A Biological Study of the Conecuh - Escambia Rivers in the Vicinity of Brewton, Alabama, 1979

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Introduction

The 1979 study is the ninth yearly survey of water quality-biological productivity of the Conecuh-Escambia Rivers conducted by personnel of the Department of Fisheries and Allied Aquacultures of Auburn University. Prior to these studies on the stretch of these two rivers between Brewton, Alabama and Escambia Bay in Florida, the Institute of Paper Chemistry of Appleton, Wisconsin had conducted 15 surveys.

The primary objective of these yearly surveys is to determine if major changes in water quality or biological productivity are evident during periods of low river flow. The water quality survey is primarily concerned with nutrient analyses since chemists of Container Corporation of America maintain a constant surveillance on dissolved oxygen and carbon contents of these waters. Current biological studies utilize standardized sets of benthic plate samplers, placed at fixed stations, and for uniform periods of time each year.

The results obtained by the 1979 survey are summarized in this report. It is noted that the Conecuh-Escambia Rivers systems were again subjected to major flooding in the cooler months of 1979, but the water level during this year's sampling period was near normal for the season. Two sampling periods were employed in 1979 since a major fish kill, apparently due to ammonia, occurred between Murder Creek and the Century Bridge stations mid-way in the first plate sampling period.

Part I
Water Quality Data, Conecuh-Escambia Rivers, 1979

Water samples, for nutrient analyses, were collected at the time (June 12) the plate samplers were placed in the river by personnel of the Fisheries Department of Auburn University. A second set of water samples was collected on July 11 at the time the plate samplers were retrieved. The locations of the sampling stations are shown in Figures 1 and 2.

These water samples were collected from the surface of the rivers into 64-ounce Nalgene plastic bottles and stored in ice chests for their return to the laboratory.

The suspended matter in the water samples was removed in the laboratory by passing the water through a Type A-E Gelman glass fiber filter for carbon analyses and a 0.45 micron Millipore filter for phosphorus analyses. The glass fiber filters had been weighed prior to collecting the suspended matter samples. All pads were dried and again weighed. The weight of suspended matter was determined from these glass filter weight loss data. Loss on ignition was determined by ashing the glass filter pads. The Millipore filters were ashed and the residue was dissolved in 0.05 N HCl. The filtered water and digested suspended matter were analyzed separately for phosphorus. The filtered water was also analyzed for ammonia, nitrite and nitrate nitrogen.

The chemical data on the composition of filtered water and suspended matter (Tables 1 and 2) still indicated the relative impoverishment of soluble elements in the soils comprising the drainage basin of the Conecuh and Escambia Rivers.

The nutrient, i.e. nitrogen and phosphorus concentrations indicate that these river waters are still capable (nutrient-wise) of supporting a greater quantity of phytoplankton than were present during this survey. The velocity

Figure 1. Stream sampling stations on the Conecuh River.

