The Sockeye Run to Williams Creek -- 1953

Williams Creek accomodates 80-90 percent of the Lakelse sockeye spawning run. Consequently the Williams Creek fence is the main tool in the adult program. By eunumeration and observation information is gained on the size of the seeding population, sex ratio, lake mortality and incidence of injured fish. Inspecting the gonads of samples of live fish passing upstream through the fence and of dead fish drifting downstream onto the fence provides an appraisal of the size and success of deposition. Length samples of both live unspawned fish and dead "spawned out" fish provide clues to the age composition of the run. These length frequencies when compared to length frequencies obtained by sampling the run at an earlier stage in their spawning migration should point out whether one size of fish successfully reaches the spawning stream and another size does not. Trends in length are also revealed by comparing lengths from year to year. Recapture of fish which have been tagged while entering the lake through the river fence allows appraisal of the length of time the sockeye spend in the lake. This data also provides information on the fate of individual fish whose characteristics (injuries, size, etc. were recorded at an earlier stage. Tagging fish at the Williams Creek fence followed by stream surveys gives a method of checking the dynamic distribution of the run in spawning areas of the creek; recovery of these tags on dead fish tells how long these fish have spent in the spawning stream.

Conditions for carrying out the above studies were very favourable this year. Only during a small part of the run was the water sufficiently high in glacial silt to suspend observations. Consequently nearly 100% of the run was examined for sex ratio, injuries, and tags. The Blackwater diversion that detracted from last year's program was successfully blocked and all sockeye spawning in Williams Creek went by way of the main channels.

Early in the run it was discovered that fish would move up the fence and after making several unsuccessful attempts to get through would on some occasions return to the lake for as long as a full day. This was especially evident at night when fish that were at the fence and even in the pens at midnight would not be there on the following morning. It was also found that handling a fish or the web of a dip net then returning it to the water would introduce sufficient repellent odour to the water to "scare" the fish back into the lake. With this knowledge it was possible to modify techniques in such a manner that whenever possible fish were rapidly passed through the fence at whatever time they reached the fence. Rubber gloves were worn when inspecting tagged fish. Tagging and sampling utilized fish that had accumulated in the pen and was carried out after the main body of the daily run had been passed through. This was a "semi-successful" attempt to move the fish upstream at their own intrinsically dictated time with no appreciable delay from the fence. It is felt that this would in turn allow normal distribution on the spawning stream.

Two sources of error arose as a result of failure in the fence. In one case a small panel of pickets was raised for an unknown period during one morning. Observations indicated that from 50 to 200 fish passed through this opening. The other source of error arose as a result of a few too-widely spaced pickets. It is believed that a fraction of the fish under 56 cm. passed through unobserved. By knowing the size composition of the fish on the spawning stream and being familiar with the operation of the fence it is possible to estimate that 200 to 400 small fish passed through unaccounted for. The sex ratio of the fish moving upstream on the day of the first source of error would weight the estimate in favour of males while the size of fish in the second source of error would weight it in favour of females. Thus for the present it will be assumed that 200 sockeye of each sex passed through the fence unrecorded.

The total number of fish spawning in Williams Creek then was 8,508 (8,050 counted, 400 estimated and 50 estimated in the stream below the fence). The sex ratio of the total run was almost exactly 1:1. The first fish went through the fence August 3, and for a week the sex ratio was predominately male. The sex ratio changed to a female predominance in the second week and continued this way until August 29 when the main body of the run went through. By taking the life span of the fish and calculating the number of live males and females on the spawning ground each day, it is seen that there is not a functional 1:1 sex ratio. The seven days between the 8th and 14th saw an average daily surplus of 785 males. The week between the 22nd and the 28th saw an average daily deficiency of 828 mf males. If all eggs were fertilized, many of the males must have attended extra females. This is physically possible because observations show that at the time of a male deficiency many females have alrady deposited eggs and remain guarding their nests unattended.

