RIVERS INLET
SPRING SALMON INVESTIGATION
1956

DEPARTMENT OF FISHERIES, CANADA
VANCOUVER, B.C.
JULY 12, 1957

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INTRODUCTION

In 1956, the Department of Fisheries continued the spring salmon investigation at Rivers Inlet. The investigation was initiated originally in 1948 to record the sports catch of spring salmon at the head of the inlet. Since that time, in spite of restrictive regulation, the sports catch has increased from 120 to a high of 1,014 in 1955.

Turbidity of the water on the spawning grounds prevents accurate visual estimation of the total escapement and therefore the present catch to escapement ratio is unknown. Spring salmon destined for the head of the inlet must pass through a very intense gill-net fishery before entering the sports fishing areas and since accurate information on escapement is lacking, the Department has become concerned for the safety of the stock.

In 1955, a biological party attempted unsuccessfully to estimate the total population by tagging at the head of the inlet. Although this plan did not prove successful, a study of past spawning ground records, together with an investigation of commercial and sports catch statistics did provide some information on exploitation and on the movement of spring salmon through the fisheries.

The sports catch was again sampled in 1956, and the dead recovery program on the Wannock River repeated. A more extensive coverage of the spawning streams, complemented by two aerial surveys, was attempted this year.

In addition a close observation was maintained on spring

salmon gill-net fishermen to study the actual fishing effort for that species.

METHODS

1. Sampling of Sports Catch

Regulations still require each angler to obtain and keep in his possession a permit supplied at no cost to him by the Department, and also to provide the local Fishery Officer daily information on the number of fish caught or killed. This year, as in previous years a sampling station was maintained and the catch of each angler was recorded daily. For each fish caught, the length, weight, sex, state of maturity, colour of flesh and the name and licence number of the angler were recorded and a scale sample taken.

A further restrictive measure was adopted in 1956. In order to make the limited number of salmon available to a larger number of anglers, a daily catch limit of two and a seasonal one of six spring salmon was imposed.

2. Spawning Ground Surveys

The 1956 spawning ground surveys were similar to those conducted the previous two years, except for the addition of two aircraft flights over the rivers at the head of the inlet. The streams tributary to Owikeno Lake and the Chuckwalla and Kilbella rivers were inspected periodically by the local Fishery Officers, and a dead recovery program was conducted additionally on the Wannock River by Fish Culture personnel, assisted by the local officers. An attempt was made to release marked carcasses on the spawning grounds of the Wannock River in order to make a popula-

tion estimate for that area. High water conditions, however, made the problem of transport too difficult.

The 1955 report recommended that aerial surveys be made in early September, mid-October and mid-November. Subsequently, the September and November flights were made by the local officers and personnel from the Fish Culture branch. The October flight was not made.

3. Commercial Fishery

The local officers attempted to secure the names of all fishermen using spring gill-nets in Rivers Inlet. This information was used to determine the actual commercial effort exerted on this species. As in 1955, the commercial catch statistics for Area 9 have been analyzed.

RESULTS

Sports Fishery

The major sports fishing period at Rivers Inlet occurs between July 20 and August 15, generally peaking during the first week in August. In 1956, however, the inlet was invaded by blackfish on five occasions, July 31 and August 6, 10, 12 and 17. It is known that the presence of blackfish at the head of the inlet will drastically reduce the sports catch for a period of 2 or 3 days. In 1956, these invasions took place at close intervals throughout the peak fishing period, effectively reducing the availability of fish to the anglers. Although the number of permits issued, 916, almost doubled the 1955 total of 480, the catch was only 248 or less than one-quarter of the 1955 catch of 1,014. The commercial catch and the spawning estimates do not

reflect this decrease, and the small catch can be directly attributed to the blackfish invasions. The effect on the sports catch of the blackfish is illustrated graphically in Figure 1, which depicts the cumulative catch curves for 1954, 1955, and 1956 and in Figure 2 which compares the daily sports catch for the past two years. The 1956 catch was actually higher than that of the previous two years until July 31, the date of the first invasion. The continued presence of these whales after this date however, depressed the catch for the remainder of the angling season.

Table 1 lists the catch of American and Canadian anglers by the number of fish reported. Percentage-wise the American catch rose from 61.6 in 1955 to 70.6, while the Canadian catch dropped from 38.4 to 29.4. The table shows that not one angler filled the six fish season limit.

TABLE 1. The Catch of Rivers Inlet Spring Salmon by American and Canadian Anglers.

Individual Season Catch:	1	2	3	4	5	Total	Percentage of Catch
American	88	25	8	2	1	175	70.6
Canadian	49	7	2	1		73	29.4

Since 1951, the angling pressure at the head of the inlet has increased almost fourfold (Table 11). The period of intense pressure however, is confined to only a four week period and thus far the total catch has been easily regulated.

Figure 3 illustrates the weight-length relationship of sports caught spring salmon at Rivers Inlet.

