

Growth Rates of Fishes of Lake Hiwassee, Oklahoma, After Two Years of Attempted Population Control¹

JOHN E. KING, Oklahoma Game and Fish Department, Fairview

The Lake Hiwassee fish removal program was originated as a result of a survey conducted February 12, 1951 by members of the fisheries division of the Oklahoma Game and Fish Department. Fishing in the lake had been poor for several years, and the results of the 1951 survey indicated an over-population of stunted fish, particularly white crappie and bluegill. The program was originally planned for a five-year period to effect partial fish population removal by annual application of powdered derris root (5 percent rotenone) to shallow areas of the lake. The results of this and the age and growth rates of fishes collected after each of three applications are presented in this paper.

DESCRIPTION OF THE LAKE

Lake Hiwassee is located in Section 33, Township 14 N, Range 1W, near the town of Arcadia, Oklahoma County. The lake bed and watershed are of the sandstone and Permian redbed soil types. The water varies from turbid to slightly turbid, depending on runoff and wind and wave action. A large portion of the shoreline is matted with pondweed, *Potamogeton americanus*.

The surface area as computed from a 1951 PMA aerial photograph is 154 surface acres. With the exception of 40 cultivated acres, the watershed is tall-grass prairie and post oak-blackjack woodland. One small, intermittent creek drains the watershed and empties into the lake. The earthen dam with rock rip-rap and a concrete spillway was constructed in 1938. A drain pipe was not installed.

PROCEDURES

The first partial removal of the fish population by rotenone was conducted on April 19, 1951. Five hundred pounds of powdered derris root were applied to a cove on the west side of the lake by dragging the chemical in burlap bags behind a boat in the deeper water and by spraying the shallower water with a power-driven pump. The area covered was approximately 20 surface acres in extent and had an average depth of about six feet. The second partial removal was conducted on May 13, 1952. Five hundred pounds of derris root were similarly applied at the south end of the lake in an area of about 30 surface acres and averaged six feet in depth. The entire sampling area was blocked off the previous day with gill nets and seines. The gill nets showed little movement of fishes either in or out of the area. When nets were lifted the morning following the treatment only four fish were taken, two of which were going in and two moving out of the area. The third partial removal, conducted on June 20, 1953, varied from the two previous ones in that 1000 pounds of powdered derris root were used, and the entire shoreline was sprayed, with the exception of the area along the dam. The pondweed bed areas were thoroughly treated with the chemical and the entire areas of several small coves were treated. In concentrating on the shoreline in 1953, it was hoped to remove more of the smaller fishes that tend to inhabit this area and kill fewer of the larger fish which will readily move out of shallow water when disturbed.

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The following species were taken during all three operations and are listed in the approximate order of the relative number killed:

SCIENTIFIC NAME	COMMON NAME
<i>Pomoxis annularis</i>	White crappie
<i>Dorosoma cepedianum</i>	Gizzard shad
<i>Lepomis macrochirus</i>	Bluegill
<i>Ictalurus punctatus</i>	Channel catfish
<i>Micropterus salmoides</i>	Largemouth bass
<i>Lepomis cyanellus</i>	Green sunfish
<i>Lepomis microlophus</i>	Redear sunfish
<i>Ohaenobryttus coronarius</i>	Warmouth
<i>Cyprinus carpio</i>	Carp
<i>Lepomis humilis</i>	Orangespotted sunfish
<i>Ameiurus melas</i>	Black bullhead
<i>Notemigonus crysoleucas</i>	Golden shiner
<i>Pimephales promelas</i>	Fathead minnow
<i>Carpionodes carpio</i>	River carpsucker

The species composition obtained each year was similar, but in each operation there was some variation in the relative numbers killed which was probably attributable to a change in the locality of the operation and not to any change in species densities. The first operation in 1951 produced no small channel catfish and only a few large ones. In comparison, the 1952 operation killed a very large number of channel catfish of all sizes. Thousands of gizzard shad and white crappie were killed during all three operations. Many largemouth bass of all sizes were collected during 1951 and 1952, while fewer large bass were killed in the 1953 operation. Few carp were killed in 1953 as compared to fairly large kills, particularly of larger carp, in 1951 and 1952. No important variations were noticed in any of the other species.

