
THE AGE AND GROWTH OF WHITE CRAPPIE, *POMOXIS ANNULARIS* (RAFINESQUE) FROM FOUR SMALL OKLAHOMA LAKES

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The data presented in this paper were collected by a lake inventory party sponsored by the Oklahoma Game and Fish Department during the summer of 1948. It is hoped that the presentation of this data will initiate a series of more detailed research projects in Oklahoma relative to this valuable sports species.

The white crappie is usually one of the most abundant species in lakes of Oklahoma. In new artificial lakes a period of unusually good crappie angling

¹Oklahoma Game and Fish Department and the University of Oklahoma Biological Survey.

has been observed three or four years after impoundment. This is followed by an indefinite period during which crappie of large sizes tend to disappear from the creel except for a week or so during the early spring. Smaller crappie may continue to be taken, but since the majority are barely legal size, crappie fishing is then considered poor or at best only fair. The four lakes examined are all in this later stage of development.

Black crappie occur in Oklahoma waters in definitely the minority. They are seldom seen in waters of western Oklahoma except as a result of artificial planting. More black crappie are found in the clear, cooler streams and lakes of eastern Oklahoma, but even there the white crappie usually dominates. In general, the white crappie seem to be better adapted to Oklahoma waters than the other species.

LAKE CLINTON. Lake Clinton is an artificial lake impounding 4,603 acre feet of water and covering an area of 235 surface acres. A dam 3,960 feet long was completed in 1930 across Little Elk Creek approximately three miles east of Canute, Oklahoma in Sec. 16, Twp. 11 N., Range 4 W. (Washita County). The water shed consists of 16,250 acres of which approximately one-half is under cultivation. Although the maximum depth of the lake was originally 50 feet, substantial areas are now silted in and much shallow water exists. The soil of the area is of a Permian Red Bed type and consequently it is erosive even when not in cultivation. According to authentic sources, the lake remained clear during its early life and supported a quantity of aquatic plants in the shallow areas. In later years the winds have been very effective in keeping the finely divided silt in suspension. The resulting turbid waters plus an approximate water level fluctuation of 6 feet have no doubt been the most important factors in reducing the aquatic vegetation to a minimum.

The lake was opened to fishing in 1933. During the first three years angling for large-mouthed bass, crappie and channel catfish was exceptionally good. After 1936 anglers were less successful. Many small, emaciated crappie became noticeable in a few years after 1933. Bullheads were present in the creel in fair numbers during the first few years but decreased as the lake aged. By 1944 this species appeared to be extinct. The flathead catfish assumed an important place in the creel after 1944. White crappie, carpsuckers, (*Carpoides*'), channel catfish, and carp were the dominant large fishes taken in 1948.

LAKE FAIRFAX. Lake Fairfax is an artificial lake located 4½ miles northwest of Fairfax, Oklahoma in Sections 25-26-35-36, Twp. 25 N., Range 5E. (Osage County.) A dam 1,320 feet long was completed in 1937 across Wild Creek and impounded 1,795 acre feet of water covering an area of 110 surface acres. The maximum depth of the lake is 65 feet. There are approximately 25 surface acres of water under 5 feet in depth. The drainage area consists of approximately 4,800 surface acres of prairie pasture land. In 1946, the dam was raised from a height of 40 feet to the present 48 feet. Average annual water level fluctuation is 5 feet.

Unlike Lake Pawnee, Lake Clinton and Lake Cleveland, this lake is typically clear. Smartweed and chara are found in abundance in the shallow areas. It appears that largemouth bass and bluegill have been most successful in Lake Fairfax. Perhaps fewer channel catfish are now taken from Lake Fairfax, but their growth is much more rapid than of those from the other three silted lakes. The gizzard shad appears to be present in larger numbers than in the other three lakes mentioned.

LAKE PAWNEE. Lake Pawnee is an artificial reservoir located a mile north of Pawnee, Oklahoma, in Sec. 30, Twp. 22 N., Range 5 E. (Pawnee County.) A dam 2,200 feet long and 45 feet in height was completed in 1933 across Skedee Creek. The lake covers an area of 305 surface acres and has a maximum depth

*One specimen weighing 10.5 pounds was taken by the survey party from the lake. Several others weighing 7-9 pounds were recorded. As far as is known these are record sizes for Oklahoma waters.

of 38 feet. The average annual water level fluctuation is approximately 4 feet. The drainage area is approximately 15 square miles in extent.

