Creel Census and Biological Investigation, with Particular Reference to Lake Trout, *Salvelinus namaycush*, on Kasba Lake, Northwest Territories, 1979

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CREEL CENSUS AND BIOLOGICAL INVESTIGATION, WITH PARTICULAR REFERENCE TO LAKE TROUT, *Salvelinus namaycush*, ON KASBA LAKE, NORTHWEST TERRITORIES, 1979

by

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In 1979 a creel census, experimental netting and biological sampling program was carried out on Kasba Lake, Northwest Territories. The purpose of the study was to examine the biological status and harvest of the fish stocks with particular reference to the lake trout, *Salvelinus namaycush* (Walbaum), sport fishery, and to obtain information necessary to assess the potential for the lake trout stock to provide a high quality fishery. Lake trout in Kasba Lake comprised 38% of the gillnet catch. Other species caught included lake whitefish, longnose and white sucker, northern pike, cisco , round whitefish and lake chub. Catch per unit of effort (CPE) for lake trout was 14.0 fish per 100 m of gillnet per 24 h. Three species angled for at Kasba Lake were lake trout, Arctic grayling and northern pike.

The total angler harvest of lake trout for the 1979 fishing season was estimated to be 1846 fish (3692 kg). Catches were 7.8 fish per angler-day and 1.5 fish per angler-hour. The harvest of lake trout per angler was 6.6 fish (13.2 kg).

Angled lake trout from Kasba Lake had a mean length of 726 mm (range: 377-1035 mm), a mean weight of 5776 g (range: 550-12550 g) and a mean age of 18.5 yr (range: 11-30 yr). Lake trout caught by gillnet had a mean length of 518 mm (range: 172-855 mm), a mean weight of 1689 g (range: 50-7120 g), and a mean age of 16.2 yr (range: 4-53 yr). The total annual mortality rate was 0.15. Fecundity was 1153 ova/kg body weight (range: 689-14964 ova/kg body weight) and sex ratio was 1:1. First sexual maturity was reached at age 9 (400 mm) for both sexes, while complete sexual maturity was reached at ages 16 (525 mm) and 17 (557 mm) for males and females respectively.

Key words: angling, catch/effort; catch composition; experimental netting; life history; sport fishing statistics; tagging.

RESUME

Falk, M.R., L. Dahlke and M.M. Roberge. 1982. Creel census and biological investigation, with particular reference to lake trout, *Salvelinus namaycush*, on Kasba Lake, 1979. Can. MS Rep. Fish. Aquat. Sci. 1642: v + 45 p.

En 1979, nous avons procédé, au Kasba Lake (Territoires du Nord-Ouest), à un programme de recensement des prises, d'échantillonnage biologique et de prise au filet expérimentale. L'étude avait pour objet d'examiner l'état biologique et la récolte des stocks de poisson, plus particulièrement ceux du touladi, *Salvelinus namaycush* (Walbaum), la pêche sportive, ainsi que d'obtenir des reseignements qui nous permettent de dire si le lac a, ou n'a pas, un potentiel en touladi assez considérable pour y établir une pêcherie exploitable. Le touladi représente 38% des espèces capturées au filet maillant, dans le Kasba Lake. Les autres espèces sont le grand corégone, le meunier rouge, le meunier noir, le grand brochet, le ciscoe, le ménomini rond et le méné de lac. Dans le cas du touladi, la prise par unité d'effort (CPE) était 14 poissons par 100 m de filet maillant par 24 h. Il y a trois espèces qui font l'objet de la pêche sportive (à la ligne) dans le Kasba Lake: le touladi, l'ombre arctique et le grand brochet.

La récolte globale de touladis capturés durant la saison de pêche de 1979 se monte, à 1846 poissons (3692 kg). Les prises étaient de 7.8 poissons par jour de pêche et de 1.5 poisson par heure de pêche. La récolte de touladis par pêcheur (sportif) était de 6.6 poissons (13.2 kg).

Le touladi pêché à la ligne dans le Kasba Lake avait une longueur moyenne de 726 mm (fourchette de 377 à 1035 mm), un poids moyen de 5776 g (fourchette de 550 à 12,550 g), et un âge moyen de 18.5 ans (fourchette de 11 à 30 ans). Le touladi pris au filet maillant avait une longueur moyenne de 518 mm (fourchette de 172 à 855 mm), un poids moyen de 1689 g (fourchette de 50 à 7120 g), et un âge moyen de 16.2 ans (fourchette de 4 à 53 ans). Le coefficient de mortalité annuelle global était de 0.15, la fécondité était de 1153 oeufs/kg (fourchette de 689 à 1496 oeufs/kg), et la proportion des sexes était de 1:1. L'âge usuel à maturité sexuelle initiale est 9 ans (400 mm) pour les deux sexes, tandis que l'âge usuel à maturité sexuelle complète est 16 ans (525 mm) et 17 ans (557 mm) pour les mâles et les femelles respectivement.

Mots-clés: pêche à la ligne; prises/effort; composition des prises; prise au filet expérimentale; évolution biologique; statistiques sur la pêche sportive; étiquetage.

INTRODUCTION

In 1979, the Department of Fisheries and Oceans began a five-year investigation of sport fishing in major lakes in the District of Keewatin, Northwest Territories, with particular emphasis on lake trout, *Salvelinus namaycush* (Walbaum). The study was undertaken in response to increased sport fishing lodge development in the District and a proposal from the lodges to have major lakes designated as high quality fishery lakes. The major lakes in the Keewatin area with existing or proposed sport fishing lodges (or outposts) are: Kasba, Henik, Dubawnt, Mosquito, Snowbird and Nueltin. It is intended that over the five-year period all or most of these lakes will be studied to gain a better understanding of the sport fishing industry and to assess the potential of these lakes to provide high quality fisheries for lake trout. It is planned that the study will culminate with a sport fishery management plan after 1983 for these major lakes in the District of Keewatin.

To date there are only two lakes in the Northwest Territories (N.W.T.) that are managed as high quality fishery lakes and have restricted catch and possession limits for lake trout: Great Bear and Great Slave lakes. The daily catch and possession limits for lake trout on these two lakes are two and three fish per angler with a size limit being imposed so that only one trout removed is over 700 mm (ca 4.5 kg). These management measures have been imposed to restrict the harvest of lake trout and to attempt to sustain a continuing supply of large size fish for the fishery. All other lakes in the N.W.T. have a catch and possession limit of 3 and 5 lake trout.

Kasba Lake was selected to be surveyed during the first year of the five-year study of the sport fisheries in the major lakes in the Keewatin area. This report presents information on the harvest and biological status of lake trout and other species from the 1979 survey.

THE STUDY AREA

Kasba Lake is situated north of the Manitoba-Saskatchewan border at 60°18'N, 102°07'W where it straddles the division between the Districts of Keewatin and MacKenzie in the Northwest Territories (Fig. 1). The lake has a maximum length of 79.5 km, a maximum width of 40 km and a total surface area of 132,560 ha. A number of small rivers flow into Kasba Lake including the Snowbird River but there is only one outlet, through the Kazan River. The Kazan River flows north through a series of lakes into Baker Lake and then into Hudson Bay.

The lake is located on the Canadian Shield. Bedrock in the area is composed of hard, crystalline Precambrian material covered with heavy glacial deposits of morainic material. The western shore of the lake is characterized by large eskers which constitute the shoreline and form many of the islands. Kasba Lake is located about 50 km south of the northern limit of trees. Birch and spruce dominate along the southern shoreline but are sparce towards the north end of the lake. Surrounding ground cover includes willows, alders, crowberries, cranberries, mosses and lichens.

THE FISHERY

The sport fishery potential in the District of Keewatin has long been recognized but development of this resource has only occurred over the past decade. Kasba Lake Lodge is the largest of the sport fishing lodges and outposts in the District (Fig. 1) with a 38 guest-bed capacity. It is anticipated that expansion of the sport fishery will continue with the establishment of lodges or outpost camps on other lakes such as Yathkyed, Schultz and Ennadai in the future.

Kasba Lake has a history of both commercial and sport fishing. The lake was first fished commercially in 1963 when 9388 kg of lake whitefish and 19,700 kg of lake trout from a 317,515 kg (700,000 lb) quota were taken. Commercial fishing was subsequently discontinued because of a high infestation rate of *Triaenophorus crassus* in lake whitefish and excessive transportation costs. In July 1967, the lake was sampled to assess its potential to support a renewed commercial fishery. A lower infestation rate at that time led to a small commercial operation in September during which 4537 kg of lake trout and lake whitefish were taken. The lake was again and last fished in 1968 producing 16,343 kg of lake whitefish and 22,111 kg of lake trout (Moshenko 1980).

Sport fishing operations began in 1971 with the establishment of a 12 guest-bed capacity fishing lodge (Fig. 2) and a 4,082 kg sport fishery quota. In 1972 the 317,515 kg lake quota was divided into 24,494 kg for the sport fishery and 293,021 kg for the commercial fishery. The guest capacity of the lodge was subsequently expanded to 38 guest-beds in 1979.

Lodge management of Kasba Lake Lodge has implemented a policy whereby guests are permitted to take home only one large-size fish of each species. In addition, anglers may catch fish for shore lunches.

Guests generally spend seven days at the lodge, but shorter stays are also available. Anglers are flown in by DC-3 aircraft from Winnipeg. The lodge uses a float-equipped Cessna 185 for side trips. With the exception of rotation days and depending upon the weather, anglers spend most of the day fishing (average of 5.2 hours). They usually fish two to a boat and are under the direction of a guide. Lake trout is the most preferred species, followed by Arctic grayling and northern pike. In addition, lake whitefish is sought by a few fly fishermen. Side trips are offered to the Snowbird River or the Kazan River (Fig. 2) for Arctic grayling. Northern pike are angled in the Snowbird River or selected areas near the lodge. While most areas of Kasba Lake are fished for lake trout, most of the angling pressure is exerted in the islands east of the lodge (Fig. 2). Shorelines and drop-offs are preferred fishing locations since they provide better angler success.

MATERIALS AND METHODS

CREEL CENSUS

During 1979, a creel census was conducted at Kasba Lake Lodge from 12 July to 31 August. The creel census procedure and the forms used were adapted from those described by Falk et al. (1973, 1974a). Anglers or guests were questioned at the end of each day regarding the numbers of fish caught, released, and retained by species, as well as the number of hours spent fishing and the locations fished. The number of fish eaten for shore lunches was also recorded. Anglers or guides who fished in the evening were interviewed when they returned, or the next day. When possible, the retained catch was sampled for later biological analysis.

EXPERIMENTAL NETTING

Experimental netting was carried out using standard gangs composed of 47.5 m lengths each of 38, 64, 89, 114 and 139 mm (stretched mesh) nylon gillnets. Nets were set at a number of different locations (Fig. 3). The catch was recorded by mesh size and by species. Fish were sampled for later biological analysis; however, lake whitefish and cisco were sub-sampled when the catches were large. In addition, large lake trout in good condition were tagged. Gillnetting was also carried out using small mesh gillnets (38 and 64 mm stretched mesh) to capture lake trout for tagging. A portion of the other species caught by these gillnets was also sampled for later biological analysis.

TAGGING

Lake trout were captured for tagging by angling and by the use of small mesh gillnets. Spinning gear with an assortment of barbless lures were used when angling. A 90 m and a 135 m long gang, each of 38 and 64 mm (stretched mesh) gillnets, were set in shallow water and were checked every 24 hours. It was determined that this procedure did not result in excessive mortalities to lake trout. After the trout were removed from the net or taken off the lure, they were placed in a measuring trough, measured, weighed and tagged. White Floy (spaghetti) tags bearing a return address and a reference number were used. Tags were applied using a Dennison tagging gun (model FDM-68). They were inserted on the left side just under the dorsal fin and anchored between the pterygiophores. After tagging, the fish were held in the water to recuperate and observed for a short while after release. Only trout considered to be in good condition were tagged. Guides and anglers were informed of the program and asked to cooperate in providing tag recapture information. A certificate and crest is offered for tag returns.

BIOLOGICAL SAMPLING

Fish were sampled from the anglers' creel and from gillnets for fork length (±1 mm), weight (±50 g), aging structures, sex and stage of maturity. Trophy (usually large fish kept for mounting) and tagged fish were only sampled for length and weight. Sex and relative stage of maturity were determined by examination of the gonads. Relative stages of maturity were coded according to the stages described in Appendix 1.

Sagittal otoliths were taken from lake trout and burbot and stored dry in coin envelopes for later age determination. In the laboratory, the convex surface of the otoliths were selectively ground on a carborundum stone and cleared in a 3:1 solution of benzyl-benzoate and methyl salicylate. They were then observed under a binocular dissecting microscope (x30) using reflected light against a black background. Ages were determined by counting the annual growth zones. Scales were taken from ciscoes, lake whitefish, round whitefish, Arctic grayling and northern pike as described by Hatfield et al. (1972). Suckers were not aged. Scales were mounted between two glass slides and the completed annuli counted on the image produced by an Eberbach microprojector (x60). Opercula were also taken from northern pike as comparative aging structures. These bones were dissected out and placed in boiling water until the flesh separated from them. They were then cleaned and allowed to dry before being stored in coin envelopes.

Ovary samples were taken from lake trout collected over the summer and preserved in a 5% formalin solution. In the laboratory, the ovaries were weighed (wet weight ±1 g) and the total number of ova from each ovary were counted after removal of the ovarian tissue. Ovum diameters were determined from an average of 20 ova, each taken from the anterior, middle and posterior sections of the ovary.

DATA ANALYSIS

An IBM 370/168 computer, based at the University of Manitoba, was used to manipulate the data. The Statistical Analysis System (1972) was used to generate length, weight, sex, age and maturity summaries and to perform basic calculations and statistical analysis. Total annual mortality rates (A) were calculated using a Hewlett-Packard programmable computer (model 9810-A) following the procedure outlined by Robson and Chapman (1961). When calculating mortality rates for lake trout a "moving mean" (average of two successive age-classes) was used (Moshenko and Gillman 1978). In dealing with lake trout there is probably one unusable age-class that intervenes between the first usable age and modal age (or second of two nearly-equal ages). The use of moving means then smoothes out the irregularities of the frequency distribution at age-classes in the right hand descending limb of the catch curve. In calculating mortality rates for whitefish the actual means were used.

Weight-length relationships were determined using the following power equation:

$$\log_{10}W = a + b\ (\log_{10}L)$$

where: W = weight in grams
L = length in centimetres
a = Y-intercept
b = slope of the regression line.

The standard deviation of the coefficient $b(S_b)$ was also calculated. Relative condition factor (K) was calculated using the formula:

$$K = \frac{W \times 10^5}{L^3}$$

Scientific names follow Scott and Crossman (1973) as follows: lake trout, *Salvelinus namaycush* (Walbaum), lake whitefish, *Coregonus clupeaformis* (Mitchell), cisco , *Coregonus* sp., longnose sucker, *Catostomus catostomus* (Forster), white sucker, *Catostomus commersoni* (Lacépède), burbot, *Lota lota* (Linnaeus), northern pike, *Esox lucius* (Linnaeus), round whitefish, *Prosopium cylindraceum* (Pallas), lake chub, *Couesius plumbeus* (Agassiz), and Arctic grayling, *Thymallus arcticus* (Pallas).

RESULTS AND DISCUSSION

CREEL CENSUS

In 1979, Kasba Lake Lodge operated from 16 June to 31 August (77 days) and accommodated an estimated 279 guests (Table 1). A total of 1165 angler-interviews (1018, 106 and 41 from Kasba Lake, Kazan River and Snowbird River respectively) were conducted during a 51-day creel census from 12 July to 31 August. All trips to the Kazan and Snowbird rivers in 1979 were conducted during the creel census survey.

Lake trout

The total harvest of lake trout from Kasba Lake in 1979 was estimated to be 1846 fish (3692 kg) (Table 2). Harvest per hectare fished was estimated to be 0.16 fish (0.32 kg) while the yield for the entire lake was 0.01 fish (0.03 kg). The harvest per angler was 6.6 fish (13.2 kg).

The catch of lake trout from Kasba Lake during the census survey, including Kazan and Snowbird rivers was 9045 fish with an effort of 1165 angler-days (Table 3). Total fish caught per angler was 38.2 (76.4 kg). The catch per unit effort for lake trout was 7.8 fish per angler-day or 1.5 fish per angler hour. Catch statistics for lake trout from Kazan and Snowbird rivers are also presented.

While the total catch and harvest of lake trout from Kasba Lake in 1979 are higher than those reported for the lake for 1978 (Appendix 3) and by Lustig (1979) for 1975, the catch per unit of effort values were similar for all years. The catch per angler was 8.5 in 1975, 10.8 in 1978 and 8.4 in 1979 and the catch per angler-hour was 1.7 for 1975 and 1979 and 1.9 for 1978.

Arctic grayling

The total harvest of Arctic grayling from Kasba Lake in 1979 was estimated to be 346 fish (329 kg) (Table 2). The harvest per angler was 1.2 fish (1.1 kg). Fish caught per angler was 7.3 (6.9 kg) (Table 3). The CPE was 1.5 fish per angler-day or 0.3 per angler-hour.

Northern pike

The total harvest of northern pike from Kasba Lake in 1979 was estimated to be 69 fish (Table 2). The harvest per angler was 0.3 fish. Fish caught per angler was 2.6 (Table 3). CPE was 0.5 fish per angler day or 0.1 per angler-hour.

EXPERIMENTAL NETTING

During July and August 1979, 11 experimental gang gillnet sets were made in Kasba Lake. A total of 618 fish were caught. The catch (in numbers) was composed of lake trout (38%), lake whitefish (36%), longnose sucker (16%), ciscoe (5%), round whitefish (3%), northern pike (1%), white sucker (<1%) and lake chub (<1%) (Table 4). Overall catch per unit of effort (CPE) was 33.6 fish per 100 m of gillnet per 24 h. The value for lake trout was 14.0 CPE per set (range 0.6 to 66.8 fish per 100 m of gillnet per 24 h (Appendix 6)).

BIOLOGICAL INVESTIGATION - LAKE TROUT

Biological data on harvested (retained) lake trout is biased towards larger and older fish since lodge policy restricts possession to fewer and therefore usually larger fish.

Size composition

Angled (retained only) lake trout ranged in fork length from 377 to 1035 (N = 85, mean = 726) and in weight from 550 to 12,550 g (mean = 5775 g) (Table 5). The modal size group was 925-949 mm. The mean fork length of lake trout caught by gillnet from Kasba Lake was 518 mm (N = 390, range = 172-855 mm) and the mean weight was 1689 g (range = 50-7120 g) (Table 6). The modal size group of gillnetted trout was 500-524 mm. Additional length-frequency data for tagged lake trout is presented in Table 7.

