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AN INVESTIGATION OF THE WALLEYE, *Stizostedion vitreum vitreum* (Mitchill), FROM THE SPORT FISHERY OF THE HAY RIVER, NORTHWEST TERRITORIES, 1975

by

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ABSTRACT

Bond, W.A., R.W. Moshenko, and G. Low. 1978. An investigation of the walleye, *Stizostedion vitreum vitreum* (Mitchill), from the sport fishery of the Hay River, Northwest Territories, 1975. Can. Fish. Mar. Serv. MS Rep. 1449: v + 19 p.

During the period June 19 to August 21, 1975 a creel census and biological investigation was carried out on the walleye sport fishery of the Hay River, Northwest Territories. The 748 anglers interviewed spent a total of 958.9 hours angling with a success rate of 1.23 walleye per angler-hour and 1.57 walleye per angler. The total catch was estimated to be approximately 2600 walleye with 81.9% of the total catch retained, resulting in a total harvest of about 860 kg (1900 lb). Angling success was highest in late June and in August.

Mean values for measurements from angled walleye were 328 mm (range 232-477) in fork length, 406 g (range 75-1125) in weight and 5.4 yr (range 3-11) in age. Age classes 4-6 made up 83.1% of the total sample. This summer walleye population consists almost entirely of immature fish. In this area, male walleye do not spawn before reaching age 7 and females before age 8. This sport fishery should be monitored at least every second or third year, with a follow-up study in the near future on spawning assessment and movement patterns.

Key words: angling; catch composition; catch/effort; sport fishing statistics; exploitation; fishery management; life history; monitoring.

RESUME

Bond, W.A., R.W. Moshenko, and G. Low. 1978. An investigation of the walleye, *Stizostedion vitreum vitreum* (Mitchill), from the sport fishery of the Hay River, Northwest Territories, 1975. Can. Fish. Mar. Serv. MS Rep. 1449: v + 19 p.

Nous avons effectués, du 19 juin au 21 août 1975, un relevé des prises et une investigation biologique sur la pêche sportive du doré jaune de la Hay River, dans les Territoires du Nord-Ouest. Les 748 pêcheurs consultés ont pêché pendant un total de 958.9 h, avec un taux de succès de 1.23 doré par heure-pêcheur, ou 1.57 doré par pêcheur. La prise total a été évaluée à environ 2600 dorés, dont 81.9% ont été gardés; ce qui donne une récolte totaled'environ 860 kg (1900 lb). Les meilleures prises ont été enregistrées à la fin de juin et en août.

Les valeurs moyennes des paramètres enregistrés étaient 328 mm (écart de 232 à 477) pour la longueur à la fourche, 406 g (écart de 75 à 1125) pour le poids et 5.4 ans (écart de 3 à 11) pour l'âge. La classe d'âges de 4 à 6 ans constituait 83.1% de l'échantillon total. La population de dorés de cet été est constituée presque entièrement de poissons immatures. Dans cette région, les mâles ne se reproduisent qu'à partir de l'âge de 7 ans, et les femelles, à partir de 8 ans. Cette pêche sportive devrait être contrôlée au moins à tous les deux ou trois ans et une étude complé-

mentaire devrait être faite dans un proche avenir sur l'évaluation du frai et la configuration des déplacements.

Mots clés: pêche sportive; composition des prises; prise en fonction de l'effort; statistiques sur la pêche sportive; exploitation; gestion des pêches; cycle vital; contrôle.

INTRODUCTION

The walleye, *Stizostedion vitreum vitreum* (Mitchill), is perhaps the most economically important species of fish in Canada's fresh water. It is highly esteemed by anglers and commercial fishermen alike. In Ontario an angler survey has shown that the walleye is the game fish most often fished for and is the second most abundant in anglers' catches (Scott and Crossman 1973). During 1976 Canadian commercial fisheries landed 2.1 million kg (4.5 million lb) of walleye with a landed value of 5.5 million dollars. However, production figures have declined considerably since 1956 when commercial walleye landings approached 9.6 million kg (21 million lb).

In the Northwest Territories, the walleye is restricted in distribution to the Mackenzie River drainage system, reaching its northern limit in the delta region. Commercial production of walleye in the Territories averages about 45,450 kg (100,000 lb) annually (round weight) most of which comes from Tathlina, Kakisa and Great Slave lakes in the southwest corner of the District of Mackenzie. While not a major sports fish in the Northwest Territories, it is of considerable recreational value in certain areas during the spring and summer months. Especially important in this regard are the areas around the growing population centers of Yellowknife and Hay River. With limited road access in these areas and, therefore, limited angling opportunity, it is to be expected that the increasing human population will place increasing demands on the more easily accessible fish populations. If such fish populations are to be maintained it is essential that knowledge be obtained on the size of the populations in question, their age composition, age of maturity, rate of growth, and the annual harvest.

On the south shore of Great Slave Lake, a walleye sport fishery has existed near the mouth of the Hay River for many years. Although fisheries workers have been present in this region, their efforts have been primarily directed towards the whitefish and lake trout fishery on Great Slave Lake and the walleye have been largely neglected. Thus there exists no baseline data on the original state of the Hay River walleye population. During the past few years, fisheries workers have become aware of the recreational importance of this fishery and of an increase in the amount of angler effort expended. In an effort to determine angling pressure and harvest and to describe the age and growth characteristics of this walleye population a creel census and biological sampling program was initiated in 1974 (Falk and Dahlke 1975), and continued in 1975. This report summarizes the data collected during the summer of 1975 and describes our present knowledge of various biological parameters of this population.

MATERIALS AND METHODS

STUDY AREA

The Hay River rises in northeastern British Columbia and passes through northwestern Alberta before entering the Northwest Territories and flowing into the west arm of Great Slave Lake (Fig. 1). The river has a drainage area of 47,500 km^2 and, for much of its 480 km length, drains extensive muskeg terrain where it acquires the brown staining typical of many such streams in northern Canada. About 65 km upstream from Great Slave Lake the Hay River passes over an escarpment forming Alexandra and Louise Falls (33 and 13 m high respectively). Downstream from the Louise Falls a 52 m high gorge cuts through Devonian limestone to the edge of the escarpment, after which the river becomes slower and meanders extensively. In 1973, discharge from the Hay River ranged from approximately 570 dm^3/sec on February 13 to 594,650 dm^3/sec on April 29 with a yearly average of 124,300 dm^3/sec. The silt load is generally high in the spring, decreasing throughout the summer. In 1973 silt loads during the summer ranged from 15,751 ton/day in May to 99 ton/day in October (Davies 1973).

In the delta, the Hay River passes among a group of low-lying alluvial islands and enters Great Slave Lake through two main channels on the east and west sides of Vale Island (Fig. 2). The town of Hay River (population 3,500), originally located on Vale Island, was resituated following a disastrous flood in 1963 and is now located on the west bank of the river just upstream from the delta.

Most angling in the Hay River is carried out along a 4 km stretch in the delta region (Fig. 2) and it was in this area that the present study was conducted.

CREEL CENSUS STUDY

A partial creel census and biological sampling program was conducted on the Hay River between June 13 and August 21, 1975. Although some angling occurred in early June and late August, the sampling program is thought to have included the period of most intensive angling.

Two interview periods were scheduled each day, at 1600 and 2000 hours, although the actual time of interviews varied. No particular amount of time was allotted for any interview period; rather the time spent interviewing depended solely on the number of anglers present. Most anglers were approached while their fishing trips were still in progress and, consequently, the results are usually for incomplete trips.

Upon arriving at the site, a creel census interviewer would confront each angler with a series of questions such as:

a. Where is your place of residence?
b. How long have you been fishing here?
c. How many fish of each species have you caught and released?

The sole criterion of angler success was whether any fish had been caught, regardless of size, species or amount of time spent angling.

The creel census was conducted along a 4 km stretch of the Hay River (Fig. 2) in which two separate areas, the east and west channels can be distinguished. Boat anglers, who made up only a small percentage of the total number, usually drifted down the deeper and slower east channel, directly across from the airport road. Some interviews were conducted in this area with boat-

anglers and the relatively small number of fishermen who angled from shore. Most of the angling and, therefore, most of the interviewing, was done on the shallower and faster west channel in the immediate vicinity of the bridge (Fig. 2). In this area, all angling was done from shore.

BIOLOGICAL INVESTIGATION

After the initial question period, a portion (or all) of each angler's creel was sampled for fork length (±1 mm) and weight (±25 g) and a small scale sample was obtained. For walleye, scales were taken below the lateral line and immediately behind the pectoral fin. It was hoped that sex and maturity of all fish could also be obtained by examining the gonads. However, it was discovered that many anglers preferred to keep their fish alive on stringers; thus this aspect of the sampling program was abandoned.

