THE STATUS OF THE NANIKA - MORICE SOCKEYE SALMON POPULATION AND THE MORICETOWN NATIVE FOOD FISHERY IN 1967 AND 1968

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I. INTRODUCTION

The limited historical information available on the Nanika River sockeye salmon escapement indicates that prior to 1954 the spawning populations ranged from 20,000 to 70,000 fish annually. The run was drastically reduced in 1954 and continued to decrease until the 1957 to 1959 period when the total escapement for each of the three years was 1,000 fish or less. (Fig. I).

Remedial measures were taken firstly in 1959, with the removal of a blockage at Hagwilget on the Bulkley River, and secondly in 1961, with the installation of a hatchery on the Nanika River in an attempt to transplant fish from Pinkut River on Babine Lake.

Since the removal of the obstacle at Hagwilget in 1959, the escapement has shown a generally increasing trend. The removal of the obstacle also had the effect of eliminating the Indian fishery which depended on the delay and concentration of fish below the blockage. There is, however, no evidence to indicate that the hatchery transplant was successful either from the smolt outputs from Morice Lake or from the adult returns to the Nanika River spawning grounds.

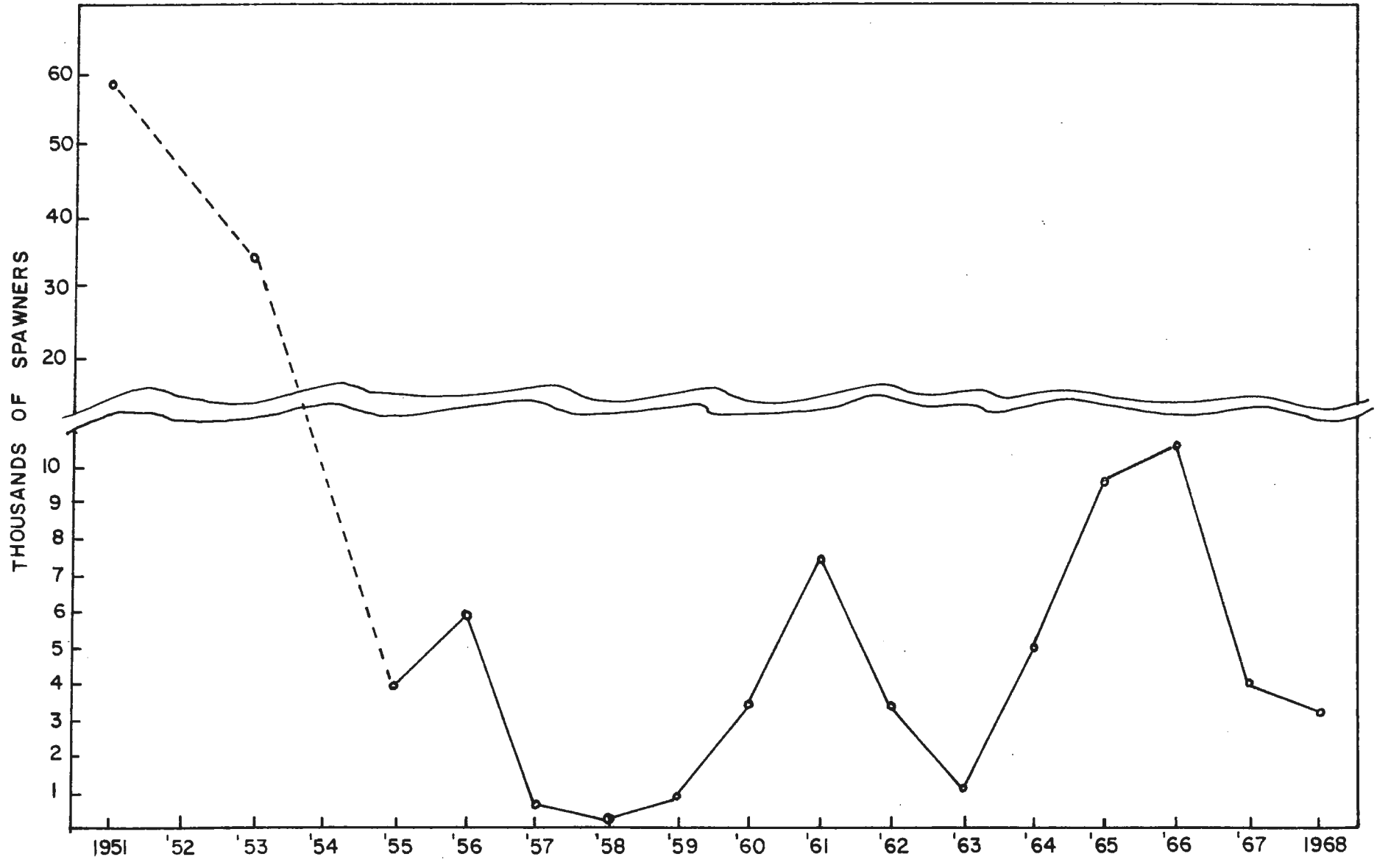

FIGURE I NANIKA RIVER SOCKEYE ESCAPEMENTS

II. THE 1967 SALMON RUN

(A) Timing and Migration -

The counting boards were installed in the left bank fishway at Moricetown Falls and the count was started on July 18, 1967. Peak migration of sockeye occurred on July 29, and the migration had passed Moricetown by August 14 (Fig. II).

Water levels at Station "Quick", about 30 miles upstream of Moricetown, during the period of peak sockeye abundance were about average for that period of the year, although they were lower than the levels encountered during the previous three years (Fig. III).

As shown by tagging, sockeye began to arrive on the Nanika spawning grounds on August 22, reached a peak on September 2, and terminated their migration about September 12.

Water levels in the Nanika River were moderate through the migration period, but rose and stayed high during the spawning period.

(B) The Moricetown Indian Fishery -

The catch of salmon and steelhead at Moricetown Falls by the Native Food Fishery in 1967 totalled 3,725 pieces which included 601 sockeye, 1,508 chinooks (including jacks), 1,218 coho, 187 pinks and 111 steelhead (Table 1).

