

1958

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Recommended Citation

Mayhew, James (1958) "The Fish Population of a Southern Iowa Artificial Lake," *Proceedings of the Iowa Academy of Science*: Vol. 65: No. 1, Article 81.

Available at: <https://scholarworks.uni.edu/pias/vol65/iss1/81>

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The Fish Population of a Southern Iowa Artificial Lake

By JAMES MAYHEW

Lake Macbride, a 138-acre state-owned artificial lake in Johnson County, was drained in the fall of 1956 to permit reconstruction of the dam. The Coralville Flood-Control Dam on the nearby Iowa River was nearing the final phases of construction, and would ultimately flood the present Lake Macbride with 27 feet of water. Rather than destroy the facilities offered by this established recreational area, the various agencies involved decided to increase the height of the Macbride dam by approximately 29 feet. Surface area of the impounded lake would be expanded to about 940 acres at the new spillway elevation.

The Macbride impoundment is situated in a deep valley with two arms protruding from the main body of the lake. Maximum depth at the time of original construction was reported as approximately 30 feet, but heavy siltation had reduced this to 20 feet. As in most artificial lakes the shoreline is highly irregular and bottom topography extremely steep. Water and temperature samples taken during the annual fisheries survey indicate thermal and chemical stratification were limited to certain favorable periods during the summer months. Vegetation is restricted mostly to the shoal and shallow bay areas.

Complete drainage projects of this nature are extremely valuable in estimating fish populations providing the outlet structure and terrain are suited to trapping fish as they exist from the lake. A similar study was conducted by Speaker (1948) at Beed's Lake in Franklin County. Since little information concerning fish populations of Iowa artificial lakes can be located in the literature it seemed expedient to obtain basic population data from this impoundment. The final project was designed to: (1) study the population structure and balance; (2) determine the age and species composition of each specific population; and (3) study the effects of past management practices.

DRAINAGE AND METHOD OF POPULATION ESTIMATE

Prior to the opening of the drain valve the outlet stream bed was cleared of all debris, shrubs, and small trees. Two sections of drag seine were installed approximately 100 and 140 feet below the outlet structure to form a trap (Figure 1). The first section of the trap

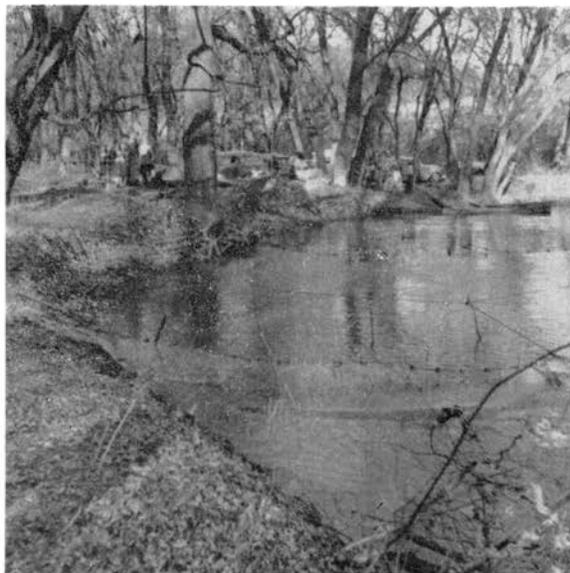


Figure 1. Fish trapping structure at outlet of Lake Macbride.

was constructed with three inch bar measure mesh. This portion of the trap was designed to capture the large rough fish, but to allow smaller game fish to pass through. The section below was isolated with one inch bar measure mesh to catch all the fish escaping through the net immediately above. Both seines were weighted along the lead line with steel chain to prevent them from raising off the bottom in the turbulent current.

Drainage was begun on October 17 by the Fish Management Section, and by October 27 only a small pool remained immediately in front of the dam. After several days of draining very few fish were observed in the trap. Subsequent investigation revealed a steel grating over the outlet prevented the fish from escaping through the tube. Immediately after this grating was removed a major migration of game-fish occurred into the blocked-off area.