The length-frequency distribution for gillnetted lake trout from Kasba Lake in 1979 is compared with previous years and with Kaminuriak Lake in Fig. 4. Lake trout from 1963 and 1967 were captured using 139 mm gillnets while those from 1979 were captured using standard gangs of 38 to 139 mm gillnets. This could account for the larger size of trout from previous years. It is noteworthy that there is a marked absence of lake trout >900 mm from both the 1967 and 1979 gillnet samples. This may be attributed to the effects of the previous commercial fishery and the selective sport fishery for large size lake trout. However, lake trout in the >900 mm size category do account for a majority (72%) of the angled trophy (retained for mounting and therefore not sexed) trout (Table 5). Angling may be more selective toward larger lake

trout than gillnets but this may also be a function of sampling vs angling locations, net avoidance in shallow water or a high release (88%) of angled lake trout. In comparison to other lakes in the District of Keewatin where comparable biological data are available, the sizes of lake trout in the modal length range from Kasba Lake are similar, i.e. to those from Baker Lake (McLeod et al. 1976) but smaller than those from Pointer and Sisson's lakes (Speller et al. 1979).

Weight-length relationship

The weight-length relationship for lake trout from Kasba Lake (Table 8) was defined by the following functional regression:

$\log_{10}W = -5.2323 + 3.094\ (\log_{10}L)$;
$N = 785$; $S_b = 0.021$.

There were no significant differences at $P = 0.05$ between slopes and elevation of the regression lines between sampling methods. Condition factors (K) were 1.05 for males and 1.04 for females (Table 6). K values tended to increase with increasing size of fish. The slopes of the weight-length regression and condition factors for lake trout from Kasba Lake were found to be lower than those from Great Bear and Great Slave lakes (Falk et al. 1982). This indicates that Kasba Lake trout tend to weigh less for a given length.

Age composition

The mean age of lake trout sampled from the anglers' creel was 18.5 yr (N = 42; range = 11-30 yr) (Table 9). From the gillnet catch the mean age was 16.2 yr (N = 384; range 4-53 yr) (Table 10).

The ages of some trophy (mounted) lake trout ranged from 28 to 47 yr (N = 20; mean = 37.2) (Appendix 9).

The age-frequency distribution for gillnetted lake trout from Kasba Lake, 1979 is compared with other lakes in the District of Keewatin in Fig. 5. Ages of lake trout from Kasba Lake are skewed to younger fish while ages from Kaminuriak Lake (Bond 1975) are skewed to older fish since only 139 mm stretched mesh gillnets were used for the latter. The ages of lake trout in the modals age-range for Kasba Lake tend to be slightly greater than for Baker Lake (McLeod et al. 1976) but similar to those for Pointer and Sisson's lakes (Speller et al. 1979).

Growth and mortality

The mean growth rate of lake trout from Kasba Lake is compared to those for other lakes in the District of Keewatin in Fig. 6. Lake trout from Kasba Lake appear to grow faster than lake trout from Kaminuriak Lake (Bond 1975) and Pointer and Sisson's lakes until age 12 (Speller et al. 1979). After age 12, the growth appears to slow down and the growth rate drops below that found for lake trout from Pointer and Sisson's lakes. Growth of lake trout from Kasba Lake falls within the lower range of growth for lake trout from other lakes in the Northwest Territories as reported by Healey (1978). The growth rate of lake trout from Kasba Lake is faster than those from Great Bear and Great Slave lakes to age 20 (Falk et al. 1982).

The total annual mortality rate for lake trout was calculated to be 0.15 (Table 11). The catch curve is shown in Fig. 7. For comparison, mortality rates have been determined to be 0.21 for Baker Lake (McLeod et al. 1976) and 0.12 for Pointer and Sisson's lakes (Speller et al.1979). The low mortality rate for lake trout from Kasba Lake is typical of lightly exploited lake trout populations in the Northwest Territories (Healey 1978).

Sex and maturity

The ratio of males to females for the angled and gillnet catches of lake trout from Kasba Lake was 1:1. First sexual maturity was reached by age 9 (400 mm) for both males and females. Full sexual maturity was reached by age 16 (525 mm) for males and age 17 (557 mm) for females. Sexual maturity was reached at a smaller size and younger age than generally reported for lake trout in the Northwest Territories (Healey 1978).

The average fecundity of 23 lake trout from Kasba Lake was 1153 ova/kg body weight (range: 689-1496 ova/kg body weight)(Table 12).

BIOLOGICAL INVESTIGATIONS - OTHER SPECIES

Lake whitefish

A total of 473 whitefish was sampled from gillnets (experimental and tagging nets) from Kasba Lake in 1979. The mean fork length of the sample was 397 mm (range = 159-602 mm), the mean weight was 911 g (range = 50-2800 g) (Table 13). The modal size group was 340-359. The size composition of lake whitefish from Kasba Lake is compared with those from previous years and with Kaminuriak Lake (Fig. 8).

The weight-length relationship (Table 8) was described by the following functional regression:

$\log_{10}W = -5.5195 + 3.240\ (\log_{10}L)$;
$N = 473$; $S_b = 0.020$.

Condition factors (K) were 1.26 for males and 1.28 for females.

Lake whitefish had a mean age of 7.2 yr (N = 279; range = 2-15 yr) and a modal age group of age 6 (Table 14). The age-frequency distribution for Kasba Lake 1979 is compared with that for Kaminuriak Lake 1972-73 in Fig. 9. The mean age of the Kaminuriak Lake whitefish was greater than the Kasba Lake whitefish. This is due to the fact that only 139 mm gillnets were used on Kaminuriak Lake thereby tending to catch the larger, older fish. The modal age for Kasba Lake whitefish was 6 and for Kaminuriak Lake it was 16, although Kaminuriak whitefish were only slightly larger than Kasba Lake whitefish. Growth of whitefish from Kasba Lake was found to be faster than that from Kaminuriak, Great Slave, Hottah and Prosperous lakes (Fig. 10) as well as from Baker Lake (McLeod et al. 1976). It falls within the upper range of growth rates for unexploited whitefish

populations in the Northwest Territories (Healey 1975). The total annual mortality rate was 0.56 (Table 19). The catch curve is shown in Fig. 11.

The ratio of males to females was 1.1:1. First sexual maturity was reached by age 4 for both sexes and complete sexual maturity was reached by age 10 for males and females.

Arctic grayling

A total of 19 Arctic grayling were sampled from the anglers' creel. They ranged in length from 345 to 465 mm (mean = 410) and in weight from 500 to 1500 g (mean = 945 g) (Table 15). The mean age was 6.7 yr (N = 9; range = 5-8 yr) (Table 16). Information on the weight-length relationship is given in Table 8. Condition factors (K) were 1.21 for males and 1.22 for females.

Northern pike

A total of 19 northern pike were sampled from gillnets (experimental and tagging nets). The mean fork length was 801 mm (range = 456-965 mm) and the mean weight was 3897 g (range = 1000-7050 g) (Table 17). Ages ranged from 5-18 yr (N = 17; mean = 12.5 yr; mode = 13 yr) (Table 18). Weight-length relationship information is presented in Table 15. Condition factors (K) were 0.73 for males and 0.65 for females.

Ciscc

In 1979, 356 ciscoes were sampled from gillnets (experimental and tagging nets). The mean fork length of the sample was 194 mm (range = 132-377 mm) and mean weight was 107 g (range = 25-570 g). The modal size group was 170-179 mm (Table 19). The mean age group was 2.9 yr (N = 247; range = 1-9) and the modal age was 2 yr (Table 20). Weight-length relationship information is presented in Table 8. Condition factors (K) were 1.09 for males and 1.05 for females.

Round whitefish

In total, 33 round whitefish were sampled from gillnets (experimental and tagging nets) from Kasba Lake in 1979. They ranged in length from 194 to 342 mm (mean = 247 mm), weight from 50 to 350 g (mean = 155 g) (Table 21). Ages ranged from 4 to 10 yr (N = 31; mean = 5.6 yr; mode = 5 yr). (Table 22). Weight-length relationship information is presented in Table 8. Condition factors (K) were 0.95 for males and 0.92 for females.

Longnose sucker

The mean fork length of 222 longnose suckers sampled from gillnets (experimental and tagging nets) in 1979 was 308 mm (range - 140-504 mm) and the mean weight was 463 g (range = 50-1700 g) (Table 23). Weight-length relationship information is presented in Table 8. Condition factors (K) were 1.28 for males and 1.27 for females.

White sucker

In total, 71 white suckers were sampled from gillnets (experimental and tagging nets) from Kasba Lake. They ranged in length from 160 to 433 mm (mean = 283 mm) and in weight from 50 to 1250 g (mean = 355 g) (Table 24). Weight-length relationship information is presented in Table 8. Condition factors (K) were 1.40 for males and 1.44 for females.

Burbot

Two burbot were caught by small-mesh tagging gillnets from Kasba Lake in 1979. They were 239 and 224 mm in length and weighed 75 g each.

Lake chub

One lake chub, with a fork length of 152 mm, was caught in an experimental gillnet (38 mm stretched mesh).

SUMMARY

1) Harvest and catch/effort statistics were calculated for lake trout, Arctic grayling and northern pike angled from Kasba Lake, 1979.
2) A total of 1186 fish were caught in the experimental and tagging gillnets including lake trout, lake whitefish, ciscoe, round whitefish, northern pike, longnose sucker, white sucker, burbot and lake chub.
3) The mean age of angled lake trout was 18.5 years, mean length was 726 mm and mean weight was 5775 g. The mean age of lake trout from the experimental nets was 16.2 years, mean length was 518 mm and mean weight was 1689 g.
4) The length/age-frequencies for gillnetted lake trout are skewed to the left which could be attributed to the effects of the previous commercial fishery and the selective sport fishery.
5) The weight-length relationship for lake trout was defined as $\log_{10}W = -5.2323 + 3.094\ (\log_{10})$.
6) The sex ratio of lake trout was found to be 1:1. First sexual maturity was reached by age 9 (400 mm) for both sexes. Average fecundity was 1153 ova/kg body weight.
7) Total annual mortality of lake trout was calculated to be 0.15.
8) Growth of lake trout from Kasba Lake appears to fall within the lower range of growth for lake trout from other lakes in the Northwest Territories.
9) Mean age, length and weight, weight-length relationship, sex ratio, age at first maturity and total annual mortality were calculated for the 473 lake whitefish caught from the experimental and tagging nets.
10) Mean length, age and weight, weight-length relationships and condition factors (K) were calculated for all other fish species caught in the experimental and tagging nets.

ACKNOWLEDGMENTS

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REFERENCES

BOND, W.A. 1975. Data on the biology of lake whitefish and lake trout from Kaminuriak Lake, District of Keewatin, N.W.T. Can. Fish. Mar. Serv. Data. Rep. Ser. CEN/D-75-4: 27 p.

FALK, M.R., R.W. MOSHENKO, and D.V. GILLMAN. In prep. An investigation of the fish populations in Prelude and Prosperous lakes, Northwest Territories, 1979. Can. MS Rep. Fish. Aquat. Sci.

FALK, M.R., D.V. GILLMAN, and M.M. ROBERGE. 1982. Creel census and biological data from sport fishing lodges on Great Bear and Great Slave lakes, Northwest Territories, 1979. Can. Data Rep. Fish. Aquat. Sci. 307: v + 22 p.

FALK, M.R., D.V. GILLMAN, and L.W. DAHLKE. 1973. The sport fisheries on Great Bear and Great Slave lakes, Northwest Territories. Can. Fish. Mar. Serv. Tech. Rep. Ser. CEN/T-73-8: 100 p.

FALK, M.R., D.V. GILLMAN, and L.W. DAHLKE. 1974. 1973 creel census data from sport fishing lodges on Great Bear and Great Slave lakes, Northwest Territories. Can. Fish. Mar. Serv. Data Rep. Ser. CEN/D-74-5: 28 p.

HATFIELD, C.T., J.N. STEIN, M.R. FALK, and C.S. JESSOP. 1972. Fish resources of the Mackenzie-River Valley. Environ. Can. Fish. Serv. Interim Rep. Vol. I: 247 p.

HEALEY, M.C. 1975. Dynamics of exploited whitefish populations and their management with special references to the Northwest Territories. J. Fish. Res. Board Can. 32: 427-448.

HEALEY, M.C. 1978. The dynamics of exploited lake trout populations and implications for management. J. Wildl. Manage. 42(2): 307-328.

LUSTIG, K.M. 1979. Analysis of catch and effort data from selected fishing lodges in Northern Saskatchewan, 1974-76. Dep. Northern Sask. Fish. Data Rep. No. 1: 100 p.

McLEOD, C.L., P.J. WIEBE, and R. A. MOHR. 1976. An examination of the aquatic ecosystems in the Baker Lake - Lower Thelon River, N.W.T., in relation to proposed Polar Gas pipeline development. Renewable Resources Consulting Services Ltd. 26B p.

MOSHENKO, R.W. 1980. Biological data of the major fish species from fifty-nine inland lakes in the Northwest Territories, 1959-1968. Can. Data Rep. Fish. Aquat. Sci. 175: viii + 81 p.

MOSHENKO, R.W. and D.V. GILLMAN. 1978. Creel census and biological investigation on lake trout, *Salvelinus namaycush* (Walbaum), from Great Bear Lake and Great Slave lakes, Northwest Territories, 1975-76. Can. Fish. Mar. Serv. MS Rep. 1440: v + 37 p.

MOSHENKO, R.W. and G. LOW. 1980. Data from the commercial fishery for lake whitefish, *Coregonus clupeaformis* (Mitchill), on Great Slave Lake, Northwest Territories, 1979. Can. Data Rep. Fish. Aquat. Sci. 149: v + 29 p.

ROBSON, D.S., and D.G. CHAPMAN. 1961. Catch curves and mortality rates. Trans. Am. Fish. Soc. 90(2): 181-189.

SCOTT, W.B. and E.J. CROSSMAN. 1973. Freshwater fishes of Canada. Bull. Fish. Res. Board Can. 184: 966 p.

SPELLER, S.D., R.E. HARRIS, J. PANGMAN, J. BOOT, N.J. DODD, and L.S. MCCARTHY. 1979. Environmental studies report - 1979, Urangesellschaft Canada Ltd. 205 p.

STATISTICAL ANALYSIS SYSTEM. 1972. Raleigh State University, Raleigh, N.C.

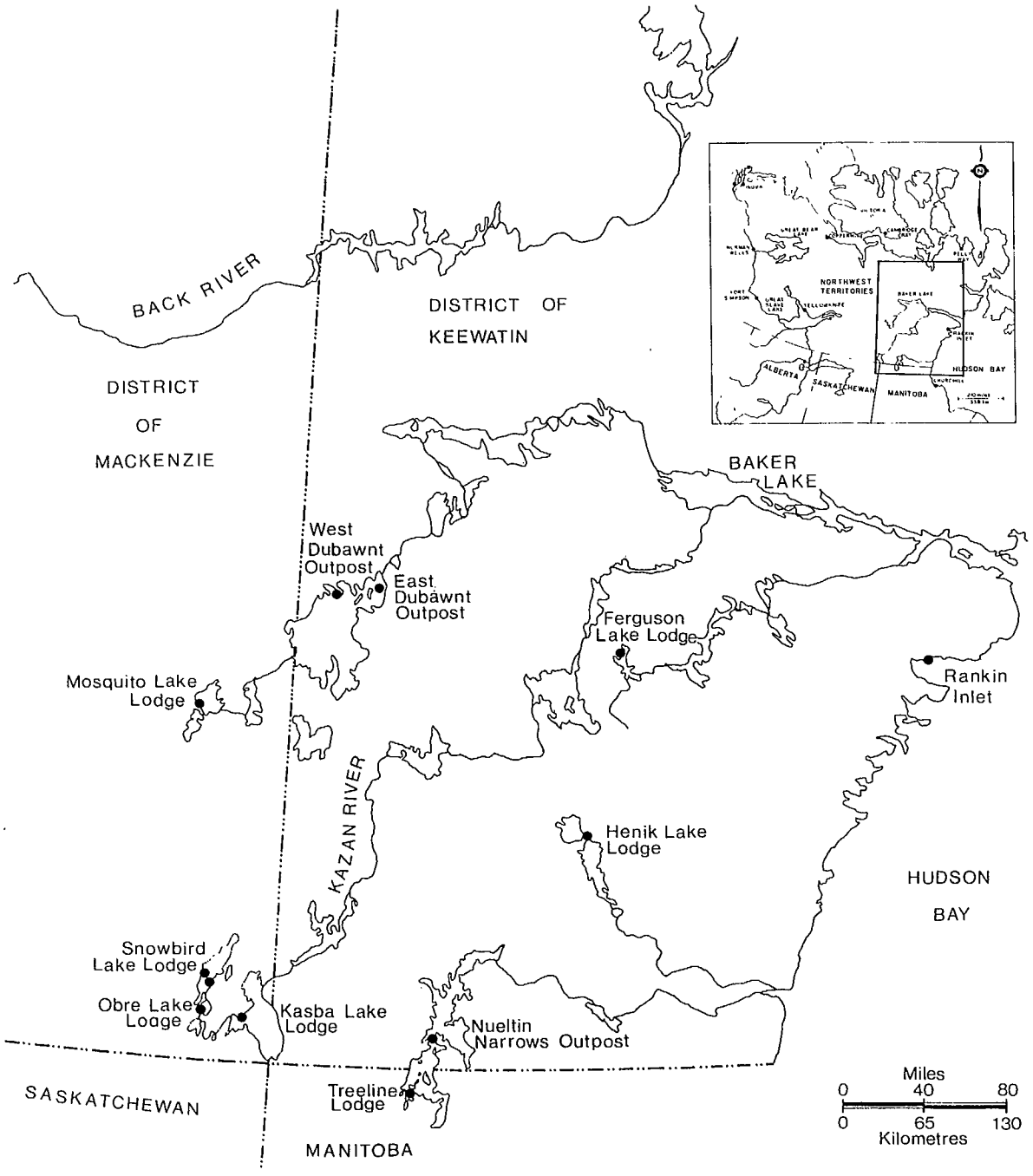


Figure 1. Map of the District of Keewatin, Northwest Territories, showing the locations of sport fishing lodges and outpost camps.

