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# Experimental Gill-Net Fishing at Lobstick and Sandgirt Lakes, Smallwood Reservoir, Western Labrador, 1974

by                    W.J. Bruce

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DEPARTMENT OF THE ENVIRONMENT  
FISHERIES AND MARINE SERVICE  
NEWFOUNDLAND REGION

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Environment Canada, Ottawa.

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## INTRODUCTION

In 1973, Fisheries and Marine Service, initiated a long term program designed to inventory the fish resources of the natural lakes and the Smallwood Reservoir in western Labrador. An investigation of Jacopie Lake, Smallwood Reservoir, (Bruce, 1974) indicated there might be a potential for a commercial fishery on this 2,500 square mile reservoir. Lake whitefish, Coregonus clupeaformis, was the most abundant species present and a further study was planned for 1974 to investigate the biological feasibility of a commercial fishery, primarily for lake whitefish. One other species which occurs frequently and has commercial value is the lake trout, Salvelinus namaycush.

Before any commercial fishery is initiated, information on the existing fish stocks, their age and growth structure, and productivity is prerequisite. Experimental gillnet settings were used to gather this information and also provide data on catch per unit of effort. This combined information will help us establish a quota and other regulations which will be required if and when a fishery develops. Should such a commercial fishery be established, yearly monitoring of the harvest must be recorded and the quota might have to be adjusted thereafter.

The Native Peoples' Association of Newfoundland and Labrador, under the joint sponsorship of L.E.A.P. (Local Employment Assistance Program), Federal Department of Manpower and Immigration, and Labrador Services, Newfoundland Provincial Government, plan to conduct a six month development study to test the biological and economic

feasibility of a commercial whitefish fishery on the Smallwood Reservoir during the summers of 1975 and 1976. This will initially involve a six man crew and if catches and market prove successful after this first phase, the program will be greatly enlarged with additional funding from both the Provincial and Federal Governments.

MATERIALS AND METHODS

In the summer of 1974, fish species were sampled in Lobstick and Sandgirt Lakes, Smallwood Reservoir. Five stations were randomly selected in the two lakes and these stations were fished for two nights each, using bottom and surface gillnet sets (Fig. 1). Each multifilament nylon gillnet consisted of 45.5 meter lengths of 3.8, 5.0, 7.6, 10.2, and 12.7 centimeter stretched mesh. At station 5 inclement weather prevented the nets from being hauled and the nets had one extra night fishing in this case.

Upon hauling the nets, fish were separated according to mesh size. All fish were scale sampled for ageing and stomach samples were removed from fifty of each species, whenever there were sufficient numbers. All fish were measured and weighed in the field. Sexual condition of individual fish was recorded when macroscopically visible.

Plankton samples were collected at the five fish sampling stations using a standard plankton tow net of number 20 bolting silk. These samples were immediately preserved in 4% formalin and later identified in the laboratory.

Water samples were also collected at each station and water analysis was later carried out by the Laboratory Services Unit of Recreational Fisheries and Habitat Management Group, Resource Development, St. John's, Newfoundland. Temperature and oxygen readings were made at the surface and bottom of each sampling station.

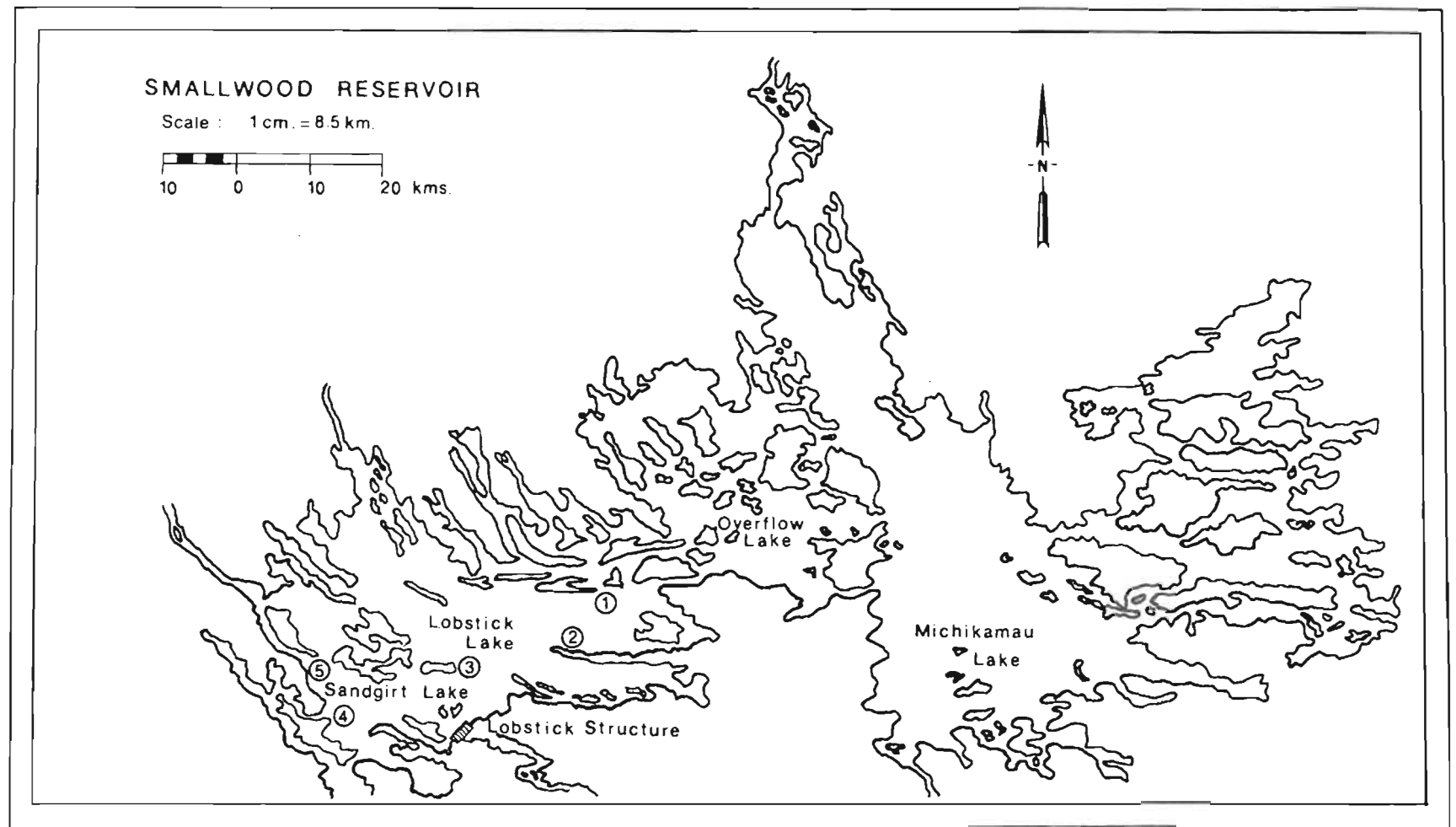


Fig. 1. Map of Smallwood Reservoir showing fish sampling station (5) in Lobstick and Sandgirt Lakes.

RESULTS

Water Chemistry

Analysis of water samples collected at each sampling station is presented in Table 1. There was very little difference between any of the sampling stations for the parameters measured. The water temperature was nearly constant for all sampling stations and the dissolved oxygen concentration was near the saturation point.

Table 1. Water quality analysis of samples collected at the five sampling stations in Lobstick and Sandgirt Lakes, (samples collected August 8 and 9, 1974).

| Station No. | pH  | Total Hardness (ppm.) | Sp. Cond. 25 C ( omhs) | Total Alkalinity (ppm.) | Turbidity (J.T.U.) | Ca <sup>+</sup> (ppm.) | Cl <sup>-</sup> (ppm.) |
|-------------|-----|-----------------------|------------------------|-------------------------|--------------------|------------------------|------------------------|
| 1           | 6.4 | 11.5                  | 20.5                   | 8.5                     | 2.1                | 2.1                    | 0.8                    |
| 2           | 6.4 | 10.5                  | 20.5                   | 8.0                     | 0.6                | 2.1                    | 0.8                    |
| 3           | 6.5 | 10.5                  | 21.0                   | 8.5                     | 1.3                | 2.0                    | 0.8                    |
| 4           | 6.4 | 10.0                  | 20.5                   | 7.5                     | 0.9                | 2.0                    | 0.8                    |
| 5           | 6.6 | 10.5                  | 21.0                   | 9.0                     | 1.1                | 2.2                    | 0.7                    |

Plankton

A check list of the plankton species present in both lakes is given in Table 2.