AGE AND GROWTH

Standard methods of scale and spine analysis were used in determining the calculated growth of the various species. A direct proportion between body length and scale and spine radius was assumed, and a nomograph was employed in computations.

LARGEMOUTH BASS. Although there has been little significant increase in the growth-rate of bass, this fish has reflected a greater change than any of the other species (Table 1). Growth during 1951 and 1952 shows a slight increase in one- and two-year-old fish, but no increase in older fish. The grand average calculated growth in length of the bass population of Lake Hiwassee is slightly slower during the first two years of life, but faster in later years, than growth in other state lakes of similar size (2).

CHANNEL CATFISH. Channel catfish growth in Hiwassee Lake is above the average for similar type lakes in Oklahoma (1), which may be due to the facts that this species was stocked only once (1500 fish in 1943), and reproduction success has been limited, so that a condition of overpopulation has not developed. Individual rate of growth is very irregular, and there is no indication of a growth increase following the rotenone treatments. Both channel catfish and largemouth bass taken in 1953 show a pronounced weight increase in relation to length. However, the assumption that this weight increase is due to the effect of population reduction cannot be made because it is characteristic during a rotenone treatment to find bass and catfish gorged with smaller fishes which would introduce errors in weight averages. Nevertheless, this weight increase is most evident in the smaller individuals which have a lessened tendency towards gorging themselves. Reports of fishing after the 1953 treatment indicate that angling for this species has greatly improved.

WHITE CRAPPIE. The white crappie in Lake Hiwassee were, and still are, badly stunted and in need of a drastic reduction in numbers. Angling pressure is not sufficient to remove the annual production. Stocking records indicate that 11,200 crappie were planted from 1938 to 1950. Yearly stocking is a very poor policy and undoubtedly had added to the stunted condition of the population. The crappie show little increase in growth-rate, but hook-and-line catches of this species have improved. Throughout the winter of 1952-53 the catch of crappie increased markedly over former years and many strings of one-half to one pound individuals were taken during the spring of 1953.

REDEAR SUNFISH. Growth of the redear sunfish is above average and shows an increase since the beginning of the rotenone treatments. Only two year-classes were collected in 1953 but they indicate an increase in weight and length over 1952 collections (Table I).

BLUEGILL. The abundance of pondweed that chokes much of the shoreline affords protection for a tremendous population of stunted bluegill, and only occasionally is a bluegill caught worthy of keeping. This species should be seined or trapped in great numbers and destruction of nests should be initiated. No increase in the growth rate has resulted from the rotenone treatments, but the spraying of the shoreline in 1953 should greatly reduce the bluegill population.

DISCUSSION

The age and growth rate studies following two successive years of partial population reduction were rather disheartening in that the anticipated growth increase was not in evidence. Possibly the percentage of the total population killed in 1951 and 1952 was too small to effect a noticeable increase. Martin (2) stated that after partial removal of the fish population of Goddard Lake a marked increase in the length and weight was observed in fish collected 9½ months later. However, 20 of the 27 surface acres in Goddard Lake were treated, a much larger percentage of the total area than that treated in Lake Hiwassee. There are approximately 1200 acre-feet of water in Hiwassee. Five hundred pounds of derris root will treat 166 acre-feet at the rate of three pounds per acre-foot. Therefore, only about 15 per cent of the total water volume was effectively treated in the 1951 and 1952 operations. Evidence from other partial fish population removals indicates that about 50 per cent of the water volume must be treated before definite growth increases can be noted. It is anticipated that the application of 1000 pounds in 1953 will have a more pronounced effect on growth of the various fishes.

Although the growth studies present no evidence that significant growth increases have occurred, the rotenone operations have definitely increased fishing in Lake Hiwassee by stimulating angler interest.

LITERATURE CITED

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