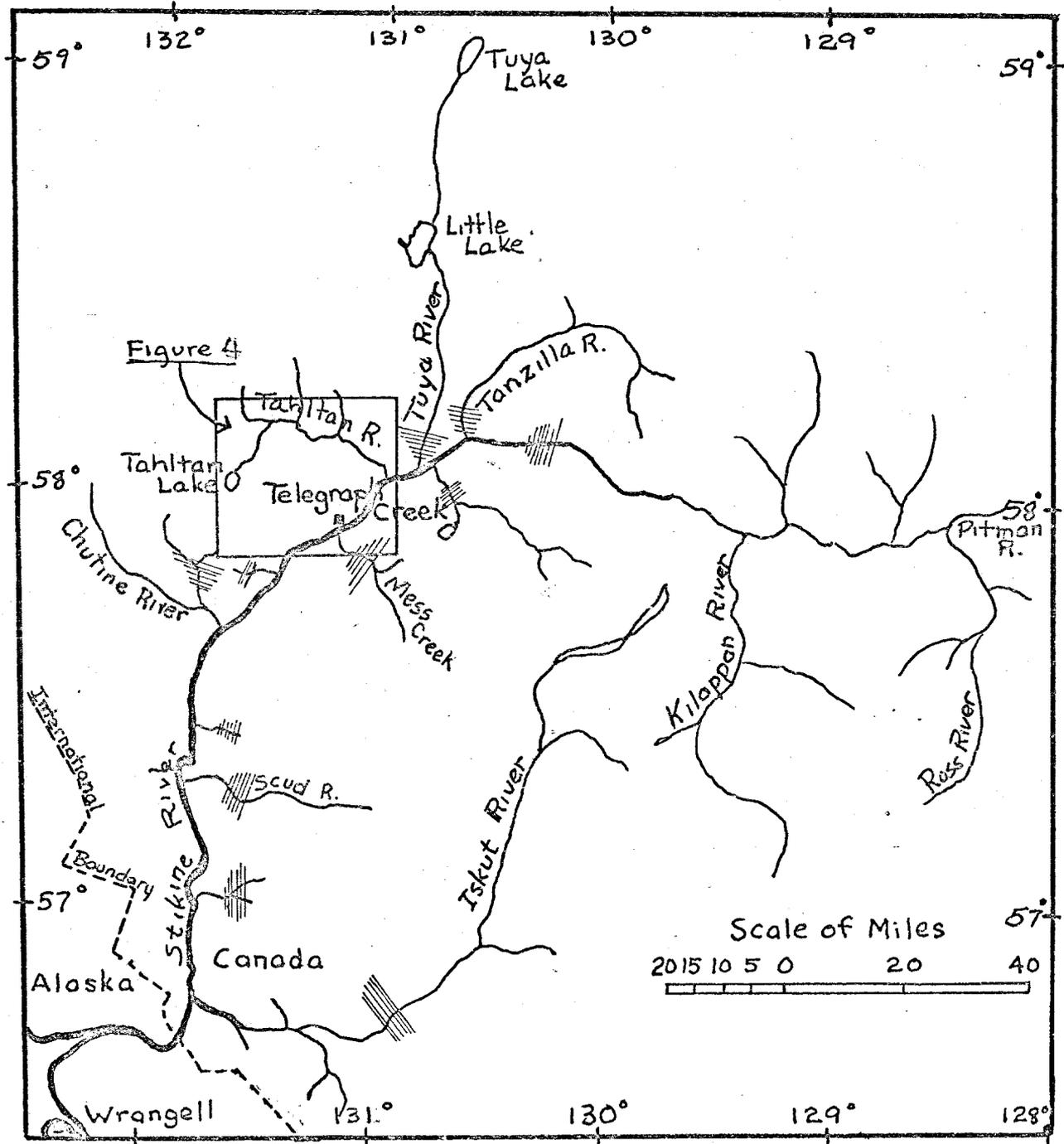


Figure 3. The Stikine River watershed showing the location of falls and velocity blocks impassible to salmon.

