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EFFECTS OF IMPOUNDMENT ON THE BENTHIC POPULATION OF BAYOU D'ARBONNE, LOUISIANA

JAMES T. DAVIS AND JANICE S. HUGHES
Fisheries Biologists
Louisiana Wild Life and Fisheries Commission
Monroe, Louisiana

INTRODUCTION

This study was initiated in 1957 in an effort to determine the effect of impoundment on stream dwelling benthos (Davis, 1960). Bayou D'Arbonne and Corney Bayou were chosen due to the proposal to construct a 15,000-acre lake on the area. A later objective was to determine the effect on benthic organisms of a water level fluctuation program.

DESCRIPTION OF STUDY AREA

Bayou D'Arbonne was formed by the confluence of Middle Fork Bayou and Little Bayou D'Arbonne eight miles southwest of Farmerville, Louisiana. Corney Bayou was a major tributary of Bayou D'Arbonne and flowed into the bayou one mile west of Farmerville. The combined drainage systems of these two bayous exceeds 1,400 square miles. They originate in south central Arkansas and Bayou D'Arbonne empties into the Ouachita River 12 miles northwest of Monroe, Louisiana.

Station 1 was located 0.5 miles below the proposed dam site (Figure 1). The banks in this area were quite steep with a drop of up to 20 feet to the water level. The area is a mixture of riffles and deep pools. Bottom types in the pools ranged from silt to sandy loam. During the actual construction of the dam this station received heavy silt deposits. At this station and at all other stations, two samples were taken on each sampling date.

One mile above the dam was the location of Station 2. This station was just below a rocky outcropping. The water was two feet deep during normal stream flow. The bottom was generally mucky with numerous sticks and leaves.

A long pool which varied up to 14 feet in depth characterized Station 3. The bottom was mucky with many partially decayed leaves and twigs. Depths of the samples were two feet to ten feet.

In an effort to determine the effect of mixing the water of the two

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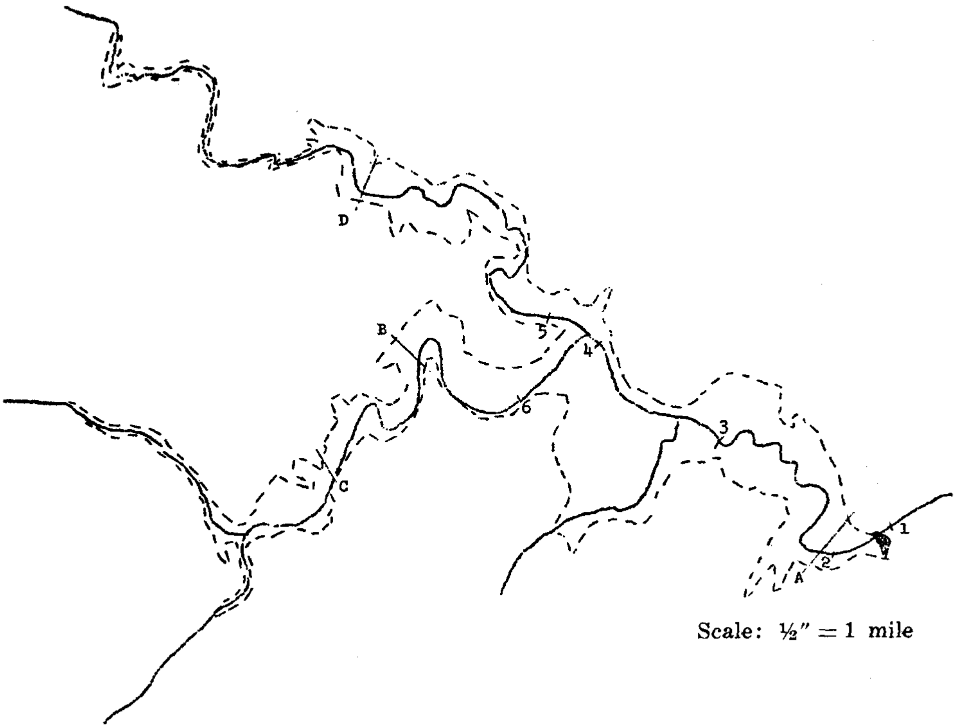

Figure 1
Benthos Sampling Stations
Bayou D'Arbonne and D'Arbonne Lake

bayous, Station 4 was located 100 yards below the mouth of Corney Bayou. The water at this station reached a maximum of eight feet in depth with gently sloping banks. The bottom type at this station was generally silty due to depositions from the highly turbid Bayou D'Arbonne. Corney Bayou at this station was clear and generally exceeded 1000 ppm. chloride ion at low flow. The effect on the benthic population of these characteristics of the water varied between sampling periods.

