MICHIGAN DEPARTMENT OF NATURAL RESOURCES

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THE FISH POPULATION OF CASSIDY LAKE, WASHTENAW COUNTY [1]

By James C. Schneider

ABSTRACT

Cassidy Lake, a warmwater lake in the Waterloo Recreation Area, is typical of many lakes in southern Michigan. In 1964, the size of the Cassidy Lake fish population was estimated, using the mark-and-recapture technique. Fish were caught in seines or trap nets, marked by clipping a fin, and recovered shortly thereafter when the lake was chemically treated. The lake contained 145 pounds of fish per acre. Bluegill (67 pounds per acre), yellow perch (24 pounds per acre), pumpkinseed (14 pounds per acre), and largemouth bass (10 pounds per acre) were the most important species. Fish were growing at rates equal to or exceeding the state average. Recruitment of new fish to the population had been fairly stable for a period of years. Consequently, total annual mortality rates could be estimated from the age-frequency distributions. Total mortality was estimated at 63% for the bluegill, 68% for the pumpkinseed, 80-96% for the yellow perch, and it varied from 26 to 73% (depending on age) for the largemouth bass. The fish population of Cassidy Lake was compared to the fish populations of nearby Sugarloaf and Mill lakes.

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[a] A continuation of the report series on fisheries research, from Institute for Fisheries Research Reports Nos. 1-1685 for the years 1930-1964, followed by a period when IFR reports Nos. 1686-1791 were included in a Research and Development Report series during 1964-1972; fisheries research is now administratively under the Fisheries Division.

[1] A contribution from Dingell-Johnson Project F-29-R, Michigan.

Introduction

Cassidy Lake is a 46-acre lake in Washtenaw County, Michigan (T. 1 S., R. 3 E., Sec. 33). It is typical of many lakes in the Waterloo Recreation Area in that it is shallow (maximum depth of 11 feet), weedy, has hard water (methyl orange alkalinity of 134 ppm) and is moderately productive.

Like most southern Michigan lakes, the predominant species of fish at the time of this study were bluegill (Lepomis macrochirus), largemouth bass (Micropterus salmoides), yellow perch (Perca flavescens), and pumpkinseed (Lepomis gibbosus). Northern pike (Esox lucius) was notable for its absence. Growth of fish was comparable to the state average (Laarman, 1963).

Public fishing was relatively light due to limited public access; however the lake was fished by residents of the Cassidy Lake Technical School. It is my contention that Cassidy Lake and its fish population were typical of other lakes and fish populations in southern Michigan.

In 1964, Cassidy Lake was selected as the site for a study on the dynamics of yellow perch (Schneider, 1972). In May and June, prior to the perch study, mark-and-recapture estimates of the native fish population were made using nets. Additional estimates were made when the lake was subsequently treated with rotenone to remove all of the fish. The abundance, structure and growth of the Cassidy Lake fish population at that time are the subjects of this report.

Methods

Fish were collected by means of trap nets (8-18 May) and a seine 1,000 feet long (21-28 May) and were given distinctive fin clips (caudal or soft-dorsal). The lake was treated with rotenone on 1 June and a large sample of fish was picked up 1-3 June. Data were stratified by species and by inch groups to reduce bias caused by gear selectivity.

Subsequent recapture of marked fish enabled computation of mark-and-recapture population estimates from Schumacher-Eschmeyer or Bailey-Petersen type formulas (Ricker, 1958). Different combinations of data from trap netting, seining, and recovery of dead fish following lake treatment permitted as many as six different estimates. However, all six estimates could not be made for all strata because of gear selectivity and inadequate numbers of recaptures.

Sometimes two or more estimates of the same stratum differed significantly. The estimates in which the seine was used on both the marking and recovery runs were consistently lower than estimates based on other gear. No doubt this was due to homing of the seine-marked fish to the areas where they had been caught. Consequently, on recapture runs over the same areas of the lake (only two portions of the lake had a firm beach), the ratio of marked to unmarked fish in the catch was not representative of the lake as a whole. Some of the other estimates, based on fish marked during seining and recovered at lake treatment, appeared to be too high. This may have been caused by an unobserved, delayed mortality of some fish taken in the seine. I am also of the opinion that there may have been differences in our ability to recognize fin clips. Fish with a caudal fin clip, or with caudal and dorsal fin clips, may have been recognized as a marked fish more readily than fish with a dorsal fin clip alone.

