The Rate of Growth of Flathead Catfish in Twenty-one Oklahoma Lakes[1]

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The flathead catfish, *Pilodictis olivaris*, is one of the most valuable commercial species in Oklahoma, and is held in high regard by fishermen for its fighting ability, edibility, and potential awe-inspiring size. Little is known about the rate of growth and abundance of flathead catfish (also known as yellow cat, Appaluchia cat, and shovelhead cat) in Oklahoma waters.

Workers at the Oklahoma Fisheries Research Laboratory have undertaken the compilation of growth-rates for several fishes of the state in order to consolidate all available data, and to provide the Oklahoma fishery worker with standards for use in comparing growth in various lakes. Calculated growth of this species has been previously reported from Grand Lake (2, 5), Fort Gibson Reservoir (4), and the Illinois River in the Tenkiller Reservoir area (3). This paper establishes a preliminary average calculated growth-rate for the state based on data from these papers and recent collections from 15 additional Oklahoma lakes of various sizes.

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Materials and Methods

The grand average rate of growth of Oklahoma flathead catfish was determined from 723 individuals representing 18 lakes. Names of the various lakes, their location, size in surface acres, and average depth, and the dates of collection are listed in Table I. Rotenone treatment of 31

TABLE I

Dates of Collection, Location and Size of the Lakes Represented in the Flathead Catfish Growth Calculations. (6).

Body of water	County	Area (acres)	Capacity acre feet	Average depth in feet	Date of collection
Boomer Lake	Payne	260	2,486	10	5/30/53
Cotteral	Logan	11	—	—	8/24/50
Walters	Cotton	156	2,620	17	8/25/53
Pawhuska	Osage	95	2,850	30	6/15/53
Duncan	Stephens	400	7,200	18	8/25/53
Texoma	Bryan	69,000	2,200,000	32	4/49—4/53
Newkirk	Kay	44	264	6	8/6/51
Poteau River	LeFlore	(Wister	Reservoir)		1949
Clinton	Washita	335	4,603	14	5/29/49
Ardmore	Carter	115	770	7	6/12/52
Ft. Gibson	Wagoner	19,000	36,500	19	1951—53
Murray	Love	5,728	153,250	27	4/53
Altus	Jackson	140	1,760	13	9/9/53
Greenleaf	Muskogee	920	14,720	16	7/20/50—5/19/52
Guthrie	Logan	274	3,875	14	7/31/53
Pawnee	Pawnee	257	3,855	15	7/29/53
Heyburn	Creek	1,070	10,200	10	6/53
Lawtonka	Comanche	1,868	42,000	22	9/3/53
Illinois River	Sequoyah	(Tenkiller	Reservoir)		1952—53
Grand Lake (Main body)	Mays	46,300	1,650,000	36	1949—1953
Neosho R. Arm (Grand Lake)	Ottawa	—	—	—	1949
Qualls Cutoff	Cherokee	2	—	—	1951

Oklahoma lakes, in connection with the municipal lake improvement program carried on during the summer of 1953, furnished samples from eight lakes (Duncan, Boomer, Walters, Ardmore City, Lawtonka, Pawhuska, Altus City, and Guthrie). Spine samples from seven lakes (Newkirk, Greenleaf, Clinton, Pawnee, Cotteral, Wister, and Murray) which had been collected in previous field surveys were on file at the Fisheries Research Laboratory. Additional spines were made available from Lake Texoma by Mr. Al Houser, and from Heyburn Lake by Mr. Orty Orr. Collecting methods included rotenone, gill-nets, hoop nets, and seines. The greatest number (72 per cent) were taken by rotenone in population sampling of the larger lakes and in partial or total fish eradication operations. Three lakes (Cotteral, Altus, and Guthrie) were represented by only one fish, and were not included in the grand average.

Methods of sectioning and measuring the spines were similar to those described by Sneed (7) and Jenkins (2). All lengths are based on measurements in inches and tenths, and weights are expressed in pounds and hundredths.