Corney Bayou at a point two miles above its mouth was the site of Station 5. A wide shallow riffle area characterized this station. Depths varied from 0.5 feet to two feet. The sandy bottom with limited debris was characteristic of most of this stream. The heavy load of chlorides in the stream and the clear water were also normal stream characteristics.

Station 6 was located in the turbid waters of Bayou D'Arbonne, two miles above the mouth of Corney Bayou. At this station the banks were quite steep and the bayou narrowed to 40 yards. The resultant deep pool had a mucky botton covered with many sticks and leaves.

D'Arbonne Lake, a 15,000-acre impoundment, was authorized by an act of the Louisiana Legislature in 1956. The purposes of the lake are for the conservation of soil and water, and the development of the areas natural resources and wealth for sanitary, agricultural and recreational endeavors.

The lake was formed by a dam and spillway across Bayou D'Arbonne, ten miles southeast of Farmerville in Section 23, T20N, R1E. At pool stage, 80 feet mean sea level, the average depth is 8.5 feet and the shoreline is 150 miles long. Over 5,000 acres of the lake were cleared during construction.

Approximately 1,000 acres of cleared land is located in front of the spillway. Three thousand acres of the clearing was done for a recreational area near Farmerville. The remaining cleared acreage is in bands along each side of Bayou D'Arbonne and Corney Bayou. The widths of these bands vary from 200 feet to 500 feet. The remainder of the lake bottom was covered with an oak-gum-cypress complex. This timber along with the attendant brushy species protrude above the water surface. The surrounding land is of red silty clay that supports a pine-oak complex on the hilly terrain. Less than ten percent of the drainage area is composed of farming land.

The dam and spillway were completed in September 1963 and the spillway gates were closed the following November. Early in January 1964, sufficient water had entered the lake basin to spill over the bayou banks. Heavy rains in March caused the lake to reach pool stage on the eighteenth of that month. Water flowed over the spillway intermittently for the next 45 days. On September 4, 1964, the spillway gates were opened and the lake lowered five feet. This stage of 75 feet mean sea level was reached on September 15, 1964. The water was held at this level until December 1, 1964. The lake gradually refilled and reached pool stage (80 feet mean sea level) on January 24, 1965.

Station A was located in the cleared area 0.5 miles above the dam (Figure 1). Ten samples were taken at this station during each of the sampling periods. The bottom in this area was a silty loam with many sticks. During the initial sampling periods, terrestrial vegetation hampered the collection of adequate samples.

Station B was located on the D'Arbonne arm where the wide bottom of the former bayou stretched across 1,000 yards. This was approximately five miles by water below the confluence of Little Bayou D'Arbonne and Middle Fork Bayou. Five of the samples were located in the inundated area of the tree-infested bottom.

One mile below the confluence of Little Bayou D'Arbonne and Middle Fork Bayou was the location of Station C. At this point the lake was 750 feet wide and reached a maximum depth of 25 feet. As at the former stations, five of the samples were taken in the old stream bed and the remaining five samples in the overflowed area. The bottom varied from a hard clay formation on the former stream bank to a debris-covered bottom in the tree area.

The Corney arm of the lake eight miles below its headwaters was the site of Station D. At this point the lake is approximately 400 feet wide and trees were quite dense. Again five of the samples were taken in the former stream channel and five additional samples were taken in the tree area. In the tree area the water had a maximum depth of three feet at pool stage. The bottom varied from sandy in the stream bed to mucky debris in the tree area.

After the lake was drawndown, the five tree samples in the latter three stations were discontinued as they were on dry ground. Sampling was resumed in these areas as the lake refilled.

MATERIALS AND METHODS

Samples were taken in both the lake and bayous using a Petersen dredge with an opening that measured 0.67 square feet. The samples were placed in plastic bags and returned to the laboratory where the silt was removed from the sample by washing through a number 30 mesh sieve. The samples were then placed in a solution of ten percent formaldehyde for preservation.

In the laboratory, initial separation was conducted using a Dazar floating magnifier. The organisms were identified and classified to family at this time. More precise identification to genus and species was done with the aid of microscopes. The classification followed that of Pennak, 1963. Identification of the Tendipedidae to species was accomplished with the assistance of Dr. James E. Sublette.

RESULTS AND DISCUSSION

Preimpoundment 1957-1964

The dominant families in the streams prior to impoundment were Tubificidae and Tendipedidae (Tables 1-6). The September and Novem-

Table 1. Average Number of Benthos Present Per Square Foot in Bayou D'Arbonne at Station 1.

