Three Years of Partial Fish Population Removal at Lake Hiwassee, Oklahoma[1]

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The Lake Hiwassee fish population manipulation 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 overpopulation of stunted fish, particularly white crappie and bluegill. The program was originally planned for a five-year period to effect partial population removal by application of powdered derris root (5 percent rotenone) each year to shallow areas of the lake. The results and the age and growth rates of fishes collected after each of the first three applications have been reported previously (1). This report reviews the past data, and presents findings following rotenoning on 24 June, 1954.

DESCRIPTION

Lake Hiwassee, constructed in 1938, is located in Section 33, Township 14N, Range 1W, near the town of Arcadia, Oklahoma County. The watershed is tall-grass prairie and postoak-blackjack woodland in sandstone and Permian redbed soil types. The 154 surface acre lake varies from turbid to slightly turbid, depending on runoff and wind and wave action. A large portion of the shore line is matted with pondweed, *Potamogeton nodosus*.

HISTORY

The first partial fish population removal was conducted on April 19, 1951. Five hundred pounds of powdered rotenone were applied to a 20 acre cove on the west side of the lake. The second partial removal conducted on May 13, 1952, applied five hundred pounds of rotenone to approximately 30 surface acres in the upper end of the lake. The third partial removal conducted on June 20, 1953, varied from the two previous ones in that 1,000 pounds of rotenone were used, and the entire shoreline was sprayed, with the exception of the area along the dam. On June 24, 1954, the fourth application was made, and again the shoreline was sprayed with 1,000 pounds of rotenone.

DISCUSSION

Two distinct differences from other kills were noted following the 1954 application. Most obvious was the absence of gizzard shad compared to thousands killed during previous operations. Only one individual was recovered during the 1954 application. Apparently the shad population has been greatly reduced, if not completely eradicated, and verifies the sensitivity of this species to low concentrations of rotenone. It was also obvious that the carp population had been altered. In past years a few large carp were recovered and indications were that little reproduction was occurring. In 1954, yearling carp, 10 to 16 inches in length, were abundant, suggesting that the 1953 treatment reduced the entire fish population sufficiently to permit an unseasonal carp spawn. This phenomenon has been observed in other state lakes where 50 to 80 percent of the fish population was eradicated.

On November 19, 1953 approximately 10,000 fingerling bass were stocked in the lake. This stocking was made because it was felt that the largemouth bass population had been drastically reduced as a result of the first three partial removals. The planted fingerlings averaged about five inches and

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none were over eight inches in length. In the 1954 sample there were two distinct groups of one year old largemouth bass. One group, believed to be hatchery fish, averaged 4.9 inches at the end of their first year of life (calculated) and ranged from 5.0 to 7.5 inches actual total length on the date of collection. The second group, believed to be native fish, averaged 8.6 inches at the end of their first year of life (calculated) and ranged from 9.0 to 12.5 inches actual total length on the date of collection. Of 84 largemouth bass sampled, 71 were age-group I fish. The growth history (Figure 1) indicates that the growth of largemouth bass has increased considerably since the 1953 application.

Channel catfish were abundant in the sample, especially in the size range of 10.0 to 15.0 inches. The 1950 year class is dominant, as 102 of 156 individuals collected belonged to this group, with a length range of 10.6-15.0 inches. Fishermen state that the majority of the channel catfish caught are in the 10.0 to 15.0 inch length range, indicating that fish spawned in 1950 are providing most of the channel catfishing. Channel catfish growth shows little improvement, being retarded primarliy by the extremely abundant, slow-growing 1950 year class.

Table 1 compares the growth of the fishes collected after each partial kill. Comparison indicates that the first two applications did not reduce the population sufficiently to effect a change in growth-rate. A substantial growth acceleration in largemouth bass, bluegill, and redear sunfish is revealed after the 1953 application of 1,000 pounds of rotenone as compared to 500 pounds used in 1951 and 1952. An even greater increase should be reflected in 1954 growth.

White crappie have shown a slight increase in growth (Table I), but it is still far below that required to provide satisfactory fishing. Apparently, the population removal measures employed in 1951-53 were not drastic enough to reduce intra-specific competition to a point where faster growth of individuals was possible. Warmouth and green sunfish also showed a growth increase but their scanty numbers make them relatively unimportant as sport fishes. The lake is maintaining a suitable population of forage fish such as golden shiner, fathead minnows, and orangespotted sunfish.

A total of 3,000 pounds of rotenone have been used in Lake Hiwassee in the course of four annual applications which would be theoretically sufficient to eliminate the entire population if employed in a single operation. The desired increase in angling success and fish growth has not been fully accomplished by partial retenoning. Reasons for this failure might be attributed to: 1) Increased turbidity and siltation each year; 2) inherent low productivity of impounded waters in the Permian redbed soil region; and, 3) inability to remove an adequate proportion of the overpopulated species without seriously reducing bass and forage fish populations.