During trapping operations several seine hauls were made in the main body of the lake in an effort to salvage game-fish. Several thousand crappie, bluegill, and largemouth bass were caught and either distributed by live trucks throughout the state or released into the Iowa River immediately below the traps.

The population estimate of each species was made by simply counting the number of individuals as they were released. During the salvage work representative lengths, weights, and scale samples were obtained from each specific population. The mean of the weight was then used to calculate the total poundage of each popu-

lation. Part of the carp and bigmouth buffalo population had to be estimated by cross section counts because several hundred of these fish were isolated on the mud flats after drainage was completed.

FISH POPULATION

The four major species originally stocked in the lake, largemouth bass, *Micropterus salmoides*, crappie, *Pomoxis annularis*, bluegill, *Lepomis machrochirus*, and black bullheads, *Ictalurus melas*, made up only 32.5 per cent of the combined populations by weight. Black and white crappie were the most abundant game-fish, but comprised only 13.8 per cent of the total poundage. Channel catfish, *Ictalurus punctatus*, had been introduced as a companion species to the bullhead, and represented 2.3 per cent of the population. Carp, *Cyprinus carpio*, and bigmouth buffalo, *Ictiobus cyprinellus*, were the dominant species, with a combined total of 65.2 per cent of the standing crop (Table 1). The mean weight per acre was estimated at 897 pounds of fish.

Table 1

The Estimated Fish Population of Lake Macbride by Number and Weight

Species	Total Number	Per Cent of Population	Total Weight	Per Cent of Weight
Largemouth Bass	6,511	2.5	2,767	2.2
Bluegill	60,577	23.5	5,939	4.8
White Crappie	108,672	42.2	13,584	10.9
Black Crappie	20,718	8.0	2,945	2.4
Black Bullhead	35,048	13.6	15,071	12.2
Channel Catfish	3,024	1.3	2,828	2.3
Carp	15,996	6.2	47,989	38.8
Bigmouth Buffalo	7,007	2.7	32,713	26.4
Grand Total	257,553		123,836	

Largemouth Bass

The magnitude of the largemouth bass population in Lake Macbride was not as large as expected. Only 511 adult and 6,000 sub-adult (age groups I and II) bass were recovered during the rescue operations. Extensive electro-fishing shortly before drainage indicated that largemouth bass were not abundant. Growth rates were above normal in comparison with bass from similar impoundments, averaging 4.9, 6.9, 13.0, 17.0, and 18.1 inches total length for the first, second, fourth, fifth, and sixth years of life respectively. The mean weight of 42 adult bass was 3.2 pounds; whereas 710 sub-adults averaged 0.3 pounds.

Bluegill

The bluegill ranked as the second most abundant species of fish. During the project 60,577 bluegills of all age groups were captured

and released. These fish constituted 23.5 per cent of the population by number, but only 4.8 per cent by weight. Average weight of 1,102 bluegills was 0.21 pounds. Mean growth for the first three years of life was 3.4, 4.7, and 6.0 inches total length. There was no significant difference in year class strength for the first three years, indicating a relatively stable population.

Crappie

During the early history of Lake Macbride the black crappie was considered more numerous than the white crappie. Fishery survey records reveal this situation remained constant until 1947. Reproduction and survival of white crappie during the next few years slowly reversed this ratio until at drainage this species represented 85 per cent of the population.

The crappie population was undoubtedly overcrowded. Growth and general physical condition were considerably below normal. Mean total length attained in the first three years of life was 3.9, 6.5, and 7.1 inches total length respectively. Growth during the first two years was near normal, but diminished rapidly thereafter. Part of this was probably due to the exceptionally strong 1953 year class. Of 531 crappie sampled at random, 93 per cent were represented by this age group. The periodic development of vigorous year classes seems to be a characteristic of Iowa artificial lakes. Correspondingly, the years between strong year classes result in sub-normal reproduction and above normal growth.

Black Bullheads

Since natural reproduction of the bullhead is minimal in Iowa artificial lakes, fishable populations of fish must be maintained on a "put-and-take" management basis. Man's control over the abundance of these populations usually results in optimum growth. No attempt was made to analyze the age composition of the bullhead population, but mean total length was 9.3 inches and average weight 0.41 pounds. By weight, this species comprised 12.2 per cent of the standing crop.