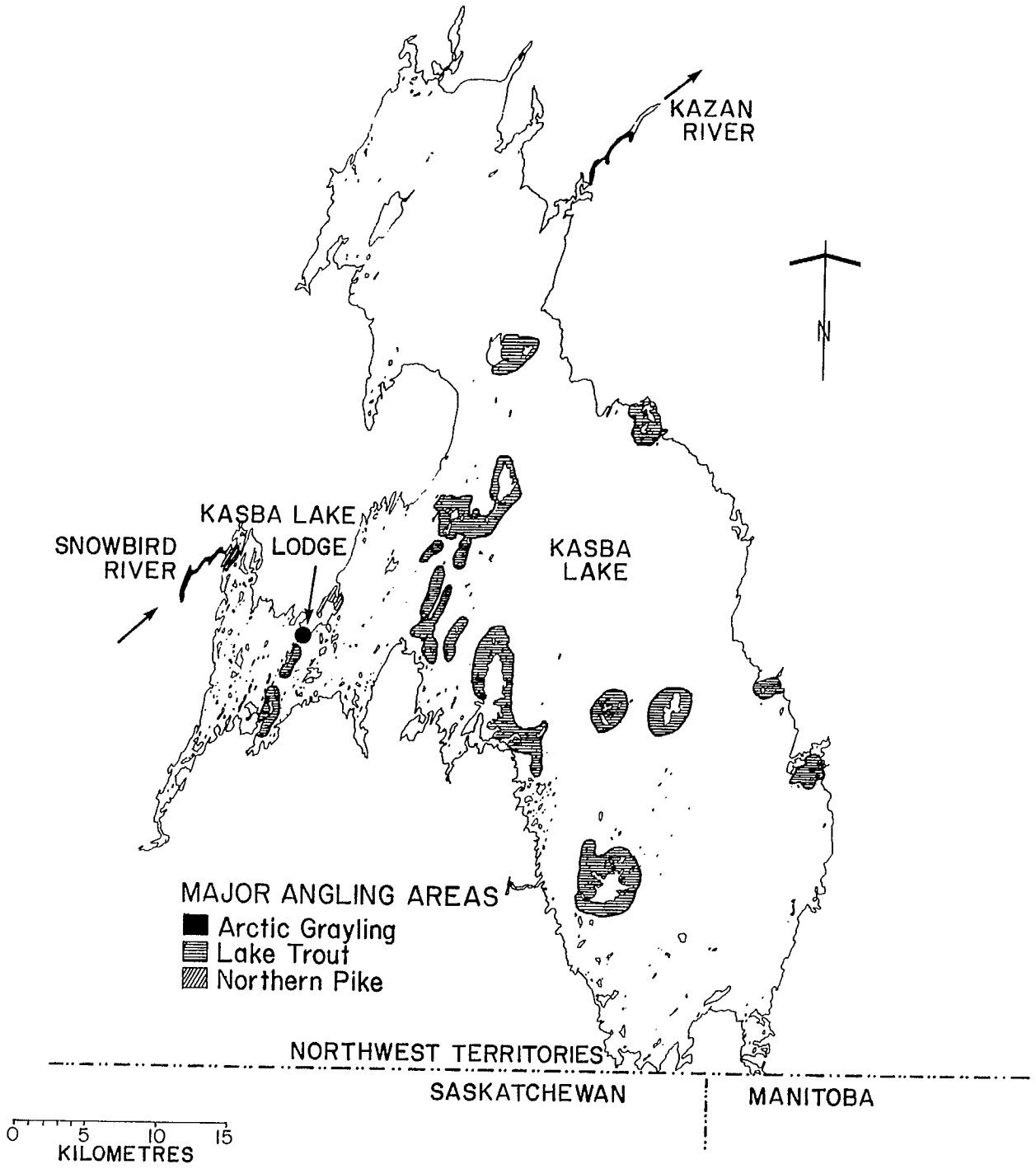


Figure 2. Map of Kasba Lake showing the sport fishing lodge and the areas fished for lake trout, northern pike and Arctic grayling, 1979.

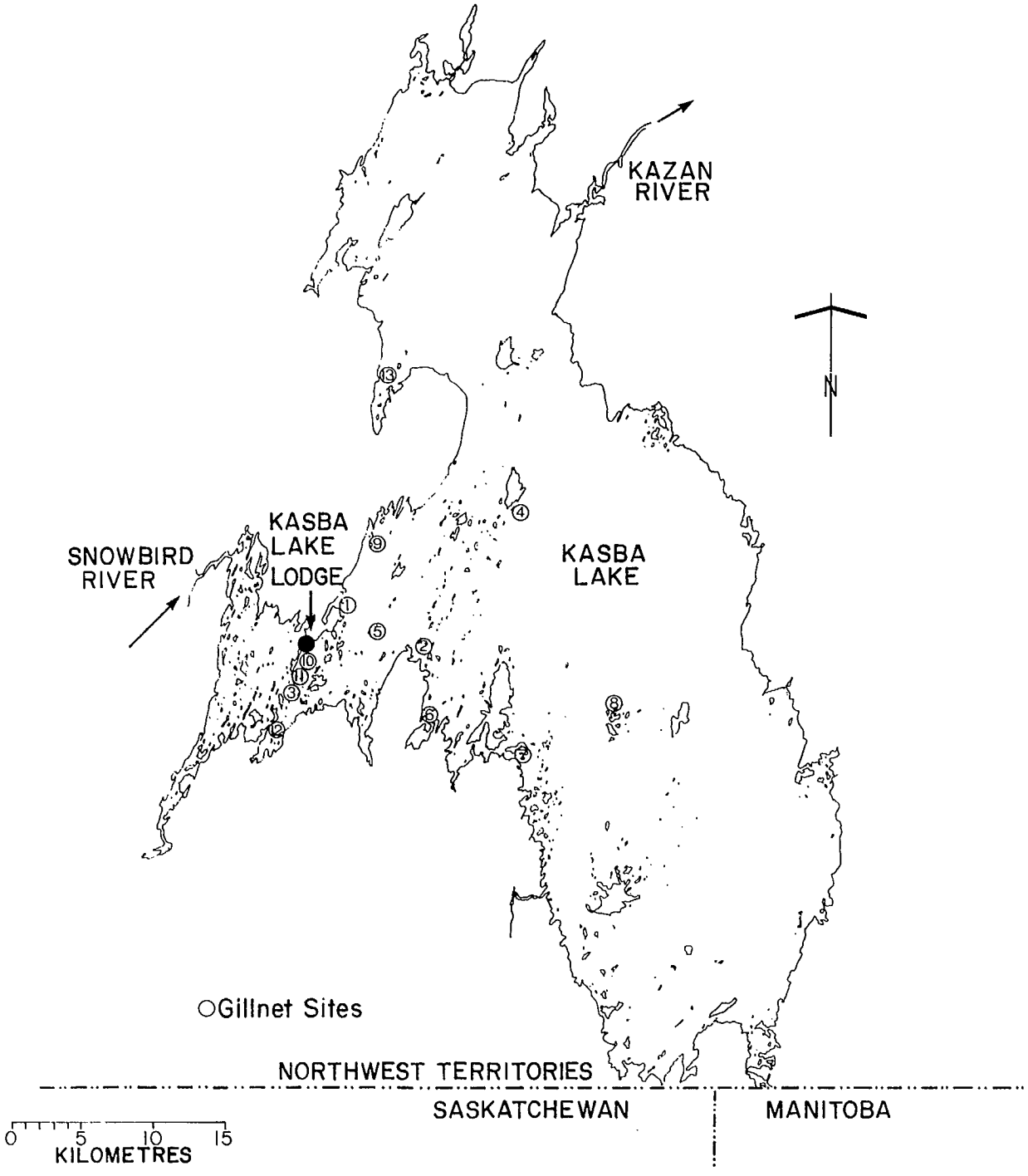


Figure 3. Map of Kasba Lake showing the experimental net locations for 1979.

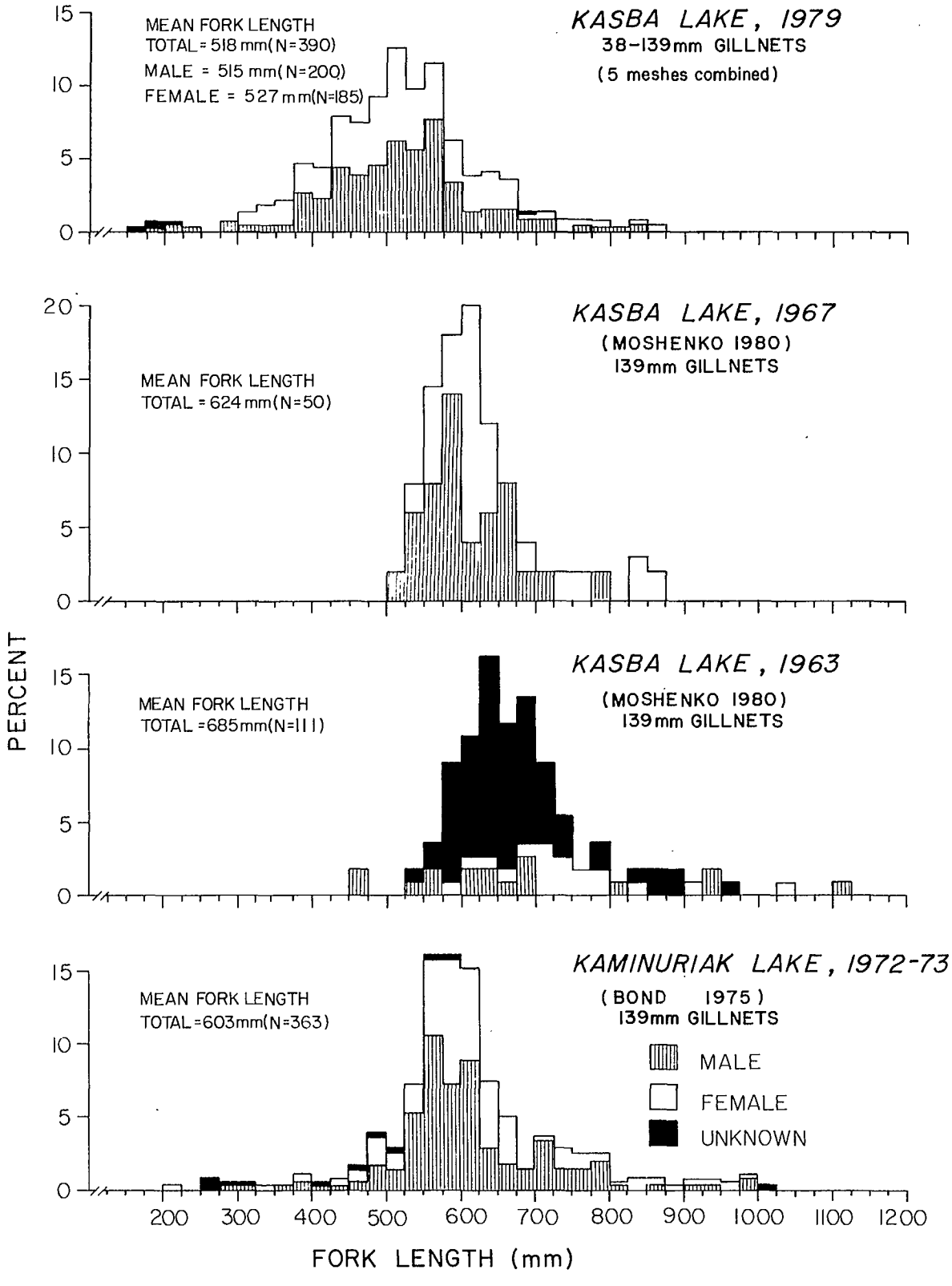


Figure 4. Length-frequency distribution for lake trout from Kasba Lake, 1979 compared with previous years and with Kaminuriak Lake.

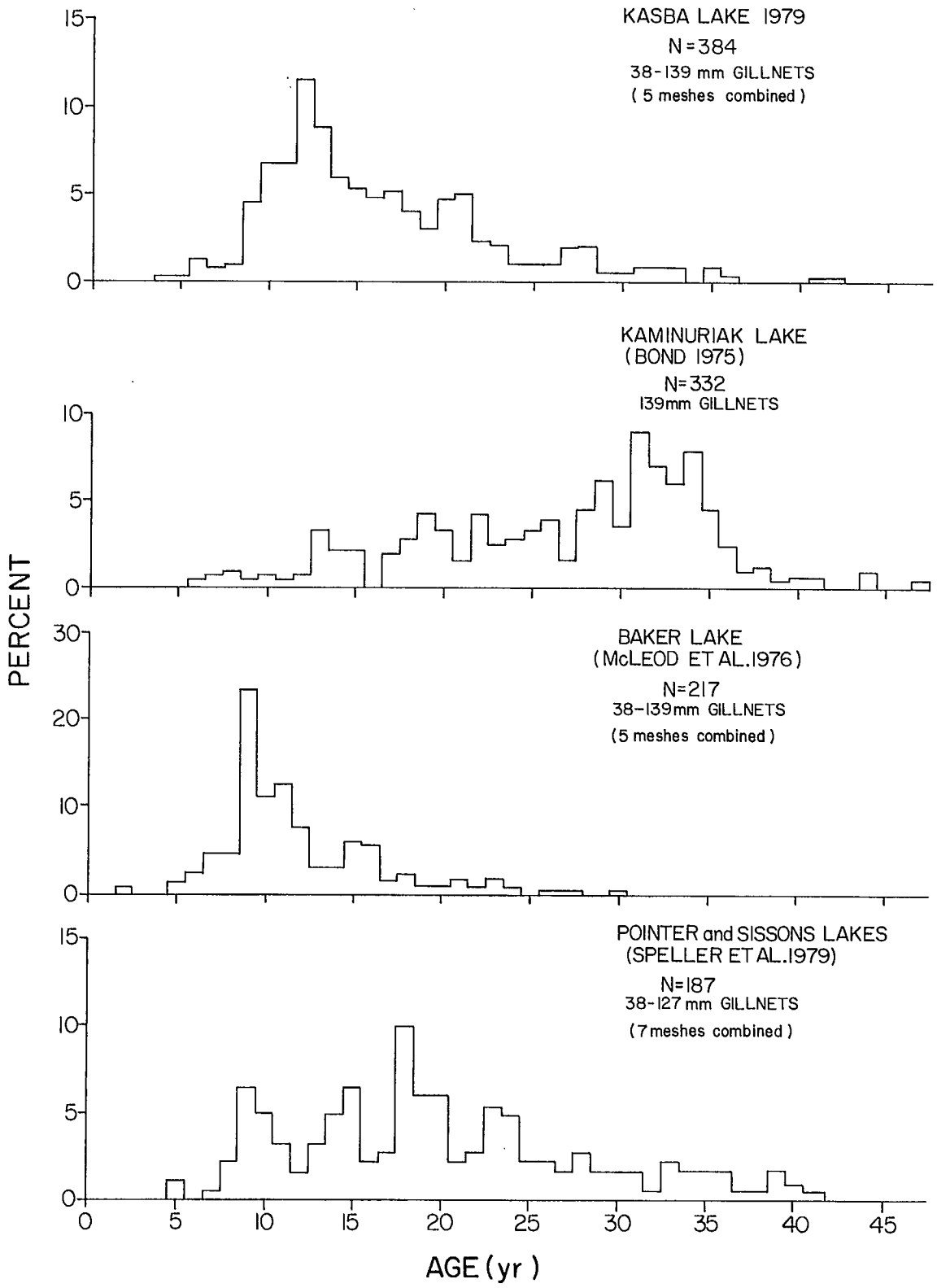


Figure 5. Age-frequency distribution for lake trout from Kasba Lake, 1979 compared with other lakes in the District of Keewatin.

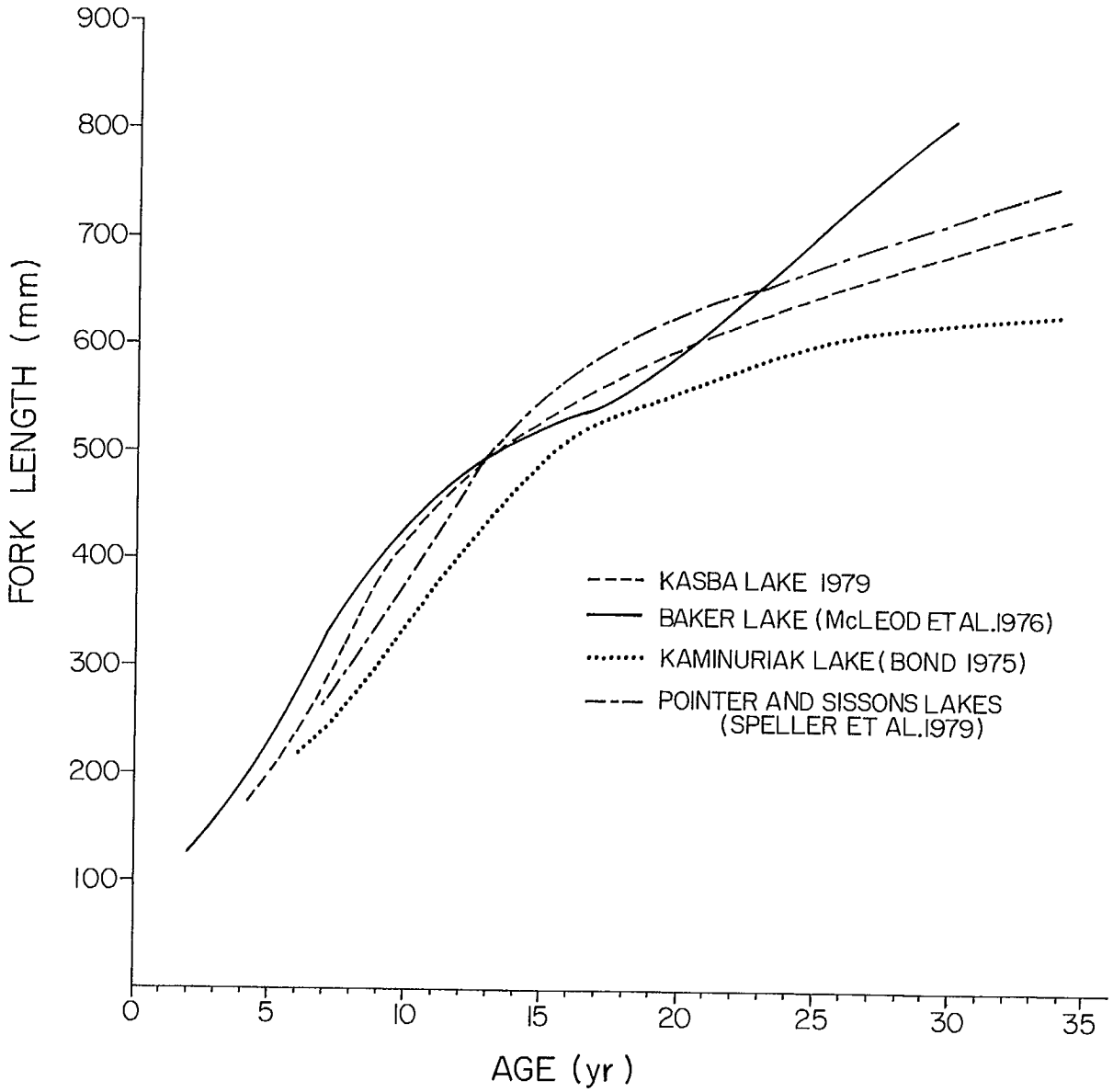


Figure 6. Length-age relationship for lake trout from Kasba Lake, 1979 compared with other lakes in the District of Keewatin.

