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# AGE AND GROWTH OF REDEAR SUNFISH, *LEPOMIS MICROLOPHUS* (GUNTHER), FROM BOB KIDD LAKE

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## ABSTRACT

Total lengths (62-285mm) and body scales from 75 redear sunfish collected by electroshocking from Bob Kidd Lake during October and November 1985 were used for this study. The length-frequency distribution yielded five age groups, however, the body scale analysis revealed eight age groups. The total length — scale radius relationship was estimated as,  $TL = 17.98 + 0.92 S_r$ . Lengths attained at earlier ages were estimated by the Fraser-Lee method and the Bertalanffy growth model was fitted to the lengths for ages five through ten, and the resulting equation,  $L_t = 295 [1 - \exp - 0.29 (t - 1.83)]$ , estimated lengths similar to the back-calculated lengths ( $r = 0.98$ ).

## INTRODUCTION

The redear sunfish (*Lepomis microlophus*) is a large, hard-fighting panfish that can be harvested in great numbers at certain times of the year, and is a popular sport-fish in Arkansas and other states. Studies on growth are integral to sound management of redear populations and although numerous studies on redear growth have been conducted in other states (Finnell, 1954; King, 1955; Louder and Lewis, 1957; Schoffman, 1938; Swingle, 1965; Tharratt, 1966), none have been done in Arkansas. This paper describes the age and growth of redear sunfish from Bob Kidd Lake, Arkansas, and, to the best of the authors' knowledge, represents the first published study of redear age and growth in Arkansas.

## STUDY AREA

Bob Kidd Creek was impounded in 1975 to create an 81 ha reservoir with an average depth of 4.2 m, and a maximum depth of 13.3 m. Bob Kidd Lake is located 5.4 km north of Prairie Grove on Arkansas State Highway 62, and is owned, operated, and managed by the Arkansas Game and Fish Commission. Six thousand redear fingerlings were stocked in Bob Kidd Lake on 20 September 1979, 6,800 fingerlings on 20 October 1980 and 5,000 yearlings on 23 October 1980 (Fourt, Pers. Comm.).

## MATERIALS AND METHODS

During October and November 1985, 180 redear sunfish were collected with a boat-mounted 230 volt AC electroshocker. All redear were measured for total length to the nearest millimeter. A scale sample was removed from the body of each fish at the tip of the apposed left pectoral fin. Scales were mounted between two glass slides and photocopied at a magnification of 41X with a microfiche copy machine, as described by Kilambi and Galloway (1986). The scales that were too large for a 41X magnification were photocopied at 20X. These photocopies were used for all age and growth determinations. Scale measurements (mm) were recorded from the focus to each annulus, and to the right corner margin of the anterior field (scale radius). A subsample of 75 fish, representing all size groups, was used to determine the total length — scale radius relationship. The lengths of fish at previous ages were estimated by the Fraser-Lee method (Carlander, 1982), and the data were analyzed by the Bertalanffy growth model (Ricker, 1975)

$$L_t = L_{\infty} [1 - \exp - K (t - t_0)]$$

where,  $L_t$  = length at age  $t$ ,  $L_{\infty}$  = maximum attainable size,  $K$  = rate constant (coefficient of catabolism), and  $t_0$  = age at which length is zero.

## RESULTS AND DISCUSSION

The total length (TL) — scale radius ( $S_r$ ) relationship for 75 redear sunfish, ranging in length from 62 to 285mm, was estimated as:

$$TL = 17.98 + 0.92 S_r; (r = 0.96)$$

Back-calculated lengths at earlier annuli, when plotted on a Walford graph, revealed a line that increased in slope for fish less than 160mm long, and then decreased for larger fish. This has been reported for centrarchids from the warmer parts of eastern North America (Ricker, 1975). The increased slope is often caused by selection for fast growing younger fish. A way to avoid this bias is to use lengths calculated from scale annuli of older fish to represent the younger ones (Ricker, 1975). Therefore, Fraser-Lee estimates of lengths at previous annuli from fish of ages 5-10 were fitted by the Bertalanffy growth equation as:

