Initial Effects of Impoundment on the Growth-Rate of Channel Catfish in Two Oklahoma Reservoirs[1]

ROBERT M. JENKINS and EDGAR M. LEONARD,
Oklahoma Fisheries Research Laboratory, Norman

Studies of the growth-rates of fishes taken from several large Oklahoma reservoirs have shown that the most rapid growth occurs during the first two or three years of impoundment. Buck and Cross (2) found that for all Canton Reservoir fishes studied, with the exception of the river carpsucker, the largest year-classes and the greatest annual growth occurred during the first year of impoundment. Latta (5) compared his post-impoundment study of the Wister Reservoir with Hall's pre-impoundment study (3), and demonstrated that the growth-rates of the buffaloes and catfishes exhibited a decided increase during the first year of impoundment. Sneed and Thompson (7) concluded that the growth of crappie and largemouth bass in Lake Texoma was greatest during the first two years of impoundment.

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This study presents evidence of rapid growth of the channel catfish, *Ictalurus punctatus* (Rafinesque), in two new eastern Oklahoma reservoirs. This species has exhibited alarmingly slow growth in most old reservoirs (over 8 years) in the state and fishing success has steadily declined in these waters. A more complete knowledge of the growth-rate and year-class abundance in the early stages of the development of such stunted populations is needed if sound management practices are to be effected.

Methods and Materials

Data for this investigation were collected during the summer of 1952 by the survey party of the Oklahoma Fisheries Research Laboratory, using Fish-Tox (a rotenone mixture), and gill nets (3/4- to 2 1/2-inch bar mesh). Spines were collected from 252 individuals taken in Grand River and Lake Wagoner, June 18 to July 10, and from 310 specimens taken in the Illinois River and Tenkiller Reservoir, July 10 to August 8, and on October 17.

The ages of the channel catfish were determined by counting rings representing annual marks or "annuli" which are visible in a cross-section of the dorsal, or pectoral, bony spine (6). Cross-sections were placed in water and measured with an ocular micrometer mounted in a binocular microscope. All growth calculations were based on total-lengths, assuming a direct proportion relationship, and a nomograph was employed in computation.

Growth-Rate Increase in Tenkiller Reservoir

The Illinois River is a clear, rocky stream which drains 1,000 square miles of mountainous, Ozark terrain in extreme eastern Oklahoma. Tenkiller Dam is located on the Illinois about 13 miles upstream from its confluence with the Arkansas River. When full, the reservoir will be about 34 miles long, with a surface area of 12,500 acres under normal operation.

A remarkably accelerated rate of growth was exhibited by channel catfish taken immediately above Tenkiller Dam. Completion of a part of the dam in 1950 created a lake in the old river channel and adjacent excavation (borrow pit) approximately 600 acres in extent. Catfish in this new impoundment grew an average of 1.2 inches more in length in 1951 than they did under river conditions in 1950 (Table I). On July 1, 1952, the outlet gates were closed and the water level rose rapidly. By the first of August impounded water extended upstream about 6 miles, and had covered many acres of the floor plain. Fish taken during this time had already completed as much growth as had been accomplished in the entire 1951 growing season. No such increase was observed in individuals caught below the dam (Table II).

Individuals of age-group I grew 2.8 inches in length during the period July 16 to October 17, 1952 (Table III). This represents an average empirical length increase per day of 0.03 inches, as compared to an average calculated length increase of 0.02 inches per day of the growing season under previous conditions in the Illinois River. Considering yearly growth as complete on October 17, age-group-I fish grew about 6.9 inches in length during 1952. Average calculated second-year growth in the Illinois River (1946-1950) was 4.1 inches. Growth of age-groups I, II, and III in the 92-day period following gate closure on July 1 is presented in Table IV. Appelget and Smith (1) found a tendency for younger channel catfish in the Mississippi River to grow more rapidly during the early part of the growing season and have the major portion (95 per cent) of their annual increment attained by mid-summer. In contrast, about 40 per cent of the annual growth in newly-impounded Tenkiller Reservoir was completed after the middle of July.