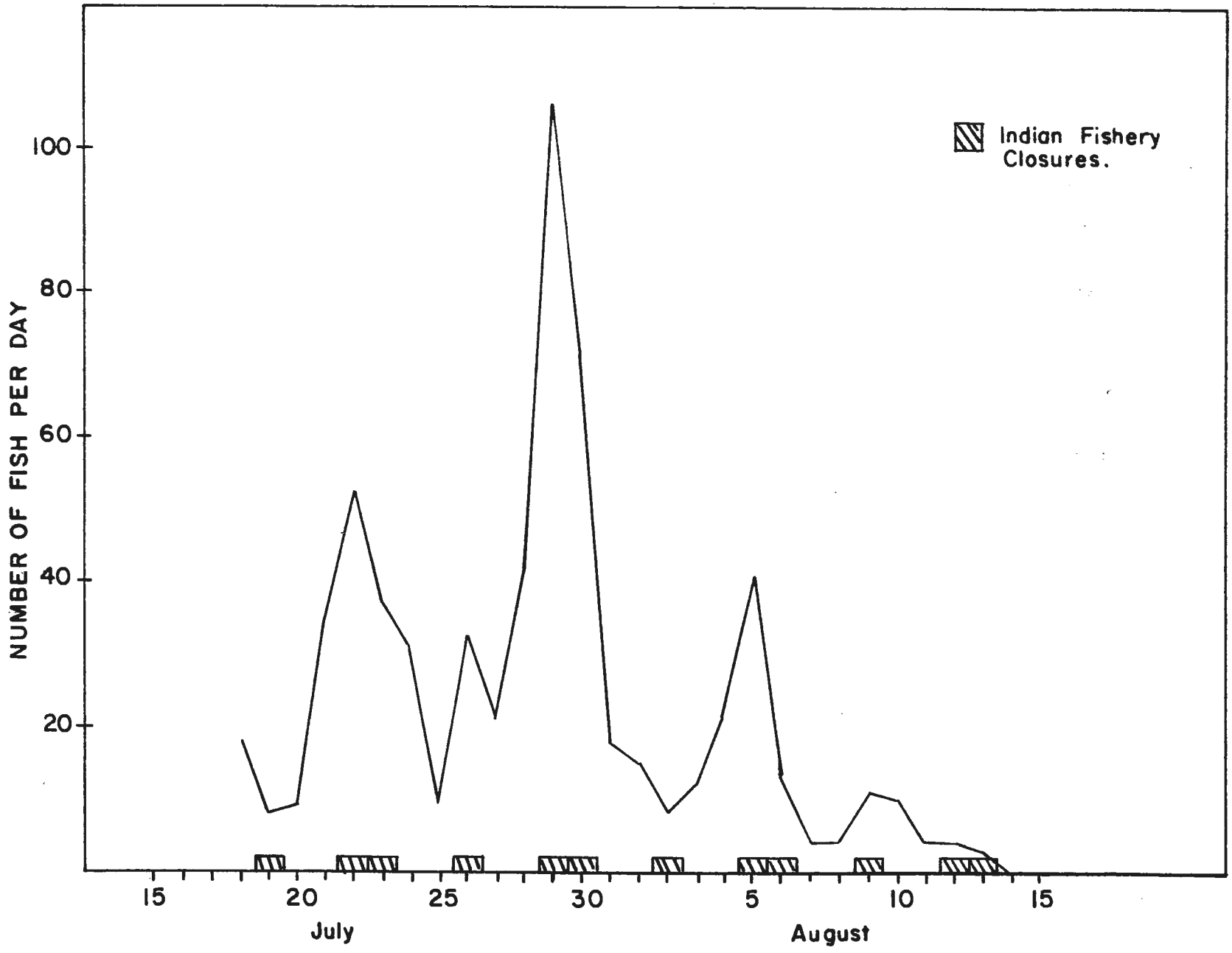

FIGURE II SOCKEYE MIGRATION THROUGH MORICETOWN 1967

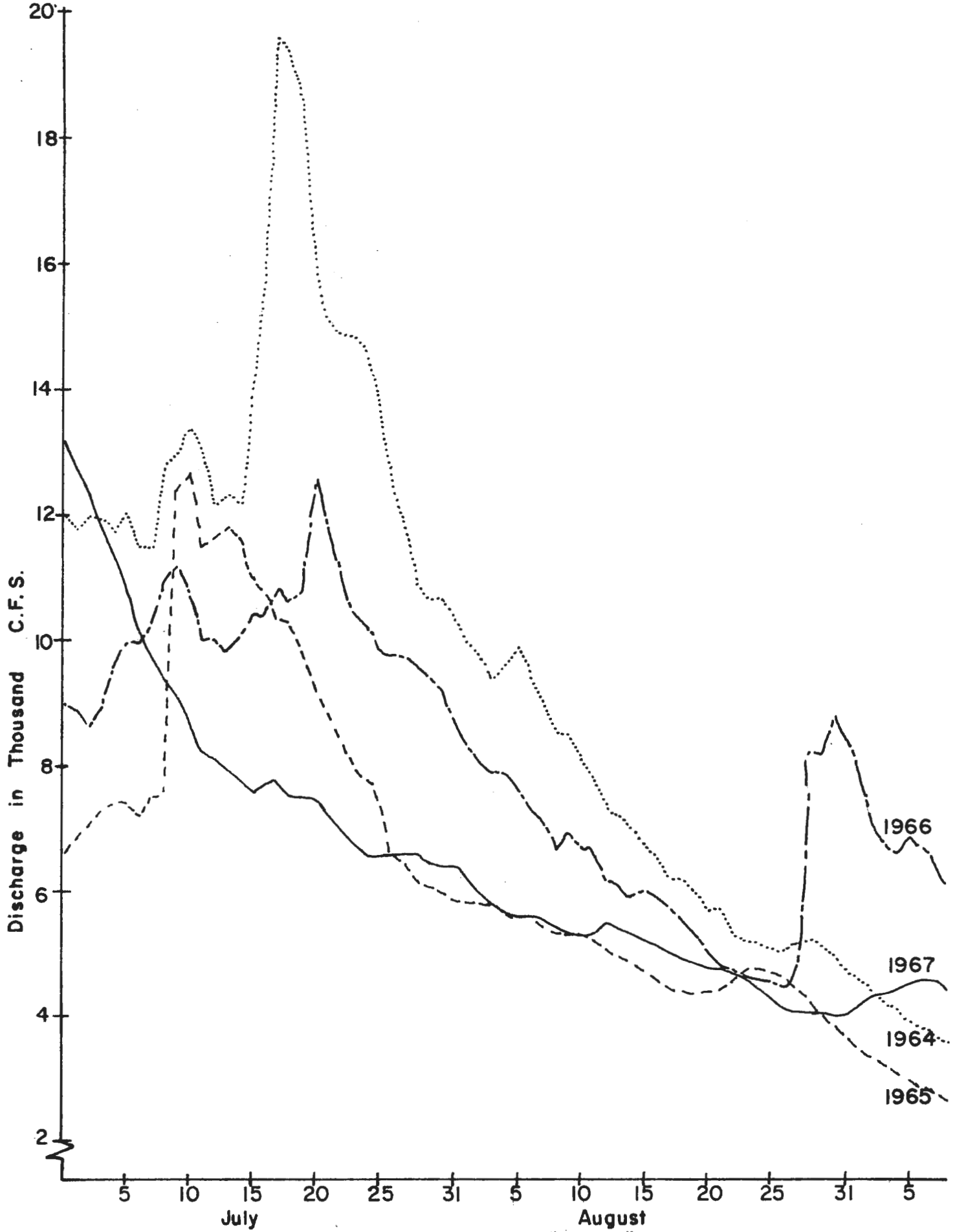

FIGURE III BULKLEY RIVER DISCHARGES AT "QUICK" STA. 1964—1967

TABLE I

ANNUAL CATCHES OF SALMON AND STEELHEAD TROUT
BY THE NATIVE FOOD FISHERY AT MORICETOWN FALLS 1956-1968

Year	Sockeye	Chinook	Coho	Pink	Chum	Steelhead	Total
		Numbers of Fish					
1956	1400	3200	1600	0	0	300	6500
1957	200	2400	500		0	100	3200
1958	200	2900	200		0	100	3400
1959	600	2500	200	1000	0	300	5700
1960	500	700	900	200		100	2400
1961	2100	2500	1200	1200	0	600	7600
1962	800	2500	1400	500		400	5600
1963	2300	2600	1400	1600		500	8400
1964	2300	1600	1000	700		100	5700
1965	1500	1400	3200	1100	0	200	7400
1966	2400	1200	2600	500		400	7100
1967	600	1600	1200	200		100	3700
1968	800	1000	2000	200		200	4200

Less than 100

In order to obtain an estimate of the rate of loss of fish by gaff fishermen at the falls, individual fisherman were observed at different times of the day and on different days of the week. Many different fishermen were observed at least once while those who fished regularly or frequently were observed several times. The results are shown below:

TABLE II: FISHING SUCCESS OF NATIVES AT MORICETOWN FALLS

	Fish Landed	Fish Lost			Total
		In air	In water	Indefinite	
Number	109	21	29	84	243
Percent	44.9	8.6	11.9	34.6	100
		55.1			

An indefinite loss is reported as an instance where the gaff fisherman dislodges the gaff hook from its socket under water but the observer was unable to tell from the movements of the pole whether or not a fish had been struck. Because most of the gaff injured fish do not survive to spawn (Palmer 1966) and because the fisherman can usually tell that he contacted a fish rather than a rock before he struck, it can be assumed that the under water losses also represent removals from the spawning population. On this basis fatalities resulting from the Native Food Fishery are in the order of 8,300 fish and include 1,300 sockeye and 3,700 chinook.

A split four-day fishing week was enforced in 1967 similar to that of 1966 with weekly closures extending from 6 P.M. Tuesday, to 6 P.M. Thursday, and 6 P.M. Saturday to 6 P.M. Sunday.

Exploitation of sockeye by the food fishery was calculated to be 18%, which is similar to years in which river discharges were comparable: 1947 - 21%, 1961 - 18%, 1965 - 14% (Palmer 1966). The chinook run experienced similar exploitation at 15% while the coho run was only exploited at 7%. This latter rate is probably a reflection of the decreased effort in the last part of August when the coho run was strongest.

The influence of the Native fishery on the migration through the fishways can be seen in Figure IV. The fishway count days are taken from 6 P.M. to 6 P.M. to agree with the openings and closures of the Native fishery. The peaks in migration occur the day following closures and migration decreases the second day of a two-day closure.

An hourly count of gaff fishermen was made as a measure of effort. An examination of the hourly fishway counts revealed that 59% of the fish passing through the right-bank fishway moved through during the Native fishery closures (3 days of the week). A further 21% passed through before 11 A.M. in the morning when the effort was usually low and concentrated on the right bank. A total of 81% of the fish passed through the fishway during the time when only 19% of the effort was expended. (Table III).

