Growth of the Basses of the Illinois River, Oklahoma[1]

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With the exception of taxonomic and pre-impoundment studies, very little has been done toward investigating the fishery resources afforded by streams in Oklahoma. While it is true that impoundments bear the brunt of angling pressure in Oklahoma, there are several streams in the eastern part of the state which attract many anglers. The popularity of the Illinois River and its major tributaries as bass waters warrants investigation and management consideration in the Game and Fish Department's overall program.

The material in this paper is concerned with the age and growth of the Neosho smallmouth bass, *Micropterus dolomieui velox* Hubbs and Bailey, the spotted bass, *M. punctalatus* (Rafinesque), and the largemouth bass, *M. salmoides* (Lacépède). The basses were collected during a survey of the Illinois River system from June 15 to August 15, 1952 by the Oklahoma Fisheries Research Laboratory.

Data on the physical and geographical features of the Illinois River drainage basin are to be found in Moore and Paden (6), and the Tulsa District Corps of Engineers' pamphlet "General Information, Tenkiller Ferry Dam and Reservoir," (14).

Methods

The collection of the three species of bass was accomplished by gill nets, seines, and Fish-Tox, a rotenone product of Standard Supply Distributors, Wenatchee, Washington. Pertinent data concerning individual fish were entered on standard Oklahoma Game and Fish Department scale envelopes for analysis in the laboratory.

Experimental nylon gill nets of five mesh sizes (25 feet each of 3/4-, 1-, 1 1/2-, 1 3/4-, and 2-inch bar measure), and linen gill nets of 2 1/2- and 3-inch bar measure, ranging in length from 125 to 175 feet, were used in that portion of the river impounded by Tenkiller Dam at the time the study was made. Seines of three mesh sizes were used: 3/4-inch seine, 1/4-inch minnow seines, and 4-foot seines of nylon screening such as those described by Moore (5). Bag seines and 20-foot 1/4-inch mesh minnow seines were not as satisfactory as were the 10-foot, 1/4-inch mesh seines, and the nylon seines.

Poisoning with Fish-Tox proved to be the most efficient means of collecting fish. A greater number of fish were collected with less expenditure of man-hours when using this drug than with any other method. Fish-Tox was not used in the river proper, since the rate of water exchange would have created a condition whereby fish would have been killed for a distance of several miles downstream. Seepage pools, cut-off lakes, and pools in the major tributaries that could be blocked off by gill nets to catch the drugged fish, constituted the types of habitats poisoned. These operations did not have a deleterious effect on fish populations in the river proper since the water exchange was not great and the drug dissipated before extensive harm was done. Areas poisoned were visited on the second day after the operation to pick up dead fish that had risen during the night.

All scale samples were taken from bass collected during the summer of 1952. Lengths are based on measurements of total-length in inches and

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weights are expressed in ounces. Age determinations were made by an examination of scales in a conventional scale projector at a magnification of 45X. A zero intercept was used for growth calculations made on a direct proportion basis, utilizing a nomograph.

Neosho Smallmouth Bass

Many glowing phrases have been written by outdoor writers about the streamlined "brownie," and its reputation as a valiant fighter is well-established among fishermen who float the swift-water streams of the Ozark mountains. According to Hubbs and Bailey (3) the form of the Neosho smallmouth is more elongate than that of the typical northern smallmouth, especially in the young, but becomes more robust with age. They define its range as the tributaries of the Arkansas River system in northeastern Oklahoma and western Arkansas and the headwaters of the same streams in Missouri (and presumably Kansas).

Scales were taken from 435 smallmouth bass collected from the Illinois River proper, Ballard Creek, Caney Creek, Snake Creek, and a Caney Creek cut-off pool. Growth rates exhibited in the various streams are quite similar (Table I). Such similarity is not surprising since these streams, though varying in size and volume of flow, are physically and geologically alike. Table II presents the average calculated total-lengths of age-groups of the Illinois River system smallmouth bass, all collections combined. The average length at the end of the first year of life was 3.4 inches. Averages for the three succeeding years were 6.8, 9.7, and 12.9 inches.