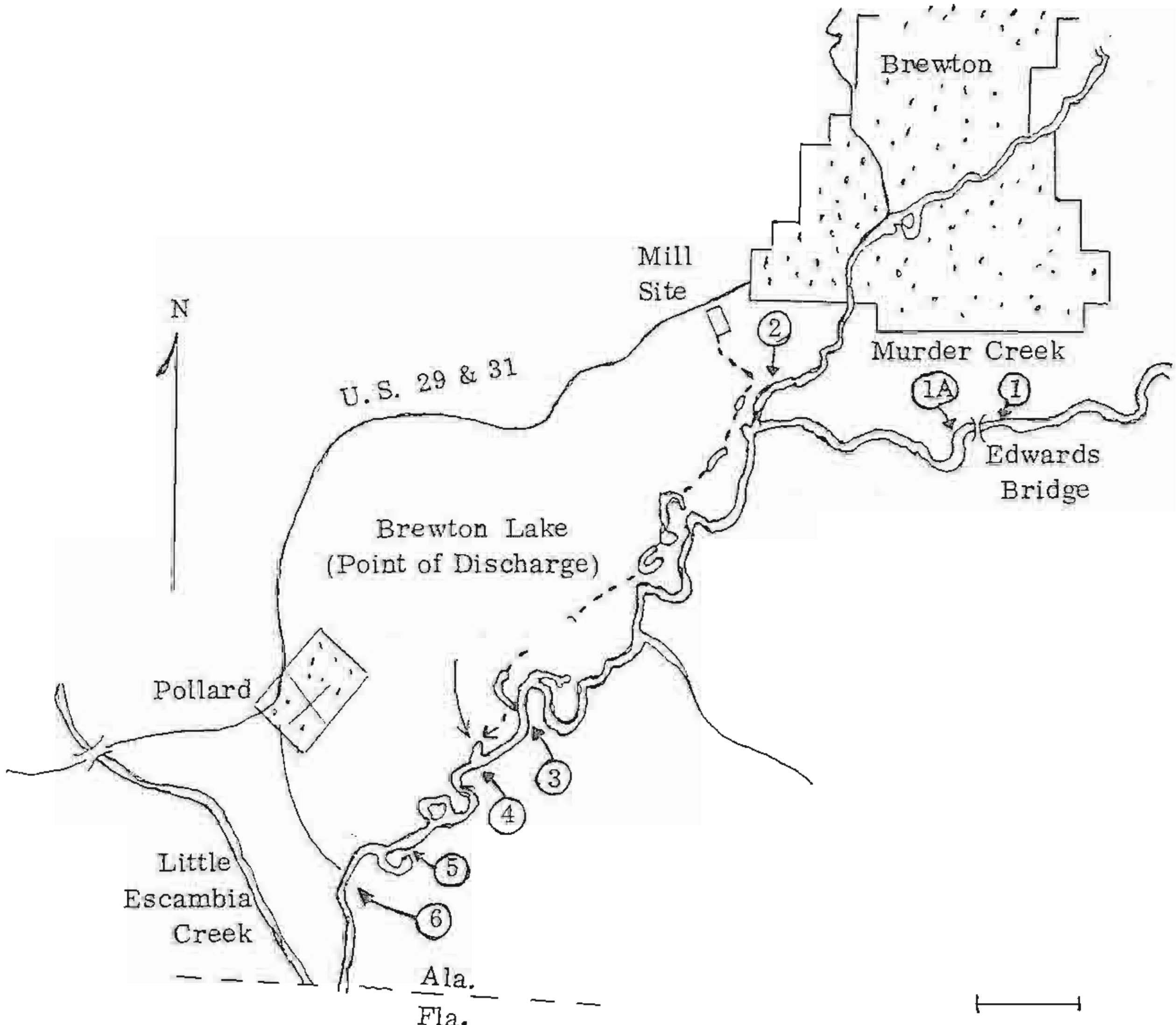

Figure 2. Stream sampling stations on the Escambia River.