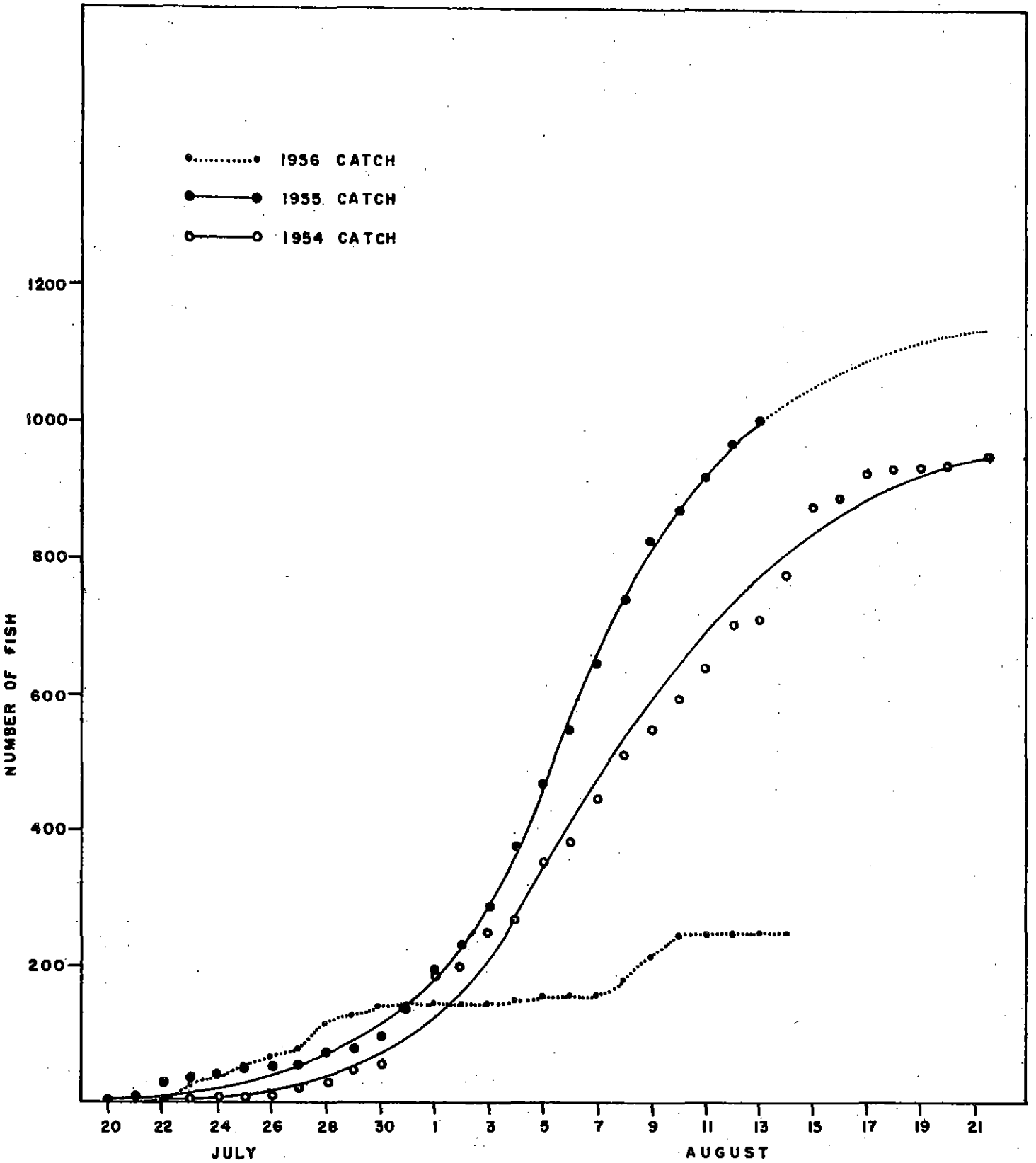

Figure 1.- The cumulative catch of spring salmon by sportsfishermen at Rivers Inlet 1954-56.

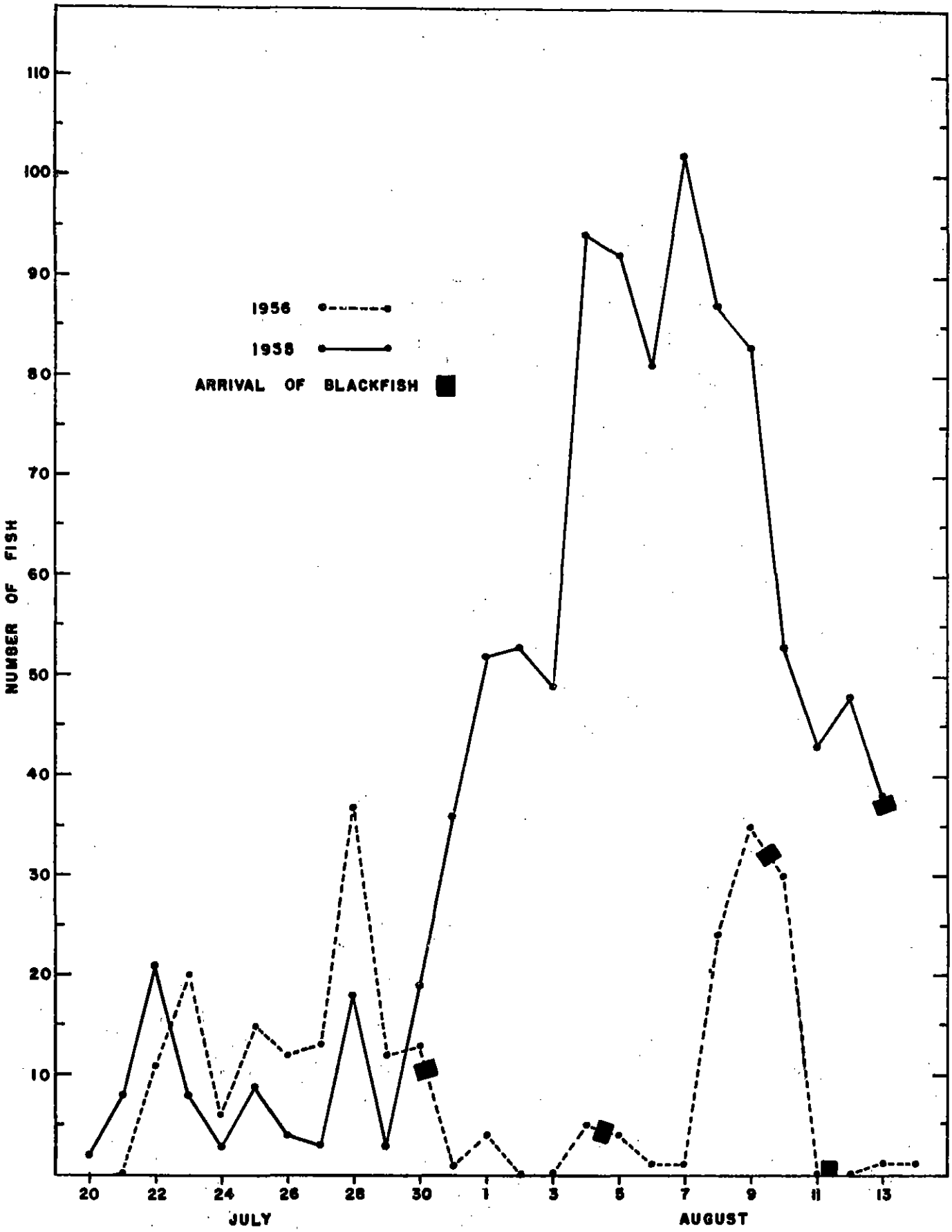

Figure 2. A comparison of the weekly sports catch of spring salmon at Rivers Inlet for 1955 and 1956.