		1957-1958	1958-1959	1959-1960	1960-1961	1961-1962	1962-1963	1963-1964
Plesiopora	Tubificidae	13.9	12.4	9.7	25.6	38.4	20.0	25.4
Prosopora	Lumbriculidae	—	—	0.8	12.7	26.5	—	—
	Unidentified	—	—	0.8	—	0.4	0.2	—
Arhynchobdellida	Hirudidae	—	1.0	—	0.4	0.4	2.2	—
Collembola	Unidentified	—	—	—	—	—	2.2	—
Ephemeroptera	Ephemeridae	—	0.2	—	—	1.5	0.4	0.4
	Batidae	0.2	—	—	—	0.2	—	—
	Unidentified	—	—	—	—	—	0.8	—
Odonata	Libellulidae	—	0.2	—	—	—	—	—
	Gomphidae	—	—	—	0.2	0.4	—	—
	Unidentified	—	—	—	—	0.2	—	—
Hemiptera	Unidentified	—	—	—	—	—	0.2	—
Trichoptera	Hydrosychidae	—	—	—	—	0.2	—	—
	Rhyacophilidae	—	—	—	0.2	—	—	—
	Unidentified	0.2	—	0.2	0.9	—	0.6	—
Coleoptera	Elmidae	0.7	—	—	0.2	—	6.9	—
	Haliplidae	—	—	—	0.2	—	0.2	—
Diptera	Culicidae	—	1.4	—	1.3	0.2	—	11.2
	Tendipedidae	8.0	5.0	3.0	20.7	1.8	26.3	12.7
	Heleidae	0.2	1.0	0.8	2.0	—	6.9	0.8
	Unidentified	—	—	—	—	—	—	0.4
Ctenobranchiata	Viviparidae	—	—	—	—	0.2	0.4	—
Pulmonata	Physidae	—	—	—	—	0.2	—	0.8
Eulamellibranchia	Unionidae	—	0.7	—	—	0.6	0.4	—
	Sphaeridae	0.4	—	—	0.4	—	—	—

Table 2. Average Number of Benthos Present Per Square Foot in Bayou D'Arbonne at Station 2.

		1957-1958	1958-1959	1959-1960	1960-1961	1961-1962	1962-1963	1963-1964
Plesiopora	Tubificidae	15.2	20.5	2.0	15.9	20.3	14.7	22.8
Prosopora	Lumbriculidae	—	—	0.5	4.7	3.0	2.0	—
	Unidentified	—	0.2	0.8	—	1.5	0.2	—
Arhynchobdellida	Hirudidae	1.1	0.7	—	0.2	0.4	—	—
Podocopa	Unidentified	—	—	39.3	—	—	—	—
Hydracarina	Unidentified	0.2	—	—	—	—	—	—
Plecoptera	Unidentified	0.2	—	—	—	—	—	—
Ephemeroptera	Ephemeridae	—	0.7	—	—	0.2	—	—
	Batidae	—	—	—	—	0.2	—	—
	Unidentified	—	—	—	—	—	0.6	—
Odonata	Libellulidae	—	—	0.2	—	—	—	—
	Gomphidae	—	—	—	0.6	0.2	—	—
Hemiptera	Corixidae	—	—	—	—	0.2	—	—
	Unidentified	—	—	—	—	—	0.2	—
Megaloptera	Unidentified	—	—	—	—	—	0.2	—
Trichoptera	Hydrosychidae	—	—	—	0.6	—	—	—
	Unidentified	0.2	0.2	0.2	0.4	—	1.1	—
Coleoptera	Elmidae	0.4	0.2	—	0.6	0.2	2.8	—
	Haliplidae	—	—	—	0.6	—	—	—
Diptera	Culicidae	0.9	1.2	—	3.2	—	0.6	134.3
	Tendipedidae	3.2	13.8	2.2	14.7	1.7	12.5	6.0
	Heleidae	0.2	0.2	4.2	0.9	—	0.8	—
	Unidentified	—	—	—	—	0.4	0.2	—
Ctenobranchiata	Viviparidae	0.2	—	0.5	1.5	—	—	—
Eulamellibranchia	Unionidae	—	0.4	—	0.4	0.4	0.8	0.8
	Sphaeridae	0.4	—	—	0.4	0.4	0.4	1.5

Table 3. Average Number of Benthos Present Per Square Foot in Bayou D'Arbonne at Station 3.

