TRAPNETTING ASSESSMENT OF WALLEYE POPULATIONS IN KAHSHE, THREE MILE AND MULDREW LAKES FROM JUNE 4 TO JULY 2, 1987

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ABSTRACT

The status of walleye populations was assessed in Kahshe, Three Mile and Muldrew Lakes with 4 and 6 foot trapnets, from June 4 to July 2, 1987. Three Mile Lake was the only lake that showed any evidence of an established walleye population. Kahshe Lake produced only two walleye and no walleye were caught in Muldrew Lake. All three lakes have an established smallmouth bass fishery.

Growth and C.U.E. of walleye and smallmouth bass were compared to Doe Lake (Parry Sound District) which has a good fishery for both species.

INTRODUCTION

The purpose of this study was to examine the status of walleye populations on Kahshe, Muldrew and Three Mile Lake. Kahshe and Muldrew were selected given the past stocking of walleye summer fingerlings, in 1984 and 1985 respectively. Assessment was conducted on Three Mile Lake (Watt Township) to determine if the egg collection program on the lake has had any adverse effect on the walleye population. This assessment will provide the basis for evaluating the relative fish populations within and between lakes and provide a data base to compare future assessments. Data collected will provide information for making future management decisions in regard to stocking.

STUDY LAKES

KAHSHE LAKE

Kahshe Lake is 750 ha in size and located in the townships of Morrison and Ryde in the District of Muskoka. It has an irregular shape with many islands and rock outcrops. The lake is shallow with a mean depth of 4.9 m and a maximum depth of 20 m. About two-thirds of its surface area is less than 6 m deep. The littoral zone represents 73.38% of the lake. When the lake was last surveyed in 1975, the secchi disk reading was 2.9 m and the morphoedaphic index was 4.5. (Table 1).

Granite rock borders much of the lake. The surrounding relief is hilly but contains pockets of loamy sand which provides good drainage.

The lake has two inlets and two outlets. The major inlet is from Bass Lake via the Kahshe River at the eastern end of the lake which is fed by the Kahshe and Gartersnake rivers. The other inlet is from Three Mile Lake (not the Three Mile Lake reported here). At the time of the 1975 lake survey Kahshe Lake supported 442 cottages and 4 resorts.

The lake was first surveyed in 1929 (file notes). This survey stated there were few smallmouth bass (Micropterus dolomieui), "herring" (no species name provided), "suckers" (no species name provided) and burbot (Lota lota). No walleye (Stizostedion vitreum) were present. Because of abundant spawning grounds, walleye were recommended for stocking.

The first stocking of smallmouth bass occurred in 1915 and the first stocking of walleye took place in 1939. Since that time walleye, smallmouth bass and muskellunge (Esox masquinongy) have been stocked in the lake. Walleye were planted in 1956 but not again until 1984 when 29,184 fingerlings with a mean size of 50.6 mm were stocked.

A lake survey report in 1975 stated that there was only a moderate fishery for walleye, smallmouth bass and largemouth bass, and muskellunge. Trapnetting for walleye was conducted in 1978 and 1981. Catch per unit

effort (C.U.E.) for walleye was 1.07 fish per net night based on 3.73 trapnet nights in 1978. In 1981, walleye had a C.U.E. of only 0.77 fish per net night based on 3.63 trapnet nights. The C.U.E. for walleye in 1981 was the lowest of the five species captured (Table 2).

THREE MILE LAKE

Three Mile Lake is 929 ha in size and located in Watt Township in the District of Muskoka. It is a shallow lake (mean depth 3.5 m) with the littoral zone comprising about 84% of the lake. At the time the lake was surveyed in 1972 the secchi disk was 3.2 m and the morphoedaphic index was 10.4 (Table 3).

The lake has a large bay (Hammel Bay) on the north portion with the remainder of the lake running east and west. Hammel Bay is bordered by steep rock faces whereas the remainder of the lake has a flat uniform bottom with a rock rubble shoreline.

There are seven inlets to the lake and one outlet. The lake is highly developed. The 1972 lake survey report noted 297 cottages and seven resorts.

The original survey of the lake in 1931 noted that walleye were numerous. During the 1972 lake survey 5 sets of standard lake survey gillnets (see Aquatic Habitat Inventory Manual 1977 for net specifications) captured the following species and numbers: walleye (111), yellow perch (Perca flavescens) (183), common white sucker (Catostomus commersoni) (240), pumpkinseed (Lepomis gibbosus) (41), brown bullhead (Ictalurus nebulosus) (3), and golden shiner (Notemigonus crysoleucas) (6).

Walleye fry were stocked between 1939 and 1947 at a rate varying from 100,000 to 500,000 per year. In 1951, 150,000 eggs were planted in the lake. Walleye were not planted in the lake again until 1985 when 150,000 one month old fry were planted along with 5,860 fingerlings.

Smallmouth bass fry were first stocked in 1940 and fry stocking at the rate of 5,000 to 10,000 per year continued until 1986. In 1954 48 smallmouth adults were stocked and in 1960 another 4,000 fingerlings were stocked. Brook trout yearlings (1,500) were stocked in 1945.

Largemouth bass fingerlings (5,000) were stocked in 1973, followed by 6,000 fry in 1974, and 4,500 fry in 1975.

Correspondence in the file reveals that there was a well established walleye fishery in the early 1950s but there was concern over the small size of the walleye in the lake. Two studies (Slasteneko 1956, Reitte 1963), examined the growth rate of walleye in Three Mile Lake and found that their growth rate was less than the average of walleye from 14 other lakes in North America.

Trapnetting of walleye was conducted during the spawning run in Bennett's Creek in 1963 and in the lake in 1977 and 1978. Table 4 summarizes C.U.E. (fish per net night) and total effort for 1977 and 78 trapnetting. One hundred and twenty-two walleye were captured on a single trap net night in 1963 during the spawning run.

MULDREW LAKE

Muldrew Lake (401 ha) is located in Muskoka, Wood and Morrison Townships. It has a mean depth of 6.6 m with the littoral zone representing 48% of the lake. At the time of the last lake survey in 1975 the secchi disk was 3.7 meters and it had a morphoedaphic index of 3.9 (Table 5).

The lake is comprised of two long narrow arms, designated as North and South Muldrew Lake separated by rock ridges. The surrounding land is characterized by high ridges of pre-cambrium granite with valleys between. A large percentage of the shoreline contains no vegetation because of the rocky and often steep shoreline. Weedbeds are located in bays at the wider south end of the lake. The lake contains twenty islands and numerous exposed rocks.

There are three inlets and one outlet. At the time of the 1975 lake survey, there were 326 cottages and two resorts.

At the time of the 1975 survey, one walleye, six smallmouth bass, 96 yellow perch, 29 lake herring (Coregonus artedii), 50 brown bullheads, six common white suckers, and one pumpkinseed (Lepomis gibbosus) were captured in a standard lake survey gill net (see OMNR 1987 for specifications). A largemouth bass caught by an angler was noted.

Smallmouth bass fingerlings (15,000) were stocked in 1945. Tagged adult walleye were transplanted from Three Mile Lake (Watt Township) in 1953 (1150) and in 1954 (200). In 1956, 200,000 walleye eggs were planted in the lake. In July 1985, 20,920 walleye fingerlings were stocked in the lake. The 1975 lake survey report noted that smallmouth bass fishing was fair but there was no statement concerning the quality of the walleye fishery. Tagged walleye that were planted in the lake in 1954 were reported captured in the lake up until 1962, eight years after they were introduced. A letter from the Parry Sound District Office (J. Ball) to a cottage owner on Muldrew Lake dated June 9, 1970 noted the poor success of yellow pickerel (walleye) in the lake and attributed it to the low fertility of the lake. Ball recommended that the lake be managed as a self supporting smallmouth bass fishery.

Trapnetting has not previously been attempted in this lake.

METHODS

Trapnetting on Kahshe Lake was conducted from June 4 to June 18, on Three Mile Lake from June 22 to June 25, and on Muldrew Lake from June 29 to July 12, 1987. One 4 foot and two 6 foot trapnets were set in each lake. Locations for the trapnets (Figs. 1, 2, 3) were chosen first to sample at sites used in previous studies on Kahshe and Three Mile Lakes and secondly, to sample as many shallow and deep water habitats as possible within the time alloted for assessing each lake. The timing of the 1987 sampling was similar to the 1981 collection on Kahshe and 1978 work on Three Mile. The

rocky and steeply sloped shoreline of Kahshe Lake limited the number of set locations. In Three Mile and Muldrew Lakes nets were moved daily except for the last sampling period in Muldrew when each net was set for 2 days without being checked.

Set number, net size, date and time the net was set and lifted were recorded. Weight, total length and fork length were recorded for each individual walleye, smallmouth bass and largemouth bass captured. A scale was removed from each individual of these species and placed in a sample envelope upon which the above mentioned weight and length measurements were recorded. All scales were aged by John Tost who was not connected with the study. For the remaining species, aggregate weight and number were recorded. The number of fish captured in all nets was summed and relative abundance (C.U.E.) was calculated for each species. The C.U.E. was defined on the basis of a 24 hour period, a trap netting night.