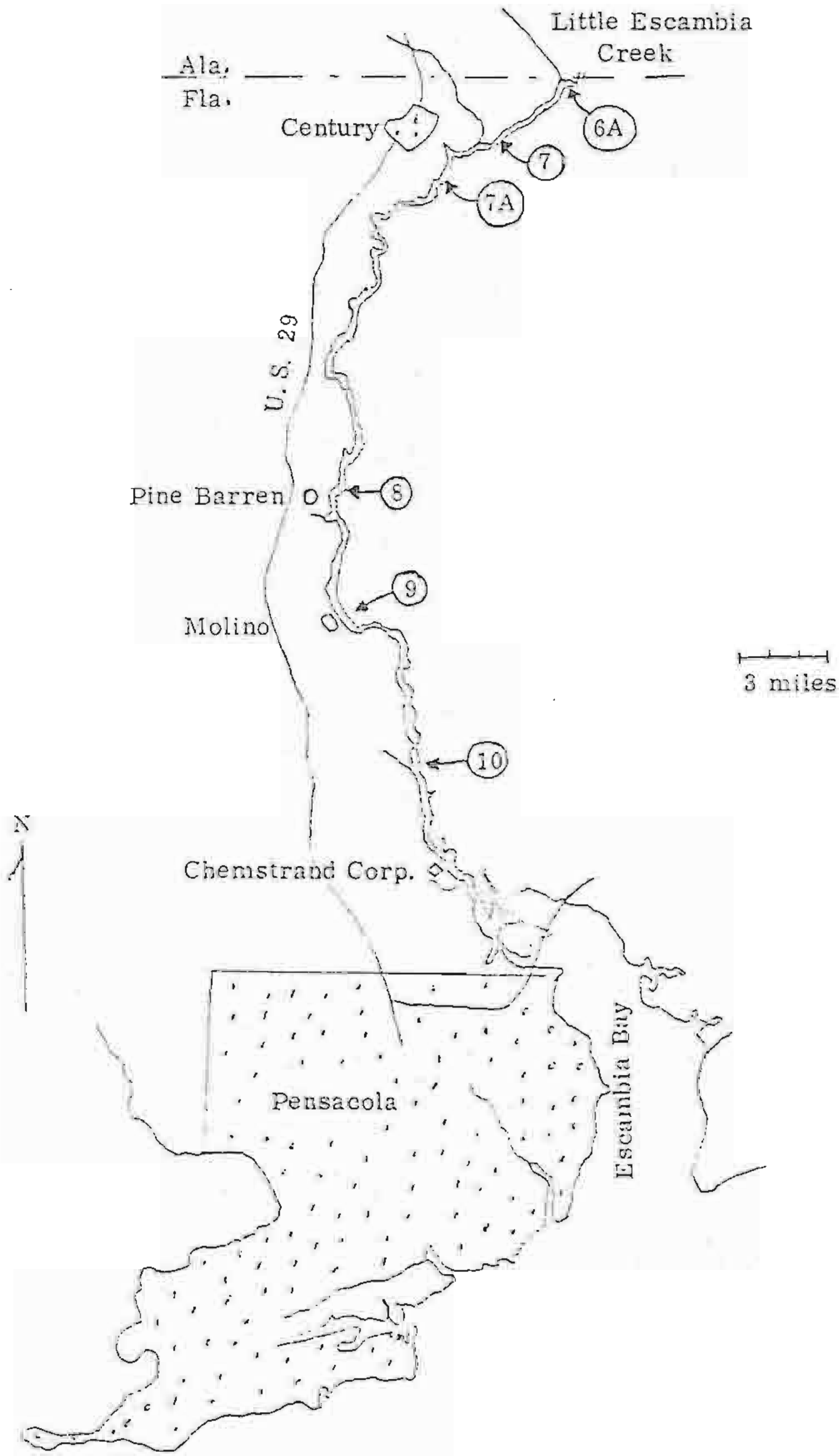

Table 1

Water Analyses

Conecuh-Escambia Rivers
June 12, 1979

Parameter	Sta. 1	Sta. 2	Sta. 3	Sta.10
pH	7.02	7.08	7.02	7.18
Total alkalinity, ppm $CaCO_3$	31.00	32.25	24.00	24.00
Free CO_2, ppm	3.74	3.52	2.42	2.62
NH_4, ppm	.088	.108	.088	.186
NO_2, ppm	.003	.003	.003	.003
NO_3, ppm	.190	.194	.215	.270
ortho P, ppm	.038	.023	.021	.019
Conductance, umhos	90.91	113.64	91.74	89.29
Turbidity, JTU	13.0	12.5	11.0	11.0
Temperature, ^{o}C	30.0	30.0		
D. O., ppm	7.0	6.9		
Total C, ppm	13.0	14.5	12.3	11.9
Inorganic C, ppm	6.3	6.4	5.1	5.0
Particulate C, ppm	3.89	5.03	4.73	2.63
Suspended matter, ppm	18.4	10.4	22.6	16.00

Table 2

Water Analyses

Conecuh-Escambia Rivers
July 11, 1979

Parameter	Sta.1	Sta.2	Sta.2	Sta.4	Sta.6	Sta.10
pH	6.65	7.11	7.25	6.79	7.00	7.05
Total alkalinity, ppm $CaCO_3$	28.25	15.75	17.00	24.00	23.75	23.25
Free CO_2, ppm	3.08	.88	.88	2.20	1.32	1.32
NH_4, ppm	.039	.184	.062	.031	.070	.047
NO_2, ppm	.003	.003	.003	.003	.003	.003
NO_3, ppm	.141	.152	.136	.139	.140	.162
ortho P, ppm	.008	.047	.031	.009	.010	.011
Conductance, umhos	54.95	39.84	42.92	48.08	74.63	67.11
Turbidity, JTU's	11.0	14.0	19.0	14.0	14.5	15.5
Temperature, ^{o}C	31.0			30.0	29.5	27.8
D.O., ppm	7.4			7.0	7.5	6.4
Total C, ppm	10.0	9.1	8.7	9.3	11.0	9.7
Inorganic C, ppm	5.7	3.3	3.3	4.5	5.2	4.5
Particulate C, ppm	.99	1.71	2.09	1.22	1.53	1.51
Suspended matter, ppm	4.62	5.46	7.52	4.36	4.14	5.24
Secchi disc, cm	60					75

of the current in each of the rivers was undoubtedly still responsible for the inadequate utilization of these nutrients.

For comparative purposes the nutrient passage at Century, Florida, expressed as pounds of nitrogen and phosphorus per square mile of drainage area per day for 1979 are given below. These data, of necessity, are based upon the average flow past the Century bridge.

Year	Lbs N/mi^2 drainage area/day* Century	Lbs P/mi^2 drainage area/day Century
1972	--	0.259
1973	3.58	0.092
1974	3.50	0.265
1975	5.45	0.022
1976	7.52	0.970
1977	6.792	0.770
1978	3.07	0.167**
1979	2.02	0.127**

*Based upon an average flow rate of 5,940 cfs and a drainage area of 3,817 square miles.

**This value is for ortho P flow only.

Part II
Fish Population Studies - Conecuh River, 1979

The same sites, i.e. above Edward's Bridge and between Pollard Landing and the Florida line, sampled in 1973 through 1978, were sampled on June 12, 1979. In 1979 only electrofishing was employed to sample the fish. Data on fishing success at each station in 1979 are presented in Tables 3 and 4. Information on size and condition of the individuals at each sample station were not determined in 1979 since state fishing regulations discourage the collecting and keeping of shocked fish.