Ages of walleye were determined by counting annuli on the scales. Scales were mounted between two glass slides and the annuli counted on the image produced by a microprojector (magnification 45x).

In order to obtain a larger and more representative sample on which to base a description of the age and growth of Hay River walleye, several gillnet sets, using a 4 inch stretched mesh size, were made near the mouth of the river between June 18 and July 4, 1975. The catch data obtained from these gillnet sets are given in Appendix 2. All fish were sampled for fork length, weight, scales, sex and maturity. Sex and maturity were coded as follows:

Sex: 1 - males; 2 - females

Maturity F	Maturity M	Gonad Condition	
1	6	immature	Fish which have not reached spawning age (thin ovaries; transparent or translucent).
2	7	maturing	Fish which will not spawn in year of capture.
3	8	mature	Fish which will spawn in year of capture (ova or sperm cannot be expelled by light pressure).
4	9	ripe	Fish which will spawn soon (ova or sperm can be expelled out of genital pore).
5	10	spent	Spawning has occurred recently.

Data from angled walleye sampled during the creel census are listed in Appendix 1. In addition, data presented by Falk and Dahlke (1975) have been incorporated into this report.

The length-weight relationship for walleye is described by the power equation:

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

where: W = weight in grams

L = fork length in millimeters

a = Y-intercept

b = slope of the regression line

Condition factors (K), often used to describe the relative plumpness of fish, were calculated from the formula $K = W \times 10^5/L^3$.

Data were analyzed using a programmable calculator (Hewlett-Packard Model 9810-A).

RESULTS AND DISCUSSION

CREEL CENSUS

Angler interviews were conducted on 47 days during the 10 week period June 13 - August 21, 1975, including 15 weekend-days and 32 weekdays. While some angling did occur prior and subsequent to the actual census period it is known that such pressure was light and few fish were taken. Certainly the great majority of the angling pressure was exerted within the 70 day period mentioned above. Creel census results are summarized in Table 1.

Angling pressure

A total of 825 anglers were observed during the creel census period, of which 748 were interviewed. Many of those observed but not interviewed were boat-fishermen. The 748 anglers interviewed had accumulated 958.9 angler-hours.

The greatest amount of angling pressure was exerted on the west channel in the vicinity of the bridge (Fig. 2). At this site, 557 (67.5%) of the total observations were made, with angling conducted exclusively from shore. The east channel was utilized by 268 (32.5%) of the observed anglers.

As reported by Falk and Dahlke (1975) a large percentage of the anglers (71.5%) were residents of the Northwest Territories and, although no data were obtained, many of these were school-aged children from Hay River. Other anglers interviewed represented eight Canadian provinces (26.5%) and seven American states (1.9%) as shown below:

Residence	Anglers Interviewed No.	Anglers Interviewed %	Angler-Hours No.	Angler-Hours %
Canada				
N.W.T	535	71.5	614.8	68.4
Alta.	116	15.5	147.3	16.4
B.C.	24	3.2	31.7	3.5
Ont.	22	2.9	34.0	3.8
Sask.	20	2.7	28.8	3.2
Man.	9	1.2	14.3	1.6
N.S.	3	0.4	6.5	0.7
N.B.	3	0.4	7.0	0.8
P.Q.	1	0.1	2.0	0.2
United States	14	1.8	12.0	1.4
Germany	1	0.1	0.5	0.1
TOTAL	748	-	898.9	-

Afternoon (40.6%) and evening (58.1%) were the times of day preferred by most anglers. The number of anglers tended to increase from 1400 hours until 1700 hours, then to drop off during the supper hour. After 1900 hours angling pressure usually increased again and by 2200 hours most people had left for the night.

Angler harvest

The total catch by 748 anglers in 958.9 hours included 1178 walleye, 37 pike, 17 inconnu and 1 burbot of which 81.9%, 64.9%, 88.2% and 100.0% respectively were retained (Table 1). Sixty-four percent of all anglers were successful, i.e., caught at least one fish. In terms of the number of fish caught per angler, success varied from zero on July 2nd and July 7th to 3.75 on June 28th. The overall average was 1.65 fish per angler. In terms of the number of fish caught per angler-hour, the mean was 1.29, varying from zero on July 2nd and July 7th to 5.38 on June 26th. Angling was generally good through the last half of June, producing an average of 1.19 fish per angler-hour. During the first three weeks of July angling was poor, with an average of only 0.56 fish per angler-hour. Fishing success improved during the latter part of July and during August angling produced an average of 1.60 fish per angler-hour. In 1974 angler success was determined to be 1.11 fish per angler-hour (Falk and Dahlke 1975).

In order to obtain an estimate of the total number of walleye harvested by anglers during the summer it is necessary to make certain assumptions; i.e., that the anglers who were not interviewed were equally as successful as those who were; that the angling pressure on those days on which no interviews were conducted was equal to that on interview days; that at best the interviewers were only able to account for 75% of all walleye caught on the days that the creel census was conducted. In the last case it should be noted that on days when the angling pressure was light probably close to 100% of all fish taken were accounted for. This value would be considerably less on days when angling pressure was heavy.

Accepting the above assumptions as valid, the total harvest from the creel census area between June 13 and August 21 was estimated as 2600 walleye of which 2120 were retained by anglers.

BIOLOGICAL INVESTIGATION

Size and age of creeled walleye

A total of 408 angled walleye were measured and weighed during the 1975 census period. Ages were determined for 396 walleye. The length frequency distribution for angled walleye is shown in Fig. 3, while mean weight, mean fork length and condition factor by age class are summarized in Table 2. Angled walleye had a mean weight of 406 g (range: 75-1125). The mean scale age of these fish was 5.4 years, ranging from age 3 to 11. Age 5 fish made up 41.7% of the total sample while age 4 and 6 fish accounted for 23.7% and 17.7% respectively. Walleye caught by angling in 1975 appear to be younger and smaller than those taken in 1974. For angled walleye sampled in 1974, Falk and Dahlke (1975) obtained a mean fork length of 399 mm, a mean weight of 532 g and a mean scale age of 6.3 years.

For 1975, the 408 angled walleye samples were augmented by a gillnet sample of 61 fish. In order to increase the sample size as well as the size range represented, we have included 184 walleye for which data were provided by Falk and Dahlke (1975). Thus, a total of 653 walleye, captured by various methods between 1973 and 1975 were used to determine the age and growth patterns of walleye in the Hay River.

Length-frequency distribution

The length-frequency distribution for walleye used in the age and growth description is shown in Fig. 4. These fish ranged in fork length from 81 to 524 mm with a mean of 328 mm. This was also the mean for the 534 angled walleye represented. Walleye captured by ¼ inch mesh seines (Falk and Dahlke 1975) had a mean fork length of 170 mm (range: 81-410 mm) while those taken in 4 inch gillnets showed a mean fork length of 385 mm (range: 186-524 mm).

Length and weight of the age groups

Scale ages were determined for 451 walleye captured in 1975. The total number of walleye used in this section was increased to 629 by incorporating the data of Falk and Dahlke (1975). Since the sex of many of the samples was not determined, growth curves were produced only for the sexes combined. Many authors have shown that at some point in time the growth rates of male and female walleye begin to diverge so that beyond that point females are typically larger than males. This divergence usually begins to appear just prior to or at the age of first sexual maturity. Mraz (1968) and Priegel (1969) showed this phenomenon occuring at age 3 in Wisconsin while in Lac la Ronge, Saskatchewan, Rawson (1957) indicated that divergent growth began at age 7. On the other hand, Kennedy (1949) showed no difference in growth rate between male and female walleye in Lake Manitoba. In Great Slave Lake, as will be shown later, sexual maturity in most walleye does not occur until about age 8 for males and age 9 or 10 for females. Thus for a large portion of our sample a common growth curve for both sexes is probably adequate.

Growth curves (Fig. 5 and 6) were plotted using the data in Table 3.

Although the mean fork length for age 1 walleye is shown on Table 3 as being 125 mm, it should be pointed out that this value is probably high. Two of the fish used to determine this mean value were captured at the end of May, i.e., before they had begun their summer growth. These 2 fish and 3 other age 1 walleye captured at about the same time had a mean fork length of 89 mm. Four age 1 fish captured in August, but used in determining the mean fork length indicated in Table 3, had a mean fork length of 141 mm. These fish had undoubtedly completed a considerable amount of their second summer's growth at the time of capture. At the end of their first year, walleye in the Hay River probably average around 89 mm in length and (as calculated from the length-weight equation) weigh approximately 5 g.

Comparison of age-length curves for walleye from various areas throughout their geographic range (Fig. 7) indicates that those from Hay River have one of the slowest growth rates reported in the literature for this species. This was also suggested by Rawson (1951) who described the growth of walleye in Great Slave Lake on the basis of 46 specimens. The slowest growth rate the authors could locate in the literature was reported by Hatfield et al. (1972) for walleye captured in the Mackenzie River between Fort Simpson and Arctic Red River, N.W.T., where the species approaches its northern range limit. In constructing Fig. 7 it was necessary to convert total lengths to fork lengths in some cases. This was done by utilizing the relationship: total length = 1.05 fork length (Rawson 1957).

