A BIOLOGICAL STUDY OF THE CONECUH-ESCAMBIA RIVERS IN THE VICINITY OF BREWTON, ALABAMA, 1972

Prepared by

J. S. Dendy, Professor
J. M. Lawrence, Professor
David B. Rouse, Graduate Assistant
Charles J. Turner, Graduate Assistant
W. T. Dumas, III, Student

Department of Fisheries and Allied Aquacultures
Agricultural Experiment Station
Auburn University
Auburn, Alabama

January, 1973

INTRODUCTION

In 1972 a study which evaluated water quality by the presence of macroinvertebrate organisms was conducted on the Conecuh-Escambia River between Brewton, Alabama, and Escambia Bay, Florida, by personnel of the Department of Fisheries and Allied Aquacultures of Auburn University.

No ¶ The purpose of the study was to document the long-term effects on the river of the papermaking effluent from the Brewton Mill of the Container Corporation of America. The data from this study will be compared with data obtained on previous surveys.

Biological water quality is measured by several parameters. Classically, the concentration of dissolved oxygen is a major parameter and continued concentrations of 5 ppm or more oxygen are considered to be characteristic of good water quality. Since such data are measurements for the moments at which the samples were obtained, they do not tell what conditions existed over an extended period of time. However, organisms that live in the river have to endure conditions including whatever changes may occur. For this reason the organisms that can be found at any station reflect the conditions of minimal water quality that occurred over an extended period of time. Since organisms vary considerably in their tolerance of various conditions of low water quality, different organisms become parameters of conditions that have existed in the stream. In general a diversity of organisms is indicative of good quality of water, while lack of diversity, and yet possibly large numbers of certain kinds of organisms, is indicative of limiting conditions to which a few species are tolerant. Thus, variety rather than quantitative numbers of individuals becomes the parameter. In small streams that can be surveyed by wading, the sampling may be done by hand-picking of rocks, sticks, leaf masses, etc. In rivers too deep for this method, it is common practice to use added substrate material that can be placed in the stream and recovered after a given period of exposure for colonization by the organisms present. In this study multiple-plate samplers of plexiglass served as the substrate that was added. In addition some twig sampling was used for comparison with previous studies.

PROCEDURES

Sampling stations were located in the same general vicinity as those in the 1971 survey. The locations of all sampling stations are indicated in Figures 1 and 2, which are maps of the Conecuh-Escambia River. Table I provides a description of each station used in 1972, including some of the physical and hydrological features of each location. The mileage index used in this and preceding reports has been calculated using the Brewton Lake outfall as 0.0. Stations located upstream from the outfall have been assigned negative distances.

Most of the sampling was done by using multiple plate samplers made of three plexiglass disks separated by about 1/8 inch spacers. The upper and lower surfaces of the disks totaled 0.5 square foot per sampler. Each sampler was fastened to an anchor by a rope and was supported in the water by being tied to a float. Each anchor was tied by a rope to an overhanging tree or to a tree or stump on the bank. The samplers were exposed for a period of three weeks. When a sampler was picked up the anchor rope was used to lift the anchor until the sampler approached the surface of the water. The sampler was then placed in a plastic bag or a bucket before being removed from the river. The container and the sampler were kept cold and aerated at intervals until they could be taken to the laboratory to be processed. The processing involved removing the organisms and preserving them in alcohol. The larger individuals were removed first. Then the minute organisms were subsampled. Each subsample was 1/24 of the residue after the large animals were removed.