Table 2. List of zooplankton and common phytoplankton species<sup>1</sup> identified in Lobstick and Sandgirt Lakes, 1974.

| Species                         | St. 1 | St. 2 | St. 3 | St. 4 | St. 5 |
|---------------------------------|-------|-------|-------|-------|-------|
| Protozoa                        |       |       |       |       |       |
| <u>Epistylis rotans</u>         | r     | r     | c     | +     | +     |
| <u>Vorticella sp.</u>           | +     | +     | -     | -     | -     |
| Rotifera                        |       |       |       |       |       |
| <u>Asplanchna sp.</u>           | r     | c     | +     | +     | -     |
| <u>Conochiloides sp.</u>        | -     | +     | -     | -     | -     |
| <u>Conochilus unicornis</u>     | a     | c     | a     | -     | c     |
| <u>Kellicottia longispina</u>   | a     | a     | a     | s     | c     |
| <u>Keratella cochlearis</u>     | r     | +     | +     | +     | +     |
| <u>Polyarthra sp.</u>           | +     | -     | -     | -     | -     |
| <u>Trichocera sp.</u>           | +     | -     | -     | -     | -     |
| Hydracarina                     |       |       |       |       |       |
| Hydrachnid                      | +     | +     | -     | -     | -     |
| Cladocera                       |       |       |       |       |       |
| <u>Bosmina coregoni</u>         | c     | +     | +     | +     | -     |
| <u>Ceriodaphnia reticulata</u>  | -     | -     | +     | -     | -     |
| <u>Chydorus sphaericus</u>      | -     | +     | -     | -     | +     |
| <u>Daphnia galeata mendotae</u> | r     | +     | +     | c     | c     |
| <u>Daphnia longiremis</u>       | a     | c     | c     | c     | c     |
| <u>Daphnia pulex</u>            | c     | +     | +     | +     | r     |

Table 2 (cont'd.)

| Species                      | St. 1 | St. 2 | St. 3 | St. 4 | St. 5 |
|------------------------------|-------|-------|-------|-------|-------|
| <u>Daphnia rosea</u>         | -     | +     | -     | -     | -     |
| <u>Holopedium gibberum</u>   | a     | c     | c     | a     | c     |
| <u>Leptodora kindtii</u>     | -     | -     | +     | +     | -     |
| <u>Polyphemus pediculus</u>  | r     | r     | c     | +     | -     |
| <u>Sida crystallina</u>      | -     | -     | -     | +     | +     |
| Copepoda Calonoida           |       |       |       |       |       |
| <u>Epischura lacustris</u>   | r     | r     | +     | +     | -     |
| <u>Diaptomus nauplii</u>     | +     | +     | +     | +     | +     |
| <u>Diaptomus (juveniles)</u> | c     | c     | c     | a     | c     |
| <u>Diaptomus minutus</u>     | c     | r     | c     | c     | r     |
| <u>Diaptomus sanguineus</u>  | c     | c     | r     | c     | r     |
| Cyclopoida                   |       |       |       |       |       |
| <u>Cyclops scutifer</u>      | +     | +     | r     | r     | r     |
| <u>Mesocyclops edax</u>      | r     | +     | +     | -     | -     |
| <u>Cyclopoid nauplius</u>    | a     | c     | c     | a     | c     |
| juvenile cyclopoid           | -     | -     | -     | +     | -     |
| Common Phytoplankton         |       |       |       |       |       |
| <u>Tabellaria fenestrata</u> | d     | d     | d     | d     | d     |
| <u>Asterionella formosa</u>  | a     | +     | d     | a     | +     |
| <u>Dinobryon divergens</u>   | a     | a     | a     | +     | a     |

<sup>1</sup> Plankton species identified by Dr. C.C. Davis, Biology Department, Memorial University of Newfoundland, St. John's, Newfoundland.

+ - present; r - regular, not very common; c - common; a - very common; d - dominant.

Test Netting

Location of Sets: Five sampling stations were randomly selected within the two lakes (Fig. 1). Three stations were selected in Lobstick Lake, and two in Sandgirt Lake. These stations ranged in depth from 9.2 m to 12.8 m.

Composition of the Catch: The total catch for 22 bottom and surface sets was 1,114 fish weighing 746.6 kg (Table 3). The average catch per set was 50.6 fish and 33.9 kg. Lake whitefish was by far the most abundant species, dominating the catch both in terms of numbers (57.6%) and weight (50.6%). Longnose suckers were the second most abundant species constituting 20.0% of the total number but made up only 4.5% of the total catch by weight because of their small size. Lake trout made up 10.9% of the total catch by number, but constituted 35.2% of the total catch by weight. Round whitefish, northern pike, burbot, brook trout, common sucker, and ouananiche were taken in small numbers and together they made up 9.4% of the total catch by weight. Figure 2 clearly illustrates the dominance of the lake whitefish.

Table 3. Percent number and weight of each species taken from Lobstick and Sandgirt Lakes, 1974.

| Species         | Number | Percent | Weight (kg) | Percent |
|-----------------|--------|---------|-------------|---------|
| Lake whitefish  | 642    | 57.6    | 377.5       | 50.6    |
| Longnose sucker | 223    | 20.0    | 33.5        | 4.5     |
| Lake trout      | 121    | 10.9    | 262.6       | 35.2    |
| Round whitefish | 58     | 5.2     | 6.2         | 0.8     |

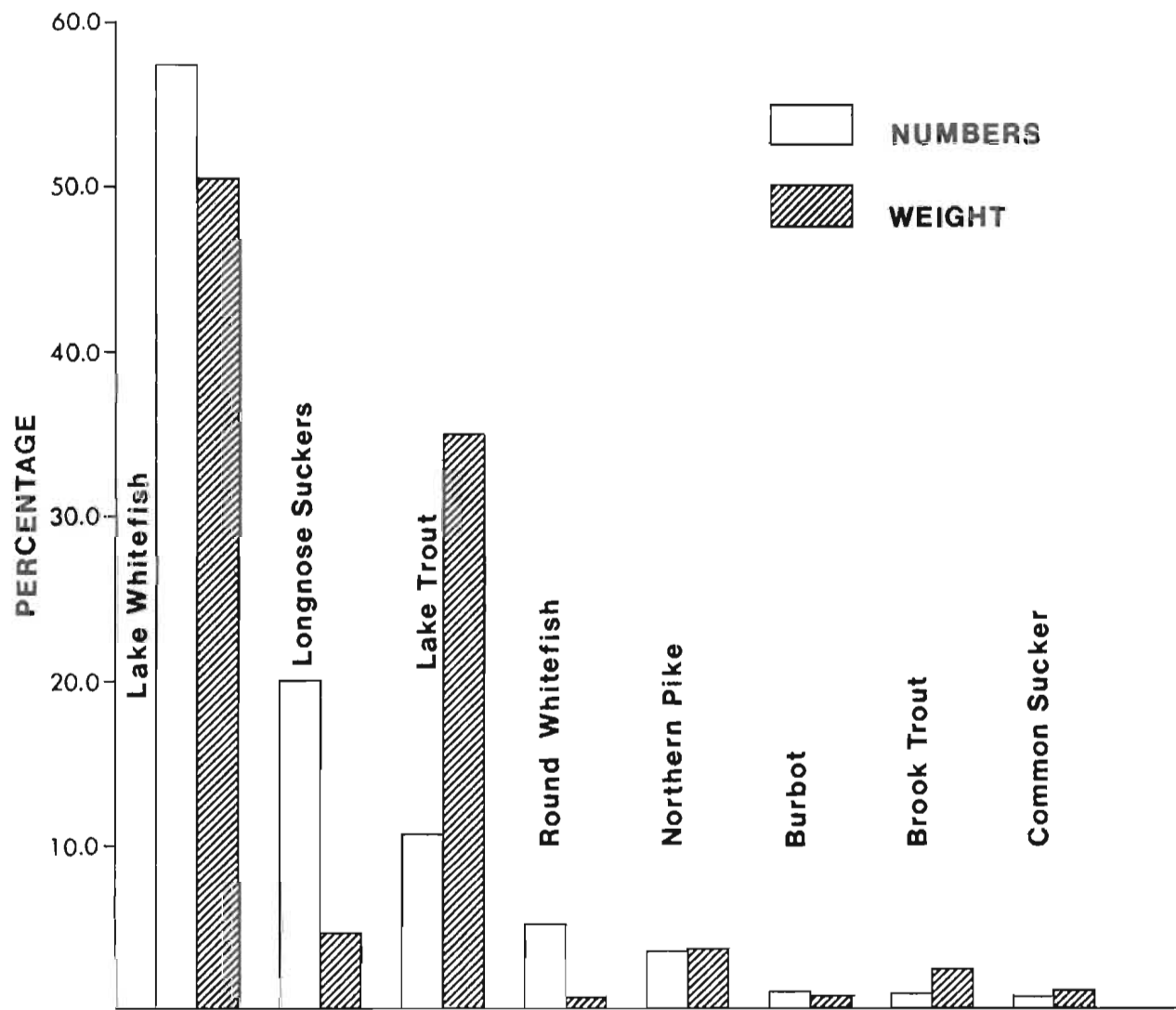


Fig. 2. Percentage composition of gillnet catch expressed numerically and in terms of weight.