Length-weight relationship

The mathematical relationship between fork length and weight for Hay River walleye is described by the equation:

$$\log_{10} W = -5.7821 + 3.3331 (\log_{10} L);$$

$$s_b = 0.0308$$

Separate length-weight equations were not calculated for male and female walleye for reasons previously mentioned. However, many authors (Rawson 1957; Priegel 1969) have found no sexual differences in length-weight relationship for walleye in other areas except during the spawning period.

Agreement between empirical mean weights and those calculated from the length-weight equation (Table 3) was generally good, with deviations being less than 25 g in most cases. The greatest deviations occurred in the older age classes where sample size was small and large ranges in weight might be expected within age classes.

Age of first sexual maturity

There is no direct evidence known to the authors to indicate that a spring spawning migration of walleye does occur into the Hay River. It is clear, however, that the summer walleye population of the river consists almost exclusively of immature fish. If a spawning migration does occur the spawners must leave the river shortly after spawning.

Falk and Dahlke (1975) reported no mature walleye from their creel census sample but did indicate that by age 7, 40% of male walleye could still be classified as immature while 40% had reached the maturing stage. Their data would seem to indicate that it is unlikely that male walleye spawn before age 7 or that females spawn before age 8.

During the latter part of June and early July, 1975, gillnets set in the Hay River near its mouth did produce a few walleye that had spawned recently (Appendix 2). The youngest spent male was age 7 while the youngest spent female was 10 years old.

In Mosquito Creek, on the north arm of Great Slave Lake, spawning male walleye range from age 7 to 15 and spawning females range from age 8 to 15 (S. Stephansson unpublished data). However, age 7 males and age 8 and 9 females made up only a very small proportion of the spawning population. From the data provided by the author it appears that, at Mosquito Creek, while male walleye may spawn as early as age 7, most do not spawn before age 8 and the majority of spawning males are age 9 to 12 inclusive. Similarly, while female walleye may spawn as early as age 8, most do not spawn until age 10 and the majority of spawning females are age 10 to age 13 inclusive. It seems reasonable to assume that a similar situation will be found to occur in the Hay River area which is approximately 200 km from Mosquito Creek. Figure 8 shows the age frequency distributions for walleye taken from the Hay River by anglers during 1974 and 1975 and for the 1974 Mosquito Creek spawning population (S. Stephansson unpublished data). This figure gives at least an approximation of the relationship between the summer resident walleye population of the Hay River and the overall population.

According to Scott and Crossman (1973) male walleye usually mature at 2 to 4 years of age and females at 3 to 6 years of age. In Lac la Ronge, Saskatchewan, walleye may spawn as early as age 5. However, most do not spawn before age 7 and the bulk of the spawning population is 10 to 12 years old (Rawson 1957). It would appear, therefore, that in Great Slave Lake walleye mature considerably later in life than in other areas.

CONCLUSIONS AND RECOMMENDATIONS

Continued high exploitation of juvenile fish no doubt can be detrimental to the population, especially if an insufficient number of prerecruits survive to the spawning age. In the Hay River situation, there remain several unknowns, namely, the size of the total population, whether or not walleye spawn in the Hay River and whether or not these juveniles migrate in from some other adjacent system. It is therefore recommended that a creel census and biological investigation be carried out at least once every two or three years to monitor angling pressure, angling success, and age and size of walleye vulnerable to this sport fishery. In addition, a follow-up study should be undertaken in the near future to identify walleye movement patterns and spawning locations in the Hay River area.

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Table 1. Summary of the creel census from Hay River, 1975.

Date	No. Anglers Interviewed Successful	Unsuccessful	Percentage Successful	Walleye C[a]	R[b]	K[c]	N. Pike C	R	K	Inconnu C	R	K	Burbot C	R	K	Total Hours Angled	No. Fish Caught Per Angler	Per Hour
June 13	9	4	69	19	3	16	-	-	-	-	-	-	-	-	-	13.5	1.46	1.41
14	4	1	80	8	2	6	-	-	-	-	-	-	-	-	-	4.0	1.60	2.00
15	5	7	42	16	5	11	-	-	-	-	-	-	-	-	-	18.5	1.33	0.86
16	4	10	29	8	0	8	1	0	1	-	-	-	-	-	-	10.5	0.64	0.86
17	2	0	100	5	0	5	-	-	-	-	-	-	-	-	-	3.0	2.50	1.67
18	2	3	40	3	0	3	-	-	-	-	-	-	1	0	1	7.0	0.80	0.57
19	9	6	60	13	4	9	-	-	-	1	0	1	-	-	-	15.8	0.93	0.89
20	15	7	68	33	0	33	-	-	-	8	0	8	-	-	-	50.0	1.86	0.82
21	22	15	59	64	0	64	1	0	1	1	0	1	-	-	-	56.9	1.78	1.16
22	4	7	36	7	3	4	-	-	-	1	0	1	-	-	-	12.0	0.73	0.67
23	18	6	75	30	0	30	2	0	2	2	1	1	-	-	-	26.7	1.42	1.27
24	33	12	73	88	19	69	2	0	2	1	0	1	-	-	-	48.4	2.02	1.88
25	19	4	83	45	11	34	1	0	1	1	0	1	-	-	-	85.0	2.04	0.55
26	4	6	40	7	2	5	-	-	-	-	-	-	-	-	-	1.3	0.70	5.38
28	14	2	88	59	21	38	-	-	-	1	0	1	-	-	-	12.1	3.75	4.96
29	21	7	75	41	6	35	-	-	-	-	-	-	-	-	-	22.7	1.46	1.81
30	11	7	61	15	0	15	2	1	1	-	-	-	-	-	-	21.5	0.94	0.79
July 1	2	9	18	3	1	2	1	1	0	-	-	-	-	-	-	10.0	0.36	0.40
2	0	2	0	-	-	-	-	-	-	-	-	-	-	-	-	1.0	-	-
3	6	3	67	10	5	5	1	0	1	-	-	-	-	-	-	8.5	1.22	1.29
4	6	2	75	8	2	6	-	-	-	-	-	-	-	-	-	6.7	1.00	1.19
5	7	8	47	14	1	13	-	-	-	-	-	-	-	-	-	17.0	0.93	0.82
6	1	5	17	1	1	0	-	-	-	-	-	-	-	-	-	8.5	0.17	0.12
7	0	2	0	-	-	-	-	-	-	-	-	-	-	-	-	0.7	-	-
8	1	1	50	-	-	-	-	-	-	1	1	0	-	-	-	0.8	0.50	1.25
13	5	4	56	6	0	0	-	-	-	-	-	-	-	-	-	11.8	0.67	0.51
14	2	6	25	2	0	0	-	-	-	-	-	-	-	-	-	6.5	0.25	0.31
17	2	2	50	1	0	1	1	1	0	-	-	-	-	-	-	5.0	0.50	0.40
18	4	6	40	5	0	5	-	-	-	-	-	-	-	-	-	19.0	0.50	0.26
25	4	3	57	9	0	9	-	-	-	-	-	-	-	-	-	8.0	0.78	1.13
26	1	5	17	10	5	5	-	-	-	-	-	-	-	-	-	8.5	1.67	1.18
27	12	8	60	28	3	25	-	-	-	-	-	-	-	-	-	29.0	1.40	0.97
28	3	5	38	8	1	7	-	-	-	-	-	-	-	-	-	6.5	1.00	1.23
31	21	18	54	73	20	53	3	3	0	-	-	-	-	-	-	52.3	1.95	1.45
Aug. 1	26	4	87	97	22	75	1	0	1	-	-	-	-	-	-	57.8	3.27	1.70
2	13	2	87	38	9	29	-	-	-	-	-	-	-	-	-	17.7	2.53	2.15
3	24	1	96	73	13	60	3	2	1	-	-	-	-	-	-	34.3	3.04	2.22
4	3	3	50	4	0	4	-	-	-	-	-	-	-	-	-	5.3	0.67	0.75
6	15	13	54	32	3	29	3	2	1	-	-	-	-	-	-	28.2	1.25	1.24
7	3	3	50	4	0	4	-	-	-	-	-	-	-	-	-	5.0	0.67	0.80
8	38	11	78	99	12	87	4	0	4	-	-	-	-	-	-	71.6	2.10	1.44
9	11	10	52	19	5	14	1	0	1	-	-	-	-	-	-	19.2	0.95	1.04
10	9	1	90	22	6	16	1	1	0	-	-	-	-	-	-	14.8	2.30	1.55
11	6	0	100	14	4	10	1	0	1	-	-	-	-	-	-	6.3	2.50	2.38
12	10	2	83	31	9	22	4	2	2	-	-	-	-	-	-	20.3	2.92	1.72
13	18	20	47	36	5	31	-	-	-	-	-	-	-	-	-	30.9	0.95	1.17
21	30	6	83	70	10	60	4	0	4	-	-	-	-	-	-	38.8	2.06	1.91
Total 47	4479	269	64	1178	213	965	37	13	24	17	2	15	1	0	1	958.9	-	-
Mean -	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.65	1.29
Percent Retained				81.90			64.90			88.20			100			-	-	-
No. Caught per Hour				1.23			0.04			0.02			<0.01			-	-	-
No. Caught per Angler				1.57			0.05			0.02			<0.01			-	-	-

[a] Number caught.
[b] Number released.
[c] Number kept.