The lake water is turbid during the most of the year. Only sparse growths of cattail and smartweed were observed along the shorelines.

The larger species of fishes known to inhabit the lake in abundance are white crappie, channel catfish, flatheaded catfish and carp. A creel census* for 1940, 1941, 1942 and 1943 indicated the following:

1. Largemouth bass, bluegill and bullheads were taken in fair numbers as late as 1940 but were on a decline each year after that date.

2. One hundred and twenty-six bullheads were taken in 1940, as compared to seventy-six for 1941, twelve for 1942 and none for 1943. Flatheads were recorded in the creel for the first time during 1942.

LAKE CLEVELAND. Lake Cleveland is located 5 miles southwest of Cleveland, Oklahoma, in Sec. 20, Twp. 21 N., Range 7 E. (Pawnee County). A dam 1,200 feet in length and 69 feet in height was completed in 1935 across Branch Creek. The impoundment is 205 surface acres in area. The maximum depth of the lake is 55 feet (1935) and there are approximately 55 surface acres of water less than 5 feet in depth. The annual average water level fluctuation is approximately 4 feet. Lake Cleveland is similar to Lake Clinton and Lake Pawnee in that it has been subjected to considerable siltation and reddish (turbid) water is the rule rather than the exception.

While fewer details are known relative to the angling history of this lake it is thought to be nearly comparable to that of Lake Clinton and Lake Pawnee. At least white crappie, channel catfish and flathead catfish no doubt are among the dominant larger species present now.

Two hundred and one white crappie were collected by means of gill nets, seines and hook and line fishing from four small Oklahoma lakes during the summer of 1948. Fifty-two of this number were from Lake Cleveland, 51 from Lake Fairfax, 44 from Lake Pawnee, and 54 from Lake Clinton.

The anterior radii of the scales were measured from micro-projections which were magnified 28 times.

Calculated standard lengths were determined for the fish of each lake according to formulae developed for each of the four groups of fish. While it is admitted that the number available for each group are small, the information made available should have considerable application to management.

Body-scale relationship curves were calculated for the fish of each lake. The calculations were based on all fish of each group rather than upon averages of the length intervals. The formula used for subsequent calculations was $L = a + bS$ (L = standard body length, a = constant, b = a constant and S = anterior scale radius.)

TABLE I
Regression Line Data and Coefficients of Correlation for White Crappie of the Four Lakes.

LAKE	INTERCEPT (a)	SLOPE OF CURVE (b)	COEFFICIENT OF CORRELATION
Lake Clinton	58	1.58	.881
Lake Fairfax	48	1.75	.950
Lake Pawnee	21	1.77	.856
Lake Cleveland	25	1.67	.949

Using the above method, the length at the time of formation of each annulus was calculated for each fish individually. Average calculated lengths were determined for the age groups and for all the fish of each lake. The average growths in length of the fish of each lake were shown according to the year

*Creel census data furnished by the City of Pawnee.

of life of the various age groups (Tables III, IV, V and VI). The average calculated increments for all classes of each lake are shown at the end of each year of life (Table VII).

The average growth in length for the first two years of life of all year classes was 126 millimeters for those of Lake Fairfax, 123 millimeters for those for Lake Clinton, 92 millimeters for Lake Pawnee and 88 millimeters for Lake Cleveland.

Growth in weight as indicated by the *K* (condition) factor (Tables III, IV, V and VI) was nearly comparable for Lake Cleveland, Lake Fairfax and Lake Pawnee. Clinton was the exception in that groups I, II, and III were in unusually poor condition. The *K* factor for the individuals of three groups (I, II and III) ranged from 0.28 to 1.97. Only three of fifty-four fish from Lake Clinton had a *K* factor about 2.00. Nine individuals had a *K* value which was over 1.00. The three fish with satisfactory length-weight ratios belonged to groups IV and V. Since growth in length of the Lake Clinton fish at the end of the first two years of life has been more rapid than the average for those of the four lakes, it may be suggested that the Clinton fish have lost a substantial amount of weight since attaining their approximate present length. This apparent phenomenon has been observed in other waters of Oklahoma.

In comparison to the growth of white crappie of other similar lakes of Oklahoma the average growth for those of the four lakes is perhaps typical. This rate of growth is not typical for fish during the first few years of new reservoirs. Growth rates as low as those presented in this paper are not as a rule conducive to a high degree of angling success.

Table II presents a summary of growth of crappie in length for lakes of other states.