The estimates in which fish were caught in trap nets initially and recaptured by seining or poisoning appear to be the most reliable. The estimates in which fish were marked while seining and recaptured at poisoning were used for those small fish which were not caught in trap nets (and hence were not estimated). For those strata in which the data were insufficient to compute an estimate, the minimum number of fish known to be present, or a conservative approximation, was substituted. Fish removed from the lake for special studies or to restock another lake have been added to the population estimates.

An analysis of the growth of fish in Cassidy Lake was made by Percy W. Laarman. These data were used to apportion population

estimates by size groups into estimates by age groups. Estimates of standing crop were computed from the size-group estimates and average length-weight data given by Beckman (1948) or Carlander (1969).

Results

The age and growth of the fish in Cassidy Lake as of May 1964, are summarized in Table 1. Bluegills and largemouth bass were growing at the state average rate. Pumpkinseeds, yellow perch, and black crappies were growing faster than average.

The best estimates of the number of bluegills, pumpkinseeds, perch, and bass larger than 3.0 inches long are summarized in Table 2. The approximate standing crops in pounds per acre were computed to be 66.9 for the bluegill, 14.5 for the pumpkinseed, 23.5 for the yellow perch, and 9.9 for the largemouth bass. In addition, there were about 125 black crappies (Pomoxis nigromaculatus) weighing 0.5 pound per acre, 30 rock bass (Ambloplites rupestris) weighing less than 1 pound per acre, 3,400 green sunfish (Lepomis cyanellus) weighing 2.9 pounds per acre, 1,730 yellow bullheads (Ictalurus natalis) weighing 5.7 pounds per acre, 900 brown and black bullheads (Ictalurus nebulosus and I. melas) weighing 12.5 pounds per acre, 450 lake chubsuckers (Erimyzon sucetta) weighing 2.5 pounds per acre, 81 large bowfin (Amia calva) weighing 5.3 pounds per acre, and 356 grass pickerel (Esox americanus) weighing 0.8 pound per acre. The total standing crop of fish was about 145 pounds per acre.

The estimated numbers of bluegills, pumpkinseeds, yellow perch, and largemouth bass belonging to various age groups are contained in Table 2. Annual recruitment appears to have been relatively constant for these species during the 7 years or so involved; therefore total mortality was estimated from lines, fitted by eye, to the age-group estimates (Figs. 1-4).

For the bluegill, fishing mortality plus natural mortality was about 63% per year (Fig. 1). In fitting the line to the estimates, I assumed

that the 1957 and 1958 year classes were unusually strong. No bluegills in the 1956 or older year classes were found in Cassidy Lake. This may be due to poor recruitment in those years or to an increase in mortality among older bluegills, such as occurred at Mill Lake (Schneider, 1971).

Total mortality for the pumpkinseed was about 68% per year (Fig. 2). The 1961 year class appears to be slightly stronger than average and the 1957 and 1956 year classes appear to be weak. As with the bluegill, the absence of older sunfish may indicate that mortality increases with age.

The mortality rate of the yellow perch was extremely high--96% per year (Fig. 3). Possibly this rate was inflated because of uneven recruitment. However if the line is drawn through the age-I estimate (excluded previously because I considered it less reliable than the age-II estimate) and the age-III estimate, the resulting estimate of mortality is still 80%. The true mortality rate probably lies somewhere between 80 and 96%. From the data on hand it is impossible to determine whether the 1963 year class was weak or the 1962 year class was strong.

For the largemouth bass, the relationship between number of survivors and age seems to be described better by a curve than a straight line (Fig. 4). This was true also for bass in Mill Lake (Schneider, 1971). According to the survivorship curve in Figure 4, total mortality increased from 26% during age II to 73% during age VIII. The number of yearling bass was probably underestimated, and was excluded from consideration when fitting the curve. The 1961, 1957, and 1956 year classes appear to be weak.

Discussion

The fish population of Cassidy Lake was similar to the fish populations in Sugarloaf Lake (Cooper and Latta, 1954) and Mill Lake (Schneider, 1971). All are shallow, hard-water lakes in the Waterloo Recreation Area.

