SUMMARY

Brown, et al. (1967) collected 18 species and observed a paucity of cyprinids with the exception of *Campostoma anomalum* and noted an abundance of darters. A total of 21 species was collected in this study with only slight changes in the composition of the ichthyofauna. Centrarchids, although well represented by six species, were generally few in numbers. Species present now that were not reported by Brown, et al. (1967) are *Notropis chrysocephalus, Ictalurus melas, Lepomis microlophus, Micropterus punctulatus, Etheostoma blennioides, Salmo trutta, Salmo gairdneri,* and *Pimepheles notatus.*Species reported by Brown, et al. (1967) which were not collected in the present study are *Notropis galacturus, Notropis whipplei, Ictalurus punctatus, Fundulus olivaceus, Fundulus catenatus, Etheostoma juliae,* and *Cottus carolinae.*

ACKNOWLEDGMENTS

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GROWTH OF BLUE CATFISH *Ictalurus furcatus (LeSueur)* IN THE TOMBIGBEE RIVER OF ALABAMA

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ABSTRACT

Length-weight data from 196 fish and spine samples from 125 fish taken August 5, 1965 were used to determine growth and age composition of blue catfish in the upper Tombigbee River in Western Alabama. Mortality rates were calculated in an effort to determine the abundance of harvestable age classes of fish. The 1964 year class was represented by one specimen and no fish of the 1965 year class were taken in the sample area. The year classes prior to 1964 were well represented in the

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sample. The length-weight relationship indicates that weight increments increase rapidly after fish reach 25 inches total length.

INTRODUCTION

The blue catfish is one of the most important commercial species of freshwater fishes occurring in southern waters. Its life history is similar to that of the channel catfish, *Ictalurus punctatus* (Rafinesque), with the distinction that blue catfish prefer larger rivers.

Blue catfish range throughout the Mississippi Valley, north to Canada and south through Eastern Mexico to the Yucatan Peninsula (Trautman, 1957). The Alabama and Black Warrior River systems of Alabama support large populations of blue catfish. Swingle (1953) lists the E-values of the blue catfish (percentage of the weight of a particular species in the total population) as 46.1 for shallow water areas and 48.6 for deep water areas in the Tombigbee River.

A knowlege of reproduction, growth, mortality, and harvest can aid in maintaining a maximum sustained yield of this species. This study represents the first step in attaining information needed for the management of blue catfish in the Tombigbee River.

Spine samples and length-weight data used in this study were taken from fish collected on August 5, 1965 from the upper Tombigbee River in a population survey conducted by the Alabama Department of Conservation.

DESCRIPTION OF THE STUDY AREA

The Tombigbee River originates in Northeastern Mississippi, flows through Western Alabama and joins the Alabama River to form the Mobile River. That portion of the Tombigbee River from Cocharane (Pickens County) to one mile below its junction with the Sipsey River (Greene County) Alabama was designated as the study area. The Tombigbee River above Cocharane drains 5,990 square miles of gray and grayish-brown sandy loam soils. These soil types occur in nearly level terrain along most of the Northern Tombigbee River.

Emigh (1941) describes the climate of this area as being largely subtropical with an average annual precipitation of 52 inches. The annual average temperature is 64.2°F with extremes from –5°F to 105°F.

Annual mean discharge of water through the Tombigbee River at Cocharane is 7,590 cfs with a maximum discharge of 108,000 cfs and a minimum discharge of 271 cfs.[2] During the months of January through April, water flow is usually in excess of 12,000 cfs and the majority of the surrounding lowlands are inundated. The river is at its lowest ebb during August, September, and October.

METHODS OF DETERMINATIONS FROM SPINES

Spines were collected, dried, and sectioned with a Dremel Mototool and number A-6 saw blades. The spines were sectioned and measured, Figure 1, following the technique described by Sneed (1951). Difficulties in sectioning and aging spines were similar to those encountered and described by Muncy (1959).

Spine sections were mounted between two glass slides and soaked in ethyl alcohol to increase the differentation between the opaque and translucent zones. This technique was first described by Probst and Cooper (1955) in a s study on growth of sturgeon in which sections of the marginal ray of the pectoral fin were used.

Of the 125 spines examined, 3 were rejected because of regeneration. A linear regression of total length on spine radius was computed by the least squares method to obtain the correction factor 9a). This factor was used to correct for the body spine relationship in back-calculating using the equation: $a = y - b(x)$, where y = mean total length, x = mean spine radius, and (b) is the regression coefficient. For this population (a) was equal to 1.96 inches. The total length at each annulus was then back-calculated with the nomograph as described by Carlander (1953).