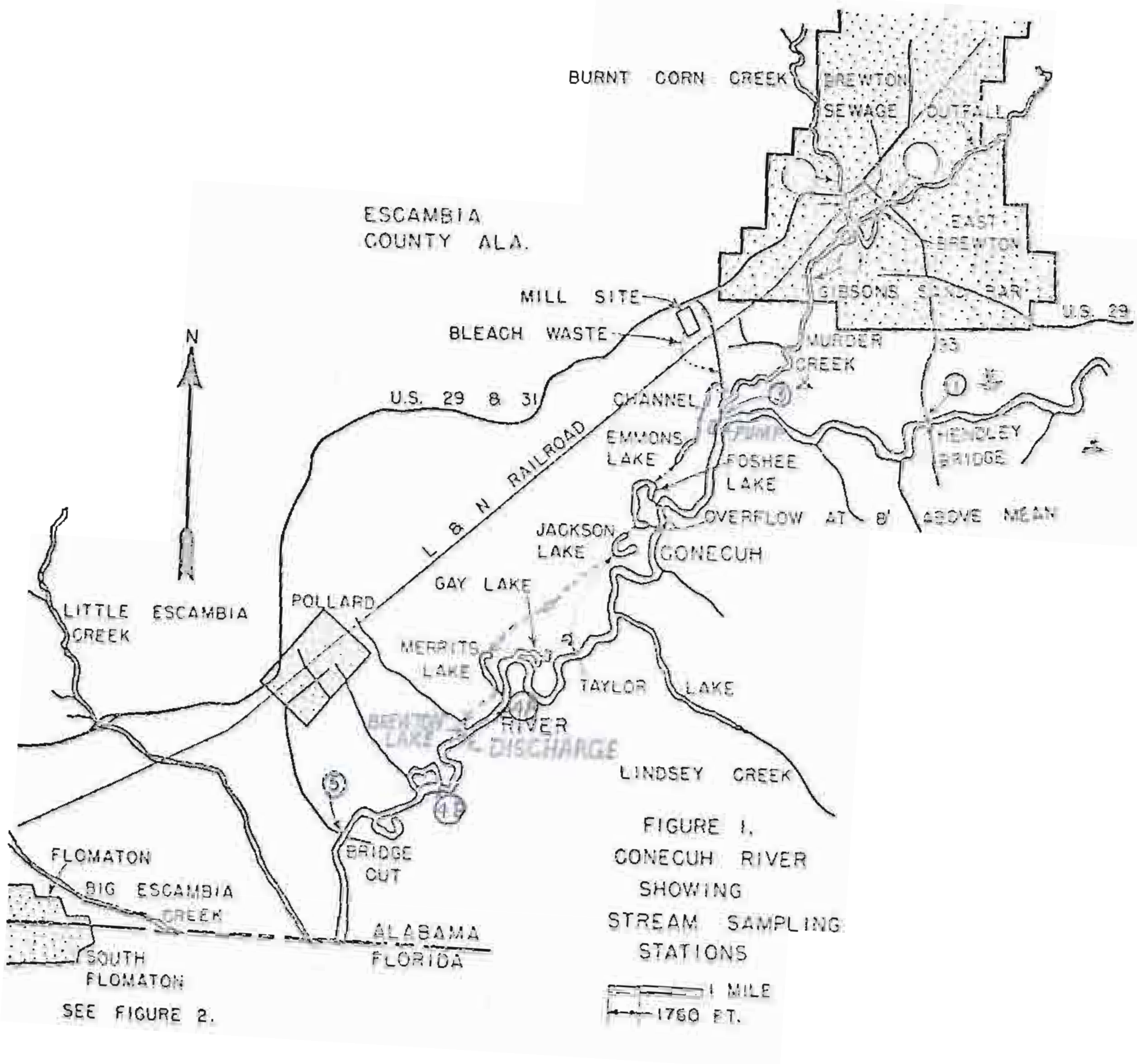

FIGURE 1.
CONECUH RIVER
SHOWING
STREAM SAMPLING
STATIONS

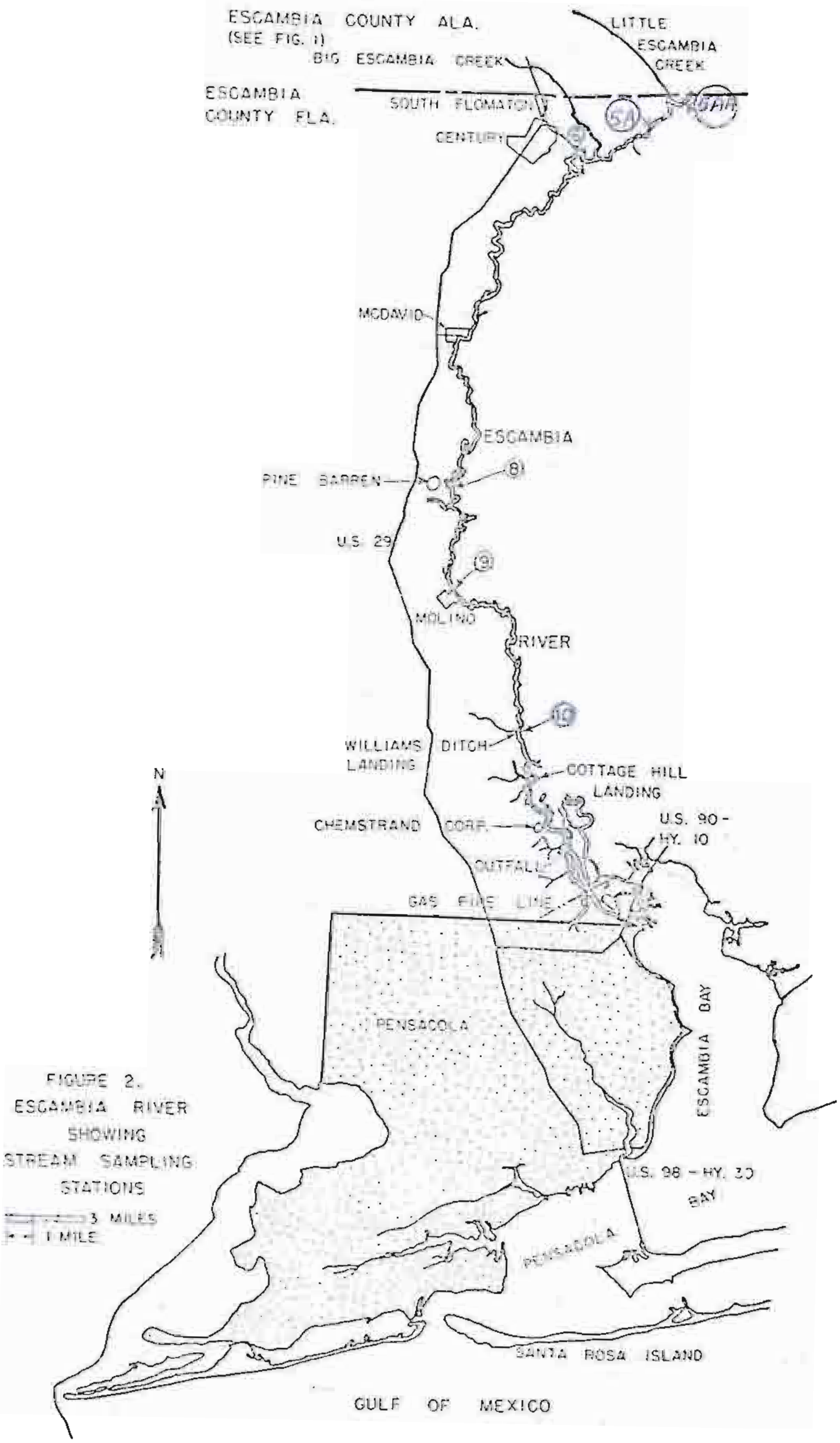

FIGURE 2.
ESCAMBIA RIVER
SHOWING
STREAM SAMPLING
STATIONS

TABLE I

STATION DESCRIPTIONS OF 1972 CONECUH-ESCAMBIA RIVER STUDIES

Samples Picked-Up July 20-21, 1972

Mileage Index[a]	Station	Description	Current	Location of Sample
-9.7	1	Edwards (Hendley) Bridge	Rapid	1/8-Mile downstream from bridge on right side of river
-6.9	3	Mouth of Murder Creek (in creek)	Rapid	Immediately upstream from CCA pumping station
-.5	4A	1/2 mile upstream from Brewton Lake outfall	Rapid	Right side of river
1.0	4B	1 mile downstream from Brewton Lake outfall to allow mixing	Rapid	Right side of river
1.5	5	Pollard, Alabama	Rapid	Right side of river
3.1	5AA	1/8 mile upstream from mouth of Little Escambia Creek	Rapid	Right side of river
5.2	5A	Midway between Pollard and Century	Rapid	1/4 mile downstream from aerial pipeline crossing right side of river
8.6	6	Century Bridge, Florida	Rapid	Downstream from bridge on right side of river
13.5	7A	Bluff Springs	Rapid	Downstream from landing on right side of river
--	7	McDavid, Florida	Rapid	Immediately upstream from mouth of creek on right side of river
20.1	8	Pine Barren	Rapid	Left side of river
38.6	9	Molino	Rapid	Right side of river
--	10A	Cottage Hill Landing	Moderate - slow	Right and left sides of river

[a] Mileage based on Brewton Lake outfall as 0.0. Upstream distances expressed as negative.

Δ to MLA or CBE style

Reference publications used for identification of the animals were as listed below:

1. Beck, W. M., Jr., and Beck, E. R. 1966. Chironomidae (Diptera) of Florida. I. Pentaneurini (Tanypodinae). Bull. Fla. St. Mus. 10, no. 8: 305-379 pg.

2. Edmondson, W. T. 1959. Fresh-Water Biology, Second Edition. John Wiley and Sons, New York, 1248 pg.

3. Mason, William T., Jr. 1968. An Introduction to the Identification of Chironomid Larvae. Division of Pollution Surveillance, Federal Water Pollution Control Administration, U. S. Dept. of Interior, Cincinnati, Ohio. 89 pg.

4. Needham, J. G., and Needham, Paul R. 1938. A Guide to the Study of Fresh-Water Biology, Fifth Edition. Holden-Day Inc., San Francisco. 107 pg.

5. Parrish, F. K. 1968. Keys to Water Quality Indicative Organisms (Southeastern United States). F. W. P. C. A., U. S. Dept. of Interior.

6. Pennak, R. W. 1953. Fresh-Water Invertebrates of the United States. Ronald Press Company, New York. 740 pg.

7. Roback, S. S. 1957. The Immature Tendipedids of the Philadelphia Area (Diptera: Tendipedidae). Monograph of the Academy of Natural Sciences of Philadelphia, no. 9:1-152 pg., Pl. 1-28.

