

**FISHERIES RESEARCH BOARD
OF CANADA**

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Title

Report on Nueltin Lake

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INTRODUCTION

In September, 1948, the author was requested to make recommendations regarding Nueltin Lake. This request arose from an enquiry by Mr. F. O. Martin of Churchill, Manitoba regarding the possibility of getting a license for commercial fishing there. It was decided that some information regarding the lake should be collected before making any recommendations. A considerable body of information has come to light, and analysis of it is reported below.

THE DATA

Information on the approximate shape and size of the lake, and approximate size of its drainage basin was derived from topographical survey maps. Unfortunately neither the lake nor most of the surrounding area have been accurately mapped.

Dr. Francis Harper, a naturalist, visited Nueltin Lake in 1947 under the auspices of the Arctic Institute of North America. His published report is available. It includes a list of known species, some data on fish taken by him in gill nets, and a review of all the previously published references to fish of the region starting with references by Samuel Hearne who went through the lake in the winter of 1770-71. Unfortunately Dr. Harper confined his fishing to Windy Bay, a very limited area in the northwest corner of the lake. His companion, Mr. F. M. Mowat has provided some valuable unpublished data. Mr. Charles Schweder who formerly ran a

trading post at Windy Bay (not now being operated) has also supplied information.

The Geodetic Survey had a base camp at the southwest corner of the lake in 1945. Mr. B. J. Woodruff and Mr. W. H. Stilwell of Geodetic Survey and Mr. R. G. Madill, Magnetician, all of whom were at the base camp have supplied such information as they could. Through the cooperation of Wing Commander Thomas, the following members of the R. C. A. F. who have been to Nueltin Lake mostly in connection with the Geodetic Survey camp supplied information: Flight-Lieutenants Garrett and R. Skuce, Flying Officer F. E. Weeks, and Corporal L. P. Padburg. The following residents of The Pas who have been to the lake also supplied information: Dr. R. F. Yule, Mr. J. Hone, and Mr. T. Lamb.

PHYSICAL CHARACTERISTICS OF NUEL TIN LAKE

Nueltin Lake is about 100 miles long and averages about 10 miles wide. There are two basins, the northern one being about twice the size of the southern. They are connected by a narrow channel known as "The Narrows".

The lake as shown on the latest available maps has a water area of about 1,100 square miles. The estimated total area of islands is about 40 square miles, which is not included in the above. About 20 per cent of the water area lies in Manitoba, the remainder in the Northwest Territories.

The lake drains an area of about 12,000 square miles.

The scanty information available indicates that this basin may be chiefly sand and gravel, that about 50 per cent of the surface is water, and that the land surface is well covered with vegetation, predominantly "moss" and grass with clumps of trees, mostly black spruce and tamarack. About one-quarter of the drainage lies north of the tree-line.

Mr. Mowat reports a sounding of 100 feet about five miles south of The Narrows and 150 feet about ten miles north of The Narrows, also 35 feet to 75 feet in Windy Bay. These soundings indicate that probably most of the lake is less than 200 feet deep. The opinion of several informants that the lake is deep indicates that depths probably increase quickly from the shore. Mr. Mowat states that mud and silt bottoms are rare.

The water is described as clear and blue in color. In 1947 water temperatures at Windy Bay did not exceed 40 degrees Fahrenheit. Breakup occurs between June 15 and July 15 and freeze-up between October 15 and November 1. Mr. Schweder reports that the ice becomes four to five feet thick in the southern part and six to eight feet thick in the northern part.

FISH POPULATIONS

The following species have been recorded: lake trout Cristivomer namaycush, tullibee Leucichthys nuelinensis, whitefish Coregonus atikameg atikameg, round whitefish Prosopium hearnei, grayling Thymallus signifer, common sucker Catostomus commersonii, northern sucker Catostomus catostomus, pike, Esox sator burbot

Lota maculosa, stickleback Pungitius pungitius, and sculpin, Cottus cognatus. The author regards L. nueltinensis as probably synonymous with one of the previously described Leucichthys, C. atikameg atikameg as probably an ecological variation of C. clunseaformis, P. hearnei, as probably synonymous with P. cylindraceum and E. estor as synonymous with E. lucius.

