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Title

Exploratory fishing in Lake Winnipeg
with gill nets of graded mesh size.

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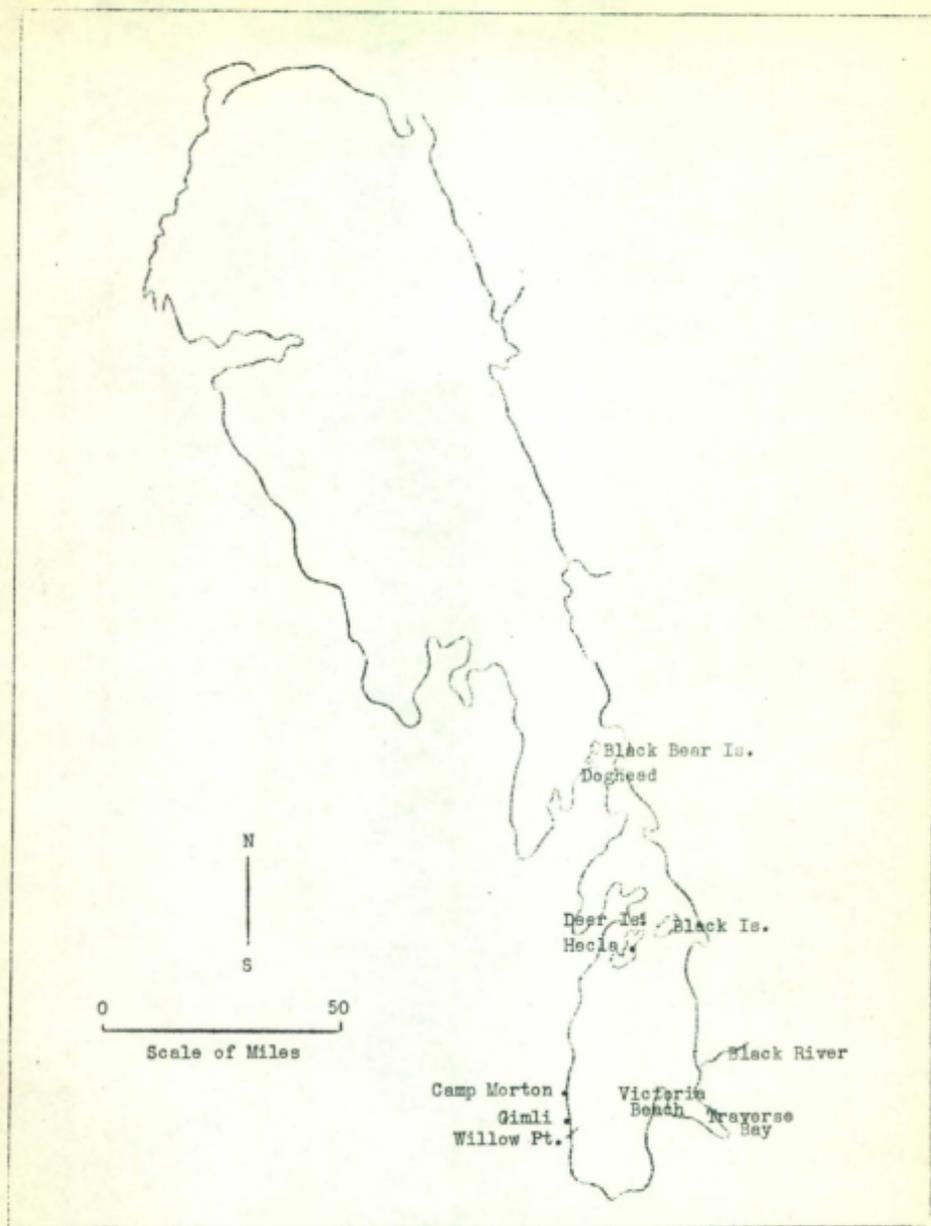


Figure 1. A map of Lake Winnipeg

INTRODUCTION

This study was designed to explore some fishing grounds and the fish populations on them to furnish background information on the commercial fishery. Besides providing these data, the operations were themselves useful in developing the interest and the skills of the investigators, which qualities are desirable in studies of this kind.