Biomass was calculated on the basis of the total weight of each species captured in all the trap nets set per lake.

In the absence of a standard for evaluating these lakes the growth rates and age distributions of walleye and smallmouth bass were compared to these same species captured with trap nets in Doe Lake (Ryerson, McMurrich and Armour Townships). Doe Lake is 1186 hectares in size and supports a good but over-exploited coolwater fishery (McMullian 1985). Physical and chemical parameters of Doe Lake are most like that of Three Mile Lake.

Summarized and raw data are in the respective lake files at the Bracebridge District office of the Ministry of Natural Resources, High Falls Road, Box 1138, Bracebridge, Ontario POB 1CO.

RESULTS

KAHSHE LAKE

A total of 31.12 trap nights was conducted on Kahshe Lake but only two walleye were captured. Rock bass was the predominant species by C.U.E. (8.07 fish per net night) and weight (32.7%) in the catch. Pumpkinseeds and smallmouth bass ranked second and third respectively by C.U.E. (4.80, 2.09 fish per net night). However, smallmouth bass ranked third by weight (17.5% followed by pumpkinseeds (12.4%). Brown bullheads had the second highest weight (21.2%) but were fifth by C.U.E. (1.03 fish per net night) (Table 6, Fig. 4). The remaining species - yellow perch, largemouth bass and golden shiner - had C.U.E.'s of less than 2 (Table 6) and contributed only 7.7% to the total weight of the catch.

A sufficient number of smallmouth bass were captured to obtain an age distribution and to examine their growth rate. The majority of smallmouth bass were two to four years of age, the latter being the predominant age class (Fig. 5). Mean fork length at age from two to five years was similar to those from Muldrew Lake but consistently less than similar aged fish from Doe Lake (Fig. 6). Insufficient numbers of fish from older age classes prevented further comparisons (Appendix 1).

THREE MILE LAKE

A total of 15.53 trap nights was conducted in Three Mile Lake. Walleye had a C.U.E. of 2.90 (fish per net night) but this was much below that of pumpkinseeds at 15.33 and less than rock bass at 4.05. All the other species - yellow perch, largemouth bass, smallmouth bass, and comon white sucker - had C.U.E.'s of less than 2.0 (Table 6). Common white sucker (28.6%), walleye (28.0%), and pumpkinseed (27.5%) accounted for most of the total weight of the catch (Fig. 7).

The walleye catch consisted mostly of fish in the two to four year old age class, with the two year old age class predominating (Fig. 8).

Mean fork length at age was consistently higher in 1987 for the two to five year age classes than for the same year classes captured in 1952-54 and 1963 (Fig. 9). Although sample sizes were small (less than or equal to 2), mean fork length at age for walleye greater than 6 years does not appear to be much greater in 1987 than in 1952-54 and 1963 (Fig. 9). Compared to walleye from Doe Lake, mean fork length at age was similar for age class two to five but significantly less (p less than 0.05, students t test) at six and seven years (Fig. 10).

MULDREW LAKE

A total of 11.97 trap nights were conducted in Muldrew Lake but walleye were not captured. As was the case in Kahshe Lake, rock bass had the highest C.U.E. of 10.53 (fish per net night) and accounted for the most weight (36.4%) by species. Pumpkinseed and smallmouth bass ranked second and third (4.51, 3.76 (fish per net night)) respectively by C.U.E.. Brown bullhead had a C.U.E. of 2.59. Smallmouth bass and brown bullhead accounted for 17.8% (second) and 17.7% (third) of the total weight respectively of the catch, followed by pumpkinseed (14.2%). The remaining species - yellow perch, largemouth bass and common white sucker had C.U.E.'s of less than two and accounted for 14% of the weight of the catch (Table 6, Fig. 11).

Smallmouth bass had predominant age class from three to five with only three fish year class 6 being captured (Fig. 12).

Growth was similar to smallmouth bass from Kahshe Lake but mean fork length at age was consistently less than smallmouth bass in Doe Lake (Fig. 6).

DISCUSSION AND RECOMMENDATIONS

Three Mile Lake is the only one of the three lakes surveyed that has an established walleye fishery. Although the growth rate of walleye was below the average of fourteen other lakes in the 1950s and 1960s (Slastenenko 1956, Reitte 1963), it is now well above the reported rates for the 1950s and 1960s. Slasteneko (1956) suggested that the slow growth rate was a

result of insufficient food in the lake. At that time, the walleye fishery may have been underexploited resulting in a high population and high intraspecific competition for a limited supply of forage fish. With increased cottage development on the lake since the 1950s and 1960s, the walleye population may have undergone increased exploitation resulting in reduced competition for the available forage fish and thus an increased growth rate. The lower frequency of age four and five year old fish in the present study compared to that reported by Slasteneko (1956) and Reitte (1963) suggests increased exploitation.

The present growth rate is comparable to Doe Lake at least to age five. Doe Lake is considered to have a healthy walleye fishery although McMillan (1985) speculated that it was experiencing over exploitation.

The C.U.E. of walleye in Three Mile Lake at 2.9 was better than the combined C.U.E. of 1.2 for 4 foot and 6 foot trap nets in Doe Lake (McMillan 1985). It is also better than the C.U.E. of 0.63 reported in 1978 but much below the C.U.E. of 34.8 reported in October 1977. The significance of these summer differences however are unknown given the variability in sampling effort and timing. The yield of walleye in Three Mile Lake may be limited by the presence of other sport fish of similar trophic status. Given the relative abundance of younger age classes recruitment would appear to be strong and unaffected by the egg collection program over the past few years. The contribution of stocked fry and fingerlings over the past few years for the purpose of compensating for the egg collection program is unknown.

Although only two walleye were caught in Kahshe Lake, there is at least a remanent population. An angler (D. Woods) reported that he caught three walleye measuring 49-50 cm (T.L.) during June and July 1987. Informal interviews with anglers on Kahshe Lake on July 22, 1987 indicated that walleye in the 35 to 50 cm range were occasionally captured during June and July.

A walleye population was established in Kahshe Lake as a result of stocking of fingerlings in 1939 and 1956. However, the walleye fishery has never been strong and was classified as moderate in the 1975 lake survey report.

The walleye population size in Kahshe Lake appears to be less than that in 1978 and 1981 as indicated by the C.U.E. of only 0.06 in 1987 compared to 1.07 in 1977 and 0.27 in 1981.

A lack of evidence from trap netting and angler catches of the presence of walleye younger than three years in Kahshe Lake suggests there are problems with recruitment. This problem could be inadequate spawning sites on the Gartersnake River where walleye from Kahshe are known to spawn (D. Marshall pers. comm.) or high mortality of fry and fingerlings. An investigation of spawning sites on the Gartersnake should be undertaken first before possible causes of fry and fingerling mortality are investigated.

At the present time Kahshe Lake is essentially a smallmouth bass and pan fish fishery, as it was historically. The growth rate of smallmouth bass is slower in Kahshe than in Doe Lake but the C.U.E. of 2.09 is the same as in Doe Lake (2.12) from four and six foot trapnets (McMillan 1975). However, if the C.U.E. from trapnetting is any indication of changes in population numbers, the number of smallmouth bass in Kahshe Lake has declined since 1981 when the C.U.E. for trapnetting was 30.85.

Muldrew Lake is presently a smallmouth bass and pan fish fishery, as it was historically. The C.U.E. of 3.76 for smallmouth bass compares favourably to Kahshe and Doe Lakes. The growth rate of smallmouth bass is similar to Kahshe but less than Doe Lake. Both Muldrew and Kahshe Lakes have low MEI values which is consistent with the observed pattern of slow growth (Ryder et al 1974).

Past attempts at establishing a walleye fishery in Muldrew Lake have failed. Further attempts to establish walleye in Muldrew Lake should not be undertaken until factors limiting success of past efforts are determined.

The greater proportion of biomass for rock bass than smallmouth bass in Kahshe and Muldrew Lakes is of some concern. Rock bass compete for food with smallmouth bass (Scott and Crossman 1973). The greater proportion of rock bass and pumpkinseeds in all three lakes (Kahshe, Muldrew and Three Mile) suggests their fish communities are unbalanced. According to

McMillan (1985) Doe Lake has a well balanced fish community containing a small proportion of these species.

Stocking walleye fry and or fingerlings in lakes to maintain a walleye population with limited natural reproduction or to supplement weak year classes of walleye has met with limited success (Laarman 1978). Maintenance stocking was more successful in 37.5% of lakes than supplementary stocking 5% of lakes (Laarman 1978). Recent evidence from Michigan (P. Colby pers. comm.) indicates that about 1% of stocked fingerlings can be expected to survive to three years of age provided environmental conditions are appropriate for walleye. The most optimistic survival rate is about 5%. Given a 1% survival rate, the 29,184 fingerlings stocked into Kahshe Lake in 1984 would provide 290 walleye in 1987. The average density would be 0.4 walleye/ha, which would supply very poor angling (Prentice and Clark 1978).