In calculating growth, a direct proportion between body length and spine radius was assumed, and a nomograph employed in computations.

TABLE II

Growth of the Flathead Catfish in 21 Oklahoma Lakes.

Body of water	Number of fish	Average calculated total-length in inches at end of each year of life													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
Grand Lake (Main body) (5)	221	3.4	6.3	9.5	12.7	15.1	17.3	19.1	20.4						
Newkirk City Lake	9	4.1	6.3	10.2	14.6	15.4	18.1	21.5	22.8	24.3					
Qualls Cut-off Lake (4)	23	2.8	7.0	10.9	13.8	16.0	20.8	22.5							
Greenleaf Lake	6	4.0	6.5	10.4	14.1	20.2									
Illinois River (4)*	46	4.0	8.2	13.1	17.1	20.0	21.0								
Clinton Lake	5	3.4	8.4	14.3	18.3	21.0	21.7	23.8	25.3						
Fort Gibson Reservoir	43	4.0	9.4	15.8	18.8	23.5	24.7								
Pawnee Lake	4	3.8	7.1	12.7	19.5										
Neosho River Arm (Grand Lake) (2)	86	5.5	10.2	15.0	19.3	23.0	25.8	28.3	30.9	34.6	37.2	39.9	42.3		
Poteau River (6)**	14	4.8	9.5	15.2	20.3	24.1	26.6	33.0	43.4						
Duncan Lake	58	2.5	6.8	11.9	21.2	25.4	29.2	34.5	37.0	39.5	43.5				
Walters Lake	69	3.5	8.2	14.3	22.1	26.7	29.6	32.2	33.7	35.5	37.2	38.9	39.9	42.7	43.5
Lake Texoma	27	6.2	10.8	17.2	22.4	26.9	29.9	33.3	36.1	38.2	36.4				
Pawhuska Lake	4	7.3	16.5	27.2	29.2	30.6	32.2	33.2	34.2	35.0	35.8	36.6			
Boomer Lake	75	—	11.3	18.1	25.1	29.2	32.5	34.8	36.5	38.1	39.5	40.6	42.2	42.9	43.0†
Ardmore City Lake	12	6.6	10.5	17.9	25.3	31.0	33.2	35.0	36.4						
Lake Lawtonka	4	5.2	13.7												
Lake Murray	2	5.5	15.4	18.5	25.8	26.8									
Heyburn Reservoir	15	6.4	12.5	22.2											
Grand average length	723	4.6	9.7	15.2	20.0	23.4	25.9	28.9	32.4	35.1	38.3	39.0	41.5	42.8	43.3
Average annual increment		4.6	5.1	5.5	4.8	3.4	2.5	3.0	3.5	2.5	3.2	0.7	2.5	1.3	0.5
Cotteral Lake (Guthrie)	1	—	9.8	11.4	13.8	17.8	20.4	23.0	25.8	27.6	29.6	31.8	33.4	34.6	36.4‡
Altus City Lake	1	4.0	8.6	16.0	27.0	32.4									
Guthrie City Lake	1	11.0	21.8	30.8	32.8	34.6	35.8								
Upper Mississippi River (8)§	236	8.0	13.0	16.3	17.9	21.5	23.4	27.5	34.0	35.5	37.5				

* in Tenkiller Reservoir area
** in Wister Reservoir area
† Boomer Lake, cont'd: 15-43.4; 16-42.3; 17-42.2; 18-42.7; 19-42.0
‡ Cotteral Lake, cont'd: 15-37.4
§ Age-groups; not calculated growth.