TABLE III. FISH MIGRATION AND GAFF FISHERY EFFORT

	TOTAL	CLOSURES	OPENINGS	
			Before 11 A.M.	After 11 A.M.
Effort	355 hours	0 hours	66 hours (19%)	289 hours (81%)
Fishway Count	3,688 fish	2,184fish (59%)	789 fish (22%)	715 fish (19%)

Average daily man-hours of effort for the month of August are given in Table IV, and are broken into day (up to 6:00 P.M.) and evening hours (after 6:00 P.M.). Average effort during the day for the different days of the week displayed little variation, but average effort during the evening was 2 to 3 times higher on those evenings when the fishery opened at 6:00 P.M. after a closure.

TABLE IV FISH MIGRATION AND GAFF FISHERY EFFORT

Man-hours of Effort	DAY OF WEEK							
	S	M	T	W	Th	F	Sa	Total
Day	-	13	15	-	12	14	-	54
Evening	10	4	-	10	3	-	-	27

Evidence of delay at the falls may be determined from the mean time out from date of tagging to date of recovery of tags in the fishway. In 1967, however, insufficient

numbers of tagged fish were recaptured in the fishway and a reliable estimate of delay could not be determined by this method alone. Tags returned from fish captured by the Indian gaff fishery in the vicinity of the falls were used to augment the data obtained from the fishway recoveries, and these combined data indicate a mean delay for the 1967 run of seven days. Tags returned from the Native gillnet fishery were not included as this fishery takes place downstream of the canyon, where fish tend to delay before again attempting the falls. Inclusion of Native fishery tags tends to minimize the estimate of delay as the captured fish had not yet ascended the falls.

(C) MORICETOWN ENUMERATION

(1) Sockeye Salmon -

In 1967 the sockeye run to Moricetown was light, based on evidence from the fishway counts, native catch and tagging success. The fishway count of 659 sockeye was considerably lower than those obtained during the 1961-1966 migration periods, and the native catch of sockeye was the lowest since 1960. A total of 135 tags was applied to sockeye of which only 3 passed through the right bank fishway, and a further 28 were returned from the Native food fishery. Using all available data of fish and tags observed and adjusting for gaff injury, the total run arriving at Moricetown was calculated

to be 5,100 sockeye. As the escapement to the Nanika spawning grounds was in the order of 4,000 sockeye and the Native catch and injury total was approximately 1,300 sockeye, to allow for Morice Lake and Atna Lake spawners and other losses the total run arriving at Moricetown would have to be a minimum of 6,000 fish.

(2) Chinook Salmon -

Of the 224 tags applied to chinook salmon at Moricetown, 26 were returned by local Natives and 5 were observed on the 237 fish which passed through the left bank fishway. On the basis of these tag and recovery data the number of chinook salmon which arrived at Moricetown Falls totalled 18,000. The catches of the native fishery indicated that part of the chinook run had passed Moricetown Falls prior to the installation of the counting boards and the start of the counting. If the native catches recorded prior to the start of counting were in the same proportion to abundance as they were after counting started, the total run could be in the order of 22,000 chinooks.

(3) Coho Salmon -

A total of 1,967 coho was counted through the left bank fishway and 42 of these bore tags from the 717 that were applied. The calculated run to the time the counting boards were removed was 30,000 and adjustments for the latter part of the run based on the Native catch would add approximately 5,000 fish to bring the total to 35,000.

(4) Pink Salmon -

Seven hundred and sixty-two pink salmon were counted through the fishway, 208 were tagged at the falls and 6 tags were observed passing through the fishway. The best estimate of the pink salmon run is 4,000 fish.

(5) Steelhead trout -

No tagged steelhead were observed passing through the left bank fishway, but 65 were tagged at the falls and 66 untagged fish were observed passing through the fishway. The Native fishery returned 6 tags and an estimate based on the fishery would place the run in the order of 1,000 fish.

(D) ENUMERATION AT NANIKA -

A tagging program was conducted at the lower extremity of the spawning grounds during the latter part of August and the early part of September. A total of 561 sockeye salmon was tagged of which 147 were subsequently recovered in a total dead recovery of 1,047. An escapement estimate based on tagged-untagged ratio estimates from visual counts on the spawning grounds before the water level rose, agreed closely with the calculated escapement of 4,100 sockeye.