TABLE II
Comparison of Growth of Crappie in Lengths Found in Other Waters.

WATER AND SOURCE	LENGTHS ATTAINED AT END OF YEAR											
	1		2		3		4		5		6	
	MM	IN	MM	IN	MM	IN	MM	IN	MM	IN	MM	IN
Foots Pond, Indiana (Ricker and Lagler 1942)	52	2.0	113	4.5	171	6.7	203	8.0	229	9.0		
Greenwood Lake (Johnson 1945) ^a	95	3.8	144	5.7	164	6.5						
Michigan Lakes (Beckman 1946) ^a			123	4.8	160	6.3	181	7.2	199	7.9	214	8.4
Cherokee Lake, TVA-(Stroud 1949) ^b	31	1.2	175	6.9	232	9.2						
Douglas Lake, TVA-(Stroud 1949) ^b	58	2.3	147	5.8	185	7.3						
Hilwassee TVA-(Stroud 1949) ^b	48	1.9	138	5.5	191	7.5	192	7.5				

^aCalculated average standard length of white crappie at the time of annulus formation. Fish were taken in 1940 and 1941.

^bCalculated average standard length of white crappie collected in 1940, 1941 and 1942. Approximate standard lengths are derived from the ratio S.L./F.L. (0.814) as determined by Johnson for Greenwood Lake crappie.

^cAverage standard length at time of capture of various age groups of black crappie. Based on 1333 specimens from 84 lakes.

^dAverage calculated standard length at successive ages of white crappie for 1944-45 (Cherokee), 1943-44 (Douglas), 1943-43 (Hilwassee).

TABLE III
Summary of Average Calculated Standard Lengths and Annual Length Increments for White Crappie of Lake Clinton. Collected in July of 1948.

AGE GROUPS	NUMBER FISH	LENGTH AVERAGE		AVERAGE WEIGHT		AVERAGE K
		MM	IN.	GMS.	OZ.	
0						
I	5	118	4.6	11	.4	0.80
II	22	139	5.5	19	.7	0.76
III	24	146	5.8	22	.8	0.71
IV	1	213	8.4	270	9.5	2.79
V	2	238	9.4	365	12.9	2.67

	CALCULATED STANDARD LENGTH AT END OF YEAR OF LIFE											
	1		2		3		4		5		6	
	MM	IN.	MM	IN.	MM	IN.	MM	IN.	MM	IN.	MM	IN.
0												
I	9	3.9	122*	4.8*								
II	87	3.4	123	4.8	138*	5.4*						
III	87	3.4	120	4.6	136	5.4	143*	5.6*				
IV	84	3.4	121	4.8	164	6.5	196	7.8	208*	8.3*		
V	106	4.1	148	5.9	183	7.3	206	8.1	226	8.9	234*	9.3*
Grand Av. Calculated Standard Length	89	3.5	123	4.8	139	5.5	150	5.9	220	8.6	234	9.3
Grand Av. Annual Increment	89	3.5	34	1.4	16	0.6	11	0.5	70	2.8	14*	0.6*
Number Fish	54		54		49		27		3		2	

*Represents Growth to July 3 of 1948

TABLE IV

Summary of Average Calculated Standard Lengths and Annual Length Increments for White Crappie of Lake Fairfax. Collected September 11, 1948.

AGE GROUPS	NUMBER FISH	AVERAGE LENGTH		AVERAGE WEIGHT		AVERAGE K							
		MM	IN.	GMS.	OZ.								
0													
I	2	134	5.3	58	2.1	2.31							
II													
III	48	153	6.0	87	3.1	2.40							
IV													
V	1	282	11.1	652	23.0	2.91							
CALCULATED STANDARD LENGTH AT END OF YEAR OF LIFE													
		1		2		3		4		5		6	
		MM	IN.	MM	IN.	MM	IN.	MM	IN.	MM	IN.	MM	IN.
0													
I	97	3.8	141*	5.3*									
II													
III	73	2.9	125	4.9	153*	6.0*							
IV													
V	80	3.1	158	6.3	198	7.8	235	9.3	272	10.6	277*	10.9*	
Average Calculated Standard Length	74	2.9	126	4.9	154	6.1	235	9.3	272	10.6	277	10.9	
Grand Av. Annual Increment	74	2.9	52	2.0	28	1.1	81	3.3	37	1.5	5*	0.1*	
Number Fish		51		51		49		1		1		1	

*Represents Growth to September 11 of 1948

TABLE V
Summary of Average Calculated Standard Lengths and Annual Length Increments for White Crappie of Lake Pawnee. Collected August 1, 1948.