The limited data available on game fish indicated that carnivorous species, such as largemouth bass, are able to maintain approximately average size, but the insectivorous species, such as bluegills, are below average size. This indicates that the relatively few bass present are able to find sufficient numbers of smaller fish to maintain their growth rate. The bluegills and other insectivorous species have a very limited food supply and this is reflected in their growth rate. It has been previously noted that the production of insectivorous species of fish is largely confined to the lakes in the adjoining flood plain, and that much of the river standing crop of bream migrated from the lakes during flood periods.

However, when the river was sampled on June 12, 1979 it appeared that the overall fish population was somewhat improved over prior years. Of course, the population within the Pollard area was eliminated by the fish kill on the weekend of June 24.

Table 3

Electrofishing Data

Edward's Bridge Area
June 12, 1979

1 hour of shocking

Species	Number
Largemouth bass	3
Redear sunfish	2
Longear sunfish	5
Rock bass	3
Highfin carpsucker	15
American eel	2
Mullet	1
Bowfin	1
Needlefish	2
Speckled madtom	2
Blackbanded darter	3
Notropis (a minnow)	24

Table 4

Electrofishing Data

Pollard Landing Area
June 12, 1979

1 hour of shocking

Species	Number
Largemouth bass	6
Black crappie	1
Bluegill	1
Redear sunfish	1
Longear sunfish	6
Chain pickerel	1
Bowfin	3
Spotted gar	1
Highfin carpsucker	3
Notropis (minnow)	40

Part III
Macroinvertebrate Populations in Conecuh - Escambia Rivers, 1979

In 1979 a study was again conducted to evaluate extended-term water quality by the presence of macroinvertebrate organisms in the Conecuh-Escambia Rivers between Brewton, Alabama and Escambia Bay, Florida, by personnel of the Department of Fisheries and Allied Aquacultures of Auburn University. The purpose of this study was to continue the documentation for any long-term effects upon aquatic organisms of paper-making effluents from the Brewton Mill of Container Corporation of America. This was the 24th biological survey of this river, thus abundant background data are available for long-term comparison.

Water quality suitable for the growth of aquatic biota is measured by several parameters. The concentration of dissolved oxygen is a major parameter, and continuous concentrations of 5 ppm or greater are considered to be characteristic of good water quality. Since measurements of the concentration of dissolved oxygen are generally for that moment of sampling, they do not reflect the conditions that might exist during an extended period of time. The organisms living in the river have to endure all conditions that exist throughout their life cycle. Therefore, the organisms that can be found at a specific location reflect the conditions of minimum water quality that existed in their lifetime. Since organisms vary considerably in their tolerance of various conditions of low water quality, different organisms become indicators of conditions that have existed in the stream. In general, a large diversity of aquatic organisms is indicative of good water quality, while lack of diversity, and yet possibly large numbers of individuals of certain organisms, is indicative of limiting conditions to which a few species are tolerant. Thus variety rather than quantitative numbers becomes the parameter.

In small streams that can be surveyed by wading, the sampling may be accomplished by hand-picking of organisms from rocks, sticks, leaf masses, etc. In rivers too deep to employ 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 and examined for colonization of organisms present. This technique is somewhat selective, but it is standardized and allows better comparisons between locations and over periods of time than hand-picking methods. In this study as well as in those conducted in 1971 through 1978, multiple plate samplers made of plexiglass served as the added substrate.

Procedures

Sample stations were located in the same general vicinity as those utilized in most previous surveys. The locations of all stations sampled in 1979 are shown in Figures 1 and 2 which are maps of the Conecuh and Escambia Rivers. Table 5 provides a description of each sampling station including the physical and hydrological features of each location. The mileage index used in this and all previous reports has been calculated using the Brewton Lake outfall as mile 0.0. Stations located upstream of the outfall have been assigned negative distances.

In 1979 a sampler consisted of a set of nine plexiglass plates separated by 1/8 inch-thick spacers. The upper and lower surfaces of each plate were sanded to give a textured surface for organism attachment. The total attachment surface area (exclusive of all edges) was 1.0 square foot.

Setting of each sampler was accomplished in such a manner as to suspend the plates 2 to 3 feet below the river surface and approximately the same distance above the bottom. This positioning was achieved by attaching the suspension line to a brightly colored 2-liter plastic float and then attaching a brick anchor separately to the float. An effort was made to locate each sampler on a site where the water depth was 5 or more feet.

In 1979 the first set of samplers was placed in the rivers on June 12. These samplers were retrieved on July 11. A second set of samplers was placed in the rivers on July 12 and retrieved August 9. In retrieving a sampler, the suspending line was slowly lifted until the sampler was just under the water surface, at which point the line from the sampler to the brick was cut. A one gallon wide-mouthed container was then slipped under the sampler and

Table 5 . Description of sampling stations on the Conecuh-Escambia Rivers, 1979.