Future stocking of walleye fingerlings should allow for a low survival rate (1%). The density of fingerlings stocked should be high enough to provide good angling. Prentice and Clark (1978) suggested that good walleye angling occured in Texas lakes at a density of 20 to 40 catchable walleye per hectare. Given a density of 20 catchable walleye per hectare and a survival rate of 1%, approximately 1.5 million summer fingerlings would have to be stocked to create a completely artificial fishery with no recruitment. Given the expense of such a program, efforts should concentrate on improving recruitment into the fishery from existing stock.

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LITERATURE CITED

Laarman, P.W. 1978 - Case histories of stocking walleye in inland lakes, impoundments and the Great Lakes - 100 Years with Walleye In Selected Coolwater Fishes of North America, ed R.L. Kendall, Amer. Fish. Soc. Spec. Publ. 11:254 - 260.

McMillan, M.A. 1985 - The results of a trap and gill netting program conducted on Doe Lake (McMurrich, Ryerson, Armour Townships), August 8 to 20, 1982. Unpubl. report, M.N.R. Parry Sound District, 33 pp typed.

Ontario Ministry of Natural Resources 1987 - Manual of Instruction, Aquatic Habitat Inventory Surveys, Fisheries Branch, 1987 edition, Queen's Printer, Toronto. 247 pp.

Prentice, J.A. and R.D. Clark Jr. - Walleye fishery management program in Texas - A systems approach. In Selected Coolwater Fisheries of North America ed R.L. Kendall. Amer. Fish. Soc. Spec. Publ. 11:408-416.

Reitte, C.A. 1963 - Length - Age relationship of spawning run walleye transferred from Three Mile Lake, Watt Township. Unpubl. report. Dept. of Lands and Forests, Parry Sound District. 7 pp. typed.

Ryder, R.A., S. R. Kerr, K.H. Loftus and H.A. Regior 1974 - The morphoedaphic index, a fish yield estimator - review and evaluation. J. Fish. Res. Board Cas. 31:663-688.

Scott, W.B. and E. J. Crossman 1973 - Freshwater Fishes of Canada. Bull. 184 Fish. Res. Board of Can. 966 pp.

Slastenenko, E.P. 1956 - The growth of yellow pikeperch (Stitostedion vitgeum) (Mitchill) in Three Mile Lake, Ontario. Can. Fish. Cult. Nov. 1956. 8 pp.

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Table 1. Kahshe Lake - Water Chemistry at the Deepest of Three Sampling Stations in July 1975.

DEPTH (m)	TEMP. °C	DO(ppm)	pH	ALK.	M.E.I. = 4.5 Mean Depth = 4.9 m Littoral Zone 73.83% Area 750 ha Secchi 2.9 m Thermocline 4-6 m
00	18.8				
1.5	2.0	8.4	7.5	20.5	
4.6	11.7	5.0	6.0	13.7	
9.1	5.0	4.0	6.0	13.7	
2.0	4.4	3.6	6.0	13.7	

Table 2. Kahshe Lake - Summary of Trap Net Data From 1978 and 1981.

September 1978

Species	C.U.E. (3.73 trap net nights)	Mean Weight (kg)	Weight Range (kg)	Mean Total Length (cm)	Range Total Length (cm)
Walleye	1.07	3.875	2.750-4.500	67.4	60.2-74.5
Smallmouth bass	24.1	0.416	0.180-1.480	30.7	26.1-46.2
Pumpkinseed	38.6				
Brown bullhead	10.4				
Rock bass	35.4				
Yellow Perch	1.3				
Largemouth bass	0.54				
Muskellunge	0.27				
Common White Sucker	0.27				

July 1981

Species	C.U.E. (3.63 trap net nights)
Walleye	0.27
Smallmouth bass	30.85
Pumpkinseed	15.15
Rock bass	20.94
Muskellunge	0.55

Table 3. Three Mile Lake - Water Chemistry of The Deepest of Three Sampling Stations in June 1972.

DEPTH (m)	TEMP.°C	DO(ppm)	pH	ALK.	M.E.I. = 10.4 Mean Depth = 3.5 m Littoral Zone 83.89% Area 929 ha Secchi 3.2 m Thermocline = 3-6 m
00	21.1				
1.5	20.5	9.0	7.3	20.52	
6.1	8.3	9.4	6.4	27.36	
10.7	6.1	6.0	6.0	27.36	

Table 4. Three Mile Lake - Summary of Trap Net Data For October 1977 and 1978.

Species	C.U.E.	
	October 1977 (0.83 trap net nights)	Summer 1978 (1.58 trap net nights)
Walleye	34.8	0.63
Smallmouth bass	1.2	- -
Pumpkinseed	2.4	5.07
Brown bullhead	6.0	- -
Yellow perch	7.2	4.44
Largemouth bass	- -	- -
Common White Sucker	7.2	- -

Table 5. Muldrew Lake - Water Chemistry Deepest of Six Sampling Stations - September 1975.

DEPTH (c)	TEMP.°C	DO(ppm)	pH	ALK.	M.E.I. = 3% Mean Depth = 6.6 m Secchi = 3.7 m Area = 40/ha Thermocline = 6.4-7.0 m
0.0	17.2				
1.5	17.2	7.8	6.5	13.7	
4.6	17.2	8.0	6.5		
6.0	16.7	7.0	6.5		
16.2	5.0	1.8	5.5	13.7	

Table 6. Number, Weight, and C.U.E. of Each Species Captured With Four and Six Foot Trap Nets in Kahshe, Three Mile and Muldrew Lakes - June 1987.

SPECIES	NUMBER			TOTAL WEIGHT (kg)			C.U.E. (#/TRAP PER NIGHT)		
	Kahshe	Three Mile	Muldrew	Kahshe	Three Mile	Muldrew	Kahshe	Three Mile	Muldrew
Walleye	2	45	- -	6.13	27.44	- -	0.06	2.90	- -
Smallmouth Bass	65	2	45	12.72	- -	5.47	2.09	0.13	3.76
Largemouth Bass	8	10	4	2.40	6.13	1.74	0.26	0.64	0.33
Rock Bass	252	63	126	23.71	17.68	11.18	8.07	4.05	10.53
Pumpkinseed	150	238	54	9.00	22.06	4.34	4.80	15.33	4.51
Yellow Perch	39	17	23	1.60	2.03	1.72	1.25	1.09	1.92
Brown Bullhead	32	- -	31	15.37	- -	5.44	1.03	- -	2.59
Golden Shiner	28	- -	- -	1.57	- -	- -	0.90	- -	- -
Common White Sucker	- -	27	1	- -	22.94	0.82	- -	1.74	0.08

Table 7. Mean Fork Length and Weight for Each Age Class Of the Major Game Fish Caught by Trapnetting in Kahshe, Three Mile and Muldrew Lakes, June 1987.

Species (Lake)	Age	2 17	3 7	4 4	5 2	6 2	7 2	8 1	9 1	10 1	11 1
Walleye (Three Mile)	Number of Fish										
	Mean Fork Length (cm)	21.2	27.4	37.0	43.5	39.2	42.3	47.3	47.8	59.5	60.8
	Standard Error	1.4	1.1	3.0	0.5	0.5	1.8				
	Mean Weight (kg)	0.099	0.211	0.560	0.850	0.750	0.787	1.040	1.120	2.500	2.440
	Standard Error	0.022	0.043	0.128	0.150	0.150	0.150	0.142			
Smallmouth Bass (Kahshe)	Number of Fish	12	14	23	3	NS	1	1	1	NS	1
	Mean Fork Length (cm)	16.9	19.6	24.1	25.6		35.7	34.3	37.7		45.2
	Standard Error	1.7	1.0	1.3	2.5						
	Mean Weight (kg)	0.069	0.102	0.189	0.250		0.435	0.680	0.860		1.360
	Standard Error	0.022	0.017	0.030	0.778						
Smallmouth Bass	Number of Fish *	3	6	8	9	3	NS	NS	NS	NS	NS
	Mean Fork Length (cm)	15.2	17.2	21.1	22.9	21.4					
	Standard Error	0.1	1.0	2.4	1.7	0.3					
	Mean Weight (kg)	0.048	0.081	0.081	0.171	0.133					

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Figure 1: Trap net locations in Kahshe Lake from June 4 to June 18, 1987. Size of each net is indicated (4 or 6 foot).

Figure 2: Trap net locations in Three Mile Lake from June 22 to June 25, 1987. Size of each net is indicated (4 or 6 foot).

Figure 3: Trap net locations in Muldrew Lake from June 29 to July 2, 1987. Size of each net is indicated (4 or 6 foot).

Figure 4: Proportion of species captured by number and weight with 4 and 6 foot trap nets in Kahshe Lake, June 4 to June 18, 1987.

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Figure 6: Mean fork length at age for smallmouth bass caught with 4 and 6 foot trap nets in Kahshe (June 4 to June 18, 1987), Muldrew (June 29 to July 2, 1987), and Doe (August 8 to 14, 1985, McMillan 1985) Lakes.

Figure 7: Proportion of species captured by number and weight with 4 and 6 foot trap nets in Three Mile Lake from June 22 to June 25, 1987.