$$L_t = 295 [1 - \exp - 0.29 (t - 1.83)]$$

Analysis of the length-frequency distribution of all the 180 redear by the probability method (Harding, 1949) revealed five age groups (age group I, 61-100mm; age group II, 101-130mm; age group III, 131-160mm; age group IV, 161-200mm; the two large fish in an age group V). The scale analysis yielded eight age groups representing ages 1-6, 10, and 11 (Table 1). The length-frequency distribution also showed modal increases with increased fish length up to 160mm. The small sample size for fish over 160mm long, as well as the slow growth of older fish (causing overlap of age groups) made the length-frequency distribution unreliable for fish over 160mm. Age determinations by the scale analysis were verified for redear sunfish under 160mm long by the increase in the number of scale annuli with increase in fish length (Table 1) and agreement of age estimates by the scale annuli and length-frequency distribution. Hence, the scale analysis was considered to estimate correctly the ages of the larger redear sunfish. Furthermore, the lengths estimated by the Bertalanffy growth model and by back calculations using Fraser-Lee method (Table 2) were in agreement ( $r = 0.98$ ) indicating the suitability of this model to describe growth of redear from the Bob Kidd Lake.

Comparison of growth of Bob Kidd Lake redear with the growth of redear from lakes in other states (Table 3) revealed a slightly slower growth rate in Bob Kidd Lake. Houser and Grinstead (1961) found that a reduction of the bluegill population in Rod and Gun Club Lake,

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Table 1. Age group frequencies in relation to length-frequency distribution of redear sunfish from Bob Kidd Lake.

Total length range (mm)	Number of annuli											
	1	2	3	4	5	6	7	8	9	10	11	
61-70	5											
71-80		11										
81-90		11										
91-100		11	1									
101-110			7									
111-120			1									
121-130			2	1								
131-140				5								
141-150				6								
151-160				6	1							
161-170					1							
171-180					1							
181-190					1							
191-200					1	1						
261-270												1
281-290											1	
Total	5	33	11	18	5	1				1	1	

Table 2. Average back-calculated lengths of redear sunfish from Bob Kid Lake.

Age group	Number of Fish	Total length (mm) at annulus										
		1	2	3	4	5	6	7	8	9	10	11
I	5	42										
II	11	51	74									
III	10	50	75	97								
IV	17	56	82	106	130							
V	5	49	90	116	139	159						
VI	1	62	95	116	141	162	175					
VII	0	--	--	--	--	--	--	--				
VIII	0	--	--	--	--	--	--	--	--			
IX	0	--	--	--	--	--	--	--	--	--		
X	1	69	100	141	177	208	239	251	271	275	290	
XI	1	52	82	120	149	179	207	223	232	241	251	259
Weighted mean		53	78	107	135	168	202	237	251	258	266	259

Oklahoma, was followed by an increase in redear growth rate. The abundance of bluegill in an Alabama pond was found to depress the growth rate of redear (Elrod, 1971). We found bluegill to be more abundant than redear sunfish in Bob Kidd Lake. This could be responsible for the relatively low growth rate of redear sunfish in Bob Kidd Lake.

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Table 3. Comparison of growth rates of redear from Bob Kidd with growth rates of populations from other states.

Locality and reference	1	2	3	4	5	6	7	8	9	10	11	age 6 and below
Bob Kidd L., AR (Present Study)	53	78	107	135	168	207	237	251	258	266	259	31
Sub-prison L., OK (Finnell, 1954)	49	89	119	155								35
Hiwassee L., OK (King, 1955)	66	117	170	208	240							38
Murphysboro L., IL (Louder and Lewis, 1957)	46	94	132	165	188	216	259					34
Reelfoot L., TN (Scott (1939, 1938))	-	110	151	175	189	207						24
Folsom L., CA (Tharrett, 1962)	48	124	191	224								59
Spear L., HI (Ricker, 1955)	43	91	147	182	208							41
Harris L., FL (Freeman and Huiish, 1953)	112	147	183	198	224	251	257	216				28
97 lakes, ponds, streams (lowest rated) (Jenkins et al., 1955)	38	79	117	163	203	218						36

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