The purpose of this paper is to summarize and place on file some of the more prominent data that were collected during each of the three summers of 1948, 1950 and 1951.

A list of the species noted from the catches.

| | |
|-----------------|-------------------------------------|
| sauger | <u>Stizostedion canadense</u> |
| yellow walleye | <u>Stizostedion vitreum vitreum</u> |
| yellow perch | <u>Perca flavescens</u> |
| freshwater drum | <u>Aplodinotus grunniens</u> |
| white sucker | <u>Catostomus catostomus</u> |
| longnose sucker | <u>Catostomus commersoni</u> |
| lake whitefish | <u>Coregonus clupeaformis</u> |
| cisco | <u>Leucichthys</u> spp. |
| burbot | <u>Lota lota</u> |
| northern pike | <u>Esox lucius</u> |
| brown bullhead | <u>Ameiurus nebulosus</u> |

Fishing operations, 1948

During this year the nets were set in the vicinity of Black Bear Island and nearby Doghead. The equivalent of 5 one-night

lifts and 2 two-night lifts were made between August 30 and October 1. The gangs of gill nets consisted of 50 yards of each of the following mesh sizes; $1\frac{1}{4}$, 2, 3, 4, 5 and $5\frac{1}{2}$ inches, (stretched measure). The nets were set and lifted with the aid of the small vessel "Coregonus". The fishing sites were chosen at various depths and localities, and were probably representative of the general area.

On October 27, a single net lift of a gang made up of 50 yards of $1\frac{1}{4}$ -inch mesh, 50 yards of 2-inch mesh, and 360 yards of 3-inch mesh was made at Willow Point, near Gimli. Data from this catch have been included with those from Black Bear and vicinity.

The catches from each mesh were segregated. Each fish was weighed on a small spring scale, and/or measured (fork length) in millimetres. Many specimens were both weighed and measured. A gross examination of the stomach contents (not shown) was made, and the sex of most specimens was determined by an examination of the gonads.

An outstanding feature of the catches was the large proportion of walleye. Of the total catch of 217 pounds of all species, 71 per cent were walleye. Other species were as follows: drum 11 per cent, burbot 9 per cent, white sucker 8 per cent, perch 1 per cent and sauger 1 per cent.

The average size of each of these species just mentioned varied with the mesh size. These data are shown in Table I. Walleye were taken in all six mesh sizes, but the largest

Table I. Approx. size of numbers of fish captured in various mesh sizes during August to October, 1946.

| | 1½"-mesh | | | 2"-mesh | | | 3"-mesh | | | 4"-mesh | | | 5"-mesh | | | 5½"-mesh | | |
|------------------|----------|------|-----|---------|------|-----|---------|------|-----|---------|------|-----|---------|------|-----|----------|------|-----|
| | mm. | lbs. | no. | mm. | lbs. | no. | mm. | lbs. | no. | mm. | lbs. | no. | mm. | lbs. | no. | mm. | lbs. | no. |
| Yellow walleye | 217 | 0.31 | 45 | 252 | 0.42 | 113 | 299 | 0.73 | 97 | 241 | 0.42 | 6 | 254 | 0.47 | 22 | 269 | 0.54 | 16 |
| Sauger | 217 | ... | (4) | 253 | 0.65 | 2 | 295 | ... | 4 | ... | ... | ... | 263 | ... | 1 | ... | ... | ... |
| Yellow perch | 130 | 0.16 | (1) | 180 | 0.31 | 2 | 234 | 0.52 | 3 | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| White sucker | ... | ... | ... | 176 | 0.25 | 1 | 386 | 3.06 | 1 | 415 | 2.56 | 1 | 473 | 3.75 | 1 | 475 | 3.81 | 2 |
| Fresh-water drum | ... | ... | ... | ... | ... | ... | ... | ... | ... | 341 | 1.19 | 2 | 363 | 1.94 | 6 | 430 | 3.0 | 3 |
| Burbot | 209 | 0.22 | 2 | 263 | 0.35 | 3 | 374 | 0.84 | 18 | 588 | 2.37 | 1 | ... | ... | ... | ... | ... | ... |