Information is available from Dr. Harper, Mr. Mowat and Mr. Schweder regarding gill net catches in Windy Bay, but the information is in such a form that it is difficult to use it. It appears, however, that 100 yards of 5½-inch-mesh (stretched measure) gill nets if left for 24 hours would catch on the average about 60 pounds of whitefish, 50 pounds of trout and 10 pounds of pike. During the fall spawning run, of course, much larger catches of whitefish can be made at certain places. Fishing seems to improve slightly throughout the summer. The circumstances under which the reported catches were made were such as to make it seem probable that commercial fishermen would make better catches.

In the southwest corner of the lake an average of about 50 pounds of trout per hour of angling were reported. This indicates that they are probably more plentiful there than in Windy Bay. Indians sometimes run nets in this corner during the open water season, and take large numbers of whitefish and lake trout. Reports indicate progressively poorer fishing towards the middle of the summer followed by improved fishing, from both Indian nets and angling. Indians usually fish inshore, and the reporting anglers as far as can be determined used non-metal lines, so that probably

all the reported fishing was done at depths of less than 25 feet. Probably water temperatures increase enough in this region to cause a summer migration to deeper water. If so, conditions would presumably be better for producing fish there than in Windy Bay where the recorded temperatures are probably below the optimum for fish production.

Actual data on abundance is confined to the above two very limited regions which are about 75 miles apart. Data on other parts of the lake are lacking although statements by various informants indicate similar levels of abundance.

QUALITY OF COMMERCIAL FISH

Dr. Harper's published account contains various photographs of fish. The lake trout shown is obviously a "waster", that is one with a thin body for its size. In fact it weighs about one-half as much as a normal trout of the same length. Mr. Mowat states that only the larger trout show this tendency. It would be difficult or impossible to market such fish.

The whitefish shown is obviously a representative of the ecological form known in Great Slave Lake as "black"-whitefish. This form (which is also known from other lakes) is generally more heavily infested with cysts of the tapeworm, T. crassus than other whitefish. However, in certain localities this is not true. If tullibee were as scarce as Dr. Harper's account indicates, the rate of infestation of whitefish would presumably be low. However, since he fished only in shallow water, speculation on this point is of little value. Mr. Lamb reports that he cut up one whitefish without

finding any cysts. No informant has reported cysts in fish from the lake which they have eaten.

"Black" whitefish are generally less marketable than the others because of their appearance. They generally do not keep as well.

ASSESSMENT OF POTENTIAL FISH PRODUCTION

From the information given under "Physical characteristics" it would appear that the lake is oligotrophic, although not so extremely oligotrophic as Great Bear Lake. However, it is probably more oligotrophic than Great Slave Lake. Considering the presumed degree of resemblance to these lakes, and their estimated (this estimate is very rough) potential sustained yields, Nueltin Lake might be expected to yield one-half million pounds of commercial fish annually without detriment to the fish population.

From information given under "Fish populations" and assuming:

1. that the availability in Windy Bay represents an average value for the lake,
 2. that similar availabilities in Nueltin and in Great Slave Lake represent similar concentrations of fish,
- then Nueltin Lake would be expected to produce at least one million pounds annually. The hypothetical nature of this estimate cannot be overemphasized.

An assessment of any lake's ability to produce fish is at best only approximate, even after a thorough survey. The lack

of reliability of such an assessment on the basis of the meager information here given is therefore apparent. However, it seems probable that the lake could sustain an annual yield of at least one-quarter of a million pounds. It is quite conceivable that it could support a fishery of several million pounds per annum.

DOMESTIC FISHERY

As with all northern lakes, the effect of a commercial fishery on the food supply of local people must be considered. Although little information is available on this point, it would seem that the amount of fish taken locally is negligible. Indians visit the south end of the lake occasionally but apparently they are primarily interested in caribou. Since they slaughter the caribou in great numbers, and often use only the tongue (several informants have reported seeing the carcasses), it is apparent that they do not depend on fish for food. Mr. Schweder says "as there is merely at all times a plentiful supply of meat to be had, I have been very little concerned with fishing".

CONSIDERATIONS INVOLVED IN A BIOLOGICAL SURVEY

A proper survey of the lake would require a minimum of 1,000 soundings and 75 net sets. Samples of bottom organisms and plankton, also physical and chemical data should be gathered, the amount to depend on the thoroughness desired. Because of the thickness of ice reported in winter, the survey would have to be done during the summer.