The bluegill was the predominant fish in each lake. In Mill Lake bluegills grew slowly, whereas in the other lakes the bluegills

grew at the state average rate. The density of large bluegills (6.0 inches and longer) was about 113 per acre in Mill Lake, 122 per acre in Cassidy Lake, and 82 per acre in Sugarloaf Lake. Total standing crops of bluegills were about 44, 67, and 31 pounds per acre, respectively. At Mill Lake, where angling was prohibited, the total annual mortality of large bluegills was about 54%. At Sugarloaf Lake, total annual mortality of large bluegills was 66%, with 25% due to fishing. Total mortality of large bluegills in Cassidy Lake was 63%; the amount of mortality caused by fishing there is unknown.

The yellow perch was the second most abundant fish in these lakes. The perch population of Sugarloaf Lake has not been estimated carefully but it is known to be large, perhaps 30 pounds per acre. The perch population of Cassidy Lake was about 24 pounds per acre. The smallest perch population, 14 pounds per acre, and also the slowest growing, occurred in Mill Lake. In these lakes only a small fraction of the perch biomass reaches a size useful to anglers. In Cassidy and Mill lakes, for example, there were only about 4 perch per acre larger than 7.0 inches. Total annual mortality was high in both lakes: 80-96% in Cassidy and 70% in Mill. The higher rate in Cassidy Lake was likely due to angling.

The pumpkinseed is a common species of fish in the Waterloo Area lakes which have been studied intensively. Total standing crops were about 3, 12, and 14 pounds per acre, and the numbers of large sunfish were 4, 21, and 15 per acre, for Sugarloaf, Mill, and Cassidy lakes, respectively. Mortality rate among the large sunfish was 81% for Sugarloaf Lake, 57% for Mill Lake, and 68% for Cassidy Lake. At Sugarloaf Lake expectation of death due to fishing was 29% and natural mortality was 52%. All of the mortality at Mill Lake was due to natural causes, because the lake was closed to fishing.

Largemouth bass were the most abundant predacious fish in lakes of the Waterloo Area. In the spring of the year, populations averaged about 4 pounds per acre in Sugarloaf, 12 pounds per acre in Mill, and 10 pounds per acre in Cassidy. The number of bass of legal

size (greater than 10.0 inches) was 3, 9, and 9 per acre, respectively. Total mortality of legal-sized bass averaged 70% (35% due to fishing and 35% due to natural causes) at Sugarloaf Lake and 41% (all due to natural causes) at Mill Lake. A single estimate (including both natural and fishing mortality) for Cassidy Lake bass is 47%. This is a weighed estimate (like the estimate at Mill Lake) which takes into account the increase in mortality with age (or size).

Moderate-sized populations of other predators were present in Sugarloaf and Mill lakes: northern pike, 2 to 9 pounds per acre; bowfin, about 3 pounds per acre; grass pickerel, probably less than 1 pound per acre; black crappie, 1 to 5 pounds per acre; and rock bass, about 1 pound per acre. Northern pike were not present in Cassidy Lake, and the populations of the other species were slightly different: bowfin, 5 pounds per acre; grass pickerel, 1 pound per acre; black crappie, 0.5 pound per acre; and rock bass, less than 0.1 pound per acre. Bullheads (yellow, brown, and black, combined) weighed about 5, 5, and 18 pounds per acre in Sugarloaf, Mill, and Cassidy lakes, respectively. I estimate the total standing crop of fish of all sizes to be about 95 pounds per acre in Sugarloaf Lake, 116 pounds per acre in Mill Lake, and 145 pounds per acre in Cassidy Lake.

Acknowledgment

The four figures were drafted by Mr. Dean B. Armstrong.

Table 1.--Age and growth of fish in Cassidy Lake, May 1964

Species and age group	Number of fish	Range (inches)	Mean length (inches)	State average (inches)
Bluegill				
II	6	3.4- 4.0	3.5	3.7
III	99	4.0- 6.0	5.0	4.9
IV	45	4.9- 6.5	5.9	5.9
V	35	6.3- 7.5	7.0	7.0
VI	35	6.7- 8.2	7.3	7.5
VII	20	6.7- 8.2	7.6	7.9
Pumpkinseed				
II	14	3.3- 4.8	4.4	3.8
III	103	4.3- 6.6	5.4	5.0
IV	61	5.7- 7.6	6.6	5.9
V	34	6.7- 7.8	7.3	6.4
VI	8	7.6- 8.5	7.9	6.9
Yellow perch				
I	49	2.9- 3.6	3.2	3.7
II	70	4.1- 6.5	4.9	5.5
III	16	5.9-10.2	7.5	6.9
IV	2	11.3-11.4	11.4	7.8
V	2	11.7-12.4	12.0	9.0
Black crappie				
II	25	7.2- 9.3	8.0	6.8
Rock bass				
II	1	...	4.6	4.5
Largemouth bass				
I	2	3.4- 3.4	3.4	4.1
II	31	6.1- 9.8	7.9	7.2
III	15	9.9-11.9	10.9	9.8
IV	12	10.8-12.6	12.0	11.6
V	9	12.5-13.8	13.0	13.6
VI	6	12.6-14.2	13.4	15.1
VIII	1	...	18.2	17.7
XI	1	...	20.8	19.6