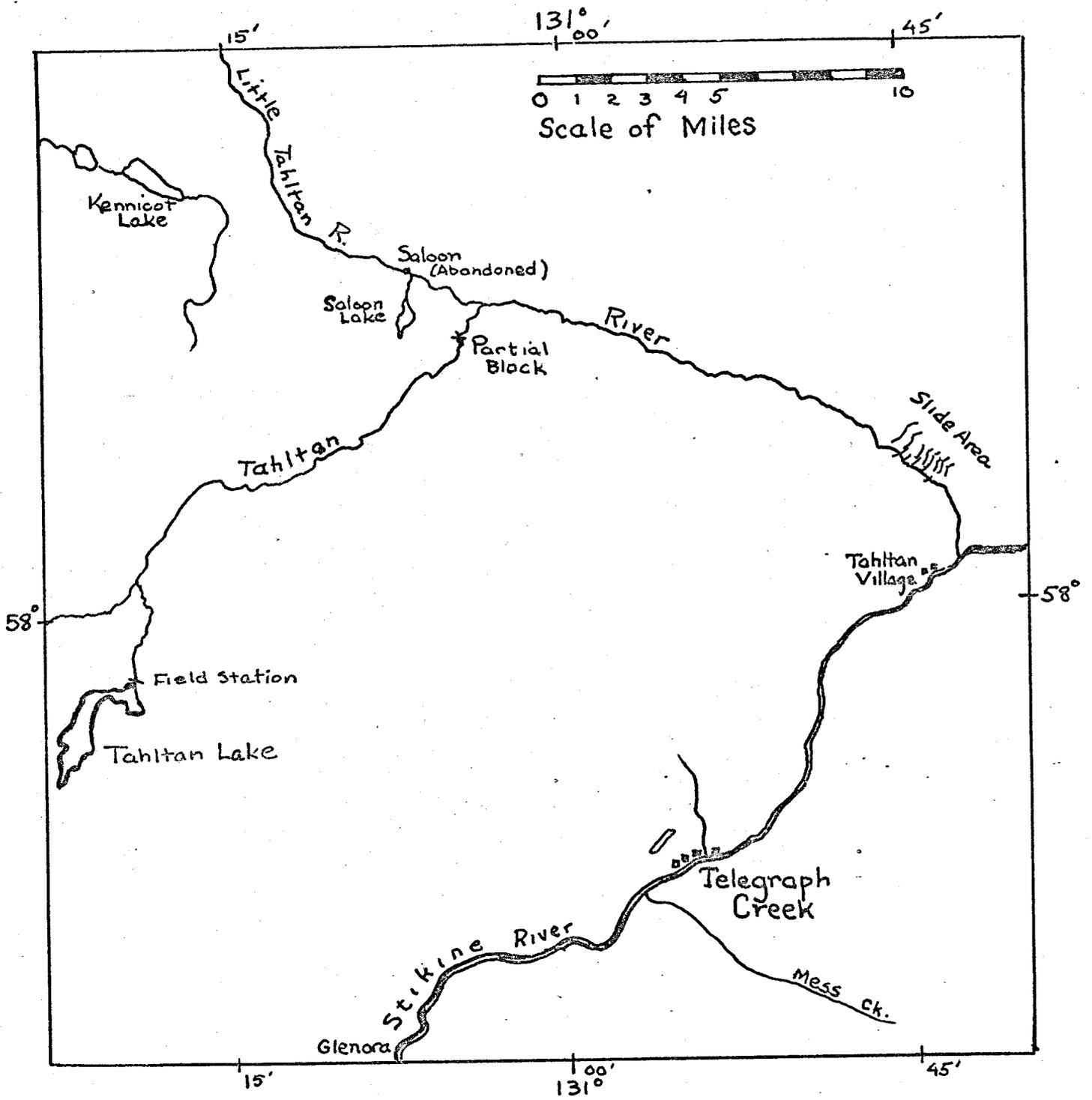
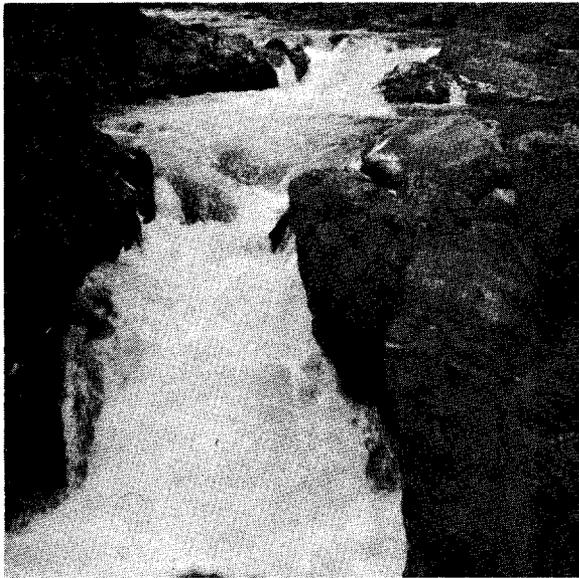


Figure 4. Tahltan River Drainage



The Partial Block



The 1965 Tahltan River Landslide



Tahltan Lake



Water Flow Maintenance Dam, Tahltan Lake



Adult Red Salmon Weir, Tahltan Lake

the Stikine River commercial gillnet catch to indicate magnitude of total run. These figures do not reflect the personal use harvest or estimation of incidental escapement into other minor spawning tributaries. The 1965 figures include an estimate of the large loss of spawners due to the 1965 Tahltan River landslide which is discussed further in this report. These data are shown in graph form in Figure 5.

Year	Escapement	Stikine Gillnet Catch	Est. Total Run
1959	4,311	20,258	24,569
1960	7,000	13,783	20,763
1961	16,619	20,919	37,538
1962	15,000	27,300	42,000
1963	1,700	9,995	11,695
1964	18,012	20,154	38,166
1965	26,471 *	21,433	47,904

\* includes escapement lost due to the 1965 landslide

Timing of escapement into Tahltan Lake has varied considerably as shown in Figures 6 through 8. During normal years the first salmon reach the lake in early August, peak in mid-August and diminish to a small trickle by the first week of September.