Mileage index	Station	Location	Current	Location of Sample
-9.9	1	Edward's Bridge	Rapid	1/8 mile upstream on West bank
-9.7	1A	Edward's Bridge	Rapid	1/8 mile downstream on both sides of river
-6.9	2	Mouth of Murder Cr. (in creek)	Rapid	Immediately upstream from CCA pumping Sta.
-0.5	3	1/2 mile upstream Brewton Lake	Rapid	Both sides of river
0.3	4	1/4 mile downstream Brewton Lake outfall	Rapid	Both sides of river
1.0	5	1 mile downstream Brewton Lake outfall	Rapid	Both sides of river
1.5	6	Pollard Landing	Rapid	East side of river
3.1	6A	Above mouth Little Escambia Cr.	Rapid	Both sides of river
5.2	7	Overhead pipeline crossing	Rapid	Upstream pipeline both sides of river
8.6	7A	Century Bridge, Florida	Rapid	Downstream of bridge both sides of river
20.1	8	Pine Barren, Florida	Rapid	West side of river
38.6	9	Molino, Florida	Rapid	East side of river
	10	Cottage Hill Landing	Moderate	Both sides of river

*Mileage based on Brewton Lake outfall as 0.0. Upstream distances expressed as negative.

the discs and their contents were collected in this container of water. The container with its contents was stored in an ice chest until it could be returned to the laboratory. In the laboratory the contents were preserved with 10% formalin and the macroinvertebrates on the plates were removed, identified, sorted and counted. An indication of the groups of organisms recovered at each station is presented in Table 6. Detailed data on organisms captured by the multiple-plate samplers at each station are given in Appendix Tables.

Table 6. Number of genera captured at each station.

Organism		1	1A	2	3	4	5	6	6A	7	7A	8	9	10
Acari		1	1	1	0	1	0	1	0	1	0	1	0	0
Mollusca		1	3	0	1	2	1	0	0	0	1	1	0	1
Ephemeroptera		7	7	1	5	6	7	7	6	7	7	8	6	2
Trichoptera		11	10	2	5	7	7	7	9	10	11	8	5	4
Plecoptera		2	1	1	0	2	2	1	0	1	0	1	1	0
Odonata		1	1	0	0	1	1	0	0	0	1	1	0	0
Coleoptera		1	2	1	2	2	1	2	0	1	1	1	1	0
Megaloptera		1	0	1	2	2	2	2	0	1	1	1	1	0
Diptera		18	19	8	10	11	13	14	14	12	13	12	9	2
Total No. of genera	a*	41	44	15	22	34	31	27	14	33	29	32	23	0
	b	19	0	0	13	0	16	24	23	10	15	16	0	9
Av. No. of genera/ sampler		21	24	15	14	17	19	14	20	18	22	17	16	9
No. of samplers recovered	a	4	4	1	1	4	2	3	1	3	3	4	3	
	b	1		0	2		1	3	1	1	2	1	0	1

* a = 6-12-79 to 7-11-79 sampling date
b = 7-12-79 to 8-7-79 sampling date

Results and Discussion

Current studies relating biological productivity and water quality rely mainly on diversity of resident macroinvertebrate organisms collectively called benthos, as a measure of conditions that allowed them to exist in the river prior to and during sampling. Some kinds of these organisms, 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 over a wide range of often stressed conditions.

When representatives of a small number of very tolerant species become very abundant, the population is considered as an indicator of poor environmental conditions. A population of tolerant with some very tolerant organisms, especially when a number of kinds are present, is an indicator of better water quality. The presence of intolerant organisms is usually accompanied by a wide variety of tolerant and occasionally even some very tolerant forms. These principles were developed in streams with headwaters in mountains. These streams possessed pools with an abundance of riffles resulting from the presence of outcroppings of rocks and the bottoms included varying quantities of gravel, sand and mud. Even in such streams of the various types of habitats that were available, sand bottoms were the least productive of benthic organisms.

The river bottom within the area included in this study was composed almost entirely of shifting sands. During periods of high water the current is swift and the capacity for transporting sand is great. The scouring caused by such conditions limits the population of benthos. Moffett (1936) recorded the depletion of stream benthos by the scouring effects of floods. In other situations plexiglass discs exposed in streams that did not have such sandy bottoms became self populated with benthic organisms. Examination of the discs exposed in the Conecuh-Escambia Rivers revealed that few organisms were able to attach and many of the organisms were on the topside surface of the plate. Under the conditions of past studies the current was so swift that the samplers were pulled downstream and the topside of the plates were most protected from scouring. This was moderately pronounced in 1979 due to moderate water levels and strong currents.