TABLE I

Comparison of the Average Calculated Total-lengths of Channel Catfish for Corresponding Years of Life at End of Calendar Year Stated Under Pre- and Post- impound nent Conditions in Tenkiller Reservoir and Lake Wagoner.

Body of water	Year	Number of fish	Total-length in inches at end of year of life						
			1	2	3	4	5	6	7
Illinois river	1945-50*	222	4.0	8.1	12.3	15.6	17.4	19.5	
Illinois river (below reservoir)	1951	124	4.5	7.6	11.0	15.9	17.0		21.6
Tenkiller Reservoir	1951	177	4.9	9.9	14.6	16.7	18.6	19.6	
Tenkiller reservoir	1952**	12		11.8	16.2	19.4			
Grand lake (6)	1948	188	2.4	5.2	8.0	10.4	11.7	15.4	16.9
Grand river	1949	66	3.3	6.1	8.4	11.8	13.7	16.2	
Grand river	1950	208	3.0	6.5	8.7	12.7		21.2	
Lake Wagoner	1951	232	3.2	6.8	11.9	15.6	17.7		25.3

* Grand average of six year-classes, 1945-1950.

** Assuming that 1952 growth was completed by October 17.

TABLE II

Comparison of the Average Length in Inches of Age-groups of Channel Catfish from Various Waters under Pre- and Post-impoundment Conditions.

Body of water	Date of collection	Number of fish	Age-group						
			I	II	III	IV	V	VI	VII
Illinois River (below reservoir)	July 1952	124	6.4	9.3	12.8	16.9	18.1		22.6
Tenkiller Reservoir	July 1952	177	9.6	13.7	17.1	18.4	19.7	21.1	
Tenkiller Reservoir	17 Oct. 1952	12	11.8	16.2	19.4				
Grand Lake (6)	August 1949	188	4.7	7.1	9.8	11.8	13.3	16.9	18.2
Grand River	June 1950	20			10.2	12.1	13.5	16.9	
Lake Wagoner	June 1952	232	5.3	7.2	13.5	17.2	18.6		25.3
Poteau River (3)	Summer 1949	163	4.9	7.7	10.3	13.8	16.5	17.8	21.8
Wister Reservoir (5)	Summer 1951	56	12.0	15.4	16.9	21.8	21.7	24.1	23.9
Lake Mc Alester*	October 1949	6	13.4	15.6	18.0				
Average growth in Oklahoma (4)	1948-52	4,054	6.8	10.0	12.7	14.9	16.4	17.7	19.9

* Drained in 1946; refilled in 1948.