8. Sinclair, Ralph. 1964. Water Quality Requirements of the Family Elmidae (Coleoptera). Tennessee Stream Pollution Control Board, Tennessee Dept. of Public Health. 1-14 pg.

9. Townes, H. K., Jr. 1954. The Nearctic Species of Tendipedini Diptera Tendipedidae (=Chironomidae). The American Midland Naturalist, Vol. 34, no. 1:1-206 pg.

10. Usinger, R. L. 1956. Aquatic Insects of California. University of Cal. Press, Berkely and Los Angeles. 508 pg.

Stations above and below the outfall were sampled using the branch and twig method for comparison with past reports. The stations sampled with this method were stations 1, 5, 5A, and 6. These samples were processed in the same manner as was done for plate samples.

Some sampling was done along the margin of the water by walking on the sand or wading in shallow water and selectively picking up sand and debris from the water.

The multiple plate samplers were taken out of the water on July 20-21, and the replacements were taken out on August 11. The sampling along the margin was done July 20-21. Twigs were sampled on September 29.

After samples had been picked for macroinvertebrates the residues were examined to determine what microorganisms were present. Detailed identification of these forms was not attempted.

OBSERVATIONS AND DISCUSSION

The present study of biological water quality relies chiefly on variety of resident macroscopic invertebrate organisms, collectively called the benthos, as parameters of conditions that allowed them to exist in the river prior to sampling. Of these organisms some kinds, recognized as intolerant forms, cannot survive in water of poor quality, especially in low concentrations of dissolved oxygen. Some kinds are capable of surviving in a moderately wide range of environmental conditions and are termed tolerant. Still other kinds are very tolerant of a wide range of often stressful conditions.

When representatives of a small number of very tolerant species become very abundant the population is considered as a parameter of quite poor environmental conditions. A population of tolerant and possibly some very tolerant organisms, especially when several kinds are present, is a parameter of better water quality. The presence of intolerant organisms is usually accompanied by a wide variety of tolerant, and occasionally even some very tolerant kinds. These principles were developed in streams with headwaters in mountains. Pools and riffles resulted from the presence of outcropping rocks and the bottom included various degrees of gravel, sand and mud. These were trout waters. Trout and most trout food organisms require cool water and an abundance of dissolved oxygen. Even in such streams, of the various types of habitats that are available sand bottoms are the least productive of bottom organisms.

