

Comparison of Growth-Rates of Fishes in Stringtown Sub-prison Lake Prior to, and Three Years After Draining and Restocking¹

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A survey of Sub-Prison Lake on August 22, 1950, by members of the fisheries division of the Oklahoma Game and Fish Department, revealed an overpopulation of stunted fishes. In December, 1950, the lake was partially drained and the remaining 10 acres of water were treated with rotenone to remove the entire fish population. Restocking was not accomplished until December 11, 1951, when the Durant state fish hatchery planted one-year-old fish of the following species and numbers:

Number	Average length	Species
6,000	5.0 inches	Largemouth bass
4,000	4.0 inches	Channel catfish
3,000	3.0 inches	Black crappie
4,000	2.0 inches	Redear sunfish

With the exception of a small hook and line sample of fishes on March 12, 1953, further data were not collected until the summer of 1954, when a program of seining, trapping, and rotenoning from June 28 to July 15 was conducted by the summer survey party of the Oklahoma Fisheries Research Laboratory. A comparison of the growth-rates of fishes from the 1950 and the 1954 collections is presented in this paper.

DESCRIPTION OF THE LAKE

Sub-Prison Lake is a 60 surface acre body of water located on the Stringtown state game refuge in Section 27, Township 1N, Range 12E near the town of Stringtown, Atoka County. The lake was formed by the impoundment of a small intermittent tributary of North Boggy Creek and has a drainage area of approximately 1,500 acres. The watershed supports vegetation of the tallgrass prairie, post oak-blackjack forest, and oak-pine forest types. The lake averages about 15 feet in depth with a maximum of 32 feet, and is slightly turbid to turbid, with an abundance of buttonbush, willow and smart weed around the shoreline and no submerged aquatic vegetation. Thermo-stratification is well established during the summer months. Data compiled during the 1954 survey showed an average surface temperature of 89.8° F and an average bottom temperature of 66.1° F. at 32 feet with a thermocline occurring between 8 and 20 feet. Dissolved oxygen in the surface waters ranged from 6.6 to 7.6 p.p.m., and pH averaged 7.7. The dam is earthen, with rock rip-rap and a concrete spillway.

MATERIALS AND METHODS

The age and growth-rates of all species of fish from the 1950 collection were calculated by standard methods of scale and spine analysis. A direct proportion between body length and scale and spine radius was assumed and a nomograph was employed in computations. Growth averages represent the weighted average for each species and all lengths are expressed as total length in inches.

From the 1954 collections, only those fishes obtained by means of rotenone on July 14 were used in computing post-drainage growth. Length-

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frequency histograms of the six major species, based on the total number of fishes collected by all methods, are given in Figures 1 and 2. Average calculated growth of species occurring in both pre- and post-drainage samples are compared in Table 1. Those species occurring in only one collection are listed in Table 2, along with their growth histories.

AGE AND GROWTH OF THE MAJOR SPECIES

Largemouth bass

Bass growth in the 1950 pre-drainage sample averaged 4.9 inches at the end of the first year and 7.6, 11.1, 13.8, and 15.9 inches in succeeding years. Omitting the first year average which represents hatchery growth, bass from the 1954 collection averaged 11.1 and 14.0 inches at the end of their second and third years (Table 1), which is a significant increase over pre-drainage conditions, but below the state average for new small lakes (4). The absence of two year old fish indicates that bass stocked by the hatchery in December, 1951, were too small to reproduce the following spring. Spawning was successful in the spring of 1953, and yearling bass in the July, 1954 sample ranged from 4.0 to 11.7 inches in length (Figure 1).

Channel catfish

Although channel catfish had become overpopulated to such an extent that their rate of growth was one of the slowest in the state in 1950 (3), the 1954 specimens indicate that no reproduction has occurred since they were restocked. All channel catfish in the latter sample were three years old and ranged in length from 11.2 to 23.7 inches. Their growth showed an increase over pre-draining rates, averaging 12.7 inches (Table 1) at the end of the third year, which exceeds the state average (3).