AGE GROUPS	NUMBER FISH	AVERAGE LENGTH		AVERAGE WEIGHT		AVERAGE K			
		MM	IN.	GMS.	OZ.				
0									
I	4	109	4.3	33	1.2		2.47		
II	15	126	4.9	57	2.0		2.57		
III	25	149	5.9	87	3.1		2.43		
CALCULATED STANDARD LENGTH AT END OF YEAR OF LIFE									
		1		2		3		4	
		MM	IN.	MM	IN.	MM	IN.	MM	IN.
0									
I	72	2.9	112 ¹⁰	4.4 ¹⁰					
II	58	2.3	96	3.8	125 ¹⁰	4.9 ¹⁰			
III	50	2.0	86	3.4	126	5.0	149 ¹⁰	5.9 ¹⁰	
Average Calculated Standard Length	55	2.1	37	1.5	34	1.4	23 ¹⁰	0.9 ¹⁰	
Grand Av. Annual Increment	55	2.1	37	1.5	34	1.4	23 ¹⁰	5.9 ¹⁰	
Number of Fish		44		44		40		25	

TABLE VI
Summary of Average Calculated Standard Lengths and Annual Length Increments for White Crappie of Lake Cleveland. Collected August 1, 1948.

AGE GROUPS	NUMBER FISH	AVERAGE LENGTH		AVERAGE WEIGHT		AVERAGE K					
		MM	IN.	GMS.	OZ.						
0											
I											
II	13	108	4.3	34	1.2		2.44				
III	33	135	5.4	63	2.2		2.38				
IV	6	166	6.5	185	6.5		2.54				
CALCULATED STANDARD LENGTH AT END OF YEAR OF LIFE											
		1		2		3		4		5	
		MM	IN.	MM	IN.	MM	IN.	MM	IN.	MM	IN.
0											
I											
II	55	2.1	78	3.1	109 ¹¹	4.3 ¹¹					
III	58	2.3	90	3.5	113	4.4	135 ¹¹	5.4 ¹¹			
IV	74	2.9	101	4.0	132	5.3	151	6.0	164 ¹¹	6.5	
Average Calculated Standard Length	59	2.4	88	3.5	114	4.5	138	5.5	164	6.5	
Grand Av. Annual Increment	59	2.4	29	1.1	26	1.0	24	0.9	26 ¹¹	1.0 ¹¹	
Number of Fish		52		52		39		6			

¹⁰Represents Growth to August 1 of 1948

¹¹Represents Growth to August 1 of 1948

TABLE VII

Summary of Average Annual Increments of All Year Classes of White Crayfish of Lake Fairfax, Lake Pawnee, Lake Clinton, and Lake Cleveland

LAKES	NUMBER OF AVERAGE FISH <i>K</i>	AVERAGE CALCULATED INCREMENT AT THE END OF YEAR OF LIFE											
		1		2		3		4		5		6	
		MM	IN.	MM	IN.	MM	IN.	MM	IN.	MM	IN.	MM	IN.
Cleveland	52	2.41	2.4	29	1.1	28	1.0	24	0.9	28 ¹²	1.0 ¹²		
Fairfax	51	2.40	2.9	52	2.0	28	1.1	81	3.3	37	1.5	5 ¹²	1.0 ¹²
Pawnee	44	2.48	2.1	37	1.5	34	1.4	23 ¹²	0.9 ¹²				
Clinton	54	0.85	3.5	34	1.4	16	0.6	11	0.5	70	2.8	14 ¹²	0.6 ¹²
Grand Average and Totals	201		2.8	38	1.5	26	1.0	20	0.8	40	1.6	11	4.0
Number of Fish		201.		201		190		92		10		10	

¹²Represents Growth to July, August and September.

SUMMARY

1. Two hundred one white crappie from four lakes were used in this study.
2. Average growth in standard length was slightly better at the end of two years for the Lake Fairfax and Lake Clinton fish than for those of Lake Pawnee and Lake Cleveland.
3. Length-weight ratios as indicated by the *K* factor were nearly comparable for Lake Fairfax, Lake Cleveland and Lake Pawnee. The fish from Lake Clinton were in almost unbelievably poor condition and yet their growth in length at the end of two years was second only to those of Lake Fairfax.
4. In general, the average growth rate in length of the fish of the four lakes is considered slow.

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