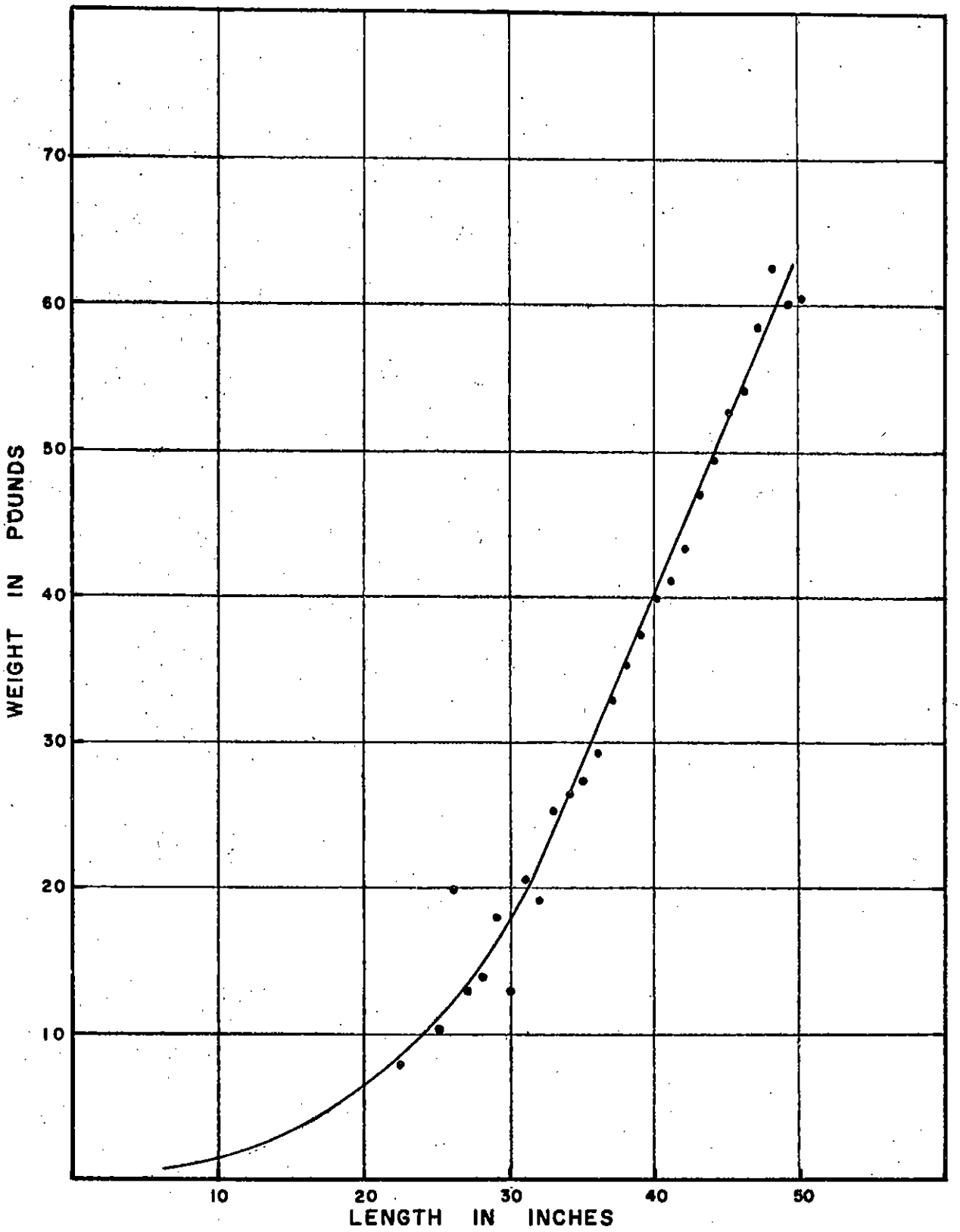

Figure 3. The length-weight relationship of spring salmon at Rivers Inlet (Based on 1954 sports catch).

TABLE 11. The Annual Rivers Inlet Sports Catch from 1948 and the Number of Angling Permits Issued from 1951.

Year	Catch	Number of Permits
1948	120	-
1949	250	-
1950	379	-
1951	328	245
1952	485	303
1953	477	341
1954	998	442
1955	1014	480
1956	248	916

Commercial Fishery

The Area 9 commercial catch statistics for 1956 have been examined. Table 111 gives a breakdown of the catch and average weight by type of gear.

TABLE 111. The Number and Weight of Commercially Caught Spring Salmon in Area 9 - 1956.

	Number of Pieces			Average Weight		
Gear	White	Red	Total	White	Red	Combined
Gill-net	1026	2731	3757	20.2	16.6	17.6
Seine	1	15	16	-	17.9	17.5
Troll	15	144	169	13.7	10.0	10.6
			3942			

As in previous years the catch was taken chiefly by the gill-net fishery. The total catch was 3,942 and the gill-net catch was 3,757 averaging 17.6 pounds. The corresponding figures for 1955 were all higher. The total catch was 4,850 and the gill-

net catch was 4,695 averaging 21.2 pounds.

The 1955 report indicated that the large size of the sports caught fish was attributable to extreme selection of the smaller spring salmon by the sockeye gill-net fishery. The report also suggested that a few gill-net fishermen found it profitable to switch from sockeye to spring gear late in the season. The result was that a relatively large number of the spring salmon which had survived selection and had escaped the sports fishery were taken near the end of the sockeye season. The large size of these fish raised the season average weight considerably.