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

The stream showed little degradation as a result of pollution. The physical conditions in the habitat appeared to be the chief factors that prevented development of a "good" population of benthos. The shifting sandy bottom and strong current were probably the most important limiting factors. Even under low-flow conditions, submerged twigs, logs and stumps appeared to be the best natural sites for the development of populations of aquatic insects. These sites were periodically subjected to coating by silt and excessive scouring by sand during periods of high water and subsequently became variably unsuitable habitats for benthic organisms.

In the 1979 survey the classification of the benthos follows the designation used in the Flint River Basin Study of the Georgia Water Quality Control Board dated 1972. A listing of representative macroinvertebrates included in each classification group was given in Appendix Tables in the 1978 report. Current references to taxonomic classification of the macroinvertebrates are included in this year's Appendix.

Data on aquatic macroinvertebrates collected by plate samplers at the various sampling stations on the Conecuh-Escambia Rivers during the 1979 surveys are presented in Appendix Tables. A summary of the numbers of different forms within various orders of aquatic insects collected at each station during 1979 is given in Table 7 . It is evident that the numbers of forms collected at the various stations varied considerably between the two sampling periods. These variations were probably associated with abrasive action of suspended particles carried by the river waters and with differences in air temperature between the two periods.

A summary of the numbers of intolerant, partially tolerant and tolerant forms present at each station during these two 1979 sampling periods is given in Table 8 . While it is evident that variation existed in the numbers collected during the two sampling periods, the data do show a rather consistent ratio between numbers of intolerant and partially tolerant forms for each period.

Macroinvertebrate populations below the Container Corporation discharge approximated those found both above the discharge and further downstream as evidenced by numbers of genera recovered at each station (Table 8). All stations throughout the sample area contained a diverse assemblage of intolerant Ephemeropterans, Trichopterans, Plecopterans and Odonates (Table 7).

In summary, the multiple-plate sampler data from the 1979 study did not reveal any deleterious effects of Container Corporation of America effluents on the biological water quality of the Conecuh-Escambia River system.

Table 7. Numbers of different forms within various orders of insects collected at each station in 1979.

Station	Date	Plecoptera	Ephemeroptera	Megaloptera	Trichoptera	Coleoptera	Odonata	Diptera	Total
1	7-11	2	7	1	10	1	1	14	36
	8-7	0	6	0	5	0	0	6	17
2	7-11	1	1	1	2	1	0	8	14
	8-7	No data							
3	7-11	0	3	1	4	2	0	10	20
	8-7	0	3	1	3	0	0	5	12
4	7-11	2	6	2	7	2	1	11	31
	8-7	No data							
5	7-11	2	7	1	7	1	1	11	30
	8-7	0	3	1	3	0	0	8	15
6	7-11	0	6	2	7	1	0	11	27
	8-7	1	6	0	4	2	0	10	23
6A	7-11	0	2	2	0	0	0	10	14
	8-7	0	6	8	0	0	0	9	23
7	7-11	1	7	1	10	1	0	12	32
	8-7	0	3	0	2	0	0	5	10
7A	7-11	0	5	0	11	1	1	11	29
	8-7	0	6	1	4	0	0	4	15
8	7-11	1	7	1	8	1	1	11	30
	8-7	0	4	0	4	1	0	6	15
9	7-11	1	6	1	5	1	0	9	23
	8-7	No data							
10	7-11	No data							
	8-7	0	2	0	4	0	0	2	8

Table 8. Numbers of genera of intolerant, partially tolerant and intolerant forms of macroinvertebrates collected in 1979.

Station	Intolerant	Partially Tolerant	Tolerant
1	6	24	2
1A	5	28	
2	1	8	1
3	2	20	1
4	5	20	2
5	7	18	2
6	6	19	2
6A	5	16	2
7	7	16	2
7A	7	22	1
8	7	18	1
9	5	15	2
10	1	4	

APPENDIX TABLES

Reference Publications Used for Identification of the Animals.

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Plate Sampler Collections, 1979
Station 1, Above Edwards Bridge

Organism	Tolerance	Av. No./ft² A (7-11)	B (8-7)
Acari		7	
Mollusca		T	
Gastropoda	PT	T	
Oligochaeta			1
Insecta			
Ephemeroptera			
Baetis	PT	29	4
Caenis	I	5	9
Heptageniidae		1	5
Isonychia	I	39	
Stenonema	PT	4	4
Tricorythodes	I	3	1
Unidentified		19	3
Megaloptera			
Corydalus	PT	T	
Trichoptera			
Cherimatopsyche	PT	2	
Chimarra	PI	30	1
Hydropsyche	PT	27	2
Hydropsychidae		49	13
Leptocellidae			1
Macronema	T	22	5
Nectropsyche	PT	T	
Neureclipsis	I	T	
Oecetis	I	3	
Philopotamidae		T	
Unidentified		25	
Plecoptera			
Acroneuria	I	T	
Unidentified		T	
Coleoptera		6	
Odonata		T	
Diptera			
Simulidae	T	25	13
Empididae		1	
Chironomidae			
Cladotanytarsus	PT		1
Corynoneura	PT	1	
Cricotopus	PT	17	
Cryptochironomus	PT	3	
Eukiefferiella	PT	3	
Nilotanypus	PT		1
Orthocladiinae	PT	5	
Paratanytarsus	PT	5	
Pentaneura	PT	1	
Polypedilum convictum	PT	40	5
Psectrocladius	PT	1	
Rheocricotopus	PT	7	
Rheotanytarsus	PT	31	15
Tanytarsini	PT	5	
Tanytarsus	PT	14	1
Thienemanniella	PT	16	1