Table 3 (cont'd.)

| Species       | Number | Percent | Weight (kg) | Percent |
|---------------|--------|---------|-------------|---------|
| Northern pike | 38     | 3.4     | 28.6        | 3.8     |
| Burbot        | 12     | 1.1     | 6.6         | 0.9     |
| Brook trout   | 11     | 1.0     | 18.3        | 2.5     |
| Common sucker | 8      | 0.7     | 8.4         | 1.1     |
| Ouananiche    | 1      | 0.1     | 2.0         | 0.3     |
| Totals        | 1,114  |         | 746.6       |         |

Distribution by Area: Table 4 shows the numbers and percentages of each species caught in test nets at each of the 5 sampling stations. Lake whitefish dominated catches at all stations, except at Station 4, where they, together with longnose suckers, made up 39.0% of the catch each. Longnose suckers, lake trout, round whitefish, and burbot were also taken at each station but in lesser numbers. Northern pike were taken at all stations except Number 4.

Table 4. Test net results for each sampling station, 1974.

| Species         | Station 1 |      | Station 2 |      | Station 3 |      | Station 4 |      | Station 5 |       |
|-----------------|-----------|------|-----------|------|-----------|------|-----------|------|-----------|-------|
|                 | No.       | %    | No.       | %    | No.       | %    | No.       | %    | No.       | %     |
| Lake whitefish  | 105       | 16.4 | 85        | 13.2 | 113       | 17.6 | 80        | 12.5 | 259       | 40.3  |
| Longnose sucker | 24        | 10.8 | 26        | 11.7 | 36        | 16.1 | 80        | 35.9 | 57        | 25.6  |
| Lake trout      | 16        | 13.2 | 13        | 10.7 | 16        | 13.2 | 25        | 20.7 | 51        | 42.2  |
| Round whitefish | 8         | 13.8 | 3         | 5.2  | 16        | 27.6 | 15        | 25.9 | 16        | 27.6  |
| Northern pike   | 7         | 18.4 | 19        | 50.0 | 8         | 21.1 | -         | -    | 4         | 10.5  |
| Burbot          | 1         | 8.3  | 1         | 8.3  | 6         | 50.0 | 2         | 16.7 | 2         | 16.7  |
| Brook trout     | 2         | 18.2 | -         | -    | 4         | 36.4 | 2         | 18.2 | 3         | 27.3  |
| Common sucker   | 4         | 50.0 | 3         | 37.5 | 1         | 12.5 | 1         | 12.5 | -         | -     |
| Ouananiche      | -         | -    | -         | -    | -         | -    | -         | -    | 1         | 100.0 |

Catch by mesh sizes: Table 5 and Figure 3 show the percentage of the total catch taken by each mesh size for all species and all areas combined. The greatest number of fish were captured in the 5.0 cm mesh (37.9%) while the largest catch in terms of weight was made in the 7.6 cm mesh (28.8%). The 3.8 cm mesh caught 25.5% of the total number while 17.4% were caught in the 7.6 cm mesh. The remaining fish (19.2% in terms of numbers) were taken in the 10.2 and 12.7 cm meshes. The three largest mesh sizes (7.6 cm, 10.2 cm, 12.7 cm) accounted for 75.4% of the total catch in terms of weight. Even though the 3.8 cm mesh accounted for 25.5% of the total catch by numbers, it caught only 8% of the total catch by weight.

Table 5. Number of fish caught in different mesh sizes at Lobstick and Sandgirt Lakes, 1974.

| Species            | Stretched Mesh Size (cm) |       |       |       |       | Total |
|--------------------|--------------------------|-------|-------|-------|-------|-------|
|                    | 3.8                      | 5.0   | 7.6   | 10.2  | 12.7  |       |
| Lake whitefish     | 174                      | 181   | 130   | 94    | 63    | 642   |
| Longnose sucker    | 46                       | 169   | 8     | -     | -     | 223   |
| Lake trout         | 18                       | 31    | 33    | 23    | 16    | 121   |
| Round whitefish    | 39                       | 17    | 2     | -     | -     | 58    |
| Northern pike      | 7                        | 14    | 14    | 3     | -     | 38    |
| Burbot             | -                        | 8     | 2     | 1     | 1     | 12    |
| Brook trout        | -                        | 1     | 2     | 3     | 5     | 11    |
| Common sucker      | -                        | 1     | 3     | 2     | 2     | 8     |
| Ouananiche         | -                        | -     | -     | -     | 1     | 1     |
| Total No.          | 284                      | 422   | 194   | 126   | 88    | 1,114 |
| Percent            | 25.5                     | 37.9  | 17.4  | 11.3  | 7.9   |       |
| Total weight (kg.) | 59.8                     | 123.9 | 214.7 | 180.1 | 168.0 | 746.6 |
| Percent            | 8.0                      | 16.6  | 28.8  | 24.1  | 22.5  |       |

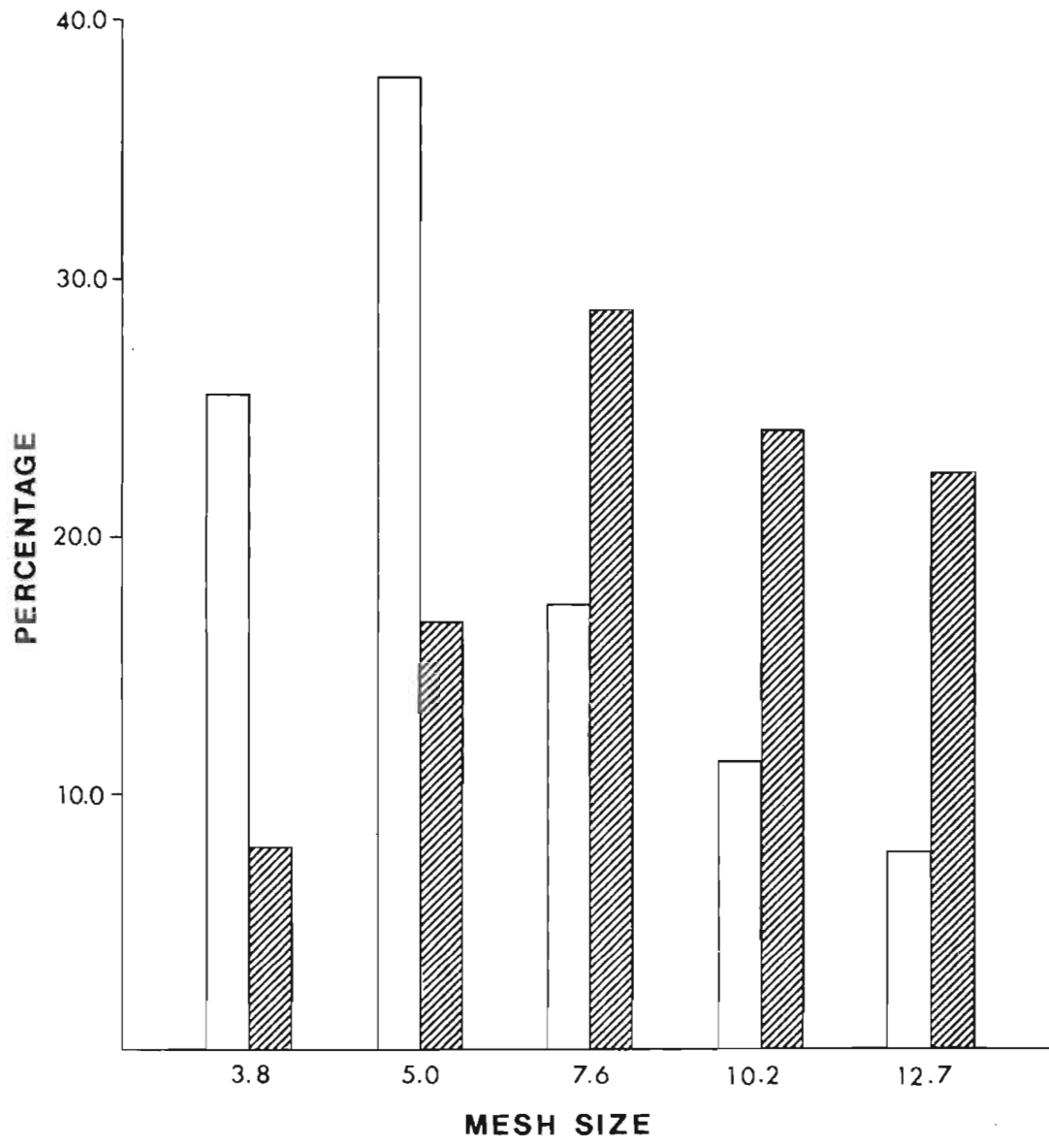


Fig. 3. Percentage of total net catch by mesh size expressed numerically and by weight.