In 1956, a gill-net closure was enforced to protect sockeye for the week ending August 11. The total catch by other gear for that week was 115 pieces averaging 9.8 pounds. For the corresponding week in 1955, a total of 617 pieces were landed averaging 32.6 pounds and of that total 595 were taken by the gill-net fishery.

Figure 4, which compares the average weekly weight of commercially caught spring salmon for 1955 and 1956, shows graphically that the average weight towards the end of the 1955 season was much higher than that for this past season. Also, the second small peak in catch which generally occurs late in the season, and which is depicted by the catch curve for 1955 in Figure 5, was missing in 1956. Since the sports catch was drastically reduced by the blackfish invasions, several hundred more of these large spring salmon would have been available to the late season commercial effort. Had the closure therefore not

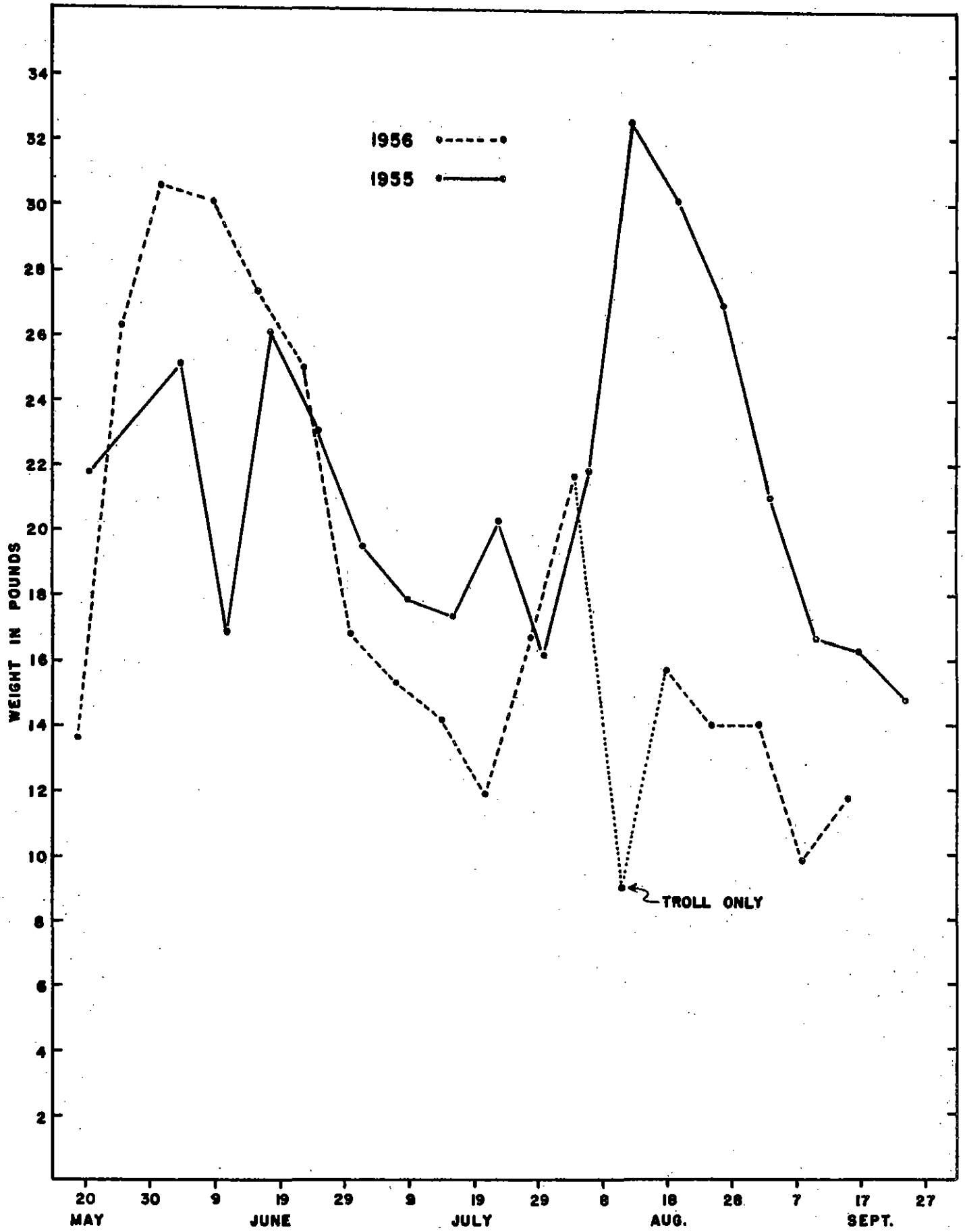

Figure 4. The average weight of commercially caught spring salmon in Rivers Inlet.