Table 2. Mean fork length, mean weight and condition factor by age for walleye taken by anglers from the Hay River, 1975.

Age (yr)	No.	Fork Length (mm) Mean	Range	SE	Weight (g) Mean	Range	SE	Condition Factor
3	3	246	232-261	8.4	133	75-200	36.3	0.90
4	94	295	238-356	2.7	290	100-600	9.2	1.13
5	165	313	258-374	1.7	354	175-650	6.7	1.16
6	70	341	292-390	2.7	457	225-700	12.1	1.16
7	32	363	324-395	3.3	560	350-800	19.2	1.17
8	18	387	325-436	7.3	681	375-1000	37.4	1.18
9	9	417	381-448	7.7	847	675-1075	50.3	1.17
10	4	450	425-477	12.1	1044	950-1125	41.3	1.15
11	1	430	-	-	850	-	-	1.07
TOTAL	396	-	232-477	-	-	75-1125	-	-
MEAN	-	325	-	-	406	-	-	1.15

Table 3. Mean fork length, mean weight and condition factor by age for Hay River walleye, 1972-1975.

Age (yr)	No.	Fork Length (mm) Mean	Range	SE	Weight (g) Mean	Range	SE	Calculated Weight (g)	Condition Factor
1	6	125	86-149	11.7	21	6-32	4.7	16	1.08
2	24	157	113-195	3.6	28	5-50	2.6	34	0.71
3	9	235	189-261	7.4	153	50-275	25.2	132	1.18
4	123	292	238-356	2.4	288	100-600	7.6	272	1.15
5	193	310	256-374	1.7	349	175-650	6.2	333	1.18
6	102	339	268-390	2.4	463	200-800	11.2	448	1.19
7	60	372	324-445	3.2	621	350-950	17.9	611	1.21
8	45	397	325-452	4.5	739	375-1175	25.0	758	1.18
9	31	417	379-458	4.3	849	650-1100	25.6	893	1.17
10	20	438	380-477	4.9	996	750-1250	27.4	1052	1.18
11	11	448	410-481	7.5	1066	800-1525	67.0	1135	1.18
12	2	473	469-477	4.0	1150	1100-1200	50.0	1360	1.09
13	2	503	482-524	21.0	1625	1575-1675	50.0	1669	1.28
14	1	475	-	-	1250	-	-	1379	1.17
TOTAL	629	-	86-524	-	-	5-1675	-	-	-
MEAN	-	328	-	-	457	-	-	-	1.16

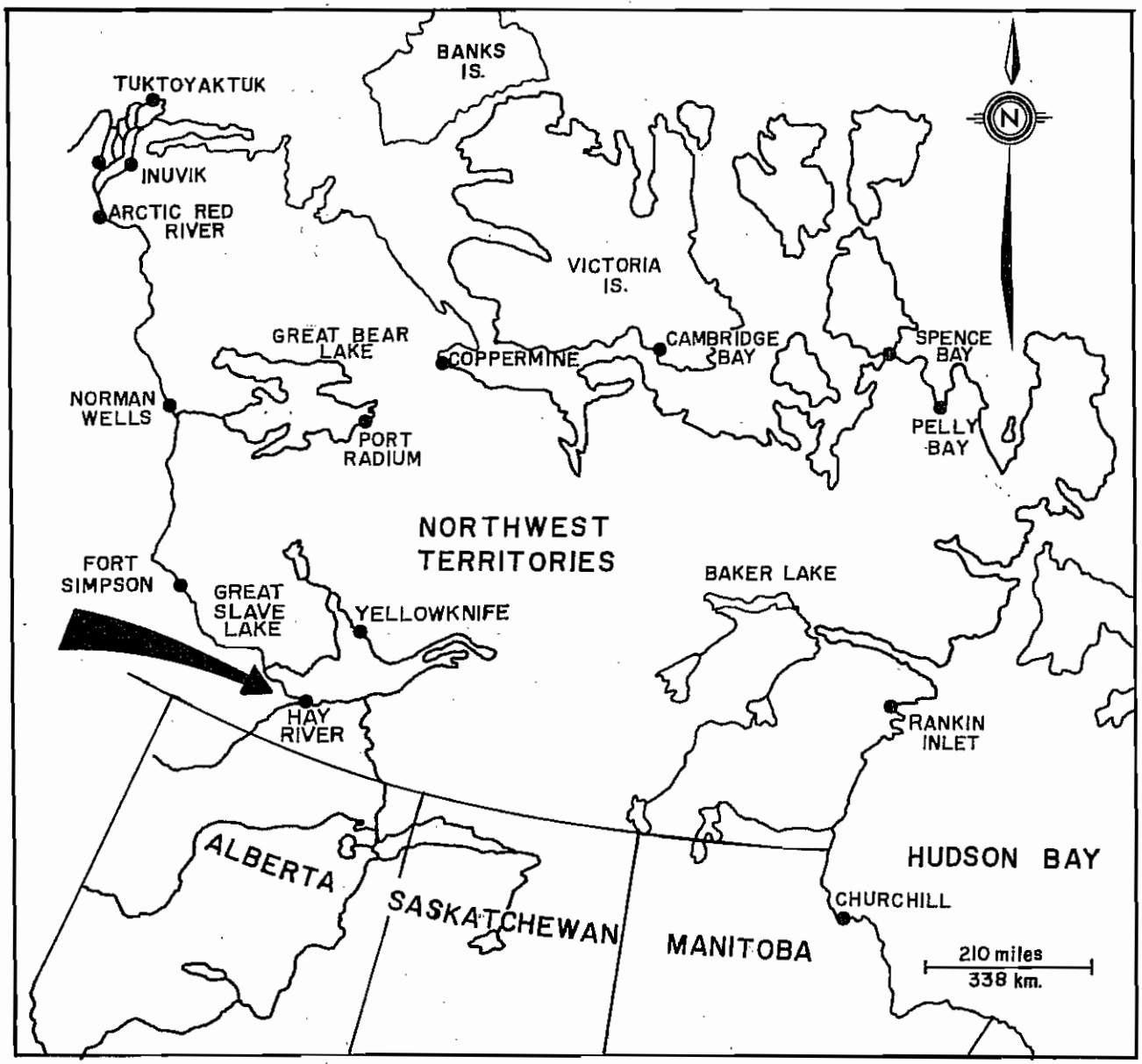

Fig. 1. Map of northwestern Canada showing the location of the study area.