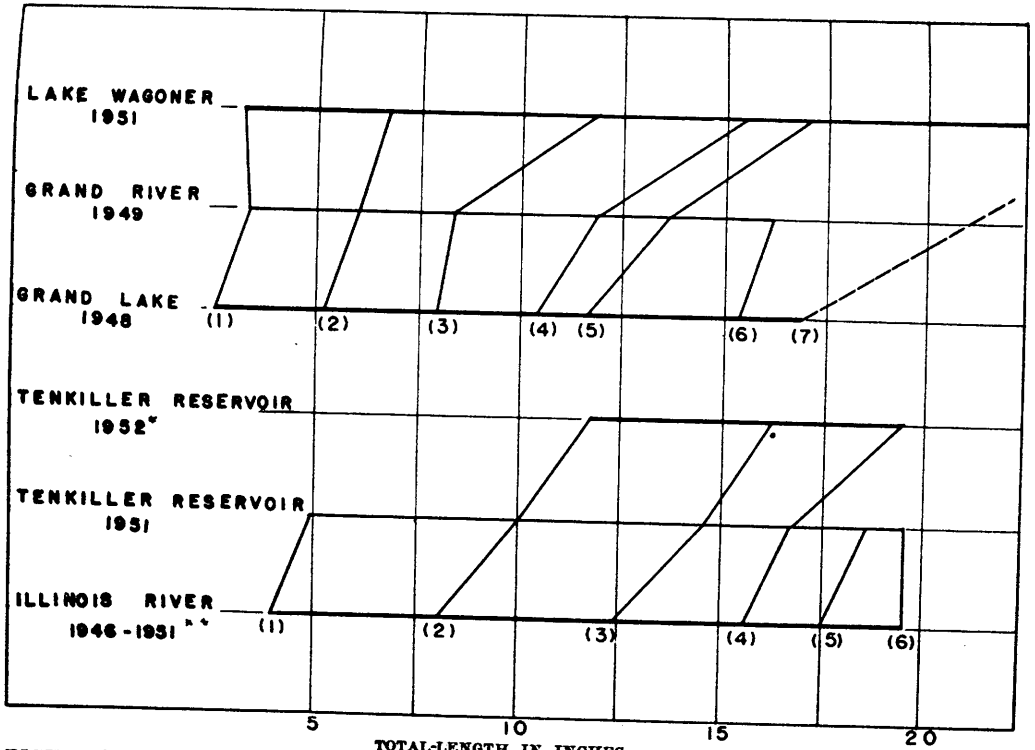

*FIGURE 1. Comparison of the Calculated Growth of Channel Catfish under Pre- and Post-impoundment Conditions in Tenkiller Reservoir and Lake Wagoner. Figures in parentheses indicate year of life. *Assuming year's growth completed on Oct. 17. **Grand average calculated lengths of year-classes 1946 through 1951.*

Growth-rate Increase in Lake Wagoner

Lake Wagoner (Fort Gibson Reservoir) which will be a 19,000 acre impoundment of the Grand River upon filling, is located in Wagoner County, 50 miles downstream from Grand Lake (Lake O' The Cherokees). It has been operated as a detention reservoir since 1950, and the reservoir level fluctuated sharply during flood stages of the Grand River in 1950 and 1951. The water level was held at 525 f.s.l. (30 feet below conservation pool level in 1952, until July 1, when it was raised 5 feet.

Growth rates have increased in Lake Wagoner since 1950. The most marked acceleration has occurred in the older age-groups (III-VII). The growth of age-groups I and II (year-classes 1951 and 1950, respectively) is similar to that observed in Grand River before partial impoundment and in Grand Lake in 1949 (Figure 1). This suggests that channel catfish reproduction was highly successful in 1950 and 1951, and population pressures were felt promptly in those two age-groups (I and II). In addition, thousands of small catfish are known to have passed over the spillways of Grand Lake Dam during the floods of 1950 and 1951, and it is possible that their presence in Lake Wagoner resulted in the observed slow growth rate. The older age-groups showed slight growth acceleration during 1950, and a large increase during 1951, exceeding that exhibited in Tenkiller Reservoir in the same year (Table I).

TABLE III

Growth in Length of Age-group-I Channel Catfish in Tenkiller Reservoir from July 16 to October 17, 1952.

Number of fish	Date of capture	Average total-length (inches)
16	July 16	9.0
8	July 18	9.4
5	July 22	9.2
4	July 23	9.7
17	July 25	9.5
11	July 30	10.2
27	August 7	9.9
—	—	—
9	October 17	11.8

TABLE IV

Increase in Length and Weight of Channel Catfish in Tenkiller Reservoir in the 92-day Period from July 1 to October 17, 1952.