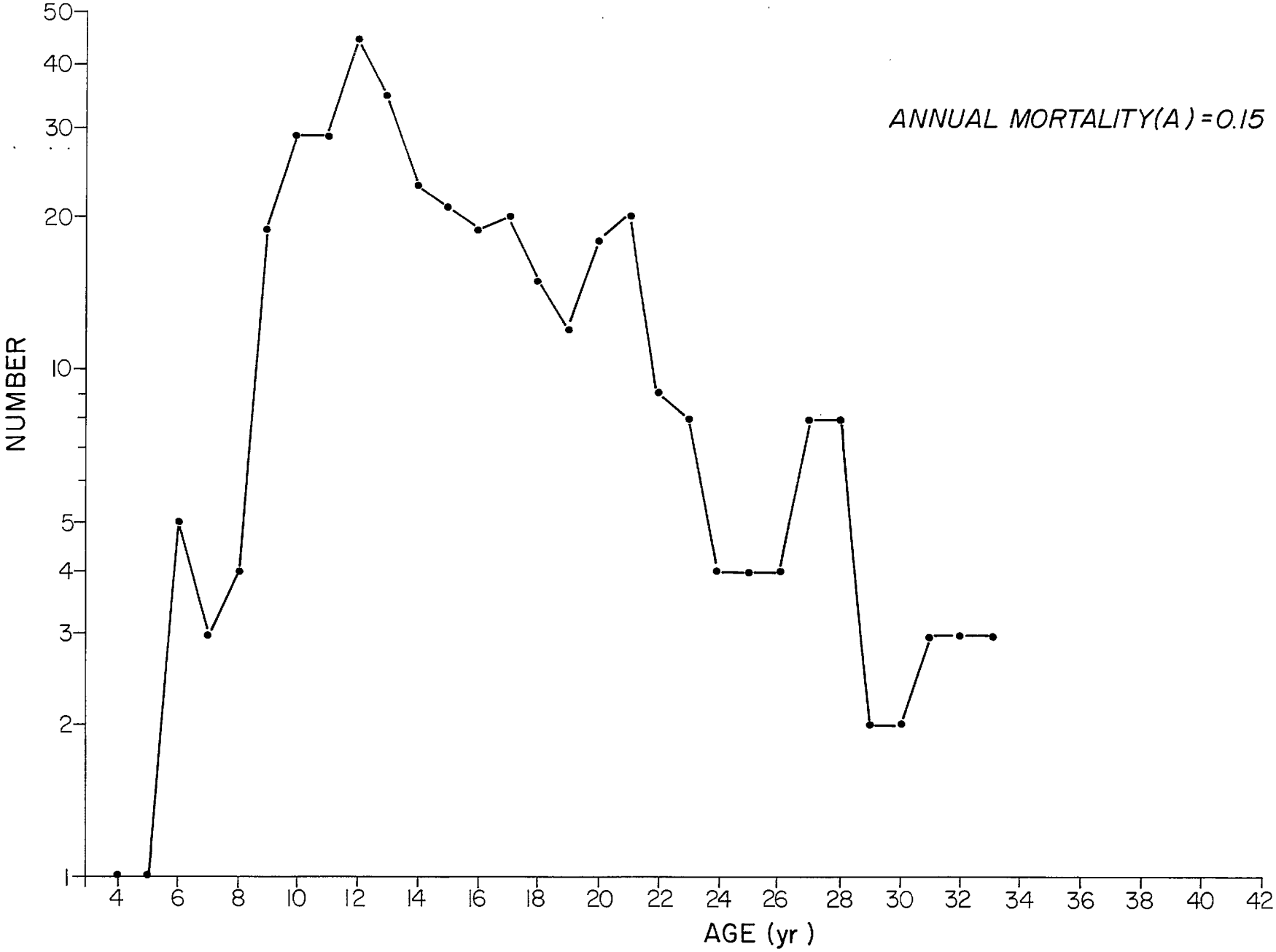


Figure 7. Catch curve for lake trout caught by gillnet from Kasba Lake, 1979.

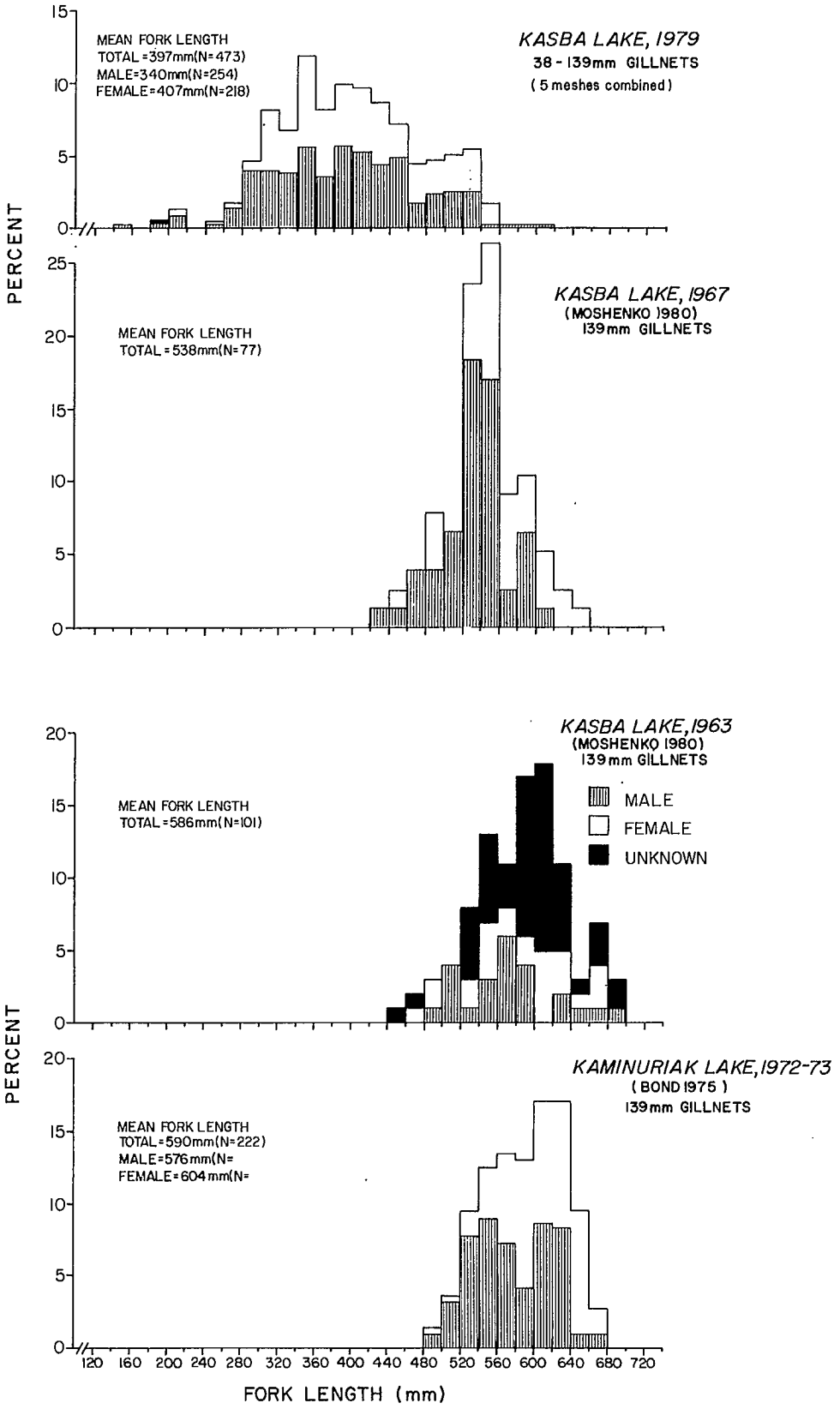


Figure 8. Length-frequency distribution for lake whitefish from Kasba Lake, 1979 compared with previous years and with Kaminuriak Lake.

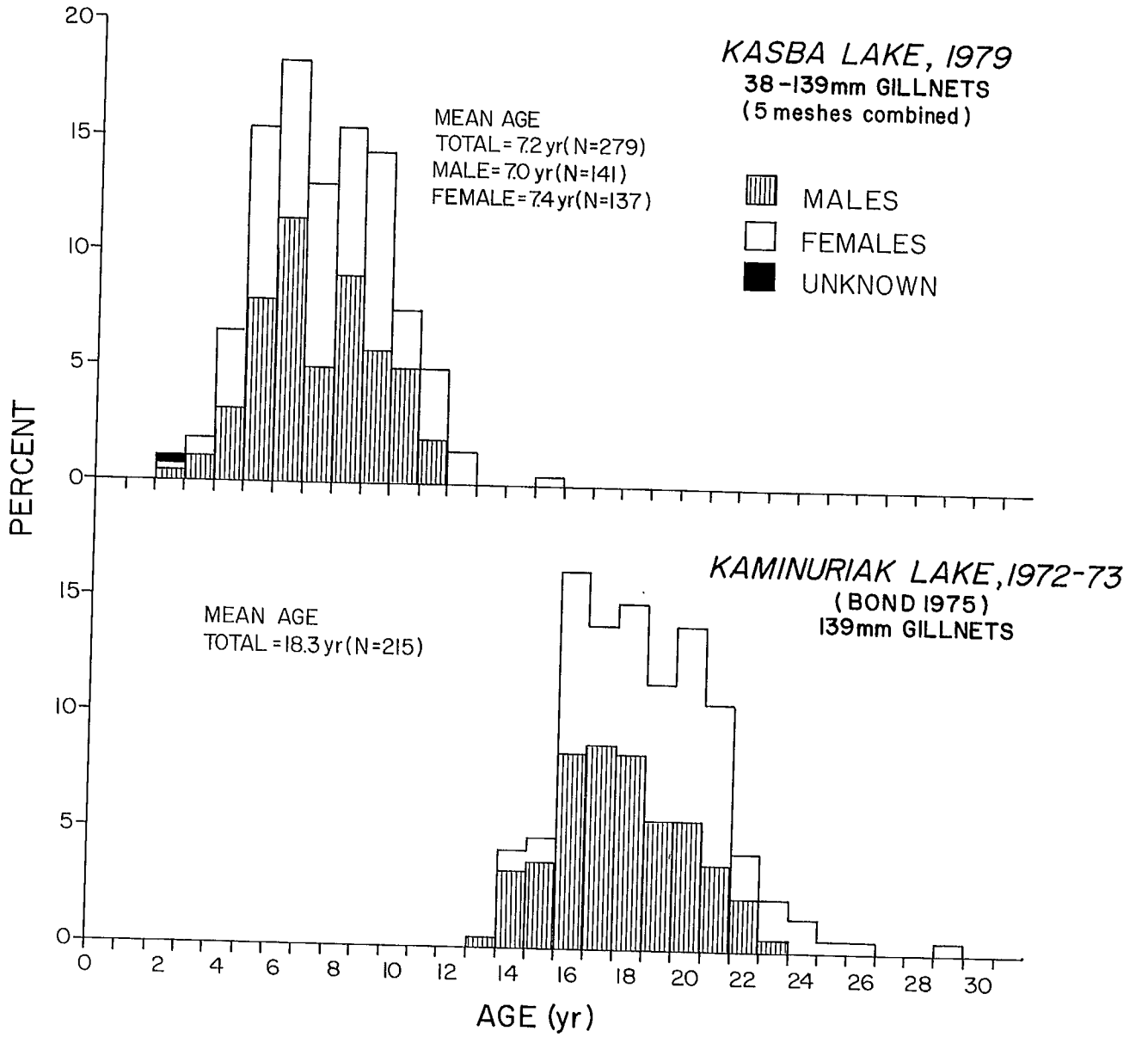


Figure 9. Age-frequency distribution for lake whitefish from Kasba Lake, 1979 compared with Kaminuriak Lake.

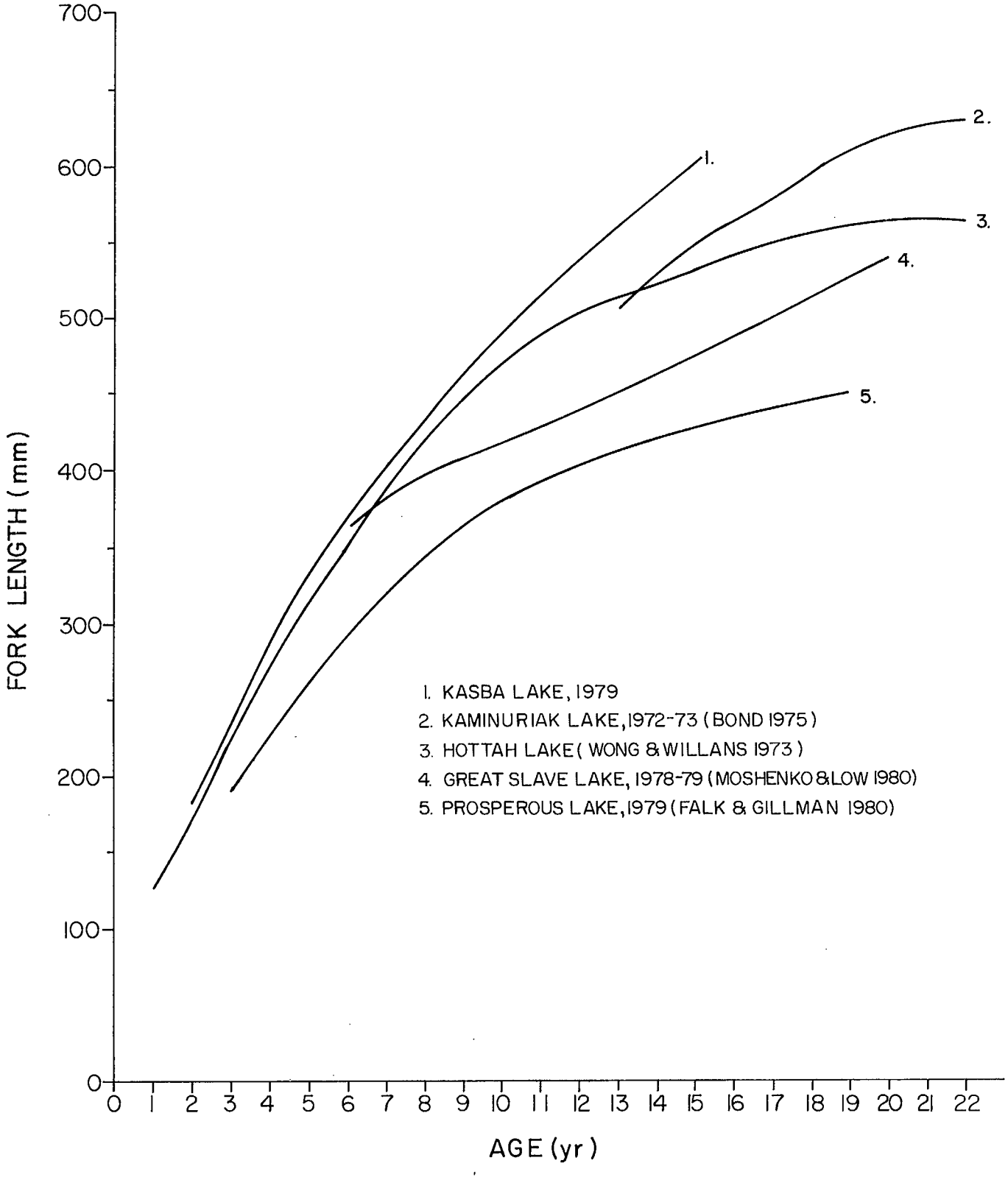


Figure 10. Length-age relationship for lake whitefish from Kasba Lake, 1979 compared with other lakes in the Northwest Territories.

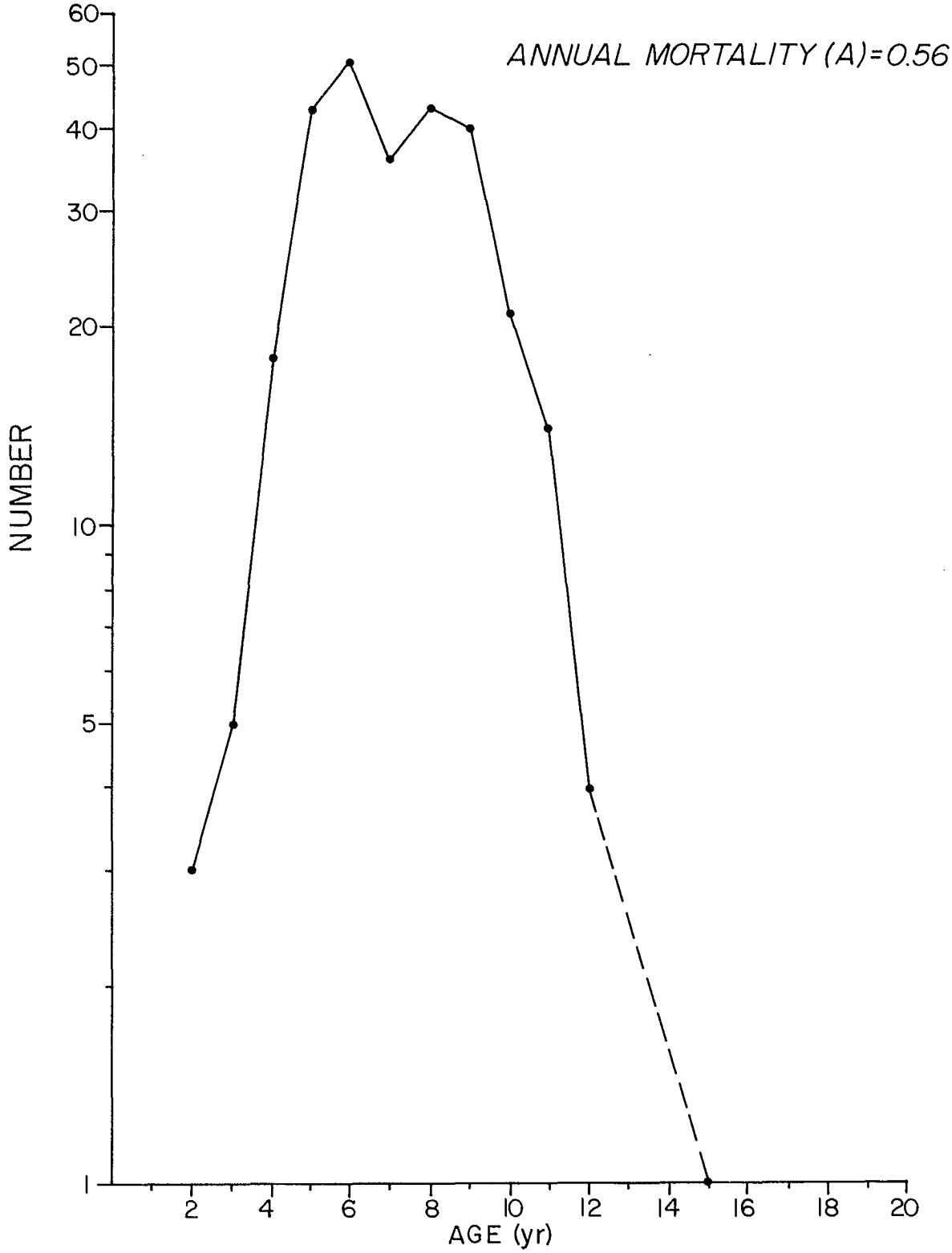


Figure 11. Catch curve for lake whitefish by experimental nets from Kasba Lake, 1979.

Table 1. Summary of information pertaining to lodge operation and creel census survey at Kasba Lake Lodge, 1979.

Location	Lodge Operation						Creel Census					
	Period	Duration (days)	No. Guests		Angler days [b]		Period	Duration		No. Anglers	Angler-days	Angler-hours
			Calculated	License Sale [a]				Total	Censused			
Kasba Lake	16 June - 31 August	77	279	286	1542		12 July - 31 August	51	51 (100)	237	1018	5085.3
Kazen River	-	-	-	-	-		12 July - 31 August	51	26 (100)	106	106	758.5
Snowbird River	-	-	-	-	-		12 July - 31 August	51	9 (100)	41	41	213.0

[a] Provided by Dept. Renewable Resource, Government of Northwest Territories.

[b] Estimated.

( ) Percent of census days actually worked.

Table 2. Summary of harvest statistics for Kasba Lake, 1979.