Plate Sample Collections, 1979
Station 1A, Below Edwards Bridge

Organism	Tolerance	Av. No./ft² A (7-11)
Acari		1
Mollusca		
Gastropoda		
Physa	PT	1
Laevipex	PT	7
Pelecypoda	PT	1
Oligochaeta		
Insecta		
Ephemeroptera		
Baetis	PT	8
Caenis	I	11
Heptagenia	I	1
Heptageniidae		1
Isonychia	I	3
Stenonema	PT	4
Tricorythodes	I	6
Trichoptera		
Cheumatopsyche		T
Chimarra	PT	2
Hydropsyche	PT	1
Hydropsychidae		2
Hydroptilidae		T
Leptoceridae		T
Macroneura	PT	T
Nectropsyche	PT	T
Oecetis	I	3
Unidentified		119
Plecoptera		T
Coleoptera		
Dineutes	PT	T
Elmidae		T
Odonata		T
Diptera		
Chironomidae		
Ablabesmyia mallochi	PT	2
Chironomini	PT	4
Cladotanytarsus	PT	2
Corynoneura	PT	2
Cricotopus	PT	13
Cryptochironomus	PT	1
Dicrotendipes	PT	1
Eukiefferiella	PT	T
Orthocladiinae	PT	5
Paratanytarsus	PT	
Pentaneura	PT	1
Polypedilum	PT	3
Psectrocladius	PT	3
Rheotanytarsus	PT	4
Tanypodinae		2
Tanypus	PT	2
Tanytarsini	PT	6
Tanytarsus	PT	15
Thienemanniella	PT	3

Plate Sample Collection, 1979
Station 2, Murder Creek

Organism	Tolerance	Av. No./ft^2 A (7-11)
Acari		3
Insecta		
Ephemeroptera		
Unidentified		24
Megaloptera		
Corydalus		1
Trichoptera		
Hydropsyche	PT	48
Hydropsychiidae		48
Plecoptera		
Acroneuria	I	2
Coleoptera		
Elmidae	PT	3
Diptera		
Empididae		1
Simuliidae	T	144
Chironomidae		
Cricotopus	PT	75
Orthocladiinae	PT	75
Polypedilum	PT	75
Rheotanytarsus	PT	524
Tanytarsus	PT	37
Thienemanniella	PT	150

Plate Sample Collections, 1979
Station 3, Above CCA outfall

Organism	Tolerance	Av. No./ft^2	
		A (7-11)	B (8-7)
Acari			
Mollusca			
Pelecypoda	PT	1	
Oligochaeta			
Nematoda		2	12
Insecta			
Ephemeroptera			
Baetis	PT	15	
Caenis	I	1	
Heptagenia	I		T
Heptagenidae		2	12
Stenonema	PT		14
Megaloptera			
Corydalus	PT	1	
Sialis	PT		1
Trichoptera			
Brachycentridae		1	
Chimarra	PT	5	
Hydropsyche	PT	16	38
Hydropsychidae	PT	25	216
Nectropsyche	PT		12
Coleoptera			
Dineutes	PT	1	
Elmidae	PT	2	
Diptera			
Simulidae	T	10	528
Chironomidae			
Chironomini	PT	4	
Cricotopus	PT	7	
Cryptochironomus	PT	8	
Eukiefferiella	PT	4	12
Polypedilum	PT	35	36
Rheotanytarsus	PT	21	108
Tanytarsini	PT	4	
Tanytarsus	PT	4	
Thienemanniella	PT	4	24