The majority of the fish reach legal length (10 inches) during their fourth summer of life. Approximately 10 per cent of the individuals in age-group II and 80 per cent in age-group III taken during the summer were of legal length. Increments of growth for successive years of life were approximately three inches.

A comparison of modes of length-frequency distribution with modes of distribution in each age-group shows considerable agreement (Figure 1). This agreement is especially pronounced in age-groups O and I. The length-range within each age-group is about five inches, and there is marked overlap between age-groups I, II, and III (Figure 1, Table II). This overlap, combined with the small numbers of fish represented in the older age-groups, tends to mask the coincidence of the modes.

The oldest individuals found in the Illinois River system were in their fifth year of life. Much older specimens are reported from northern waters: Smith and Moe (8) reported smallmouth bass 15 years of age, and Webster (15) stated that a few exceed the age of ten years in Cayuga Lake, New York. Stroud (10) found very few smallmouth six years or older in Norris Lake, Tennessee. He stated that most Norris Lake smallmouth must die of "old age." Tate (11) reported that smallmouth bass over four years of age were rarely taken from the small streams of Iowa. He attributed the absence of older fish to movement from the smaller to the larger streams. Such a migration may take place in the Illinois River system, but reports of anglers' catches do not substantiate such a conclusion. Apparently there is a high mortality rate in the fifth year of life. This fact, coupled with a selective take of only large individuals by "giggers," severely limits the number of smallmouth bass exceeding one pound which are available to rod and reel fishermen. Seining revealed a more than adequate number of young-of-year and yearling bass in all the streams sampled. Fly fishermen seldom fail to catch smallmouth bass during a day's float trip down the river, but only about 10 per cent are over 10 inches in length, and these rarely exceed 12 inches.

Comparison indicates that the growth of Illinois River smallmouth is somewhat superior to that in more northern states, (Iowa, Wisconsin, Ohio), but slower than that in the TVA reservoirs in Tennessee and North

Carolina (Table III). It is anticipated that growth will accelerate in the new impoundment of the Illinois River (Tenkiller Reservoir), and equal or surpass that exhibited in Hiwassee and Norris Reservoirs.

TABLE I

Comparison of Smallmouth Bass Growth in the Illinois River and Its Tributaries (1952)

Source	Number of fish	Average calculated total-lengths in inches at each annulus			
		1	2	3	4
Caney Creek	130	3.8	7.1	9.6	
Caney Creek cut-off pools	40	3.5	6.5	9.3	12.3
Ballard Creek	50	2.7	6.5	10.0	12.8
Illinois River	25	3.9	7.2	9.5	13.2
Snake Creek	59	3.0	6.8	10.3	13.1

TABLE II

Summary of Average Calculated Lengths of Illinois River System Smallmouth Bass in Each Age-group (Combined 1952 Collections).

Age-group	Number of fish	Average total-length in inches	Average weight in ounces	Length range	Average calculated total-length in inches at each annulus			
					1	2	3	4
0	126	2.1		1.0- 4.4				
I	185	6.4	2.0	3.9- 8.6	3.6			
II	88	8.7	4.6	6.6-10.5	3.3	6.9		
III	29	10.5	8.5	8.2-12.3	2.9	6.4	9.5	
IV	7	13.1	15.6	12.2-14.6	3.2	7.7	11.0	12.9
	Grand average				3.4	6.8	9.7	12.9

TABLE III

Comparison of the Growth of Smallmouth Bass in the Illinois River System and Other Waters.