Size Distribution of Fish by Mesh Size: The mean fork lengths and mean weights for each species of fish taken by the various mesh sizes are given in Table 6. There is an increase in mean lake whitefish length and weight with increasing mesh size (Fig. 4). The difference between the mean length in the 3.8 cm mesh and the 12.7 cm mesh for lake whitefish was approximately 25 cm. More than half (55.6%) of the whitefish sampled were less than 300 mm and nearly all of the larger fish were taken in the three largest mesh sizes (7.6 cm, 10.2 cm, 12.7 cm).

There would not appear to be any relationship between mean lake trout size and mesh size (Table 6 and Figure 5). There was very little difference between mean lengths for trout taken in the 3.8 cm and 5.0 cm or the 7.6 cm and the 10.2 cm meshes.

Table 6. Mean fork lengths and mean whole weights for fish captured in different mesh sizes at Lobstick and Sandgirt Lakes, 1974.

|                 | 3.8 cm mesh |                       |                  | 5.0 cm mesh |                       |                  | 7.6 cm mesh |                       |                  | 10.2 cm mesh |                       |                  | 12.7 cm mesh |                       |                  |
|-----------------|-------------|-----------------------|------------------|-------------|-----------------------|------------------|-------------|-----------------------|------------------|--------------|-----------------------|------------------|--------------|-----------------------|------------------|
|                 | No.         | Mean Fork length (cm) | Mean weight (kg) | No.         | Mean Fork length (cm) | Mean weight (kg) | No.         | Mean Fork length (cm) | Mean weight (kg) | No.          | Mean Fork length (cm) | Mean weight (kg) | No.          | Mean Fork length (cm) | Mean weight (kg) |
| Lake whitefish  | 174         | 18.66                 | .09              | 181         | 22.85                 | 0.18             | 130         | 35.73                 | 0.86             | 94           | 41.64                 | 1.30             | 63           | 43.64                 | 1.57             |
| Longnose sucker | 46          | 18.47                 | .08              | 169         | 22.81                 | 0.16             | 8           | 30.35                 | 0.43             | -            | -                     | -                | -            | -                     | -                |
| Lake trout      | 18          | 49.90                 | 1.91             | 31          | 37.50                 | 1.73             | 33          | 54.78                 | 2.36             | 23           | 53.58                 | 1.92             | 16           | 61.51                 | 3.29             |
| Round whitefish | 39          | 19.51                 | 0.08             | 17          | 24.06                 | 0.13             | 2           | 33.20                 | 0.40             | -            | -                     | -                | -            | -                     | -                |
| Northern pike   | 7           | 36.30                 | 0.53             | 14          | 35.10                 | 0.33             | 14          | 51.83                 | 1.06             | 3            | 61.37                 | 1.77             | -            | -                     | -                |
| Burbot          | -           | -                     | -                | 8           | 29.74                 | 0.19             | 2           | 50.50                 | 1.02             | 1            | 58.60                 | 1.32             | 1            | 57.80                 | 1.69             |
| Brook trout     | -           | -                     | -                | 1           | 50.70                 | 1.95             | 2           | 48.15                 | 1.62             | 3            | 47.37                 | 1.49             | 5            | 48.28                 | 1.73             |
| Common sucker   | -           | -                     | -                | 1           | 39.90                 | 0.10             | 3           | 32.87                 | 0.46             | 2            | 45.50                 | 1.36             | 2            | 51.45                 | 2.09             |
| Ouananiche      | -           | -                     | -                | -           | -                     | -                | -           | -                     | -                | -            | -                     | -                | 1            | 57.0                  | 2.02             |

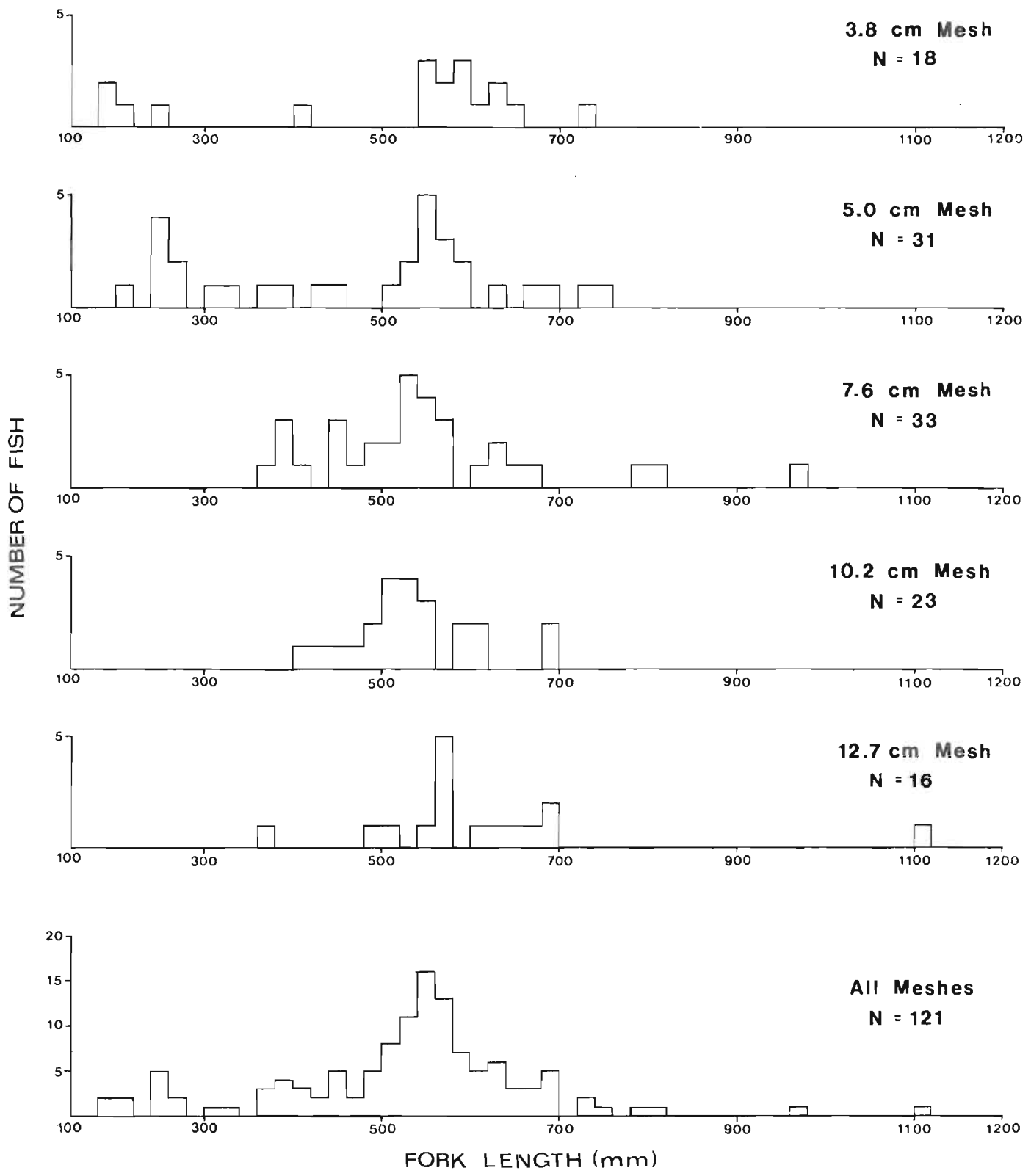


Fig. 4. Length frequency distribution of lake whitefish in different mesh sizes.