average size, 0.73 pounds, appeared in the 3-inch mesh. Average size decreased unexpectedly with the larger mesh sizes, indicating considerable exploitation of the population by the commercial fishery. On the other hand, drum were not taken in mesh sizes smaller than 3 inches. They averaged from one pound in the 4-inch mesh to three pounds in the $5\frac{1}{2}$ -inch mesh. White sucker and burbot were taken in negligible numbers and over a wide range of mesh sizes.

The sex and maturity of the walleye catch in each mesh size is shown in Table II. Of the total of 325 specimens taken, 33.5 per cent were mature. Mature specimens were most numerous in the 3-inch mesh and numbered 58 fish (55 per cent) of the 106 captured. In contrast, seven of 52 fish (13 per cent) were mature in the catch of the $1\frac{1}{2}$ -inch mesh. The sex ratio of the entire catch from all meshes was 95 males to 146 females.

The sex and maturity of the few specimens of perch, drum and burbot taken is listed by mesh sizes in Table III.

Fishing operations, 1950

During this year there were a total of 9 one-night lifts and 2 two-night lifts of a gang of nets made up of 50 yards each of the following mesh sizes: $1\frac{1}{2}$, 3, 4, 5 and $5\frac{1}{2}$ inches. A 2-inch mesh net was not available. All lifts were made in the vicinity of Hecla, Black Island and Deer Island. Catches were segregated by mesh size and weights of individual fish were recorded. The gang was usually fished in a location likely to

Table II. The sex and maturity of some Black Bear Island walleye, August-October, 1948.

| Flesh size (Arches) | Male | | Female | | Immature | Total fish | Total Mature | Per cent Mature |
|---------------------------|--------|----------|--------|----------|----------|---------------|-----------------|-----------------------|
| | Mature | Immature | Mature | Immature | | | | |
| 1½ | 5 | 4 | 2 | 16 | 25 | 52 | 7 | 13 |
| 2 | 20 | 29 | 4 | 35 | 36 | 124 | 24 | 19 |
| 3 | 17 | 8 | 41 | 27 | 13 | 106 | 58 | 55 |
| 4 | 2 | ... | 1 | 4 | 1 | 8 | 3 | 37 |
| 5 | 2 | 4 | 1 | 8 | 7 | 22 | 3 | 14 |
| 5½ | 2 | 2 | 0 | 7 | 2 | 13 | 2 | 15 |
| Total fish | 48 | 47 | 49 | 97 | 84 | 325 | 97 | 33.5 |

Table III. The sex and maturity of some fish taken in various meshes in 1948.

| | SAUGER | PERCH | DRUM | BURBOT |
|-------------|--------|-------|------|--------|
| <u>1½"</u> | | | | |
| Male mat. | 2 | 23 | ... | ... |
| imm. | 0 | 1 | ... | ... |
| Female mat. | 0 | 1 | ... | ... |
| imm. | 0 | 9 | ... | 1 |
| Immature | 2 | 0 | ... | 1 |
| <u>2"</u> | | | | |
| Male mat. | 6 | 11 | ... | ... |
| imm. | 1 | 0 | ... | ... |
| Female mat. | 0 | 3 | ... | ... |
| imm. | 1 | 1 | ... | 1 |
| Immature | 5 | 0 | ... | 2 |
| <u>3"</u> | | | | |
| Male mat. | 2 | 3 | ... | 4 |
| imm. | 0 | 0 | ... | 3 |
| Female mat. | 1 | 3 | ... | ... |
| imm. | 1 | 0 | ... | 10 |
| Immature | 0 | 0 | ... | 1 |
| <u>4"</u> | | | | |
| Male mat. | ... | ... | 1 | ... |
| imm. | ... | ... | 0 | 1 |
| Female mat. | ... | ... | 0 | ... |
| imm. | ... | ... | 1 | ... |
| Immature | ... | ... | 0 | ... |
| <u>5"</u> | | | | |
| Male mat. | 1 | 1 | 4 | ... |
| imm. | 0 | 0 | 1 | ... |
| Female mat. | 0 | 0 | 2 | ... |
| imm. | 0 | 0 | 0 | ... |
| Immature | 0 | 0 | 0 | ... |
| <u>5½"</u> | | | | |
| Male mat. | ... | ... | 3 | ... |
| imm. | ... | ... | ... | ... |
| Female mat. | ... | ... | ... | 1 |
| imm. | ... | ... | ... | ... |
| Immature | ... | ... | ... | ... |