Escapements in 1959 and 1960 were in moderate numbers. In 1961 and 1962 they were considerably higher, entering the lake in sizeable numbers in early to middle August. The 1963 escapement of only 1,700 spawners was disappointing but understandable in light of the near complete loss of the parent run sustained in 1958.

During 1964, however, an excellent and wide spread escapement of 18,000 reds was counted, appearing as early as July 26, and running in good numbers throughout August.

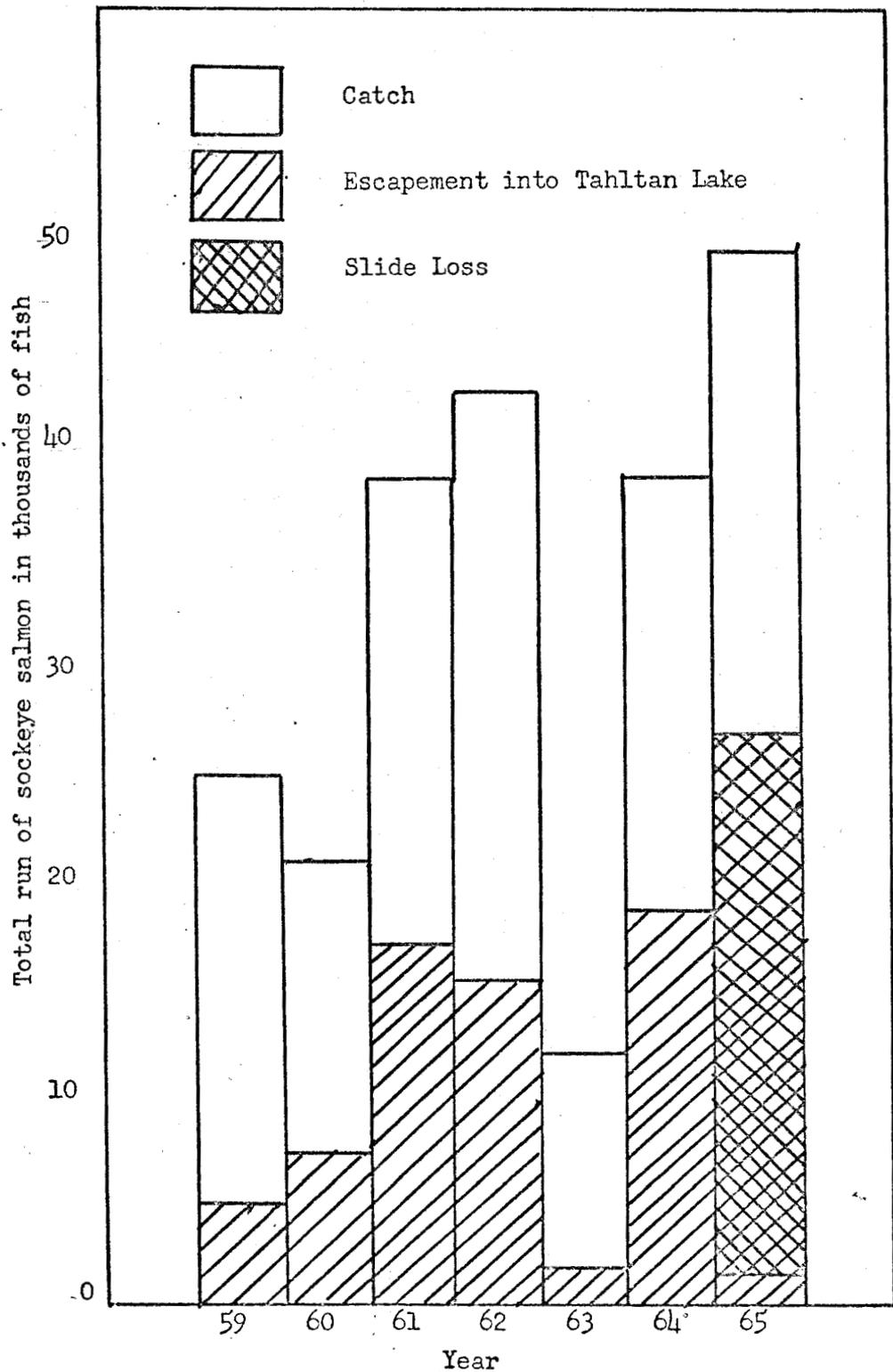


Figure 5. Stikine River: Catch and escapement of sockeye, 1959 to 1965

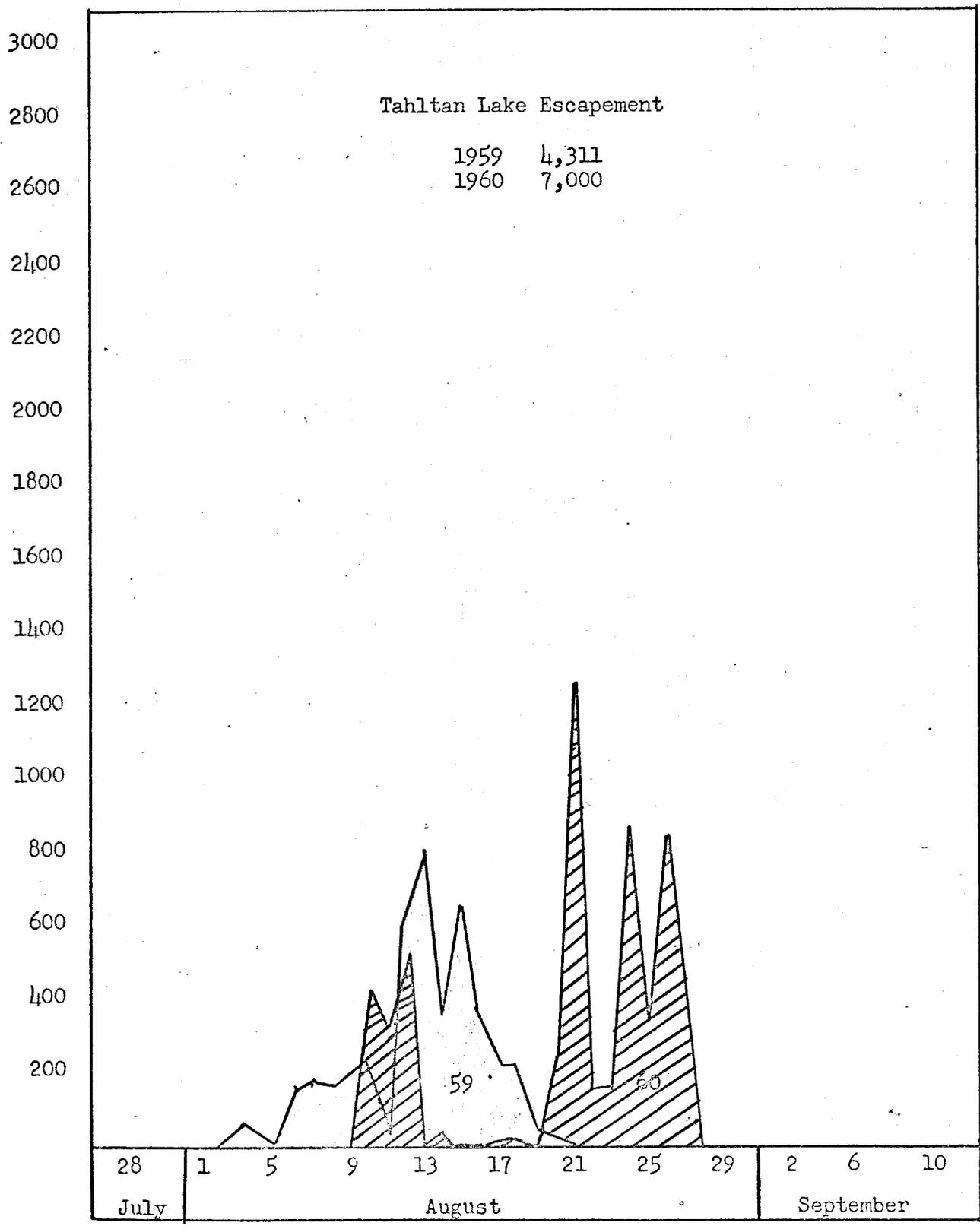


Figure 6. Tahltan Lake escapement, 1959 and 1960. The 1960 escapement count was probably minimal as there were salmon still in the outlet stream when the weir was dismantled.