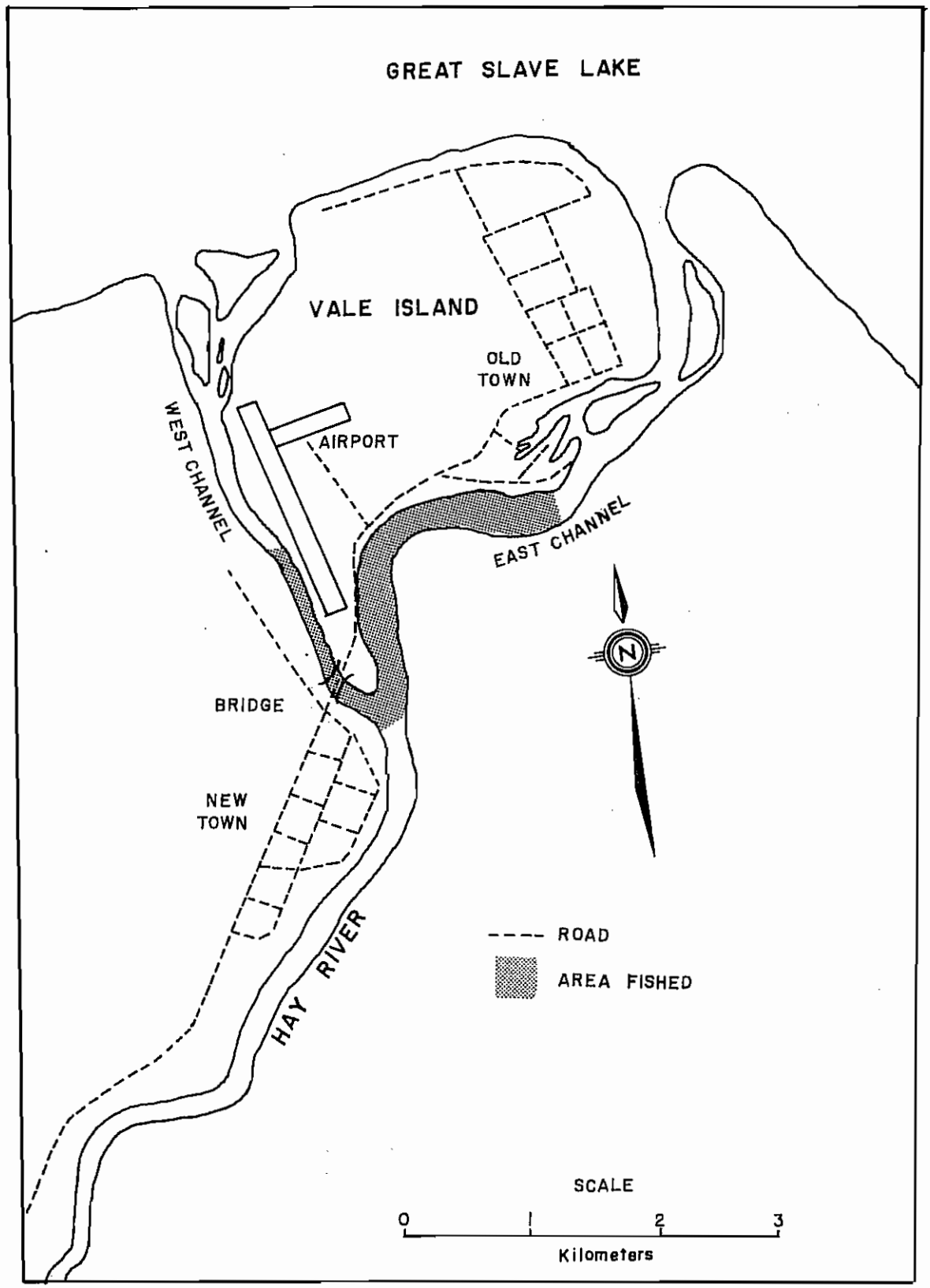

Fig. 2. Map of the mouth of the Hay River showing the area of the 1975 creel census.

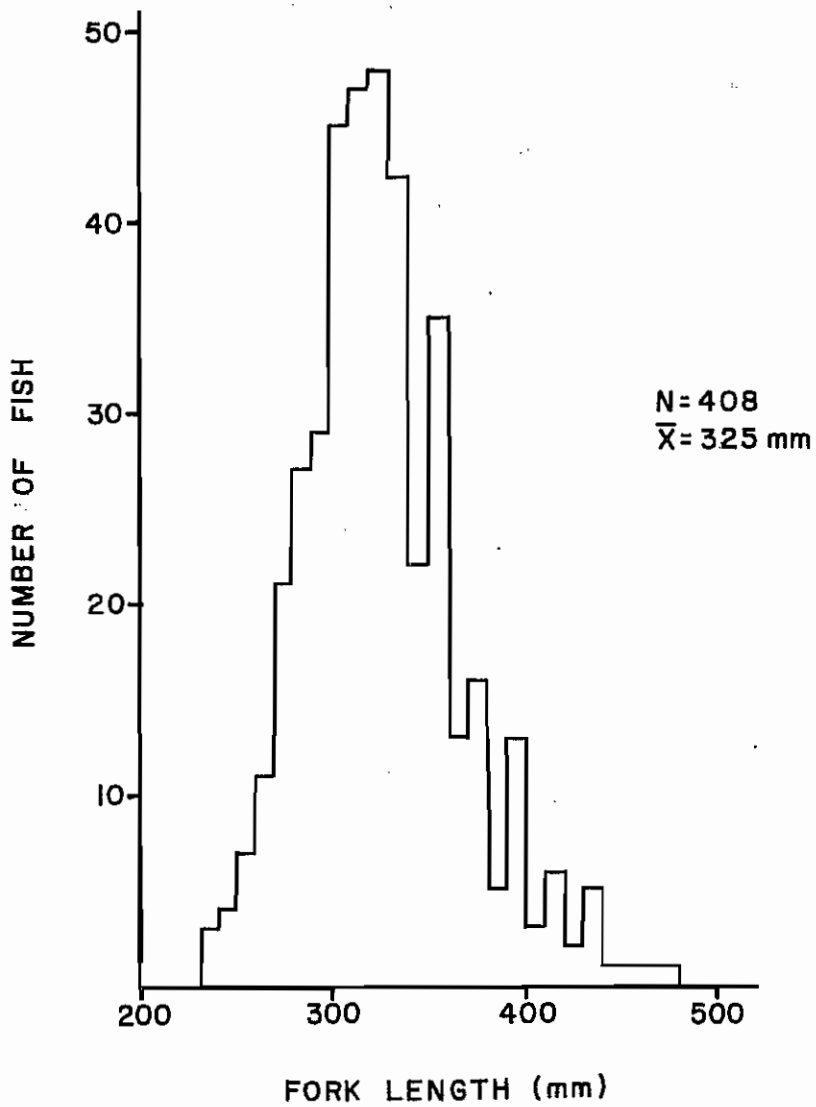

Fig. 3. Length-frequency distribution of angled walleye sampled during the 1975 creel census.

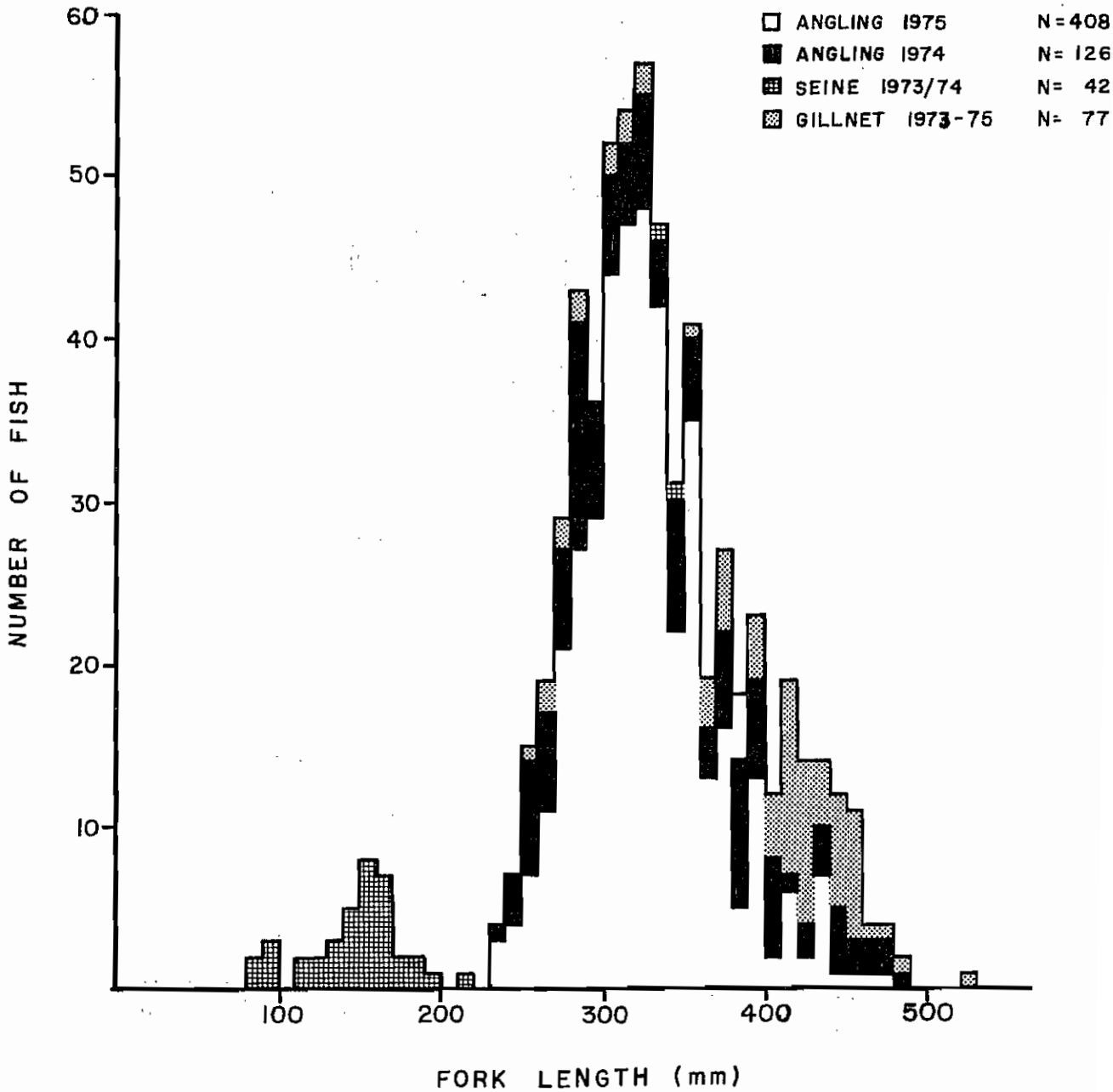

Fig. 4. Length-frequency distribution used in describing the growth of Hay River walleye, 1973-1975.