produce whitefish and the catch is therefore not necessarily representative of the fishing grounds as a whole.

Fishing began August 15 and ended September 1. The total catch was 495 pounds and seven species were represented as follows: (per cent) drum 48, sauger 19, burbot 18, perch 12, white sucker and northern sucker 1 per cent each, and cisco less than 1 per cent.

The average size of each species taken in five different mesh sizes is shown in Table IV. The average size of sauger, taken in all five meshes, varied over a short range from 0.47 pounds in $1\frac{1}{2}$ -inch mesh to 0.65 pounds in $5\frac{1}{2}$ -inch mesh. The greatest numbers were taken in 3-inch mesh and these fish averaged 0.64 pounds in weight. The 3-inch mesh was clearly the most efficient size used. Drum were most numerous in 5-inch mesh and averaged 1.7 pounds in weight while burbot were present in the greatest numbers in the 4-inch mesh, and averaged 2.19 pounds. Perch were taken in quantity only in the $1\frac{1}{2}$ -inch mesh, and averaged only 0.15 pounds.

The sex and maturity were determined by an examination of the gonads. These data are shown for four species in the upper part of Table V. Of 66 sauger, 16 were immature. The sex ratio was 24 males to 39 females. There were 53 fish in the perch sample, about half of which were immature. Among those of known sex, females outnumbered males about five to one. The sample of 92 male and 29 female drum was 80 per cent mature. The sex ratio of the burbot was 24 males to 18 females. Only two

Table V. The sex and maturity of some fish taken in various meshes during two years.