The river bottom in the area studied was composed almost entirely of shifting sand. During periods of high water, such as were encountered in this study, the current was swift and the capacity for transporting sand was great. The scouring effects of such conditions limited the population of benthos. Moffett (1936) recorded the depletion of stream benthos by the scouring effects of floods. In other situations the plexiglass disks of the plate samplers exposed in streams that did not have such sandy bottoms became well populated with benthic organisms. Examination of the surfaces of the disks that had been exposed in the Conecuh-Escambia River revealed that few organisms were able to attach and most of the organisms were on the top surface of the top disk. However, under the conditions in this study the current was strong enough to overcome the upward pull of the float and cause the "top" disk to be the downstream disk and the top surface to be the area least exposed to direct action of the current and most exposed to eddy conditions that would have less scouring effect to dislodge organisms. It may be mentioned here that the fibers of the ropes that were used to attach anchors and samplers appeared to offer good places for attachment of claws of caddis larvae. At least on some of these ropes net-building caddis larvae were abundant. Also, the edges of the disks of plexiglass had been smoothed by use of sandpaper. Frequently those edges were populated more densely than were the upper and lower surfaces. Since the edges were not included in the 1/2 square foot of surface normally used in this type of sampling, the organisms on the edges were observed but were not included in the samples.

In general the Conecuh-Escambia River in the areas studied was a physically poor habitat for the development of benthos. The categories "balanced, unbalanced, semipolluted, and polluted" do not seem to describe the situations that were encountered.

The stream did not show degradation as a result of pollution. Rather the populations appeared to exhibit more or less degree of recovery from scouring effects of periodic flooding. The physical conditions appeared to be the chief limiting factors that prevented development of a "good" population of benthos. The sandy bottom and strong current probably were important factors. Twigs, stumps, and logs appeared to be the best sites for development of populations of aquatic insects. In time even these sites became coated with fine sand and mud, no longer supported good populations. Numerous old branches and small logs were examined. All were coated with accumulations of "mud" and were inhabited only sparsely with benthos. Recently submerged material, such as strings and ropes used to hold anchors or samplers, sometimes were populated densely with caddis larvae.

The effects of the CCA effluent in the canal from Brewton Lake and immediately downstream from its mouth indicated some degree of pollution, but elsewhere downstream no effect of CCA effluent on the benthos could be demonstrated. Reduction of concentration of dissolved oxygen, the most commonly used parameter of the effects of pollution, did not occur downstream from the outfall. The concentration of oxygen was 6.5 ppm in the river upstream from the point of entrance of the CCA effluent, while it was 7.0 where mixing occurred downstream from that point.

At the lower stations, where the river was larger and other effluents entered the stream, the effect of the CCA effluent could not be demonstrated. The populations of benthos did not improve as depth of water increased.

Samples of the fish populations at Station 1 and further downstream indicated that the standing crop of fish was quite low. After studying the populations of invertebrate organisms that might serve as food for fish in the river, only a low carrying capacity for fish could be expected.

Comparisons of 1971 and 1972 results given below are indicated according to the "intolerant, tolerant and very tolerant" designations in the 1971 report. However, as footnoted in Table II, it seems more realistic to disagree with designation of at least 11 genera and to follow the designation presented in the "Flint River Basin Study" of the Georgia Water Quality Control Board dated 1972.

Station 1.

Because station 1 was upstream from any pollution from Brewton or CCA, the biological water quality was assumed to be higher there than at stations farther downstream

The presence in 1971 of 25 genera (including 2 kinds of stoneflies, 4 kinds of mayflies,1 kind of dobsonfly, 7 kinds of caddisflies, 3 kinds of beetles, 1 kind of dragonfly, 1 kind of blackfly, 5 kinds of chironomids, and 1 kind of snipefly) gives documentary evidence of reasonably high water quality, and that those collections included twigs in the upper layers of water where scouring effects were minimal.

TABLE II
MACROINVERTEBRATES

[illegible] ORGANISMS

	Station	1	2	3	4	5	5AA	5A	6	7A	7	8	9	10
	Year	71 72	71 72	71 72	71 72	71 72	71 72	71 72	71 72	71 72	71 72	71 72	71 72	71 72
Plecoptera														
Acroneuria		X O	X O	X O	X O	X O	O O	O O	X X	O O	X O	X O	X O	O O
Allocapnia		O O	O O	O O	O O	O O	X O	O O	O O	O O	X O	X O	X O	O O
Paragnetina		X O	X O	X O	X O	X O	X O	X O	X O	X O	X O	X O	X O	O O
Ephemeroptera														
Baetis[1]		X O	X O	X O	X O	X O	X O	X O	O O	X O	X O	X O	X O	X O
Caenis		O O	O O	O O	O X	O X	O X	O O	O X	O X	O O	O O	O O	O O
Centroptilum		X O	O O	O O	O O	O O	O O	O O	O O	O O	O O	O O	O O	O O
Ephemerella		O O	O O	O O	O O	X O	O O	O O	O O	O O	O O	O O	O O	O O
Heptagenia[1]		O O	O O	X O	O O	X O	X O	O O	X O	X O	X O	X O	X O	X O
Hexagenia		O O	O O	O O	O O	O O	O O	O O	O X	O O	O O	O O	O O	O O
Isonychia		O O	O O	X O	O O	O X	X O	O O	O O	O O	O O	O O	O O	X O
Pseudocloeon		O O	X O	O O	O O	O O	O O	O O	O O	O O	O O	O O	O O	O O
Stenonema[1]		X X	O O	X O	X O	X X	X X	X X	X O	X O	X O	X O	X O	X O
Tricorythodes		X X	X O	O O	X X	O X	X X	X O	X X	X O	X X	X O	X X	X X
Unidentified nymphs		O O	O O	O O	O O	O O	O O	O O	O O	O O	O O	O O	O O	O O
Megaloptera														
Corydalus		X X[1]	X O	X O	X O	X X[1]	X O	X O	X O	X O	X O	X O	X O	X O
Trichoptera														
Agraylea		O O	X O	O O	O O	O O	O O	O O	O O	O O	X O	X O	X O	O O
Athripsodes		X O	X O	X O	X X[1]	X O	X O	X O	O O	X O	X O	X O	X O	O O
Brachycentrus		O O	O O	O O	O O	O O	O O	O O	O O	O O	X O	O O	O O	O O
Cheumatopsyche[1]		X O	X O	O O	O O	X O	X O	X O	O O	X O	X O	X O	X O	X O
Chimarra		X O	O O	O O	O O	O O	O O	O O	O O	X O	X O	X O	X O	X O
Cyrnellus		O O	O X	O O	O O	O O	O O	O O	O X	O O	O O	O O	O O	O X
Hydropsyche[1]		X X	X X	X X	X X	X X	X O	X X	X X	X X	X X	X X	X X	X O
Leptocella		O O	O O	O O	O O	O O	O O	O O	O X	O X	O O	O O	O O	O O
Leucotrichia		O X[1]	O O	O O	O O	O O	O O	O O	O O	O O	O O	O O	O O	O O
Macronemum		X O	O O	X O	O O	X O	X O	O O	X O	X O	X O	O O	X O	X O
Neureclipsis		O O	O O	O O	O O	X O	X O	O O	O O	O O	O O	O O	O O	O O
Protoptila		O O	O O	O O	O O	O O	O X	O O	O O	O O	O O	O O	O O	O O
Oecetis		X O	X O	O O	O O	X X	X X	O X[1]	O O	O O	X O	X O	X O	X O
Polycentropus		O O	O O	O O	O O	O O	O O	O O	O X[1]	O O	O O	O O	O O	O O
Psychomyia		O O	O O	O O	O O	O O	O O	O O	O O	O O	X O	X O	O O	O O
Triaenodes		X O	O O	O O	O O	O O	X O	O O	O O	X O	O O	O O	X O	O O