White and black crappie

White crappie, which were inadvertently stocked, were present in greater numbers in the 1954 sample than black crappie and showed an increased rate of growth over the pre-draining sample (Table 1). Growth of both species exceeded the state average (2) in the 1954 sample. Black crappie apparently spawned in the spring of 1952, but that year class is absent from the white crappie population. No black crappie were present in the pre-drainage sample for comparison, but those collected three years later averaged 3.3, 8.0, and 10.1 inches, respectively, at the end of the first three years of life (Table 2).

Redear sunfish

Redear sunfish also showed an increased rate of growth in the post-drainage sample (Table 1), and the 1952 year-class was not represented.

Green sunfish and bluegill

Although neither of these species was supposedly stocked after the lake refilled, specimens of both were present in the 1954 collection and showed an increased rate of growth (Table 1). Spawning success is indicated for both species in 1952, suggesting that a few individuals survived the rotenone treatment or entered the lake from ponds on the watershed.

Golden shiner

Although not stocked, large populations of this prolific minnow were present before and after draining. Four year old specimens were taken in the 1950 collection, but only a few two year old individuals were observed in 1954. Apparently, the small number which survived the rotenoning or entered from upstream ponds was sufficient to repopulate the lake within two years. The majority of golden shiners collected in 1954 were yearlings and showed a significant increase in their rate of growth (Table 1) over pre-drainage conditions.