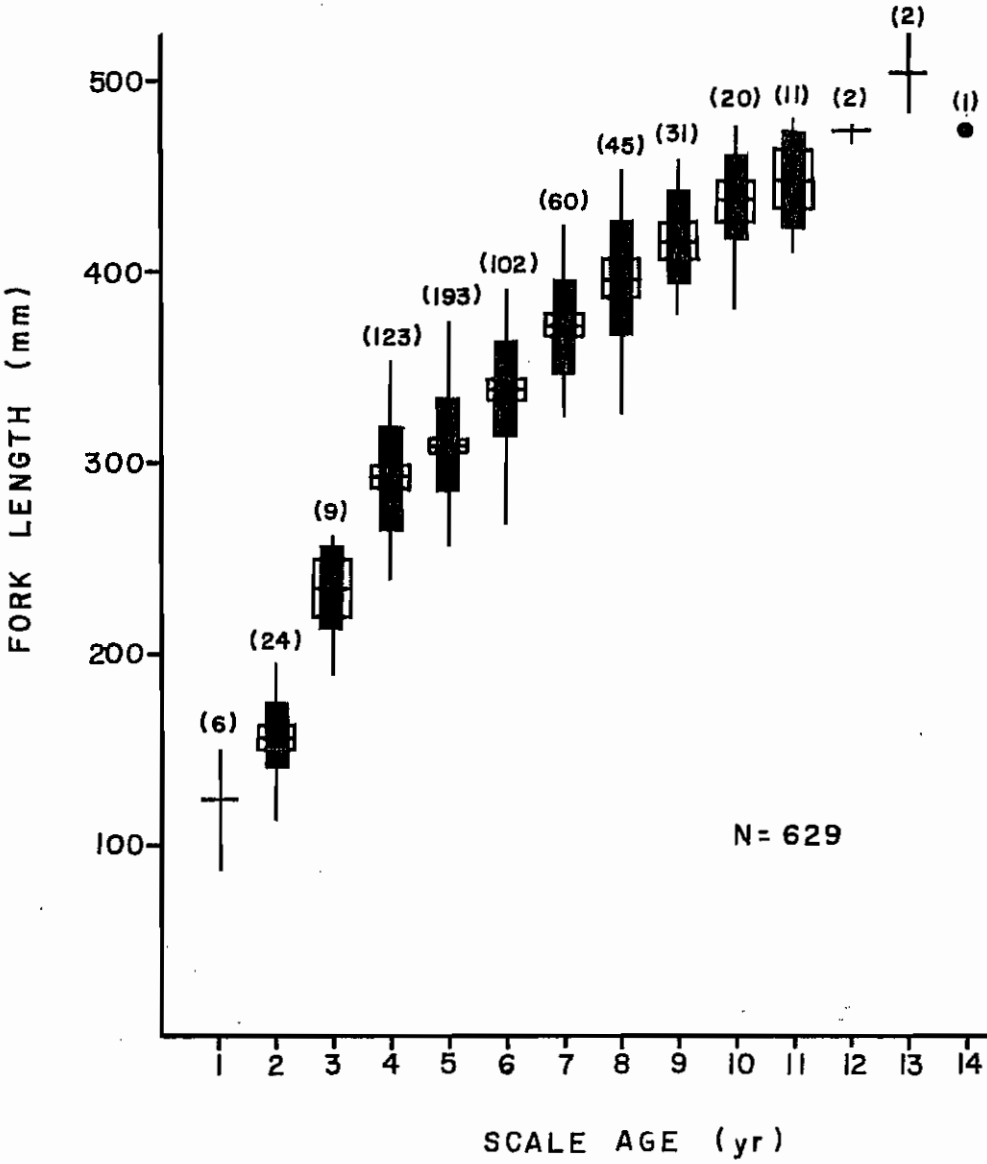

Fig. 5. Growth in fork length for walleye in the Hay River. The mean fork length is represented by a horizontal line and the range by a vertical line. The bar indicates ±1 SD while the hollow bar indicates ±2 SE.

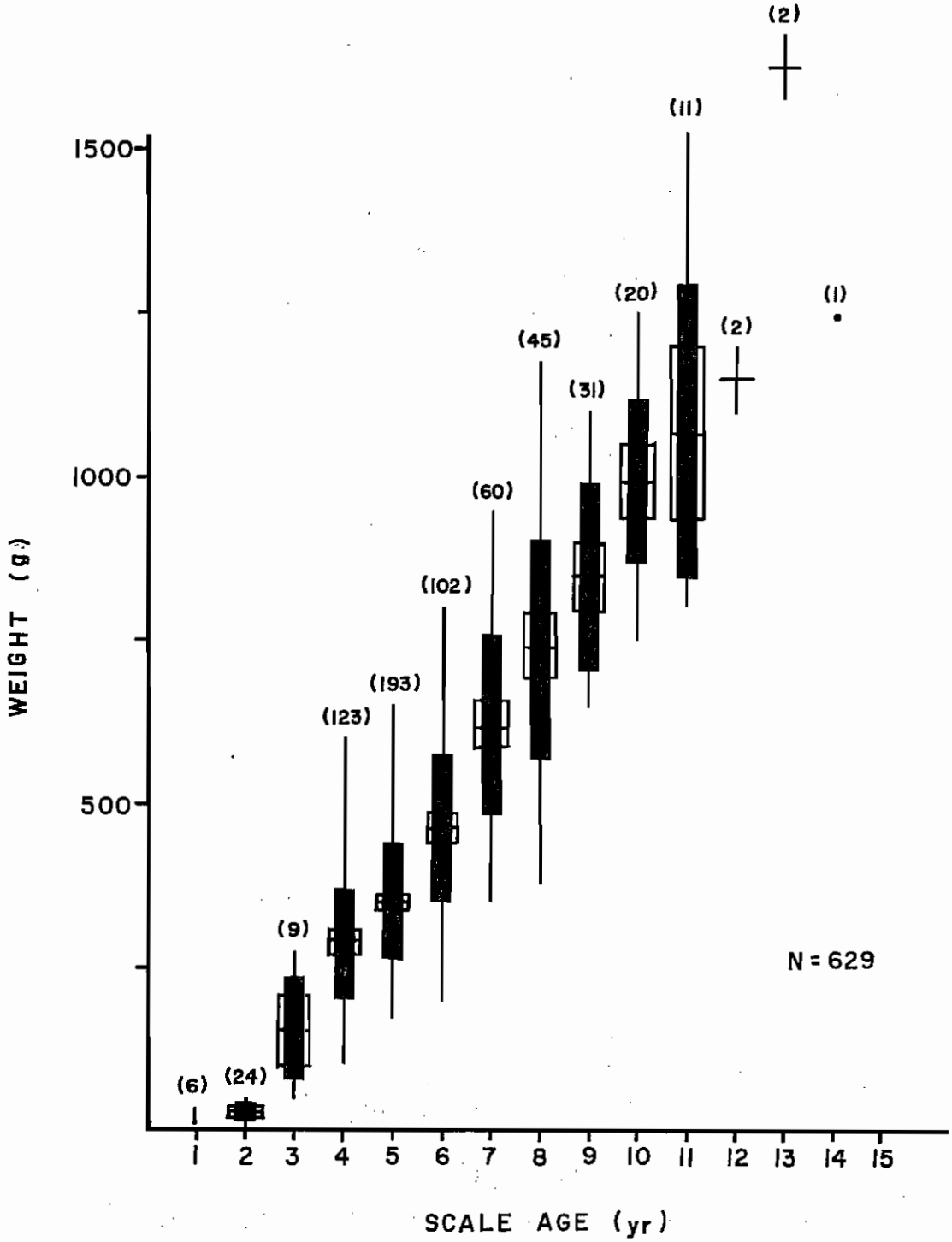

Fig. 6. Growth in weight for walleye in the Hay River. The mean weight is represented by a horizontal line and the range by a vertical line. The solid bar indicates ±1 SD while the hollow bar indicates ±2 SE.