		1957-1958	1958-1959	1959-1960	1960-1961	1961-1962	1962-1963	1963-1964
Plesiopora	Tubificidae	113.5	38.8	33.6	75.9	98.1	40.1	50.4
Prosopora	Lumbriculidae	2.5	0.2	9.2	30.0	6.9	0.6	—
	Unidentified	—	—	16.2	—	0.2	1.5	—
Arhynchobdellida	Hirudidae	0.9	1.0	—	0.4	0.6	—	—
Podocopa	Unidentified	—	0.2	—	—	—	—	—
Amphipoda	Unidentified	—	—	—	—	—	0.2	—
Ephemeroptera	Ephemeridae	—	0.9	—	—	0.2	0.6	—
	Unidentified	—	—	0.2	—	—	—	—
Odonata	Libellulidae	0.2	—	—	—	—	—	—
Megaloptera	Sialidae	—	—	—	—	—	0.6	—
	Unidentified	—	—	—	—	—	0.2	—
Trichoptera	Psychomyiidae	—	—	0.2	—	—	—	—
	Unidentified	—	0.2	0.2	0.8	—	—	—
Coleoptera	Elmidae	0.2	—	0.2	—	—	—	—
	Haliplidae	—	—	—	0.6	—	—	—
Diptera	Culicidae	—	0.4	0.5	3.9	11.9	2.1	313.1
	Tendipedidae	4.3	8.2	18.7	15.3	3.7	12.5	0.4
	Heleidae	2.0	0.9	1.5	0.6	—	1.3	5.6
	Unidentified	—	—	—	0.4	—	0.2	—
Ctenobranchiata	Viviparidae	—	—	0.5	2.4	1.9	1.5	0.4
Pulmonata	Physidae	—	—	—	0.6	—	—	—
Eulamellibranchia	Unionidae	—	—	0.5	—	1.5	0.4	—
	Sphaeridae	1.2	—	0.5	0.6	0.2	0.4	—

Table 4. Average Number of Benthos Present Per Square Foot in Bayou D'Arbonne at Station 4.

		1957-1958	1958-1959	1959-1960	1960-1961	1961-1962	1962-1963	1963-1964
Plesiopora	Tubificidae	32.2	14.8	123.6	36.4	38.2	26.7	24.4
Prosopora	Lumbriculidae	0.5	0.2	6.2	13.1	10.3	1.7	—
	Unidentified	—	—	6.2	—	0.6	—	0.4
Arhynchobdellida	Hirudidae	—	0.7	—	0.4	0.2	—	—
Ephemeroptera	Ephemeridae	0.5	0.4	—	—	—	1.9	—
	Unidentified	—	—	0.5	—	—	0.2	—
Odonata	Gomphidae	—	—	0.2	—	0.2	—	—
	Unidentified	—	—	—	—	—	0.2	—
Megaloptera	Sialidae	—	—	—	—	—	0.4	—
	Unidentified	—	—	—	—	—	0.2	—
Trichoptera	Hydrosychidae	—	—	—	0.2	—	—	—
	Unidentified	0.5	—	0.8	0.2	—	—	0.4
Coleoptera	Elmidae	0.4	0.2	—	—	—	—	—
	Haliplidae	—	—	—	0.6	—	—	—
	Gyrinidae	—	—	—	0.2	—	—	—
Diptera	Culicidae	0.2	0.7	—	7.3	—	0.4	188.4
	Tendipedidae	2.7	2.8	13.2	8.8	2.6	11.2	3.7
	Heleidae	1.2	1.2	1.2	—	0.6	2.2	—
Ctenobranchiata	Viviparidae	—	0.2	0.2	1.9	0.6	0.4	0.4
Pulmonata	Lymnaeidae	—	—	—	—	—	0.4	—
	Physidae	—	—	0.2	—	—	—	1.1
Eulamellibranchia	Unionidae	—	0.7	1.0	—	0.2	0.2	—
	Sphaeridae	0.4	0.4	1.0	0.4	—	—	—

Table 5. Average Number of Benthos Present Per Square Foot in Bayou D'Arbonne at Station 5.