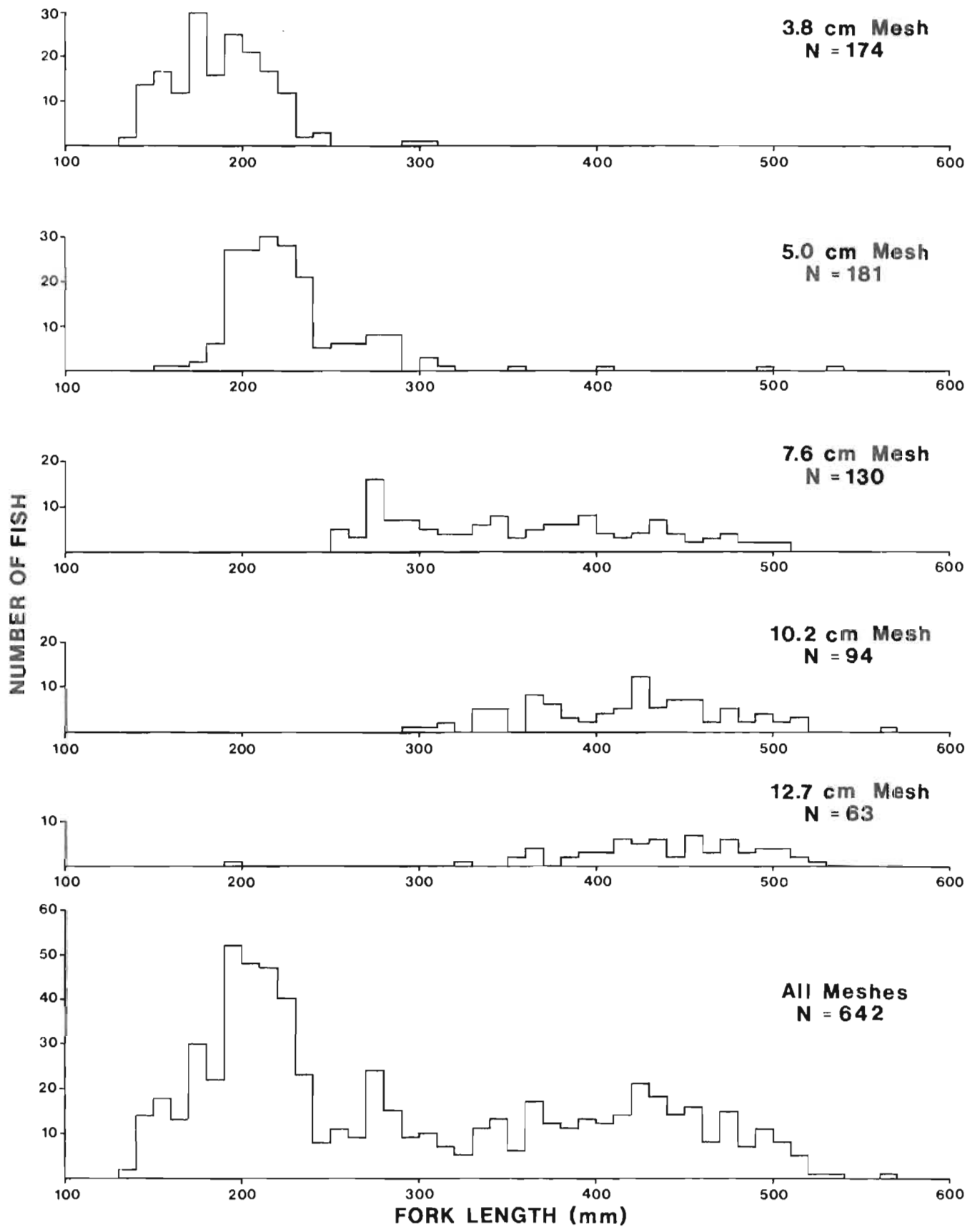


Fig. 5. Length frequency distribution of lake trout in different mesh sizes.

Age Composition of Lake Whitefish and Lake Trout by Mesh Size: Age frequency distributions for lake whitefish and lake trout by mesh size are given in Tables 7 and 8. It is clear from these tables that the oldest fish are being captured in the larger mesh sizes and for the greater part the two smallest meshes are only taking the young and immature fish of both species. Age I-III years of lake whitefish constituted 54.1 percent of the total catch while 17.6 percent of the catch were older than X years. No lake trout younger than III were taken in the catch and 87.3 percent of the catch were between the V-XII year age-groups.

Sex Ratios: Sex ratios (male:female) for each species are given in Table 9. There were over twice as many males than females in the lake whitefish sample and the males also outnumbered the females in the lake trout and northern pike samples.

Table 7 . Age frequency (percent) distribution of lake whitefish by mesh size from test netting.

| Age<br>(Years) | Mesh size (cm) |      |      |      |      | Total |
|----------------|----------------|------|------|------|------|-------|
|                | 3.8            | 5.0  | 7.6  | 10.2 | 12.7 |       |
| I              | 100.0          | -    | -    | -    | -    | 32    |
| II             | 60.9           | 38.4 | -    | -    | 0.7  | 133   |
| III            | 29.8           | 56.4 | 12.2 | 1.7  | -    | 181   |
| IV             | 12.2           | 31.7 | 41.5 | 14.6 | -    | 41    |
| V              | -              | 6.7  | 53.3 | 26.7 | 13.3 | 45    |
| VI             | -              | 7.1  | 71.4 | 14.4 | 7.1  | 28    |
| VII            | -              | 18.0 | 33.3 | 20.5 | 28.2 | 39    |
| VIII           | -              | -    | 32.1 | 39.3 | 28.6 | 28    |
| IX             | -              | 2.6  | 23.1 | 41.0 | 33.3 | 39    |
| X              | -              | -    | 25.8 | 54.8 | 19.5 | 31    |
| XI             | -              | -    | 27.8 | 33.3 | 38.9 | 18    |
| XII            | -              | -    | 25.0 | 41.7 | 33.3 | 12    |
| XIII           | -              | 10.0 | 10.0 | 40.0 | 40.0 | 10    |
| XIV            | -              | -    | -    | -    | -    | -     |
| XV             | -              | 50.0 | -    | -    | 50.0 | 2     |

Table 8. Age frequency (percent) distribution of lake trout by mesh size from test netting.

| Age<br>(Years) | Mesh size (cm) |       |       |      |      | Total |
|----------------|----------------|-------|-------|------|------|-------|
|                | 3.8            | 5.0   | 7.6   | 10.2 | 12.7 |       |
| III            | 100.0          | -     | -     | -    | -    | 1     |
| IV             | 66.7           | 33.3  | -     | -    | -    | 3     |
| V              | 33.3           | 66.7  | -     | -    | -    | 3     |
| VI             | -              | 83.3  | 16.7  | -    | -    | 6     |
| VII            | 7.1            | 14.4  | 50.0  | 21.4 | 7.1  | 14    |
| VIII           | 4.8            | 19.0  | 28.6  | 38.1 | 9.5  | 21    |
| IX             | 25.9           | 29.6  | 22.3  | 11.1 | 11.1 | 27    |
| X              | 5.9            | 29.4  | 23.5  | 17.7 | 23.5 | 17    |
| XI             | 7.7            | 7.7   | 23.1  | 38.5 | 23.1 | 13    |
| XII            | 33.3           | -     | 33.3  | 16.6 | 16.6 | 6     |
| XIII           | 25.0           | 50.0  | 25.0  | -    | -    | 4     |
| XIV            | -              | -     | 100.0 | -    | -    | 2     |
| XV             | -              | 100.0 | -     | -    | -    | 1     |
| XVI            | -              | -     | 100.0 | -    | -    | 1     |

Table 9. Sex ratios (male:female) for fish in net catches at each salmping station.

| Species         | St. 1 | St. 2 | St. 3 | St. 4 | St. 5 | Total |
|-----------------|-------|-------|-------|-------|-------|-------|
| Lake whitefish  | 1.476 | 2.375 | 4.579 | 5.667 | 1.871 | 2.38  |
| Lake trout      | 1.00  | 1.60  | 0.333 | 1.778 | 2.000 | 1.37  |
| Round whitefish | 0.333 | 0.50  | 0.333 | 0.875 | 1.286 | 0.66  |
| Northern pike   | 5.00  | 18.0  | 7.0   | -     | 1.0   | 6.40  |
| Burbot          | -     | -     | 1.0   | 1.0   | 1.0   | 1.00  |
| Brook trout     | 1.0   | -     | 0.333 | 1.0   | 2.0   | 0.83  |
| Common sucker   | 0.333 | 2.0   | -     | -     | -     | 0.60  |