Table 2.--Estimates, stratified by inch group, of the number of bluegills, pumpkinseeds, yellow perch, and largemouth bass present in Cassidy Lake, May 1964

Inch group	Species			
	Blue-gill	Pumpkin-seed	Yellow perch	Largemouth bass
3.0-3.9	33,603	3,416	14,364	36
4.0-4.9	7,418	2,115	14,665	13
5.0-5.9	5,398	1,648	3,448	3
6.0-6.9	4,537	489	416	81
7.0-7.9	1,082	175	134	111
8.0-8.9	16	32	12	62
9.0-9.9	...	...	9	79
10+	...	...	15	394

Table 3.--Estimates, stratified by age group, of the number of bluegills, pumpkinseeds, yellow perch, and largemouth bass present in Cassidy Lake, May 1964

Age group	Species			
	Blue-gill	Pumpkin-seed	Yellow perch	Largemouth bass
I	...	...	15,297	...
II	33,714	4,051	18,011	320
III	10,323	3,181	678	124
IV	4,373	463	6	147
V	1,713	134	4	82
VI	1,409	46	...	38
VII	522	...	...	...
VIII	...	...	...	1
IX	...	...	...	1

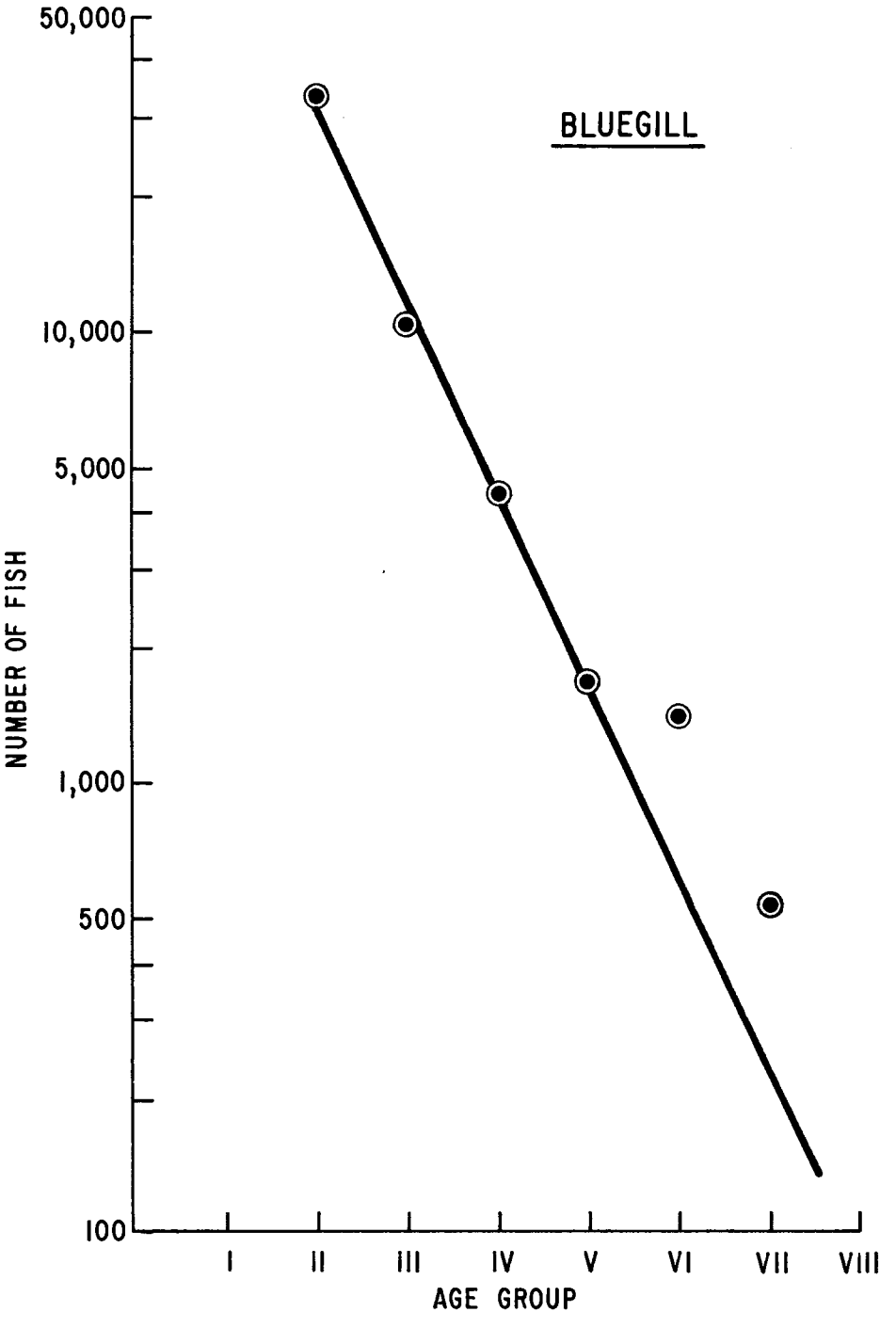

Figure 1.--Survival curve for bluegill, Cassidy Lake, May 1964.