Figure 8: Age frequency of walleye captured in Three Mile Lake with 4 and 6 foot trap nets from June 22 to June 25, 1987.

Figure 9: Mean fork length at age for walleye caught with 4 and 6 foot trap nets in Three Mile Lake from June 22 to June 25, 1987. Also shown are date for Kahshe Lake from 1952-54 (Slastonenko 1956); 1963 (Keiffel 1963) and from Doe Lake, August 8 to 14, 1985 (McMillan 1985).

Figure 10: Mean fork length at age for walleye caught with 4 and 6 foot trap nets in Three Mile Lake from June 22 to June 25, 1987 and Doe Lake, August 8 to 14, 1985 (McMillan 1985).

Figure 11: Proportion of species captured by number and weight with 4 and 6 foot trap nets in Muldrew Lake from June 29 to July 2, 1987.

Figure 12: Age frequency of smallmouth bass captured in Muldrew Lake with 4 and 6 foot trap nets from June 29 to July 2, 1987.

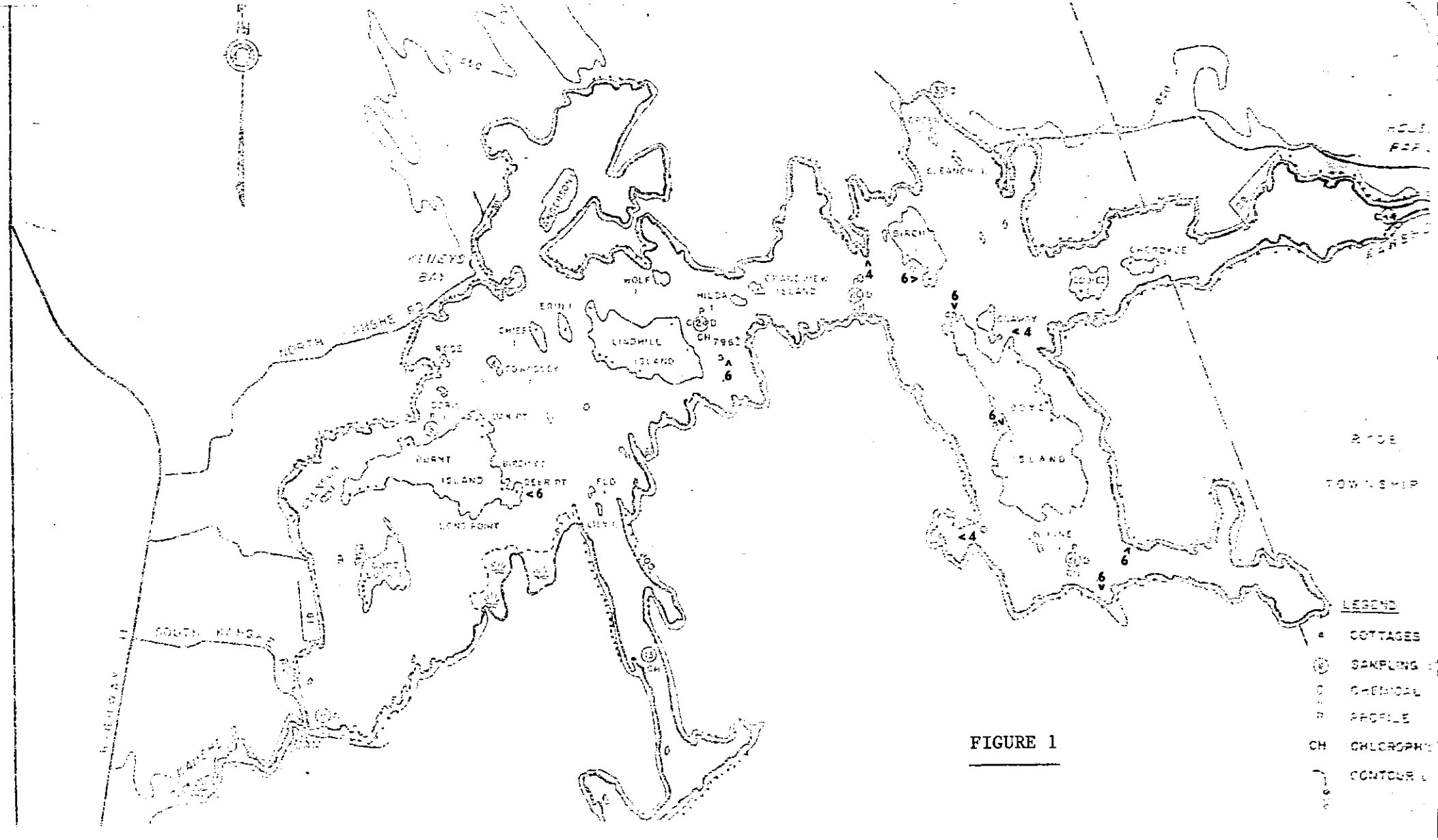

KENNEYS BAY
NORTH ARISAIG
WOLF I.
HILDA I.
CRAIGVIEW ISLAND
ERRIL I.
CHEESE I.
LYNGHILL ISLAND
CH 7982
ROCK PT.
BURNT ISLAND
BIRCH PT.
DEER PT.
LOST POINT
SOUTH ARISAIG
ELEANOR I.
BIRCH I.
CHLOROPHYLL
ISLAND
<4
<6
6
6>
LEGEND
COTTAGES
SAMPLING
CHEMICAL
PROFILE
CH CHLOROPH
CONTOUR

FIGURE 1

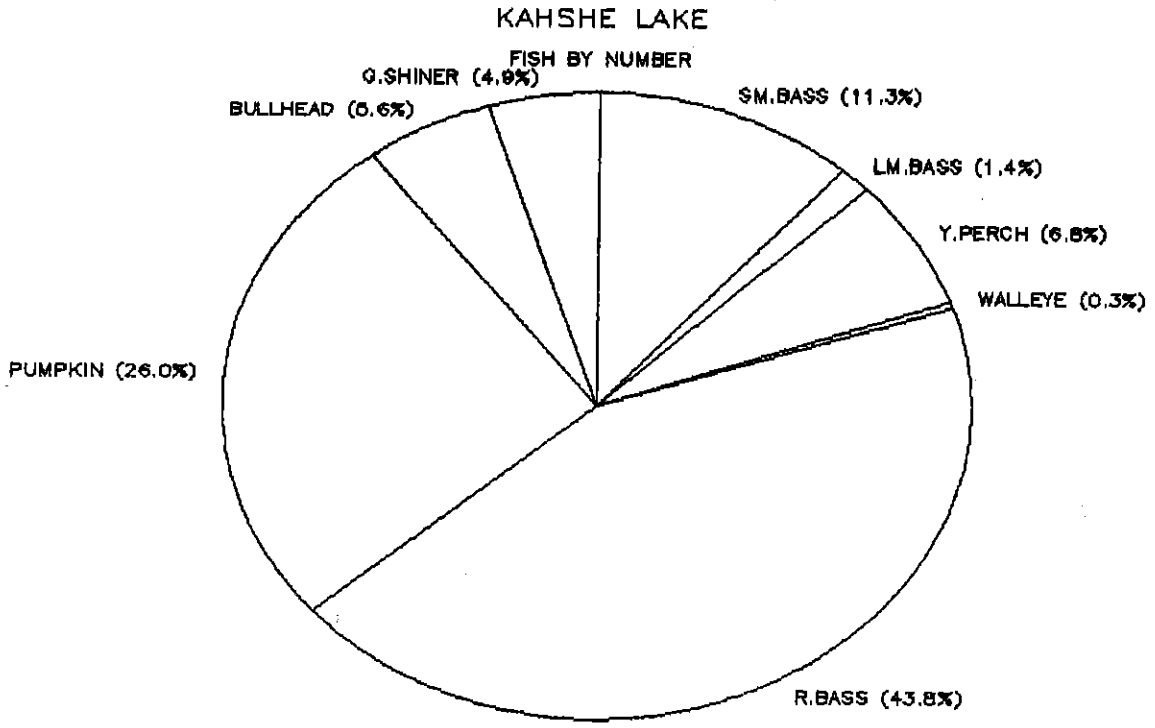

Burn L.
Hammel
Bay
Echo Beach
Lottie L.
Three
Mile
Green Bay
Lake
Ufford
516
516
6
6
6
4
6

FIGURE 2

FIGURE 3

Muldrew Lake
(South + North)
Muskoka/Wood Twp
Brace Bridge
May 15 1975
N

FIGURE 4


KAHSHE LAKE
FISH BY NUMBER
G.SHINER (4.9%)
SM.BASS (11.3%)
BULLHEAD (5.6%)
LM.BASS (1.4%)
Y.PERCH (6.8%)
WALLEYE (0.3%)
PUMPKIN (26.0%)
R.BASS (43.8%)

