Creel Census and Biological Investigation on Lake Trout, *Salvelinus namaycush*(Walbaum), from Great Bear and Great Slave Lakes, Northwest Territories 1975-76

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March 1978

Fisheries & Marine Service
Manuscript Report No.1440

Fisheries and Marine Service

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Fisheries and Marine Service

Manuscript Report 1440

March 1978

CREEL CENSUS AND BIOLOGICAL INVESTIGATION

LAKE TROUT,

Salvelinus namaycush (WALBAUM), FROM GREAT BEAR AND GREAT SLAVE LAKES,

NORTHWEST TERRITORIES, 1975-76

by
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This is the first Manuscript Report from the

Western Region, Winnipeg

Cat. no. Fs 97-4/1440 ISSN 0701-7618

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ABSTRACT

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

Data from the creel census and the biological investigation, on the lake trout sport fishery, at four lodges on Great Bear and Great Slave lakes studied during 1975 and 1976 are presented and discussed. Lodges operated from July 4 to August 28 on Great Bear and from June 18 to September 24 on Great Slave. A total of 3,165 angler-interviews were done with 84% of the operating season censused on Great Bear and 44% on Great Slave. Catch per angler-hour ranged from 0.37 to 1.75 fish and number of fish retained per angler-day varied from 0.92 to 1.53. Percent of trout retained was 14-30% and 25-54% on Great Bear and Great Slave respectively. Total harvest at the four lodges was estimated to be over 28,500 kg of lake trout. Of the fish retained, including trophy fish, ages ranged from 10-40 yr, length 355-1175 mm, weight 600-17,325 g for Great Bear, and 7-28 yr, length 375-1025 mm, weight 575-12,800 g for Great Slave. Mean lengths and weights were similar on both lakes; however, trout on Great Slave were up to 5 years younger, were heavier and apparently grow faster in both length and weight. Sexual maturity was first reached at age 8 (431 mm; 1075 g) on Great Slave and age 15 (506 mm; 1577 g) on Great Bear. The rotational monitoring at the lodges must be expanded to gather information on the size of all catchable lake trout. To protect some of the prerecruits of this trophy fishery, utilized mostly for fillets, it is recommended that the angler catch and possession limits be lowered to two (2) lake trout.

Key words: exploitation; management; life history; sport fishery.

RESUME

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

Les auteur présentent, à la suite du dénombrement des prises et d'une étude biologique, les données compilées en 1975 et en 1976 sur la pêche sportive du touladi de quatre pavillons au Great Bear Lake et au Great Slave Lake. Les pavillons ont été ouverts du 4 juillet au 28 août au Great Bear Lake, et du 18 juin au 24 septembre au Great

Slave Lake. Au cours de la saison, 3165 pêcheurs à la ligne ont été interrogés, ce qui correspond à 84%, au Great Bear Lake et à 44% au Great Slave Lake, des pêcheurs recensés. La prise horaire par pêcheur s'est située entre 0.37 et 1.75 et le nombre de poissons conservés par journée-pêcheur entre 0.92 et 1.53. De 14 à 30% et de 25 à 54% des truites ont été respectivement conservées au Great Bear Lake et au Great Slave Lake. La prise totale des quatre pavillons s'est élevée à plus de 28,500 kg de touladis. En ce qui concerne les touladis conservés parmi lesquels figurent les poissons de trophées, au Great Bear Lake, leur âge a varié entre 10 et 40 ans, leur longueur entre 355 et 1175 mm, et leur poids entre 600 et 17,325 g. Quant à ceux du Great Slave Lake, leur âge a varié entre 7 et 28 ans, leur longueur entre 375 et 1025 mm, et leur poids entre 575 et 12,800 g. La longueur et le poids moyens ont été semblables au deux lacs. Les touladis du Great Slave Lake ont eu jusqu'à cinq ans de moins, ont été plus lourds et avaient grossi et grandi visiblement plus vite. Au Great Slave Lake, le plus jeune sujet mature avait 8 ans (431 mm; 1075 g), et, au Great Bear Lake 15 ans (506 mm; 1577 g). Pour recueillir des renseignements sur l'ensemble des touladis susceptibles d'être capturés, il faudrait augmenter le contrôle par rotation aux pavillons. Afin de protéger les préréglés de cette pêche sportive, tranchés d'habitude en filets, il est recommandé de limiter à deux (2) le nombre de touladis capturés et conservés par pêcheur.

Mots-clés: exploitation; gestion; cycle évolutif; pêche sportive.

INTRODUCTION

This report describes the results of a creel census and biological sampling program conducted, from June through August, at Arctic Circle Lodge on Great Bear Lake and Frontier Lodge on Great Slave Lake during 1975, and Great Bear Trophy Lodge on Great Bear Lake and Indian Mountain Lodge on Great Slave Lake during 1976. The program is part of a continuing study (Falk et al. 1973, 1974a, 1974c and 1975) intended to monitor the sport fishery harvest of lake trout, *Salvelinus namaycush* (Walbaum); to define further possible effects of exploitation on the fish populations; and to provide information on the life history of lake trout in order to manage the species more effectively on a biological basis.

Both Great Bear Lake and the east arm (north of Simpson Islands) of Great Slave Lake (Fig. 4) are closed to commercial fishing; however, domestic fishing is carried out in the Keith Arm of Great Bear by residents of Fort Franklin (Fig. 1) and in the Christie Bay area of Great Slave by residents of Snowdrift (Fig. 5).

As a result of an adequate data base obtained from intensive studies in previous years, lodges will be monitored on a rotational basis (one lodge/lake/year) such that each lodge on Great Bear and Great Slave will be censused at least once over a five-year period.

MATERIALS AND METHODS

STUDY AREA

During 1975 and 1976, an intensive creel census and biological investigation on lake trout was carried out at Arctic Circle Lodge and Great Bear Trophy Lodge on Great Bear Lake (Fig. 1), and Frontier Lodge and Indian Mountain Lodge on Great Slave Lake (Fig. 4). Figures 2, 3, 5 and 6 indicate the specific locations of the four lodges censused, the principal areas fished for lake trout, and the total potential areas available for fishing. The potential fishing area is based on a guideline adopted by the Tourism Department of the Northwest Territories Government of 4.02 kilometers (2.5 miles) of shoreline per guest bed; the principal area fished is based on observations by fisheries personnel stationed at the location and represents fishing areas frequently used by the angler-guests throughout the entire season. Additional areas are utilized by fishermen at most locations on an intermittent basis.

LODGE OPERATION

Details concerning the operation of sport fishing lodges on Great Bear and Great Slave Lakes have been covered in previous reports by Falk et al. (1973, 1974a). The lodges tend to be large isolated sport fishing establishments which cater mainly to anglers from the United States (see Appendix 5). Lake trout angling provides the major attraction but some lodges also offer fishing for Arctic grayling, *Thymallus arcticus* (Pallas); northern pike, *Esox Lucius* Linnaeus, and walleye, *Stizostedion vitreum vitreum* (Mitchill) as well as side trips to the Arctic coast for anadromous Arctic char, *Salveninus alpinus* (Linnaeus). The usual length of stay is one week and guests are rotated on or near the weekend. With the exception of rotation days and depending on the weather, angler-guests typically spend from early morning to late afternoon fishing for lake trout. They usually fish two per boat and are under the direction of a guide.

CREEL CENSUS STUDY

Interview procedure

Information pertaining to the methods employed by census workers has been described previously by Falk et al. (1973, 1974a). Upon returning from a day's fishing as many anglers as possible were questioned as to the number of fish caught, released, retained and used for shore lunches, by species, as well as the hours and location fished. The census worker also recorded the number of anglers not interviewed and/or those not fishing on a daily basis and the total number of anglers present at the lodge on a weekly basis.

During the 1975 and 1976 field seasons two census record forms were used by field personnel (Appendices 1 and 2). These were: i) a catch record form on which catch, effort and location information was recorded by species for each angler interviewed, and ii) a summary form on which catch, effort, sample and location information was recorded by species on a daily and weekly basis.

On-site or creel surveys may often be subject to interview and response biases. Sinclair et al. (1975) describe a corrective procedure; however, in our studies the likelihood of these biases occurring is minimized by providing on-site staff training and by using standardized interview procedures. The "length of stay" and "frequency of use" biases are non-applicable due to the type of lodge operation.

Lake trout harvest

Procedures followed in calculating the total harvest of lake trout from individual lodges have been outlined in detail by Falk et al. (1974a). During the 1975 and 1976 field seasons the methods employed by the creel census workers and the procedures for calculating the harvest of lake trout were modified after the 1974 techniques and refined to the point where a high degree of accuracy may be expected. In addition, a substantial data base has been collected on which estimations or predictions can be made. Yields per surface area for the lodges were calculated by dividing the total harvest by both the potential area available and the area principally fished. The definitions and explanations given below will be useful in interpreting data outlined in the Results and Discussion, and the Appendices.

Number caught: This is the number of fish caught by anglers and includes fish taken for use in shore lunches.

Number retained: This is the number of fish brought back to the lodge by anglers but does not include fish taken for use in shore lunches.

The total harvest is actually an estimate arrived at by summing the retained catch, shore lunches and release mortality.

Retained catch: For the lodges censused during 1975 and 1976 the number of lake trout retained by anglers was calculated in three stages: first by considering the number of days worked during the census period and the actual number of anglers interviewed; second by including the total number of interviews possible during the census period (i.e., including anglers not interviewed and days not worked); and finally by extrapolating to include portions of the season not censused. The weight of the retained catch was subsequently obtained by multiplying this number by the average weight of lake trout sampled.

The number of fish retained includes trophy lake trout, and those to be filleted, to be dressed for "bakers" or, at some lodges, smoked and/or steaked. The portion of the retained catch sampled for biological data usually excludes the trophy fish. These trophy lake trout, usually greater than 7 kilograms (15 pounds) and destined for taxidermy purposes, up to 1976 were often not available for length and weight measurements due to anglers and/or lodge management claims against excess handling and the need for quick freezing. Therefore, the average length and weight of the sampled catch is often biased toward the smaller fish, except at Great Bear Trophy Lodge in 1976 where all trophy fish were sampled. In the future, all trophy lake trout are to be sampled for length and weight.

Shore lunches: In addition to the number of lake trout retained by anglers, fish are also taken for use in shore lunches. The method of calculation was similar to that followed for determining the retained catch. The number of trout taken for shore lunches was calculated first by considering the number of angler-interviews, second by including the total number of interviews possible during the census period and finally by extrapolating to include portions of the season not censused. The weight of the shore lunches was subsequently obtained by multiplying this number by the average weight of the lake trout sampled.

Release mortality: Through a catch-release study carried out in the vicinity of Great Slave Lodge during June 1973 it was found that 7.0 percent of lake trout caught on treble hooks died after being held for four days (Falk et al. 1974b). This percentage was applied to the number of trout released over the season to estimate the number which would probably die as a result of hook or handling damage.

Trophy Lake trout: As previously mentioned, the weight of these fish was not included with the sampled portion of the retained catch. If they had been, then the average weight of lake trout sampled would be greater and consequently the total harvest would be increased accordingly. Harvest estimates are therefore conservative. However, by employing consistent methodology it is possible to monitor the harvest with a relatively high degree of accuracy and to determine if regulation changes are effective in reducing the harvest of lake trout.

Falk et al. (1975) summarized all available creel census data for the sport fishing lodges on Great Slave and Great Bear lakes through 1974. This information appears in Appendices 3 and 4 which has been updated to include the 1975 data from Frontier Lodge and Arctic Circle Lodge and the 1976 data from Great Bear Trophy Lodge and Indian Mountain Lodge.

BIOLOGICAL INVESTIGATION

In addition to the angler-interview, a random portion of the daily retained catch was sampled for fork length (± 5 millimeters), total weight (± 25 grams), and sex and maturity. The relative stage of maturity was determined by examination of the gonads and coded by reference to a scale as follows:

Sex		Maturity	
F	M	stage	Description of gonads
1	6	immature	virgin fish, gonad thin and threadlike, often incomplete
2	7	maturing	virgin or non-virgin fish not spawning in current year, gonad full length, firm, eggs of small size, gonads partially filling body cavity
3	8	mature	fish spawning in current year, gonad full size filling body cavity, eggs prominent, full size
4	9	ripe	mature fish in spawning condition, eggs translucent, milt or eggs expelled under slight pressure
5	10	spent	mature fish completed spawning, gonads collapsed with ruptured blood vessels prominent

Otoliths were obtained for aging purposes from the majority of the sampled lake trout by splitting the skull and locating the sagittal otolith with forceps. They were stored dry in envelopes marked with the sample information. In the laboratory the convex surface of the otolith was ground on a fine carborundum stone to expose the annual growth zones. The otolith was then immersed in a 3:1 solution of benzylbenzoate and methyl salicylate on a depression slide and read under a dissecting microscope.