Channel Catfish

Recently the channel catfish has been stocked as a supplemental species to the bullhead in southern Iowa artificial impoundments. Reproduction is usually limited and populations perpetuated through annual fingerling planting. Average weight was 1.06 pounds from a sample of 15 adult catfish. Growth was calculated at 9.0, 13.0, and 15.1 inches total length for the third, fourth, and fifth years of life.

Carp

The carp, by all criteria, was the dominant species of fish in Lake Macbride. This species made up 38.8 per cent of the total population by weight. Growth was exceptionally rapid, with an average of 8.4, 14.0, 19.4, and 25.3 inches total length during the first four years of life. Fish in age group III were slightly more abundant than any other group. Average weight of 1,022 specimens was 3.04 pounds.

Bigmouth Buffalo

This species ranked second to the carp in total poundage. The buffalo comprised 26.4 per cent of the population by weight and 2.7 per cent by number. Most of these fish were large individuals, averaging slightly over 5.0 pounds each. Several specimens in excess of 20 pounds were recovered from the trapping area. Scale samples were obtained from a representative sample of buffalo, but age analysis was not reliable because of the size and poor transparency of the scales.

DISCUSSION

Fish populations in Lake Macbride were obviously in a state of imbalance. Two exotic species existed in quantity enough to dominate the entire fish population. Survey records do not reveal the initial date that carp and buffalo appeared in the lake, but it was apparently sometime before 1945.

Throughout the history of the impoundment there were definite changes in the habitat and environmental conditions. A considerable portion of this change undoubtedly occurred with increasing siltation. The original effect of silting and turbidity in changing the habitat might have been a primary factor in changing the species composition. Each species has a different tolerance to habitat and lives more favorably in different optimum conditions. Siltation has a definite influence in alteration of environment which would favor the carp and buffalo. After domination of the population structure by the species most tolerant to the changing conditions, this species (carp in this case) also influenced changes in environmental conditions to further suit their basic requirements by normal feeding and social activities. Other evidence to indicate habitat changes are observed by the reversal of the ratio of black and white crappies. Black crappie were more numerous until 1948, after which the white crappie became the more abundant. As the habitat was further changed to fit the optimum conditions the proportion of white to black crappie was even more divergent. This criterion is considered good evidence of the slow evolution of environmental conditions.

Evidence of overcrowded conditions was very apparent in the crappie population. Growth was considerably below normal for

this type of impoundment. The predator population had been reduced by low reproduction and/or survival to the extent that prey fish were much more adapted to controlling the predator than the predators were of controlling the prey. This situation cannot be present because of interspecific competition for food, but rather for space and similar common needs. Bennett (1952) states this to be evident in bass-bluegill populations in small ponds, in that dominant bluegill populations are much more adapted to controlling bass than bass are to controlling bluegills.

In recent years management problems have occurred frequently with rough fish and stunted pan-fish populations. Rough fish control is virtually impossible because of stumps, debris, and fish shelters in all areas of the lake. Recently attempts have been made to remove portions of the excessive crappie populations in order to increase growth. It is thought that if average size increased these fish would be more desirable to the angler, and thus increase the harvest of the surplus population. During the past two years approximately 25,000 crappies were removed by seining, but little change in the size or growth was noted. Apparently by creating a void within the crappie population, by approximately 3,500 pounds, compensatory weight adjustment by the population structure was made by the dominant species rather than by the species removed.

SUMMARY

Lake Macbride was drained in October, 1956, to facilitate dam reconstruction. The stream outlet was blocked off by two sections of seine to facilitate rescue of desirable fish from the lake, and also to prevent rough fish migration downstream to the Iowa River. The total standing crop in the lake was estimated by counting and weighing representative samples. Total standing crop was estimated at 123,836 pounds.

Carp and bigmouth buffalo were most numerous fish by weight; whereas crappie and bullhead were the most abundant game-fish.

Growth rates were good for carp, buffalo, and largemouth bass, but relatively slow for crappie and bluegill.

Predator-prey relationships, interspecific competition, past management practices, changes in habitat are discussed.

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