Location	Species	Census Harvest[a]		Total Harvest[b]		Harvest per-					
						Hectare fished		Hectare Available[d]		Angler	
		No.	Wt.(kg)	No.	Wt.(kg)	No.	Wt.(kg)	No.	Wt.(kg)	No.	Wt.(kg)
Kasba Lake	Lake trout	968	1936	1766	3532	0.16	0.32	0.01	0.03	6.33	12.66
	Northern pike	20	--	59	--	--	--	0.03	--	0.21	--
	Arctic grayling	2	2	7	7	--	--	<0.01	<0.01	0.03	0.03
Kazan River[c]	Lake trout	76	152	76	152	--	--	--	--	0.72	1.43
	Northern pike	0	--	0	--	--	--	--	--	--	--
	Arctic grayling	206	196	206	196	--	--	--	--	1.94	1.85
Snowbird River[c]	Lake trout	4	8	4	8	--	--	--	--	0.10	0.20
	Northern pike	10	-	10	--	--	--	--	--	0.24	--
	Arctic grayling	13	12	13	12	--	--	--	--	0.32	0.29
Kasba Lake (Total)	Lake trout	1048	2096	1846	3692	--	--	--	--	6.62	13.23
	Northern pike	30	--	69	--	--	--	--	--	0.25	--
	Arctic grayling	221	210	346	329	--	--	--	--	1.24	1.18

[a] Includes fish retained and shore lunches.

[b] Includes fish retained, shore lunches and estimated release mortality.

[c] Actual statistics for 1979 fishing season.

[d] Surface area of Kasba Lake = 132,560 ha.

Table 3. Observed catch, effort and catch/effort statistics by anglers during the Kasba Lake creel survey, 1979.

Location	Species	Catch		Effort		Fish per angler		Fish per angler-day		Fish per angler-hour	
		No.	Wt.	days	hours	No.	Wt.(kg)	No.	Wt.(kg)	No.	Wt.(kg)
Kasba Lake	Lake trout	8562				36.1	72.2	8.4	16.8	1.7	3.4
	Northern pike	516		1018	5085.3	2.2	-	0.5	-	0.1	-
	Arctic grayling	41				0.2	0.2	<0.1	<0.1	<0.1	<0.1
Kazan River	Lake trout	460				4.3	8.6	4.3	8.6	0.6	1.2
	Northern pike	2		106	758.5	<0.1	-	<0.1	-	<0.1	-
	Arctic grayling	933				8.8	8.4	8.8	8.4	1.2	1.1
Snowbird River	Lake trout	23				0.6	1.2	0.6	1.2	0.1	0.2
	Northern pike	102		41	213.0	2.5	-	2.5	-	0.5	-
	Arctic grayling	749				18.3	17.4	18.3	17.4	3.5	3.3
Kasba Lake (Total)	Lake trout	9045				38.2	76.4	7.8	15.6	1.5	3.0
	Northern pike	620		1165	6056.8	2.6	-	0.5	-	0.1	-
	Arctic grayling	1723				7.3	6.9	1.5	1.4	0.3	0.3

Table 4. Catch and catch per unit effort data for fish caught by experimental gang gillnets from Kasba Lake, 1979.

Fish		Mesh Size 1.5 (38)	2.5 (64)	3.5 (89)	4.5 (114)	5.5 (140) (in) (mm)	Total	CPE[a]
Lake trout	No	52	66	85	24	10	237	14.0
	%	21.9	27.8	35.9	10.1	4.2	38.3[b]	
Lake whitefish	No	35	48	84	46	10	223	11.5
	%	15.7	21.5	37.7	20.6	4.5	36.1	
Longnose sucker	No	29	18	36	16	-	99	5.1
	%	29.3	18.2	36.4	16.2		16.0	
White sucker	No	-	1	1	-	-	2	0.1
	%		50.0	50.0			0.3	
Northern pike	No	1	2	2	-	3	8	0.5
	%	12.5	25.0	25.0		37.5	1.3	
Cisco	No	6	14	12	-	-	32	1.3
	%	18.8	43.8	37.5			5.2	
Round whitefish	No	12	4	-	-	-	16	1.1
	%	75.0	25.0				2.6	
Lake Chub	No	1	-	-	-	-	1	<0.1
	%	100					0.2	
Total	No	136	153	220	86	23	618	33.6
	%	22.0	24.8	35.6	13.9	3.7		

[a]CPE = catch per unit of effort(No. fish per 100 m of gillnet per 24 h).

[b]percent of total catch.

Table 5. Biological data by length interval for lake trout angled and retained (creel census) from Kasba Lake, 1979.

Length Interval (mm)	Males							Females							Total							F/M Ratio
		Length(mm)		Weight(g)			%		Length(mm)		Weight(g)			%		Length(mm)		Weight(g)			%	
	N	Mean	SD	Mean	SD	K	Mat.	N	Mean	SD	Mean	SD	K	Mat.	N	Mean	SD	Mean	SD	K	Mat.	
375 - 399	1	377	-	550	-	1.03	0	-	-	-	-	-	-	-	1	377	-	550	-	1.03	-	-
425 - 449	2	432	1.4	850	70.7	1.05	50	2	437	16.3	950	141.4	1.14	0	4	434	9.8	900	108.0	1.10	25	1.0
450 - 474	5	459	5.7	960	96.2	1.00	80	-	-	-	-	-	-	-	5	459	5.7	960	96.2	1.00	80	-
475 - 499	1	487	-	1200	-	1.04	100	5	485	6.7	1210	89.4	1.06	60	6	486	6.1	1208	80.1	1.06	67	5.0
500 - 524	2	512	13.4	1425	459.6	1.05	100	4	508	5.7	1275	86.6	0.97	100	6	509	7.7	1325	229.7	1.00	83	2.0
525 - 549	3	530	3.2	1533	115.5	1.03	100	2	541	9.2	1500	70.7	0.95	100	5	534	7.8	1520	90.8	1.00	100	0.7
550 - 574	2	564	4.2	1850	212.1	1.03	100	6	562	5.7	1850	181.7	1.04	100	8	563	5.2	1850	173.2	1.04	100	3.0
575 - 599	2	587	15.6	2000	424.3	1.00	100	2	590	11.3	2200	141.4	1.07	100	4	589	11.2	2100	282.8	1.03	100	1.0
600 - 624	-	-	-	-	-	-	-	2	607	6.4	2150	212.3	0.97	100	2	607	6.4	2150	212.1	0.97	100	-
775 - 799	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	792	-	5400	-	1.09	-	-
825 - 849	1	826	-	5900	-	1.05	100	-	-	-	-	-	-	-	3	835	8.2	6617	633.1	1.13	-	-
850 - 874	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	857	11.0	7850	769.7	1.24	-	-
875 - 899	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	889	5.8	8833	1184.8	1.26	-	-
900 - 924	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	909	5.3	9606	1143.8	1.28	-	-
925 - 949	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	932	5.7	10781	1930.4	1.19	-	-
950 - 974	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	957	7.4	11741	2224.7	1.34	-	-
975 - 999	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	987	10.4	11500	1948.7	1.19	-	-
1000-1024	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	1011	2.5	12550	2315.9	1.22	-	-
1025-1049	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1035	-	-	-	-	-	-
Total	19						84	23						83	85[a]						-	1.2
Mean		514	95.1	1542	1152.0	1.02			529	50.3	1559	50.3	1.03			726	212.6	5775	4625.8	-		

[a] Includes fish not sexed.

Table 6. Biological data by length interval for lake trout caught by experimental nets from Kasba Lake, 1979.

Length Interval (mm)	Males							Females							Total							F/M Ratio
	N	Length(mm) Mean	SD	Weight(g) Mean	SD	K	% Mat.	N	Length(mm) Mean	SD	Weight(g) Mean	SD	K	% Mat.	N	Length(mm) Mean	SD	Weight(g) Mean	SD	K	% Mat.	
150 - 174	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	172	-	50	-	0.98	-	-
175 - 199	1	194	-	100	-	1.37	0	-	-	-	-	-	-	-	3	191	7.0	75	25.0	1.06	-	-
200 - 224	2	208	14.1	100	0.0	1.11	0	-	-	-	-	-	-	-	3	211	5.9	100	0.0	1.06	-	-
225 - 249	1	244	-	150	-	1.03	0	-	-	-	-	-	-	-	1	244	-	150	-	1.03	0	-
275 - 299	3	289	8.6	283	57.3	1.16	0	-	-	-	-	-	-	-	3	289	8.6	283	57.7	1.16	0	-
300 - 324	2	310	7.8	300	0.0	1.01	0	3	320	5.1	333	28.9	1.02	0	5	316	7.7	320	27.4	1.02	0	1.5
325 - 349	2	338	14.1	400	141.4	1.02	0	5	342	4.6	420	75.8	1.05	0	7	341	7.2	414	85.2	1.04	0	2.5
350 - 374	2	354	2.1	400	70.7	0.90	0	6	358	4.9	450	0.0	0.98	0	8	357	4.7	438	35.4	0.96	0	3.0
375 - 399	10	391	6.5	590	77.5	0.98	0	8	388	5.9	588	102.6	1.01	0	18	390	6.3	589	86.7	0.99	0	0.8
400 - 424	9	409	5.4	667	35.4	0.97	13	8	418	4.9	700	59.8	0.96	25	17	413	6.5	682	49.8	0.97	18	0.9
425 - 449	17	439	7.1	894	70.5	1.06	41	14	437	7.2	886	102.7	1.06	40	31	438	7.0	890	85.1	1.06	35	0.8
450 - 474	15	462	8.1	1050	122.5	1.06	47	14	462	7.8	1054	88.7	1.07	75	29	462	7.8	1052	105.6	1.06	45	0.9
475 - 499	18	488	7.4	1206	109.7	1.04	72	18	488	7.5	1256	186.2	1.08	72	36	488	7.4	1231	152.7	1.06	72	1.0
500 - 524	24	512	6.5	1417	194.9	1.05	100	25	513	8.2	1388	179.9	1.03	88	49	512	7.4	1402	186.0	1.04	94	1.0
525 - 549	22	534	6.9	1611	179.2	1.05	95	16	532	7.0	1541	88.0	1.02	94	38	534	7.0	1582	150.4	1.04	95	0.7
550 - 574	30	564	7.1	1827	254.9	1.02	100	15	565	7.2	1827	123.7	1.01	87	45	564	7.0	1827	218.4	1.02	96	0.5
575 - 599	13	585	6.2	2027	214.7	1.01	100	11	585	5.0	2068	268.6	1.03	100	24	585	5.6	2046	236.3	1.02	100	0.9
600 - 624	5	615	4.5	2690	462.9	1.16	100	10	609	8.5	2420	201.7	1.07	100	15	611	7.8	2510	323.6	1.10	100	2.0
625 - 649	6	642	7.0	2867	331.2	1.08	100	10	639	7.5	2715	129.2	1.04	100	16	640	7.2	2772	228.7	1.06	100	1.7
650 - 674	6	662	7.6	3117	129.1	1.08	100	8	665	6.9	3031	345.3	1.03	100	14	664	7.2	3068	269.3	1.05	100	1.3
675 - 699	3	690	8.0	3783	251.7	1.15	100	1	687	-	3700	-	1.14	100	5	691	7.0	3720	204.9	1.13	-	0.3
700 - 724	3	717	6.2	4283	202.1	1.16	100	2	714	14.8	4275	1025.3	1.17	100	5	716	8.8	4280	532.2	1.17	100	0.7
725 - 749	-	-	-	-	-	-	-	3	736	9.1	4383	288.7	1.10	100	3	736	9.1	4383	288.7	1.10	100	-
750 - 774	2	763	1.4	5450	424.3	1.23	100	1	761	-	5300	-	1.20	100	3	762	1.5	5400	312.2	1.22	100	0.5
775 - 799	1	790	-	5050	-	1.02	100	2	788	2.8	5700	1131.4	1.16	100	3	789	2.3	5483	883.6	1.12	100	2.0
800 - 824	1	813	-	6450	-	1.20	100	-	-	-	-	-	-	-	1	813	-	6450	-	1.20	100	-
825 - 849	2	836	7.8	7275	742.5	1.25	100	3	832	6.1	7017	665.8	1.22	100	5	833	6.1	7120	616.0	1.23	100	1.5
850 - 874	-	-	-	-	-	-	-	2	855	7.1	5750	282.8	0.92	100	2	855	7.1	5750	282.8	0.92	100	-
Total	200						72	185						69	390[a]						-	0.9
Mean		515	106.5	1646	1149.8	1.05			527	110.6	1760	1281.9	1.04			518	113.2	1689	1221.8	1.05		

[a] Includes fish not sexed.

Table 7. Biological data by length interval for tagged lake trout from Kasba Lake, 1979.

Length Interval (mm)	Total No.	Length and Weight Sample						
		Length			Weight			
		N	Mean	SD	N	Mean	SD	K
300-324	1	1	306	-	1	200	-	0.70
325-349	4	4	339	7.6	4	475	150.0	1.21
350-374	4	4	357	4.2	4	450	91.3	0.99
375-399	8	8	390	6.7	8	719	96.1	1.22
400-424	16	13	412	6.5	13	808	155.8	1.16
425-449	31	24	438	6.0	24	956	111.6	1.14
450-474	30	23	461	6.9	23	1087	219.6	1.11
475-499	50	27	488	8.0	27	1341	276.3	1.15
500-524	47	37	510	6.6	37	1438	132.2	1.06
525-549	86	42	537	7.1	42	1623	149.1	1.05
550-574	81	42	561	6.7	42	1814	241.5	1.03
575-599	66	37	587	6.7	37	2047	261.7	1.01
600-624	36	16	608	7.3	16	2313	404.4	1.03
625-649	23	14	636	7.7	14	2414	370.3	0.94
650-674	9	3	663	1.1	3	2650	444.4	0.91
675-699	10	5	684	3.2	5	2920	423.7	0.91
700-724	5	3	713	3.8	3	3533	797.4	0.97
725-749	2	2	739	8.5	2	4075	106.1	1.01
750-774	1	0	-	-	0	-	-	-
775-799	1	1	792	-	1	4200	-	0.85
800-824	3	3	824	0.6	3	7417	431.1	1.33
825-849	2	1	825	-	1	6950	-	1.24
850-874	2	2	865	7.1	2	8475	176.8	1.31
875-899	1	1	878	-	1	8150	-	1.20
900-924	2	0	-	-	0	-	-	-
925-974	1	0	-	-	0	-	-	-
975-999	1	0	-	-	0	-	-	-
Total	523	313			313			
Mean			533	91.0		1752	1122.6	1.07

Table 8. Weight-length relationship summary, $\log_{10}W = a + b(\log_{10}L)$, for each fish species (sexes combined) from Kasba Lake, 1979.

Species	N	Y-intercept (a)	Slope (b)	Standard Dev. of b(S_b)	95% C.I. of b
Lake trout - angled	83	-5.8467	3.317	0.047	3.224-3.410
tagged	312	-4.4942	2.823	0.053	2.719-2.927
gillnetted	390	-5.1718	3.070	0.024	3.023-3.117
combined	785	-5.2323	3.094	0.021	3.053-3.135
Lake whitefish	473	-5.5195	3.240	0.020	3.201-3.279
Cisco	356	-5.6317	3.288	0.042	3.206-3.370
Longnose sucker	222	-5.1635	3.106	0.024	3.059-3.153
White sucker	71	-5.9917	3.463	0.066	3.331-3.595
Round whitefish	33	-4.6941	2.858	0.178	2.495-3.221
Northern pike	19	-4.2919	2.704	0.255	2.166-3.242
Arctic grayling	19	-6.7559	3.718	0.214	3.266-4.170

Table 9. Biological data by age group for lake trout angled and retained (creel census) from Kasba Lake, 1979.

Age (Yr)	Males N	Males Length(mm) Mean	Males Length(mm) SD	Males Weight(g) Mean	Males Weight(g) SD	Males K	Males % Mat.	Females N	Females Length(mm) Mean	Females Length(mm) SD	Females Weight(g) Mean	Females Weight(g) SD	Females K	Females % Mat.	Combined N	Combined Length(mm) Mean	Combined Length(mm) SD	Combined Weight(g) Mean	Combined Weight(g) SD	Combined K	Combined % Mat.	F/M Ratio
11	2	422	63.6	775	318.2	1.00	0	-	-	-	-	-	-	-	2	422	63.6	775	318.2	1.00	0	-
12	3	460	27.0	933	230.9	0.95	67	1	481	-	1100	-	1.00	0	4	465	24.5	975	206.2	0.96	50	0.3
13	1	457	-	1000	-	1.05	100	1	425	-	850	-	1.11	0	2	441	22.6	925	106.1	1.08	50	1.0
14	2	495	50.9	1225	247.5	1.01	100	3	469	18.5	1217	144.3	1.17	33	5	480	31.9	1220	160.5	1.11	60	1.5
15	2	532	41.7	1400	424.3	0.92	100	1	509	-	1150	-	0.87	100	3	524	32.2	1317	332.9	0.90	100	0.5
16	1	451	-	950	-	1.04	100	-	-	-	-	-	-	-	1	451	-	950	-	1.04	100	-
17	1	431	-	900	-	1.12	100	4	544	29.3	1625	301.4	1.00	100	5	521	56.4	1480	416.2	1.03	100	4.0
18	-	-	-	-	-	-	-	2	493	0.7	1175	35.4	0.98	100	2	493	0.7	1175	35.4	0.98	100	-
19	2	535	3.5	1675	106.1	1.17	100	1	508	-	1300	-	0.99	100	3	518	9.3	1550	229.1	1.11	100	0.5
20	-	-	-	-	-	-	-	2	543	12.7	1550	0.0	0.97	100	2	543	12.7	1550	0.0	0.97	100	-
21	2	565	46.7	1650	70.7	0.93	100	1	515	-	1350	-	0.99	100	3	548	43.8	1550	180.3	0.95	100	0.5
22	-	-	-	-	-	-	-	1	560	-	1850	-	1.05	100	1	560	-	1850	-	1.05	100	-
23	-	-	-	-	-	-	-	1	565	-	1850	-	1.03	100	1	565	-	1850	-	1.03	100	-
26	2	572	6.4	2150	212.1	1.15	100	-	-	-	-	-	-	-	2	572	6.4	2150	212.1	1.15	100	-
28	-	-	-	-	-	-	-	2	600	28.3	2300	0.0	1.06	100	2	600	2.8	2300	0.0	1.06	100	-
29	1	826	-	5900	-	1.05	100	2	597	20.5	2050	70.7	0.97	100	3	673	13.3	3333	2223.4	1.00	100	2.0
30	-	-	-	-	-	-	-	1	569	-	2100	-	1.14	100	1	569	-	2100	-	1.14	100	-
Total	19						84	23						83	42						83	1.2
Mean	17.0[a]	514	95.1	1542	1152.0	1.02		19.8[a]	529	50.3	1559	427.4	1.03		18.5[a]	522	73.4	1551	825	1.03		

[a]Indicates mean age.

Table 10. Biological data by age group for lake trout caught by experimental nets from Kasba Lake, 1979.