Annual mortality rates (natural and fishing) were calculated using the method (all ages known) outlined by Robson and Chapman (1961). The total annual mortality is defined as the number of fish which die during a year, divided by the initial number (Ricker 1975). Thus, if the mortality rate was 20%, then among the larger fish beyond the age where they are fully vulnerable to the fishery, of every 100 fish alive at a given time, 20 are expected to die during the next year. The right hand descending portion of a catch curve may be used to estimate annual mortality rates if the following assumptions can be met:

i) constant survival or mortality rates over the range of age-classes, and with time,
ii) constant year-class strength (even recruitment), and
iii) all fish beyond some age are equally vulnerable to the harvesting gear.

Ricker (1975) indicates that the modal age in the catch curve will commonly lie quite close to the first year in which recruitment can be considered effectively complete. Recruitment is defined as the addition of new fish to the vulnerable population by growth from among smaller size categories. In our particular case with lake trout, probably one unusable age-class intervenes between the first usable age and modal age (or second of two nearly-equal ages). When annual mortality is moderate or small (50% or less), at the beginning of recruitment at least, there are usually two adjacent ages having the same number of fish, with the mode falling sometimes at the median age of recruitment, sometimes in the next older age. In our calculations, we first selected the modal age-class from the catch curve and then chose the next older age-class to be sure that all fish beyond this age are at the age of effectively complete recruitment and fully susceptible to the gear. Ricker (1975) further states that deviations from the basic assumptions stated above often result in a non-linear right limb of the catch curve, especially from fluctuations in recruitment from one year class to the next. With our data, a small sample size considering the large age span may also be a contributing factor to the very irregular appearance of some of the catch curves. It is very difficult to accept estimates when this irregular distribution of data is used. To avoid this irregularity from unstable recruitment, samples from successive years may be combined (Ricker 1975). Due to our rotational monitoring, data from successive years is unavailable. Instead, Falk et al. (1974c) used a "moving mean" (average of two successive age-classes) to smoothen out the irregularities of the frequency distribution at age-classes in the right hand descending limb of the catch curve. Annual mortality rates were calculated using both the actual or irregular frequency data, and the moving means.

The length-weight relationships were determined by the following power equation:

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

where: W = total weight in grams

a = Y-intercept

b = slope of the regression line

L = fork length in millimeters

The condition factors (K) were calculated from the formula

$$K = W \times 10^5 / L^3$$

The K-values indicate a relative measure of robustness, plumpness or fatness of the fish.

Data collected during the study were analyzed using a programmable calculator (Hewlett-Packard model 9810-A) and computer facilities based at the University of Manitoba.

RESULTS AND DISCUSSION

CREEL CENSUS

Details on the 1975 and 1976 creel census program at sport fishing lodges on Great Bear and Great Slave Lakes are provided in Tables 1 to 5. A brief comparison of number of lake trout caught per angler-hour, number retained per angler-day, total seasonal lodge harvest, and yield is shown below:

	Arctic Circle 1975	Great Bear Trophy 1976	Frontier Fishing 1975	Indian Mountian 1976
Fish caught per angler-hour	1.75	0.65	1.22	0.37
Fish retained per angler-day	1.53	0.92	1.38	1.30
Total seasonal harvest (kg)	6,517	9,132	11,042	1,814
Yield (kg/ha potential area)	0.19	0.36	0.75	0.29

The number of lake trout retained per angler-day, in addition to shore lunches, is more a reflection of lodge philosophy rather than a direct relation to angler success (catch per angler-hour). Since the size of fish retained is similar at all lodges, 2.9 ± 0.5 kg (Table 3), the total seasonal harvest and yield are directly dependent on number of fish retained per angler-day and subject to the total number of angler-guests.

At Arctic Circle Lodge, on Great Bear Lake, the total number of angler-guests has generally remained static since 1972 (Falk et al. 1973); however, lake trout harvest per angler-week and total seasonal harvest have increased from 34.9 kg to 55.9 kg, and 3,912 kg to 6,517 kg respectively (Appendix 3). Furthermore, a decrease in yield from 0.35 to 0.19 kg/ha indicates an extension of the fishing area. Comparing the 1973 data by Falk et al. (1974 a) at Great Bear Trophy Lodge and our studies in 1976, the following decreases are recorded : total angler-guests, fish retained per angler-day from 1.89 to 0.92, angler success from 0.85 to 0.65 fish per angler-hour, and yield of 0.51 to 0.36 kg/ha. All of the above, except angler success, are relative to decreases in number of angler-guests and percentage of catch retained. However the drop in angler success may be an indication of overfishing in this particular area. On Great Slave Lake, Frontier Lodge has increased its angler-guests from 200 in 1972 to 280 in 1974 and 1975. The number of fish retained per angler-day has declined slightly since 1973 and 1974 (Falk et al. 1974a, 1975). Angler success and yield have increased from 0.96 to 1.22 fish per angler-hour, and 0.66 to 0.75 kg/ha. Potential fishing area has remained

relatively unchanged, thus between 1972 and 1975 the exploitation of lake trout in this area has remained relatively high and constant. At Indian Mountain Lodge, the 1976 creel census was the first study carried out at this location. Based on license sales and extrapolated data from other adjacent lodges, number of angler-guests and total harvest appear to have doubled since 1972. Angler success was low, 0.37 fish/angler-hour, yet percentage of fish retained was about twice the value at other lodges in 1975 and 1976 (Table 3). This low angler success may be due to limited trout stocks, and continued exploitation at this high level could be detrimental to the lake trout population in the Thompson's Landing area.

BIOLOGICAL INVESTIGATION

Biological data on lake trout sampled from lodges on Great Bear and Great Slave Lakes during 1975 and 1976 is provided by length interval in Appendices 6 to 9, and by age group in Appendices 10 to 13. No biological data is available for Arctic Circle and Indian Mountain lodges previous to this study, thus data from the nearest lodge is used for comparisons.

Length-frequency distribution

Figure 7 shows the length-frequency distribution for lake trout from lodges studied during 1975 and 1976. On Great Bear Lake, lake trout averaged 591 mm fork length at Arctic Circle and 651 mm at Great Bear Trophy Lodge, while on Great Slave Lake, lake trout averaged 616 mm at Frontier Lodge and 607 mm at Indian Mountain Lodge. The mean fork lengths for lake trout retained are both similar at all 4 lodges and unchanged from values for previous years.

Length-weight relationship

Details on the length-weight relationship are given in Table 6. The logarithmic relationship of length-weight (combined sexes and excluding trophy fish) is shown as follows:

Arctic Circle: $\log_{10} W = -4.6123 + 2.8947 (\log_{10} L)$

Great Bear

Trophy: $\log_{10} W = -4.9760 + 3.0075 (\log_{10} L)$

Frontier: $\log_{10} W = -6.0266 + 3.4117 (\log_{10} L)$

Indian Mountain: $\log_{10} W = -5.3289 + 3.1382 (\log_{10} L)$

This data is similar with previous years. It is interesting to observe the change in length-weight relationship for lake trout at Great Bear Trophy Lodge when trophy fish data are included (Table 6). Both the slope and Y-intercept increase indicating accelerated growth in weight per unit length which further supports the findings of Johnson (1976) that the modal length of each age group of lake trout in Great Bear Lake beyond age 20 generally shows little or no increase with age. Lake trout in Great Slave are heavier per unit length than those in Great Bear Lake (Falk et al. 1973).

Age, growth and maturity

The age-frequency distribution is illustrated in Fig. 8. On Great Bear Lake, trout had a mean age of 19.6 years from Arctic Circle Lodge and 17.6 years from Great Bear Trophy Lodge. Mean age at Trophy Lodge has decreased from 23.2 years, and trout from Arctic Circle are somewhat younger when compared to nearby lodges. On Great Slave Lake mean age was 14.7 years at Frontier and 14.9 years at Indian Mountain Lodge, and was generally similar to previous data. Lake trout harvested in Great Bear in 1975 and 1976 were 3-5 years older than those in Great Slave, whereas in 1972 the age difference was 7-8 years.

Figure 9 gives growth in length and weight at the four lodges. The growth patterns compare generally with those in previous years (Falk et al. 1974c). At Frontier Lodge, as in 1973, lake trout beyond age 18 showed a lower rate of growth, especially in length. Falk et al. (1974c) postulate that these fish may be taken from a very oligotrophic habitat resulting in slow growth rates, or are morphologically different. Apart from this particular case, trout growth is more rapid in Great Slave than in Great Bear.

During 1976, 104 trophy lake trout were sampled at Great Bear Trophy Lodge. Mean values were 968 mm fork length and 11,315 g in weight.

Catch curves are shown in Fig. 10. The irregularity of the catch curves, perhaps due to fluctuations in recruitment and/or small sample size considering the large age span, makes mortality estimates, using the actual and irregular frequency at age-classes, very difficult. Thus, the estimates using the moving means are the most acceptable. Table 7 provides the annual mortality rates. On Great Bear Lake, the annual mortality rate was 17.4% (using ages 18-36) at Arctic Circle and 20.1% (using ages 19-40) at Great Bear Trophy Lodge. On Great Slave, the annual mortality rates were 28.8% (using ages 15-28) at both Indian Mountain and Frontier lodges. Previous mortality rates were 14.5% (using ages 22-37) for Great Bear and 22.2% (using ages 15-27) for Great Slave (Falk et al. 1974c). Thus, comparing to 1973, mortality rates have increased by about 5-6%; this may likely be the result of the high sustained Exploitation of the trout stocks by the sport fishery.

Sexual maturity was first reached at age 15 (506 mm; 1577 g) at Arctic Circle Lodge, age 16 (584 mm; 2233 g) at Great Bear Trophy Lodge, age 8 (431 mm; 1075 g) at Frontier Lodge, and age 12 (507 mm; 1377 g) at Indian Mountain Lodge. Generally, lake trout on Great Slave appear to reach sexual maturity 3-5 years earlier than those in Great Bear. Data on relative stages of gonad maturity furthur substantiates the opinion that after maturity most lake trout spawn once every two years in Great Slave and once every 2-3 years in Great Bear, which conforms to the findings of Miller and Kennedy (1948), and Kennedy (1954).

The angler's retained catch is selective toward the larger and more robust lake trout. Since trophy-size fish are seldom sampled, the biological data collected is biased toward a given size range of fish, generally those which are to be filleted. The lake trout populations are slow

growing with a large variability in growth rates. Thus, mean values for age, length and weight will remain similar over the short term (5-10 years) even though changes in the population structure may be occuring. To obtain a more sensitive measure on the effects of this short-term exploitation the current monitoring program must be expanded to assess the size distribution of the total population, especially the size range of trout vulnerable to angling. This can be accomplished by incorporating more experimental angling and gillnetting along with the tagging program to determine intra-lake movement patterns in lake trout. Knowledge of size of fish caught, released and retained would make angler success (fish/angler-hour) a more effective measure of the rate of exploitation. On the other hand, factors such as fish retained/week, total harvest/ season, and yield are relative values reflecting the individual fishing lodge's policy with regards to shore lunches, and filleting of fish.

Johnson (1976) states that in Great Bear Lake the rate of turnover in the adult lake trout population is 17.3 years plus the period of 8-20 years these adult spend as prerecruits. Previous studies (Johnson 1975b; Miller and Kennedy 1948) have shown that lake trout on Great Bear are most abundant in the size group of 500-800 mm. These fish are prerecruits for the trophy fishery, generally weighing 1.5-6.0 kg, and are 13-27 years of age. The situation is similar in the deep and cold oligotrophic east arm of Great Slave Lake. Sport fishing lodges attract their angler-guests by advertising the availability of large trophy trout but at the same time continue to allow at least 5-10 kg of trout fillets, often in addition to the trophy fish, with each angler-guest. In 1972, it was estimated that over 72,000 kg of lake trout was harvested from these two lakes (Falk et al. 1973). Our studies have shown that most of the lake trout used for filleting are prerecruits with a mean weight of 3.2 kg. Recently some lodges have had to extend their fishing areas to continue to harvest larger fish in abundance, but this is perhaps short term. Continued heavy exploitation of these prerecruits will no doubt have a detrimental effect on the size and availability of trophy fish within 10-15 years. In addition, angler success will decline, since lake trout may not be able to respond, to any great extent, to heavy exploitation by increasing their growth rates as shown for lake whitefish (Healey 1975). Very restrictive conservation measures must be taken now by greatly reducing the harvest of some of the prerecruits. The current angler catch and possession limits for lake trout are three (3) daily and five (5) maximum. It is recommended that the angler catch and possession limits be lowered to two (2) lake trout for both daily and maximum limits. This would substantially reduce the "fillet utilization" and result in a more realistic "trophy fishery".

ACKNOWLEDGMENTS

Field assistance was provided by E. Annett, F. Hnytka, H. Hommel, D. Leroux, R. Sie, D. Rudy and other Fishery Management staff. The management and staff of the sport fishing lodges on Great Bear and Great Slave Lakes deserve special thanks for their continued cooperation. Fisheries Officers G. Bogdan, J. Caudron, D. Dowler,D. Green and T. Turnbull assisted in the transport of personnel and equipment. C. Read provided drafting assistance. Drs L. Johnson and J.S. Campbell provided help, suggestions and criticisms of the manuscript. To all, the authors are extremely grateful.