Locality and	Average calculated total-length in inches at each annulus				
	1	2	3	4	5
Illinois River system (Present study, 1952)	3.4	6.8	9.7	12.9	
Iowa (11)	3.7	5.7	7.8	9.8	11.7
Norris Reservoir, Tennessee (10)	3.1	8.9	13.3	15.8	17.4
Wisconsin (1)	2.4	5.3	8.2	10.6	12.5
Hiwassee Lake, North Carolina (10)	3.6	9.1	12.5	14.0	15.4
Ohio (7)	4.0	6.0	7.5	8.8	10.0

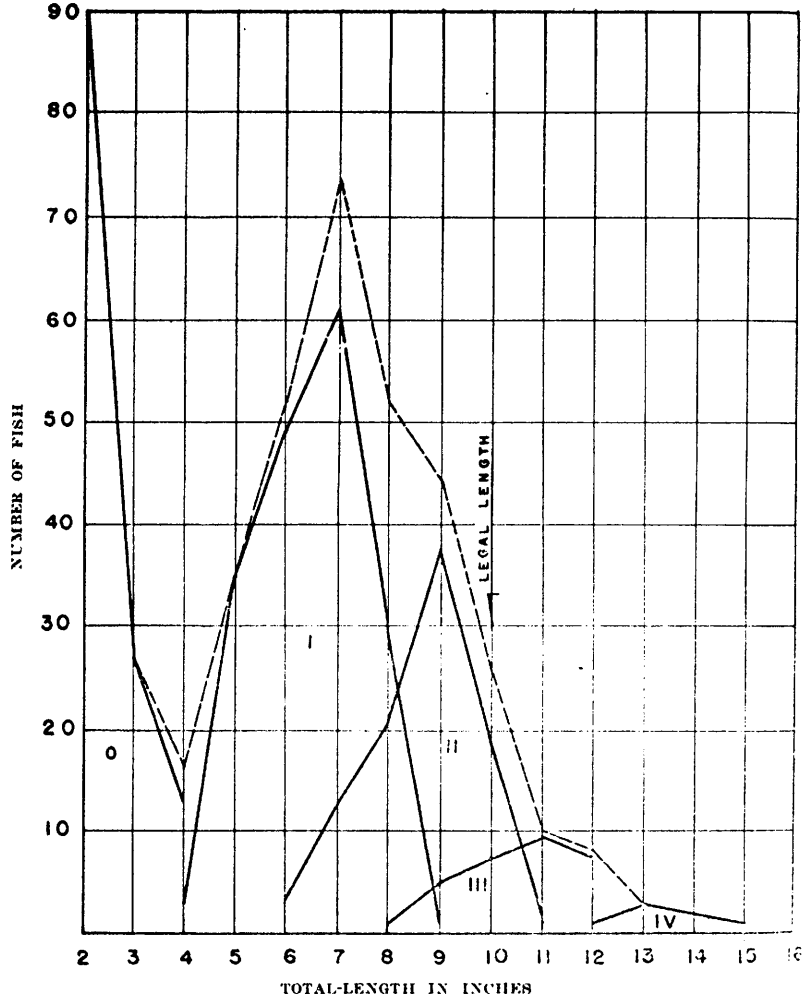

FIGURE 1. Length-frequency of Sample of Neosho Smallmouth Bass from the Illinois River System Compared with Length-Frequencies of Fish Assigned to Each Age-group. Roman Numerals Indicate Successive Age-groups. Fish were grouped in one-inch length intervals.

Spotted Bass

Growth calculations of the spotted bass were based on 173 scale samples. As with the smallmouth bass, locality seemed to have little effect on the growth of this species, but data from individual streams are too meager to give a reliable comparison. Averages of the calculated growth for the first five age-groups (Table IV) are as follows: 4.5, 7.6, 9.9, 12.1, and 13.6 inches. Relatively early mortality of spotted bass is apparent. However, rate of growth is not rapid enough to be a decimating factor as was found by

Stroud (10) in Norris Reservoir, Tennessee. Five spotted bass in their sixth summer of life were taken, suggesting that this species is somewhat longer-lived than the Neosho smallmouth bass. River fishermen catch more legal-sized spotted bass than smallmouth and this may be attributed to the proportionately greater longevity of the former and also the fact that a larger percentage reach legal length in their third summer.