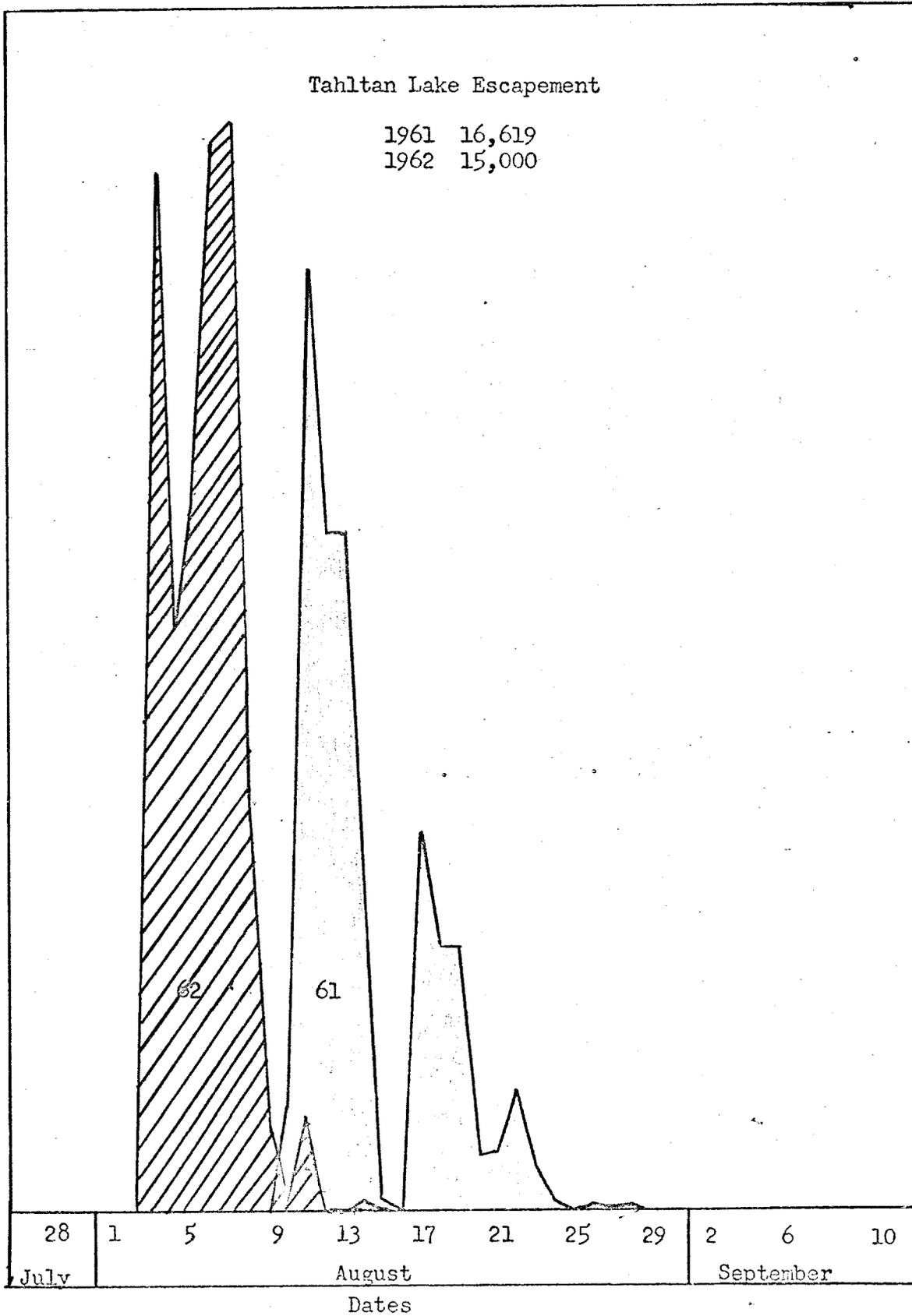


Figure 7. Tahltan Lake escapement, 1961 and 1962

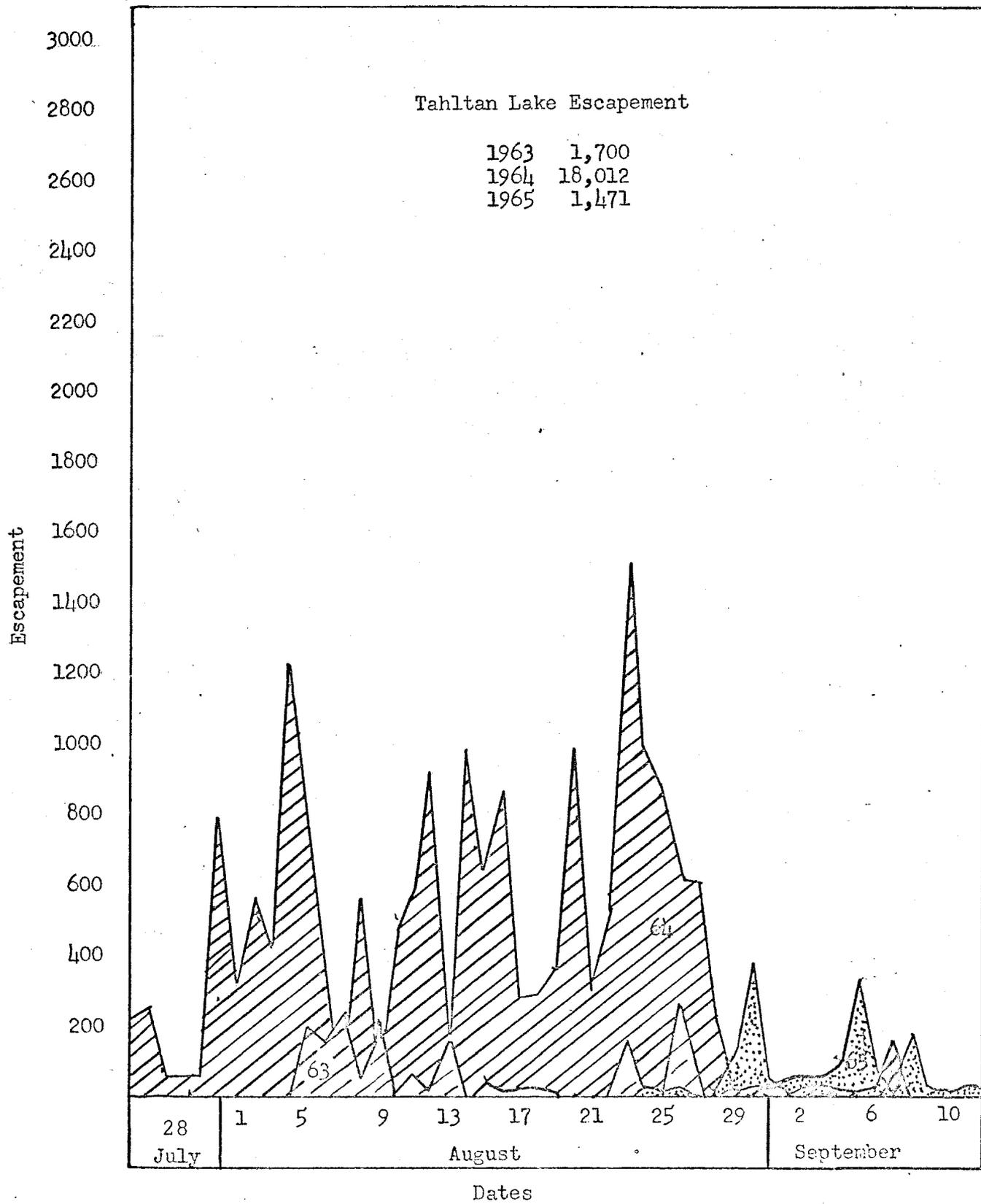


Figure 8. Tahltan Lake escapement, 1963, 1964 and 1965

## THE 1965 TAHLTAN LANDSLIDE

The 1965 escapement, estimated at between 20,000 and 30,000 red salmon and the largest obtained since counting began in 1959, was tragically blocked by a gigantic landslide which created a total block on the Tahltan River some 40 miles below Tahltan Lake. Over 10,000 reds were airlifted past the barrier by the Canadian Department of Fisheries, only to be halted further upstream by the old existing partial block. Because of the weakened condition of these fish plus low water conditions, the falls now presented a total block. About 1,800 red salmon were again hand dipped and carried over the falls after attempts to install an emergency steep-pass failed and 1,471 were eventually counted through the Tahltan Lake weir, extremely late and in very poor condition. Timing of migration from the partial block to the lake, a distance of 20 miles, was established at 5 days based on observation of tagged fish.

## AGE COMPOSITION OF THE RUN

Scale samples have been collected annually from the Tahltan Lake escapement from 1959 through 1964. Salmon reaching the lake in 1965 were in small quantity and in such advanced state of maturity that sampling was eliminated in order not to subject the limited spawning stock to further stress.

The age composition of the escapement entering Tahltan Lake varies considerably from one year to the next as shown in Table 2. The five-year age class (V) has varied from 88 percent in 1959 to only 1 percent in 1960. Conversely the four year age class (IV) has varied from 6 percent in 1959 to 96 percent in 1960.

Biological sampling of the commercial gillnet fishery at the mouth of the Stikine River has been conducted irregularly since 1949. Samples obtained prior to 1964 were collected by the U.S. Bureau of Commercial Fisheries. The percentage age composition from these data are shown in Table 3.