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Table 1. Summary of information pertaining to the operation of sport fishing lodges censused on Great Bear and Great Slave Lakes, 1975 and 1976.

Lodge	Year	Guest Capacity[a]	No. of Guests		Period of Operation		
			Calculated	License Sales[b]	From	To	Days
GREAT BEAR LAKE							
Arctic Circle	1975	28	119	110	July 4	August 23	50
Great Bear Trophy	1976	43	303	315	July 5	August 28	48
GREAT SLAVE LAKE							
Frontier	1975	28	279	246	June 22	September 15	90
Indian Mountain	1976	12	55	55	June 18	September 24	98

[a] Figures obtained from the Division of Tourism, Government of the Northwest Territories.
[b] Figures obtained from Yellowknife District Office, Fisheries and Marine Service (Appendix 5).

Table 2. Summary of information pertaining to the creel census period at sport fishing lodges censused on Great Bear and Great Slave Lakes, 1975 and 1976.

Lodge	Year	Period of Creel Census			Percent of Season Censused	Percent of Census Period Worked	No. of Angler Interviews
		From	To	Days			
GREAT BEAR LAKE							
Arctic Circle	1975	July 4	August 12	38	76.0	93.0	610
Great Bear Trophy	1976	July 5	August 24	44	91.0	100	1207
GREAT SLAVE LAKE							
Frontier	1975	June 26	August 20	56	62.0	93.0	1116
Indian Mountain	1976	June 24	August 12	47	26.0	55.0	232

Table 3. Summary of information pertaining to the angler's creel from lodges censused on Great Bear and Great Slave Lakes, 1975 and 1976.

Lodge	Year	Species	No. Caught	No. Released	No. Retained	% Retained	No. Sampled	Mean Wt. (kg)	Fish Retained Per Angler-Day	
									No.	Wt. (kg)
GREAT BEAR LAKE										
Arctic Circle	1975	Lake trout	6648	5389	931	14.0	604	2.80	1.53	4.29
		Arctic grayling	51	31	15	29.4	2	1.30	-	-
		Northern pike	3	3	-	-	-	-	-	-
Great Bear Trophy	1976	Lake trout	3769	2096	1115	29.5	403	3.31	0.92	3.15
		Arctic grayling	1224	666	437	35.7	228	0.82	0.36	0.30
		Northern pike	625	522	87	13.9	-	-	0.07	-
GREAT SLAVE LAKE										
Frontier	1975	Lake trout	6180	3792	1549	25.1	937	3.22	1.38	4.44
		Arctic grayling	1425	1141	281	19.7	220	0.62	0.25	0.15
		Northern pike	2036	1850	126	6.2	-	-	0.11	-
Indian Mountain	1976	Lake trout	562	210	302	53.9	344	2.24	1.30	2.91
		Arctic grayling	40	39	11	27.5	11	0.82	-	-

Table 4. Summary of information pertaining to the harvest of lake trout from lodges censused on Great Bear and Great Slave Lakes, 1975 and 1976.

Lodge	Year		Trout Caught	Trout Released	Trout Retained	Release Mortality	Shore Lunch	Total Harvested	Harvest of Trout Per Angler
GREAT BEAR LAKE									
Arctic Circle	1975	No.	9425	7634	1319	534	472	2325	19.9
		Wt.	26419	21399	3697	1497	1323	6517	55.9
Great Bear Trophy	1976	No.	6049	3535	1479	247	1032	2758	8.8
		Wt.	20018	11704	4897	818	3417	9132	29.0
GREAT SLAVE LAKE									
Frontier	1975	No.	8479	5203	2125	149	1151	3425	12.3
		Wt.	27334	16772	6851	479	3711	11042	39.6
Indian Mountain	1976	No.	1316	544	472	38	300	820	14.7
		Wt.	2947	1218	1057	85	672	1814	32.9

Table 5. Summary of information pertaining to the hours fished, angler success and yield for lake trout from lodges censused on Great Bear and Great Slave Lakes, 1975 and 1976.

Lodge	Year	Hours Fished (Lake Trout)		Lake Trout Caught		Surface Area (ha)		Yield (kg/hectare)	
		Total	Per Angler-Day	Per Angler-Day	Per Angler-Hour	Available	Utilized	Area Available	Area Utilized
GREAT BEAR LAKE									
Arctic Circle	1975	3787	6.2	10.9	1.75	34033	14930	0.19	0.44
Great Bear Trophy	1976	5737	4.7	3.1	0.65	25464	16062	0.36	0.57
GREAT SLAVE LAKE									
Frontier	1975	4989	4.5	5.5	1.22	14694	5121	0.75	2.16
Indian Mountain	1976	1462	6.3	2.4	0.37	6185	2986	0.29	0.61

Table 6. Length-weight relationship summary, $\log_{10} W = a + b (\log_{10} L)$, for lake trout from Great Bear and Great Slave lodges, 1975 and 1976.

Lodge	Year	Sex	N	Y-intercept (a)	Slope (b)	Standard deviation of b (S_b)	95% C.I. of b
Arctic Circle	1975	males	278	-4.5505	2.8730	0.0436	2.7875 - 2.9585
		females	258	-4.6856	2.9205	0.0522	2.8182 - 3.0228
		combined[a]	536	-4.6123	2.8947	0.0479	2.8008 - 2.9886
Great Bear Trophy	1976	males	165	-4.9683	3.0061	0.0739	2.8613 - 3.1509
		females	228	-4.7179	2.9212	0.0681	2.7877 - 3.0547
		combined[b]	401	-4.9760	3.0075	0.0244	2.9369 - 3.0681
		combined[c]	505	-5.0929	3.0529	0.0283	2.9974 - 3.1074
Frontier	1975	males	447	-6.1230	3.4455	0.0469	3.3536 - 3.5374
		females	413	-5.9187	3.3738	0.0518	3.2723 - 3.4753
		combined[a]	860	-6.0266	3.4117	0.0494	3.3144 - 3.5085
Indian Mountain	1976	males	165	-5.2944	3.1244	0.0593	3.0002 - 3.2406
		females	171	-5.3650	3.1525	0.0730	3.0094 - 3.2956
		combined[a]	336	-5.3289	3.1382	0.0463	3.0475 - 3.2289

[a] Includes unsexed fish.

[b] Excludes 104 trophy fish.

[c] Includes 115 unsexed fish of which 104 are trophy fish.

Table 7. Annual mortality rates for lake trout from Great Bear and Great Slave lodges, 1975 and 1976.

Lodge	Year	Type of frequency data at age-class used	Age-classes used	Survival (S)	SE of S	Var. of S	Annual Mortality Rate (A), where A=1-S
Arctic Circle	1975	actual and irregular[a]	18-36	0.8278	0.0092	0.0001	0.1722
		moving means[b]	18-36	0.8260	0.0097	0.0001	0.1740
Great Bear Trophy	1976	actual and irregular	19-40	0.9505	0.0197	0.0004	0.0495
		moving means	19-40	0.7987	0.0124	0.0002	0.2013
Frontier	1975	actual and irregular	15-28	0.7188	0.0127	0.0002	0.2812
		moving means	15-28	0.7122	0.0137	0.0002	0.2878
Indian Mountain	1976	actual and irregular	15-28	0.7196	0.0173	0.0003	0.2804
		moving means	15-28	0.7118	0.0187	0.0003	0.2882

[a]The true or actual number frequency at each age-class.

[b]Mean number frequency of two successive age-classes.

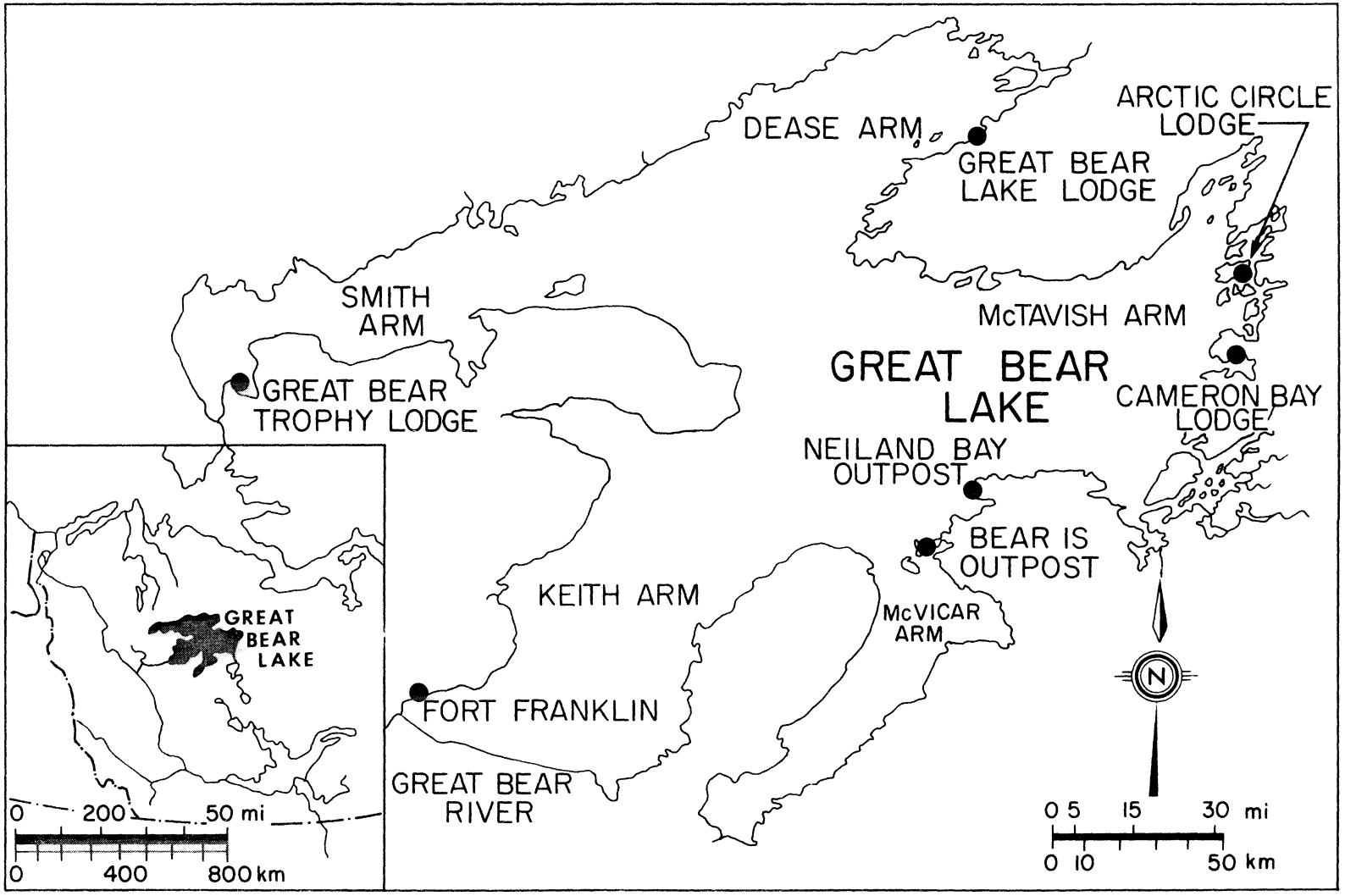

Fig. 1. Map of Great Bear Lake showing the location of sport fishing lodges.