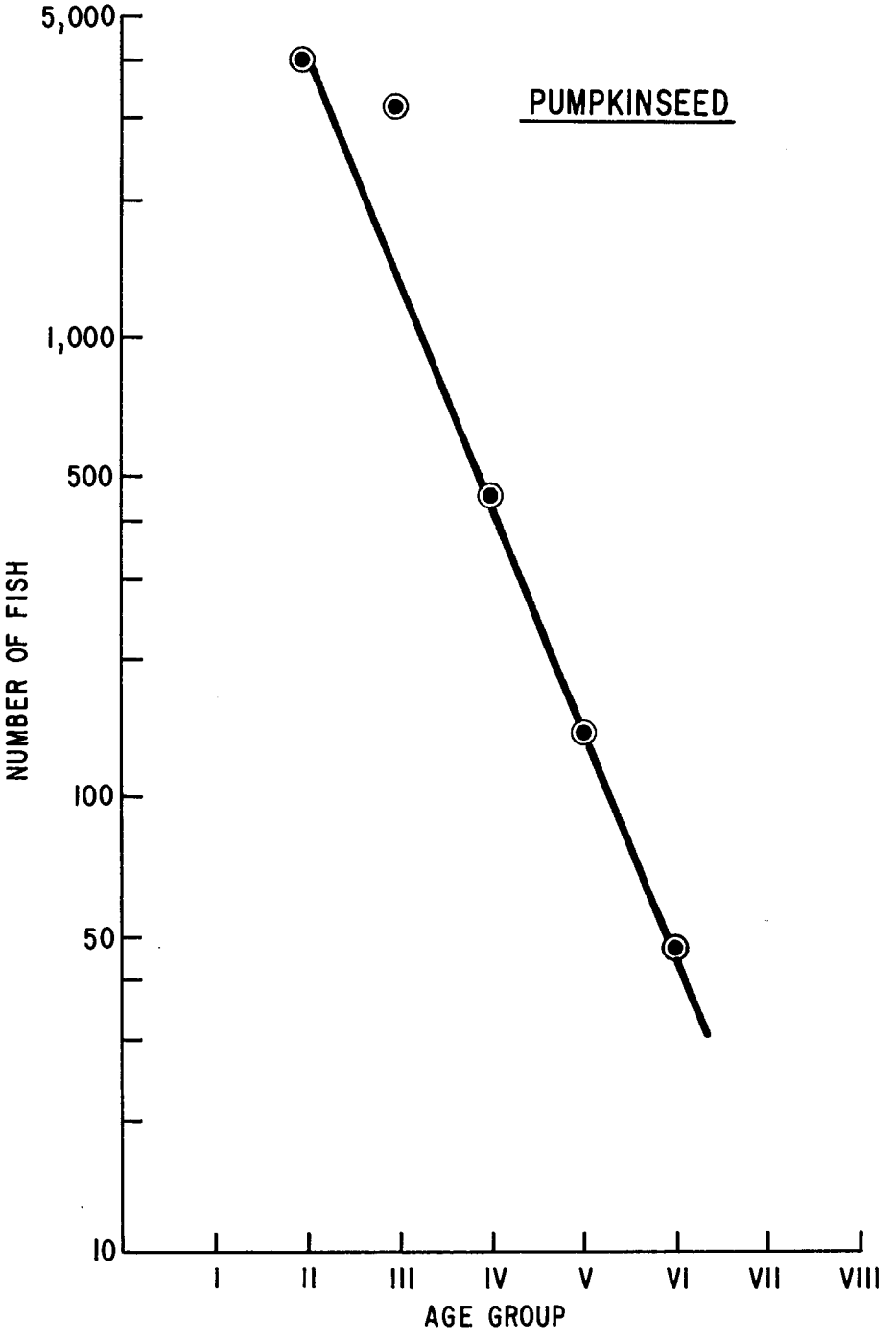

Figure 2.--Survival curve for pumpkinseed, Cassidy Lake, May 1964