The age composition of the catch appears to be fairly consistent for the eight years sampled. V year fish are dominant, comprising an average of 75 percent of the annual commercial harvest. IV and VI year fish contributed an annual average of 17 percent and 7 percent respectively.

<u>Year</u>	<u>Tahltan Lake Escapement</u>	<u>No. samples collected</u>	<u>% Age Composition</u>					
			<u>3<sub>2</sub></u>	<u>4<sub>2</sub></u>	<u>5<sub>2</sub></u>	<u>5<sub>3</sub></u>	<u>6<sub>2</sub></u>	<u>6<sub>3</sub></u>
1959	4,311	197		6	72	16	1	5
1960	7,000	329		96		1		3
1961	16,619	123		30	62	8		
1962	15,000	508		10	84	2	1	3
1963	1,700	112	5	65	21	5		4
1964	18,012	459		59	38	2		1

TABLE 2. Percentage age composition of Tahltan Lake escapement, 1959-64.

<u>Year</u>	<u>Stikine gill-net catch</u>	<u>No. samples collected</u>	<u>% Age Composition</u>					
			<u>3<sub>2</sub></u>	<u>4<sub>2</sub></u>	<u>5<sub>2</sub></u>	<u>5<sub>3</sub></u>	<u>6<sub>2</sub></u>	<u>6<sub>3</sub></u>
1949	8,761	307		3	72	5	6	6
1950	13,000	445		24	67	4		2
1952	22,831	90		12	71	6		6
1955	11,401	57		7	75	2		11
1958	22,320	106		12	59	22		7
1959	20,258	98		12	77	6		5
1964	20,154	310		36	56	3		4
1965	21,433	242		27	65	4		4

TABLE 3. Percent age composition of the Stikine River gillnet fishery for years sampled.

In comparing the age composition of the red salmon escapement and catch where samples were collected from both sources during the same year, data are available for the years 1959 and 1964 only as shown herein.

<u>Year</u>		<u>% Age Composition</u>					
		$3_2$	$4_2$	$5_2$	$5_3$	$6_2$	$6_3$
1959	Catch (20,258)		12	77	6		5
	Esc. (4,311)		6	72	16	1	5
1964	Catch (21,433)		36	56	3		4
	Esc. (18,012)		59	38	2		1

The 1959 age composition compared quite favorably with a slightly greater percentage of three-ocean salmon ( $5_2$  and  $6_3$ ) occurring in the catch. However, the 1964 run, which was considerably larger than 1959, resulted in very different age composition in the catch and escapement. There was a significantly larger number of three-ocean salmon in the catch. This may indicate that gillnet gear is selective to the larger, older fish, varying in degree with magnitude and age composition of the run.