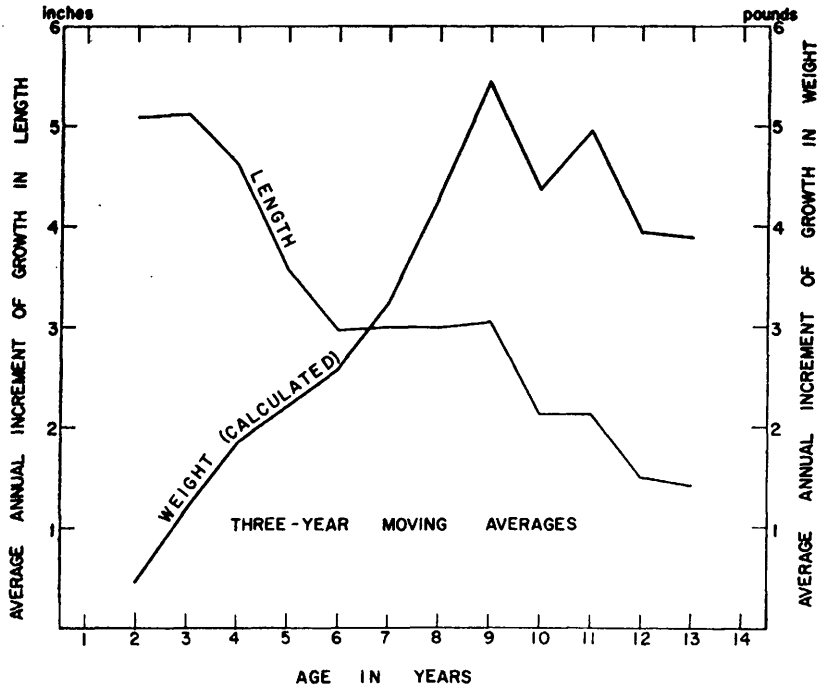

FIGURE 1. Average Annual Increment of Growth in Length and Weight, of flathead catfish in 18 Oklahoma Lakes, Based on Three-year Moving Averages.

Average Growth in Eighteen Lakes

The average calculated length of Oklahoma flathead catfish in 18 lakes at the end of each year of life, and the number of fish used in each computation appear in Table II. The collections are listed in the approximate order of increased rate of growth. In the computation of average lengths in individual waters, fish were grouped into year-classes and a weighted average was obtained. The simple average of the weighted means for each lake was computed to establish the average length at the end of each year of life for the entire sample. On the basis of this sample, flathead catfish average about 4.6 inches at the end of the first year of life, and during the succeeding 13 years attain average lengths of 9.7, 15.2, 20.0, 23.4, 25.9, 28.9, 32.4 35.1, 38.3, 39.0, 41.5, 42.8, and 43.3 inches. Corresponding average weights at these lengths (calculated from length-weight formula in later section are approximately 0.03, 0.31, 1.34, 3.28, 5.47, 7.61, 10.88, 15.77, 20.48, 27.20, 28.87, 35.32, 39.05, and 40.57 pounds, respectively.

The average annual increment of growth in length is approximately five inches for the first four years of life, three inches during the following six years, and decreases to about one inch per year by the fourteenth year (Table II, Figure 1). The average annual increment of growth in weight accelerates sharply to about five pounds per year by the ninth year of life (Figure 1). On the basis of three-year moving averages the rate of weight increase declines slightly after the tenth year of life. However, this phenomenon is not typical of large reservoir populations (2) and is more probably a reflection of the fact that the older fish in Walters and Boomer lakes (see Table II) were slower-growing individuals.

TABLE III

Average Lengths of Age-Groups of Flathead Catfish from Boomer Lake, Oklahoma, Collected June 1953.

AGE-GROUP	NUMBER OF FISH	AVERAGE TOTAL-LENGTH (INCHES)	LENGTH RANGE (INCHES)
III	4	18.4	16.9—20.0
IV	3	22.9	21.7—23.5
V	17	27.45	25.6—28.7
VI	4	32.2	30.5—34.3
VII	4	35.2	31.6—38.5
VIII	—		
IX	2	40.5	39.8—41.1
X	3	38.0	33.5—39.0
XI	6	39.5	36.0—46.0
XII	4	45.7	43.0—48.0
XIII	9	44.2	41.2—54.5
XIV	6	44.6	43.1—46.7
XV	5	46.3	41.2—55.5
XVI	4	43.7	37.2—50.5
XVII	1	43.1	—
XVIII	2	43.2	42.0—44.5
XIX	1	24.0	—

A 42.0-inch, 19-year-old flathead catfish taken from Boomer Lake was the oldest individual in the entire sample, and is the oldest individual of any Oklahoma species on record at the Fisheries Research Laboratory.