TABLE II (CONTINUED)

INTOLERANT ORGANISMS

	Station	1	2	4a	4b	5	5AA	5A	6	7A	7	8	9	10
	Year	'71 '72	'71 '72	'71 '72	'71 '72	'71 '72	'71 '72	'71 '72	'71 '72	'71 '72	'71 '72	'71 '72	'71 '72	'71 '7[illegible]
Coleoptera														
Ancyronyx[1]		O O	O O	O O	O X	O O	X O	O O	O O	O O	O O	O O	X O	O [illegible]
Dubiraphia[1]		X O	X O	O O	O O	X O	X O	O O	X O	O O	X O	X O	O O	X [illegible]
Gonielmis[1]		X X[1]	X O	O O	O O	O O	X O	O X[1]	X O	O O	X O	O O	O O	O [illegible]
Microcylloepus[1]		O O	O O	O O	O O	O X[4]	O O	O O	O O	O O	O O	O O	O O	O [illegible]
Stenelmis[1]		X X[1]	X O	X O	X O	X O	X O	X O	X X	X O	X O	X O	X O	X [illegible]

TOLERANT ORGANISMS

	1	2	4a	4b	5	5AA	5A	6	7A	7	8	9	10
Odonata													
Zygoptera													
Boyeria	O O	O O	O O	O O	O O	O O	O O	O O	O O	X O	O O	O O	O [illegible]
Gynacantha	O O	O O	O O	O O	O O	X O	O O	O O	O O	O O	O O	O O	O [illegible]
Hetaerina	O O	O O	O O	O O	X O	O X	O O	O O	O O	X O	O O	O O	O [illegible]
Ishnura	O O	O O	O O	O O	O O	O O	O O	X O	O O	O O	O O	O O	O [illegible]
Anisoptera													
Macromia	X O	X O	O O	X X[5]	X O	X O	X O	X O	X O	X O	X O	X O	X [illegible]
Neurocordulia	O O	O O	O O	O O	O O	O O	O X[4]	O O	O O	O O	O O	O O	O [illegible]
Coleoptera													
Gyrinus	O O	O O	X O	O O	O O	O O	O O	O O	X O	X O	O O	O O	O [illegible]
Diptera													
Ceratopogonidae													
Unidentified Ceratopogonids	O X[1]	O O	O X	O O	O X[4]	O X	O X[4]	O O	O O	O O	O O	O O	O O
Atrichipogon	O O	O O	O O	O O	O O	O O	O X[4]	O X[4]	O O	O O	O O	O O	O O
Chironomidae													
Ablabesmyia	X O	X O	O O	O O	O O	O O	O O	X O	O X	O O	O O	O O	O O
Calopsectra (= Tanytarsus)	X X	X X	X O	O O	O X	X X	X X	O X[4]	X X	X O	X X	X O	X O
Conchapelopia	O O	O O	O O	O O	O O	O O	O X[4]	O O	O O	O O	O O	O O	O O
Corynoneura	O O	O O	O O	O O	O O	O O	O O	O O	O O	O O	O X	O O	O O
Cricotopus	O X[4]	O X	O O	O O	O X[4]	O O	O X	O X[4]	O O	O O	O O	O O	O O
Cryptochironomus	O O	O O	O O	O O	O X[4]	O O	O O	O X	O O	O O	O O	O O	O O
Dicrotendipes	O X[4]	O O	O O	O O	O X[1]	O O	O O	O O	O O	O O	O O	O O	O O
Nanocladius	O O	O X	X X	O O	O O	O O	O O	O O	O O	O O	O O	O X	O X
Orthocladius	O O	O X	O O	O O	O O	O O	O O	O O	O O	O X	O O	O O	O O
Pentaneura	O O	O O	O O	O X[4]	O O	O O	O X[4]	O O	O O	O O	O O	O O	O O
Polypedilum	X X[4]	X O	X X	X O	O X	X X	X X	X X[4]	X X	X O	X O	X X	X O
Prodiamesia	O X[4]	O O	O O	O O	O O	O O	O O	O O	O O	O O	O O	O O	O O
Psectrocladius	X O	X O	O O	X O	X X	O O	O O	X O	X O	X O	X O	X X	O O
Stenochironomus[2]	X X[4]	O O	O O	O O	O O	O O	O O	O X[4]	O O	O O	O O	O O	X O