The Tahltan escapement has averaged 71 percent V year fish if the years 1960 and 1963 are excluded. Investigation of the parent cycle for these years gives us a possible explanation of what happened.

There is no escapement count available for 1955, the parent year for V year fish returning in 1960. The commercial catch for that year, however, was only 11,401 reds which was the third poorest season in the 28 year catch data history of the Stikine fishery (Figure 1). Examination of the 1959 age composition reveals only 11 percent IV year fish. No VI year fish were found in the 1961 scale samples, (Table 5). It appears likely, therefore, that the 1955 year class was a failure with either very little escapement reaching the lake or some unknown mortality effecting the resulting spawn.

Again, there is no escapement count for 1958, the parent year for V year fish returning in 1963. However, field survey work conducted by Charles Meacham in that year indicated severe loss of escapement due to

prevailing low water conditions and extensive beaver activity in the Tahltan Lake outlet, (Alaska Department of Fish and Game, 1958). The small numbers of IV year fish in 1962 and VI year fish in 1964 also support the theory that the 1958 parent year produced a very poor return.

Estimated total production for the brood years 1956 through 1960 are shown in Table 6.

#### BASIS FOR PREDICTION

There is a fairly good correlation between the number of IV year fish in a given year and that of V year fish returning the following year and, in one instance, the presence of a number of III year fish in the escapement during the previous year. Table 7 and Figure 9 show the relationship.

The use of Figure 9 has some value in determining the probable magnitude of the forthcoming years run. The following limiting factors should be considered, however.

1. The age composition of the escapement may differ somewhat from that of the commercial fishery due to gear selectivity.
2. The number of scale samples collected in certain years were quite minimal.
3. The IV year class may fluctuate considerably thereby varying the total return appreciably. For example, the 1950 return would have been a failure if not for the unusually large number of IV fish returning that year. During most years, the return of III's is not sufficient to use as an indicator.

#### SUMMARY

This report is a summation of over ten years of investigation, research and management conducted on the Stikine River red salmon run. Exploratory surveys prior to 1959 revealed that Tahltan Lake in British Columbia is the major contributor to the Stikine red salmon run but received limited escapements in certain years due to velocity blocks, active beaver dams, and low

Table 5. Percentage of total run returning annually by age group based on scale analysis.

PARENT YEAR	ESC.	59 <sup>1/</sup>	60	61	62	63	64 <sup>1/</sup>	65 <sup>2/</sup>
1953	Unknown	5						
1954	Unknown	84	3					
1955	Unknown	11	1					
1956	Unknown		96	70	4			
1957	Unknown			30	86	4		
1958	Poor				10	26	2	
1959	4,311					65	51	4
1960	7,000					5	47	69
1961	16,619							27
1962	15,000							
1963	1,700							
1964	18,012							
1965	1,471							

Table 6. Calculated total run returning annually by age group based on scale analysis.

PARENT YEAR	ESC.	59 <sup>1/</sup>	60	61	62	63	64 <sup>1/</sup>	65 <sup>2/</sup>	EST. PROD.
1953	Unknown	1,228							Inc.
1954	Unknown	20,638	622						Inc.
1955	Unknown	2,703	207						2,910
1956	Unknown		19,932	26,277	1,680				47,889
1957	Unknown			11,261	36,120	468			47,849
1958	Poor				4,200	3,040	763		8,003
1959	4,311					7,602	19,465	1,916	28,983
1960	7,000					585	17,938	33,054	51,577
1961	16,619							12,934	Inc.
1962	15,000								
1963	1,700								
1964	18,012								
1965	1,471								
TOTAL RUN		24,569	20,763	37,538	42,000	11,695	38,166	47,904 <sup>3/</sup>	

<sup>1/</sup> 1959 and 1964 samples collected from both the escapement and the commercial fishery.

<sup>2/</sup> 1965 samples collected from the commercial fishery only.

<sup>3/</sup> The total 1965 run of 47,904 includes an estimated 25,000 red salmon unable to traverse the Tahltan landslide barrier and partial block.

Table 7. Relationship of the number of IV year fish in a given year and III year fish the preceding year, V year fish the following year, and VI year fish two years later.

<u>Year</u>	<u>No. of III fish returning pre- vious year</u>	<u>No. of IV fish</u>	<u>No. of V fish returning one year later</u>	<u>No. of VI fish returning two years later</u>
1959	?	2,703	207	0
1960	0	19,932	26,277	1,680
1961	0	11,261	36,120	468
1962	0	4,200	3,040	986
1963	0	7,602	19,465	1,916*
1964	585	17,938	33,054*	?
1965	0	12,934*	?	?

\*Based on samples collected from the commercial fishery only which may be selective toward larger fish.

