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Some information on the minimum adult stock of fish
needed to provide adequate natural spawning

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INTRODUCTION

During a survey of Tathlina and Kakisa Lakes, N.W.T. which was made jointly by the Fisheries Research Board of Canada and the Department of Fisheries, between July 28 and August 9, 1946, a situation was discovered which bears on the question of the minimum stock of adult fish necessary to provide adequate spawning.

Both these lakes are expansions of the Kakisa River, with Tathlina Lake the further upstream. Tathlina Lake is approximately 220 square miles in area with a firm sandy-mud bottom, and a remarkably uniform depth of five feet. Kakisa Lake is approximately 130 square miles in area, with the same type of bottom and a maximum depth of twenty-four feet.

Prior to 1943, Indians who occasionally went to Tathlina Lake found fish plentiful there. In the spring of 1943, dead fish were observed in quantities on the shores of Tathlina Lake and the lack of fish has completely discouraged Indians from camping there since then. A winter kill such as apparently took place seems to be an unusual occurrence in Tathlina Lake. The northern pike, Esox lucius, in the muskeg waters which adjoin Tathlina Lake, and the few in the lake itself, had apparently not been affected by the winter of 1942-43. However, in the case of the dore, Stizostedion vitreum, whitefish, Coregonus clupeaformis, northern suckers, Catostomus catostomus, common suckers, Catostomus commersoni, and burbot, Lota lota, although young fish which must have been hatched since the winter of 1942-43 were present, no adults which could have provided the spawn from which those young were hatched were taken (except two mature common suckers that were taken). The data regarding these last five species indicate that adequate spawning has resulted from a negligible number of adult fish. The evidence is most conclusive in the case of the dore.

No mature dore were taken in four net-nights with 5¼-inch mesh and five net-nights with 4¾-inch mesh (these were gill-nets each 100 yards long and 30 meshes deep). When these same nets were fished in Kakisa Lake a few days later, the availability was such that the above effort would have taken approximately 170.

One fish in its second year, 6 in their third year and 18 in their fourth year were taken in 1½- and 2½-inch gill-nets, and these fish must have been produced by mature fish which were alive in the springs of 1945, 1944 and 1943 respectively. One other, a fish in its fifth year, which must have survived the winter of 1942-43, was taken. When the same small mesh nets were fished in Kakisa Lake a few days later, they caught 3 fish in their fourth year and none younger, although the same effort in Tathlina Lake would have taken approximately 2 in their second year, 12 in their third year and 33 in their fourth year.

It might be argued that adult dore could have been present in quantities in different parts of Tathlina Lake from those in which nets were set. The remarkably constant depths and type of bottom which were found makes this unlikely. It is possible that the limited soundings taken could have missed "holes" which were several square miles in area. However, on a windy day considerable quantities of bottom material are held in suspension in the water; these settle out quickly when the water is undisturbed, so that over the period of time during which the lake has existed such holes must have been filled. There was a limited area of rocky bottom in one part of the lake which was not fished, but since its area is less than one per cent of the total, even if adult dore were as available there as in Kakisa Lake, they could be considered as present in negligible numbers in the lake as a whole. Although the Kakisa River above Tathlina Lake is deeper than the lake itself, it is not a typical dore habitat, and the Indian family which lives a short distance up the river catch mainly suckers and northern pike. Since the river between Tathlina and Kakisa Lakes drops 175 feet in 20 miles, with many rapids and one falls, it is unlikely that dore move from lake to lake extensively.

It cannot be argued that there might have been dore present which were too large to be taken in the small mesh nets and too small to be taken in the large mesh nets since they are so frequently caught by their teeth that any given size is taken in any size of mesh. For instance, the largest dore taken in Kakisa Lake was caught in small mesh net. It is unlikely also that behaviour differences account for large catches of adult fish in Kakisa Lake compared with nil in Tathlina Lake, since the lakes are so similar to one another. Tathlina Lake supplies most of the water which enters Kakisa Lake, their bottoms are composed of similar material, and their temperatures were practically the same at the time of the investigations. Again it is unlikely that adult fish were present in quantity in early 1943, 1944 and 1945 but had vanished by the middle of 1946. There seems to be no alternative to the conclusion that only a few mature fish produced the young fish which were present in 1946.

There is some justification for considering that the catch per unit of effort did not necessarily represent the relative abundance of small fish in the two lakes. Big fish were caught in the small mesh nets in Kakisa Lake, which must have decreased the chances of catching small fish. Also, whereas in Tathlina Lake the nets practically reached from surface to bottom, they did not do so in Kakisa Lake, and although the same conditions prevailed when small mesh nets were set inshore, as they generally were, the deeper parts of the lake were not adequately sampled. In spite of this it seems probable that small fish were more abundant in Tathlina Lake than in Kakisa Lake, although not necessarily 16 times as abundant as the relative availabilities would indicate.

It is clear that the hypothesis that a very few adult dore have provided an abundance of young is highly probable. The concentration of adult fish was probably much lower than could be profitably brought about by commercial fishing. The resulting young are probably numerous enough to fully utilize the food available. It should be noticed that competition and predation from older fish of all species must have been negligible.