TABLE II (CONTINUED)

TOLERANT ORGANISMS

	Station	1		3		4a		4b		5		5AA		5A		6		7A		7		8		9		10	
	Year	'71	'72	'71	'72	'71	'72	'71	'72	'71	'72	'71	'72	'71	'72	'71	'72	'71	'72	'71	'72	'71	'72	'71	'72	'71	'72
iptera																											
Empididae																											
Hemerodromia		O	X	O	O	O	O	O	O	O	X[4]	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Rhagionidae																											
Atherix		X	O	X	O	O	O	O	O	X	O	X	O	O	O	O	O	X	O	O	O	O	O	X	O	O	O
Simuliidae																											
Simulium		X	O	X	O	X	O	X	O	X	X	X	O	X	O	X	O	X	O	X	X	X	X	X	O	X	O

VERY TOLERANT ORGANISMS

	Station	1		3		4a		4b		5		5AA		5A		6		7A		7		8		9		10	
	Year	'71	'72	'71	'72	'71	'72	'71	'72	'71	'72	'71	'72	'71	'72	'71	'72	'71	'72	'71	'72	'71	'72	'71	'72	'71	'72
iptera																											
Chironomidae																											
Brillia		O	O	O	O	O	O	O	O	O	O	O	O	O	X[4]	O	O	O	O	O	X	O	O	O	O	O	O
Chironomus		O	O	O	O	O	O	X	X[5]	O	X[4]	O	O	O	O	O	X[4]	O	O	O	O	O	O	O	O	O	O
Glyptotendipes		O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	X	O	O	O	O	O	O	O	O	O	O
Tanypus		O	O	O	O	O	O	O	X	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O

1. Organisms classified as intolerant which we called tolerant
2. Organisms classified as tolerant which we called very tolerant
3. Organisms not found in this region
4. Organisms found on twigs, etc.
5. Plate sample from Brewton Lake outfall collected in September, 1972.

The absence of certain kinds of organisms from plate samplers and from twig samples in 1972 was not taken to indicate presence of pollution but was thought to indicate the effects of flood conditions that existed at the beginning of the sampling period.

Station 3.

The larger number of genera (22) obtained in 1971 than (6) in 1972 did not seem to indicate difference in water quality but rather the difference in sampling method, especially the depths at which samples were obtained. In 1972 no sampling of twigs was done at this station. Of the groups of organisms obtained from this station, 2 were intolerant and 4 were tolerant. None of the very tolerant group was included. Moderately good conditions were indicated by these data.

Station 4A.

The 1971 sampling included 11 genera of intolerant and 5 genera of tolerant organisms, but none that was very tolerant. In 1972 no intolerant organisms were found. There were 4 genera of tolerant forms and no very tolerant. Moderately good conditions were indicated by these data.

Station 4B.

In 1971 the samples included 9 intolerant and 4 tolerant genera. In 1972 the samples included 4 intolerant, 2 tolerant, and 2 very tolerant genera. The very tolerant organisms were chironomid larvae that are more or less typical of oxygen-poor habitats. Such organisms would not have been expected in 1971 populations from twig samples. The presence of more intolerant than tolerant genera indicates reasonably good water quality.

Immediately downstream from the point of entrance of the Brewton Lake outfall into the river, there was some accumulation of dark organic material near the right bank. The outfall water had kraft odor and was dark in color. There was only a minor amount of foam on top of the water.

Station 5.

In 1971 the samples included 15 intolerant and 5 tolerant genera. In 1972 the samples included 6 intolerant, 9 tolerant, and 1 very tolerant genera. From these data conditions at this station 1.5 miles below the Brewton Lake outfall were somewhat better than at Station 4B.

Station 5AA.

In 1971 the samples included 19 intolerant and 5 tolerant genera. In 1972 the samples included 5 intolerant and 4 tolerant genera. At this station 3.1 miles below Brewton Lake outfall conditions appeared to be about as good as at Station 5.

Station 5A.

Stations downstream from 5AA are beyond the influence of CCA effluents. In 1971 the samples included 10 intolerant and 4 tolerant genera. In 1972 the samples included 4 intolerant and 8 tolerant genera and 1 very tolerant genera. There appeared to have been some decline in water quality at this station in 1972 as in 1971.

Station 6.

In 1971 samples included 12 intolerant and 6 tolerant genera. In 1972 the samples included 8 intolerant, 6 tolerant, and 2 very tolerant genera. This data indicate some improvement of conditions when compared with those at Station 5A.

Station 7A.

In 1971 the samples included 13 intolerant and 8 tolerant genera. In 1972 the samples included 3 intolerant, 3 tolerant and no very tolerant genera.

Station 7.

In 1971 the samples included 20 intolerant, 7 tolerant and no very tolerant genera. In 1972 the samples included 2 intolerant, 2 tolerant and 1 very tolerant genera.

Station 8.

In 1971 the samples included 17 intolerant and 5 tolerant genera. In 1972 the samples included 1 intolerant and 5 tolerant genera.

Station 9.

In 1971 the samples included 18 intolerant and 6 tolerant genera. In 1972 the samples included 2 intolerant and 3 tolerant genera.

Station 10.

In 1971 the samples included 13 intolerant and 5 tolerant genera. In 1972 the samples included 2 intolerant and 1 tolerant genera.

A histogram, Figure 3, summarizes the numbers of intolerant, tolerant, and very tolerant genera that were found at each station during the 1972 survey.