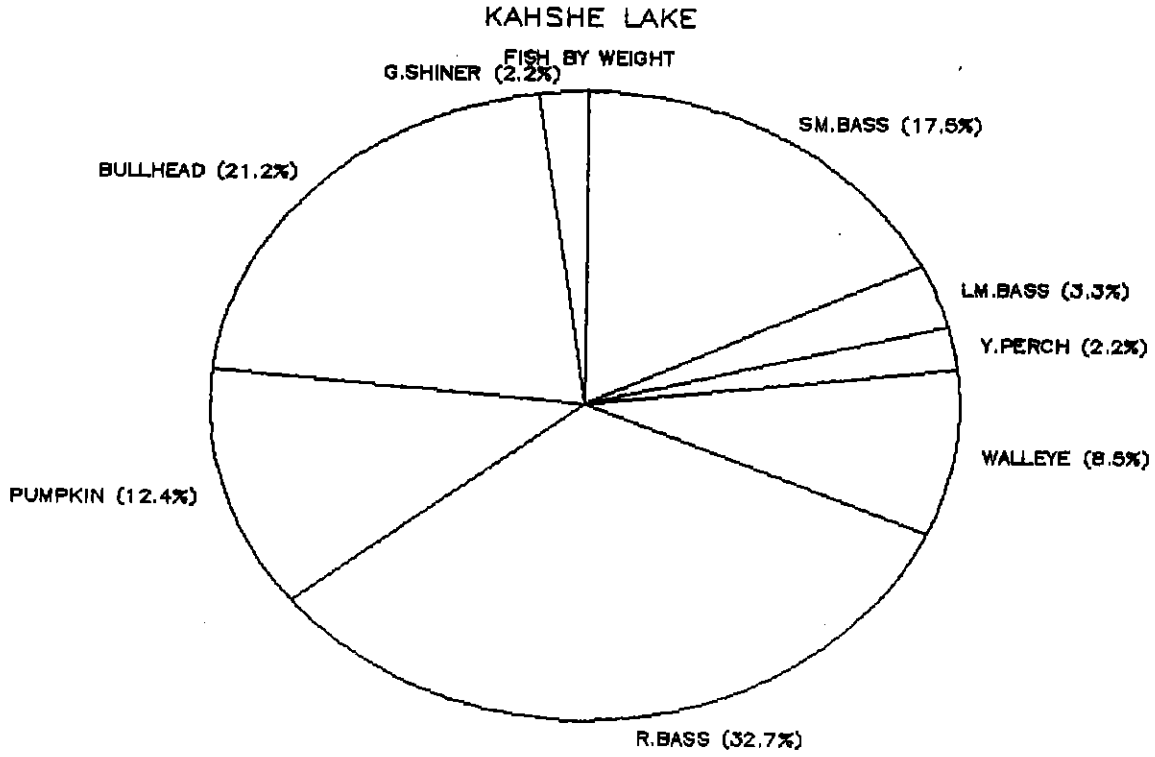
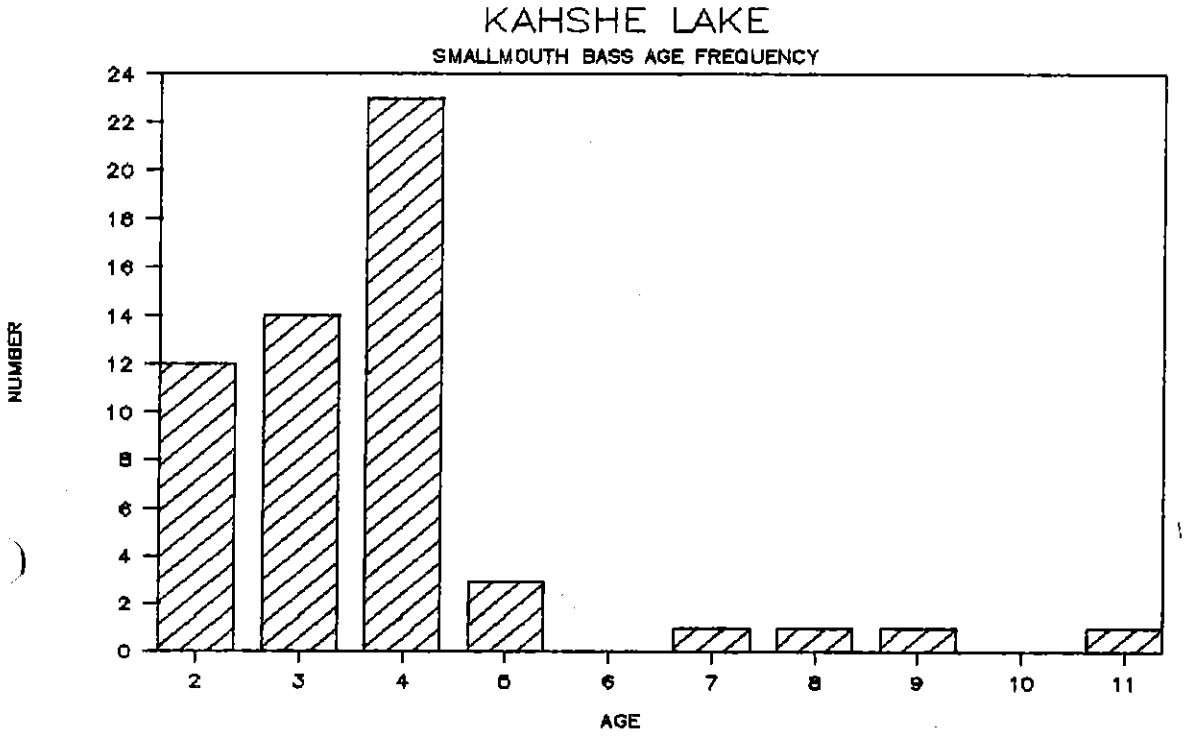

KAHSHE LAKE
FISH BY WEIGHT
G.SHINER (2.2%)
SM.BASS (17.5%)
BULLHEAD (21.2%)
LM.BASS (3.3%)
Y.PERCH (2.2%)
WALLEYE (8.5%)
PUMPKIN (12.4%)
R.BASS (32.7%)