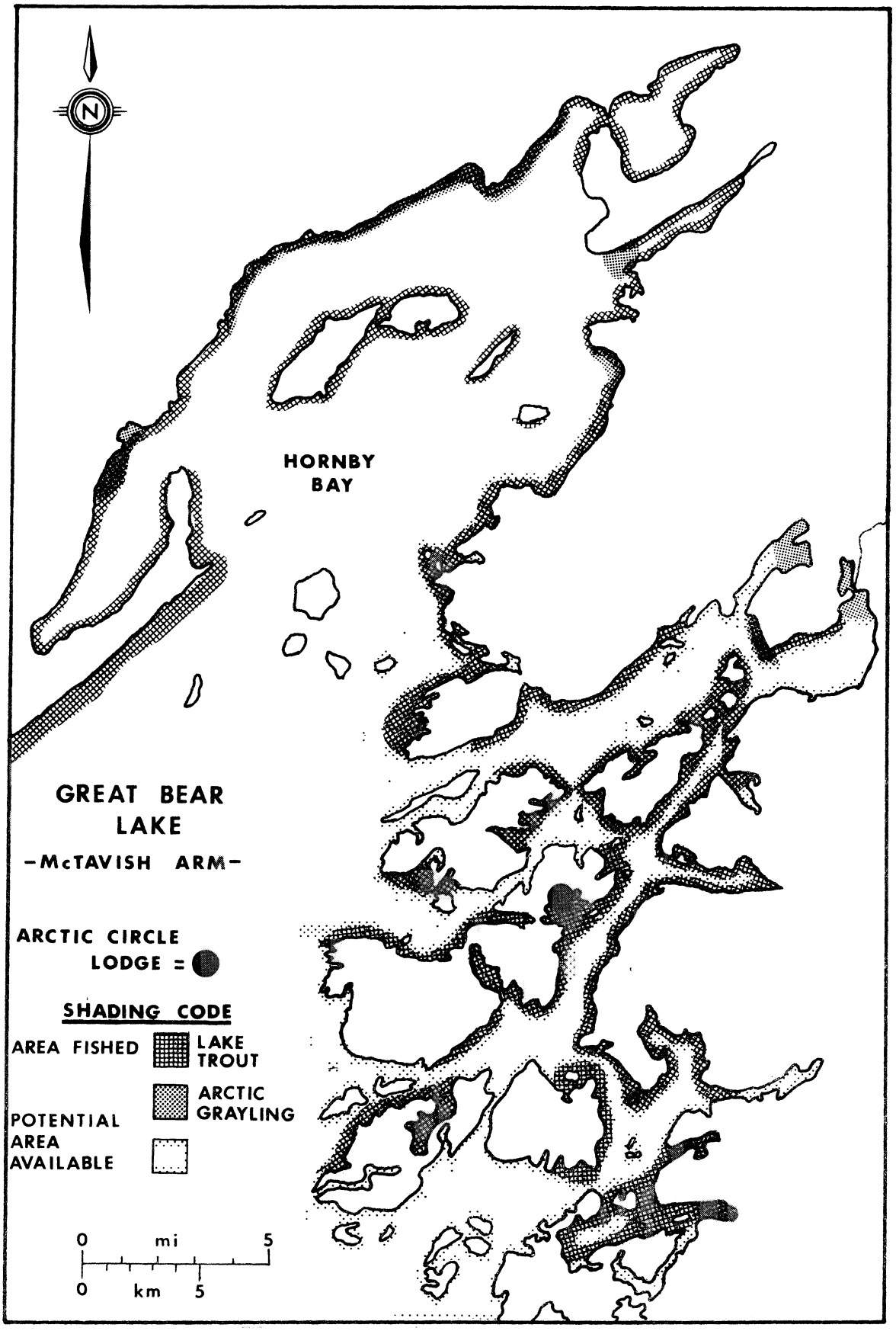

Fig. 2. Location of Arctic Circle Lodge showing the areas fished.

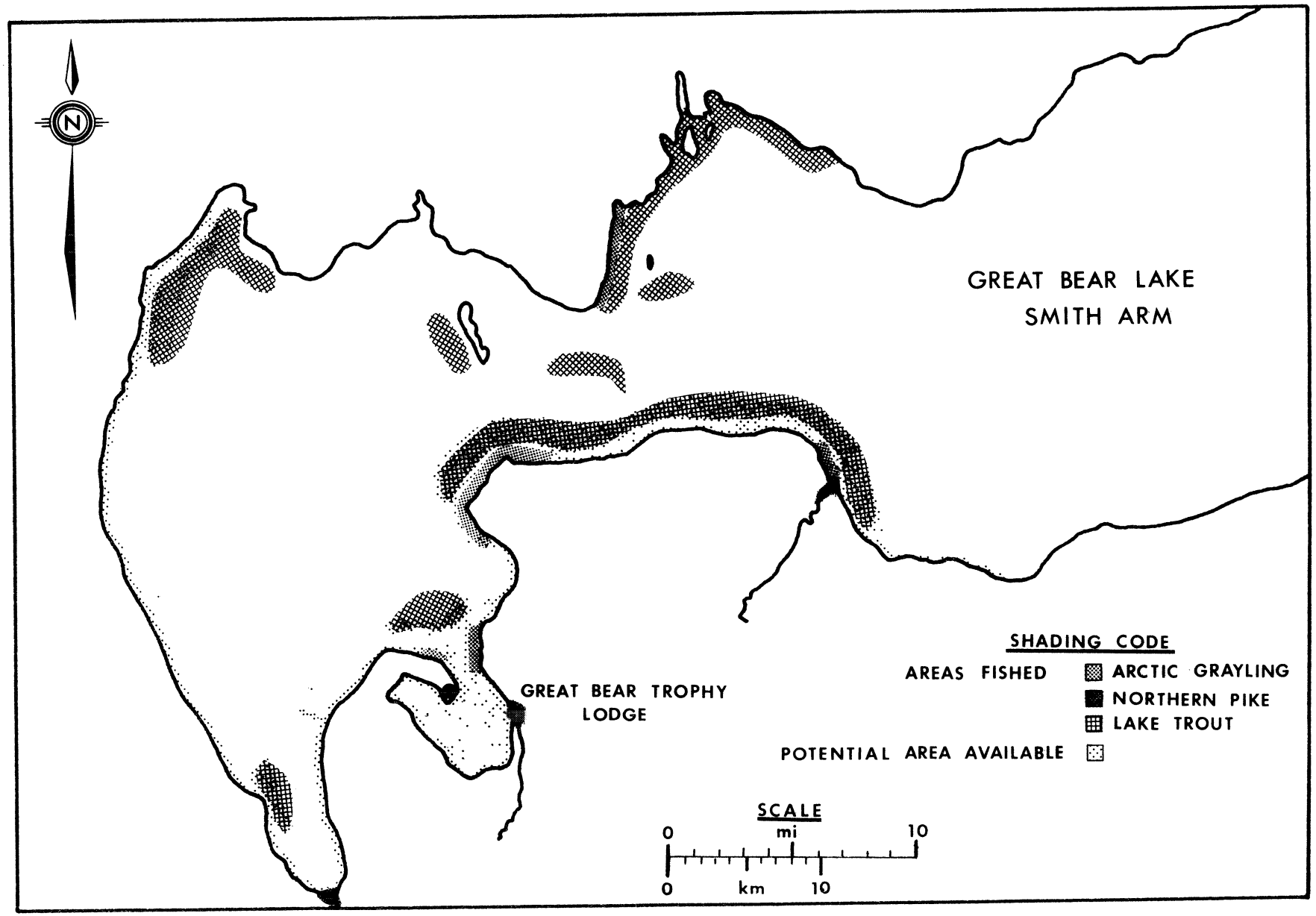

Fig. 3. Location of Great Bear Trophy Lodge showing the areas fished.

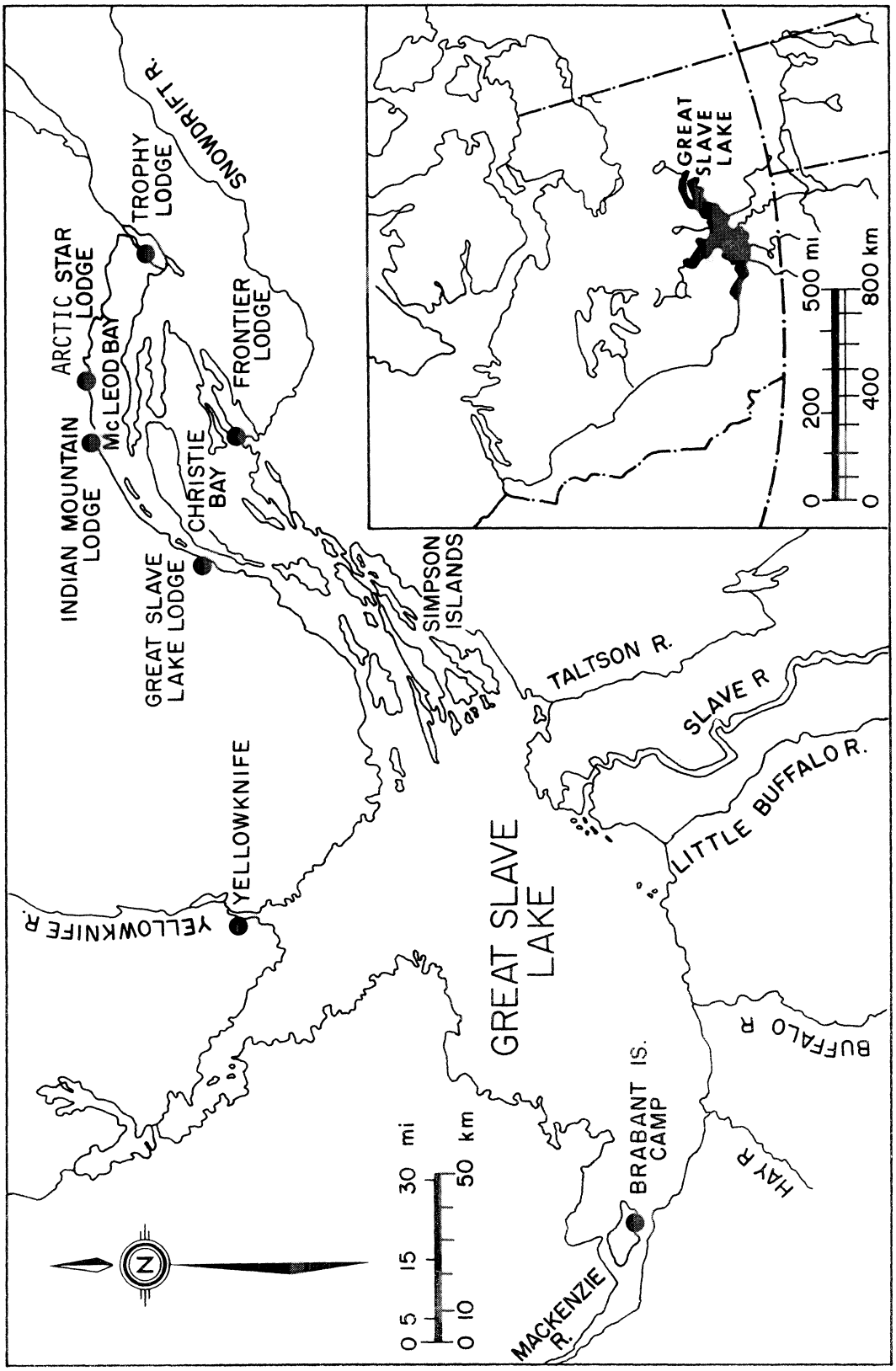

Fig. 4. Map of Great Slave Lake showing the location of sport fishing lodges.

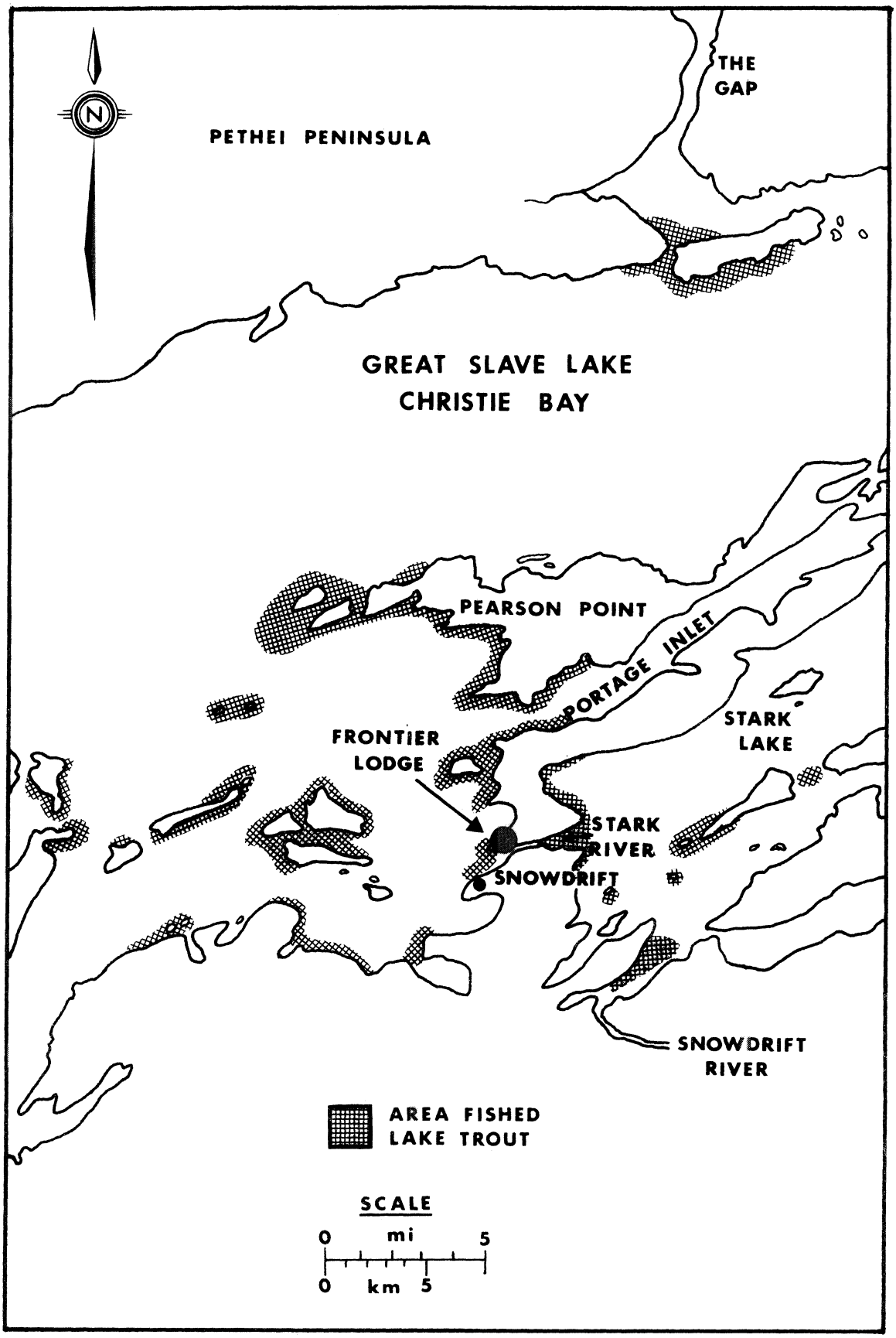

Fig. 5. Location of Frontier Lodge showing the areas fished.

