1st draft

THE SPORTS FISHERY FOR CUT-THROAT TROUT AT LAKELSE LAKE B.C.

For the past decade, Lakelse Lake has supported an active sport fishery for cut-throat trout. Since 1950 the Fisheries Research Board has kept records of this fishery in connection with its investigations on the ecology of the sockeye salmon of the area. Apart from information on the predator-prey inter-relationship of the cut-throat and young sockeye, much has been learned of the life history of the cut-throat and of the factors affecting the success of angling. Although the present fishery is apparently not severe enough to bring about noticeable depletion in the cut-throat stock, further expansion of B.C.'s Northland may result in increased exploitation and eventual decline in the anglers' returns. The present report summarizes the information collected to date and outlines our present understanding of the status of the cut-throat population of Lakelse Lake.

Life history

From March to May of each year, following the break up of ice in the lake, the cut-throat of Lakelse carry out their spawning migrations. There tend to be two more or less separate groups of spawners - those ascending the eight creeks draining into Lakelse Lake (see map) and those spawning in the Lakelse River which drains the lake. Fish participating in the spawning runs are usually four to six years old, although some of the larger three-year-old fish also spawn. During this time, the temperature of the lake is quite uniform from top to bottom, and immature fish (mainly three years old and younger) are found widely dispersed throughout the lake and in the river. These fish feed mainly on insects (caddis larvae, mayfly nymphs) and the occasional young sockeye.

Following the spawning period, when the lake warms, the spawners frequenting the tributary streams, as well as many of the immature fish move to the reedy,

inshore areas, where mayflies are hatching in profusion. Large numbers of the immature fish are still scattered in the offshore areas where they are concentrated in the upper 20 feet of water. Fish spawning in the Lakelse River remain there for the summer, returning upstream in the late fall.

As the summer progresses and adult sockeye salmon ascend the major tributaries to spawn, many cut-throat move to the creek mouths and up the creeks, where they eat sticklebacks, insects and the eggs of the ripe salmon. A significant proportion of the cut-throat population still remains in the offshore area.

In the fall, when the lake cools and all fish species tend to become widely dispersed, cut-throat may be caught in nets throughout the lake, although again they tend to concentrate in the surface waters. At this time, with the availability of insect food waning, the trout turn more to fish (stickleback and young sockeye salmon) for their diet.

When ice cover forms, the trout remain near the surface, feeding principally on stickleback.

The angling fishery

Annually, sports fishermen (largely "week-end" transients and cottagers) remove about 2000 cut-throat from the Lakelse area. In addition, two or three year round local residents at Lakelse the year round carry out intensive fishing at times when the creek census does not operate (primarily during the late summer and fall). Also, in the course of its investigations, the Fisheries Research Board conducts gill-netting, adding another source of mortality. In all, it is estimated that about 650 fish have been removed annually by the latter two agencies. Thus, the sport fishery accounts for no less than 75% of the total removal of trout from the area. In future years, as the populations of the neighboring Kitimat and Terrace areas expand, this proportion will undoubtedly increase.

During the past 5 years the fishing season has opened on May 1st. At this time the major effort of the anglers has been concentrated on the trout moving

down the Lakelse River. Prior to the first of May, many mature fish pass downstream to the spawning grounds in the vicinity of Coldwater Creek (see map). By the time the fishing season opens most of the trout moving downstream are immature individuals feeding on pink fry, and coho and sockeye yearlings, but the run also includes a few mature fish, which do not readily take a lure. From late May to July, fishing shifts from the river to the reedy shoreline areas of the lake, where good catches of fish can be attained until early August, when the anglers tend to move to the tributary creek mouths. Tagging studies have shown that most of the older fish taken in June and July had spawned earlier in the creeks at the south end of the lake. As the summer progresses fishing drops off and by mid-September only an occasional fishing party may be found on the lake.

Examination of anglers' catches has given good information on the biology of the Lakelse Lake cut-throat population and on how the fishery influences and is influenced by the characteristics of the population. An important question in this study has been: do the catches of anglers reflect the abundance of fish? Many factors other than the availability of the fish could affect the catch per unit of effort, e.g. weather, time of fishing, skill, and the method of fishing used. However, these factors have apparently not introduced much variability from year to year. Analyses of the data indicate that the success of angling has not been clearly related to yearly variations in cloud coverage, wind action and water levels. It has also been shown that the nature of the fishery has remained more or less constant from year to year, with the methods of fishing used and the proportions of experienced and unskilled anglers not varying significantly. Thus, annual variations in catches probably reflect the changes in the availability of the fish to the anglers in a consistent way and are not unduly confounded by changes in the character of the fishery. It is felt that the catch per unit of effort forms an index of the abundance of the fish which is sufficiently accurate to reflect gross changes in the size of the cut-throat population.