Two thousand 4-8 inch largemouth bass were stocked 30 November 1954, in an effort to augment natural reproduction. It is planned to conduct a population analysis by sampling a small area in the spring of 1955, but major population reduction measures will not be resumed until findings warrant it. It is recommended that efforts now be made to decrease turbidity and curtail further siltation in the lake.

Literature Cited

KING, JOHN E. (1953). Growth rates of fishes of Lake Hiwassee, Oklahoma, after two years of partial fish population removal. Proc. Okla. Acad. Sci. 34:53-56.

TABLE 1.

Comparison of the growth rates of largemouth bass, channel catfish, white crappie, redear sunfish and bluegill in Lake Hiwassee collected following rotenone treatment in 1950, 1951, 1952, and 1953.

Year of life	Average calculated total length in inches at end of year of life																			
	Largemouth bass				Channel catfish				White crappie				Redear sunfish				Bluegill			
	1950	1951	1952	1953	1950	1951	1952	1953	1950	1951	1952	1953	1950	1951	1952	1953	1950	1951	1952	1953
1	3.6	5.2	5.4	7.1			3.7	4.6			2.2	3.1	4.3	4.3	4.3	5.3	3.5	3.3	3.3	2.7
2	8.5	9.0	9.0	12.5	8.1	7.7	7.9	8.4			3.7	4.7	5.8	6.6	6.9	7.1	4.6	4.7	4.1	5.2
3	13.6	11.7	13.0	15.6	11.8	11.7	10.0	10.0		5.4	5.8	5.7	8.1	8.3			5.5	5.7	5.1	
4	15.1	13.7	15.0	16.9	14.8	14.2	12.9	11.8	6.1	7.0	6.9	7.0		9.6		8.7	6.5	6.5	6.0	
5	18.2	18.0	17.9	18.2		19.2	14.4	15.2	7.0	8.0	8.6	9.0								
6	20.2	18.6	19.2				19.3	17.7	8.0	8.7										
7	20.7	21.5	20.6	21.6	21.4	16.3		18.1												
No. of fish	32	40	51	84	19	23	53	155	4	11	40	90	10	15	32	29	6	15	22	57

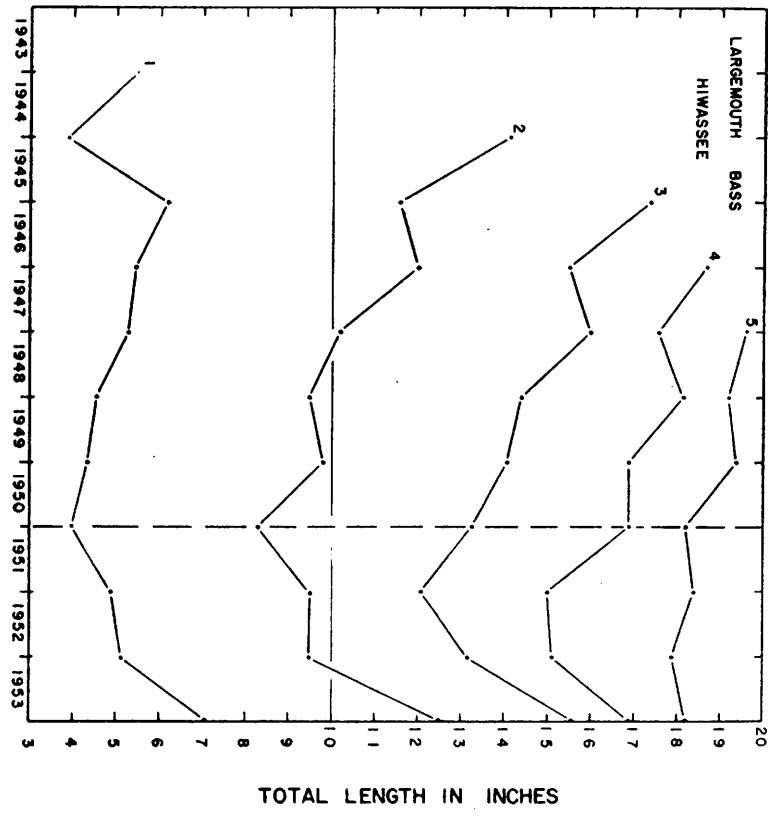

FIGURE 1. Eleven-year (1943-1953) growth history of 207 Lake Hiwassee largemouth bass showing growth curves by year-classes. Lines connect points representing lengths attained at end of year indicated by numeral at left.