[2]Stream-flow gaging station data, Alabama U. S. Dept. Interior (U.S.G.S.)

Figure 1. Spine section from a five-year-old blue catfish. Measurements for growth were made between point A and point B.

The length frequency method as described by Petersen in 1931 (Lagler, 1956) was also used in aging these specimens, Figure 2. This method assumes that the sample is collected over a short period of time, is representative of all age groups, and is composed of a large number of individuals. In this case the overlap in total lengths between age groups was misleading when age determinations were made from the graph. Probability paper was employed in an attempt to determine exactly where the inflection points occurred, however, the overlap in age groups obscured the true inflection points.

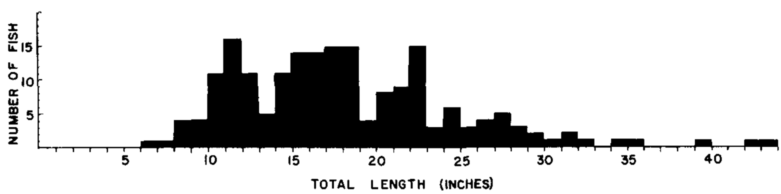

Figure 2. Length frequency of blue catfish collected from the Tombigbee River August 5, 1965.

MORTALITY

A Chi-square test of significance was computed and age group III was determined to be the first completely recruited year class. Survival rates were calculated by the Heincke (1913) and the Robson-Chapman (1961) methods. The survival rates (s) were 0.64 and 0.61 respectively for the two methods. The two estimates were close when using age roup III as the coded age N_O. The Robson-Chapman estimate is probably the better of the two in that it is less subject to sampling error.

The annual mortality rate (a) was calculated by the formula a = 1 - s. For this population the annual mortality rate by the Robson-Chapman method was 39%.

A catch curve (Ricker, 1958), calculated for this population did not exaggerate the mortality rate since all fish were collected on the same date at a single location, Figure 3. Year class strengths are probably representative of the population structure as they are free of influence from multiple sampling dates. It can be noted from the rounded, sloping right limb of the curve that this is an under-fished population.

No records of catch have been taken in this area, therefore estimates of fishing mortality and natural mortality could not be compared.

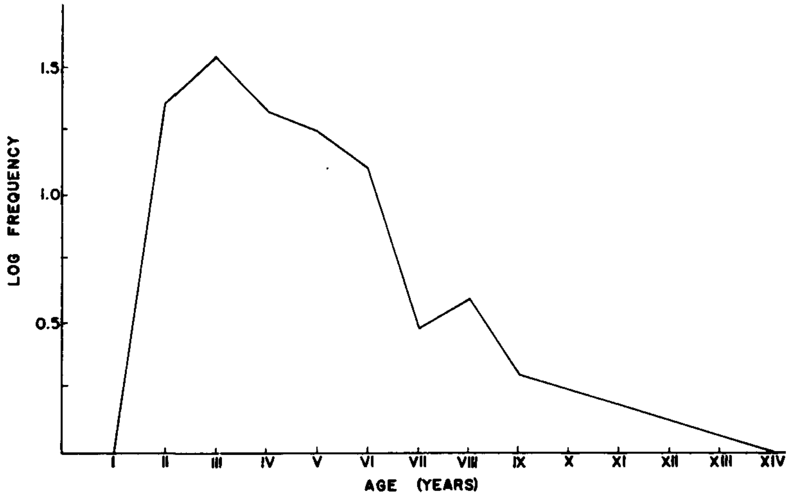

Figure 3. Catch curve of blue catfish collected from the Tombigbee River August 5, 1965.

AGE AND GROWTH

Annual growth rates were back-calculated from annuli occurring on the spine sections. The calculated lengths and average annual increments are shown in Table 1.

Blue catfish of age class O were absent from the population at the time of sampling, however, many young-of-the-year channel catfish were recovered. One blue catfish of the 1964 year class was recovered. From the data, the author cannot postulate a reason for the absence of these two year classes.

The annual average length increments, Table I, show that fish in this population grew at a relatively constant rate. The growth rate of blue catfish taken from the Mississippi River Delta is almost double that of Tombigbee River catfish, Kelley and Carver (1965). Blue catfish taken in Kentucky Lake, Tennessee, Conder and Hoffarth (1964), closely approximated the growth of fish taken in this study.