Catch statistics

When a fish stock is subjected to a fishery sufficiently intense to bring about a marked depletion in the population, two changes may occur in the catch. First, the numbers of older and larger fish in the catch may decline, and second, the return per unit of fishing effort may drop.

The age composition of the catches (determined from examination of the scales) of trout from both the Lakelse River and the Lake has remained quite constant since 1950. As shown in the table below with the exception of the river catch of 1952 and the lake catch of 1954 (when an unusually large number of older fish were taken), the average age of fish in the anglers' catches has remained quite constant. Age III and IV trout have predominated in the catch each year (see graph). A lesser number of II-, V- and VI-year-old trout are also taken. The average age composition of the catch and the average sizes of the fish are shown in the accompanying graph. The proportion of older fish taken has not declined since 1950, and actually has tended to increase (see table). These findings suggest that the pressure of fishing has not been sufficiently great to deplete the population to a point where the age composition of the stock has been affected.

Figures on the catch per unit of effort on Lakelse Lake provide further evidence that no severe depletion has occured in the lake population; the catch per hour has tended to increase since 1950 rather than to decline. However, the catches on the Lakelse River have declined since 1950. This has probably been associated with a change in the distribution of the fish and the fishing effort due to the operation of the Lakelse River sockeye counting fence.[1] Prior to the installation of the weir in 1952, the fishing effort was distributed quite uniformly on the Lakelse River between the mouths of Herman and Coldwater Creeks

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[1] This weir has been described in an article by Dr. R.E. Foerster in Prog. Rept. Pac. No. 93, 1952, pp. 30-32.

(see map). In March of 1952, the weir, located halfway between the two creeks, was installed. Although a boat passage was provided to facilitate the movement of anglers up and downstream, the fishing effort was largely concentrated in the area upstream from the weir. During this year, the movements of the trout were also restricted by the fence operation. It is estimated that from 1,000 to 2,000 of the older and larger ~~trout~~ trout which normally would have migrated downstream were confined in the upstream region. This occurrence is reflected in the higher average age of fish caught during this season (see table). Thus, although the area utilized by the anglers was reduced, the restriction of the fish to the upstream area provided them with an unusually heavy concentration of fish. The result was that a catch per effort similar to previous years was ~~observed~~ attained.

In 1953 and 1954, however, improvements in design resulted in the ready passage of trout downstream through the fence. As in 1952, the anglers ventured but rarely to the fishing grounds below the fence and thus failed to exploit a proportion of the population they normally would have fished, had they moved into the downstream area as they did in years prior to 1952. Failure to fish the downstream area during the summer, when the spring spawners in the Coldwater area are available to angling further decreased the extent of their exploitation. It is probable that these conditions are responsible for the catch per unit of effort in 1953 and 1954 being considerably lower than in the previous three years.

Rates of exploitation

In the past three years, approximately 1500 cut-throat trout in both the Lakelse River and in the lake have been marked by the removal of fins or by the application of tags. Population estimates based on these experiments have shown that the population in Lakelse Lake during the summer is in the neighbourhood of 15,000 fish of catchable size. Of these, the anglers have removed annually an average of 1,080 trout or approximately 7 ~~%~~ percent of the available stock.

The marking experiments have also shown that from ~~three~~ 3 to ~~five~~ 5 thousand trout migrate down the Lakelse River each spring. Of these fish, up to 3,000 may be mature individuals which are not readily available to the early season fishermen. The anglers have taken an average of 934 fish from the River annually, which represents between 18% and 31% of the population.

In general, the catches of cut-throat at Lakelse Lake have remained relatively constant over the past 5 years. There is no evidence to suggest that the abundance of the fish has decreased, although the catch per unit effort in the early part of the season has declined in recent years. This decline is felt to be the consequence of a change in the distribution of fish and of fishing effort, associated with the installation of a salmon counting weir on the Lakelse River and not of a change in population size. Although the population has withstood the effects of the present fishery without apparent signs of depletion, the influx of more fishermen when the road link between Kitimat and Lakelse is completed may have pronounced effects.

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Sketch map of Lakelse showing distribution of fishing effort from May to August.

Average age and size composition of anglers' catches, 1950 to 1954.

Legend for Figures

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Average age and size composition of anglers' catches, 1950 to 1954.

Catch statistics of the Lakelse cut-throat fishery, 1950-1954

Year	River				Lake			
	Hours fished	Estimated catch	Catch per hour	Avg. age	Hours fished	Estimated catch	Catch per hour	Avg. age
1950	819.0	1148	1.40	3.23	1294.0	1342	1.03	3.21
1951	764.0	836	1.09	3.59	885.0	768	.86	3.41
1952	1026.8	1140	1.11	4.93	1240.0	1338	1.08	3.75
1953	1103.7	781	.71	3.71	830.0	1068	1.29	3.45
1954	1206.2	765	.63	3.48	463.7	887	1.93	4.61
Average	983.9	934	.94	3.54	942.5	1080.6	1.14	3.69