Life History of the Sockeye Salmon

Necesity to Increase Spawning Reserves to Augment Egg Production and Avoid Consequences of Over-Fishing Result of Dr. Gilbert's Investigations Last Year.

Dr. Charles H. Gilbert, who has been scientifically investigating the life history of the sockeye salmon for the Provincial Department of Fisheries, and whose work has been an outstanding contribution to the science of fish culture, contributes his sixth paper in the 1919 annual report of the Commissioner of Fisheries, Victoria.

In reviewing his paper Mr. J. P. Babcock, assistant to the Commissioner, says:

Dr. Gilbert's sixth contribution to the report of the Department on the life-history of the sockeye salmon, which is issued herewith, contains an analysis of the sockeye runs to the principal waters of the Province for the year 1919. We now have a complete history of the runs for eight years, and in consequence are enabled to make comparisons that are of economic value.

The outstanding feature of the examination of the scales collected from the 1919 run of sockeye to the Fraser was the remarkable series that passed in procession during the season. Sockeye having a defined type of scale-structure made its appearance on a given date, would occupy the stage for a time to the practical exclusion of any other type, and then, on another date, would suddenly be supplanted by another type of structure, which was so sharply distinguished from the first that it could not conceivably be found in company with it on any spawning-ground. The run in 1919 was peculiar in comparison with previous years in the distinctness of these components of the run. Apparently fewer types were represented than has been the case in other seasons, or if represented, then by fewer individuals, which could not confuse the characteristics of the race which was dominant in that part of the run. Whereas during other seasons it has been a rare occurrence to find in any period of the run a race unmixed with any other and appearing homogeneous, the impression during 1919 was a succession of such occurrences, in each of which one race strongly predominated, even if not wholly without mixture. Apparent paucity of races can only find explanation in the practical extermination of the run to certain tributaries, which even in the depleted condition of the river during the last decade have until now furnished their quota. Not only did the migration waves exhibit each its characteristic structural peculiarities, it possessed also its own distinctive proportionate representation of age-groups. The succession of racial forms which appeared in the main run, either in the sea approaches to the river or in the main channel of the latter, are most readily detected by charatceristics shown in the central or nuclear area of the scales. It is this area which records the growth of fry and fingerlings in fresh water—a growth which takes place in a number of lakes scattered widely through the river-basin, varying extensively in their climatic conditions and in the character and amount of food which they offer. The growth in these lakes differs materially, and the size of the yearlings, when they migrate seawards in the early spring, is an index of the favorable or unfavorable conditions under which the different lots have been nourished. The fingerling groups of smaller size will have at migration smaller scales, and these will be marked by fewer rings. In the adult salmon, therefore, the size of the nuclear area, which represents the entire scale of the fingerling migrant, and the number of rings which this nuclear area contains, serves as a measure of the size of the fingerlings, and thus enables us to sort out the races which have differed in amount of growth during the first year. Not all races may have differed in this respect. But they frequently do so, and where this is the case an examination of the nuclear area gives data of high value.

One fact which emerges clearly from the tables giving the lengths and weights contained in the paper is the small size of the sockeye of each group of the 1919 run as compared with previous years. The run of 1919 produced the smallest sockeye of which we have any record on the Fraser.

In his analysis of the data collected at Rivers Inlet during the run of 1919, Dr. Gilbert finds that the present conditions there are fast developing into one of pronounced danger. He shows that the productivity of the river has fallen during the past four years to little more than half its previous magnitude, and that we are no longer justified in classing the recent poor years with those occasional fluctuations which occurred in previous cycles.

For comparison the history of the Rivers Inlet sockeye catch is divided into successive four-year periods, as follows:

1904-1907, average pack of 98,589 cases.
1908-1911, average pack of 99,142 cases.
1912-1915, average pack of 98,717 cases.
1916-1919, average pack of 53,948 cases.

In commenting on general conditions at Rivers Inlet, Dr. Gilbert states: "Unless the intensity of the fishing is at once diminished, unless we decrease the total number of sockeye taken annually from this watershed, we are in danger of repeating there on a smaller scale the tragic history of the Fraser River."

The eight years of study of the sockeye runs to Rivers Inlet show that the average size of the sockeye within their own group was so nearly constant during the first years of the investigations that any considerable change in this respect becomes immediately apparent. Such a change undoubtedly occurred in the runs of the last three years. There is no present reason to allege in support of an assumption that there is a casual connection between the size of the individual fish and the magnitude of the run. The coincidence during the last three years may be only chance association. But against this hypothesis Dr. Gilbert states we have our observations of other exceptionally poor runs in the rivers of the Province during the years 1913 and 1917, when, as stated in the Department's report for 1917, "We have extremely poor packs of sockeye in all the large rivers of the Province, and we have these poor runs consisting everywhere of undersized fish."

At present there is no explanation for the extensive annual fluctuation in the size of the runs in our northern salmon streams. Neither the Naas, the Skeena, nor in Rivers Inlet has it been established that there was any relation between the size of the run in any given year and the size of the broods from which it has been derived. How can this lack of relation between the two be explained? Of course, it may be contended that the apparent lack of relation is due to incorrect estimates of the size of the runs during some or all of the seasons. Estimates have been made on the apparent abundance of the fish and the size of the commercial catches. Failure by this method, due to exceptional conditions, may indeed occur now and then. But quite generally it has been noted that seasons of good fishing correspond with successful seasons on the spawning-grounds, as these are established by direct observation. So, while we may admit occasional lapses of method, it must be agreed that years of apparent abundance are correctly so characterized and correspond with seasons in which the spawning-beds are abundantly seeded. As Dr. Gilbert submits, "the conclusion that the relative amount of seeding of the beds has comparatively little influence on the size of the resulting runs becomes palpably absurd if pressed to the limit. If the number of eggs deposited in the beds be sufficient reduced, it must have a paramount influence on the magnitude of the run. When the variation in the annual production of eggs is of lesser amount, no greater than has occurred in the Naas, the Skeena, and on Rivers Inlet in the last ten years, there is the possibility that other factors which limit