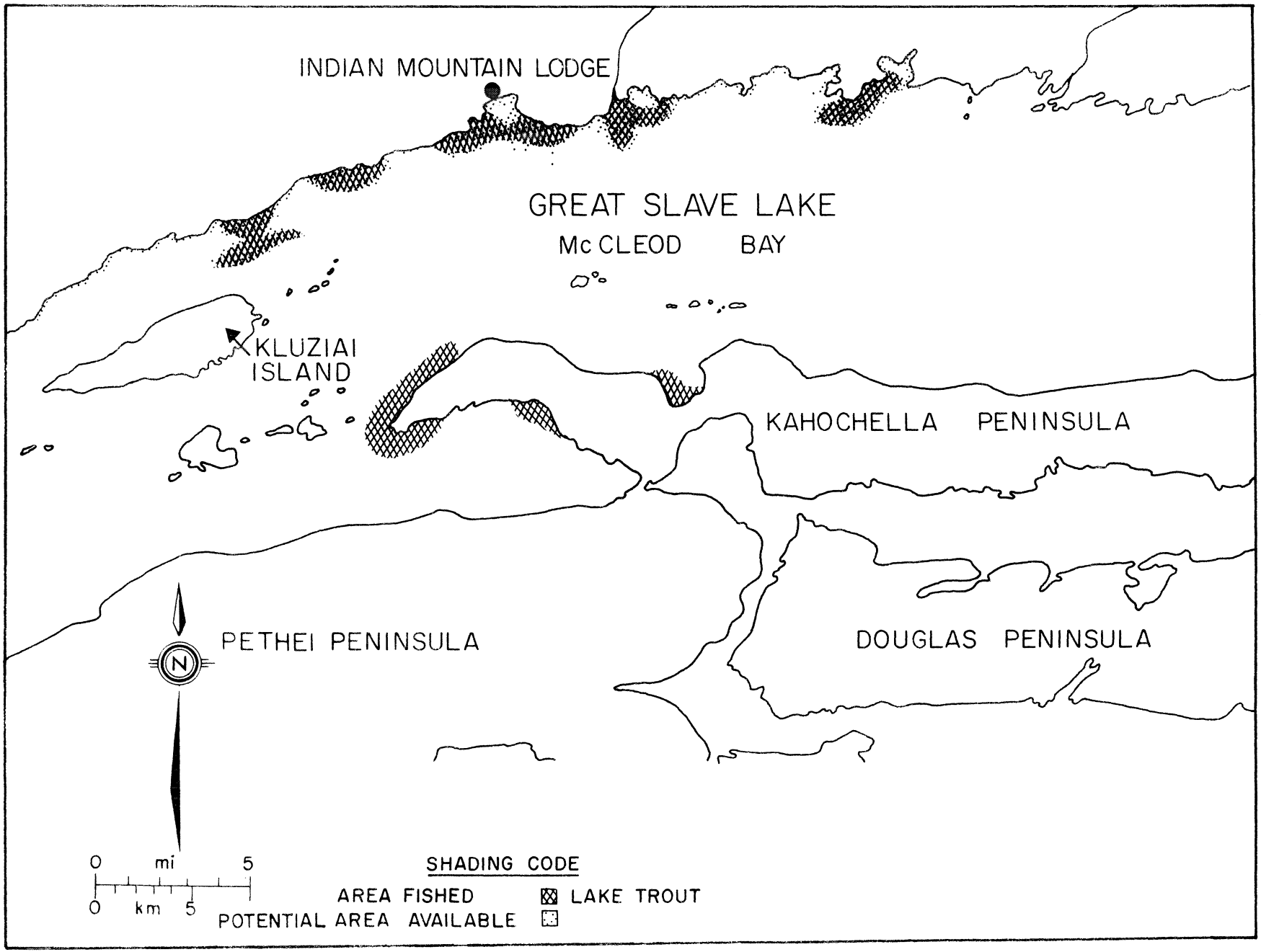

Fig. 6. Location of Indian Mountain Lodge showing the areas fished.

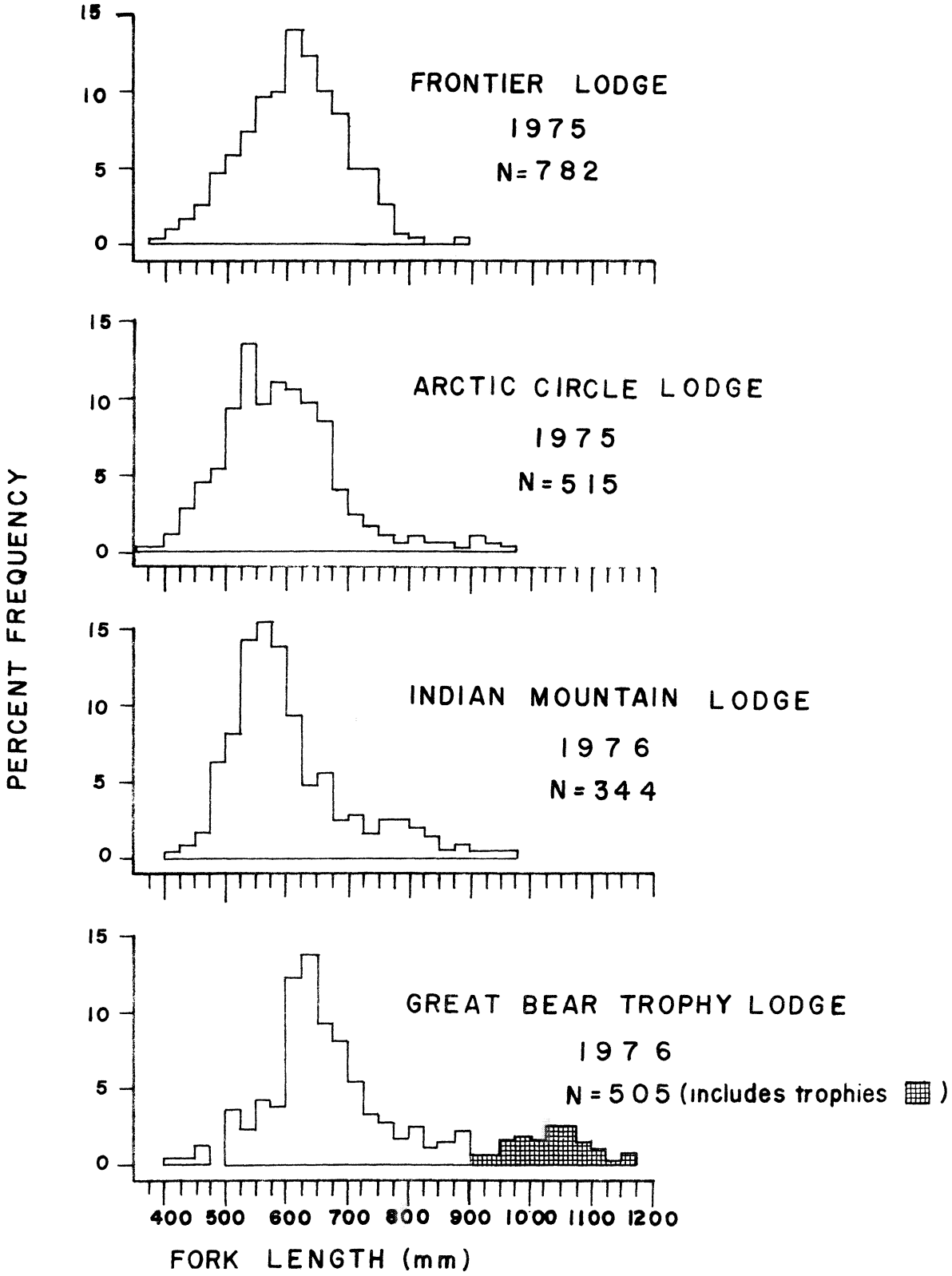

Fig. 7. Length-frequency distribution for lake trout from Great Bear and Great Slave lodges.

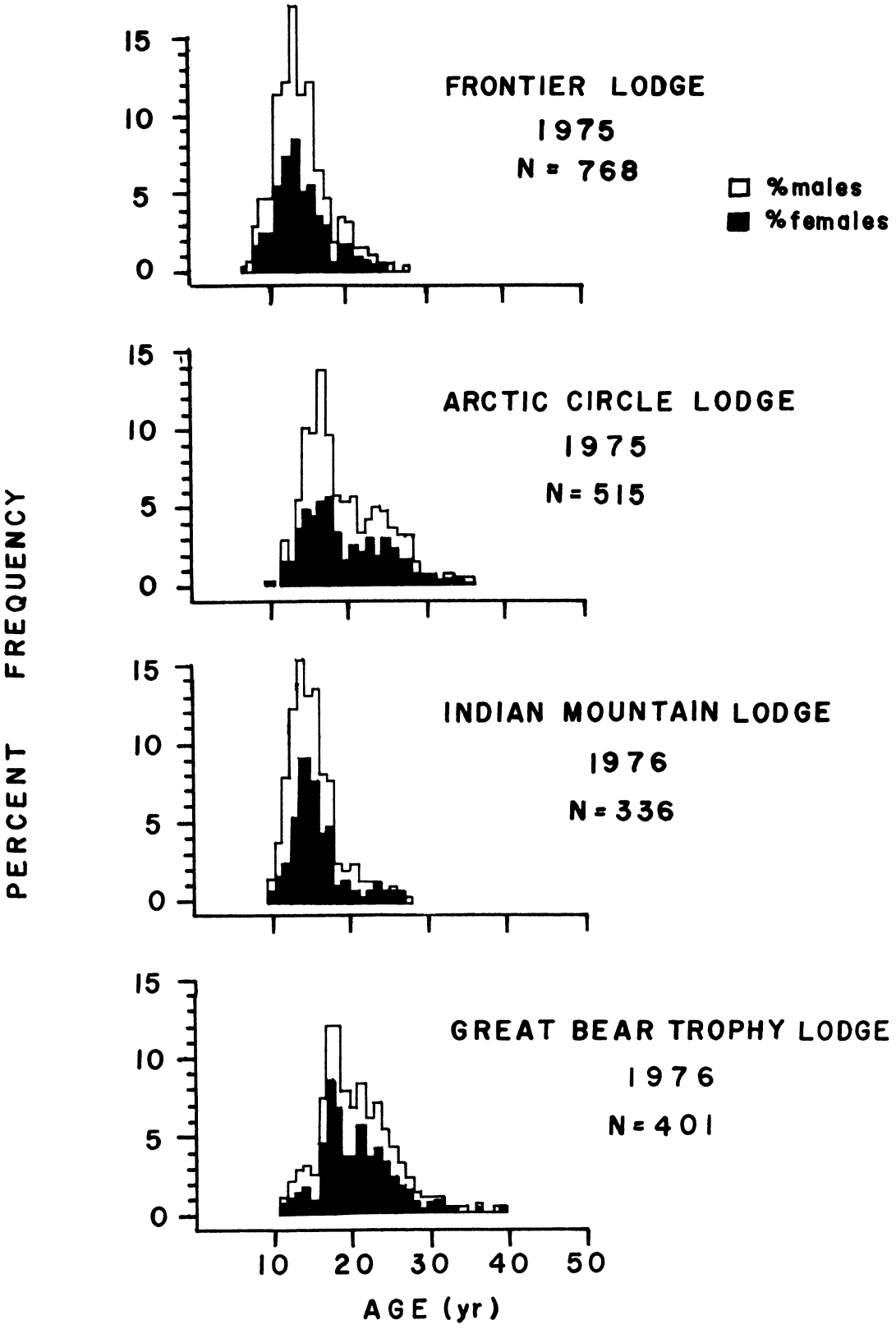

Fig. 8. Age-frequency distribution for lake trout by sex from Great Bear and Great Slave lodges.