The mean length, range, standard deviation, and coefficient variation are illustrated graphically in Figure 4. The decreasing coefficient variation and increasing standard deviation indicate the age groups are becoming less skewed and more normally distributed with age.

LENGTH-WEIGHT RELATIONSHIP

Linear, quadratic, cubic, and log transformation equations were computed for the data and analysis of variance calculated to determine which curve gave a significant reduction in the residual sum of squares. These equations were calculated using total length on weight and standard length on weight.

The cubic equation of total length on weight gave the line of best fit. The basic formula for this equation is: $Y = a + bX + cX^2 + dX^3$ In this case Y = 0.152299X -

TABLE 1

Average calculated total length (inches) at annulus formation of blue catfish, collected on August 5, 1965 from the Tombigbee River in Northwestern Alabama.

Year Class	*Age Group*	*Number of fish*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*
1964	I	1	4.5													
1963	II	23	4.6	9.0												
1962	III	35	4.7	8.2	13.4											
1961	IV	22	5.4	9.2	14.0	18.2										
1960	V	18	4.9	8.6	13.1	17.5	20.8									
1959	VI	13	5.0	8.6	12.9	17.1	20.8	24.0								
1958	VII	3	4.7	8.0	12.6	19.6	23.3	28.6	30.9							
1957	VIII	4	4.8	8.4	12.8	17.2	21.2	24.7	27.9	30.3						
1956	IX	2	5.9	10.1	15.2	19.7	23.5	26.3	30.8	34.9	38.3					
1951	XIV	1	4.2	7.3	11.3	15.7	20.6	22.8	26.4	30.2	34.9	36.6	37.9	38.8	41.0	42.0
Av. Calculated Length			4.9	8.7	13.3	17.7	20.9	24.1	27.3	31.6	37.1	36.6	37.9	38.8	41.0	42.0
Av. Annual Increment			4.9	3.8	4.6	4.4	3.2	3.2	3.2	4.3	5.5	--	0.8	0.9	2.2	1.0

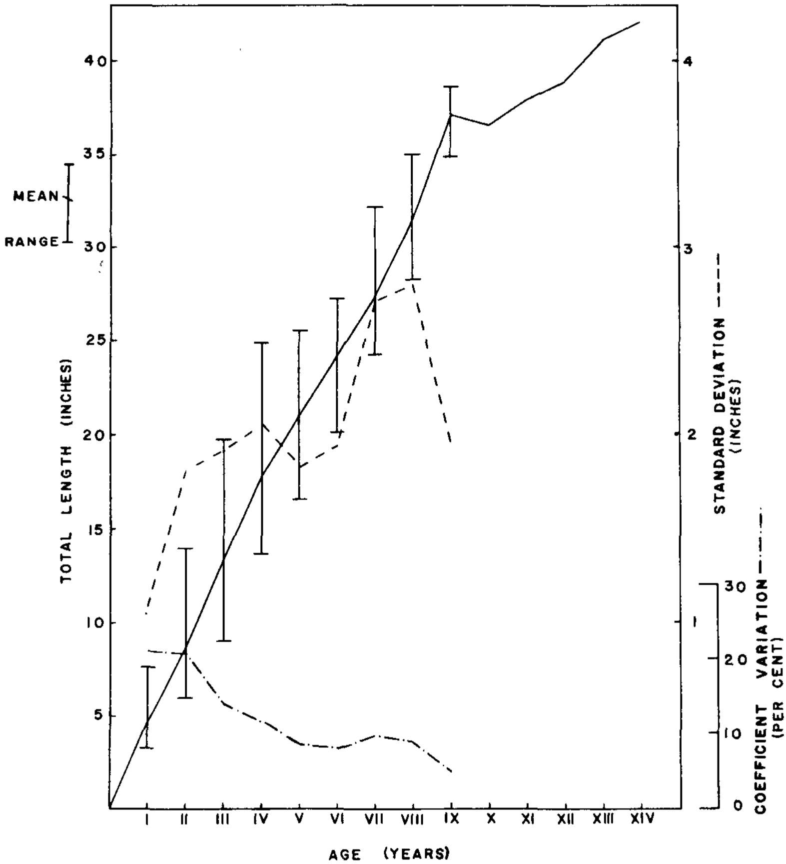

Figure 4. Mean total length, range, standard deviation, and coefficient variation of blue catfish from 1 to 14 years of age collected from the Tombigbee River August 5, 1965.

$0.013402X^2 + 0.000706X^3 - 0.5834$. The resultant curve is plotted in Figure 5. The curve is smooth and indicates that weight increments increase rapidly when the fish reach 25 and above inches total length.