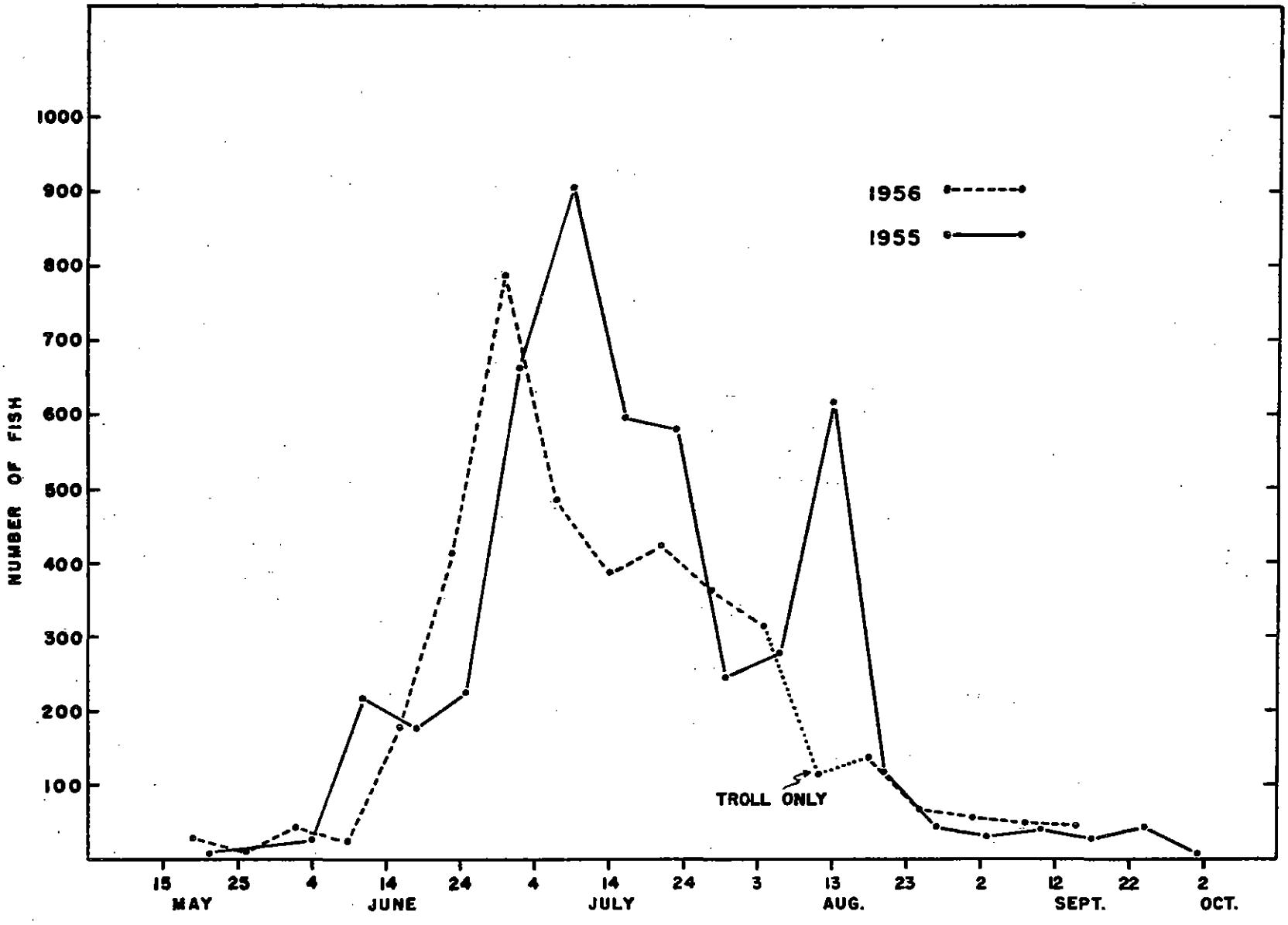

Figure 5. A comparison of the 1955 and 1956 commercial catch of spring salmon in Rivers Inlet.

been enforced, both the total catch and the season average weight of the commercial catch would have very likely approached those of 1955.

As stated previously, an attempt was made to determine the spring salmon catch by spring gill-nets in Rivers Inlet. Examination of the Area 9 sales slips revealed that 24 boats fished a total of 130 days with spring nets and caught 997 spring salmon. The average weight of these fish approximated 24 pounds. The data on this fishery is listed in Table IV and is depicted graphically in Figure 6. The table shows that 919 of the 997 springs were caught prior to July 1 and that no spring salmon were taken by spring gear from July 6 to August 3. On August 3 however, the day before the closure went into effect, 44 spring salmon averaging 37.2 pounds were taken by 4 nets.

Percentage of White Springs in the Catch

Examination of the percentage of white springs in the commercial and sport catches revealed that the majority of that variety are caught in the early part of the season. Figure 7 illustrates graphically the percentage of white springs caught throughout the season in the commercial fishery for 1955 and 1956 and in the sports catch in 1955. Prior to July 25, the percentage of white springs in the commercial catch remains relatively high, averaging over 30 percent of the total. After that date, however, the catch swings preponderantly to red springs and by the first week in July the percentage of white drops to less than 10 percent. The decrease in percentage of white was even more rapid in the 1955 sports fishery. The percentage dropped from over