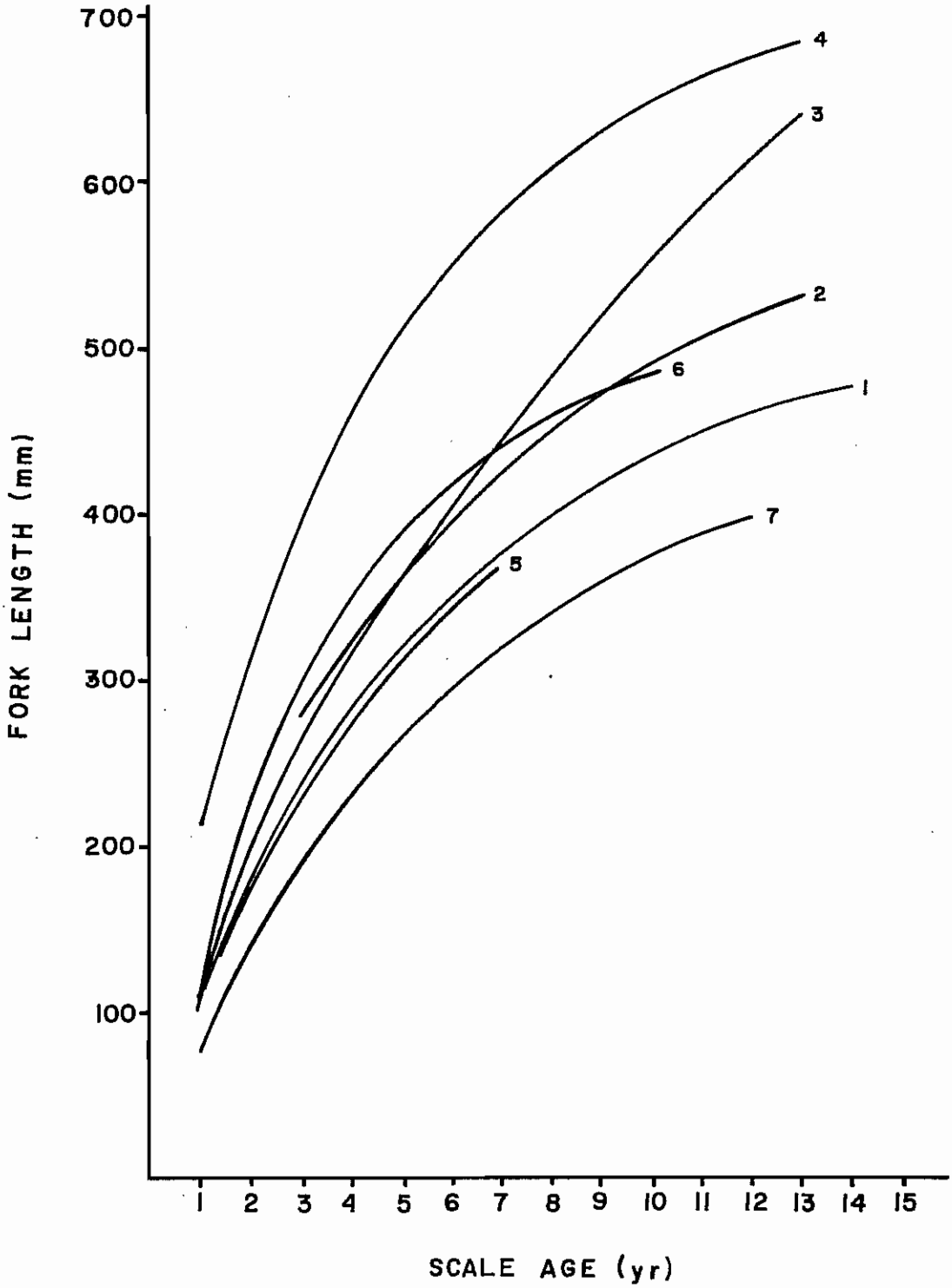

Fig. 7. Growth in fork length for walleye from Hay River, N.W.T. and from other geographic areas. 1. Hay R. (present study), 2. Lake Manitoba (Kennedy 1949), 3. Lac la Ronge (Rawson 1957), 4. Bay of Quinte (Payne 1964), 5. Three Mile Lake, Ontario (Slastenenko 1956), 6. Gogebic L. (Eschmeyer 1950), 7. Mackenzie R. (Hatfield et al. 1972).

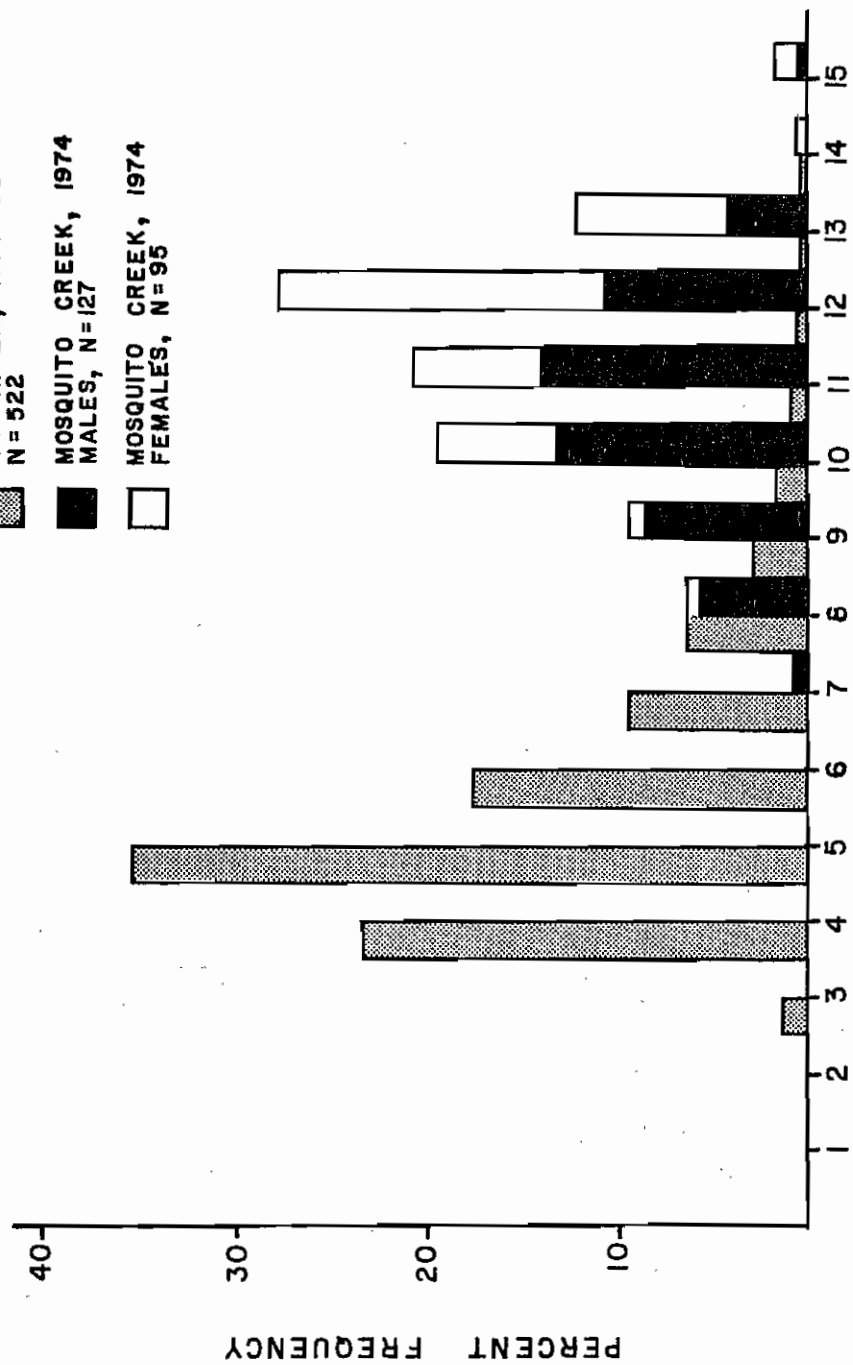

Fig. 8. Age-frequency distribution for angled walleye from Hay River, 1974-75 and from Mosquito Creek, N.W.T., 1974.

Appendix 1. Data summary for angled walleye sampled during the creel census at Hay River, 1975.