The values for other equations calculated are as follows (X = length in inches and Y = weight in pounds):

Total length

$Y = a + bX$ $\quad$ $Y = -8.6882 + 0.65786X$

$Y = a + bX = cX^2$ $\quad$ $Y = 6.1820 - 0.918032X + 0.036891X$

$\log Y = \log a + b \log X$ $\quad$ $\log Y = 1.0473 + 0.4357 \log X$

Standard length

$Y = a + bX$ $\quad$ $Y = -8.1403 + 0.788862X$

$Y = a + bX + cX^2$ $\quad$ $Y = 5.1791 - 0.956414X + 0.487665X^2$

$Y = a + bX + cX^2 + dX^3Y = -0.8776 + 0.223220X + 0.018116X^2 + 0.001120X^3$

$\log Y = \log a + b \log X$ $\quad$ $\log Y = 0.9448 + 0.4556 \log X$

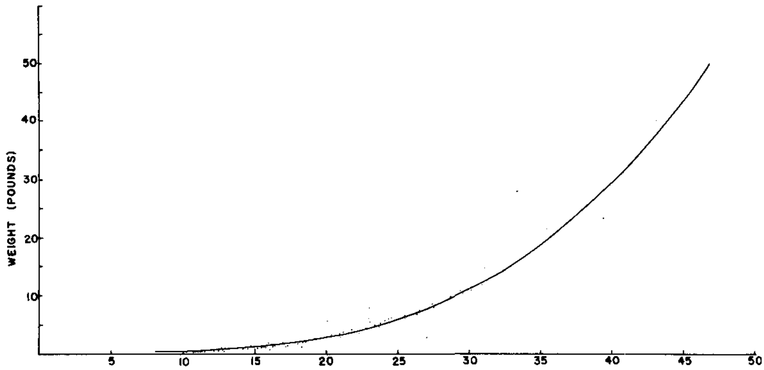

Figure 5. Length-weight relationship of blue catfish collected from the Tombigbee River August 5, 1965.

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EFFECTS OF ANTIMYCIN ON PLANKTON POPULATIONS AND BENTHIC ORGANISMS

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ABSTRACT

One phase of an evaluation of antimycin as a piscicide in ten ponds and lakes in the Southeast involved a study of its effect on plankton and bottom organisms. Net zooplankton in the groups Cladocera, Copepoda, Rototaria and nauplii larvae were enumerated before and after the application of 5.0 ppb antimycin. All groups were severely reduced and some disappeared following the treatment. Bottom organisms in the groups Tendipedidae, Ceratopogonidae and Culicidae were enumerated. Bottom organisms in these groups did not disappear following antimycin applications. Probably reasons are discussed.

INTRODUCTION

The fungicide antimycin has been evaluated as a piscicide by a number of investigators (Walker, *et al.* 1964; Hogan, 1966; Callaham and Huish, 1967; and Burress, 1968). There exists a scarcity of information regarding the effects of the toxicant upon plankton populations and benthic organisms. Walker, *et al.* (1964) reported that plankton, aquatic plants, bottom fauna, salamanders, tadpoles and turtles were not harmed by piscicidal concentrations. This report contains the results of a study in three Georgia ponds where net zooplankton and bottom fauna were enumerated before and after application of selective and total kill concentrations.

METHODS

Zooplankton

Zooplankton samples were collected from the surface and other depths depending on the morphometry of the study area. All samples were collected within the same hour on successive days to minimize discrepancies caused by diel periodicity. A Wisconsin style plankton net and bucket with No. 20 mesh was used to concentrate the plankton. Surface samples of 38 liters were dipped with a plastic pail and poured through the net. Samples taken from various depths below the surface were pumped through the net into the 38 liter container (Holder 1967). The pumping technique for collecting plankton samples below the surface may be biased by the rheotaxis of some plankters (Langford 1953). However, this bias is assumed to be the same before as it is following the application of antimycin.

The concentrate was preserved in a 10 per cent formalin solution and taken to the laboratory for counting. A 1 ml aliquot of the concentrate was removed by a large bore apparatus. This subsampler designed to deliver 1 ml had an inside diameter sufficiently large that it was not occluded by the plankton. The aliquot was transferred to a Sedgewick-Rafter cell for counting. Counting procedure followed that outlined by Plankton Analysis (1964) and Standard Methods (1965) for net zooplankton. Net zooplankton per liter was determined as follows:

$$\frac{\frac{C}{S_n V_c}}{V_s}$$