Age (Yr)	Males							Females							Total							F/M Ratio
	N	Length(mm) Mean	Length(mm) SD	Weight(g) Mean	Weight(g) SD	K	% Mat.	N	Length(mm) Mean	Length(mm) SD	Weight(g) Mean	Weight(g) SD	K	% Mat.	N	Length(mm) Mean	Length(mm) SD	Weight(g) Mean	Weight(g) SD	K	% Mat.	
4	-	-	-	-	-	-	0	-	-	-	-	-	-	-	1	172	-	50	-	0.98	-	-
5	1	194	-	100	-	1.37	0	-	-	-	-	-	-	-	1	194	-	100	-	1.37	0	-
6	3	220	20.8	117	28.9	1.09	0	-	-	-	-	-	-	-	5	208	22.7	95	37.1	1.01	-	-
7	-	-	-	-	-	-	0	2	361	26.2	475	106.1	1.01	0	3	313	84.3	350	229.1	0.99	-	-
8	4	338	78.0	450	334.2	1.05	0	-	-	-	-	-	-	0	4	338	78.0	450	334.2	1.05	0	-
9	7	400	71.5	721	381.7	1.04	29	12	406	64.5	713	324.1	1.00	67	19	403	65.2	716	335.8	1.01	32	1.7
10	16	437	46.8	847	229.1	1.00	44	13	405	46.0	735	277.9	1.06	15	29	423	48.5	797	253.9	1.03	31	0.8
11	11	429	51.1	855	299.5	1.05	18	18	457	57.2	1047	352.9	1.05	44	29	447	55.8	974	341.6	1.05	34	1.6
12	24	462	51.4	1029	352.6	1.00	54	21	459	58.3	1045	440.1	1.03	43	45	461	54.1	1037	391.3	1.01	49	0.9
13	14	483	33.0	1232	319.6	1.07	79	21	498	39.9	1290	338.6	1.03	62	35	492	37.5	1267	327.6	1.05	73	1.5
14	13	508	42.1	1369	349.1	1.03	69	10	522	46.3	1565	360.6	1.09	70	23	514	43.5	1454	359.9	1.05	70	0.8
15	13	495	56.6	1373	421.1	1.09	69	8	544	36.9	1781	524.4	1.08	100	21	514	54.5	1529	493.9	1.09	81	0.6
16	11	531	31.5	1568	286.6	1.04	100	8	521	38.0	1456	359.0	1.02	88	19	527	33.8	1521	314.6	1.03	95	0.7
17	9	550	43.0	1789	534.4	1.05	100	11	562	87.7	2018	1061.7	1.05	100	20	557	69.8	1915	852.7	1.05	100	1.2
18	9	546	27.5	1778	298.0	1.09	100	6	554	26.0	1733	273.3	1.01	100	15	549	26.3	1760	279.2	1.06	100	0.7
19	7	575	60.0	2050	780.0	1.04	100	5	590	57.6	2150	310.7	1.01	100	12	581	56.8	2092	666.7	1.04	100	0.7
20	11	619	88.7	2755	1769.2	1.06	100	7	585	7.4	2021	310.7	1.01	100	18	606	70.2	2469	1418.0	1.04	100	0.6
21	9	605	52.8	2389	742.8	1.06	100	11	605	56.5	2400	968.8	1.04	100	20	605	53.5	2395	852.2	1.05	100	1.2
22	7	596	43.5	2314	762.0	1.07	100	2	680	93.3	3575	1378.9	1.11	100	9	614	62.4	2594	991.0	1.08	100	0.3
23	4	614	62.2	2600	1070.0	1.08	100	3	589	64.6	2283	945.2	1.08	100	8	615	64.3	2600	958.0	1.07	-	0.8
24	2	570	10.6	1725	106.1	0.93	100	2	744	120.9	4550	2404.2	1.05	100	4	657	122.5	3138	2142.6	0.99	100	1.0
25	2	580	95.5	2350	1343.5	1.13	100	2	647	2.1	2675	106.1	0.99	100	4	613	67.3	2513	800.4	1.06	100	1.0
26	3	592	50.5	2133	1027.5	0.97	67	1	627	-	2800	-	1.14	100	4	601	44.7	2300	902.8	1.01	75	0.3
27	5	676	91.9	3790	1646.7	1.18	100	3	674	75.7	3517	1546.2	1.10	100	8	675	80.4	3688	1500.9	1.15	100	0.6
28	5	685	122.3	4080	2315.3	1.13	100	3	635	9.5	2583	57.3	1.01	100	8	666	96.0	3519	1914.2	1.09	100	0.6
29	1	573	-	1750	-	0.93	100	1	703	-	3550	-	1.02	100	2	638	91.9	2650	1272.8	0.98	100	1.0
30	1	762	-	5150	-	1.16	100	1	642	-	2900	-	1.10	100	2	702	84.9	4025	1591.0	1.13	100	1.0
31	1	667	-	3300	-	1.11	100	2	703	41.0	3900	919.2	1.11	100	3	691	35.7	3700	736.5	1.11	100	2.0
32	2	570	10.6	2000	282.8	1.09	100	1	850	-	5550	-	0.90	100	3	663	162.1	3183	2059.3	1.03	100	0.5
33	1	790	-	5050	-	1.02	100	2	746	116.0	5375	2793.1	1.23	100	3	761	85.8	5267	1983.9	1.16	100	2.0
35	1	690	-	3550	-	1.08	100	2	726	90.5	4500	2828.4	1.09	100	3	714	67.3	4183	2073.8	1.09	100	2.0
36	-	-	-	-	-	-	-	1	674	-	3350	-	1.09	100	1	674	-	3350	-	1.09	100	-
41	-	-	-	-	-	-	-	1	839	-	7450	-	1.26	100	1	839	-	7450	-	1.26	100	-
42	-	-	-	-	-	-	-	1	860	-	5950	-	0.94	100	1	860	-	5950	-	0.94	100	-
53	-	-	-	-	-	-	-	1	786	-	4900	-	1.01	100	1	786	-	4900	-	1.01	100	-
Total	197					-	72	182					-	70	384[a]						-	0.9
Mean	16.2[b]	516	106.0	1658	1152.6	1.05		16.4[b]	529	110.1	1776	1284.9	1.04		16.2[b]	519	112.8	1702	1224.9	1.05		

[a] Includes fish not sexed.

[b] Indicates mean age.

Table 11. Total annual mortality rates for lake trout and lake whitefish (sexes combined) from Kasba Lake, 1979.

Species	N	Age-classes used	Survival	SE of S	95% C.I. of S	Mortality Rate(A)
Lake trout[a]	384	13-33	0.85	0.01	0.83-0.87	0.15
Lake whitefish	279	9-15	0.45	0.04	0.37-0.53	0.55

[a] Moving mean.

Table 12. Fecundity of lake trout from Kasba Lake, 1979.

Date	Fork Length (mm)	Weight (g)	Ovum Diameter (mm)	Total Ovum Count
11 July	562	2200	3.5	2088
14 July	655	3350	3.4	4319
16 July	732	4550	4.2	4973
16 July	761	5300	4.0	6061
21 July	839	7450	4.2	9195
1 August	828	7350	3.9	8445
2 August	582	2100	4.6	2135
11 August	523	1350	3.1	1905
11 August	526	1550	4.1	2053
13 August	534	1500	3.8	1936
13 August	609	2500	4.5	2689
13 August	519	1600	4.9	1924
14 August	621	2550	4.2	1905
21 August	501	1300	4.5	1657
21 August	493	1200	4.6	1270
21 August	563	1800	4.8	2191
22 August	602	2300	5.1	3441
22 August	527	1650	5.1	1912
23 August	534	1550	3.8	2008
24 August	598	2300	4.9	1656
24 August	560	1850	4.8	2241
24 August	565	1850	5.2	2520
24 August	569	2100	5.3	1447
30 August	663	-	5.4	2848
30 August	608	-	4.7	3776
31 August	697	-	5.1	4151
31 August	624	-	5.6	3581
Mean	607	2663	4.5	3123

Table 13. Biological data by length interval for lake whitefish caught by experimental nets from Kasba Lake, 1979.

Length Interval (mm)	Males							Females							Total							F/M Ratio
	N	Length(mm) Mean	SD	Weight(g) Mean	SD	K	% Mat.	N	Length(mm) Mean	SD	Weight(g) Mean	SD	K	% Mat.	N	Length(mm) Mean	SD	Weight(g) Mean	SD	K	% Mat.	
140-159	1	159	-	50	-	1.24	0	-	-	-	-	-	-	-	1	159	-	50	-	1.24	0	-
160-179	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
180-199	1	186	-	50	-	0.78	0	1	195	-	50	-	0.67	0	3	191	0.5	667	28.9	0.96	-	1
200-219	4	212	0.5	100	0.0	1.06	0	2	215	0.1	100	0.0	1.01	0	6	213	0.4	100	0.0	1.04	0	0.5
220-239	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
240-259	1	251	-	200	-	1.26	0	1	242	-	150	-	1.06	0	2	247	0.6	175	35.4	1.16	0	1
260-279	6	273	0.5	225	27.4	1.11	0	2	276	0.1	250	0.0	1.20	0	8	273	0.4	231	25.9	1.13	0	0.3
280-299	19	291	0.5	284	33.6	1.15	0	3	296	0.2	333	28.9	1.29	0	22	292	0.5	291	36.6	1.17	0	0.2
300-319	19	308	0.7	361	42.7	1.23	11	20	311	0.6	363	35.8	1.20	10	39	309	0.7	362	38.8	1.22	10	1.1
320-339	18	330	0.5	439	43.9	1.22	28	14	328	0.6	439	62.6	1.24	57	32	329	0.6	439	52.0	1.23	41	0.8
340-359	27	349	0.6	520	44.4	1.23	30	29	349	0.6	534	42.5	1.25	66	56	349	0.6	528	43.6	1.24	48	1.1
360-379	17	369	0.6	638	67.4	1.27	65	15	368	0.6	630	84.1	1.26	93	32	369	0.6	634	74.5	1.26	78	0.9
380-399	27	391	0.6	754	53.6	1.26	63	20	389	0.7	758	69.3	1.28	95	47	390	0.6	755	60.1	1.27	77	0.7
400-419	25	409	0.6	880	72.2	1.29	84	21	411	0.6	902	73.3	1.30	100	46	410	0.6	890	72.7	1.29	91	0.8
420-439	21	431	0.6	1026	80.0	1.28	95	20	429	0.6	998	78.6	1.27	95	41	430	0.6	1012	79.7	1.28	95	1.0
440-459	23	449	0.5	1180	102.0	1.30	96	11	451	0.5	1186	155.1	1.29	100	34	450	0.5	1182	119.3	1.30	97	0.5
460-479	8	471	0.5	1381	148.7	1.32	88	13	469	0.6	1438	121.0	1.39	100	21	470	0.6	1417	131.7	1.36	95	1.6
480-499	11	490	0.5	1632	118.9	1.39	100	11	490	0.7	1668	169.2	1.42	100	22	490	0.6	1650	143.9	1.40	100	1.0
500-519	12	511	0.6	1721	182.7	1.29	100	12	509	0.7	1708	202.1	1.29	100	24	510	0.6	1715	188.5	1.29	100	1.0
520-539	12	527	0.5	1933	164.2	1.32	100	14	528	0.5	2082	288.6	1.41	100	26	528	0.5	2013	246.8	1.37	100	1.2
540-559	1	542	-	2000	-	1.26	100	7	555	0.6	2257	375.8	1.32	100	8	553	0.7	2225	359.6	1.31	100	7.0
560-579	-	-	-	-	-	-	-	1	560	-	2250	-	1.28	100	1	560	-	2250	-	1.28	100	-
580-599	1	586	-	2800	-	1.39	100	-	-	-	-	-	-	-	1	586	-	2800	-	1.39	100	-
600-619	-	-	-	-	-	-	-	1	602	-	2750	-	1.26	100	1	602	-	2750	-	1.26	100	-
Total	254						59	218						79	473[a]						68	0.9
Mean		340	7.7	850	511.2	1.26			407	7.8	986	597.3	1.28			397	7.9	911	556.9	1.27		

[a] Includes fish not sexed.

Table 14. Biological data by age group for lake whitefish caught by experimental nets from Kasba Lake, 1979.

Age (Yr)	Males N	Males Length(mm) Mean	Males Length(mm) SD	Males Weight(g) Mean	Males Weight(g) SD	Males K	Males % Mat.	Females N	Females Length(mm) Mean	Females Length(mm) SD	Females Weight(g) Mean	Females Weight(g) SD	Females K	Females % Mat.	Total N	Total Length(mm) Mean	Total Length(mm) SD	Total Weight(g) Mean	Total Weight(g) SD	Total K	Total % Mat.	F/M Ratio
2	1	159	-	50	-	1.24	0	1	195	-	50	-	0.67	0	3	182	2.0	67	28.9	1.12	-	1.0
3	3	239	4.3	150	86.6	1.03	0	2	228	2.0	125	35.4	1.04	0	5	235	3.3	140	65.2	1.03	0	0.7
4	9	287	2.7	294	95.0	1.20	11	9	307	3.8	372	120.2	1.22	33	18	297	3.3	333	112.5	1.21	22	1.0
5	22	331	3.4	468	172.9	1.25	18	21	333	2.5	464	138.9	1.23	38	43	332	3.0	466	155.3	1.24	28	1.0
6	32	365	2.4	609	134.1	1.24	44	19	363	2.9	613	148.0	1.27	84	51	364	2.6	611	138.0	1.25	59	0.6
7	14	420	5.0	971	395.5	1.26	71	22	402	3.0	839	212.7	1.26	95	36	409	3.9	890	299.2	1.26	86	1.6
8	25	438	3.6	1144	365.0	1.32	88	18	422	3.6	1025	314.9	1.33	100	43	431	3.6	1094	346.1	1.32	93	0.7
9	16	454	3.9	1272	346.4	1.33	94	24	470	4.7	1494	491.5	1.39	96	40	463	4.4	1405	448.0	1.37	95	1.5
10	14	484	4.7	1543	488.3	1.32	100	7	514	2.9	1786	310.5	1.31	100	21	494	4.4	1624	444.6	1.32	100	0.5
11	5	488	5.3	1660	539.0	1.37	100	9	531	2.6	2050	487.3	1.35	100	14	516	4.2	1911	522.6	1.36	100	1.8
12	-	-	-	-	-	-	-	4	537	1.4	1963	165.2	1.27	100	4	537	1.4	1963	165.2	1.27	100	-
15	-	-	-	-	-	-	-	1	602	-	2750	-	1.26	100	1	602	-	2750	-	1.26	100	-
Total	141						60	137						80	279[a]						70	1.0
Mean	7.0[b]	395	75.4	889	517.6	1.27		7.4[b]	410	82.0	1017	629.6	1.29		7.2[b]	402	79.8	949	579.2	1.28		

[a] Includes fish not sexed.

[b] Indicates mean age.

Table 15. Biological data by length interval for Arctic grayling angled from Kasba Lake, 1979.

Length Interval (mm)	Males N	Males Length(mm) Mean	Males Length(mm) SD	Males Weight(g) Mean	Males Weight(g) SD	Males K	Males % Mat.	Females N	Females Length(mm) Mean	Females Length(mm) SD	Females Weight(g) Mean	Females Weight(g) SD	Females K	Females % Mat.	Total N	Total Length(mm) Mean	Total Length(mm) SD	Total Weight(g) Mean	Total Weight(g) SD	Total K	Total % Mat.	F/M Ratio
340-359	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	345	-	500	-	1.22		-
360-379	2	375	2.1	625	35.4	1.19	100	2	371	9.9	625	35.4	1.22	100	4	373	6.2	625	28.9	1.21	100	1.0
380-399	2	383	3.5	700	0.0	1.25	100	-	-	-	-	-	-	-	2	383	3.5	700	0.0	1.25	100	-
400-419	2	407	8.5	800	0.0	1.19	100	-	-	-	-	-	-	-	4	407	4.9	875	86.6	1.30	-	-
420-439	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	434	4.9	1250	70.7	1.54	-	-
440-459	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	446	5.6	1210	65.2	1.37	-	-
460-479	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	465	-	1500	-	1.49	-	-
Total	6						100	2						100	19[a]						-	0.3
Mean		388	15.7	708	80.1	1.21			371	9.9	625	35.4	1.22			410	35.1	945	301.8	1.32		

[a] Includes fish not sexed.

Table 16. Biological data by age group for Arctic grayling angled from Kasba Lake, 1979.

Age (Yr)	Males N	Males Length(mm) Mean	Males Length(mm) SD	Males Weight(g) Mean	Males Weight(g) SD	Males K	Males % Mat.	Females N	Females Length(mm) Mean	Females Length(mm) SD	Females Weight(g) Mean	Females Weight(g) SD	Females K	Females % Mat.	Total N	Total Length(mm) Mean	Total Length(mm) SD	Total Weight(g) Mean	Total Weight(g) SD	Total K	Total % Mat.	F/M Ratio
5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	345	-	500	-	1.22	-	-
6	1	376	-	650	-	1.22	100	2	371	9.9	625	35.4	1.22	100	3	373	7.6	633	28.9	1.22	100	2.0
7	3	379	6.0	667	57.7	1.22	100	-	-	-	-	-	-	-	3	379	6.0	667	57.7	1.22	100	-
8	2	407	8.5	800	0.0	1.19	100	-	-	-	-	-	-	-	2	407	8.5	800	0.0	1.19	100	-
Total	6						100	2						100	9[a]						-	0.3
Mean	7.2[b]	388	15.7	708	80.1	1.21		6.0[b]	371	9.9	625	35.4	1.22		6.7[b]	379	19.7	667	96.8	1.21		

[a] Includes fish not sexed.

[b] Indicates mean age.

Table 17. Biological data by length interval for northern pike caught by experimental nets from Kasba Lake, 1979.

Length Interval (mm)	Males N	Males Length(mm) Mean	Males Length(mm) SD	Males Weight(g) Mean	Males Weight(g) SD	Males K	Males % Mat.	Females N	Females Length(mm) Mean	Females Length(mm) SD	Females Weight(g) Mean	Females Weight(g) SD	Females K	Females % Mat.	Total N	Total Length(mm) Mean	Total Length(mm) SD	Total Weight(g) Mean	Total Weight(g) SD	Total K	Total % Mat.	F/M Ratio
440 - 459	1	456	-	1000	-	1.06	100	-	-	-	-	-	-	-	1	456	-	1000	-	1.06	100	-
680 - 699	1	683	-	2800	-	0.88	100	-	-	-	-	-	-	-	1	683	-	2800	-	0.88	100	-
720 - 739	1	730	-	1850	-	0.48	100	1	721	-	2250	-	0.60	100	2	726	6.4	2050	282.8	0.54	100	1.0
740 - 759	2	751	10.6	2925	388.9	0.69	100	1	746	-	3150	-	0.76	100	3	749	7.9	3000	304.1	0.72	100	0.5
760 - 779	1	765	-	3050	-	0.68	100	1	777	-	2400	-	0.51	100	2	771	8.5	2725	459.6	0.60	100	1.0
780 - 799	1	791	-	3800	-	0.77	100	1	781	-	3400	-	0.71	100	2	786	7.1	3600	282.8	0.74	100	1.0
800 - 819	1	819	-	4150	-	0.76	100	-	-	-	-	-	-	-	1	819	-	4150	-	0.76	100	-
880 - 899	3	885	7.0	4500	409.3	0.65	100	-	-	-	-	-	-	-	3	885	7.0	4500	409.3	0.65	100	-
940 - 959	2	945	7.1	6525	388.9	0.77	100	1	946	-	6750	-	0.80	100	3	945	5.0	6600	304.1	0.78	100	0.5
960 - 979	-	-	-	-	-	-	-	1	965	-	7050	-	0.79	100	1	965	-	7050	-	0.79	100	-
Total	13						100	6						100	19						100	0.5
Mean		792	131.2	3773	1628.1	0.73			823	105.4	4167	2163.5	0.69			801	121.6	3897	1761.4	0.72		

Table 18. Biological data by age group for northern pike caught by experimental nets from Kasba Lake, 1979.