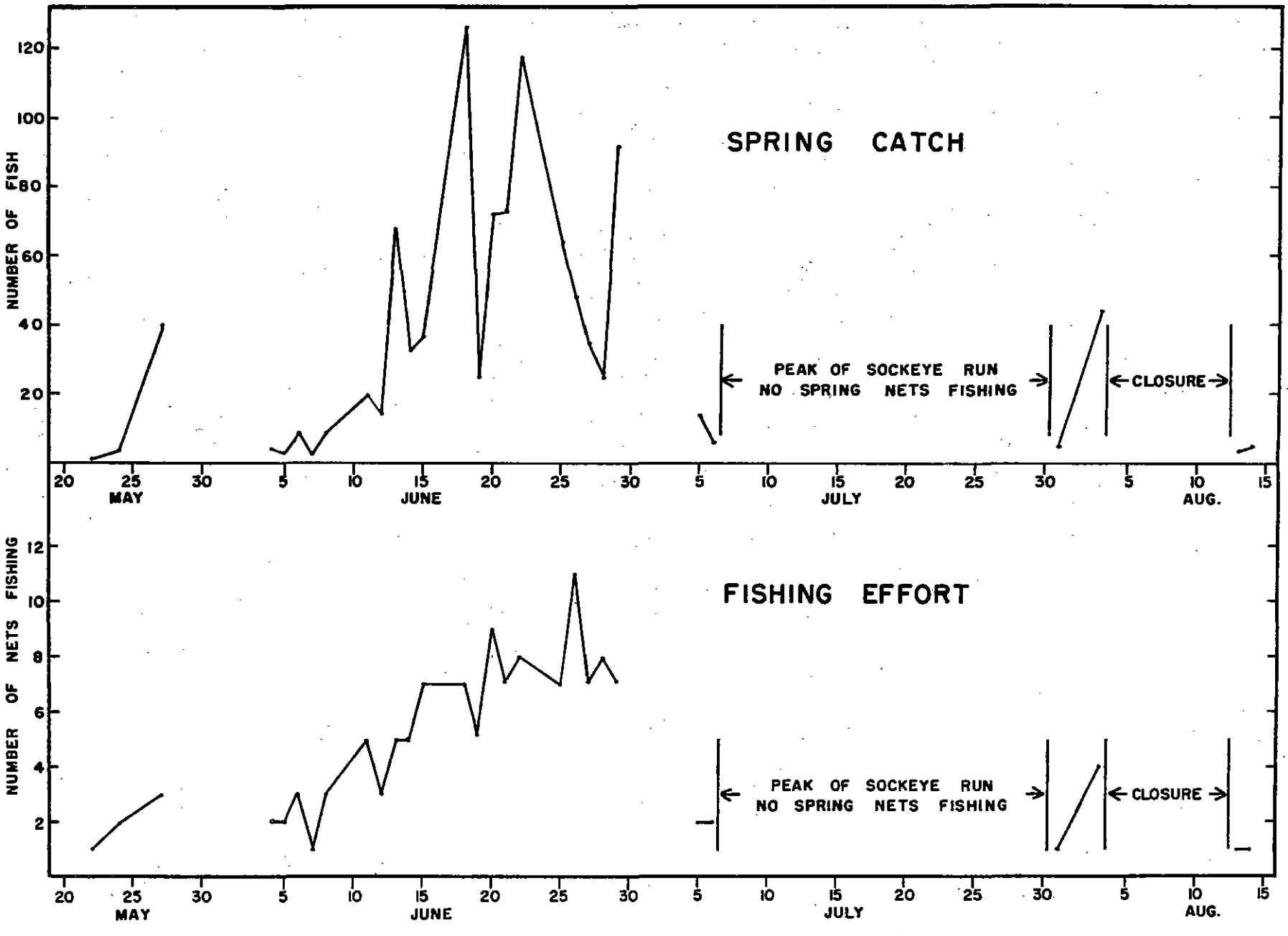

Figure 6. The spring salmon catch by spring gill-nets in Rivers Inlet in 1956.

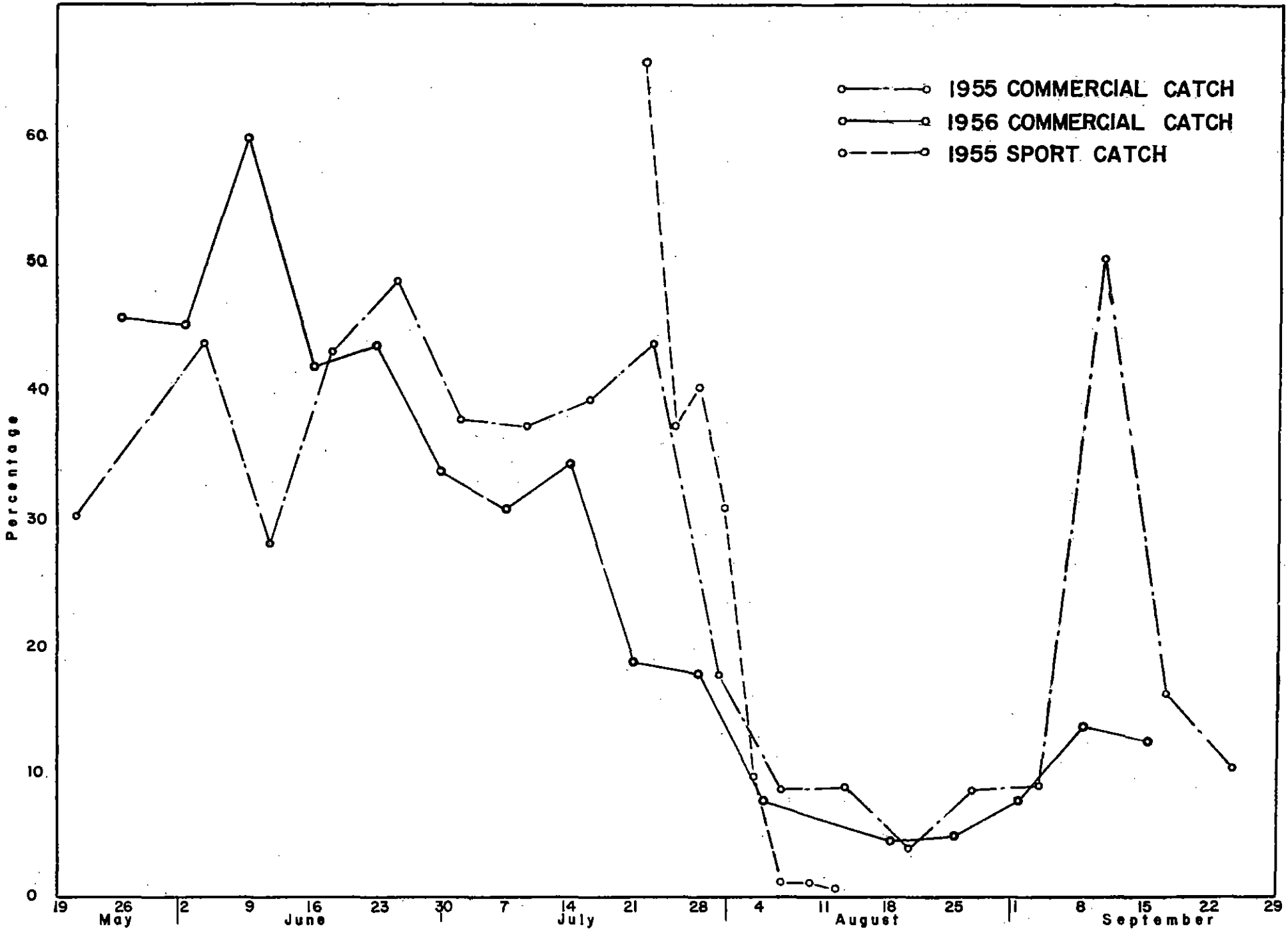

Figure 7. The weekly percentage of white spring salmon in the commercial catch of 1955 and 1956 and in the 1955 sports catch.

TABLE IV. The Daily Catch of Spring Salmon by Fishermen Using Spring Nets at Rivers Inlet - 1956.