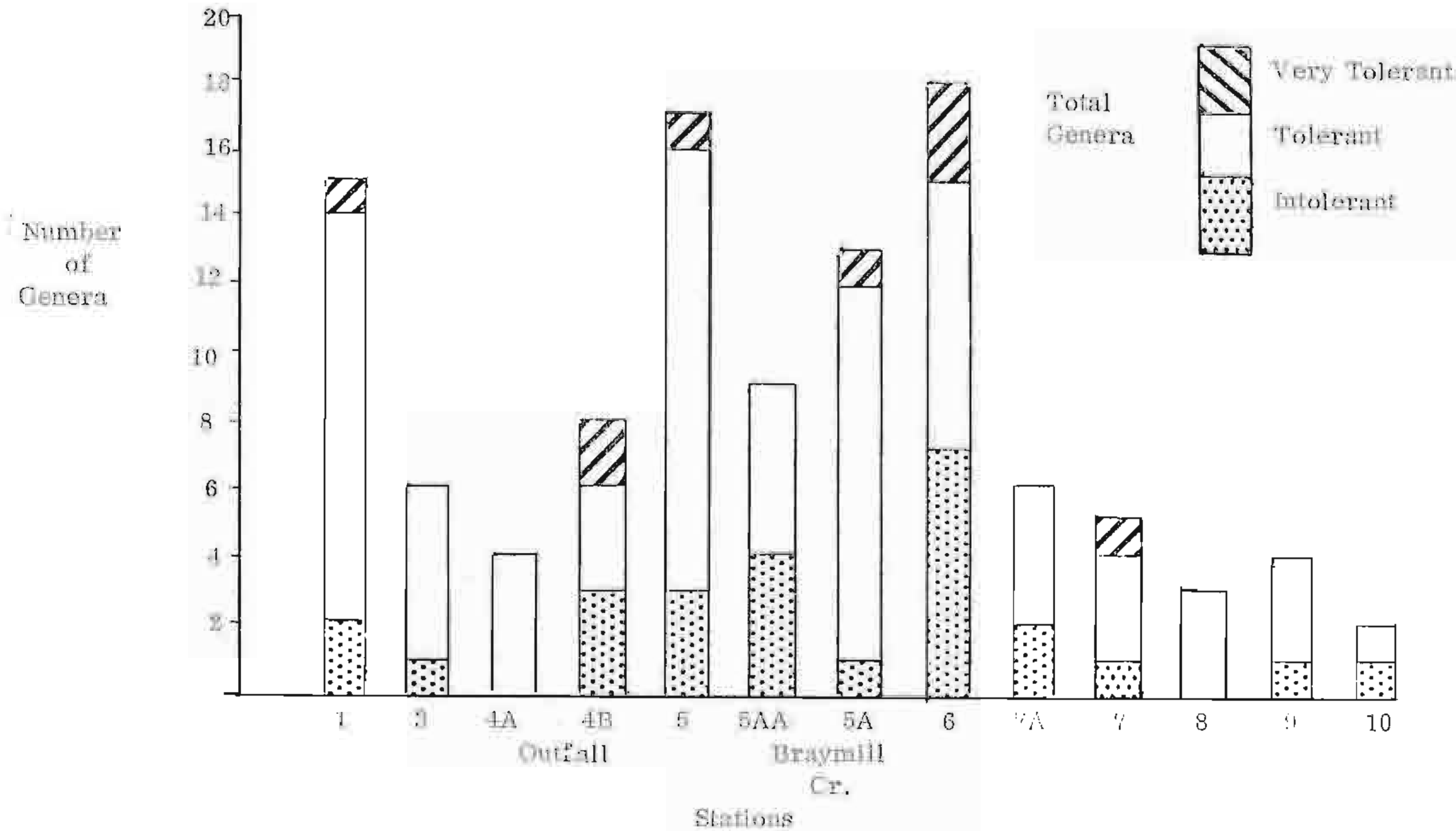

Figure3 . Histogram Illustrating Generic Diversity of Macrobenthos in the Conecuh- Escambia River - 1972

Additional collections made by walking along shore at Station 5 included organisms listed below:

Nemertea	*Prostoma rubrum*	
Oligochaeta	*Dero obtusa*	
Hirudinea	*Philobdella gracile*	
Mollusca	*Lymnaea*	
	Corbicula	
Arthropoda		
Crustacea	*Cyclops*	
Insecta		
Ephemeroptera	*Caenis*	
	Baetis	
Hemiptera	Coriadae	*Trichocorixa*
Coleoptera	Gyrinidae	*Dineutus*
Trichoptera	Leptoceridae	*Leptocella*
Diptera	Ceratopogoniiae	
	Chironomidae	
	Chironominae	*Chironomus*
		Polypedilum
		Cryptochironomus
	Tanypodinae	*Pentaneura*

A summary of the other groups of invertebrates that were collected at the various Stations during this survey is given in Table III.

Table III. Summary of Other Groups of Invertebrates Found on Conecuh-Escambia Rivers in 1972

Station	1	3	4a	4b	5	5AA	5A	6	7A	7	8	9	10
Turbellarians	X	X	X	X	X	X	X	X	X	X	X	X	X
Nematodes	X	X	X	X	X	X	X	X	X	X	X	X	X
Rotifers	X	X	X	X	X	X	X	X	X	X	X	X	X
Oligochaetes	X	X	X	X	X	X	X	X	X	X	O	X	X
Ostracods	O	O	O	X	X	X	X	X	O	O	O	O	O
Cladocerans	O	O	O	X	O	O	X	O	X	X	O	O	O
Copepods	X	O	O	O	X	O	O	X	O	X	O	O	O
Water Mites	X	X	X	X	X	O	X	O	X	O	X	X	O
Bivalve Molluscs	O	O	O	X	X	X	X	X	O	O	O	O	O
Total Groups per Station	6	5	5	8	8	6	8	7	6	6	4	5	4

X - Group present
O - Group absent

SUMMARY

Fifteen biological water quality studies have been conducted on the Conecuh-Escambia River between Brewton, Alabama, and Escambia Bay, Florida. The purpose of the 1972 study was to document the effect of treated pulp and paper-making wastes discharged from the CCA Brewton Mill upon the biological resources of the receiving stream. The 1972 data are compared with those of the 1971 survey to indicate whether any changes have occurred in the long-term quality of the river.