		1957-1958	1958-1959	1959-1960	1960-1961	1961-1962	1962-1963	1963-1964
Plesiopora	Tubificidae	13.0	27.7	4.5	9.1	29.9	11.9	23.9
Prosopora	Lumbriculidae	2.0	0.2	0.8	6.1	1.1	0.2	—
	Unidentified	—	—	2.5	—	0.2	—	0.4
Arhynchobdellida	Hirudidae	0.2	0.2	—	0.4	—	0.2	—
Podocopa	Unidentified	—	0.2	—	—	—	—	—
Isopoda	Unidentified	0.4	—	—	—	—	—	—
Amphipoda	Unidentified	0.4	—	—	—	—	—	—
Ephemeroptera	Ephemeridae	—	1.2	—	—	1.7	0.4	—
	Unidentified	—	—	0.2	—	—	0.6	—
Odonata	Libellulidae	0.2	0.2	—	—	—	—	—
	Gomphidae	—	—	—	0.2	0.2	0.2	—
	Coenagrionidae	0.2	0.2	—	—	—	—	—
	Unidentified	—	—	—	—	—	0.2	—
Hemiptera	Unidentified	—	—	—	—	—	0.2	—
Megaloptera	Sialidae	—	—	—	—	0.2	0.4	—
	Unidentified	—	—	—	—	—	0.6	—
Trichoptera	Psychomyidae	—	—	0.2	—	—	—	—
	Phryganeidae	—	—	1.2	—	—	—	—
	Hydrosychidae	—	—	—	—	0.4	0.2	—
	Unidentified	0.2	—	0.2	3.9	—	0.4	—
Coleoptera	Elmidae	0.7	—	—	—	—	2.1	—
	Haliplidae	—	—	—	0.2	—	—	—
	Dytiscidae	—	—	—	—	0.4	—	—
	Unidentified	—	—	—	0.2	—	—	—
Diptera	Culicidae	—	1.3	—	0.8	0.2	2.2	426.1
	Tendipedidae	1.6	5.2	5.0	12.1	2.6	20.0	13.1
	Stratiomyiidae	—	—	—	—	—	0.2	—
	Heleidae	0.7	0.2	2.2	0.8	—	0.6	—
Ctenobranchiata	Viviparidae	0.2	0.2	—	1.1	0.4	1.3	—
Pulmonata	Lymnaeidae	—	—	—	—	—	0.4	—
	Physidae	—	—	0.2	—	—	—	—
Eulamellibranchia	Unionidae	—	—	—	0.2	1.3	0.4	—
	Sphaeridae	0.7	0.2	—	—	—	—	—

ber samples in 1963 indicated a definite increase in the Culicidae at all stations but particularly those upstream from the dam. This increase was accompanied by a decrease in the Tendipedidae. This change was apparently the result of increased water levels in the streams caused by a low sill dam placed above the spillway in July of 1963. The 26 identified families compare favorably with that reported by Davis (1960) for Louisiana streams. O'Connell and Campbell (1953) reported a much larger number of groups (39) in their study of Black River. Their study yielded a highly significant number of groups (12) from the riffles areas only. As the study stream supported few riffles this may account for part of the disparity. The largest variety of families was found in the shallow water of the feeder streams and the least variety at stations 3 and 4 which were located in the deeper pools.

Lyman and Dendy (1943) reporting on the benthos in Holston River prior to the completion of the Cherokee Reservoir in Tennessee, found total benthic populations between 15 and 425 organisms per square foot. Our findings generally fit between these extremes.

Impoundment-1964

Inundation of all stations was completed in late February 1964. The lake did not reach spillway level until March 18, 1964. Benthos samples taken as the lake increased in depth indicated that many of the aquatic species followed the rise of the water and populated the

Table 6. Average Number of Benthos Present Per Square Foot in Bayou D'Arbonne at Station 6.

		1957-1958	1958-1959	1959-1960	1960-1961	1961-1962	1962-1963	1963-1964
Ostracoda	Unidentified	—	—	0.3	—	—	—	—
Plesiopora	Tubificidae	16.5	3.8	19.4	10.5	16.2	13.3	98.1
Prosopora	Lumbriculidae	—	—	2.0	11.9	3.2	—	—
	Unidentified	—	—	6.0	—	1.3	0.6	—
Arhynchobdellida	Hirudidae	—	—	0.3	—	—	—	0.4
Decapoda	Palaemonidae	—	—	—	0.2	—	—	—
	Unidentified	—	—	—	0.2	—	—	—
Collembola	Unidentified	—	—	—	—	—	0.2	—
Plecoptera	Unidentified	—	—	—	—	—	0.4	—
Ephemeroptera	Ephemeridae	3.6	0.9	0.5	—	0.2	0.2	—
	Heptageniidae	0.2	—	—	—	—	—	—
	Unidentified	—	—	—	—	—	0.6	—
Odonata	Libellulidae	—	—	0.5	—	—	—	—
	Gomphidae	—	—	—	—	—	0.2	—
	Coenagrionidae	0.2	0.2	—	—	—	0.2	—
Hemiptera	Unidentified	—	—	—	—	—	0.2	—
Megaloptera	Sialidae	—	—	—	—	—	0.2	—
	Unidentified	—	—	—	—	—	—	0.4
Trichoptera	Psychomyiidae	—	—	—	—	—	0.9	—
	Hydrosychidae	—	—	—	—	0.2	0.9	—
	Unidentified	0.2	—	2.2	0.6	—	0.4	—
Coleoptera	Elmidae	0.9	—	9.3	—	—	11.7	—
	Haliplidae	—	—	—	0.6	—	—	—
Diptera	Culicidae	—	0.7	—	1.3	0.4	0.2	39.6
	Tendipedidae	2.8	1.4	0.3	4.8	6.4	7.6	6.3
	Stratiomyiidae	—	—	—	—	—	0.2	—
	Heleidae	—	—	—	0.8	—	2.1	0.5
Ctenobranchiata	Vivparidae	0.4	—	—	1.1	0.2	—	—
Pulmonata	Lymnacidae	—	—	—	—	—	—	0.4
	Physidae	—	—	—	0.6	—	—	—
	Planorbidae	—	—	—	—	—	—	0.4
Eulamellibranchia	Unionidae	—	—	0.5	0.4	0.8	1.5	0.5
	Sphaeridae	—	0.5	—	—	—	—	1.1