Date	No. Nets Fishing	Catch			
		R. Spring	W. Spring	Total	Weight
May 22	1	1	-	1	27
24	2	2	2	4	107
29	3	22	18	40	1,066
June 4	2	2	2	4	115
5	2	1	2	3	78
6	3	1	8	9	203
7	1	1	1	2	59
8	3	6	3	9	237
11	5	11	9	20	487
12	3	9	5	14	373
13	5	40	27	67	1,502
14	5	18	14	32	807
15	7	20	17	37	938
18	7	78	48	126	3,362
19	5	12	13	25	543
20	9	38	34	72	1,827
21	7	36	37	73	1,622
22	8	62	56	118	2,732
25	7	39	25	64	1,603
26	11	26	22	48	1,147
27	7	17	18	35	859
28	8	14	11	25	636
29	7	42	49	91	2,256
July 5	2	10	4	14	311
6	2	7	-	7	155
31	1	5	-	5	216
Aug. 3	4	44	-	44	1,637
13	1	2	1	3	119
14	1	5	-	5	247
Totals		571	426	997	22,832

Average Weight 23.9 lb.*

*Average weight is actually higher because some fish are listed as dressed weight.

65 on July 22 to less than 10 by August 3 and to less than 2 by August 12.

Several observers have noted that a large portion of the early sports catch is composed of white springs, many of which are quite mature. In 1955, a few local residents reported that each year there was an early run of springs, largely white, at the head of the inlet, and a trapper reported that spring carcasses could be seen floating downstream in the Kildala River after mid-July. The 1955 report listed the spring salmon egg take from the Waukwash River for the Owikeno Hatchery and the spawning ground estimates for the period 1930 to 1935 inclusive. The Hatchery Superintendent reported that spawning took place in early September. The main spring salmon spawning area at present is believed to be the Wannock River, where spawning takes place in November. The 1955 report indicated that the Wannock River fish were from the same population available at the head of the inlet during August and the sports caught sample showed this group to be almost entirely of the red variety. There is a possibility then that the spring salmon populations of at least the Kilbella, Chuckwalla and Waukwash are a distinct group, migrating earlier than those of the Wannock, and being composed of a high percentage of white salmon.

Spawning Ground Surveys

As stated previously, the spawning ground surveys were to be complemented in 1956 by at least two aerial surveys. The first was scheduled for mid-September to determine whether there was early spawning, particularly in the Waukwash, Kilbella and

Chuckwalla rivers and if so to estimate the size of the populations. Unfortunately, weather conditions were poor during the short period the aircraft was available and the aerial reconnaissance was not successful. A second flight was made in early November, to determine if there was spawning at that time in these same streams. No live fish were seen and spawning presumably occurs earlier in these streams than in the Wannock River.

The dead recovery program on the Wannock was repeated in 1956. During the period November 8 to December 1, the recovery of carcasses in the river and around the immediate mouth area totalled 1,053. In the previous year, 567 carcasses were recovered from November 3 to 17. The recovery period was shorter in 1955, but Figure 8 which depicts the cumulative recovery curves for both years, indicates that the major period was overlapped by the recovery crew in both instances. The high recovery of 1956 serves as an indication that the escapement to the Wannock was much higher than that of 1955.

The spawning ground surveys for spring salmon were more extensive this year.

1. Wannock River

The escapement was estimated at 2 - 5,000 spring salmon.

2. Kilbella River

A survey in September indicated that 24 miles of potential spawning area exists in this stream. Spring salmon carcasses were observed ten miles upstream but the spawning estimate was only 100 - 200.