A party of at least five men for two and one-half months would be required. They would spend six weeks of the time on the lake. Two large skiffs or freighter canoes would be required, plus camping equipment, nets, limnological equipment, food and fuel.

The need for large enough boats is emphasized by the fact that two R. C. A. F. men were drowned from a canoe in Nueltin Lake in 1945. Providing them is a real problem. To fly in materials for a boat with boat builders, to maintain them at the lake and to fly them out again after they had built the boats would cost about \$1,500. To send in two complete boats by water and portage or by sleigh might be cheap or it might be quite expensive depending on circumstances. A very rough approximation of the cost of so doing is \$1,000. To the best of our knowledge there are no suitable boats available at the lake. The boats would probably be abandoned at the end of the survey.

The party would, of course, go by air from Churchill. On the initial trip there would be about 3,400 pounds including men, which means two trips with a Norseman. At the end of two and four weeks an aircraft should service the party carrying about 800 pounds each time. At the end of six weeks about 3,000 pounds would return to Churchill which would mean two more trips with a Norseman.

The foreseeable costs would be approximately as follows:

Salary and wages	\$2,200
Travel (exclusive of air)	800
Air transportation (6 trips)	2,400
Camping equipment	200
Nets	150
2 boats	1,000
2 outboard motors	400
Fuel	600
Food	<u>300</u>
Total	\$8,050

An additional \$1,000 should be allowed for unforeseeable expenses.

The following is recoverable:

Depreciated value of nets	\$ 50
Depreciated value of motors	300
Depreciated value of camping equipment	<u>100</u>
Total	\$ 450

The above expenses are those which would be incurred by a minimum programme of investigation. A more complete survey would be more expensive. Further, no allowance is made for a major setback such as can easily occur.

The R. C. A. F. is establishing a post on Ennadia Lake, to service which they will need to fly over Nueltin Lake. It might be possible to arrange for at least part of the air transportation with them.

It should be remembered that unlike Great Slave and Great Bear Lakes, there are no settlements on the lake, so there are none of the facilities available which were used when surveying them. Any expedition must depend entirely on its own resources.

It has been suggested that the author direct any survey of the lake that might be planned. His plans include full programmes for the summers of 1949, 1950 and probably 1951 on pressing problems closely connected with administration. He also plans to survey Lac la Martre, Northwest Territories in 1951 or 1952 which, since it seems much more likely to be eventually exploited than Nueltin Lake, should probably be done first. It seems unlikely that the author would be available to undertake the survey until 1953.

Another drawback to a survey at the present time is the lack of adequate maps. Nueltin Lake has not yet been photographed, nor is it on the agenda for 1949. It would be difficult to make an adequate survey without better maps than now exist.

ADVANTAGES EXPECTED FROM A BIOLOGICAL SURVEY

It is unfortunate but true that our knowledge of basic factors is so slight that after a biological survey is conducted only an approximate estimate can be made of the potential fish production of a lake. We can only get an accurate idea of potential production by the trial and error method of carefully observing the effect of commercial fishing on the fish population, and then

adjusting annual catch on the basis of those observations until the fishery is on the verge of overexploitation.

In the opinion of the author, the increase in accuracy of an estimate of potential production based on a biological survey, over the estimate given above on the basis of present knowledge, does not warrant the expected expenditures in view of the probabilities of exploitation given below. An examination of the lake as a purely scientific project does not seem advisable.

While the ability to predict potential production on the basis of biological surveys is at present limited, steps are being taken to remedy the situation. For instance, one of the important expected results of work now being done on Great Slave Lake and on Lake Winnipeg will be an increase in ability to so predict. It seems advisable for the present to concentrate on this work rather than to dissipate efforts on lakes such as Nueltin where any work would cost more in time and money than similar work on Great Slave Lake or Lake Winnipeg.

POSSIBILITIES FOR COMMERCIAL EXPLOITATION

Any fish caught would have to move 200 miles by air to Churchill, at which railhead they would still be a long way from market (the local market could not absorb an appreciable part of the lake's potential production). It seems improbable that a commercial fishery could be established under present or expected circumstances. For instance, it has not been possible yet to exploit Kakisa Lake, Northwest Territories in spite of a mere

25 air miles to transportation connections approximately as favourable as those at Churchill, and in spite of a probable greater concentration of more marketable fish in Kakisa Lake.