Date	Fork Length (mm)	Weight (g)	Scale Age (yr)
June 13/75	283	175	5
	245	75	3
	288	250	4
	397	800	8
	330	250	5
14/75	340	550	6
	354	550	6
	371	625	7
	275	200	5
15/75	367	750	7
	309	350	5
	385	600	6
	398	500	7
	292	300	5
16/75	307	400	4
	328	500	5
	280	250	4
	274	250	5
	340	600	4
	290	275	5
	298	250	4
	276	350	5
17/75	318	350	5
	318	375	5
	332	450	5
	334	450	5
19/75	307	375	5
	272	225	5
	340	450	–
	243	150	4
	350	525	6
	282	250	5
20/75	308	300	5
	291	225	5
	277	200	5
	330	375	6
	313	375	5
	355	400	4
	268	200	4
	278	250	5
	317	325	4
	280	250	4
	282	250	4
	318	325	4
	356	425	6
	250	150	4
23/75	258	150	4
	271	250	–
	242	150	4
	288	275	4
	279	225	4
	319	225	4
	262	200	4
	280	250	4
	245	175	4
	298	300	6
	313	400	5
	325	400	8
24/75	315	250	4
	347	275	6
	356	350	4
	335	250	5
	362	450	6
June 24/75	354	300	5
	324	200	4
	306	325	5
	377	550	7
	324	375	5
	325	425	4
	328	450	6
	315	400	5
	435	1000	10
	238	125	4
	278	225	5
	477	1125	10
	317	375	4
	270	200	4
	208	300	4
	289	275	5
	314	325	4
	274	225	4
	281	225	4
	305	325	4
	313	350	5
	266	225	4
	315	325	5
	323	400	6
	292	300	4
	332	450	5
	303	325	6
	314	375	6
	298	300	5
	315	350	5
	287	275	4
	309	225	5
	329	375	8
	339	425	5
	448	1075	9
25/75	279	250	4
	257	175	5
	407	700	8
	300	250	5
	293	225	5
	286	250	5
	279	250	5
	354	450	6
	375	625	7
	273	250	5
	422	800	9
	303	250	5
	322	400	5
	318	375	5
	250	150	4
	285	250	4
	291	275	4
26/75	316	275	5
	335	425	5
28/75	300	250	4
	358	550	6
	350	525	7
	285	250	5
	265	200	4
29/75	306	325	5
	297	300	5
	321	350	6
	326	425	6

Appendix 1. Continued.

Date	Fork Length (mm)	Weight (g)	Scale Age (yr)	Date	Fork Length (mm)	Weight (g)	Scale Age (yr)
June 29/75	329	425	6	July 27/75	391	700	9
	266	200	5		356	550	5
	272	200	5		350	500	5
	335	375	5		307	350	4
	260	200	4	28/75	418	900	8
	282	225	5		319	400	5
30/75	292	225	6		310	350	4
	290	250	5		317	400	5
July 1/75	287	250	4		327	400	5
3/75	346	475	6		370	600	8
	232	125	3		343	400	4
4/75	305	325	5	31/75	330	375	4
	456	1025	-		379	600	6
	286	275	5		317	350	4
5/75	416	700	8		372	625	6
	348	425	6		376	600	-
	257	175	4		370	575	7
	238	150	-		330	425	5
	342	500	6		302	300	4
13/75	298	275	6		315	325	4
	330	350	4		330	425	4
	297	300	-		318	350	5
	357	500	6		358	500	6
14/75	350	500	6		352	500	5
	359	550	7	Aug. 1/75	295	400	5
	350	425	7		302	350	4
18/75	296	225	5		353	500	5
	314	325	5		322	400	5
	328	325	5		343	450	5
	395	675	9		287	300	4
	320	325	6		305	400	5
	381	675	9		317	400	4
25/75	327	400	5		356	550	6
	416	900	-		350	300	6
	360	550	8		310	300	4
	310	350	5		333	400	5
	305	300	5		284	250	5
	907	300	6		332	450	5
	361	550	7		280	200	4
	340	450	6		285	300	4
	292	300	6		392	750	7
	337	400	6		430	850	11
26/75	387	650	8		295	300	5
	433	1000	9		390	650	8
	317	400	5		334	400	7
	340	400	5		336	400	5
	358	550	7		300	300	5
27/75	332	450	5		299	250	5
	368	600	6		325	400	7
	311	350	5		324	350	7
	335	400	6		306	350	5
	337	400	6		294	300	5
	312	250	5		353	500	6
	339	500	5		348	450	6
	357	500	5		315	300	4
	376	600	6		251	100	4
	357	500	6		434	900	-
	358	500	7		307	350	5
	285	250	4		389	700	8
	334	450	5		310	350	4
	281	200	4		307	350	4

Appendix 1. Continued.

Date	Fork Length (mm)	Weight (g)	Scale Age (yr)	Date	Fork Length (mm)	Weight (g)	Scale Age (yr)
Aug. 1/75	411	800	8	Aug. 6/75	333	400	5
	395	750	7		304	350	4
	314	300	4		295	300	5
	334	450	4	8/75	307	350	4
	325	400	4		307	400	5
2/75	294	300	4		320	400	5
	268	200	4		328	400	6
	378	600	6		322	400	6
	308	300	4		360	550	6
	308	300	4		364	600	7
	282	250	5		425	950	10
	322	400	4		330	400	5
	261	200	3		306	350	5
	434	800	9		340	500	6
3/75	321	350	5		302	300	4
	323	400	5		308	350	6
	288	300	4		352	550	6
	258	200	5		312	400	5
	307	350	5		330	450	5
	321	400	4		315	350	5
	343	450	5		434	950	9
	266	200	5		415	950	9
	329	450	6		353	550	6
	311	350	5		292	300	4
	360	600	7		324	400	5
	340	500	6		334	450	6
	307	350	4		390	700	6
	292	250	5		363	550	6
	275	200	5		322	350	5
	311	350	6		331	500	6
	352	500	6		371	500	7
	314	350	5	9/75	324	400	5
	279	250	4		325	400	5
	299	300	5		416	950	-
	321	350	5		353	500	6
	302	300	6	10/75	272	350	4
	311	350	5		344	450	5
	373	600	7		277	300	5
	315	350	5		305	350	5
	309	350	4		285	300	5
	310	350	4		345	500	6
	310	400	5		329	400	5
	305	300	4	11/75	310	325	5
	361	550	7		368	575	7
	274	200	4		303	300	-
	370	600	7		395	700	8
	341	450	5	12/75	389	700	8
	337	450	5		322	400	5
	262	150	4		339	450	5
	273	250	4		378	625	7
	283	250	5		351	450	6
	463	1100	10		339	450	4
	397	725	8		320	400	5
	338	425	6		322	400	5
	324	400	5		312	400	5
	334	400	5		374	650	5
4/75	320	375	5		333	500	5
	329	375	5		307	300	6
	321	375	5		338	550	6
	336	475	6		339	425	5
6/75	312	350	5		356	500	5

Appendix 1. Continued

Date	Fork Length (mm)	Weight (g)	Scale Age (yr)	Date	Fork Length (mm)	Weight (g)	Scale Age (yr)
Aug. 12/75	295	325	5	Aug. 13/75	302	325	5
	355	550	6		408	800	8
	266	225	4		358	650	7
	365	500	7		298	300	5
13/75	330	375	5		337	450	4
	325	400	5		364	600	6
	350	600	7		297	300	5
	332	450	5		393	700	–
	325	400	4		291	300	4
	353	550	5		315	300	5
	327	400	5	21/75	392	800	7
	340	500	8		325	500	4
	304	350	5		320	450	5
	436	1000	8		310	450	5
	375	400	7		340	550	6
	337	450	7		345	500	7
	327	400	6		340	500	5
	390	700	–		320	400	5
	302	325	5		308	400	5

Appendix 2. Data summary for walleye captured in gillnets (4 in) at the mouth of the Hay River, 1975.

Date	Fork Length (mm)	Weight (g)	Scale Age (yr)	Sex & Maturity	Date	Fork Length (mm)	Weight (g)	Scale Age (yr)	Sex & Maturity
June 18/75	363	550	6	6	June 26/75	186	50	2	–
19/75	420	950	7	6		412	750	9	10
	382	750	6	7		385	650	9	1
	456	950	9	8		459	1000	11	5
	390	750	9	–		438	900	10	10
	423	850	8	7		478	950	11	5
	380	750	10	6	July 3/75	419	900	9	–
	416	800	7	8		410	700	9	–
	410	750	8	7		450	750	9	–
	417	800	7	8		362	550	6	–
	429	850	8	7		435	800	–	–
20/75	452	950	8	2		452	850	10	–
	413	850	7	7		441	1050	10	–
	422	950	10	7		431	700	8	–
	389	750	7	2		412	550	8	–
	408	750	–	7	4/75	415	950	9	–
	440	1000	9	2		429	950	9	–
	423	1000	9	7		374	800	6	–
	350	650	6	6		379	650	9	–
24/75	423	850	8	6		443	1050	9	–
	420	1000	10	1		365	600	6	–
	377	800	7	6		448	1100	10	–
	448	950	10	5		431	1150	–	–
	458	1000	11	5		428	1000	10	–
	465	1050	10	5		429	850	8	–
	458	1100	10	5		310	350	5	–
	445	950	7	10		395	800	7	–
	458	1100	9	1		303	350	–	–
	449	950	9	1		376	650	–	–
	418	850	9	7		395	750	8	–
						392	700	–	–