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AGE AND GROWTH OF BLUEGILLS IN NICKAJACK RESERVOIR, TENNESSEE

TOM J. TIMMONS[1]

AND

R. DON ESTES

Tennessee Tech University
Cookeville, Tennessee 38501

ABSTRACT

Age and growth data were obtained for 672 bluegills collected from Nickajack Reservoir, Tennessee, near the Raccoon Mountain Pumped-Storage Plant during 1973 and 1974. The estimated body-scale relation was $Y = 34.302 + 0.505X$ in 1973 and $Y = 28.454 + 1.664X$ in 1974, where Y equals total length (mm) and X equals scale radius (mm). The weighted average lengths at successive annuli for five years were 58, 92, 124, 145, and 167 mm. Growth of Nickajack Reservoir bluegills was similar to growth reported from other Tennessee reservoirs. The length-weight relation was $\log W = -5.3134 + 3.2729 \log L$, where W equals weight (g) and L equals total length (mm).

INTRODUCTION

Growth rates of bluegills, *Lepomis macrochirus*, a common species in the Tennessee River, were determined from samples collected during 1973 and 1974 in Nickajack Reservoir, Tennessee. The back-calculated lengths at successive annuli provided a growth history for bluegills collected near the Raccoon Mountain Pumped-Storage Plant, and a basis for comparative growth studies after the pumped-storage plant was in operation.

Nickajack Reservoir is an unstratified Tennessee River impoundment located below Chattanooga, in Marion and Hamilton counties. The reservoir is 74.8 km long and has a surface area of 4350 ha at normal pool levels. The upper two-thirds is narrow and riverine with few coves.

METHODS

Fish were collected by electrofishing and gill netting from May through August in 1973 and 1974 near the site of the Raccoon Mountain Pump-Storage Plant. The boat-mounted electrofishing unit was equipped with a 220-volt, three-phase generator and a pulsator that provided variable DC voltage. Monofilament nylon experimental gill nets were 2 m deep and 46 m long; mesh sizes ranged from 25 to 64 mm, bar measure.

Bluegills were weighed to the nearest gram, total lengths were measured in millimeters, and scale samples were taken from the left side below the lateral line. Scale impressions were made on cellulose acetate strips, and the distance from the focus to each annulus was measured at a magnification of 43X.

The Lee method of correcting for the intercept of the body length-scale radius relation was used to back-calculate mean lengths attained at successive annuli. The length (L)-weight (W) relationship for bluegills was estimated using the equation $\log W = \log a + n \log L$, where a and n are constants.

RESULTS AND DISCUSSION

Linear regressions of total body length in millimeters (Y) on the scale radius in millimeters (X) were $Y = 34.302 + 0.505X$ in 1973 ($n = 524$) and $Y = 28.454 + 1.664X$ in 1974 ($n = 160$). Annulus formation apparently was completed before the beginning of May.

TABLE 1. *Mean calculated total lengths, overall weighted mean lengths, and weighted mean increments for each year of life for bluegills in Nickajack Reservoir, Tennessee.*

Year class	Year collected	Sample size	Length at annulus (mm) 1	2	3	4	5
1973	1974	45	60.8				
1972	1973	43	62.1				
	1974	75	54.3				
	1973+74	118	57.1	90.6			
1971	1973	247	57.6	91.0			
	1974	25	54.1	89.7			
	1973+74	272	57.3	90.9	121.8		
1970	1973	156	59.7	94.3	126.0		
	1974	3	59.7	88.0	121.4		
	1973+74	159	59.7	94.2	125.9	144.3	
1969	1973	70	59.9	94.4	121.3	145.6	
1968	1973	8	57.1	88.8	114.3	143.9	166.9
Weighted mean length			58.4	92.1	123.9	145.4	166.9
Weighted mean increments			58.4	34.3	30.2	24.7	22.9
Sample size at annulus			672	584	262	81	8

[1]Present address: Department of Fisheries and Allied Aquacultures, Auburn University, Auburn, Alabama 36830

TABLE 2. *Comparison of growth rates of bluegills from Nickajack Reservoir, 1973 with those of other studies.*

Location	Mean calculated total length at each annulus 1	2	3	4	5	Reference
Nickajack Reservoir, Tennessee	58	92	123	145	167	Present study
Eastern Tennessee Valley Reservoirs	53	94	127	157	188	Fitz (1965)[a]
White Oak Lake, Tennessee	36	76	117	140	168	Krumholz (1956)
Chickamauga Reservoir, Tennessee	53	122				Eschmeyer et al. (1944)
Woods Reservoir, Tennessee	81	130				Benson (1959)
South Holston Reservoir, Tennessee	60	99	131	157	190	Tennessee Valley[b] Authority, 1963
Oklahoma Waters (Average growth)	81	127	152	175	185	Houser and Bross (1963)
Leesville Reservoir, Virginia	70	101	131	144	153	Estes (1971)

[a]Fitz, R. B. 1965. Growth of fishes in Eastern Tennessee Valley reservoirs. Tennessee Valley Authority. Norris, Tennessee. 1 p. (mimeo.).

[b]Tennessee Valley Authority. 1963. Fish inventory data—South Holston Reservoir. Tenn. Valley Authority. Norris, Tennessee. 12 p. (mimeo.).

No bluegills were collected earlier than May, thus the time of annulus formation could not be exactly determined. Scales from 672 adult bluegills had well-defined annuli. Scales from an additional 118 fish were discarded because they were regenerated or the annuli were indistinct. The scale method for estimating the age and growth of bluegills was validated by Regier (1962).

First-year growth rates for six year classes of bluegills were almost identical (Table 1). Calculated total lengths of bluegills from the same year class but collected in two successive years were likewise similar. Weighted annual average increments of growth decreased progressively from 58 mm in the first year to 23 mm during the fifth year. Calculated growth of bluegills in Nickajack Reservoir was similar to growth reported in other studies in the southeastern United States (Carlander 1977) and specifically, for other eastern Tennessee Valley reservoirs (Table 2). Growth was slower during the second year than for fish from Chickamauga Reservoir (Eschmeyer et al. 1944) or Woods Lake (Benson 1959). Compared with the average bluegill growth of other lakes (Table 2), growth in Nickajack Reservoir was slower in later years than for some and slower during each year for others.

The length-weight relation was calculated for males, females, and the sexes combined. All regressions were statistically significant ($P \leq 0.0001$). The regression of the logarithms of weight (W) on the logarithms of the total length (L) for sexes combined was $\log W = -5.313 + 3.273 \log L$ ($r = 0.98$). The regression equation for males was $\log W = -5.419 + 3.326 \log L$ ($r = 0.99$) and for females was $\log W = -5.086 + 3.161 \log L$ ($r = 0.97$).

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