Age (Yr)	Males							Females							Total							F/M Ratio
		Length(mm)		Weight(g)			%		Length(mm)		Weight(g)			%		Length(mm)		Weight(g)			%	
	N	Mean	SD	Mean	SD	K	Mat.	N	Mean	SD	Mean	SD	K	Mat.	N	Mean	SD	Mean	SD	K	Mat.	
5	1	456	-	1000	-	1.06	100	-	-	-	-	-	-	-	1	456	-	1000	-	1.06	100	-
8	2	713	42.4	3000	282.8	0.83	100	1	721	-	2250	-	0.60	100	3	716	30.4	2750	477.0	0.75	100	0.5
10	1	765	-	3050	-	0.68	100	1	781	-	3400	-	0.71	100	2	773	11.3	3225	247.5	0.70	100	1.0
13	3	873	124.2	4967	2713.1	0.67	100	2	762	21.9	2775	530.3	0.64	100	5	829	107.7	4090	2278.5	0.66	100	0.7
15	2	819	86.3	3400	1060.7	0.61	100	-	-	-	-	-	-	-	2	819	86.3	3400	1060.7	0.61	100	-
16	1	819	-	4150	-	0.76	100	-	-	-	-	-	-	-	1	819	-	4150	-	0.76	100	-
17	2	842	72.1	4375	813.2	0.73	100	-	-	-	-	-	-	-	2	842	72.1	4375	813.2	0.73	100	-
18	1	882	-	4400	-	0.64	100	-	-	-	-	-	-	-	1	882	-	4400	-	0.64	100	-
Total	13						100	4						100	17						100	0.3
Mean	12.9[a]	796	131.2	3773	1628.1	0.73		11.0[a]	756	28.2	2800	561.2	0.65		12.5[a]	783	115.3	3544	1492.7	0.71		

[a]Indicates mean age

Table 19. Biological data by length interval for cisco caught by experimental nets from Kasba Lake, 1979.

Length Interval (mm)	Males							Females							Total							F/M Ratio
		Length(mm)		Weight(g)			%		Length(mm)		Weight(g)			%		Length(mm)		Weight(g)			%	
	N	Mean	SD	Mean	SD	K	Mat.	N	Mean	SD	Mean	SD	K	Mat.	N	Mean	SD	Mean	SD	K	Mat.	
130-139	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	132	2.1	25	0.0	1.10	-	-
140-149	-	-	-	-	-	-	-	1	145	-	25	-	0.82	0	1	145	-	25	-	0.82	0	-
150-159	9	157	1.7	47	8.3	1.21	11	4	158	1.7	50	0.0	1.28	50	14	158	1.6	48	6.7	1.23	-	0.4
160-169	54	165	3.0	50	0.0	1.11	35	37	166	2.4	50	0.0	1.10	32	95	165	2.8	50	0.0	1.11	-	0.7
170-179	49	174	3.0	52	6.9	0.98	53	53	174	2.8	50	3.4	0.96	51	104	174	2.9	51	5.4	0.97	-	1.1
180-189	26	185	2.8	65	18.8	1.02	77	18	184	2.4	53	11.8	0.85	72	44	185	2.8	60	17.3	0.96	75	0.7
190-199	17	194	2.9	84	19.6	1.14	88	15	194	2.9	75	23.1	1.03	80	33	194	2.8	80	21.4	1.10	-	0.9
200-209	10	204	3.2	98	7.9	1.15	90	11	204	2.4	95	15.1	1.12	100	21	204	2.8	96	12.0	1.14	95	1.1
210-219	4	215	3.3	100	0.0	1.01	100	-	-	-	-	-	-	-	4	215	3.3	100	0.0	1.01	100	-
220-229	1	220	-	150	-	1.41	100	-	-	-	-	-	-	-	1	220	-	150	-	1.41	100	-
280-289	-	-	-	-	-	-	-	1	281	-	250	-	1.13	100	1	281	-	250	-	1.13	100	-
290-299	1	296	-	300	-	1.16	100	1	297	-	300	-	1.15	100	2	297	0.7	300	0.0	1.15	100	1.0
300-309	2	305	6.4	375	35.4	1.33	100	-	-	-	-	-	-	-	2	305	6.4	375	35.4	1.33	100	-
310-319	1	310	-	400	-	1.34	100	1	314	-	400	-	1.29	100	2	312	2.8	400	0.0	1.32	100	1.0
320-329	-	-	-	-	-	-	-	1	326	-	500	-	1.44	100	1	326	-	500	-	1.44	100	-
330-339	1	330	-	500	-	1.39	100	5	334	2.7	500	35.4	1.34	100	6	334	3.0	500	31.6	1.34	100	5.0
340-349	6	348	1.6	542	37.6	1.29	83	4	345	3.3	588	75.0	1.43	100	11	346	2.5	555	56.8	1.33	-	0.7
350-359	2	354	1.4	600	70.7	1.35	100	5	355	3.3	610	41.8	1.37	100	7	355	2.8	607	45.0	1.36	100	2.5
360-369	3	364	2.6	567	57.7	1.18	100	1	364	-	600	-	1.24	100	4	364	2.2	575	50.0	1.19	100	0.3
370-379	-	-	-	-	-	-	-	1	377	-	750	-	1.40	100	1	377	-	750	-	1.40	100	-
Total	186						59	159						61	356[a]						-	0.9
Mean		191	48.1	99	129.7	1.09			197	55.8	117	165.4	1.05			194	52.0	107	146.8	1.07		

[a] Includes fish not sexed.

Table 20. Biological data by age group for cisco caught by experimental nets from Kasba Lake, 1979.

Age (Yr)	Males N	Males Length(mm) Mean	Males Length(mm) SD	Males Weight(g) Mean	Males Weight(g) SD	Males K	Males % Mat.	Females N	Females Length(mm) Mean	Females Length(mm) SD	Females Weight(g) Mean	Females Weight(g) SD	Females K	Females % Mat.	Total N	Total Length(mm) Mean	Total Length(mm) SD	Total Weight(g) Mean	Total Weight(g) SD	Total K	Total % Mat.	F/M Ratio
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	130	-	25	-	1.14	-	-
2	76	171	10.0	55	12.7	1.08	38	55	172	7.9	50	3.4	1.00	55	134	172	9.1	53	10.0	1.05	-	0.7
3	35	191	29.1	81	76.3	1.05	89	40	187	13.4	68	23.3	1.01	88	76	188	22.8	74	54.8	1.03	-	1.1
4	4	256	48.4	225	119.0	1.24	100	-	-	-	-	-	-	-	4	256	48.4	225	119.0	1.24	100	-
5	2	330	27.6	450	70.7	1.26	100	6	295	64.4	367	172.2	1.26	83	9	308	56.0	400	147.9	1.25	-	3.0
6	4	339	20.1	513	75.0	1.31	100	8	345	10.6	575	70.7	1.40	100	12	343	13.8	554	75.3	1.37	100	2.0
7	2	352	4.2	600	70.7	1.37	100	5	356	12.3	620	83.7	1.37	100	7	355	10.4	614	74.8	1.37	100	2.5
8	2	364	3.5	600	0.0	1.25	100	1	359	-	600	-	1.30	100	3	362	3.6	600	0.0	1.27	100	0.5
9	1	348	-	600	-	1.42	100	-	-	-	-	-	-	-	1	348	-	600	-	1.42	100	-
Total	126						60	115						65	247[a]						-	0.9
Mean	2.7[b]	195	53.2	110	146.8	1.09		3.1[b]	206	62.9	140	189.5	1.06		2.9[b]	200	58.7	124	168.9	1.08		

[a] Includes fish not sexed.

[b] Indicates mean age.

Table 21. Biological data by length interval for round whitefish caught by experimental nets from Kasba Lake, 1979.

Length Interval (mm)	Males N	Males Length(mm) Mean	Males Length(mm) SD	Males Weight(g) Mean	Males Weight(g) SD	Males K	Males % Mat.	Females N	Females Length(mm) Mean	Females Length(mm) SD	Females Weight(g) Mean	Females Weight(g) SD	Females K	Females % Mat.	Total N	Total Length(mm) Mean	Total Length(mm) SD	Total Weight(g) Mean	Total Weight(g) SD	Total K	Total % Mat.	F/M Ratio
180-199	-	-	-	-	-	-	-	1	194	-	50	-	0.69	0	1	194	-	50	-	0.69	0	-
200-219	4	208	7.4	94	12.5	1.05	0	6	211	7.1	100	0.0	1.07	0	11	210	6.7	98	7.5	1.06	-	1.5
220-239	3	228	6.7	100	0.0	0.85	0	6	228	4.5	108	20.4	0.92	0	9	228	4.9	106	16.7	0.90	0	2.0
240-259	-	-	-	-	-	-	-	2	248	3.5	100	0.0	0.66	0	2	248	3.5	100	0.0	0.66	0	-
260-279	1	276	-	150	-	0.71	0	-	-	-	-	-	-	-	1	276	-	150	-	0.71	0	-
280-299	2	291	8.5	225	35.4	0.91	50	1	283	-	200	-	0.88	100	3	288	7.6	217	28.9	0.90	67	0.5
300-319	1	318	-	350	-	1.09	100	1	313	-	300	-	0.98	100	2	316	3.5	325	35.4	1.03	100	1.0
320-339	2	333	0.7	375	35.4	1.02	100	1	327	-	300	-	0.86	100	3	331	3.2	350	50.0	0.97	100	0.5
340-359	-		-	-	-	-	-	1	342	-	350	-	0.88	100	1	342	-	350	-	0.88	100	-
Total	13						38	19						21	33[a]						-	1.5
Mean		258	50.3	183	116.1	0.95			241	43.2	139	84.3	0.92			247	45.9	155	98.0	0.94		

[a] Includes fish not sexed.

Table 22. Biological data by age group for round whitefish caught by experimental nets from Kasba Lake, 1979.

Age (yr)	Males							Females							Total							F/M Ratio
	N	Length(mm) Mean	Length(mm) SD	Weight(g) Mean	Weight(g) SD	K	% Mat.	N	Length(mm) Mean	Length(mm) SD	Weight(g) Mean	Weight(g) SD	K	% Mat.	N	Length(mm) Mean	Length(mm) SD	Weight(g) Mean	Weight(g) SD	K	% Mat.	
4	-	-	-	-	-	-	-	3	203	10.3	B3	28.9	0.99	0	3	203	10.3	83	28.9	0.99	0	-
5	8	224	24.1	103	20.9	0.93	0	10	226	14.1	100	0.0	0.89	0	19	224	18.3	101	13.1	0.92	-	1.3
6	-	-	-	-	-	-	-	1	283	-	200	-	0.88	100	1	283	-	200	-	0.88	100	-
7	2	291	8.5	225	35.4	0.91	50	2	328	20.5	325	35.4	0.93	100	4	309	24.7	275	64.5	0.92	75	1.0
8	3	328	8.4	367	28.9	1.04	100	-	-	-	-	-	-	-	3	328	8.4	367	28.9	1.04	100	-
10	-	-	-	-	-	-	-	1	327	-	300	-	0.86	100	1	327	-	300	-	0.86	100	-
Total	13						75	17						76	31[a]						-	1.3
Mean	6.0[b]	258	50.3	183	116.1	0.95		5.4[b]	243	45.5	141	88.8	0.91		5.6[b]	248	47.1	157	100.7	0.93		

[a] Includes fish not sexed.

[b] Indicates mean age.

Table 23. Biological data by length interval for longnose suckers caught by experimental nets from Kasba Lake, 1979.

Length Interval (mm)	Males							Females							Total							F/M Ratio
		Length(mm)		Weight(g)			%		Length(mm)		Weight(g)			%		Length(mm)		Weight(g)			%	
	N	Mean	SD	Mean	SD	K	Mat.	N	Mean	SD	Mean	SD	K	Mat.	N	Mean	SD	Mean	SD	K	Mat.	
140- 159	2	155	0.0	50	0.0	1.34	0	-	-	-	-	-	-	-	13	156	2.9	50	0.0	1.33	-	-
160- 179	3	168	2.0	50	0.0	1.06	0	1	169	-	50	-	1.04	0	25	168	6.1	50	0.0	1.05	-	0.3
180- 199	1	180	-	100	-	1.71	100	-	-	-	-	-	-	-	3	184	5.5	75	25.0	1.22	-	-
220- 239	3	231	6.8	183	28.9	1.48	33	1	236	-	200	-	1.52	0	8	233	5.2	188	23.1	1.47	-	0.3
240- 259	4	257	1.7	200	0.0	1.18	0	2	254	2.8	200	70.7	1.21	100	8	256	2.3	213	44.3	1.27	-	0.5
260- 279	9	272	5.2	261	33.3	1.29	30	9	270	5.6	261	48.6	1.33	56	21	270	5.7	260	37.5	1.31	-	1.0
280- 299	8	295	2.7	319	25.9	1.25	17	9	289	4.5	300	25.0	1.24	44	20	292	5.1	313	31.9	1.26	-	1.1
300- 319	6	310	6.3	383	40.8	1.29	60	9	313	5.9	378	26.4	1.24	90	16	311	5.9	381	31.0	1.26	-	1.5
320- 339	4	325	6.1	450	40.8	1.31	100	11	329	5.6	432	25.2	1.21	82	18	329	6.1	447	40.1	1.25	-	2.8
340- 359	14	348	4.3	521	50.8	1.23	92	8	350	4.2	538	23.1	1.26	90	24	348	4.4	525	41.7	1.24	-	0.6
360- 379	7	368	5.4	629	26.7	1.26	86	12	372	4.4	650	52.2	1.27	92	20	371	5.1	648	49.9	1.27	-	1.7
380- 399	3	391	7.9	750	0.0	1.26	100	9	389	6.7	800	86.6	1.35	100	12	390	6.7	788	77.2	1.33	100	3.0
400- 419	5	406	8.3	880	120.4	1.31	100	6	406	7.1	817	51.6	1.23	100	11	406	7.3	845	90.7	1.27	100	1.2
420- 439	4	432	3.9	1100	40.8	1.36	100	5	428	7.2	1080	57.0	1.38	100	9	430	6.0	1089	48.6	1.37	100	1.3
440- 459	3	448	4.6	1233	76.4	1.37	100	6	446	4.2	1150	54.8	1.30	100	9	447	4.2	1178	71.2	1.32	100	2.0
460- 479	2	463	0.7	1225	35.6	1.24	100	2	466	0.7	1325	35.4	1.31	100	4	464	1.8	1275	64.5	1.28	100	1.0
500- 519	-	-	-	-	-	-	-	1	504	-	1700	-	1.33	100	1	504	-	1700	-	1.33	100	-
Total	78						62	91						83	222[a]						-	1.2
Mean		325	74.6	508	321.8	1.28			350	62.3	601	324.7	1.27			308	87.6	463	341.9	1.26		

[a] Includes fish not sexed.

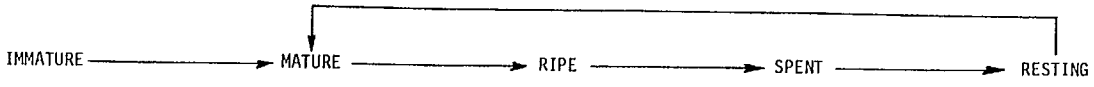
Table 24. Biological data by length interval for white suckers caught by experimental nets from Kasba Lake, 1979.

Length Interval (mm)	Males							Females							Total							F/M Ratio
	N	Length(mm) Mean	SD	Weight(g) Mean	SD	K	% Mat.	N	Length(mm) Mean	SD	Weight(g) Mean	SD	K	% Mat.	N	Length(mm) Mean	SD	Weight(g) Mean	SD	K	% Mat.	
160 - 179	-	-	-	-	-	-	-	1	171	-	50	-	1.00	0	5	169	4.7	50	0.0	1.04	-	-
180 - 199	-	-	-	-	-	-	-	1	181	-	50	-	0.84	100	1	181	-	50	-	0.84	100	-
220 - 249	-	-	-	-	-	-	-	2	235	0.0	200	0.0	1.54	0	2	235	0.0	200	0.0	1.54	0	-
240 - 259	10	248	7.3	205	28.4	1.34	20	5	254	3.2	240	22.4	1.47	25	15	250	6.7	217	30.9	1.38	21	0.5
260 - 279	6	268	6.4	267	40.8	1.38	33	1	270	-	300	-	1.52	100	7	268	5.9	271	39.3	1.40	43	0.2
280 - 299	6	289	7.3	342	37.6	1.41	33	5	288	6.7	360	22.4	1.51	80	11	289	6.7	350	31.6	1.46	60	0.8
300 - 319	10	308	6.2	405	43.8	1.39	40	5	311	4.2	420	27.4	1.39	80	15	309	5.7	410	38.7	1.39	53	0.5
320 - 339	6	328	5.0	508	20.4	1.44	100	4	328	4.5	538	25.0	1.53	100	10	328	4.6	520	25.8	1.47	100	0.7
340 - 359	2	354	2.1	700	0.0	1.58	100	1	342	-	600	-	1.50	100	3	350	6.8	667	57.7	1.56	100	0.5
380 - 399	1	380	-	900	-	1.64	100	-	-	-	-	-	-	-	1	380	-	900	-	1.64	100	-
420 - 439	1	433	-	1250	-	1.54	100	-	-	-	-	-	-	-	1	433	-	1250	-	1.54	100	-
Total	42						48	25						67	71[a]						55	0.6
Mean		295	41.2	389	207.6	1.40			280	44.6	346	147.8	1.44			283	50.1	355	197.0	1.40		

[a] Includes fish not sexed.

Appendix 1. A description of the relative stages of maturity used for northern fish.

MATURITY FLOW CHART



FISH MATURITY CODE

Maturity Stage		Female		Male
Immature (virgin)	1	-Ovaries granular in texture -hard and triangular in shape -up to full length of body cavity -membrane firm -eggs distinguishable	6	-Testes long and thin -tubular and scalloped shape -up to full body length -putty like firmness
Mature	2	-Current year spawner -ovary fills body cavity -eggs near full size but not loose -not expelled by pressure	7	-Current year spawner -testes large and lobate -white to purplish color -centers may be fluid -milt not expelled by pressure
Ripe	3	-Ovaries greatly extended & fill body cavity -eggs full size and transparent -expelled by slight pressure	8	-Testes full size -white and lobate -milt expelled by slight pressure
Spent	4	-Spawning complete -ovaries ruptured and flaccid -seed eggs visible -some retained eggs in body cavity	9	-Spawning complete -testes flaccid with some milt -blood vessels obvious -testes violet-pink in color
Resting	5	-Ovary 40-50% of body cavity -membrane thin, loose, & semi-transparent -healed from spawning -seed eggs apparent with few atretic eggs -some eggs may be retained in body cavity	10	-Testes tubular, less lobate -healed from spawning -no fluid in center -usually full length -mottled and purplish in color
Unknown (Virgin)	0	-cannot be sexed -gonads long or short & thin -transparent or translucent		
Unknown (non-virgin)	11	-resting fish -has spawned but gonads regenerated -sexing not possible		

Appendix 2. Summary of information pertaining to lodge operation and creel census survey at Kasba Lake Lodge, 1978.