Miscellaneous species

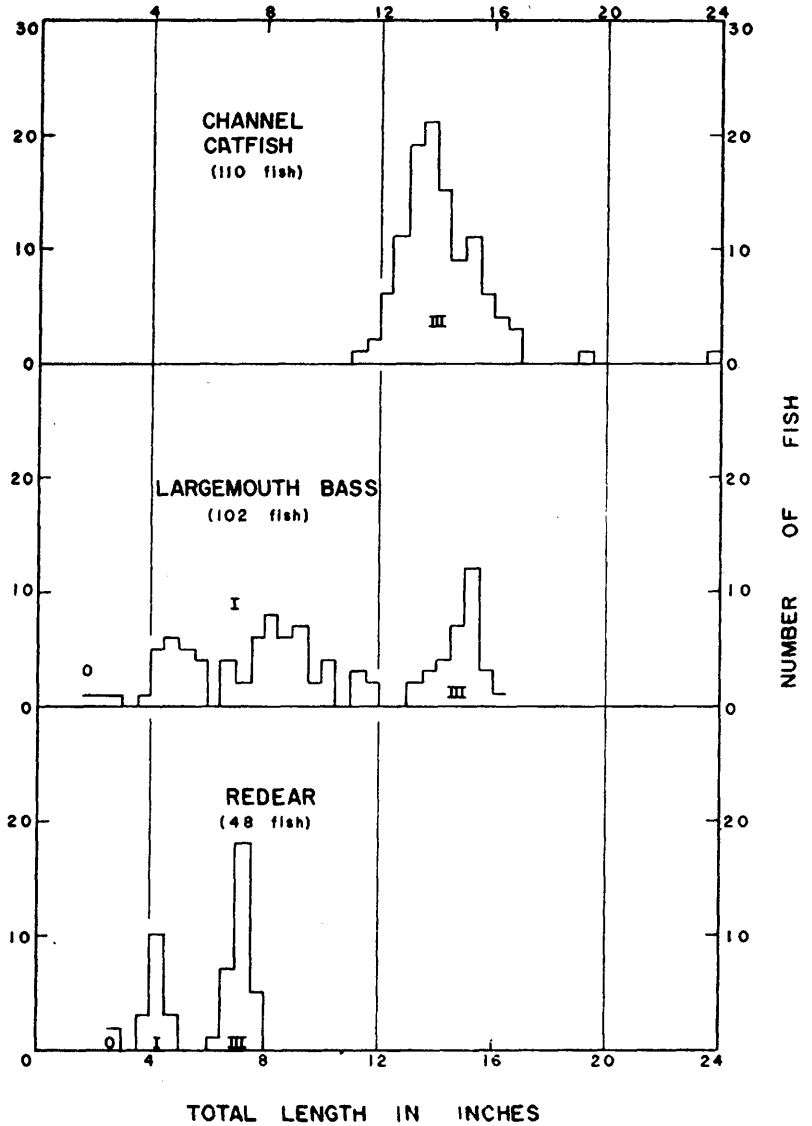


FIGURE 1. Length-frequency histograms of channel catfish, largemouth bass, and re-dear collected in Stringtown Sub-Prison Lake by means of seines, traps, and rotenone from June 29 to July 15, 1954. Fish grouped in 0.5 inch length intervals. Age-groups indicated by Roman numerals.

Warmouth and pirateperch (*Aphredoderus sayanus*) were present in Sub-Prison Lake before it was drained and rotenoned, but were evidently annihilated or did not escape in sufficient numbers to re-establish their populations. Age and growth data concerning the latter species from Sub-Prison Lake were published by Hall and Jenkins (1) (Table 2). Longear sunfish, orangespotted sunfish, spotted sucker, and black bullhead specimens were not present in the 1950 collection (Table 2). However, their appearance in the post-drainage sample suggests that they were probably present, but were not collected at that time. The two sunfishes were represented by only the 1953 year class, and the single spotted sucker was two years old. The presence of black bullheads of the 1950 and 1951 year classes suggests rotenone survival, but the absence of any succeeding year class indicates failure of subsequent spawning success for this species.

DISCUSSION

Population removal and restocking after the lake filled converted the Sub-Prison Lake fish population from an overpopulated, stunted condition to one of accelerated growth commonly associated with new impoundments. Although only four species were replanted, the presence of eleven well-established species three years later demonstrates the fecundity of the few individuals which either survived or entered the lake from some unknown source.

Of the stocked fish—one year old at the time of planting—only one species, black crappie, showed evidence of spawning in the following spring of 1952, while largemouth bass, and redear sunfish were successful in 1953. Channel catfish have not spawned since their introduction, as all specimens collected in the 1954 survey were three years old.

Fishing success, unfortunately, has not increased in proportion to the improvement of fish growth in Sub-Prison Lake. High turbidity has curtailed angling efforts of all types, and must be remedied. Unless a greater harvest is realized, reduced growth and a return to the stunted, overpopulated condition of 1950 seems inevitable within the next two or three years.

LITERATURE CITED

1. HALL, GORDON E. and ROBERT M. JENKINS. 1954. Notes on the age and growth of the pirateperch, *Aphredoderus sayanus*, in Oklahoma. *Copeia* 1:69.
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TABLE I

Comparison of the average growth rates of various species of fish in Sub-prison Lake, collected before complete population removal and three years after restocking. Numbers in parentheses denote fish used in determining age and growth.

Year of life	Average calculated total length in inches at end of year of life																			
	Largemouth bass				Channel catfish				White crappie				Redear sunfish		Green sunfish		Bluegill		Golden shiner	
	before (9)	after (87)	before (62)	after (83)	before (10)	after (49)	before (23)	after (19)	before (7)	after (32)	before (41)	after (67)	before (22)	after (92)						
1	4.9	4.6*	2.3	3.3*	2.4	2.2	1.9	1.9*	2.4	3.5	2.3	3.8	3.9	3.7						
2	7.6	11.1	4.7	7.4	4.3	8.0	3.5	5.0	4.4	6.6	4.7	6.7	5.7	6.4						
3	11.1	14.0	6.8	12.7	6.4	9.7	4.7	6.9	6.0	8.9	6.1		6.6							
4	13.8		8.5			12.6	6.1		7.3				7.1							
5	15.9		9.7						8.4											
6			11.3						9.0											
7			14.2																	
8			16.7																	

* Hatchery growth

TABLE II

Age and Growth of fishes in Sub-Prison Lake which were available from only one of the two collections: 1950 collection before draining#, and 1954 collection after restocking*.