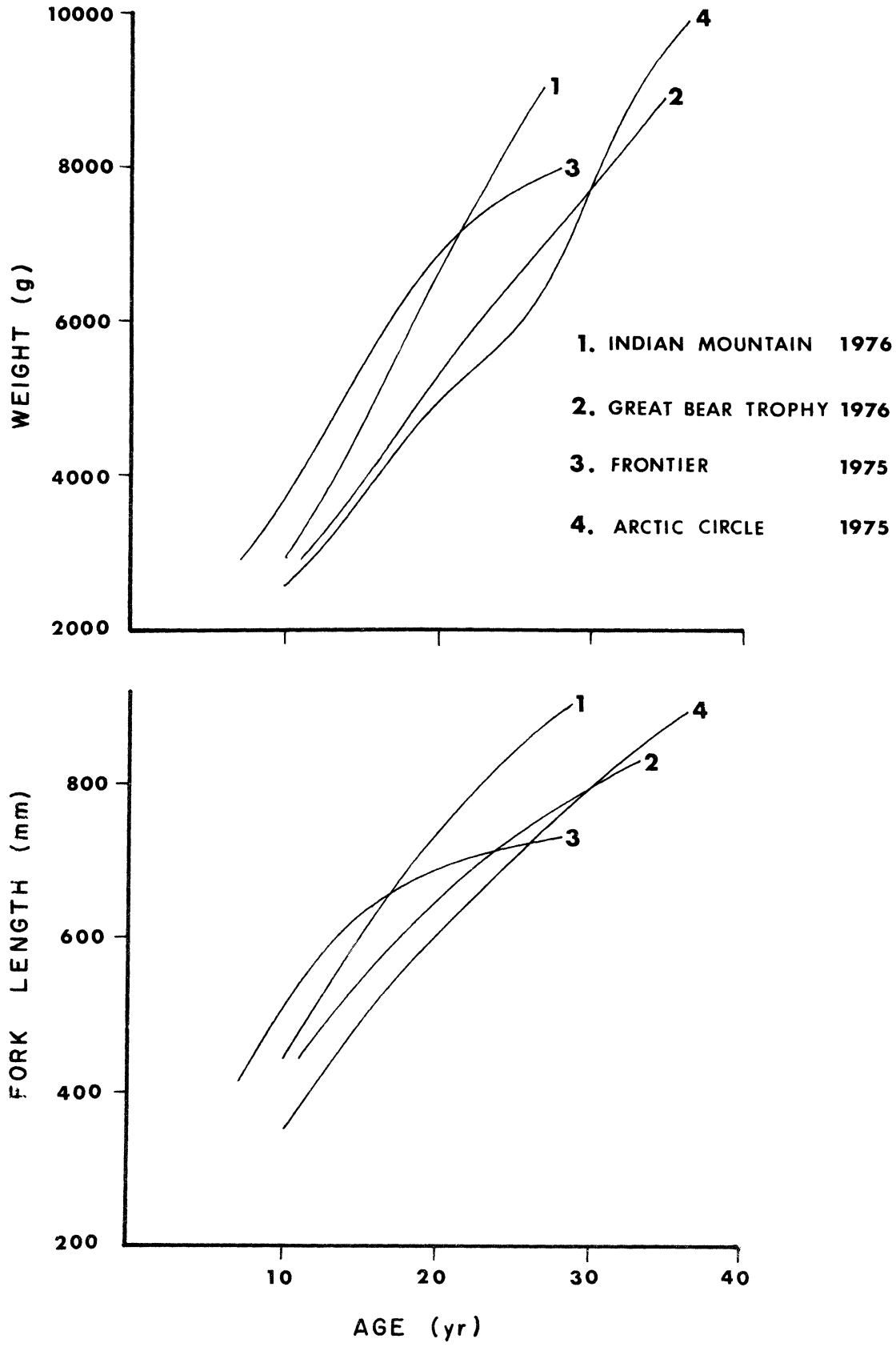

Fig. 9. Growth in length and weight for lake trout from Great Bear and Great Slave lodges.

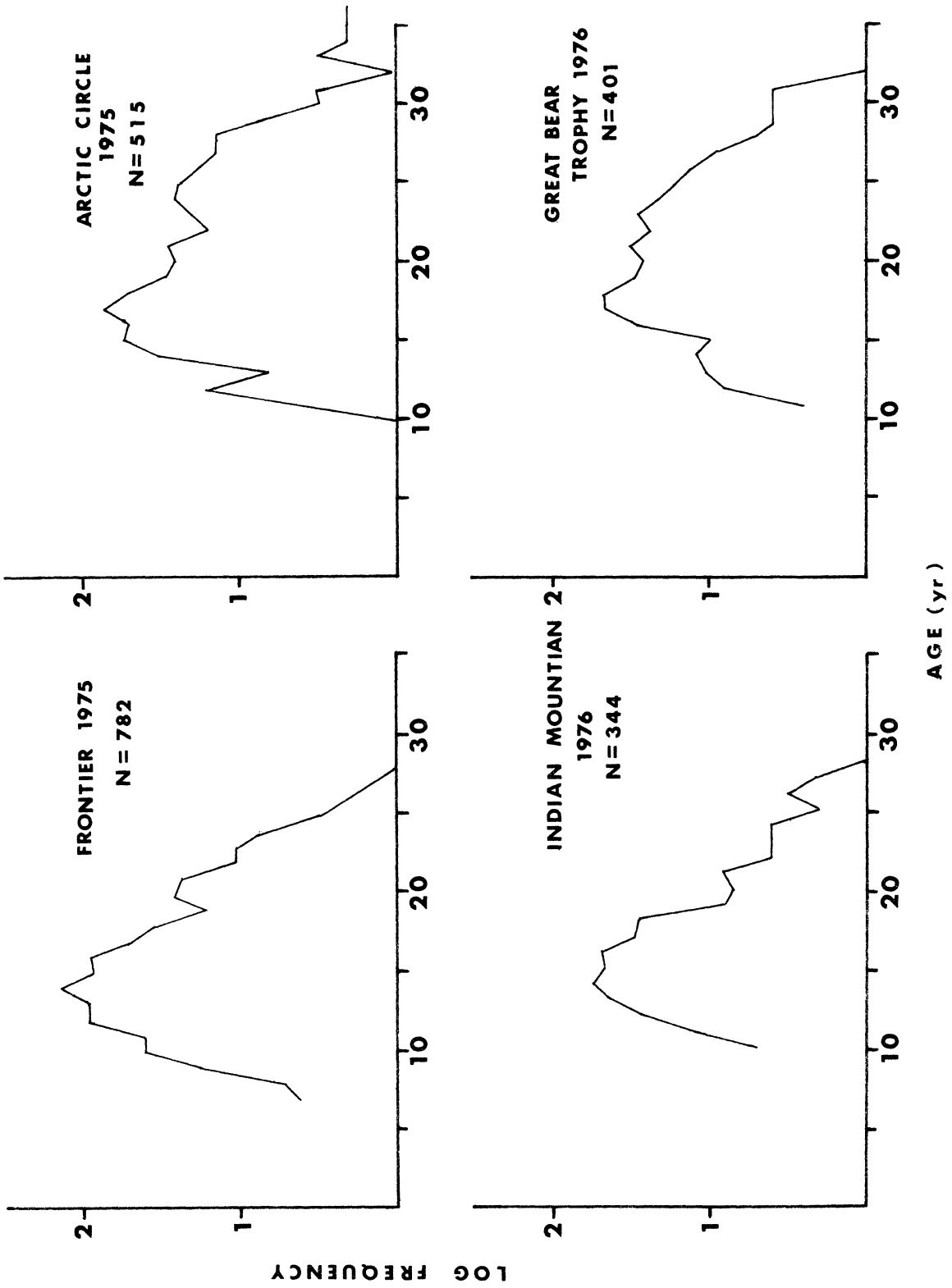

Fig. 10. Catch curves for lake trout from Great Bear and Great Slave lodges.

Appendix 1. Catch record forms used during the 1975 and 1976 field season.

Environment Canada / Environnement Canada
Fisheries and Marine / Pêches et sciences de la mer

RESOURCE MANAGEMENT
FISH MANAGEMENT – BIOLOGY

CATCH RECORD – SPORTS FISHERY

Date

Lake or Stream	Location	No Sampled Species 1	No Sampled Species 2	No Sampled Species 3
Method of Fishing	Type of Gear	Depth Fished	Water Temp.	Bottom Type

FISHERMAN				Species 1			Species 2			Species 3						
No.	ORIGIN	Res.	Alien	Number Caught	Number Released	Number Kept	Number Caught	Number Released	Number Kept	Number Caught	Number Released	Number Kept	Hours Fished	Area No		

Recorder

F-4502 (Rev 2/73)

Appendix 2. Creel census summation forms used during the 1975 and 1976 field season.

FISHERIES AND MARINE SERVICE
RESOURCE MANAGEMENT BRANCH
SPORTS FISHERY UNIT

CREEL CENSUS SUMMATION

LOCATION _____ DATE _____

LODGE _____ RECORDER _____

CREEL CENSUS PERIOD _____ TO _____

OPERATIONS:

NO. FISHERMEN PRESENT _____ NO. BOATS AVAILABLE _____

NO. FISHERMEN FISHING ON SITE _____ NO. BOATS IN USE _____

NO. FISHERMEN FISHING OFF SITE _____

INTERVIEWS:

NO. FISHERMEN INTERVIEWED _____ NO. MISSED _____

CATCH:

SPECIES	LAKE TROUT	GRAYLING	NORTHERN PIKE
	NO. CAUGHT _____	NO. CAUGHT _____	NO. CAUGHT _____
	NO. RELEASED _____	NO. RELEASED _____	NO. RELEASED _____
	NO. RETAINED _____	NO. RETAINED _____	NO. RETAINED _____
	NO. FOR LUNCH _____	NO. FOR LUNCH _____	NO. FOR LUNCH _____
	NO. SAMPLED _____	NO. SAMPLED _____	NO. SAMPLED _____
	HOURS FISHED _____	HOURS FISHED _____	HOURS FISHED _____
	SAMPLES NO. ____ TO ____	SAMPLES NO. ____ TO ____	SAMPLES NO. ____ TO ____
	TOTAL WEIGHT SAMPLED _____	TOTAL WEIGHT SAMPLED _____	TOTAL WEIGHT SAMPLED ____
	PRINCIPAL AREAS FISHED 1. _____	2. _____	3. _____

TOTAL HOURS FISHED _____ TOTAL WEIGHT SAMPLED _____

WEEKLY TOTALS:

CENSUS PERIOD _____ TO _____ NO. DAYS _____

NO. DAYS CENSUSED _____ PERCENT _____

Appendix 3. Harvest of lake trout from lodges on Great Bear Lake from 1971 to 1976, 1971-74 data from Falk et al. (1975).

Lodge	Year		Trout Caught	Trout Released	Trout Retained	Release Mortality	Shore Lunches	Total Harvested	Harvest Per Angler	Remarks
Great Bear Lake Lodge	1972	No.	10,179	3,603	5,187	252	1,389	6,828	-	-
		Wt. (kg)	36,645	12,972	18,673	908	5,000	24,581	53.0	
	1973	No.	8,959	3,726	3,994	261	1,239	5,494	-	-
		Wt.	30,636	12,747	13,652	892	4,237	18,781	43.9	
Great Bear Lodge (Neiland Bay and Bear Island)	1971[a]	No.	7,780	5,835	1,066	408	879	2,353	-	[a]Estimates based on a limited creel census.
		Wt.	27,931	20,948	3,828	1,465	3,155	8,448	28.8	
	1972	No.	9,787	7,840	811	549	1,120	2,496	-	
		Wt.	45,769	36,615	3,864	2,563	5,290	11,717	34.5	-
	1973	No.	8,153	6,302	909	441	942	2,292	-	
		Wt.	39,950	30,881	4,453	2,161	4,616	11,230	35.7	-
	1974[b]	No.	-	-	150	518	1,089	1,757	-	[b]Lake trout retained as shore lunches and trophies only.
		Wt.	-	-	1,498	2,466	6,926	10,890	30.0	
Branson's Cameron Bay Lodge	1971[a]	No.	6,380	3,145	2,464	220	771	3,455	-	
		Wt.	21,947	10,819	8,476	757	2,652	11,885	46.3	-
	1972	No.	6,622	3,212	2,708	225	702	3,635	-	
		Wt.	18,611	9,026	7,612	632	1,973	10,217	43.7	-

Appendix 3 (continued)

Lodge	Year		Trout Caught	Trout Released	Trout Retained	Release Mortality	Shore Lunches	Total Harvested	Harvest Per Angler	Remarks
Branson's Cameron Bay Lodge	1973	No.	6,188	2,658	2,975	186	555	3,716	-	
		Wt.	17,141	7,363	8,241	515	1,537	10,293	56.6	-
	1974	No.	13,311	10,052	2,182	704	1,077	3,963	-	
		Wt.	43,309	32,709	7,100	2,290	3,500	12,890	49.8	-
Great Bear Trophy	1972[c]	No.						3,709	-	[c] Estimate based on information supplied by the lodge and 1973 data.
		Wt.						12,277	51.4	
	1973	No.	8,236	4,618	2,739	232	879	3,850	-	
		Wt.	27,261	15,285	9,967	1,070	2,909	13,046	54.4	-
	1976	No.	6,049	3,535	1,479	247	1,032	2,758	8.8	
		Wt.	20,018	11,704	4,897	818	3,417	9,132	29.0	-
Arctic Circle	1972[d]	No.	5,386	4,196	854	294	336	1,484	-	[d] Estimate based on information supplied by the lodge.
		Wt.	13,668	10,490	2,325	734	853	3,912	34.9	
	1975	No.	9,425	7,634	1,319	534	472	2,325	19.9	
		Wt.	26,419	21,399	3,697	1,497	1,323	6,517	55.9	-

Appendix 4. Harvest of lake trout from lodges on Great Slave Lake from 1971 to 1976, 1971-74 data from Falk et al. (1975).