Catch Per Unit of Effort: The catch per unit of effort ranged from a low of 8.0 kg per 100 m of gillnet per 24 hours (Station 4) to a high of 17.6 kg per 100 m (Station 1) (Table 10). The mean catch per unit of effort for the five stations was 12.6 kg per 100 m of gillnet per 24 hours. A comparison was made of the catch per unit of effort values for bottom and surface sets for each species (Table 11). Bottom sets combined for all stations gave a catch per unit of effort of 14.1 kg per 100 m as compared to 10.8 per 100 m for all surface sets. Surface sets caught 66.0% of the lake whitefish while 86.8% of the lake trout were taken in bottom sets. The three largest mesh sizes (7.6 cm, 10.2 cm, 12.7 cm) yielded a catch per unit of effort value of 9.2 kg and 4.8 kg per 100 m of gillnet per 24 hours for lake whitefish and lake trout, respectively. Similar work in the Northwest Territories (Bond, 1973) gave values of 19.5 kg for lake whitefish and 3.6 for lake trout,

However, it is not possible to make direct comparisons between these figures since different mesh sizes were employed. In the Territories 14.0 and 15.9 cm mesh gillnets were used in the commercial fishery.

Table 10. Catch per unit of effort at each station in Lobstick and Sandgirt Lakes, 1974.

| Station | Amount of fish |       | Number of nets | Catch per unit of effort/100 m/24 hrs. |      |
|---------|----------------|-------|----------------|--|------|
|         | (lbs)          | (kg)  |                | (lbs)                                  | (kg) |
| 1       | 420.4          | 191.1 | 4              | 42.0                                   | 17.6 |
| 2       | 333.1          | 151.4 | 4              | 33.4                                   | 13.9 |
| 3       | 297.9          | 135.4 | 4              | 29.8                                   | 12.4 |
| 4       | 193.4          | 87.9  | 4              | 19.4                                   | 8.0  |
| 5*      | 398.6          | 181.2 | 6              | 26.6                                   | 11.0 |
|         | 1,643.4        | 747.0 | 22             | 29.8                                   | 12.6 |

\* Station 5 had three nights fishing due to stormy conditions.

Table 11. Comparison of catches (by weight in kg) for bottom and surface gillnets used in experimental sampling, 1974.

| Species         | Bottom | C.P.E. | Surface | C.P.E. | Total |
|-----------------|--------|--------|---------|--------|-------|
| Lake whitefish  | 129.1  | 4.3    | 251.2   | 8.3    | 380.3 |
| Longnose sucker | 33.5   | -      | -       | -      | 33.5  |
| Lake trout      | 228.1  | 7.6    | 34.7    | 1.2    | 262.8 |
| Round whitefish | 6.0    | -      | 0.1     | -      | 6.1   |
| Northern pike   | 13.3   | -      | 15.2    | -      | 28.5  |

Table 11 (cont'd.)

| Species       | Bottom | C.P.E. | Surface | C.P.E. | Total |
|---------------|--------|--------|---------|--------|-------|
| Burbot        | 6.6    | -      | -       | -      | 6.6   |
| Brook trout   | -      | -      | 18.3    | -      | 18.3  |
| Common sucker | 6.2    | -      | 2.2     | -      | 8.4   |
| Ouananiche    | -      | -      | 2.0     | -      | 2.0   |
| Total         | 422.9  | 14.1   | 323.7   | 10.8   | 746.6 |

Empirical Growth Rates: The empirical length and weight at time of capture for sexes combined are given in Tables 12 and 13 for lake whitefish and lake trout respectively (Figures 6 and 7).

Back-Calculation of Growth: Back-calculation of growth using scales was employed for the most abundant species (Table 14).

Table 12. Mean fork length and mean weight by age for lake whitefish caught in test nets in Lobstick and Sandgirt Lakes, 1974.

| No. of Annuli | No. of fish | Fork length (cm.) |           | Weight (kg.) |           |
|---------------|-------------|-------------------|-----------|--------------|-----------|
|               |             | Mean              | Range     | Mean         | Range     |
| I             | 32          | 15.0              | 13.6-16.3 | 0.039        | 0.02- .07 |
| II            | 136         | 18.5              | 14.9-23.5 | 0.093        | 0.02- .23 |
| III           | 179         | 22.9              | 14.5-31.2 | 0.171        | 0.02- .65 |
| IV            | 40          | 27.7              | 19.0-36.8 | 0.348        | 0.04- .80 |
| V             | 45          | 35.0              | 24.0-45.3 | 0.778        | 0.26-2.76 |
| VI            | 28          | 35.7              | 25.4-43.1 | 0.811        | 0.22-1.47 |

Table 12 (cont'd.)

| No. of Annuli | No. of fish | Fork length (cm.) |           | Weight (kg.) |           |
|---------------|-------------|-------------------|-----------|--------------|-----------|
|               |             | Mean              | Range     | Mean         | Range     |
| VII           | 39          | 37.2              | 26.3-48.4 | 0.917        | 0.22-1.91 |
| VIII          | 29          | 42.5              | 34.5-48.8 | 1.36         | 0.73-2.22 |
| IX            | 41          | 41.9              | 27.0-50.0 | 1.36         | 0.25-2.40 |
| X             | 33          | 45.5              | 29.0-49.8 | 1.67         | 0.27-2.30 |
| XI            | 18          | 47.6              | 42.5-56.9 | 1.78         | 1.00-2.32 |
| XII           | 12          | 47.8              | 43.7-51.8 | 1.91         | 1.45-2.50 |
| XIII          | 10          | 50.2              | 47.6-53.0 | 2.20         | 1.58-2.61 |
| XIV           | -           | -                 | -         | -            | -         |
| XV            | 2           | 49.7              | 49.3-50.1 | 2.12         | 1.87-2.36 |

Length-Weight Relationship: The equation,  $W = a L^b$ , where W = weight in grams, L = fork length in centimeters and a and b are constants was used to describe the length-weight relationship for each species. The total sample for each species was used in calculating the length-weight relationship (Table 15).

Table 13. Mean fork length and mean weight by age, for lake trout caught in test nets in Lobstick and Sandgirt Lakes, 1974.

| No. of Annuli | No. of fish | Fork length (cm.) |       | Weight (kg) |       |
|---------------|-------------|-------------------|-------|-------------|-------|
|               |             | Mean              | Range | Mean        | Range |
| I             | -           | -                 | -     | -           | -     |
| II            | -           | -                 | -     | -           | -     |
| III           | 1           | 18.5              | -     | 0.06        | -     |

Table 13 (cont'd.)

| No. of Annuli | No. of fish | Fork length (cm.) |           | Weight (kg.) |           |
|---------------|-------------|-------------------|-----------|--------------|-----------|
|               |             | Mean              | Range     | Mean         | Range     |
| IV            | 3           | 20.1              | 19.5-20.9 | 0.10         | 0.06-0.13 |
| V             | 3           | 24.5              | 24.1-25.0 | 0.15         | 0.13-0.16 |
| VI            | 6           | 30.3              | 24.1-39.0 | 0.33         | 0.13-0.58 |
| VII           | 14          | 42.1              | 25.1-48.8 | 0.99         | 0.17-1.82 |
| VIII          | 21          | 50.4              | 37.2-58.0 | 1.50         | 0.68-2.40 |
| IX            | 27          | 54.4              | 37.8-61.5 | 1.92         | 0.65-2.72 |
| X             | 16          | 57.1              | 51.4-69.0 | 2.31         | 1.50-4.13 |
| XI            | 14          | 61.4              | 51.6-69.8 | 2.97         | 1.75-4.24 |
| XII           | 6           | 62.8              | 57.8-68.7 | 3.07         | 2.57-3.77 |
| XIII          | 4           | 70.8              | 67.5-73.5 | 4.29         | 3.58-5.45 |
| XIV           | 2           | 79.5              | 79.1-80.0 | 6.90         | 6.10-7.70 |
| XV            | 1           | 75.6              | -         | 6.05         | -         |
| XVI           | 1           | 97.5              | -         | 11.67        | -         |

Table 14. Back-calculated growth rates (fork length in centimeters) of fish species taken by gillnets in Lobstick and Sandgirt Lakes (sample size in parentheses).