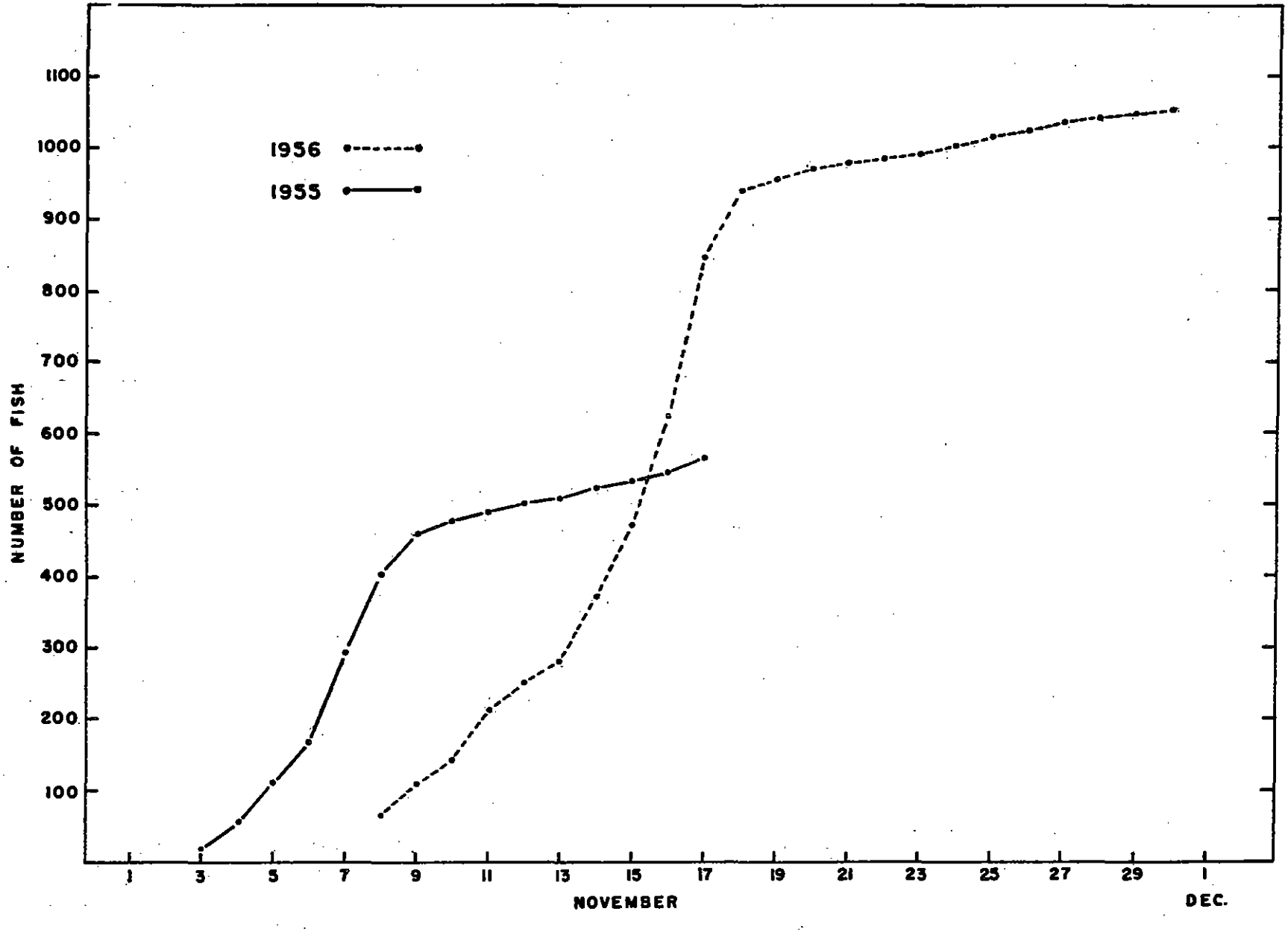

Figure 8. Cumulative curves of the dead recovery of spring salmon on the Wannock River in 1955 and 1956.

3. Chuckwalla River

A September survey showed that eight miles of potential spawning area exists above the mouth area in this stream. Only six carcasses were seen and the spawning estimate was 50 - 100.

4. Waukwash River

Approximately 100 large spring salmon were observed three miles upstream in this river in September.

5. Indian River

One spring salmon carcass was observed in September.

With the exception then of the Wannock River, all spring salmon spawning is completed prior to October.

DISCUSSION

The 1956 sports catch totalled less than one-quarter of each of the previous two years catches. There is no reason to suggest that fewer fish were available than in other years and the drop in catch therefore has been attributed directly to a series of black-fish invasions to the head of the inlet.

At present the annual sports catch is being limited to 1,000 spring salmon for the period July 20 to September 15. As angling pressure increses, the time required to fill this quota will naturally be lessened. In 1955, the 480 anglers caught approximately 1,000 spring salmon in only 24 days. In 1956, a total of 916 permits were issued.

For the 1956 season, catch limits of two fish per day and six per season were enforced. If the popularity of this inlet increases

however, there is some doubt whether these regulations alone will protect the populations sufficiently. Assuming that the availability of these salmon remains at the present level, this predetermined number will be removed from a progressively smaller segment of the total population, possibly resulting in overexploitation of one portion of the stock. Weekly closures in addition to catch limits would tend to alleviate this problem.

Of the 3,942 spring salmon caught commercially in Rivers Inlet during the 1956 season, 997 were taken by spring gill-nets and 2,760 were caught incidentally by sockeye gear. The sockeye catch in Rivers Inlet was good in 1956 and as a result, no spring gear was used during the main portion of the sockeye migration. The catch of spring salmon by spring gear was curtailed also by the gill-net closure early in August.

The early portion of the commercial catch, up until July 25, is composed of a high percentage of white springs but after that time, the proportion of white springs in the catch drops very low. The 1955 report indicated that the Wannock River springs were from the same stock that was available to the sports fishery in late July and August and also that the stock was composed almost entirely of the red variety. The Wannock River spawning occurs in November but observations and reports indicate that spawning in the other systems takes place prior to October. There is a strong possibility then, that the early part of the migration, composed of a large percentage of white springs, is destined for systems other than the Wannock, such as the Waukwash, Kilbella and Chuckwalla rivers and that the later run is destined for the

Wannock. If this is true, then based on the size of the early catch, the escapement to these streams must be considerably larger than is estimated at present.

Spawning surveys should be conducted in September on the Waukwash, Kilbella and Chuckwalla rivers and in November on the Wannock. A survey in September would determine the size of the early spawning population and if sampling for flesh colour were carried out on both surveys, there is a possibility that the existence of at least two separate migrations could be proven. On both surveys, every potential stream should be surveyed for spawning. If possible, the initial coverage for both surveys should be aerial, to determine the upstream extent of migration.

As stated previously, 24 fishermen using spring gill-nets caught 997 spring salmon in 1956. These were caught in the early portion of the season and were possibly from a different stock than those available to the sports fishery. In other years, when there has not been a closure, a few fishermen have found it profitable to switch from sockeye to spring nets in August and to catch fish which had already been exploited both by the sockeye gill-net fishery and by the sports fishery. In 1955, nearly 600 spring salmon were caught commercially at the end of the season while the sports fishery was limited to 1,000. Since this late commercial fishery is apparently based upon the same population as is the sports fishery, it should also be included in any conservation measures adopted to protect this stock.

SUMMARY

The sports catch at Rivers Inlet was again sampled in 1956.

These data as well as the commercial catch records have been analyzed as they were for 1955 in an attempt to interpret the migration pattern of the spring salmon stocks to the spawning grounds at the head of Rivers Inlet. A summary of the spawning ground surveys has also been included.

It has been suggested that an early run composed of a high percentage of white springs moves onto the spawning grounds in September while another stock, composed preponderantly of red springs spawns solely in the Wannock River in November. The consistently high catch of spring salmon early in the season, suggests that the escapement of this early spawning stock is much higher than is known at present.

A study of the fishing effort on spring salmon revealed that 997 of this species were taken in spring year in spite of two factors which must have greatly reduced the overall fishing effort for that species. First of all, the one week closure in August practically eliminated the late season effort which accounted for almost 600 springs in 1955 and secondly, the sockeye catch was good in 1956 and there were consequently no spring gill-nets operating throughout the sockeye migration period. The commercial effort for spring salmon must be kept under close observation in future years.

RECOMMENDATIONS

It is recommended that:

1. A spawning ground survey be conducted on all known and potential spring salmon spawning areas during September and November. Both of these surveys should be initiated with an

aerial survey to establish the upstream extent of migration.

2. The sports catch remain limited at 1,000 spring salmon.

3. Consideration be given to the prohibition of spring gillnets during August at the head of Rivers Inlet.

4. Consideration be given to implementing weekly closures in addition to catch limits on the sports fishery.

Department of Fisheries, Canada
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