Lodge	Year		Trout Caught	Trout Released	Trout Retained	Release Mortality	Shore Lunches	Total Harvested	Harvest Per Angler	Remarks
Great Slave Lake Lodge	1961[a]	No.	2,345	1,600	211	112	534	857	-	[a] Estimate based on data from Keleher and Meeker (1962).
		Wt. (kg)	12,544	9,520	1,256	666	1,768	3,690	39.3	
	1971	No.	4,371	1,937	1,578	135	856	2,569	-	
		Wt.	23,026	11,273	9,184	786	2,569	12,539	38.4	-
	1972	No.	4,936	2,118	2,035	148	783	2,966	-	
		Wt.	16,338	7,010	6,736	490	2,592	9,818	30.3	-
	1973	No.	8,632	4,860	2,841	340	931	4,112	-	
		Wt.	27,536	15,503	9,063	1,085	2,970	13,118	42.2	-
	1974	No.	4,564	2,345	1,356	164	853	2,373	-	
		Wt.	15,575	8,020	4,638	561	2,917	8,116	26.1	-
Frontier Lodge	1971[b]	No.	5,750	1,378	3,145	96	1,227	4,468	-	[b] Estimate based on the average weight of fish retained 1972-74.
		Wt.	13,281	3,183	7,264	222	2,834	10,320	53.7	
	1972[c]	No.	6,686	3,076	2,377	215	1,233	3,825	-	[c] Recalculated using 1972 license sales (204) and 1973-74 lake trout retention.
		Wt.	16,782	7,721	5,966	540	3,095	9,601	50.3	
	1973	No.	8,039	3,537	3,394	248	1,108	4,750	-	
		Wt.	15,274	6,720	6,449	470	2,105	9,024	38.6	-
	1974	No.	8,171	4,320	2,536	302	1,315	4,153	-	
		Wt.	20,764	10,930	6,418	765	3,326	10,509	42.5	-
	1975	No.	8,481	5,203	2,125	149	1,151	3,425	12.3	
		Wt.	27,334	16,772	6,851	479	3,711	11,042	39.6	-

Appendix 4 (continued)

Lodge	Year		Trout Caught	Trout Released	Trout Retained	Release Mortality	Shore Lunches	Total Harvested	Harvest Per Angler	Remarks
Trophy Lodge (Reliance)	1972[d,e]	No.	1,248	980	243	69	25	337	-	[d]Based on license sales of 36.
		Wt.	1,917	1,505	374	105	38	517	-	
	1973[e]	No.	1,567	1,230	306	86	31	423	-	[e]Estimates based on catch data from 1974.
		Wt.	2,437	1,920	469	132	48	648	-	
	1974	No.	1,600	1,256	312	88	32	432	-	
		Wt.	2,457	1,929	479	135	49	663	14.4	-
Arctic Star Lodge	1972[f]	No.	1,320	628	557	44	135	736	-	[f]Based on an estimate of 80 guests.
		Wt.	5,306	2,524	2,237	177	545	2,958	-	
	1973	No.	1,214	374	640	71	200	911	-	
		Wt.	3,417	1,039	1,778	197	600	2,575	64.4	-
	1974	No.	537	202	229	14	106	349	-	
		Wt.	2,122	798	905	55	419	1,379	36.3	-
Indian Mountain Lodge	1972[g,h]	No.	524	362	102	25	60	187	-	[g]Based on an estimate of 20 guests.
		Wt.	2,070	1,430	403	100	237	740	37.0	
	1973[h]	No.	667	285	322	13	60	395	-	[h]Estimates based on catch data from Great Slave Lake and Arctic Star lodges.
		Wt.	2,001	855	966	38	180	1,185	51.5	
	1974[h]	No.	356	198	149	9	69	227	-	
		Wt.	1,377	514	590	36	273	899	39.0	
	1976	No.	1,316	544	472	38	300	820	14.7	
		Wt.	2,947	1,218	1,057	85	672	1,814	32.9	-

Appendix 5. License sales from lake trout lodges on Great Bear and Great Slave Lakes, 1975-76 and 1976-77.

	1975-76				1976-77			
	Resident[a]	Non-resident	Short-term[b]	Total	Resident[a]	Non-resident	Short-term[b]	Total
Great Bear Lake								
Arctic Circle Lodge	60	110	-	170	75	114	-	189
Branson's Lodge	41	106	-	147	77	249	-	326
Great Bear Lake Lodge(Plummer's)	46	224	32	302	41	287	42	370
Great Bear Lodge	3	231	-	234	3	171	-	174
Great Bear Trophy Lodge	47	230	29	306	47	258	10	315
Sah-Tew Lodge(Fort Franklin)[c]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	197	901	61	1,159	243	1,079	52	1,374
Great Slave Lake								
Arctic Star Lodge[c]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Frontier Fishing Lodge	42	204	-	246	90	166	4	260
Great Slave Lake Lodge(Plummer's)	24	241	12	277	26	360	7	393
Indian Mountain Lodge	15	2	-	17	24	25	6	55
Trophy Lodge(Fort Reliance)	14	46	3	63	8	42	-	50
	95	493	15	603	148	593	17	758
Total for both lakes	292	1,394	76	1,762	391	1,672	69	2,132

[a]Resident of Canada.

[b]Three-day non-resident license.

[c]License sale through local and other vendors.

Appendix 6. Mean fork length, mean weight, maturity and sex ratio by length interval for lake trout from Arctic Circle Lodge, 1975.

Length Interval (mm)	No.	Class Mark (mm)	Fork Length (mm)		Weight (g)		Males		Females		F/M Ratio
			Mean	SE	Mean	SE	No.	%Mature	No.	%Mature	
351-375	1	363	355	-	600	-	1	-	-	-	-
376-400	1	388	390	-	700	-	1	-	-	-	-
401-425	6	413	413	3.4	917	30.7	5	-	1	-	0.2
426-450	15	438	442	1.7	1080	29.6	7	-	8	-	1.3
451-475	23	463	467	1.3	1261	191.0	10	-	13	-	1.2
476-500	32	488	491	1.2	1488	15.4	15	-	17	6	1.1
501-525	48	513	515	1.1	1685	29.6	28	8	20	-	0.8
526-550	70	538	540	0.9	1976	32.2	44	7	26	8	0.6
551-575	49	563	563	1.1	2300	35.1	27	26	22	-	0.7
576-600	52	588	589	1.0	2606	38.2	26	30	26	22	1.0
601-625	54	613	613	0.9	3055	54.6	26	62	28	32	0.9
626-650	50	638	641	0.9	3332	60.3	27	68	23	48	0.8
651-675	45	663	664	1.0	3661	70.7	22	75	23	48	1.0
676-700	20	688	685	1.5	3960	115.9	6	100	14	50	2.3
701-725	12	713	713	2.4	4358	153.9	4	50	8	57	1.8
726-750	9	738	738	2.3	4856	223.6	3	67	6	71	2.3
751-775	5	763	763	3.6	5390	330.3	-	-	5	60	-
776-800	4	788	787	4.2	5375	165.2	3	33	1	-	0.3
801-825	5	813	819	1.7	6440	444.5	2	100	3	33	1.5
826-850	4	838	843	1.6	6825	256.2	4	50	-	-	-
851-875	3	863	864	5.2	6866	145.3	1	-	2	50	2.0
876-900	1	888	888	-	7600	-	1	-	-	-	-
901-925	3	913	910	4.8	8200	568.6	2	50	1	-	0.5
926-950	2	938	929	0.0	8000	800.0	1	100	1	100	1.0
951-975	1	963	964	-	10040	-	1	100	-	-	-
Total	515	-	-	-	-	-	267	34	248	25	0.94
Mean	-	-	591	4.1	2768	60.6	-	-	-	-	-

Appendix 7. Mean fork length, mean weight, maturity and sex ratio by length interval for lake trout from Frontier Lodge, 1975.

Length Interval (mm)	No.	Class Mark (mm)	Fork Length (mm)		Weight (g)		Males		Females		F/M Ratio	No. Unknown Sex
			Mean	SE	Mean	SE	No.	%Mature	No.	%Mature		
376-400	3	388	387	5.6	575	189.6	1	-	-	-	-	2
401-425	8	413	409	2.2	819	81.9	4	-	3	-	0.8	1
426-450	13	438	440	2.1	960	29.9	8	-	5	-	0.6	-
451-475	19	463	463	1.5	1204	56.6	5	-	13	-	2.6	1
476-500	37	488	489	1.3	1417	35.8	18	22	17	-	0.9	2
501-525	46	513	513	1.2	1652	36.9	24	17	19	5	0.8	3
526-550	57	538	539	1.0	1980	41.0	25	41	31	16	1.2	1
551-575	76	563	563	0.8	2313	41.4	41	32	33	36	0.8	2
576-600	78	588	588	0.8	2691	47.1	33	33	45	40	1.4	-
601-625	108	613	614	0.7	3069	42.5	52	40	55	51	1.1	1
626-650	96	638	637	0.8	3462	56.9	44	30	51	63	1.2	1
651-675	77	663	663	0.8	4177	62.3	38	61	39	77	1.0	-
676-700	59	688	688	1.0	4572	99.9	24	54	35	66	1.5	-
701-725	38	713	713	1.2	5076	112.5	18	33	20	80	1.1	-
726-750	37	738	739	1.1	5712	124.4	15	40	22	100	1.5	-
751-775	21	763	764	1.8	6439	172.0	11	46	10	70	0.9	-
776-800	5	788	787	3.5	6980	333.3	1	100	4	75	4.0	-
801-825	3	813	816	4.7	8058	484.4	1	100	2	100	2.0	-
826-850	-	-	-	-	-	-	-	-	-	-	-	-
851-875	-	-	-	-	-	-	-	-	-	-	-	-
876-900	1	883	891	-	8200	-	-	-	1	-	-	-
Total	782	-	-	-	-	-	363	34	405	49	1.12	14
Mean	-	-	616	7.8	3224	53.1	-	-	-	-	-	-

Appendix 8. Mean fork length, mean weight, maturity and sex ratio by length interval for lake trout from Great Bear Trophy Lodge, 1976.

Length Interval (mm)	No.	Class Mark (mm)	Fork Length (mm)		Weight (g)		Males		Females		F/M Ratio	No. Unknown Sex (Trophy fish)
			Mean	SD	Mean	SD	No.	%Mature	No.	%Mature		
401-425	2	413	419	4.2	775	176.8	1	N/A	1	0	1.0	-
426-450	2	438	444	8.5	800	-	1		1	0	1.0	-
451-475	6	463	460	7.4	958	66.5	-		4	0	-	2
501-525	18	513	513	7.7	1886	186.4	8		8	0	1.0	2
526-550	13	538	537	7.0	1715	207.5	8		4	0	0.5	1
551-575	21	563	564	5.3	2038	318.9	12		8	13	0.7	1
576-600	38	588	591	7.5	2365	301.7	12		26	46	2.1	-
601-625	61	613	614	7.9	2703	439.4	30		31	61	1.0	-
626-650	70	638	637	8.1	3120	380.5	22		45	73	2.0	3
651-675	46	663	661	7.0	3459	541.2	20		24	58	1.2	2
676-700	41	688	689	7.4	3787	541.5	17		22	68	1.3	2
701-725	28	713	713	8.0	3964	476.5	8		18	50	2.3	2
726-750	17	738	736	6.9	4427	489.6	6		9	44	1.5	2
751-775	15	763	763	7.2	5077	549.3	6		6	83	1.0	3
776-800	10	788	791	6.7	5380	541.7	1		7	43	7.0	2
801-825	13	813	814	7.4	5508	596.8	5		8	25	1.6	-
826-850	6	838	841	4.7	6542	997.7	2		-	-	-	4
851-875	7	863	867	4.5	7236	1099.1	2		-	-	-	5
876-900	11	888	887	7.3	7346	863.5	2		3	100	-	6
901-925	4	913	911	6.0	8625	1050.0	-		-	-	-	4
926-950	3	938	940	-	8817	652.6	-		-	-	-	3
951-975	9	963	959	6.7	10389	1366.3	-		-	-	-	9
976-1000	10	988	985	6.1	11274	1136.8	-		1	100	-	1
1001-1025	9	1013	1012	6.7	11806	1670.2	1		1	100	1.0	7
1026-1050	13	1038	1038	6.6	12992	1757.1	1		1	100	1.0	11
1051-1075	13	1063	1064	5.7	15546	1393.7	-		-	-	-	13
1076-1100	8	1088	1086	6.4	16800	1758.7	-		-	-	-	8
1101-1125	6	1113	1114	5.9	16258	1952.8	-		-	-	-	6
1126-1150	1	1138	1143	-	19550	-	-		-	-	-	1
1151-1175	4	1163	1163	6.4	17325	2732.1	-		-	-	-	4
Total	505	-	-	-	-	-	165	-	228	52	1.38	112
Mean	-	-	716	162.5	4974	4053	-	-	-	-	-	-

Appendix 9. Mean fork length, mean weight, maturity and sex ratio by length interval for lake trout from Indian Mountain Lodge, 1976.