A few chinook salmon were tagged in conjunction with the sockeye tagging but very few tags were recovered. The population was estimated to be in the range of 300 to 500 fish.

III. The 1968 SALMON RUN

(A) Timing and Migration

A fishery count of migrating salmon at Moricetown Falls was not attempted in 1968, but Native Food Fishery catches indicate that sockeye first reached the falls in mid-July and the main portion of the run had passed the falls by mid-August. Peak migration occurred in the week ending August 3.

Water levels were high during the early part of the run but had dropped to near normal levels by the time of peak migration (Fishery Officer's report).

A tagging program conducted on the Nanika River spawning grounds indicated that the earliest migrants reached the spawning grounds at the end of August, the latest ones arrived in mid-September, and the peak occurred on the 5th of September.

Water levels were moderately high throughout the migration, spawning and die-off periods.

(B) The Moricetown Indian Fishery

The catch of salmon and steelhead trout at Moricetown Falls by the Native Food Fishery in 1968 totalled 4,290 pieces, which included 840 sockeye, 1017 chinooks (including jacks), 2046 coho, 227 pinks and 160 steelhead.

A split four-day fishing week was enforced on the Native Food Fishery in 1968 as in 1966 and 1967 with weekly closures extending from 6:00 P.M. Tuesday to 6:00 P.M. Thursday

and 6:00 P.M. Saturday to 6:00 P.M. Sunday.

Exploitation of sockeye salmon by the food fishery based on the ratio of catch and loss experienced in the last three years, would be in the order of 30 per cent.

(C) Enumeration at Nanika River

A tagging program was conducted at the lower extremity of the Nanika River spawning grounds during the latter part of August and the first half of September, 1968. A total of 539 sockeye salmon was tagged and 129 of these were subsequently recovered. The escapement of sockeye was calculated to be 3,300 fish and supplementary estimates based on visual counts of tagged and untagged fish on the spawning ground were in close agreement with the calculated total.

(D) Estimated Escapements at Moricetown Falls

(1) Sockeye Salmon -

No direct assessment of escapement was conducted at Moricetown Falls in 1968. The total number of sockeye reaching the falls has been estimated at 6,000, however, on the following basis:

(a) over the years 1965, 1966 and 1967, the number of sockeye landed by the native gaff fishery has represented on the average, 40 per cent of the total mortality attributable to gaffs;

applying this percentage to the landed catch of 500 sockeye reported for 1968 results in an estimated total of 1200 sockeye having been killed by gaffs.

(b) the Department of Fisheries guardian stationed at the falls in 1968 reported 400 sockeye caught by gillnets in that vicinity.

(c) escapements recorded upstream from Moricetown Falls totalled 3300 (calculated on the basis of a tag and recovery program) in Nanika River, and an additional 1,100 in other headwater areas such as Morice, Atna and Maxan Lakes.

(2) Chinook Salmon -

The exploitation of chinook salmon at Moricetown Falls in 1968, calculated on the same basis as that for sockeye, totalled 2400 fish. An estimated 7000 chinooks spawned in the Morice River, three hundred in the Nanika River and smaller numbers in the upper Bulkley and other tributaries of the Bulkley-Morice system. The escapement of chinook salmon to Moricetown Falls in 1968 totals approximately 10,000 fish.

IV. DISCUSSION

Sampling of data for age-at-return of 4 complete brood years of sockeye salmon on the Nanika Spawning grounds (Table V) indicates that 5-year-olds are the most common age ground returning from a given brood year, ranging from 40% to 80% of the total

return from a brood year, and the run exhibits a 5-year cycle. Six-year-old fish are the next most common and these two age groups compose in excess of 90% of the run for the four broods shown.

The 1955 and 1956 cycles returned strongly in 1965 and 1966 respectively and both show increasing trends. The 1959 cycle returned very strongly in 1964 from the poor escapement in 1959.

Of the two lower level cycles, the 1957 cycle had a good return in 1962 from the very small brood, but increased very little in the 1967 return. The 1958 cycle is the smallest of the cycles and was reportedly almost eliminated in 1958. In 1963, the escapement totalled 1,200 fish, composed primarily of 6 and 5-year old fish from the extremely small spawning stocks of 1957 and 1958 respectively, and the progeny of this escapement returned at a higher level than anticipated in 1968. If the run had returned at a rate of 3 fish per parent spawner, the total Nanika run would have been 3,600. Recorded exploitation of the Native fishery has ranged from 8% to 58% and the second half of the run is subject to exploitation by the Area 4 commercial fishery in the 30% to 50% range. The actual escapement to the spawning grounds through these conditions would range between 1,200 and 2,800 fish. In order to build this cycle more rapidly, at normal rates of return, it would be necessary to give it extra protection from all

fisheries.