As we understand it the operation contemplated by Mr. Martin is a special case, in that fish would be merely a return pay-load for an aircraft which would bring in trade goods. Such an operation would take only a negligible quantity of fish.

RESEARCH ACTION REQUIRED IN CONNECTION WITH A LARGE SCALE OPERATION

A fishery for less than one-quarter of a million pounds annually, or a larger temporary fishery obviously does not call for any action. However, if a fishery for more than one-quarter of a million pounds which is likely to continue indefinitely is started, then it seems desirable that the effect of the fishery on the fish be studied to detect overexploitation before its effects become serious.

The minimum requirements for detecting overexploitation are scale samples from 5,000 lake trout and 3,000 whitefish. It would be essential that the fish be taken at random from the catch. Larger samples would be desirable for more accurate results, as would data on catch per net. It might be necessary to increase the staff of the Central Station to get such data.

SUMMARY

1. Data on Mueltin Lake have been compiled from maps and from the accounts of people who have been there.

2. It is 1,100 square miles in area, of which 80 per cent is in the Northwest Territories, the rest in the province of Manitoba.

3. It is moderately oligotrophic.

4. Eleven species are known of which whitefish and lake trout are common.

5. Degree of infestation with T. crassus is unknown.

6. The lake could probably produce at least one-quarter of a million pounds and possibly several million pounds per annum.

7. Local need for fish is negligible.

8. A survey would cost at least \$7,000 to \$9,000 and possibly considerably more. It could not be conveniently undertaken until 1953. Preparation would have to begin at least one year beforehand. The resulting information would probably not warrant the expenditure.

RECOMMENDATIONS TO THE FISHERIES RESEARCH BOARD

1. It is recommended that no biological survey of Nueltin should be started at least one year in advance. The hydrographic and map service should be requested to photograph and map the lake.

3. If a commercial fishery for more than one-quarter of a million pounds per annum is started, the Board should consider making a biologist available to study the effect on the fishery.

RECOMMENDATIONS FOR THE FISHERIES DEPARTMENT

N. B. The amounts of fish referred to below are in round weights of whitefish and trout caught, whether sold or not. This

is important because at best it would probably be only profitable to market medium trout, in which case all large trout and all whitefish would be abandoned at the lake.

1. It is recommended that no restrictions be imposed on a commercial fishery under the following conditions:

(a) where less than one-quarter of a million pounds is taken in an average year.

(b) where more than one-quarter of a million pounds is taken but where there will be no attempt to fish after two years.

2. In the event that a fishery is established which can take more than one-quarter of a million pounds annually and which will continue to operate for several years, data should be collected to enable overexploitation, to be detected at an early stage.

3. If suitable arrangements can be made to collect data for detecting overexploitation, then one million pounds is recommended as a suitable annual quota for initial trial.

ADDENDUM

Since the foregoing was written a limited commercial fishery for whitefish and lake trout was started in 1949. The fish were transported by air to Churchill Manitoba. Apparently the venture was soon found to be unsound financially because exploitation ceased after a few thousand pounds had been taken.

Some of the fish caught were sent to the Central Station. The whitefish were typical of the "black whitefish" found in many Canadian lakes, and the trout were typical of their species.

Scales samples were taken from these fish, and in addition a few scales samples were secured through the kindness of the Department of Mines and Resources. The age-weight relationships determined from these scales were as follows:

The weights in pounds of 9 lake trout from Nueltin Lake whose ages have been determined.

Age	Actual weights (lbs.)	Average weight (lbs.)
8+	3.4	3.4
9+	6.4, 3.4	5.9
10+	8.6, 8.0, 7.6	8.1
11+	7.3, 6.1, 5.4	6.3

The ranges in weights and average weights in pounds of 74 whitefish from Nueltin lake whose ages have been determined.

Age	Number of fish	Average weight (lbs.)
10+	1	3.2
11+	15	3.3
12+	22	3.6
13+	20	4.1
14+	5	4.6
15+	9	4.2
16+	2	4.8