FIGURE 5


KAHSHE LAKE
SMALLMOUTH BASS AGE FREQUENCY
NUMBER
0
2
4
6
8
10
12
14
16
18
20
22
24
2
3
4
5
6
7
8
9
10
11
AGE

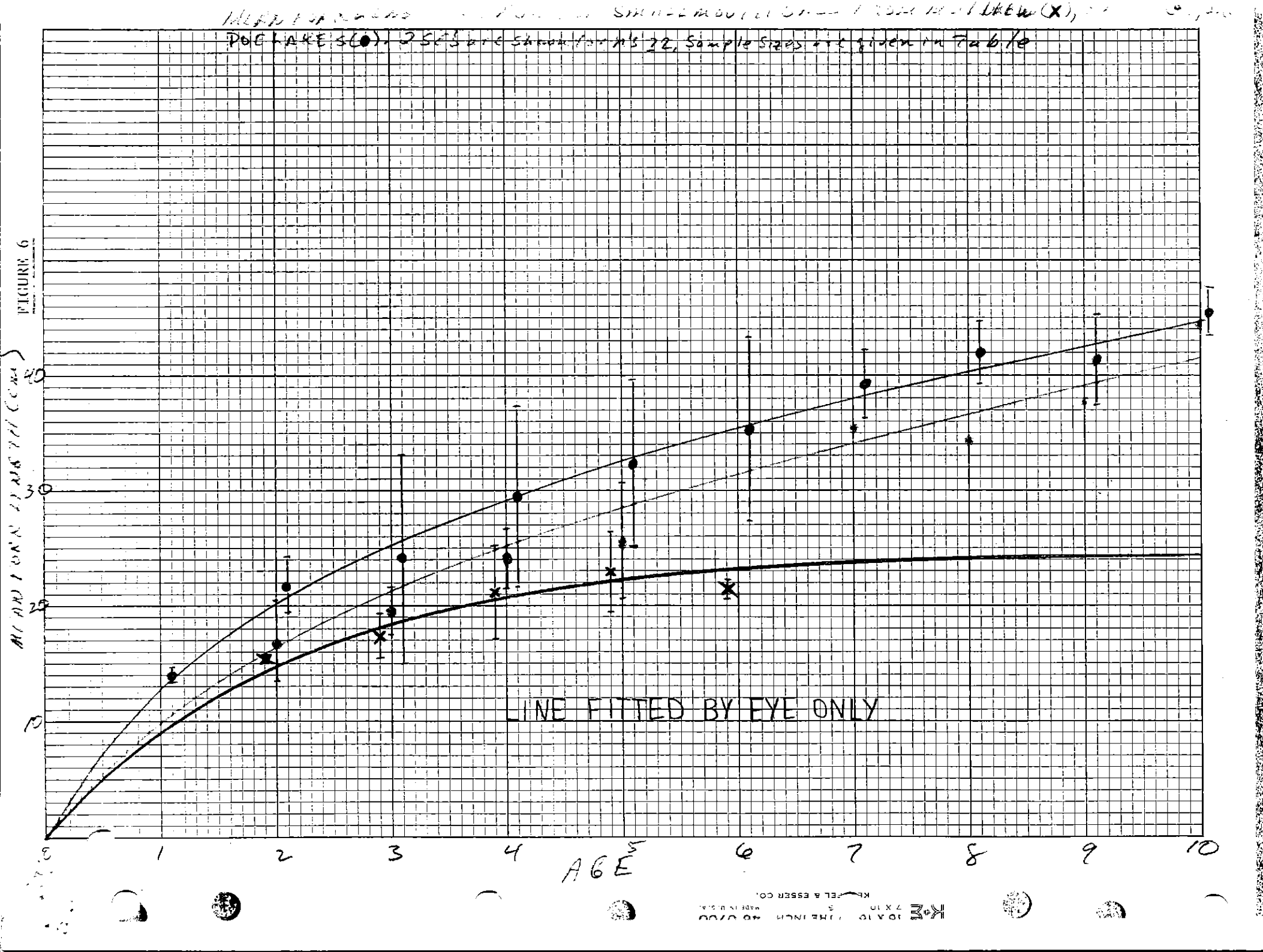
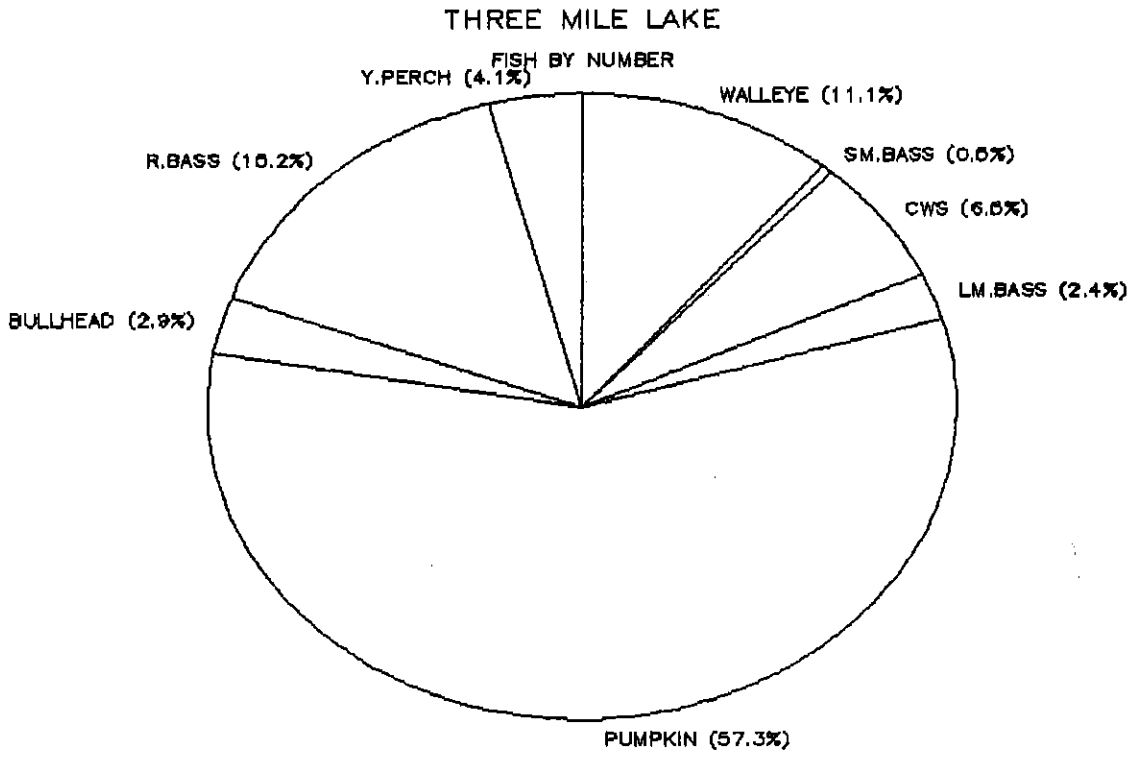
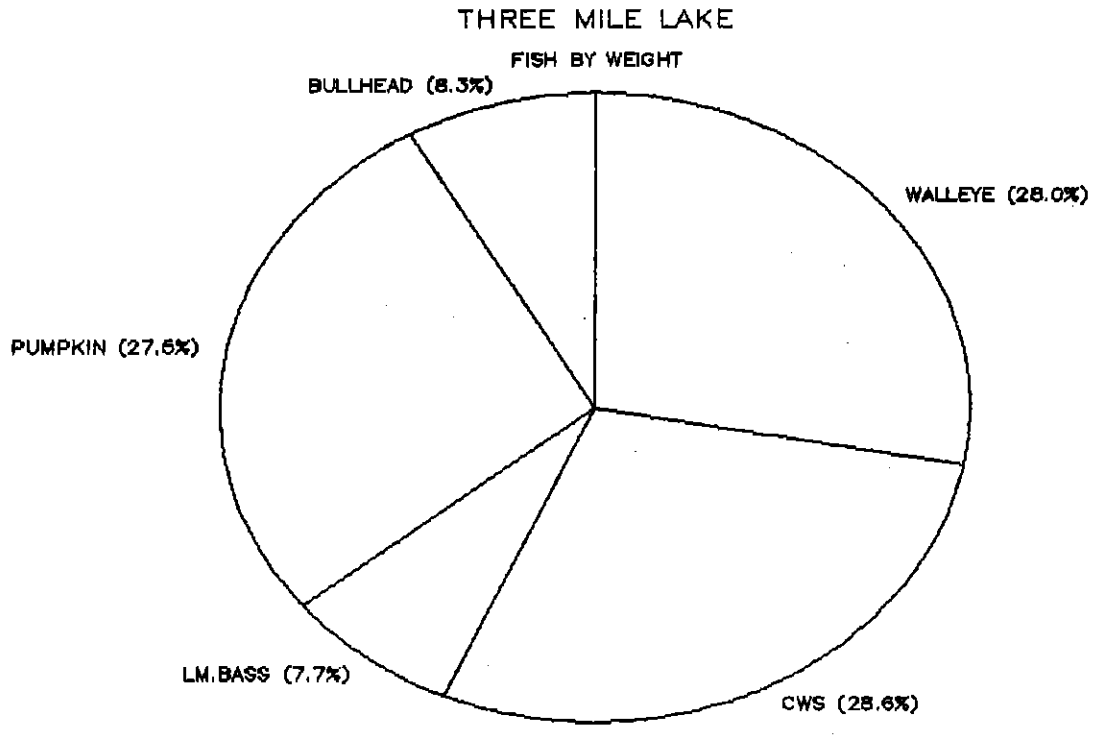

POC LAKE SCO. 25 Scores shown for ages 12, Sample sizes are given in Table
LINE FITTED BY EYE ONLY
AGE
10
20
30
40
1
2
3
4
5
6
7
8
9
10