newly inundated areas rapidly (Table 7). At the same time representatives of the major aquatic groups remained in the old bayou channel.

No attempt was made to classify the bottom types as to rapidity of populating. Due to the action of earth moving equipment some areas presented a hard clay bottom. Other areas were heavily vegetated wfth terrestrial grasses and perennial weeds. Both of these areas are difficult to sample accurately.

By midsummer the effects of the impoundment on the macrobenthos became clearer (Table 8). There was a drastic reduction in the number of families present. In addition there was a reduction in the number of organisms within each major group except the Tendipedidae.

The average of the total number of benthic organisms present per square foot, 121.1, is appreciably higher than the 83.5 reported for Clearwater Lake the first year after impoundment (O'Connell and Campbell, 1953). Geagan and Allen (1960) working on older lakes reported from 56.2 to 199.3 organisms per square foot. This was an average over a three-year period and therefore was interpreted as the mean standing crop in these lakes. From the first year's data on D'Arbonne Lake, it was surmised that the benthic population was adequate to support the fish population present at that time.

Impoundment After Drawdown

Between November 20, 1964 and January 15, 1965, benthos samples were taken on five dates. These data as summarized in Table 9 indicates a further increase in the organisms per square foot after the drawdown was completed. This is particularly evidenced by the Culicidae but is readily apparent for the less motile forms. Welch (1952) indicates that changes in lake levels cause a shifting in benthic populations. Moon (1935) states that the more active elements of the fauna readily repopulate denuded areas. He further states that movement of the littoral fauna in Lake Windermere was in a constant state of movement.

On the basis of these data, it was hypothesized that there was a movement of the benthic population towards deeper water as the water receded. The increase was too large to be the normal seasonal increase as described by Welch (1952).

Table 7. Average Number of Benthic Organisms Per Square Foot in D'Arbonne Lake[1]

	79[2]	78	77	76	75	74	73	72	71	70	65	60	55	50
2-20-64														
Terrestrial	—	—	—	—	—	22.6	—	—	1.0	1.5	—	—	—	—
Tubificidae	—	—	—	—	—	1.0	1.5	—	0.5	—	1.5	34.3	2.0	3.0
Other Annelida	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Megaloptera	—	—	—	—	—	—	—	—	—	—	—	0.3	4.0	—
Coleoptera	—	—	—	—	—	—	—	—	—	—	—	1.2	—	—
Tendipedidae	—	—	—	—	—	2.7	1.5	—	3.0	14.9	10.4	62.7	15.4	118.7
Other Diptera	—	—	—	—	—	0.2	—	—	—	—	0.7	4.5	2.0	6.7
Pulmonata	—	—	—	—	—	—	—	—	—	—	—	0.3	—	—
Eulamellibranchia	—	—	—	—	—	—	—	—	—	—	—	—	0.5	3.0
Other benthos	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3-9-64														
Terrestrial	—	—	2.2	—	—	—	—	—	—	—	—	—	—	—
Tubificidae	—	—	—	1.5	—	1.5	—	—	—	—	4.0	6.0	35.5	0.7
Other Annelida	—	—	—	—	—	2.0	0.7	—	7.5	—	0.5	—	—	4.5
Megaloptera	—	—	—	—	—	—	—	—	—	—	—	0.5	0.6	—
Coleoptera	—	—	—	—	—	—	—	—	—	—	—	0.5	—	—
Tendipedidae	—	—	—	—	—	2.0	5.2	1.5	15.7	—	15.9	19.4	27.5	82.1
Other Diptera	—	—	0.7	—	—	—	—	—	—	—	0.5	0.5	4.8	2.2
Pulmonata	—	—	—	—	—	—	—	—	—	—	2.0	—	0.3	—
Eulamellibranchia	—	—	—	—	—	—	—	—	—	—	2.5	—	—	5.2
Other benthos	—	—	—	—	—	—	—	—	—	—	—	—	0.3	1.5
4-1-64														
Terrestrial	1.5	—	—	—	—	—	—	—	—	—	—	—	—	—
Tubificidae	—	—	—	—	1.5	—	1.9	—	3.0	—	1.9	—	17.9	4.9
Other Annelida	—	1.5	3.7	—	—	—	1.9	3.0	—	—	—	—	—	1.9
Megaloptera	—	—	—	—	—	—	0.4	—	—	—	—	—	—	—
Coleoptera	—	1.5	—	—	—	—	0.4	—	—	—	—	—	—	0.7
Tendipedidae	—	0.7	3.0	—	3.0	—	12.7	1.5	7.5	—	7.5	—	13.9	35.1
Other Diptera	—	—	—	—	—	—	—	—	—	—	—	—	1.5	—
Pulmonata	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Eulamellibranchia	—	—	—	—	—	—	—	—	—	—	—	—	1.0	1.5
Other benthos	—	—	—	—	—	—	—	—	—	—	1.1	—	0.5	—
4-9-64														
Terrestrial	0.6	—	—	—	—	—	—	—	—	—	—	—	—	—
Tubificidae	—	—	0.7	—	—	—	—	—	10.4	—	1.5	0.7	—	5.0
Other Annelida	—	2.0	2.2	—	0.5	—	—	—	0.7	—	3.4	—	—	7.0
Megaloptera	—	—	—	—	—	—	—	—	—	—	0.7	—	—	—
Coleoptera	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Tendipedidae	6.0	—	—	—	1.0	—	—	—	—	—	7.8	2.2	1.5	8.5
Other Diptera	—	0.5	0.7	—	—	—	—	—	0.7	—	—	—	—	2.0
Pulmonata	—	—	—	—	—	—	—	—	—	—	—	—	—	0.5
Eulamellibranchia	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Other benthos	0.9	—	—	1.5	—	—	—	—	—	—	1.9	—	—	—