There is considerable length overlap between age-groups (Figure 2, Table IV) resulting in slight agreement of length-frequency and distribution modes except in age-group I. This may be attributed to the small size of the sample, and growth occurring within age-groups during the six-week sampling period.

Comparative growth data (Table V) shows that the growth of Illinois River spotted bass is below that of the reservoirs cited, and above that found in the Poteau River, Oklahoma (2). Legal length is attained by the majority of the fish early in their third summer in the reservoirs listed, but not until very late in the third or early in the fourth summer in the Illinois River. About 15 percent of age-group II and 95 per cent of age-group-III fish taken in July exceeded legal length.

TABLE IV

Summary of Average Calculated Lengths of Illinois River System Spotted Bass in each Age-group (Combined 1952 Collections).

Age-group	Number of fish	Total-length (inches)	Length range	Average calculated total-lengths in inches at end of year of life				
				1	2	3	4	5
I	105	6.8	4.2- 8.8	4.6				
II	30	8.9	7.4-10.8	4.7	7.6			
III	26	11.0	9.2-12.2	4.4	7.5	9.7		
IV	7	12.4	11.4-13.2	4.3	8.2	10.5	11.8	
V	5	14.5	14.1-15.0	3.8	7.6	10.2	12.5	13.6
Grand average				4.5	7.6	9.9	12.1	13.6

TABLE V

Comparison of Growth of Spotted Bass in the Illinois River System and Other Waters.

Locality and authority	Average calculated total-length in inches at each annulus				
	1	2	3	4	5
Illinois River System (Present study, 1952)	4.5	7.6	9.9	12.1	13.6
Grand Lake, Oklahoma (13)	4.2	7.8	11.6		
Norris Reservoir, Tennessee (10)	4.5	10.2	13.1	15.2	15.8
Cherokee Reservoir, Tennessee (10)	3.7	8.6	11.2		
Douglas Reservoir, Tennessee (10)	2.6	7.8	11.2		
Lake Hiwassee, North Carolina (10)	3.1	8.1	9.9		
Poteau River* (2)	5.8	7.5	9.6	13.6	

*Average total-length of age-groups of spotted bass taken in August, 1949.

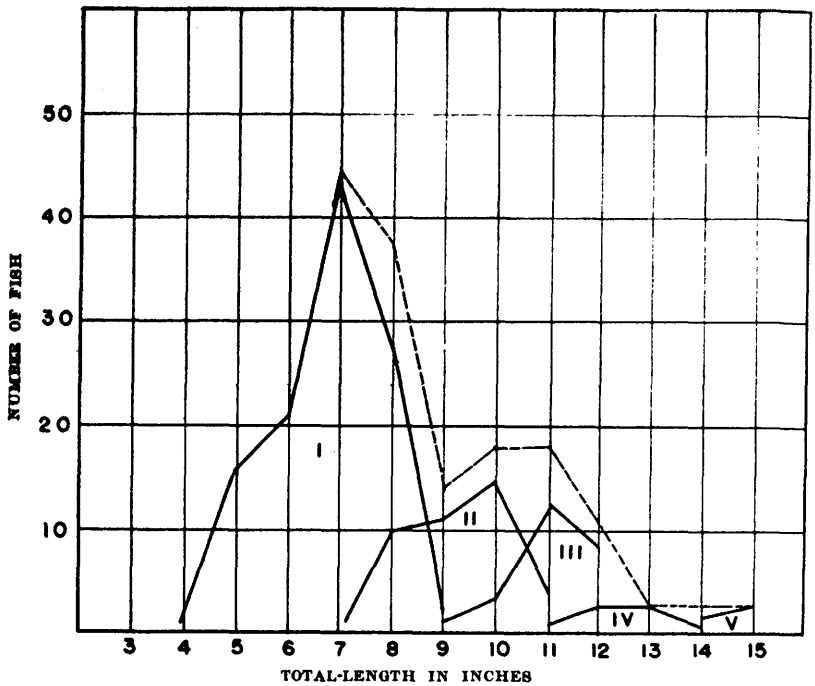

FIGURE 2. Length-Frequency of Sample of Spotted Bass from the Illinois River System Compared with Length-frequencies of Fish Assigned to Each Age-group. Roman numerals indicate age-groups. Fish were grouped in one-inch intervals.