| Age (Years) | Lake trout (121) | Lake whitefish (150) | Longnose sucker (223) | Round whitefish (58) | Northern pike (38) |
|-------------|------------------|----------------------|-----------------------|----------------------|--------------------|
| I           | 5.9              | 11.6                 | 11.6                  | 13.2                 | 12.0               |
| II          | 10.6             | 15.4                 | 12.8                  | 15.4                 | 20.2               |
| III         | 16.1             | 19.3                 | 14.2                  | 17.4                 | 27.6               |
| IV          | 21.8             | 22.8                 | 15.7                  | 19.3                 | 33.9               |

Table 14 (cont'd.)

| Age (Years) | Lake trout (121) | Lake whitefish (150) | Longnose sucker (223) | Round whitefish (58) | Northern pike (38) |
|-------------|------------------|----------------------|-----------------------|----------------------|--------------------|
| V           | 28.1             | 26.9                 | 17.9                  | 21.0                 | 40.1               |
| VI          | 33.9             | 30.1                 | 18.8                  | 22.9                 | 46.0               |
| VII         | 39.7             | 33.1                 | 22.0                  | 25.3                 | 50.7               |
| VIII        | 45.1             | 36.3                 | 24.9                  | 30.1                 | 55.8               |
| IX          | 49.2             | 39.5                 | 26.4                  | 34.3                 | 62.6               |
| X           | 55.1             | 41.4                 | 28.2                  | -                    | 66.6               |
| XI          | 57.1             | 44.9                 | -                     | -                    | -                  |
| XII         | 61.0             | 46.4                 | -                     | -                    | -                  |
| XIII        | 68.5             | 49.8                 | -                     | -                    | -                  |
| XIV         | 75.3             | 51.5                 | -                     | -                    | -                  |
| XV          | 78.2             | 54.3                 | -                     | -                    | -                  |
| XVI         | 84.0             | -                    | -                     | -                    | -                  |

Table 15. Length-weight relationships for fish species from Lobstick and Sandgirt Lakes, 1974.

| Species         | N   | Mean length (cm) | Mean weight (kg) | a Y intercept | b Slope |
|-----------------|-----|------------------|------------------|---------------|---------|
| Lake whitefish  | 642 | 29.14            | 0.59             | -4.954.3      | 3.08    |
| Lake trout      | 121 | 52.85            | 2.17             | -4.8020       | 2.92    |
| Longnose sucker | 223 | 22.18            | 0.15             | -4.7520       | 2.84    |
| Round whitefish | 58  | 21.32            | 0.11             | -4.0405       | 2.26    |
| Northern pike   | 38  | 43.56            | 0.75             | -5.9190       | 3.90    |
| Burbot          | 12  | 37.94            | 0.55             | -             | -       |

Table 15 (con'd.)

| Species       | N  | Mean length<br>(cm) | Mean weight<br>(kg) | a<br>Y intercept | b<br>Slope |
|---------------|----|---------------------|---------------------|------------------|------------|
| Brook trout   | 11 | 48.23               | 1.67                | -                | -          |
| Common sucker | 8  | 41.30               | 1.05                | -                | -          |

Age at Maturity of Lake Whitefish and Lake Trout: Approximately 55% of the lake whitefish sampled were immature. These fish were caught in the smaller mesh sizes and were less than 5 years old and all fish older than this were ripening for the fall spawning season. Seventy percent of the lake trout less than 7 years old were immature and all fish were mature by age 10.

Stomach Contents: All fish species except lake trout and northern pike, which are mainly piscivorous, are predominantly benthic feeders (Table 16). Plankton is heavily utilized by young, immature lake whitefish. Diptera pupae was the most abundant food item and occurred in all species.