In 1969 the sockeye escapement to the Nanika spawning grounds will be composed of 5-year-olds from the 1964 brood and 6-year-olds from the 1963 brood. At a normal rate of return, the run should total approximately 11,000 fish.

After exploitation of the run in the commercial fishery and the food fishery, the escapement to the spawning grounds would be in the order of 4,000 to 8,000 fish. The most probable level, 6,000 fish, equals the cycle year and represents no gain toward former spawning levels.

(2) The problem of a large number of fish being fatally injured by gaffs and not landed occurred again in 1967 when a total of 4,500 salmon and trout were considered to have been lost as a result of the gaff fishery. Palmer (1966) reports losses of 7,400 for 1965 and 11,200 for 1966. In terms of the sockeye run, 7% to 21% of the total run arriving at the falls are considered as losses from the spawning population and the food fishery as a direct result of gaff injury. The loss of hundreds of potential spawners every year delays the recovery of the run to its former size.

(3) Palmer (1966) reported the delay at Moricetown Falls for sockeye in 1961, 1962, 1965 and 1966 was 4.8 days, 4.3 days, and 8.5 days respectively. In 1967 the delay was 7 days as reported above. Prior to the fishway installation at the falls Milne (1950) reported 6.7 days, 5.1 days and 5.5 days delay for sockeye in the years 1945 to 1947 respectively. It appears from these figures that the fishways have done

little to decrease delay at the falls; however, the obstruction was considered to be at its worst during periods of low flows. From the small delay reported in 1965, a year of low flow conditions, the fishways apparently are operating successfully when those conditions exist.

According to surveys in 1961 and 1962 approximately 85% of the sockeye using the fishways use the left bank fishway (Palmer 1964). A large number of sockeye in the upper canyon migrate along the right bank, where conditions are less turbulent, to just below the entrance to the right bank fishway. Near this point fish cross the flow to the left bank and either ascend a small falls 10 yards upstream of the entrance to the left bank fishway or the left-bank fishway itself. Approximately one third of the sockeye run uses the fishways, the remainder ascends the falls.

Milne (1950) and Palmer (1966) proposed an alternate location for the right bank fishway which would place the entrance 100 feet downstream of the present entrance at a location which now serves as an important holding area for sockeye, pink and coho. The proposed location would decrease the delay at the falls and reduce the exploitation by the Native food fishery. In addition, dip nets could be used as a replacement for gaffs to increase the catch while not critically injuring any that might escape.

(4) There is no doubt that the Native fishery induces a scare reaction, as shown in Fig. IV. The number of fish migrating through the fishway increases sharply the first day of each