Length Interval (mm)	No.	Class Mark (mm)	Fork Length (mm)		Weight (g)		Males		Females		F/M Ratio	No. Unknown Sex
			Mean	SD	Mean	SD	No.	%Mature	No.	%Mature		
401-425	1	413	417	-	800	-	1	0	-	-	-	-
426-450	3	438	440	8.3	850	50.0	2	0	1	0	0.5	-
451-475	6	463	465	3.7	1133	312.5	1	0	4	0	4.0	1
476-500	21	488	493	6.3	1248	111.2	13	15	7	0	0.5	1
501-525	28	513	515	7.7	1696	142.6	19	26	9	11	0.5	-
526-550	49	538	539	6.8	1773	269.8	26	42	23	13	0.9	-
551-575	56	563	562	7.3	2096	268.6	24	63	32	50	1.3	-
576-600	48	588	588	7.3	2391	294.2	20	30	28	54	1.4	-
601-625	32	613	611	7.6	2600	269.8	15	60	17	41	1.1	-
626-650	17	638	635	6.5	2806	432.6	5	40	12	33	2.4	-
651-675	19	663	663	6.8	3416	457.0	7	57	12	58	1.7	-
676-700	8	688	690	7.4	3931	367.4	3	67	5	40	1.6	-
701-725	9	713	710	7.4	4122	452.1	6	50	2	0	0.3	1
726-750	6	738	740	5.6	4917	361.5	3	67	3	33	1.0	-
751-775	9	763	764	9.1	5144	719.1	3	100	6	83	2.0	-
776-800	9	788	790	7.6	6017	783.0	7	100	2	0	0.3	-
801-825	7	813	812	4.5	6136	523.4	5	100	2	100	0.4	-
826-850	5	838	842	5.1	6800	353.5	1	100	4	100	4.0	-
851-875	2	863	872	2.8	8800	1131.4	0	-	1	100	-	1
876-900	3	888	893	7.0	8400	1471.7	2	100	1	100	0.5	-
901-925	2	913	906	4.9	8675	106.0	1	100	0	-	-	1
951-975	2	963	960	10.6	12800	2424.2	0	-	0	-	-	2
1001-1025	2	1013	1007	2.1	11550	2757.7	1	100	0	-	-	1
Total	336	-	-	-	-	-	165	47	171	40	1.04	8
Mean	-	-	607	103.5	2857	1903.6	-	-	-	-	-	-

Appendix 10. Mean fork length, mean weight, condition factor, maturity and sex ratio by age for lake trout from Arctic Circle Lodge, 1975.

Age (yr)	No.	Fork Length (mm)		Weight (g)		Condition Factor	Males		Females		F/M Ratio
		Mean	SE	Mean	SE		No.	%Mature	No.	%Mature	
10	1	355	-	600	-	-	1	-	-	-	-
12	15	431	9.5	1056	80.1	1.31	9	-	6	-	0.7
13	6	447	13.3	1100	89.4	1.29	6	-	-	-	1.5
14	3	484	4.8	1406	42.6	1.24	13	-	19	-	-
15	51	506	3.7	1573	36.0	1.22	26	4	25	-	1.0
16	50	536	4.7	1936	53.9	1.26	28	7	22	11	0.8
17	70	551	3.6	2129	48.5	1.27	43	14	27	0	0.6
18	49	579	5.2	2508	68.9	1.29	21	24	28	21	1.3
19	29	584	5.6	2617	88.9	1.32	14	43	15	33	1.1
20	27	608	5.5	2915	91.6	1.30	19	53	8	25	0.4
21	29	622	5.2	3024	79.8	1.25	16	63	13	15	0.8
22	16	643	5.2	3347	129.7	1.26	6	67	10	40	1.7
23	21	643	6.1	3491	93.6	1.32	6	67	15	54	2.5
24	25	645	6.6	3444	104.4	1.28	16	81	9	33	0.6
25	24	665	4.1	3856	126.9	1.31	12	92	12	67	1.0
26	18	695	11.7	4117	201.5	1.23	7	57	11	82	1.6
27	15	705	8.7	4233	168.4	1.21	7	71	8	50	1.1
28	14	739	15.4	4989	276.1	1.24	6	67	8	63	1.3
29	7	808	30.8	6100	667.9	1.16	4	50	3	67	0.8
30	3	729	24.4	4867	569.6	1.26	-	-	3	-	-
31	3	844	16.7	6500	503.2	1.08	1	-	2	-	-
32	1	840	-	7300	-	-	1	-	-	-	-
33	3	853	33.5	7100	960.9	1.14	2	-	-	-	-
34	2	914	9.5	7150	50.0	0.94	-	-	2	-	-
35	2	832	96.5	7200	1600.0	1.25	1	-	1	-	-
36	2	935	29.0	9300	800.0	1.14	2	-	-	-	-
Total	515	-	-	-	-	-	267	34	248	25	0.94
Mean	19.6[a]	591	4.1	2768	77.9	1.34	-	-	-	-	-

[a] Mean age

Appendix 11. Mean fork length, mean weight, condition factor, maturity and sex ratios by age for lake trout from Frontier Lodge, 1975.

Age (yr)	No.	Fork Length (mm)		Weight (g)		Condition Factor	Males		Females		F/M Ratio	No. Unknown Sex
		Mean	SE	Mean	SE		No.	%Mature	No.	%Mature		
7	4	430	22.2	863	137.2	1.08	-	-	2	-	-	2
8	5	431	13.6	1075	172.7	1.34	5	20	-	-	-	-
9	23	456	9.3	1056	71.3	1.11	8	-	14	-	1.8	1
10	40	505	7.0	1528	64.2	1.19	17	12	19	5	1.1	4
11	41	534	6.8	1835	66.9	1.20	19	11	19	5	1.0	3
12	91	565	5.7	2283	67.7	1.27	46	22	42	26	0.9	3
13	93	600	5.3	2939	93.3	1.36	38	37	55	33	1.5	-
14	130	607	5.1	3039	85.1	1.36	64	34	66	55	1.0	-
15	84	627	7.5	3459	134.9	1.40	44	43	39	56	0.9	1
16	90	641	6.1	3693	111.4	1.40	46	44	44	61	1.0	-
17	49	653	7.6	4136	175.8	1.49	22	86	27	67	1.2	-
18	34	693	8.8	4672	192.3	1.40	11	27	23	78	2.1	-
19	15	694	15.6	4928	403.4	1.48	10	60	5	100	0.5	-
20	25	690	11.7	5044	285.8	1.54	11	46	14	86	1.3	-
21	23	695	9.5	5183	271.9	1.55	9	33	14	93	1.6	-
22	11	691	17.0	4791	429.3	1.45	3	100	8	88	2.7	-
23	11	707	25.6	5280	526.7	1.49	4	75	7	57	1.8	-
24	7	704	29.1	5143	792.0	1.47	3	33	4	100	0.8	-
25	3	708	46.7	5375	1255.1	1.51	-	-	3	67	-	-
26	2	732	39.5	6650	750.0	1.70	2	50	-	-	-	-
27	-	-	-	-	-	-	-	-	-	-	-	-
28	1	809	-	7125	-	1.35	1	100	-	-	-	-
Total	782	-	-	-	-	-	363	34	405	49	1.12	14
Mean	14.7[a]	616	7.8	3224	53.1	1.37	-	-	-	-	-	-

[a] Mean age

Appendix 12. Mean fork length, mean weight, condition factor, maturity and sex ratio by age for lake trout from Great Bear Trophy Lodge, 1976.

Age (yr)	No.	Fork Length (mm)		Weight (g)		Condition Factor	Males		Females		F/M Ratio	No. Unknown Sex
		Mean	SD	Mean	SD		No.	%Mature	No.	%Mature		
11	4	441	14.4	875	95.7	1.02	1	N/A	3	0	3.0	-
12	8	489	28.9	1181	244.8	1.00	3		4	0	1.3	1
13	11	516	24.1	1450	246.9	1.05	4		5	0	1.3	2
14	12	536	22.8	1613	186.0	1.05	4		6	0	1.5	2
15	10	552	25.7	1944	269.2	1.16	7		3	0	2.3	-
16	29	584	26.2	2233	431.8	1.12	10		18	28	1.8	1
17	48	606	31.5	2595	484.5	1.12	14		34	56	2.4	-
18	48	623	27.3	2889	536.9	1.12	20		27	63	1.4	1
19	31	639	21.8	3079	455.7	1.18	17		14	57	0.8	-
20	27	647	23.5	3228	460.4	1.19	12		14	64	1.2	-
21	33	659	36.3	3424	660.4	1.19	11		22	54	2.0	-
22	24	673	23.4	3565	588.9	1.17	10		14	86	1.4	-
23	28	698	45.5	3855	873.1	1.12	12		16	56	1.3	-
24	21	711	41.1	4095	851.9	1.14	8		13	69	1.6	-
25	17	755	52.2	4962	928.5	1.15	8		9	44	1.1	-
26	13	750	63.8	4808	1288.9	1.13	6		7	71	1.2	-
27	9	769	39.8	4894	731.6	1.07	3		6	33	2.0	-
28	5	796	76.1	5280	1066.3	1.05	2		3	0	1.5	-
29	4	765	138.4	5675	2280.5	1.23	3		1	100	0.3	-
30	4	797	33.7	4838	259.4	1.10	2		2	50	1.0	-
31	4	770	94.5	5088	1433.2	1.11	1		3	67	3.0	-
32	1	985	-	10750	-	1.13	-		1	0	-	-
33	1	892	-	6900	-	0.97	-		1	0	-	-
34	1	900	-	7900	-	1.08	1		-	-	-	-
36	2	1031	20.5	12800	1272.8	1.17	1		1	100	1.0	-
39	1	1047	-	11500	-	1.16	1		-	-	-	-
40	1	1020	-	12350	-	1.01	-		1	100	-	-
Total	401	-	-	-	-	-	165		228	52	1.38	8
Mean	17.6[a]	651	92.1	3331	1580.9	1.15	-		-	-	-	-

[a] Mean age

Appendix 13. Mean fork length, mean weight, condition factor, maturity and sex ratios by age for lake trout from Indian Mountain Lodge, 1976.

Age (yr)	No.	Fork Length (mm)		Weight (g)		Condition Factor	Males		Females		F/M Ratio	No. Unknown Sex
		Mean	SD	Mean	SD		No.	%Mature	No.	%Mature		
10	5	444	9.3	880	56.1	1.01	3	0	2	0	0.7	N/A
11	13	489	5.7	1254	69.6	1.07	7	0	6	0	0.9	
12	27	507	4.5	1377	51.6	1.06	17	12	8	13	0.5	
13	42	538	3.4	1714	54.0	1.10	24	21	18	22	0.8	
14	53	558	2.7	2059	46.7	1.19	23	57	30	40	1.3	
15	45	575	3.9	2256	58.9	1.20	17	71	28	43	1.8	
16	47	600	5.0	2469	53.7	1.15	22	45	25	44	1.2	
17	28	626	7.7	2759	113.4	1.13	15	47	13	46	0.9	
18	27	682	10.1	3932	198.7	1.25	12	78	15	53	1.3	
19	8	725	17.5	4505	368.5	1.19	5	100	3	100	0.6	
20	7	749	19.7	4835	397.4	1.15	3	67	4	25	1.3	
21	8	791	12.0	6119	301.9	1.23	6	100	2	50	0.3	
22	4	778	16.9	5650	550.4	1.20	3	100	1	100	0.3	
23	4	825	32.1	6575	567.7	1.17	2	100	2	50	1.0	
24	4	846	14.1	6650	354.1	1.09	1	100	3	100	3.0	
25	2	811	59.5	6450	1550.0	1.21	0	-	2	100	-	
26	3	868	92.9	7533	1659.9	1.15	2	100	1	100	0.5	
27	2	826	15.0	6100	100.0	1.08	0	-	2	100	-	
28	1	898	-	10000	-	1.38	1	100	-	-	-	
Total	344	-	-	-	-	-	165	47	171	40	1.04	8
Mean	14.9[a]	607	5.2	2857	85.6	1.25	-	-	-	-	-	-

[a] Mean age

Printed in Canada by
Supply and Services Canada
Printing Office
for exclusive distribution by
Fisheries and Oceans Canada
Freshwater Institute
Winnipeg, Manitoba
Canada