| | 1950 | | | | 1951 | | | | |
|---------------|--------|-------|------|--------|--------|-------|---------|------|--------|
| | SAUGER | PERCH | DRUM | BURBOT | SAUGER | PERCH | WALLEYE | DRUM | BURBOT |
| <u>1 1/2"</u> | | | | | | | | | |
| Male mat. | 3 | 0 | ... | 1 | 11 | 7 | 0 | ... | ... |
| imm. | 1 | 0 | ... | 0 | 0 | 0 | 0 | ... | ... |
| Female mat. | 8 | 1 | ... | 0 | 6 | 4 | 0 | ... | ... |
| imm. | 4 | 1 | ... | 0 | 0 | 1 | 0 | ... | ... |
| Immature | 2 | 24 | ... | 0 | 31 | 11 | 2 | ... | ... |
| <u>2"</u> | | | | | | | | | |
| Male mat. | ... | ... | ... | ... | 35 | 8 | 0 | 0 | ... |
| imm. | ... | ... | ... | ... | 3 | 0 | 0 | 0 | ... |
| Female mat. | ... | ... | ... | ... | 25 | 29 | 1 | 0 | ... |
| imm. | ... | ... | ... | ... | 2 | 3 | 1 | 1 | ... |
| Immature | ... | ... | ... | ... | 39 | 16 | 8 | 1 | ... |
| <u>3"</u> | | | | | | | | | |
| Male mat. | 9 | 5 | 4 | 14 | 18 | 6 | 4 | 4 | 1 |
| imm. | 3 | 0 | 16 | | 0 | 1 | 0 | 0 | 1 |
| Female mat. | 18 | 21 | 0 | 3 | 25 | 27 | 0 | 0 | 1 |
| imm. | 2 | 0 | 4 | | 5 | 0 | 3 | 0 | 0 |
| Immature | 1 | 1 | 4 | | 20 | 0 | 7 | 2 | 0 |
| <u>4"</u> | | | | | | | | | |
| Male mat. | 2 | ... | 12 | 7 | 4 | 0 | ... | 8 | ... |
| imm. | ... | ... | 1 | 2 | 0 | 0 | ... | 1 | ... |
| Female mat. | 3 | ... | 7 | 14 | 4 | 1 | ... | 3 | ... |
| imm. | 1 | ... | 0 | 0 | 1 | 0 | ... | 2 | ... |
| Immature | 1 | ... | 0 | 0 | 2 | 0 | ... | 0 | ... |
| <u>5"</u> | | | | | | | | | |
| Male mat. | 1 | ... | 42 | ... | 1 | ... | ... | 8 | 1 |
| imm. | 1 | ... | 0 | ... | 0 | ... | ... | 0 | 0 |
| Female mat. | 1 | ... | 9 | ... | 2 | ... | ... | 5 | 0 |
| imm. | ... | ... | 0 | ... | 0 | ... | ... | 0 | 0 |
| Immature | ... | ... | 0 | ... | 3 | ... | ... | 0 | 0 |
| <u>5 1/2"</u> | | | | | | | | | |
| Male mat. | 1 | ... | 17 | ... | 1 | ... | 1 | 3 | ... |
| imm. | ... | ... | 0 | ... | 0 | ... | 0 | 0 | ... |
| Female mat. | 1 | ... | 9 | 1 | 0 | ... | 0 | 2 | ... |
| imm. | 1 | ... | 0 | ... | 0 | ... | 0 | 0 | ... |
| Immature | ... | ... | 0 | ... | 0 | ... | 0 | 0 | ... |
| <u>Total</u> | | | | | | | | | |
| Male mat. | 19 | 5 | 75 | 22 | 70 | 21 | 5 | 23 | 2 |
| imm. | 5 | 0 | 17 | 2 | 3 | 1 | 0 | 1 | 1 |
| Female mat. | 31 | 22 | 25 | 18 | 62 | 61 | 1 | 10 | 1 |
| imm. | 8 | 1 | 4 | | 8 | 4 | 4 | 3 | 0 |
| Immature | 3 | 25 | 4 | 0 | 95 | 27 | 17 | 3 | 0 |

specimens were immature.

Fishing operations August 6 to August 29, 1951

During 1951 the fishing was carried on along the perimeter of the lake as far north as Black Island. Eight of the 17 one-night sets were made within eight miles of Victoria Beach in cooperation with a field party engaged in cisco research there. Two sets were made in Traverse Bay, another was made off Black River, three were made south of Black Island as well as one north of the island. Two sets were made on the west shore, one near Gimli and one near Camp Morton.

Two gangs of nets were used. Each gang was alternated to allow the nets to dry between lifts. One gang consisted of 50 yards each of $1\frac{1}{2}$, 2, 3, 4, 5 and $5\frac{1}{2}$ -inch mesh. The mesh sizes of the other gang were identical and so were all the nets except the 3-inch which was 100 yards long.

As in other years, the catch from each mesh was kept separate and fish were weighed individually. The sex was determined from an examination of the gonads. Various commercial species were dressed and the loss in weight incurred in the process was noted. Values were calculated from these data for use in the commercial fishery studies as conversion factors, and have been reported elsewhere.

A grand total of 529 pounds of fish were caught in the 17 lifts, and more than eight species were represented. In order of magnitude in the catch they appeared as follows: Cisco 30 per

cent, sauger 23 per cent, perch 17 per cent, drum 14 per cent, walleye 7 per cent, white sucker 6 per cent, burbot 1 per cent, and others 2 per cent.