Age-group	Increase in length July 1 to Oct. 17 (inches)	Increase in weight July 1 to Oct. 17 (ounces)
I	2.8	3.5
II	2.5	7.1
III	2.3	9.6

Discussion

Creation of new water areas provided more living space and, presumably, more readily available food for channel catfish in the new impoundments, and the rate of growth of this species increased immediately. Based on average lengths of age-groups (Table II), length increases of as much as five inches over the average yearly growth occurred in the change from

river to lake conditions. Growth is faster in Tenkiller Reservoir than in the Illinois River below the dam, and faster in Lake Wagoner than it was in Grand River or Grand Lake in 1949 (Figures 1 and 2). Forty per cent of the channel catfish in their second summer of life caught in Tenkiller on July 30 were 10 inches (legal length) or longer. Legal length is usually reached in the third summer of life in Oklahoma waters (4).

If the accelerated growth rates displayed in these two populations could be maintained, the big reservoirs might afford excellent catfish fishing for

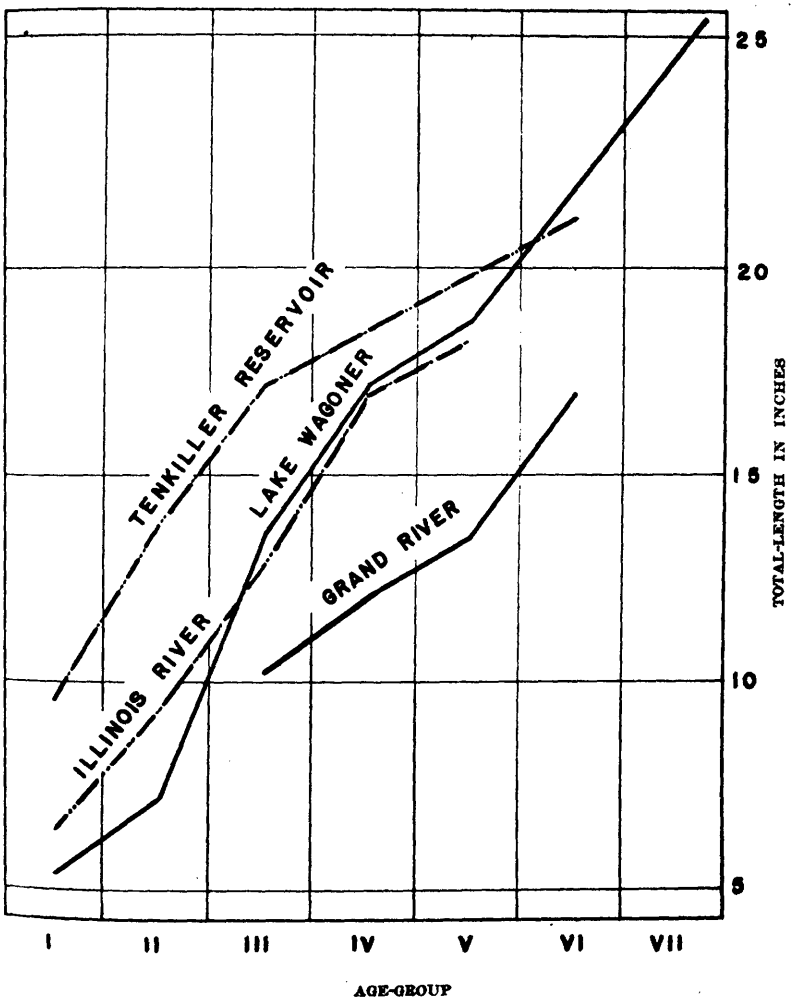

FIGURE 2. Comparison of the Growth of Channel Catfish under Pre- and Post-impoundment Conditions in Tenkiller Reservoir and Lake Wagoner. Illinois River below dam and Tenkiller Reservoir fish taken in July 1952; Grand River fish taken in June 1950. and Lake Wagoner fish taken in June 1952.

decades instead of the initial five or six years. Unfortunately, acceptable means of harvesting the enormous numbers of fishes which are produced in Oklahoma lakes, in a step towards avoiding overpopulation, have not yet been devised. Greater harvest of all species must be encouraged in order to provide good fishing.

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