A pronounced degree of overlap of length ranges between age-groups is displayed in all of the larger collections. The most extreme example was found in the Boomer Lake collection where an overlap in length-range existed from age-group XI through XIX (Table III). This striking degree of individuality in rate of growth strongly suggests that growth compensation is of little or no consequence in flathead catfish populations.

Comparison of the average calculated growth in Oklahoma with that of age-groups in the upper Mississippi River (Table II) shows that growth in Oklahoma lakes is similar or slightly faster after the first two years of life than is growth in the upper Mississippi.

LENGTH-WEIGHT RELATIONSHIP

Individuals from all of the collections which had been accurately weighed (to nearest one-half ounce) were grouped in two-inch length intervals for computation of the length-weight relationship. The calculated length-weight formula derived (log W= −4.9739 + 3.2551 log L) fits the empircial data well (Table IV). Disagreements encountered in the larger fish are probably due to the influence of individual variation in the small number of specimens represented in size groups above 39 inches. The largest flathead catfish represented in the entire sample was 55.5 inches long and weighed 95 pounds. This 15-year-old individual, taken from Boomer Lake, has a calculated weight of 91 pounds.

DISCUSSION

Clear-cut differences in rate of growth under various environmental conditions were not evident in this sample. However, some general trends were noted which were similar to those described by Hall and Jenkins (1) in a study of channel catfish growth in Oklahoma waters. Growth was fastest in new lakes and in smaller lakes where successful reproduction was not in evidence. Relative size of the body of water or degree of turbidity apparently had little effect upon the rate of growth. The existence of flathead catfish in western Oklahoma lakes is rare, and the occurrence of this species in lakes other than main-stream reservoirs in the central and eastern sections of the state is uncommon. It is estimated that about one-third of the total number of lakes in which they occur are represented in Table II.

TABLE IV

The Length-Weight Relationship of Flathead Catfish in Oklahoma Waters.

SIZE INTERVAL (INCHES)	NO. OF FISH	AVERAGE TOTAL-LENGTH (INCHES)	AVERAGE WEIGHT (POUNDS)	CALCULATED WEIGHT (POUNDS)
3.0— 4.9*	12	4.2	0.03	0.02
5.0— 6.9*	20	5.9	0.08	0.06
7.0— 8.9	37	7.9	0.18	0.16
9.0—10.9	33	10.0	0.36	0.34
11.0—12.9	27	11.9	0.59	0.60
13.0—14.9	36	13.8	0.91	0.98
15.0—16.9	20	15.8	1.37	1.51
17.0—18.9	26	17.9	2.15	2.29
19.0—20.9	17	19.9	3.14	3.23
21.0—22.9	12	22.0	4.25	4.47
23.0—24.9	22	23.8	5.93	5.82
25.0—26.9	26	26.1	7.80	7.77
27.0—28.9	32	27.8	10.16	9.58
29.0—30.9	19	29.9	12.21	12.12
31.0—32.9	14	31.9	15.57	15.05
33.0—34.9	13	33.6	18.26	17.76
35.0—36.9	14	36.1	23.50	22.44
37.0—38.9	14	37.6	25.94	25.60
39.0—40.9	8	39.6	30.07	30.46
41.0—42.9	7	41.7	35.24	35.87
43.0—44.9	11	43.6	40.35	41.43
45.0—46.9	1	45.7	50.00	48.35
	421**			

*Individuals under 7.0 inches were not used in establishing calculated length-weight relationship.

**Total number used in calculated length-weight relationship—389.

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