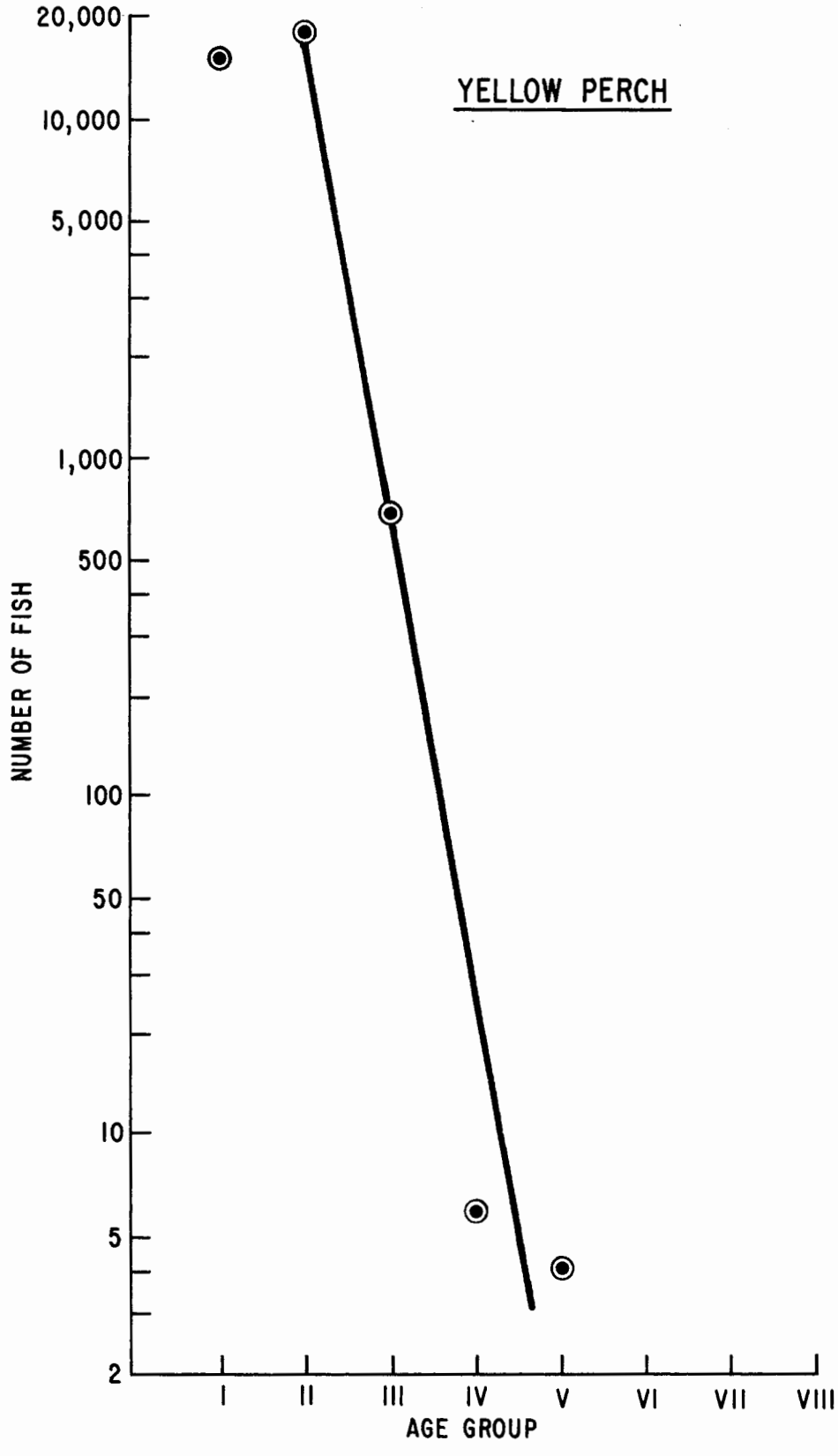

Figure 3.--Survival curve for yellow perch, Cassidy Lake, May 1964

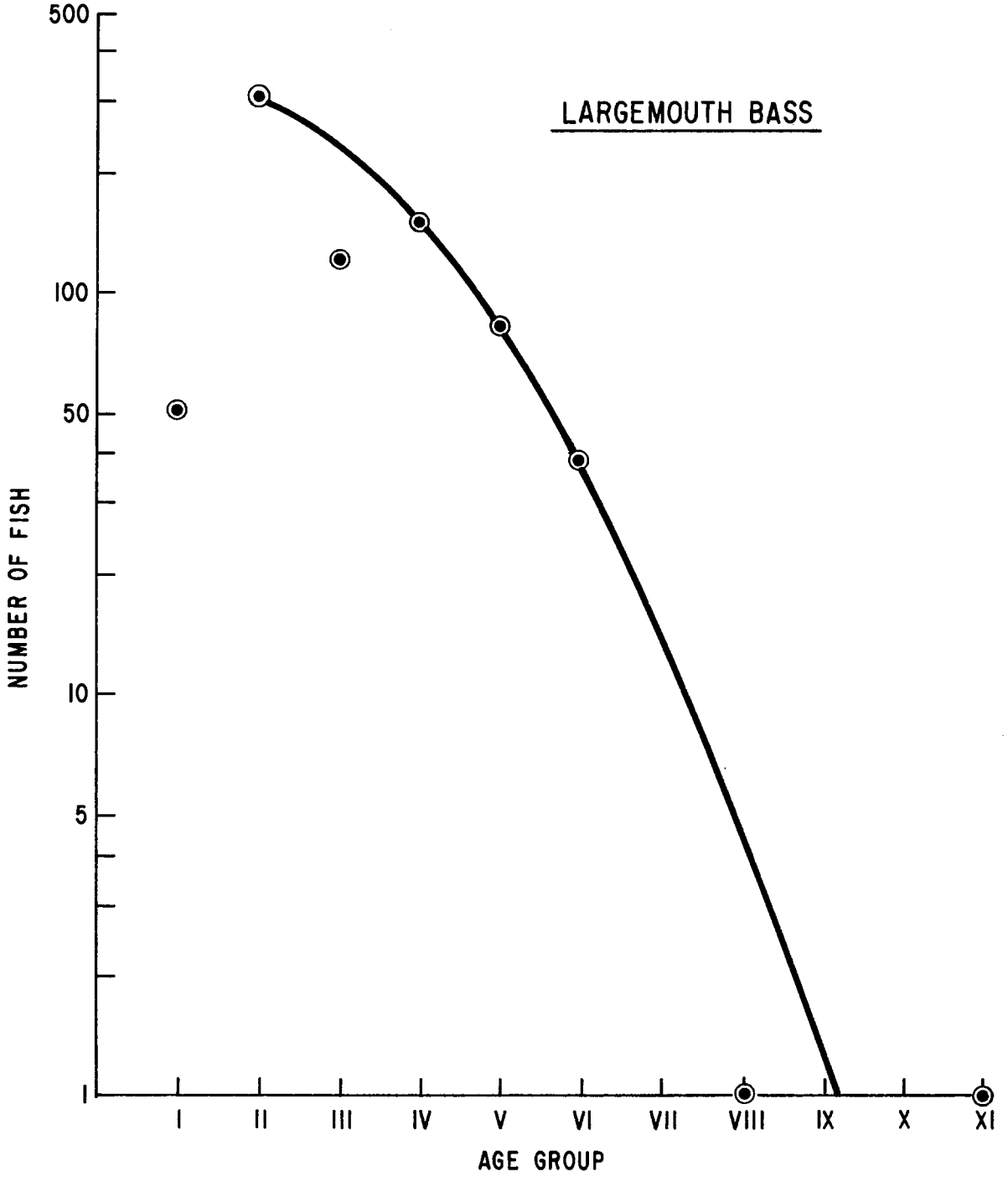

Figure 4.--Survival curve for largemouth bass, Cassidy Lake, May 1964

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