Location	Lodge Operation					Creel Census				
	Period	Duration (days)	No. Guests Calculated	No. Guests License Sale [a]	Angler-days	Period	Duration Total	Duration Censused	No. Anglers	Angler-days	Angler-hours
Kasba Lake	2 August-7 September	38	83	-	267	2 August-7 September	38	38 (100)	83	267	1549

[a] Provided by Dept. Renewable Resource, Government of Northwest Territories.
( ) Percent census days actually worked.

Appendix 3. Summary of harvest statistics for Kasba Lake, 1978.

Location	Species	Census harvest [a]		Total harvest [b]		Harvest per-					
						Hectare fished		Hectare available		Angler	
		No.	Wt.	No.	Wt.	No.	Wt. (kg)	No.	Wt. (kg)	No.	Wt. (kg)
Kasba Lake	Lake Trout	232	-	661	-	-	-	<0.01	-	7.06	-
	Arctic grayling	41	-	-	-	-	-	-	-	-	-
	Northern pike	13	-	-	-	-	-	-	-	-	-

[a] Includes fish retained.

[b] Includes fish retained, shore lunches and estimated release mortality.

Appendix 4. Observed catch, effort and catch/effort statistics by anglers during the Kasba Lake creel census, 1978.

Location	Species	Catch		Effort		Fish Per angler		Fish per Angler-day		Fish per Angler-hour	
		No.	Wt.	Days	Hours	No.	Wt.	No.	Wt.	No.	Wt.
Kasba Lake	Lake trout	2882	-			34.7	-	10.8	-	1.9	-
	Arctic grayling	279	-	267	1549	3.4	-	1.0	-	0.2	-
	Northern pike	138	-			1.7	-	0.5	-	<0.1	-

Appendix 5. Summary of information pertaining to the total harvest of fish by anglers from Kasba Lake, 1978.

Location	Species	Fish Caught	Fish Released	Release Mortality	Shore Lunches	Fish Retained	Total Harvest
Kasba Lake	Lake trout	2882	2359	198	231	232	661
	Arctic grayling	279	238	-	-	41	-
	Northern pike	138	125	-	-	13	-

Appendix 6. Summary of information pertaining to the total harvest of fish by anglers from Kasba Lake, 1979.

Location	Species		Fish Caught	Fish Released	Release Mortality	Shore Lunches	Fish Retained	Total Harvest
Kasba Lake[a]	Lake trout	No.	10079 (8562)	8940 (7594)	626	956 (812)	184 (156)	1766
		Wt.(kg)	20204	17920	1254	1918	368	3540
	Northern pike	No.	607 (516)	584 (496)	35	9 (8)	14 (12)	59
		Wt.(kg)	-	-	-	-	-	-
	Arctic grayling	No.	48 (41)	46 (39)	5	2 (2)	0 (0)	7
		Wt.(kg)	-	-	-	-	-	-
Kazen River	Lake trout	No.	460	389	5	66	5	76
		Wt.(kg)	920	778	10	132	10	152
	Northern pike	No.	2	2	0	0	0	0
		Wt.(kg)	-	-	-	-	-	-
	Arctic grayling	No.	933	808	81	82	43	206
		Wt.(kg)	-	-	-	-	-	-
Snowbird River	Lake trout	No.	23	20	1	3	0	4
		Wt.(kg)	-	-	-	-	-	-
	Northern pike	No.	102	98	6	3	1	10
		Wt.(kg)	-	-	-	-	-	-
	Arctic grayling	No.	749	684	68	56	9	133
		Wt.(kg)	-	-	-	-	-	-
Kasba Lake (Total)	Lake trout	No.	10562	9349	632	1025	189	1846
		Wt.(kg)	21124	18698	1264	2050	378	3692
	Northern pike	No.	711	684	41	12	15	69
		Wt.(kg)	-	-	-	-	-	-
	Arctic grayling	No.	1730	1538	154	140	52	346
		Wt.(kg)	-	-	-	-	-	-

[a] Estimated, 237 anglers censused.

( ) Creel census.

Appendix 7. Summary of information on sample dates, sample locations, set duration, depths and catch per unit effort for experimental gillnet sets on Kasba Lake, 1979.

Date[a]	Set Number	Location Number	Set Duration (h)	Water Depth (m)	Total Catch	CPE[b]
July 14	1	1	11.5	3	72	66.8
16	2	2	12.0	8	45	40.0
21	3	3	13.0	4	50	41.0
23	4	4	17.0	10	1	0.6
24	5	5	10.5	4	57	57.9
31	6	6	23.0	9	101	46.8
Aug. 1	7	7	18.0	10	15	8.9
3	8	8	23.0	8	13	6.0
6	9	9	26.0	6	50	20.5
6 T	10	10	19.0	4	121	-
7 T	11	10	22.0	4	76	-
8 T	12	10	21.0	4	66	-
9 T	13	10	21.5	4	74	-
10 T	14	10	21.5	4	57	-
11 T	15	10	21.5	4	37	-
12 T	16	10	22.0	4	53	-
13 T	17	11	22.0	4	100	-
13	18	12	24.0	5	87	38.7
14 T	19	11	22.5	4	70	-
15 T	20	11	22.0	5	63	-
16 T	21	10	22.0	5	81	-
16	22	13	23.0	4	140	64.9
17 T	23	10	22.0	5	81	-
18 T	24	10	22.0	5	261	-
20 T	25	10	22.0	5	54	-
21 T	26	10	22.0	5	44	-
22 T	27	13	21.0	5	66	-
22 T_2	28	3	19.0	4	34	-
24 T	29	10	46.0	5	130	-
24 T_2	30	3	47.0	5	28	-
25 T_2	31	3	22.0	5	12	-
26 T	32	10	43.0	4	87	-
27 T	33	10	29.0	5	86	-

[a] Date only indicates standard gang; T = tagging gang of 1 x 38 mm and 2 x 64 mm mesh. T_2== tagging gang of 1 x 38 mm and 1 x 64 mm mesh, each net 47.5 m long.

[b] Catch per unit effort for standard gillnet sets (No. fish per 100 m of gillnet per 24 h).

Appendix 8. Biological data by length interval for lake trout caught by all methods from Kasba Lake, 1979.

Length Interval (mm)	Males							Females							Total							F/M Ratio	Sex Unknown
	N	Length(mm) Mean	SD	Weight(g) Mean	SD	K	% Mat.	N	Length(mm) Mean	SD	Weight(g) Mean	SD	K	% Mat.	N	Length(mm) Mean	SD	Weight(g) Mean	SD	K	% Mat.		
150 - 174	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	172	-	50	-	0.98	-	-	
175 - 199	1	194	-	100	-	1.37	0	-	-	-	-	-	-	-	3	191	7.0	75	25.0	1.06	-	-	1
200 - 224	2	208	1.4	100	0.0	1.11	0	-	-	-	-	-	-	-	3	211	5.9	100	0.0	1.06	-	-	2
225 - 274	1	244	-	150	-	1.03	0	-	-	-	-	-	-	-	1	244	-	150	-	1.03	0	-	1
275 - 299	3	289	8.6	283	57.7	1.16	0	-	-	-	-	-	-	-	3	289	8.6	283	57.7	1.16	0	-	-
300 - 324	2	310	7.8	300	0.0	1.01	0	3	320	5.1	333	28.9	1.02	0	6	314	7.9	300	54.8	0.96	-	1.5	1
325 - 349	2	338	14.1	400	141.4	1.02	0	5	342	4.6	420	75.8	1.05	0	11	340	7.0	436	109.8	1.10	-	2.5	4
350 - 374	2	354	2.1	400	70.7	0.90	0	6	358	4.9	450	0.0	0.98	0	12	357	4.3	442	55.7	0.97	-	3.0	4
375 - 399	11	390	7.5	586	74.5	0.99	0	8	388	5.9	588	102.6	1.01	0	27	389	6.7	626	105.9	1.06	-	0.7	8
400 - 424	9	409	5.4	667	35.4	0.97	11	8	418	4.9	700	59.8	0.96	25	30	413	6.4	737	124.3	1.05	-	0.9	13
425 - 449	19	438	7.0	889	69.9	1.06	42	16	437	7.9	894	104.7	1.07	25	59	438	6.7	918	101.6	1.09	-	0.8	24
450 - 474	20	462	7.7	1028	120.8	1.04	55	14	462	7.8	1054	88.7	1.07	43	57	461	7.3	1058	162.5	1.08	-	0.7	23
475 - 499	19	488	7.2	1205	106.6	1.04	74	23	487	7.3	1246	169.2	1.07	70	69	488	7.5	1272	211.7	1.09	-	1.2	27
500 - 524	26	512	6.8	1417	208.3	1.05	100	29	511	8.0	1372	173.5	1.02	90	91	511	7.1	1411	170.3	1.05	-	1.1	36
525 - 549	25	534	6.7	1602	172.9	1.05	96	18	533	7.5	1536	85.4	1.02	94	85	535	7.2	1598	148.3	1.04	-	0.7	42
550 - 574	32	564	6.9	1828	249.5	1.02	100	21	564	6.8	1833	138.1	1.02	90	95	563	6.8	1823	223.8	1.03	-	0.7	42
575 - 599	15	585	7.1	2023	229.0	1.01	100	13	586	5.9	2088	253.4	1.04	100	65	586	6.6	2050	250.0	1.02	-	0.9	37
600 - 624	5	615	4.4	2690	462.9	1.16	100	12	608	7.9	2375	220.0	1.05	100	33	609	7.4	2392	370.4	1.06	-	2.4	16
625 - 649	6	642	7.0	2867	331.2	1.08	100	10	639	7.5	2715	129.2	1.04	100	30	638	7.6	2605	348.5	1.00	-	1.7	14
650 - 674	6	662	7.6	3117	129.1	1.08	100	8	665	6.9	3031	345.3	1.03	100	17	664	7.6	2994	332.5	1.03	-	1.3	3
675 - 699	3	690	8.0	3783	251.7	1.15	100	1	687	-	3700	-	1.14	100	10	688	6.3	3320	525.6	1.02	-	0.3	6
700 - 724	3	717	6.2	4283	202.1	1.16	100	2	714	14.8	4275	1025.3	1.17	100	8	715	7.1	4000	702.0	1.09	-	0.7	3
725 - 749	-	-	-	-	-	-	-	3	736	9.1	4383	288.7	1.10	100	5	737	7.9	4260	270.2	1.06	-	-	2
750 - 774	2	763	1.4	5450	424.3	1.23	100	1	761	-	5300	-	1.20	100	3	762	1.5	5400	312.2	1.22	100	0.5	-
775 - 799	1	790	-	5050	-	1.02	100	2	788	2.8	5700	1131.4	1.16	100	5	790	2.4	5210	842.9	1.06	-	2.0	2
800 - 824	1	813	-	6450	-	1.20	100	3	832	6.1	7017	665.8	1.22	100	4	821	5.4	7175	597.9	1.30	-	3.0	3
825 - 849	3	832	7.8	6817	951.8	1.18	100	2	855	7.1	5751	282.8	0.92	100	9	833	6.7	6933	591.1	1.20	-	0.7	3
850 - 874	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	859	8.7	7429	1268.5	1.17	-	-	5
875 - 899	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	887	6.6	8736	1111.9	1.25	-	-	7
900 - 924	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	909	5.3	9606	1143.8	1.28	-	-	8
925 - 949	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	932	5.7	10781	1930.4	1.19	-	-	8
950 - 974	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	957	7.4	11742	2224.7	1.34	-	-	6
975 - 999	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	987	10.4	11500	1948.7	1.19	-	-	3
1000-1024	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	1011	2.5	12550	2315.9	1.22	-	-	4
Total	219						71	208						73	785[a]						-	1.0	358
Mean		515	105.4	1637	1147.7	1.05			527	105.6	1738	1218.2	1.04			546	135.7	2146	2244.6	1.06			

[a] Includes fish not sexed.

Appendix 9. Biological data by age group for lake trout caught by all methods from Kasba Lake, 1979.

Age (Yr)	Males							Females							Total							F/M Ratio
	N	Length(mm) Mean	SD	Weight(g) Mean	SD	K	% Mat.	N	Length(mm) Mean	SD	Weight(g) Mean	SD	K	% Mat.	N	Length(mm) Mean	SD	Weight(g) Mean	SD	K	% Mat.	
4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	172	-	50	-	0.98	0	-
5	1	194	-	100	-	1.37	0	-	-	-	-	-	-	-	1	194	-	100	-	1.37	0	-
6	3	220	20.8	117	28.9	1.09	0	-	-	-	-	-	-	-	5	208	22.7	950	37.1	1.01	0	-
7	-	-	-	-	-	-	-	2	361	26.2	475	106.1	1.00	0	3	313	84.3	350	229.1	0.99	0	-
8	4	338	78.0	450	334.2	1.05	0	-	-	-	-	-	-	-	4	338	78.0	450	334.2	1.05	0	-
9	7	400	71.5	721	381.7	1.04	29	12	406	64.4	713	324.0	1.00	33	19	403	65.2	716	335.8	1.01	32	1.7
10	16	437	46.8	847	229.1	1.00	44	13	405	46.0	735	277.9	1.06	18	29	423	48.5	797	253.9	1.03	31	0.8
11	13	428	50.2	842	290.0	1.04	15	18	457	57.2	1047	352.9	1.05	44	31	445	55.5	961	338.8	1.05	32	1.4
12	27	462	49.0	1019	339.2	0.99	56	22	460	57.1	1048	429.7	1.02	41	49	461	52.2	1032	378.6	1.01	49	0.8
13	15	481	32.5	1217	313.8	1.07	80	22	495	41.9	1270	343.5	1.03	59	37	489	38.5	1249	328.4	1.05	68	1.5
14	15	506	41.6	1350	333.8	1.03	73	13	510	46.9	1485	352.6	1.11	62	28	508	43.3	1413	343.1	1.06	68	0.9
15	15	500	55.0	1377	406.1	1.07	73	9	540	36.4	1711	533.7	1.06	100	24	515	51.9	1502	476.3	1.06	83	0.6
16	12	525	37.9	1517	326.4	1.04	100	8	521	38.0	1456	359.0	1.02	88	20	523	37.0	1493	331.8	1.03	95	0.7
17	10	538	55.3	1700	576.9	1.06	100	15	557	75.8	1913	925.7	1.04	100	25	550	67.8	1828	797.5	1.05	100	1.5
18	9	546	27.5	1778	298.0	1.09	100	8	539	35.9	1594	346.9	1.01	100	17	542	30.9	1691	325.6	1.05	100	0.9
19	9	563	56.6	1967	696.4	1.07	100	6	576	61.5	2008	602.0	1.03	100	15	569	56.8	1983	638.0	1.05	100	0.7
20	11	619	88.7	2755	1769.2	1.06	100	9	576	20.3	1917	340.0	1.00	100	20	600	69.3	2378	1370.8	1.03	100	0.8
21	11	598	52.1	2255	728.9	1.03	100	12	598	59.9	2313	972.1	1.03	100	23	598	55.0	2285	845.5	1.03	100	1.1
22	7	596	43.5	2314	762.0	1.07	100	3	640	95.7	3000	1393.7	1.09	100	10	609	61.3	2520	963.6	1.08	100	0.4
23	4	614	62.2	2600	1070.0	1.08	100	4	583	54.0	2175	801.6	1.06	100	9	609	62.4	2517	930.4	1.07	100	1.0
24	2	570	10.6	1725	106.1	0.93	100	2	744	120.9	4550	2404.2	1.05	100	4	657	122.5	3138	2142.6	0.99	100	1.0
25	2	580	95.5	2350	1343.5	1.13	100	2	647	2.1	2675	106.1	0.99	100	4	613	67.3	2513	800.4	1.06	100	1.0
26	5	584	37.6	2140	734.3	1.04	80	1	627	-	2800	-	1.14	100	6	591	38.0	2250	710.0	1.06	83	0.2
27	5	676	91.9	3790	1646.7	1.18	100	3	674	75.7	3517	1546.2	1.10	100	8	675	80.4	3688	1500.9	1.15	100	0.6
28	5	685	122.3	4080	2315.3	1.13	100	5	621	20.5	2470	160.5	1.03	100	10	653	89.2	3275	1764.7	1.08	100	1.0
29	2	700	178.9	3825	2934.5	0.99	100	3	632	63.1	2550	867.5	0.99	100	5	659	106.6	3060	1736.9	0.99	100	1.5
30	1	762	-	5150	-	1.16	100	2	606	51.6	2500	565.7	1.12	100	3	658	97.4	3383	1581.4	1.13	100	2.0
31	1	667	-	3300	-	1.11	0	2	703	41.0	3900	919.2	1.11	100	3	691	35.7	3700	736.5	1.11	100	2.0
32	2	570	10.6	2000	282.8	1.09	100	1	850	-	5550	-	0.90	100	3	663	162.1	3183	2059.3	1.03	100	0.5
33	1	790	-	5050	-	1.02	100	2	746	116.0	5375	2793.1	1.23	100	3	761	85.8	5267	1983.9	1.16	100	2.0
35	1	690	-	3550	-	1.08	100	2	726	90.5	4500	2828.4	1.09	100	3	714	67.3	4183	2973.8	1.09	100	2.0
36	-	-	-	-	-	-	-	1	674	-	3350	-	1.09	100	1	674	-	3350	-	1.09	100	-
41	-	-	-	-	-	-	-	1	839	-	7450	-	1.26	100	1	839	-	7450	-	1.26	100	-
42	-	-	-	-	-	-	-	1	860	-	5950	-	0.94	100	1	860	-	5950	-	0.94	100	-
53	-	-	-	-	-	-	-	1	786	-	4900	-	1.01	100	1	786	-	4900	-	1.01	100	-
Total	216						73	205						71	426[a]						72	1.0
Mean	16.3[b]	516	104.8	1648	1150.3	1.05		16.8[b]	529	105.0	1751	1220.4	1.05		16.5[b]	520	109.5	1687	1191.6	1.05		

[a] Includes fish not sexed.

[b] Indicates mean age.

Appendix 10. Sample data from taxidermist for trophy mounted lake trout caught by angling from Kasba Lake, 1979.

Sample No.	Fork Length (mm)	Weight (g)	Girth (mm)	Age (yr)	Sex
1	927	9850	540	28	-
2	851	7250	445	28	Male
3	927	9350	502	32	-
4	914	9350	559	32	Male
5	965	10800	540	33	-
6	940	11350	514	34	-
7	953	10950	508	34	-
8	991	13350	591	35	-
9	953	11500	559	35	-
10	978	11600	546	37	-
11	940	10050	540	37	-
12	1041	12700	552	38	-
13	978	10350	502	38	-
14	826	8550	508	39	Female
15	991	10800	527	41	-
16	889	8500	495	41	Male
17	927	8850	495	43	-
18	978	10900	572	45	-
19	940	9550	483	47	-
20	927	8550	483	47	-
Mean	942	10208	523	37.2	-

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