FIGURE 6

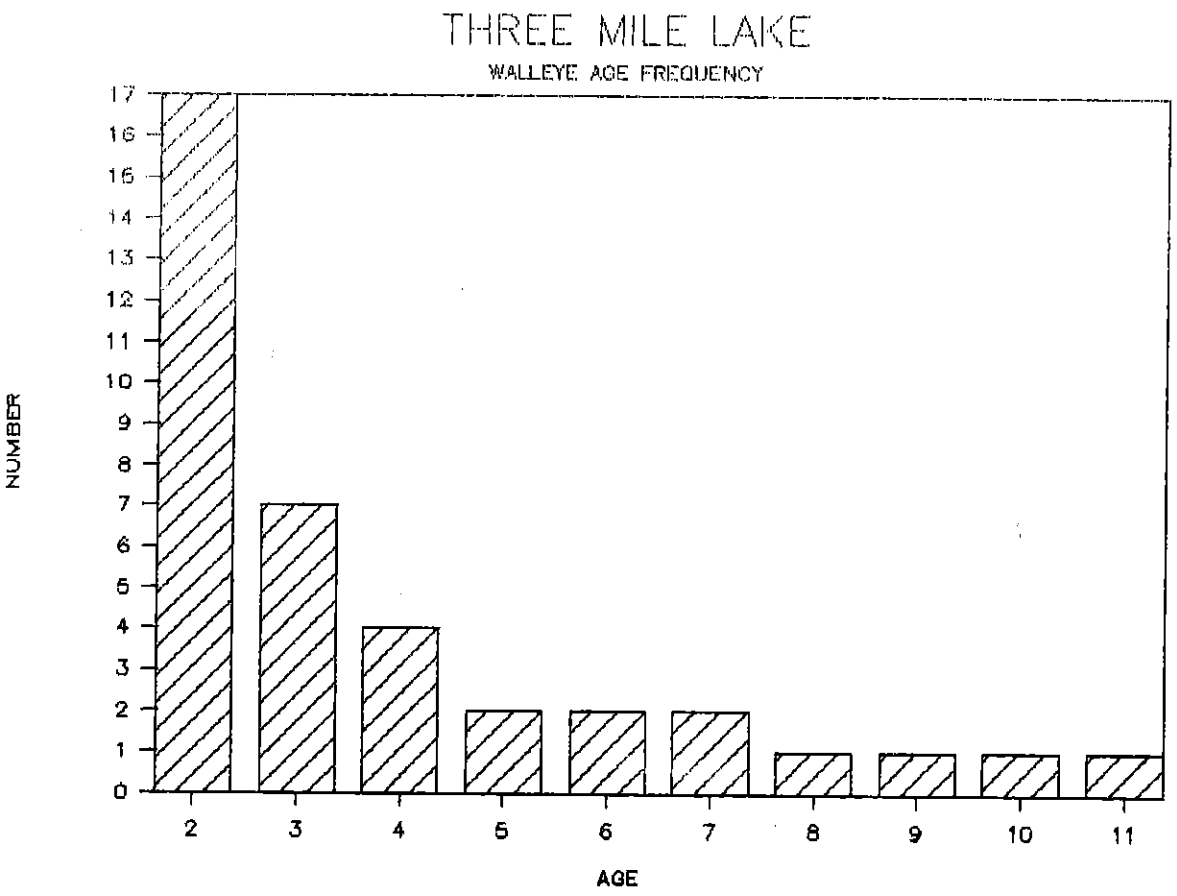
FIGURE 7

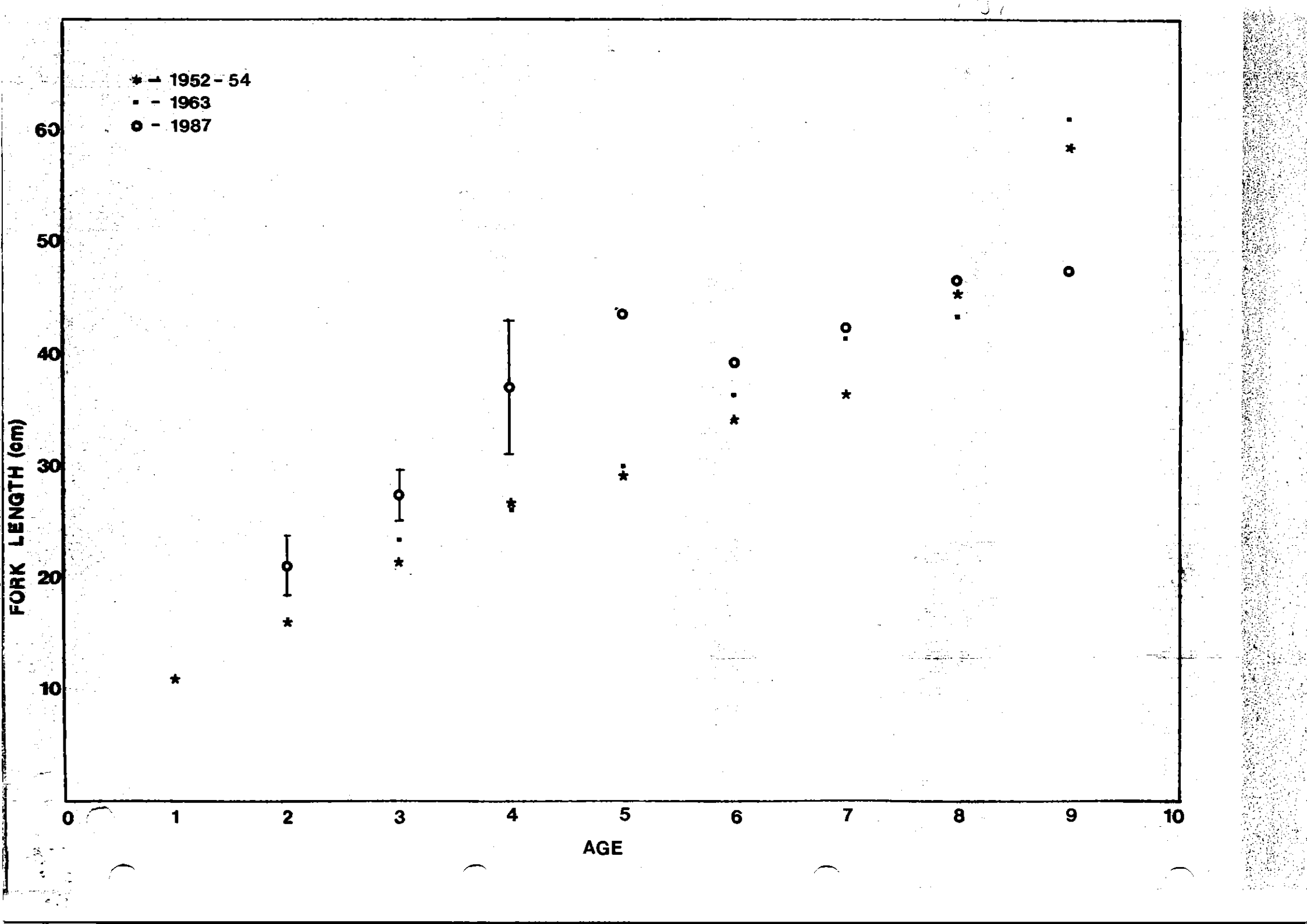




F167

FIGURE 8


THREE MILE LAKE
WALLEYE AGE FREQUENCY
NUMBER
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
2
3
4
5
6
7
8
9
10
11
AGE


* - 1952 - 54
▪ - 1963
o - 1987
FORK LENGTH (cm)
60
50
40
30
20
10
0
1
2
3
4
5
6
7
8
9
10
AGE

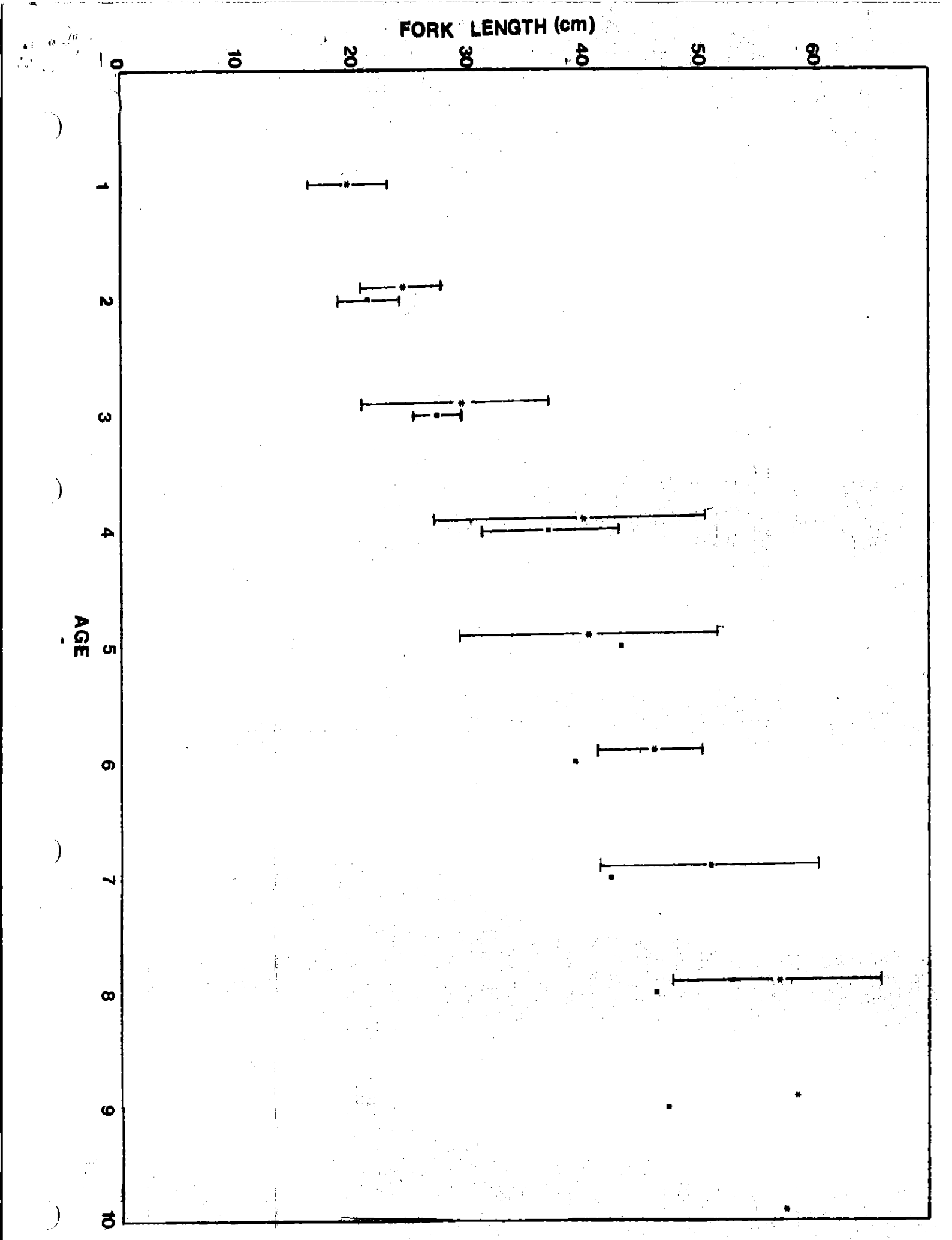
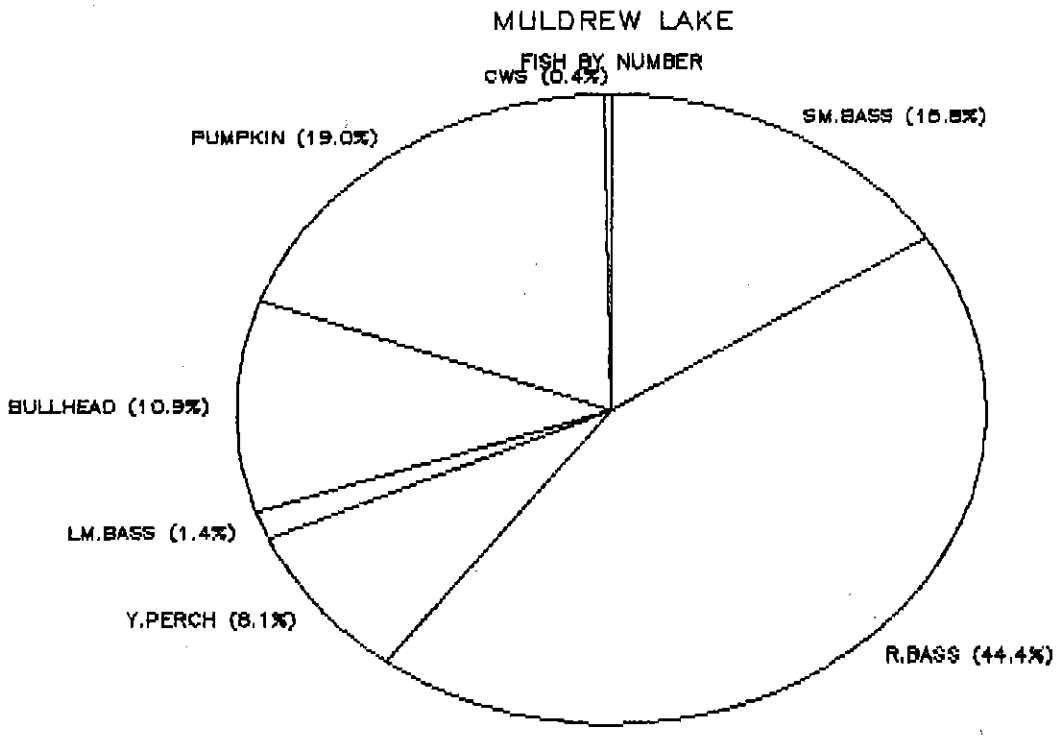