[1]Water levels on dates indicated: 1-10-64(69'); 1-29-64(73'); 2-14-64(74'); 2-21-64(75'); 3-18-64(80')
[2]Feet mean sea level, pool stage 80 m s l

TABLE 8. Average Number of Benthic Organisms Present Per Square Foot in D'Arbonne Lake Prior to Drawdown

Family	Station A	Station B	Station C
Tubificidae	17.6	1.8	13.7
Culicidae	98.5	94.2	76.7
Tendipedidae	10.0	15.1	34.6
Heleidae	0.1	0.4	0.3
Other benthos	0.1	0.2	—

TABLE 9. Average Number of Benthic Organisms Present Per Square Foot in D'Arbonne Lake After Drawdown

Family	Station A	Station B	Station C	Station D
Tubificidae	23.2	21.0	14.4	5.3
Asellidae	0.8	0.3	t	0.1
Culicidae	206.8	40.2	101.4	33.6
Tendipedidae	30.9	64.8	46.8	54.6
Heleidae	0.3	2.8	1.2	0.2
Other benthos	4.8	—	—	0.2

t — Less than 0.05

Impoundment After Refilling — 1965

After the lake reached pool stage, the benthic population again increased (Table 10). The least effect was noted at Station A. This is an open water station and all of the sample area was underwater during the drawdown. At the other three stations, the population of all benthic families increased rapidly. This increase continued until mid-February and then declined sharply. In most areas another peak population was apparent in mid-March. This second peak does not follow that normally described for northern lakes (Welch, 1952). It is too early to determine the population present during the summer months of 1965. Limited sampling indicates a very low summer population density.

There is some disparity in the reports of other authors on the effect of drawdown on benthic organisms. Pierce, et. al. (1963) working in farm ponds in Georgia concluded that their drawdowns reduced benthic populations to 0.1 of their previous volume. Schmulbach and Sandholm (1962) found that water level fluctuations had no deleterious effect on the benthos population of Lewis and Clark Reservoir in South Dakota.

SUMMARY

1. The number and variety of the benthic organisms present in the stream prior to impoundment compares favorably with that presented by other authors. The families present seem to indicate a very low order of pollution in the study streams.

2. The spread of the benthic populations over the newly inundated area as the lake reached pool stage indicates a more rapid expansion than that reported by other authors. Within one year after impoundment, it reached a level comparable to that found on other Louisiana lakes.

3. With one exception, all families of benthic organisms increased while the lake was drawndown. The exact cause of this increase is not apparent. Migration with the receding water levels and subsequent crowding is one hypothesis. This, of course, presupposes a high degree of mobility of the organisms and a lack of effective predation.