A sample of twenty females taken throughout the run showed the mean egg count to be 4,183. The mean length of the fish was 60.5 cm. This is about 150 eggs per fish higher than the average. Possibly a result of this year's reduction in delay and subsequent reduction in egg loss below the fence. The egg retention from the dead fish sample was 0.38% or 63,921 eggs. The maximum deposition above the fence then was (4022 x 4183)-63,921 = 16,761,105. Retention of milt was estimated as 7.0%. Twenty percent of the males retained approximately 25% or more of their milt. Evidence of fish of either sex dying unspawned was rare.

Length frequency distributions of dead fish washed down on the fence suggest the presence of three age groups. This evidence is presant chiefly in the length frequencies of the male fish and in these fish shows three groups dispersed about modes of 52, 61 and 71 cm. If these fish were

considered to be 3, 4, and 5 years old, the age composition would be approximately 10, 25, and 65 percent respectively. The actual age readings taken from a smaller sample at the river fence (54 days earlier) shows no three-year-old fish, 25% four-year-olds and 75% five-year-olds.

Comparison of length frequencies of live fish trapped in the pen and dead fish washed down on the fence shows that a larger percentage of small fish (under 56 cm.) were present on the spawning ground than were recorded through the fence pen. This discrepancy may have been caused by small fish getting through the pickets or by the pen capturing an unrepresentative sample. Both possibilities have evidence to support them. In the first case it was found possible to push a 53 cm. fish through one of the gaps in the pickets; in the second case sex ratio data shows that the pen does not capture a representative sample.

Tag recoveries of live fish at the fence showed that the fish spent an average of 54 days in the lake (average 42-69). The data also pointed out a 17% inaccuracy of sexing the relatively immature fish at the river fence. Eighty percent of these errors were made by mistaking females for males. The minor injuries of tagged fish recorded at the river fence when compared with the minor injuries observed at the Williams Creek fence show a large discrepancy. Two possible explanations exist -- the injuries may have healed during lake residence or the criterion for a minor injury may have been different at the two locations. Interpretation becomes more difficult in the light of bad injuries. One bad injury recorded at the river apparently healed by the time the fish reached Williams Creek while another fish uninjured at the river fence had a bad injury at Williams Creek. A third fish showed that a slight injury at the river had increased to a bad injury at Williams Creek. It is obvious that the best approach to the problem of the fate of injured fish is to tag both injured and uninjured fish at the river fence and compare their histories upon recovery at Williams Creek. The injury-mortality problem

will be treated more fully in a separate report when 1954 data is available.

Tag recoveries of fish spawned out and dead on the fence show that both male and female live approximately 15 days in the spawning stream.

Stream surveys and tagging were carried out at intervals of approximately one week during the spawning run for two reasons. First, to gain information on the distribution of the spawning sockeye in Williams Creek and second, to develop a method of estimating the size of spawning populations.

The distribution of adults varied throughout the season. At the beginning of the run the fish tended to be most concentrated in the lower reaches of the stream, whereas during the peak of the run the maximum concentration of fish was in the upstream regions. Near the end of the run, when spawned-out fish tended to drift downstream, an increase in the downstream concentration was noted. The relative changes in distribution are not great, indicating that the tendency for fish arriving during any period of the run to spawn in any particular location is not great. The relative distribution of adults as determined by creek surveys is summarized in the following table:

Date	Sect. 1	Sect. 2	Sect. 3	Sect. 4	Total
August 10	70	1,066	935	601	2,679
August 17	145	1,856	1,415*	1,535	4,882
August 26	230	1,475	1,822	1,212	4,739
Sept. 3	87	526	183	385	1,181

* includes 69 fish in ELIZA CR. (only one survey on Eliza)

The sections 1 to 4 are as follows:

1. Mouth to first gravel bar.
2. First gravel bar to large island.
3. Both sides of island including Eliza
4. All above island.

Most of the results of stream surveys will be included in a later file report dealing specifically with the estimation of spawning populations.