FORK LENGTH (cm)
0
10
20
30
40
50
60
AGE
1
2
3
4
5
6
7
8
9
10

FIGURE 11


MULDREW LAKE
FISH BY NUMBER
CWS (0.4%)
SM.BASS (15.8%)
PUMPKIN (19.0%)
BULLHEAD (10.9%)
LM.BASS (1.4%)
Y.PERCH (8.1%)
R.BASS (44.4%)

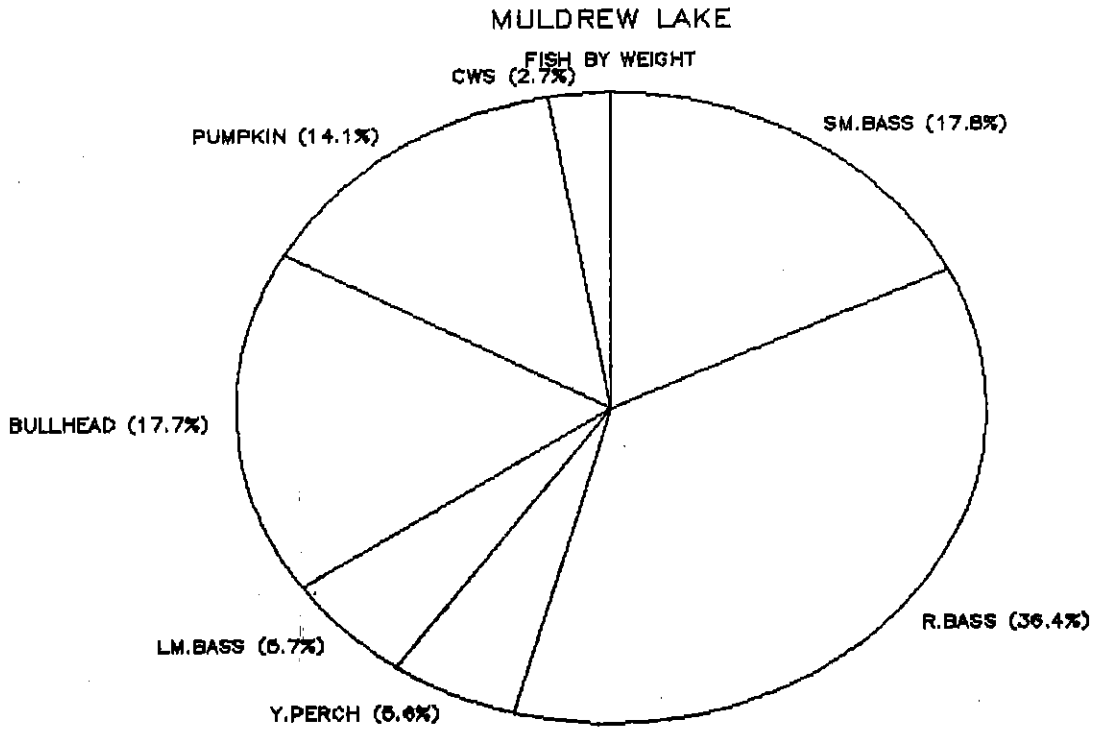
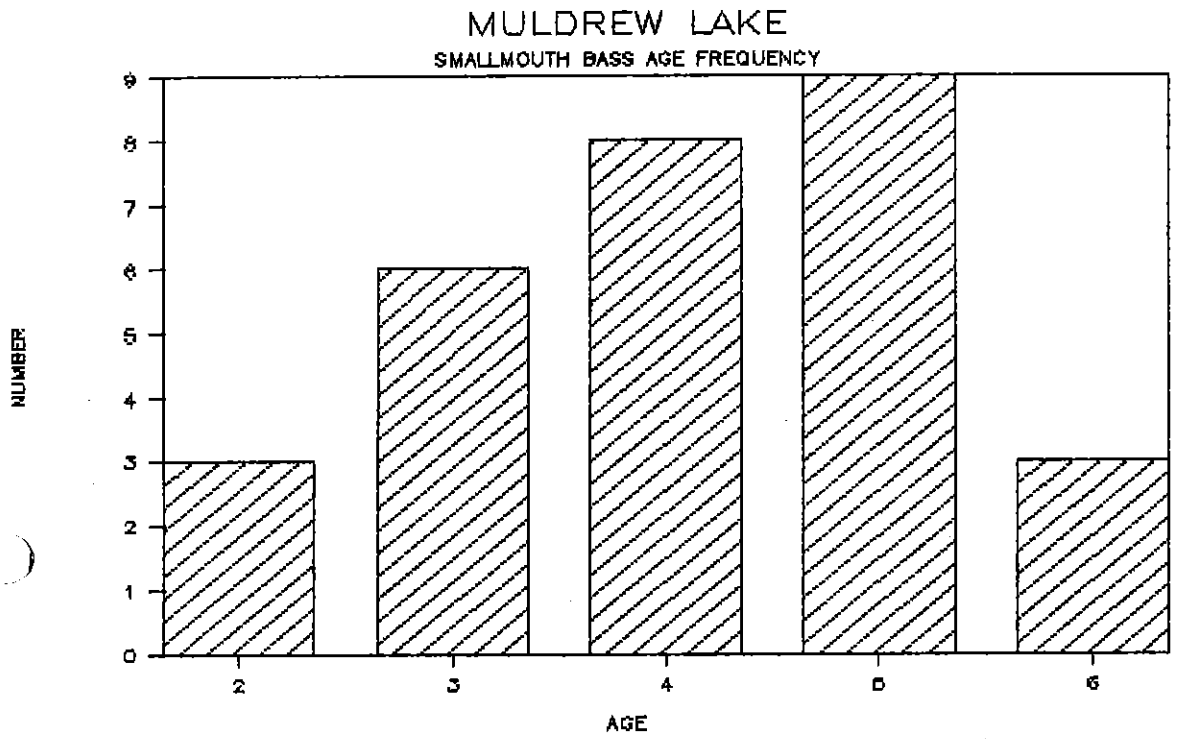

MULDREW LAKE
FISH BY WEIGHT
CWS (2.7%)
SM.BASS (17.8%)
PUMPKIN (14.1%)
BULLHEAD (17.7%)
R.BASS (36.4%)
LM.BASS (5.7%)
Y.PERCH (5.6%)

FIGURE 12


MULDREW LAKE
SMALLMOUTH BASS AGE FREQUENCY
NUMBER
0
1
2
3
4
5
6
7
8
9
2
3
4
5
6
AGE