Largemouth Bass

Largemouth bass are not as plentiful in the Illinois and its tributaries as the smallmouth and spotted basses, and were taken only in cut-off lakes and backwaters. Age and growth data for the largemouth are based on 60 specimens.

The average calculated total-length in inches of the largemouth bass from age-group I through age-group VI was as follows: 4.6, 7.8, 10.4, 13.1, 15.8, and 19.8 (Table VI). Largemouth bass of all age-groups attain a slightly greater length than do the smallmouth and spotted bass of corresponding age-groups, (Table VII). However, yearly gains in length are quite similar for all three species. The slightly accelerated growth-rate of this species does allow a few fish to enter the angler's creel in their third year of life, but it is not until the fourth year of life that they contribute substantially to the fisherman's take.

Comparison of the calculated growth of largemouth bass in various Oklahoma lakes with that exhibited in the Illinois River is presented in Table VIII. No data are available from streams in Oklahoma to compare with those of the present study. Growth of bass evidenced in both Lake Claremore (4) and Lake Shawnee (12) was comparable in the first four years of life to that in the Illinois.

The impounding of the river by Tenkiller Dam has begun to influence the rate of growth of basses inhabiting the area now inundated (unpublished data, Oklahoma Fisheries Research Laboratory). Growth for all three species of bass has been accelerated. The reservoir should prove to be a highly desirable habitat, especially for the largemouth and spotted basses.

TABLE VI

Summary of Average Calculated Lengths of Largemouth Bass from the Illinois River System (1952)

AGE-GROUP	NUMBER OF FISH	AVE. TOTAL-LENGTH AT CAPTURE	AVE. WEIGHT IN OUNCES	LENGTH RANGE	AVERAGE TOTAL-LENGTHS IN INCHES AT EACH ANNULUS					
					1	2	3	4	5	6
I	29	6.8	2.2	5.2- 8.6	4.8					
II	15	9.0	5.0	7.6-10.0	4.6	7.9				
III	9	10.9	9.7	9.5-12.4	3.8	7.2	9.5			
IV	4	12.9	16.9	11.8-13.9	4.0	8.0	10.6	12.0		
V	2	15.3	30.0	15.1-15.6	5.2	8.8	12.0	13.3	14.6	
VI	1	20.0	70.0		5.0	9.8	13.8	16.8	18.1	19.8
GRAND TOTAL AND WEIGHTED AVERAGE					4.6	7.8	10.4	13.0	15.8	19.8

TABLE VII

Comparison of Growth of the Basses in the Illinois River System (1952).

Species	Number of fish	Average calculated total-length in inches at each annulus					
		1	2	3	4	5	6
Smallmouth bass	309	3.4	6.8	9.7	12.9		
Spotted bass	173	4.5	7.6	9.9	12.1	13.6	
Largemouth bass	60	4.6	7.8	10.4	13.1	15.8	19.8

TABLE VIII

Comparison of Growth of Largemouth Bass in Various Waters in Oklahoma.

Locality and authority	Number of fish	Average calculated total-length in inches at each annulus							
		1	2	3	4	5	6	7	8
Illinois River system (Present study, 1952)	60	4.6	7.8	10.4	13.1	15.8	19.8		
Lake Texoma (9)	182	8.7	12.4	15.3	18.1				
Grand Lake (13)	174		9.9	13.8	15.4	17.9	19.6		
Lake Claremore (4)	73	3.7	7.8	10.4	13.2	14.9	18.6	20.7	
Lake Shawnee (12)	64	5.0	8.0	11.1	12.4	14.0	15.0	16.0	16.7

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