4. After the lake was refilled, the benthos in the previously inundated area remained relatively unchanged despite the increased water depth. At the other three stations the benthos density increased not-

Table 10. Average Number of Benthic Organisms Present Per Square Foot in D'Arbonne Lake After Refilling

	1-20-65	1-27-65	2-3-65	2-10-65	2-17-65	3-12-65	3-19-65
Station A							
Family							
Tubificidae	20.00	24.63	18.51	39.25	5.64	14.33	34.63
Asellidae	0.30	0.15	2.54	3.00	10.94	16.42	20.30
Culicidae	123.58	194.33	147.61	454.03	103.98	476.42	215.67
Tendipedidae	39.40	35.22	30.00	73.73	28.52	44.18	92.09
Heleidae	—	—	0.15	0.15	—	—	0.30
Other benthos	—	—	—	—	—	—	—
Station B							
Family							
Tubificidae	6.63	16.72	10.90	5.47	0.75	3.43	4.03
Asellidae	1.33	0.30	—	—	—	0.75	1.94
Culicidae	174.63	81.94	126.57	45.94	68.21	23.43	30.45
Tendipedidae	115.26	95.37	86.12	120.90	34.63	82.09	69.25
Heleidae	3.00	1.19	0.60	4.15	0.15	0.15	0.45
Other benthos	0.50	0.15	—	0.33	—	0.45	0.30
Station C							
Family							
Tubificidae	7.91	2.84	5.78	7.46	2.24	0.60	5.52
Asellidae	1.49	—	0.93	0.45	0.30	0.15	1.19
Culicidae	34.33	86.27	39.93	53.43	40.60	20.15	40.60
Tendipedidae	63.58	40.15	55.60	81.34	76.12	22.09	31.04
Heleidae	0.15	—	—	—	0.30	—	0.15
Other benthos	—	—	0.37	0.60	0.45	0.75	0.15
Station D							
Family							
Tubificidae	4.93	1.34	4.15	0.90	2.69	1.33	0.33
Asellidae	0.15	0.15	0.50	0.60	0.30	—	8.96
Culicidae	55.07	32.84	25.54	13.13	3.73	9.95	27.03
Tendipedidae	70.90	49.25	59.54	74.03	32.39	48.42	34.83
Heleidae	—	0.30	0.17	—	0.15	0.66	—
Other benthos	0.15	0.15	0.50	1.64	0.75	—	1.99

withstanding the fact that one-half of the samples at each of the stations were taken on previously dry land. Either the benthos survived the three-month dewatered period or they moved rapidly into the reinundated areas.

CONCLUSION

On the basis of these investigations it was surmised that this type of drawdown did not depress the benthic populations. In fact, the populations may actually increase as a result of such a drawdown.

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PRELIMINARY EXPERIMENTS IN THE ARTIFICIAL PROPAGATION OF STRIPED BASS, *ROCCUS SAXATILIS* *

BUFORD L. TATUM, JACK D. BAYLESS,
EDWARD G. MCCOY, AND WILLIAM B. SMITH

Division of Inland Fisheries
North Carolina Wildlife Resources Commission
Raleigh, North Carolina
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ABSTRACT

Adult striped bass purchased from commercial fishermen on Albemarle Sound, N. C. were transported to the Fayetteville and Weldon Hatcheries, injected with hormones, and spawned. In addition to ripe fish brought into the Weldon Hatchery by fishermen, sexually mature striped bass were obtained from the Roanoke River by electro-fishing gear. These fish, like those from Albemarle Sound, were injected with hormones, held in glass-front plywood aquaria (32" x 24" x 16"), and spawned. Excellent hatches were obtained from these eggs.

Laboratory experiments, confirmed by actual practice, indicated that striped bass eggs following six to 28 hours of incubation can be transported up to 12 hours in plastic bags containing water and oxygen with no significant increase in mortality.

Attempts to rear fry in aquaria failed although limited success was obtained in outdoor concrete pools. The fry in these pools began taking artificial food 28 days after hatching.

Several hundred fry also were reared in earthen ponds. Predation by *Chaoborus* spp. in these ponds proved especially serious during the sac-fry stage.

From various observations, it appeared that rapid changes in pH and/or other chemical characteristics were lethal to fry.

The 24-hour TL_m values were determined for Quinaldine, MS-222, salt, and pH using striped bass fingerlings as the test fish. The two-hour TL_m values also were determined. Quinaldine appeared to be superior to MS-222 as a tranquilizer for striped bass.

Experiments indicated that no mortality could be attributed to the handling of striped bass fingerlings per se.

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INTRODUCTION

The first striped bass hatchery was established by Mr. S. G. Worth in 1879 on the banks of the Roanoke River near Weldon, North Carolina.

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