The sex and maturity of five species taken in various meshes are shown in the lower part of Table V. For sauger, males and females appeared in approximately equal numbers. The sample numbered 238 fish and 55 per cent were mature. Of 114 perch examined 21 were mature males and 61 were mature females; the remainder were immature. Only 27 walleye were taken, 21 of which were immature. Most of the drum (82 per cent of 40 specimens) were mature and the sex ratio was 24 males to 13 females. The burbot sample numbered only four fish, two mature males, one immature male and one mature female.

The average size of seven species taken in six mesh sizes is shown in Table VI. The averages for each species are comparable with similar values for the two other years. The special efforts to capture cisco during 1951 resulted in a good number in the sample which totalled 636 fish. The small average size of these fish is evident from the fact that the 3-inch mesh nets took about two-thirds of the sample which averaged only 0.31 pounds. The extremes were 0.19 pounds in the 1½-inch mesh and 0.35 in the 5-inch mesh.

In addition to those species just mentioned, four other species were taken. These include 4 pike averaging 3.1 pounds, 2 bullhead averaging 0.5 pounds, 3 trout perch about

Table VI. Average size of members of fish captured in various meshes during August, 1951.

| | 1½" | | 2" | | 3" | | 4" | | 5" | | 5½" | |
|--------------------|------|-----|------|-----|------|-----|------|-----|------|-----|------|-----|
| | lbs. | no. |
| Sauger | 0.52 | 48 | 0.47 | 104 | 0.58 | 68 | 0.74 | 11 | 0.33 | 6 | 0.60 | 1 |
| Walleye | 0.37 | 7 | 0.60 | 17 | 0.96 | 14 | 2.80 | 1 | ... | ... | 2.0 | 1 |
| Freshwater Drum | 0.20 | 2 | 0.30 | 10 | 0.52 | 17 | 1.89 | 14 | 1.97 | 13 | 1.94 | 5 |
| White sucker | ... | ... | 0.40 | 2 | 0.76 | 14 | 1.65 | 10 | 4.40 | 1 | ... | ... |
| Percb | 0.20 | 117 | 0.24 | 185 | 0.30 | 59 | 0.40 | 1 | ... | ... | ... | ... |
| Cisco | 0.19 | 143 | 0.25 | 409 | 0.31 | 75 | 0.26 | 5 | 0.35 | 2 | 0.25 | 4 |
| Burbot | ... | ... | ... | ... | 1.40 | 3 | ... | ... | 3.3 | 1 | ... | ... |

six inches long and 1 whitefish weighing 2.9 pounds.

Table VII has been prepared to show the expected size range for each of 7 species when fishing gangs of gill nets of graded mesh size. Data from 1948, 1950 and 1951 were pooled to make the table as complete as possible.

Table VII The range in weight of 7 species of fish captured in gangs of gill nets of graded mesh size during 3 summers.

| | 1½" pounds | 2" pounds | 3" pounds | 4" pounds | 5" pounds | 5½" pounds |
|-----------------|---------------|--------------|--------------|--------------|--------------|---------------|
| Sauger | 0.2-1.0 | 0.3-0.7 | 0.3-1.8 | 0.3-0.7 | 0.1-0.9 | 0.3-1.0 |
| Walleye | 0.1-0.4 | 0.4-1.3 | 0.4-2.0 | 0.4-2.8 | 0.3-1.1 | 0.4-1.1 |
| Perch | 0.1-0.4 | 0.1-0.4 | 0.1-0.5 | — | — | — |
| Drum | 0.1-0.3 | — | 0.3-0.7 | 0.5-3.8 | 1.5-3.6 | 0.4-3.0 |
| Cisco | 0.1-0.4 | 0.1-0.7 | 0.2-0.5 | 0.1-0.5 | — | 0.1-0.3 |
| White sucker | — | — | 0.6-0.9 | 0.8-2.0 | 3.4-4.4 | 2.0-4.2 |
| Burbot | 0.8-1.6 | — | 0.8-1.5 | 1.4-2.7 | 3.3-5.9 | 1.0-4.0 |

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