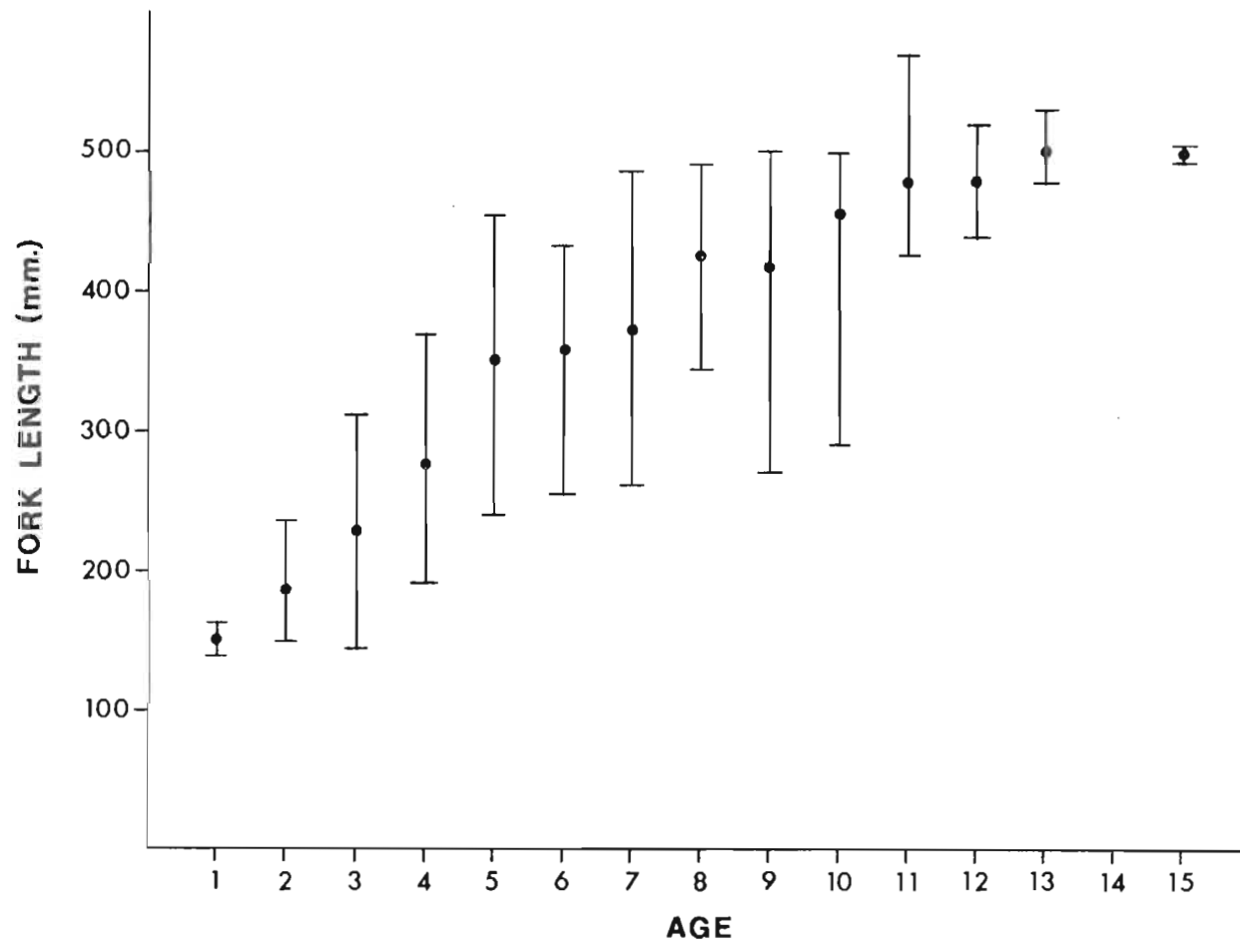


Fig. 6. Growth in length for lake whitefish

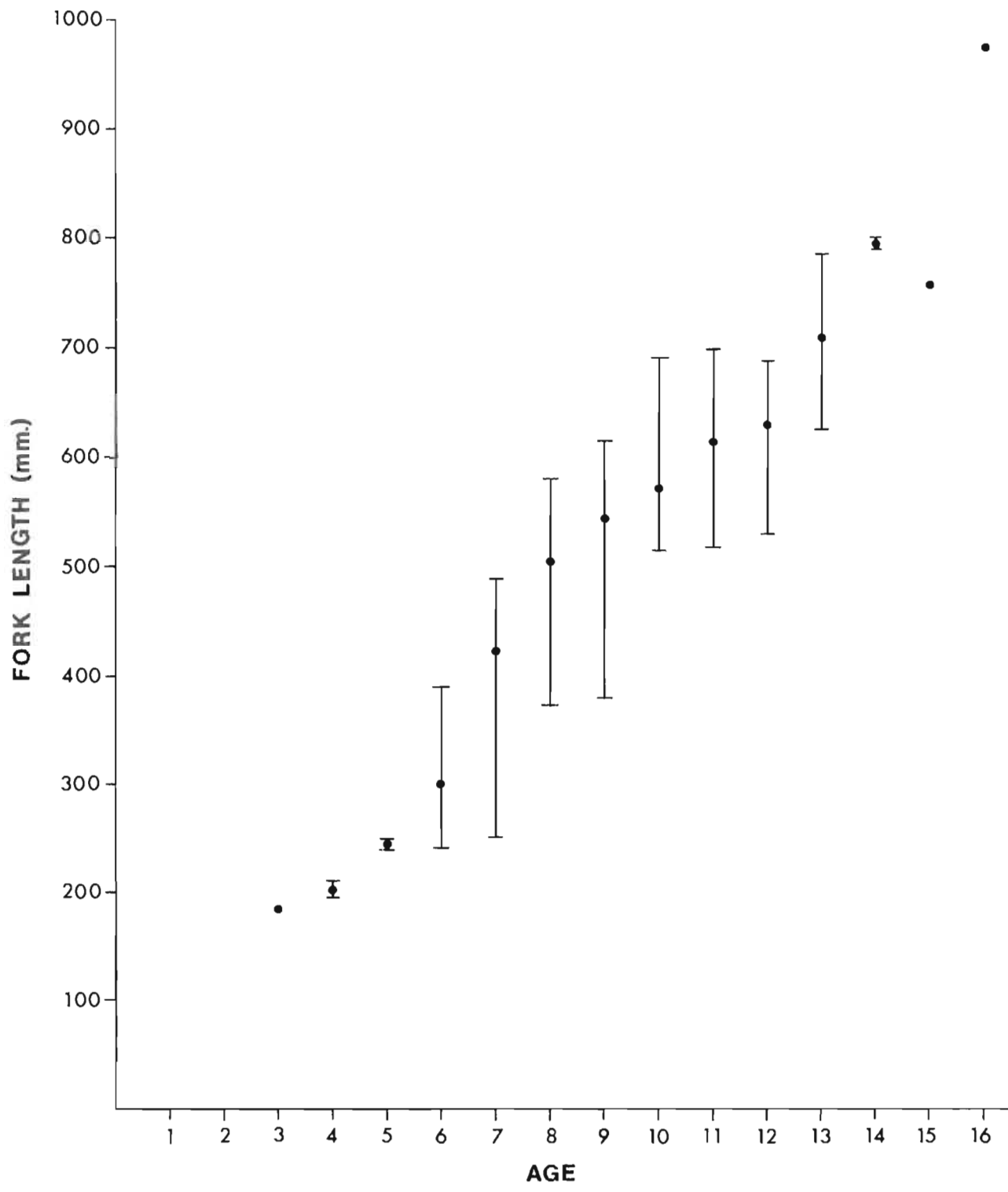


Fig. 7. Growth in length for lake trout.

Table 16 . Stomach contents (occurrence method) of fish species from Lobstick and Sandgirt Lakes, 1974 (sample size in parentheses).

| Food item                   | Species             |                 |                      |                      |                    |             |                  |                |
|-----------------------------|---------------------|-----------------|----------------------|----------------------|--------------------|-------------|------------------|----------------|
|                             | Lake Whitefish (75) | Lake trout (75) | Longnose sucker (75) | Round Whitefish (58) | Northern pike (38) | Burbot (12) | Brook trout (11) | Ouananiche (1) |
| Ephemeroptera (larvae)      | x                   | x               | x                    | x                    | x                  | x           | x                |                |
| Odonata (larvae)            | x                   | x               |                      |                      |                    |             | x                |                |
| Diptera (pupae)             | x                   | x               | x                    | x                    | x                  | x           | x                |                |
| Hemiptera                   | x                   | x               |                      |                      | x                  |             | x                |                |
| Coleoptera                  | x                   |                 |                      |                      |                    |             | x                |                |
| Hirudinea                   |                     |                 | x                    |                      | x                  | x           |                  |                |
| Hydracarina                 | x                   | x               |                      | x                    |                    |             |                  |                |
| Mollusca                    | x                   |                 | x                    | x                    |                    | x           |                  |                |
| Copepoda                    | x                   |                 | x                    |                      |                    |             |                  |                |
| Cladocera                   | x                   |                 | x                    |                      |                    | x           | x                |                |
| Suckers                     |                     | x               |                      |                      | x                  |             |                  |                |
| Whitefish                   |                     | x               |                      |                      |                    |             |                  |                |
| Burbot                      |                     | x               |                      |                      |                    |             |                  |                |
| Minnows                     |                     | x               |                      |                      | x                  |             |                  |                |
| Sticklebacks                |                     |                 |                      |                      |                    |             |                  | x              |
| Fish remains                |                     | x               |                      |                      | x                  | x           | x                |                |
| Shrews                      |                     |                 |                      |                      |                    |             | x                |                |
| Detritus                    | x                   | x               | x                    | x                    |                    | x           | x                |                |
| Unidentified insect remains | x                   |                 | x                    | x                    |                    |             | x                |                |

SUMMARY

1. In the summer of 1974, 22 gillnet sets resulted in the catch of 1,114 fish representing nine different species.
2. Lake whitefish made up 57.6% of the total number and 50.6% of the total weight. Lake trout constituted 10.9% of the total number and 35.2% of the total weight.
3. Catch distribution by mesh size showed the greatest number of fish were captured in the 5.0 cm mesh (37.9%) while the largest catch in terms of weight was made in the 7.6 cm mesh (28.8%).
4. Lake whitefish showed an increase in mean length with increasing mesh size but this same relationship didn't hold true for the lake trout.
5. Lake whitefish ranged in age from I year to XV years with 54.1% of the total catch between I-III years. The age-groups for lake trout ranged from III - XVI years with 87.3% of the catch between V-XII years.
6. The sex ratio (male:female) for lake whitefish was 2.38 and for lake trout 1.37.
7. The catch per unit effort for lake whitefish using the 7.6 cm, 10.2 cm, and 12.7 cm mesh sizes was 9.2 kg. per 100 m of gillnet per 24 hours. The same mesh sizes yielded a catch per unit of effort value of 4.8 kg for lake trout.
8. 66.0% of the total number of whitefish were taken in surface sets while 86.8% of the lake trout were taken in bottom sets.
9. The length-weight relationship for lake whitefish was:

$\log_e W = 4.9543 + 3.08 \log L$ . The length-weight relationship for lake trout was:  $\log_e W = 4.8020 + 2.92 \log_e L$ .

10. Approximately 55% of the sampled whitefish were immature. They reach sexual maturity between the ages of V - IX years. Seventy percent of the lake trout below 7 years were immature and all were mature by age 10.

RECOMMENDATIONS

Results of two years netting on the Smallwood Reservoir, western Labrador, indicates that a biological feasibility exists for a commercial fishery for lake whitefish in this area.

However, if a commercial fishery is to be started, proper management must be implemented from the initial stages.

Some factors to be remembered when considering a commercial fishery on the Smallwood Reservoir are:

- (1) A quota should be established initially and the catches monitored yearly and the quota be revised if necessary.
- (2) A market for the whitefish should be established before any fishing commences.
- (3) Cool storage facilities (of sufficient size) should be available to keep the fish before they are sent to market.
- (4) A supply of ice should be available during the summer months due to the delicate nature of whitefish flesh. The fish should be gutted and placed on ice immediately after being taken from the nets. All fish should then be re-examined when brought to shore and soft ones culled.
- (5) Transportation routes to the market, either by road, rail and/or air, should be worked out before the fishery starts.
- (6) Certain restrictions must be placed on fishing areas to avoid conflict with any recreational fishing in the area, e.g. no fishing in proximity to any streams or tributaries to the main reservoir or near any control structure.

- (7) No mesh size smaller than 8.9 cm be used as they would only catch young, immature fish. Suggested mesh sizes are 8.9 cm, 10.2 cm, and 12.7 cm.
- (8) Quality of fish must comply with Inspection Act before being sent to market. A careful examination should be made for any Trianaenophorus sp. cysts which are frequently found in whitefish musculature.
- (9) Surface sets should be used initially as they yielded the best whitefish catches during our preliminary study on the Smallwood Reservoir.
- (10) The fishing season should extend from January 1 to August 31.
- (11) Consideration might be given to marketing the fish through the Canadian Salt Fish Marketing Corporation. Under this scheme the Corporation would buy the fish from the fishermen and then ensure sale of the produce. Arctic char and Atlantic salmon from coastal Labrador are presently being marketed under this system.
- (12) At the present time it is recommended that any commercial fishery venture be limited to the residents of Labrador.

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