The only sampling method used in 1971 was the collection of organisms from submerged twigs. The numbers of different organisms from these twig samples indicated that effluent from the Brewton Lake outfall and Braymill Creek lowered the water quality of the Escambia River. The use of multiple plate samplers was the principle method of sampling in 1972. The deleterious effect of the strong current and its heavy load of sand was more pronounced in the results from the plate samplers than from the twig samples. It was concluded from the 1972 data that the current and sand were significant factors in limiting the benthic fauna. The numbers of different kinds of bottom organisms did not demonstrate any deleterious effect by the Brewton Lake outfall or Braymill Creek on the water quality of the river in 1972.

Station 1 at Edwards Bridge was upstream from Brewton and the CCA outfalls. This station offered control conditions for comparison with other stations.

Greater diversity of organisms in the 1971 survey than in the 1972 survey was

thought to be indicative of conditions near the surface (where minimal scouring occurred) and those near the bottom (in maximal scouring) respectively rather than changes in water quality during the interim between the two surveys.

While yearly sampling of macroinvertebrate populations of the Conecuh-Escambia Rivers might be historically desirable, in the opinion of the biologists involved in this study it is not a necessity. Rather, it is suggested that such studies be conducted every 3 to 5 years except in instances of suspected stream deterioration caused by effluent treatment failure, excessive domestic sewage releases, or other forms of pollution on the watershed.

Invertebrate form Collected by Mike Loden from mud sampling
on Conecuh River in vicinity of Pollards Landing
July 20, 1972

Nemertea	Prostoma rubrum			
Oligoctlaeta	Dero obtusa			
Hirudinea	Philobdella gracile			
Mollusca - Gastropoda -	Lymnaea sp			
Arthropoda				
Crustacea	Cyclops sp			
Insecta				
	Ephemeroptera	Caenis sp		
		Baetis sp		
	Hemiptera - Corixidae - Trichocorixa			
	Coleoptera - Gyrinidae - Dineutus			
	Trichoptera - Leptoceridae - Leptocella			
	Diptera	Ceratopogoninae sp		
		Chironomidae		
			Chironominae:	Chironomus
				Polypedilum
				Cryptochironom
			Tanypodinae:	Pentaneura

Container Corporation of America Project

June 29-30, 1972

Started on Conecuh River at Edward bridge on State 41 - River level 4' + above normal - muddy and swift - heavy rain delayed departure to set plate samplers in river. Water samples taken at:

Bridge on highway 41

Bridge at Pollard (muddy - no evidence of effluent in H_2O on this date.)

River at McDavid, Florida (muddy & swift)
H_2O temp 28.5° C
Air temp 25°
D.O. 7.2 ppm 0' to 5'

Container Corporation of America Project

July 19-20-21, 1972

River was clear and water level was normal and apparently falling slightly while plates were being picked up.

Shocked areas above State 41 bridge
Shocked areas below and above Pollard Landing

Water quality

7-20-72 Noon	above outfall	air temp. 31°	H_2O_2 temp. 28°
		D.O. 6 ppm 0' - 6 ppm 3'	
	Pollard ldg.	air temp. 31°	H_2O temp. 28°
		D.O. 7.1 ppm 0' - 6 ppm 3'	
	Pine Barren	air temp. 30°	H_2O temp. 29.0°
		D.O. 8 ppm 0' - 7.5 ppm 5'	

Shocking, Conecuh River, Pollard Landing

July 20, 1972

Species	Length, mm	Weight, gms
Largemouth bass	292	343
	298	373
	316	399
	317	404
	360	666
	382	861
Bluegill	148	49
	155	63
	165	68
	177	102
	193	126
	249	280
Redear	157	49
	228	221
Longear sunfish	93	16
	112	19
	150	58

Species	Length, mm	Weight, gms
Chain pickerel	451	580
Channel catfish	305	200
Blacktail redhorse sucker	239	126
	265	152
	265	164
	262	164
	272	170
	305	290
	306	264
	324	287
	335	323
	342	378
	343	395
Carp sucker	265	209
	265	229
	287	298
	287	327

Species	Length, mm	Weight, gms
Gizzard shad	268	145
	330	342
Mullet	525	1,127
Bowfin	412	709
	602	2,028
Longnose gar	879	1,920

Shocking, Conecuh River, Pollard Landing

July 20, 1972

Species	Length, mm	Weight, gms
Largemouth bass	292	343
	298	373
	316	399
	317	404
	360	666
	382	861
Bluegill	148	49
	155	63
	165	68
	177	102
	193	126
	249	280
Redear	157	49
	228	221
Longear sunfish	93	16
	112	19
	150	58

Species	Length, mm	Weight, gms
Chain pickerel	451	580
Channel catfish	305	200
Blacktail redhorse sucker	239	126
	265	152
	265	164
	262	164
	272	170
	305	290
	306	264
	324	287
	335	323
	342	378
	343	395
Carp sucker	265	209
	265	229
	287	298
	287	327

Species	Length, mm	Weight, gms
Gizzard shad	268	145
	330	342
Mullet	525	1,127
Bowfin	412	709
	602	2,028
Longnose gar	879	1,920