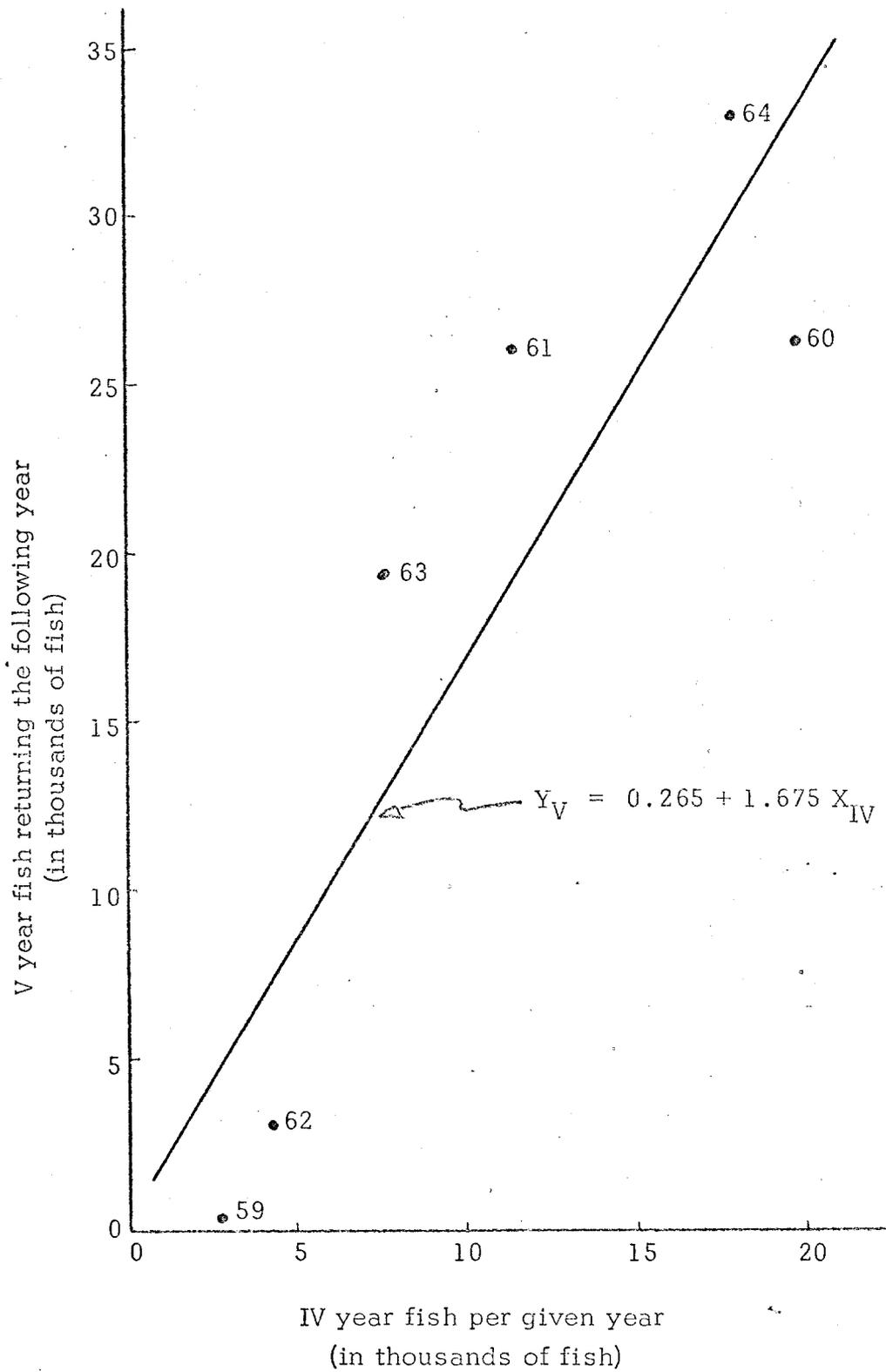


Figure 9. Number of IV fish per given year versus number of V fish returning the following year.

outlet flow. By permission of the Canadian Department of Fisheries, a flow control maintenance dam and counting weir at Tahltan Lake was established in 1959 and has been operated annually by the Alaska Department of Fish and Game.

Through respective management control in effect since 1960, coupled with the Tahltan Lake project, escapement levels have increased and have shown promising results in the 1964 and 1965 return runs. An extensive landslide on the Tahltan River occurring in 1965 may, however, endanger the future of this run.

Age analyses show the Stikine red salmon run to consist of 4<sub>2</sub> and 5<sub>2</sub> adults with the latter dominant in most years. There is a good correlation between the number of IV year fish in a given year and the number of V year fish returning the following year which may be used, within broad limits, as a basis for prediction.

Further age analysis confirm that certain brood years having suspected low escapement levels such as 1955 and 1958 did in fact produce very poor returns.

The necessity for continuation of the Tahltan Lake project is supported by:

1. The high magnitude of red salmon returning in 1964 and 1965.
2. The knowledge that escapement into Tahltan Lake is often limited without adequate control of water flow and active beaver dam removal.
3. The need to enumerate total escapement for proper evaluation of the management of the commercial fishery.
4. The need to obtain age composition data from the escapement for predicting magnitude of future runs.
5. The importance of assessing the effects of the Tahltan landslide on the future of the Stikine red salmon run.

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