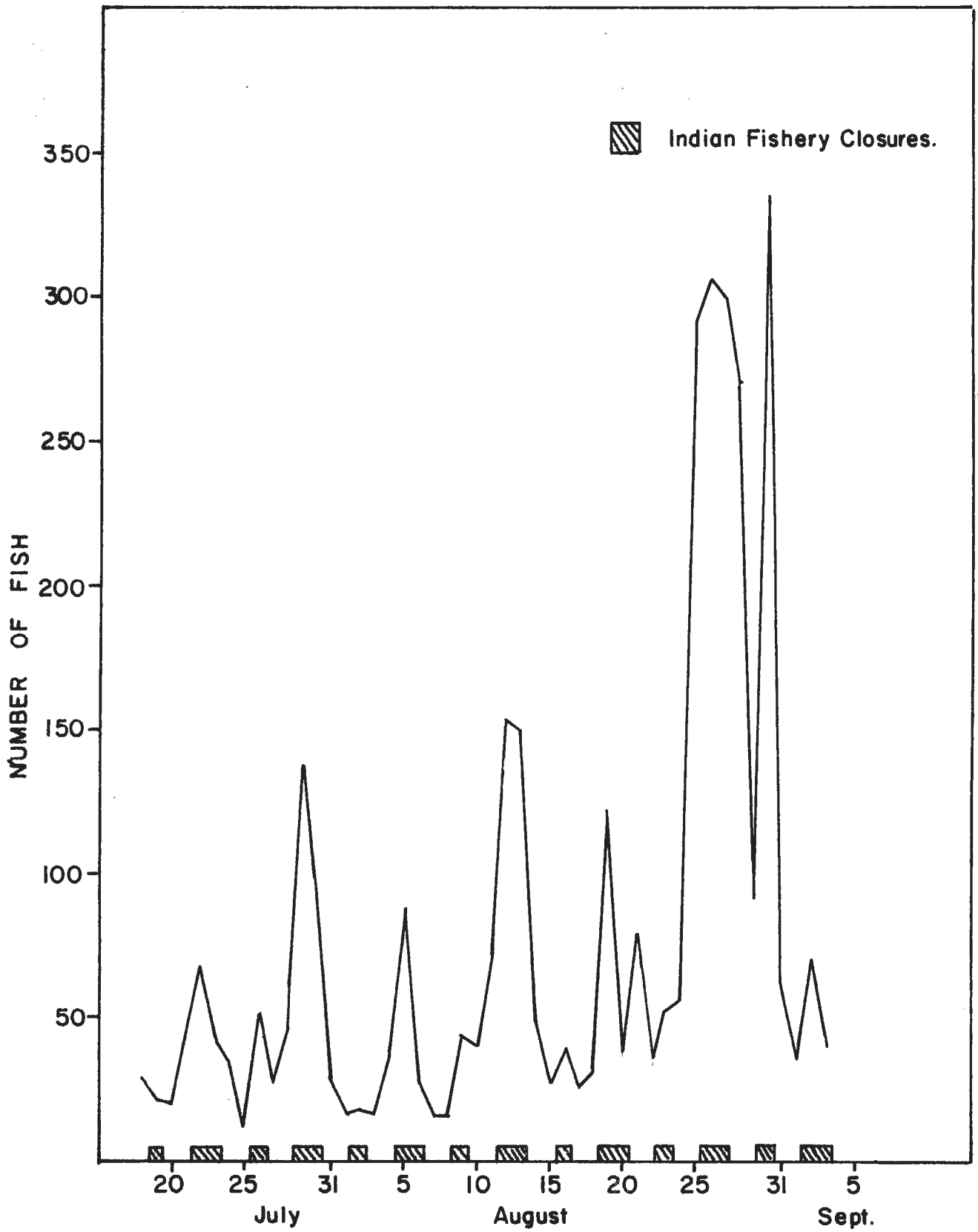

FIGURE IV DAILY TOTALS OF SALMON AND STEELHEAD TROUT ASCENDING THE LEFT BANK FISHWAY AT MORICETOWN FALLS JULY 18 TO SEPT 3/67 (BETWEEN 0800–1800 HRS)

closure, and if there is a two-day closure, decreases somewhat on the second day. Three one-day closures then should move fish through the falls more efficiently than one three-day closure.

Studies conducted in 1967 have indicated that fishing effort expended in the evening is lowest when the fishery has been open during the day and highest immediately after a closure. Effort for a 4-day fishing week could be increased by having one-day openings on a 6:00 P.M. to 6:00 P.M. fishery, or reduced by changing the hours of opening and closures to midnight. The latter method projected on figures for 1967 would allow the same effort as a projected 3-day fishing week on a 6:00 P.M. to 6.00 P.M. schedule. The resulting average man-hours of effort per week would be 72 as compared with the 81 man-hours of effort for an average week in 1967.

V. RECOMMENDATIONS

(1) Delay at the falls be reduced in the short term by changing to 3-one-day closures. The proposed fishing pattern would be weekly closed periods from 6.00 P.M. Tuesday to 6.00 P.M. Wednesday, 6.00 P.M. Thursday to 6.00 P.M. Friday and 6.00 P.M. Saturday to 6.00 P.M. Sunday.

(2) The smaller cycles should receive more protection than normal either by reducing the number of fishing days per week or by reducing the effort by changing to a midnight to midnight fishing day for the main migration period of sockeye at the falls.

(3) Use of the gaff should be strongly discouraged in order to eliminate the large loss of fish now incurred. Dip nets have been shown to be more efficient for all species other than chinook, and should be the only gear in use when chinooks are not present at the falls.

(4) The right-bank fishway should be relocated so that it can be used by all species to decrease delay at the falls.

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