Species	No. of Fish	Calculated total length at end of year of life				
		1	2	3	4	5
Black crappie*	41	3.3	8.0	10.1		
Warmouth#	2	2.0	4.2	6.1	7.2	8.1
Longear sunfish*	8	2.8				
Orangespotted sunfish*	42	2.4				
Spotted sucker*	1	5.7	11.6			
Black bullhead*	7	5.0	9.4	12.0	14.2	
Pirateperch#	82	2.2	3.3	4.0	4.6	

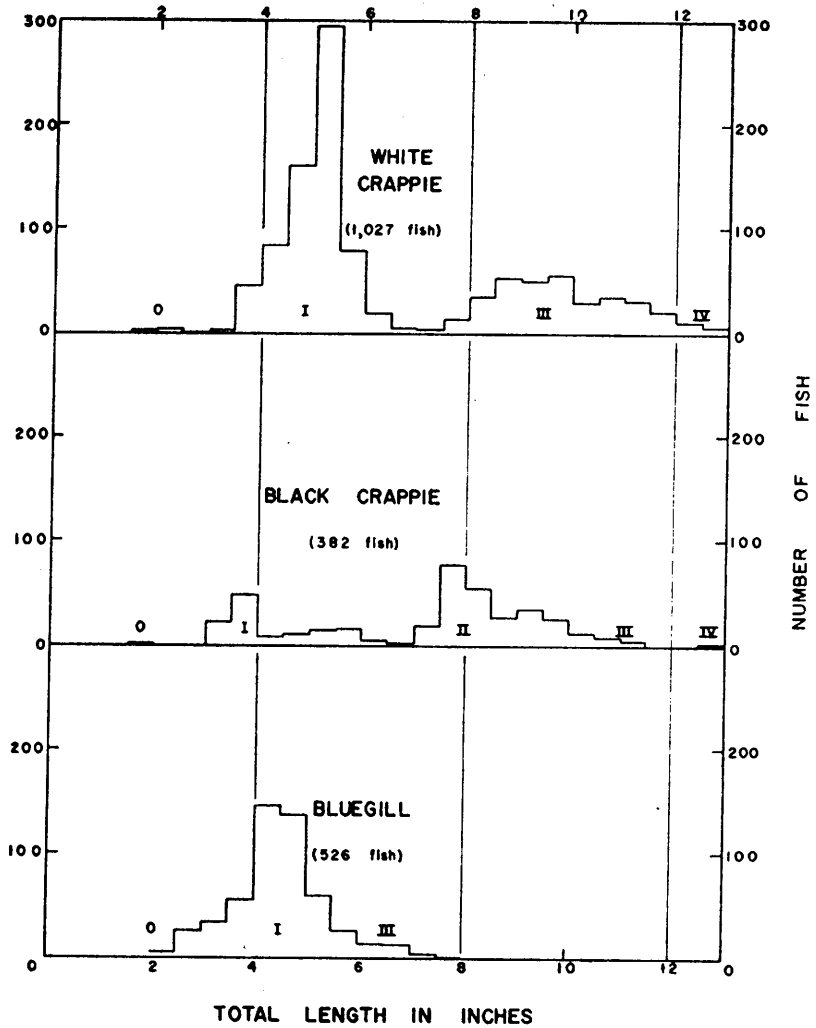


FIGURE 2. Length-frequency histograms of white crappie, black crappie, and bluegill collected in Stringtown Sub-Prison Lake by means of seines, traps, and rotenone from June 29 to July 15, 1954. Fish grouped in 0.5 inch length intervals. Age-groups indicated by Roman numerals.