Plate Sample Collections, 1979
Station 4, 0.3 mi. below CCA outfall

Organism	Tolerance	Av. No./ft² A (7-11)	B (8-7)
Acari		1	
Mollusca			
Ancylidae	PT	T	
Pelecypoda	PT	T	
Oligochaeta			
Insecta			
Ephemeroptera			
Baetis	PT	8	
Caenis	I	4	
Heptagenia	I	T	
Heptageniidae		1	
Stenonema	PT	7	
Tricorythodes	I	T	
Megaloptera			
Trichoptera			
Chimarra	PT	7	
Hydropsyche	PT	52	
Hydropsychidae		118	
Macronema	T	6	
Nectopsyche	PT	T	
Oecetis	I	16	
Unidentified		8	
Plecoptera			
Acroneuria	I	T	
Perlidae	I	T	
Coleoptera			
Dineutes	PT	1	
Elmidae	PT	T	
Megaloptera			
Corydalus	PT	T	
Nigronia	PT	T	
Odonata			
Zygoptera		T	
Diptera			
Empididae		1	
Simulidae	T	15	
Chironomidae			
Chironomini	PT	20	
Cladotanytarsus	PT	5	
Cricotopus	PT	1	
Corynoneura	PT	10	
Orthocladiinae	PT	10	
Polypedilum	PT	35	
Procladius	PT	T	
Rheotanytarsus	PT	327	
Tanytarsini	PT	5	

Plate Sample Collections, 1979
Station 5, 1 mi. Below CCA outfall

Organism	Tolerance	Av. No./ft² A (7-11)	B (8-7)
Acari			
Mollusca			
Pelecypoda	PT	T	
Oligochaeta			
Insecta			
Ephemeroptera			
Baetis	PT	T	9
Caenis	I	6	
Ephemera	I	T	
Heptagenia	I	1	
Stenonema	PT	16	7
Tricorythodes	I	2	
Unidentified		T	2
Megaloptera			
Corydalus	PT	T	
Sialis			T
Trichoptera			
Chimarra	PT	T	
Hydropsyche	PT	76	7
Hydropsychidae		14	23
Macronema	T	13	
Nectopsyche	PT	T	
Oecetis	I	T	
Unidentified		2	14
Plecoptera			
Aeroneura	I	T	
Perlidae	I	T	
Coleoptera			
Elmidae	PT	2	
Odonata			
Zygoptera	PT	T	
Diptera			
Simulidae	T	7	1
Chironomidae			
Chironomidae		16	
Chironomini		12	
Coryneura	PT		1
Cricotopus	PT	T	
Cryptochironomus	PT	1	
Nilotanypus	PT		1
Polypedilum	PT	67	1
Psectrocladius	PT	12	1
Rheotanytarsus	PT	51	4
Tanypodinae		1	1
Tanytarsus	PT	3	1
Thienemanniella	PT	1	1

Plate Sample Collections, 1979
Station 6, Pollard Landing

Organism	Tolerance	Av. No./ft^2 A (7-11)	B (8-7)
Acari			8
Mollusca			
Oligochaeta			
Insecta			
Ephemeroptera			
Baetis	PT	16	9
Caenis	I	1	8
Heptagenia	I	T	8
Heptageniidae			10
Stenonema	PT	17	9
Tricorythodes	I	4	
Unidentified		2	8
Megaloptera			
Corydalus	PT	T	
Nigronia	PT	T	
Trichoptera			
Hydropsyche	PT	89	22
Hydropsychidae		137	19
Macronema	T	T	
Nectopsyche	PT	T	
Neureclipsis	I	1	
Oecetis	I	2	T
Unidentified		27	1
Plecoptera			
Acroneura	I		T
Coleoptera			
Dineutis	PT		T
Elmidae	PT	T	T
Diptera			
Simuliidae	T	4	1
Chironomidae			
Chironomini	PT		8
Chironomidae		1	T
Corynoneura	PT	11	1
Cricotopus	PT	1	8
Cryptochironomus	PT	1	
Orthocladiinae	PT	2	8
Parachironomus	PT		1
Polypedilum	PT	27	26
Rheotanytarsus	PT	39	36
Tanypodinae		2	
Tanypus	PT	1	
Tanytarsus	PT	5	
Thienemanniella	PT		11

Plate Sample Collections, 1979
Station 6A, Little Escambia Creek area

Organism	Tolerance	Av. No./ft² A (7-11)	B (8-7)
Insecta			
Ephemeroptera			
Baetidae	PT		8
Caenis	I		3
Heptagenia	I		4
Heptageniidae			6
Stenonema	PT	2	12
Tricorythodes	I	1	2
Trichoptera			
Chimarra	PT		108
Hydropsyche	PT		5
Hydropsychidae			4
Macronema	T		1
Nectopsyche	PT		1
Neureclipsis	I	1	
Oecetis	I		1
Polycentropus			1
Unidentified		2	2
Diptera			
Simuliidae	T	3	2
Chironomidae			
Ablabesmyia	PT	2	
Chironomus	PT	1	
Cladotanytarsus	PT	1	
Cryptochironomus	PT		1
Dicrotendipes	PT		1
Orthocladiinae	PT	1	1
Polypedilum	PT	2	1
Psectrocladius	PT	3	
Rheotanytarsus	PT	2	11
Tanypodinae			1
Tanypus	PT	2	2
Tanytarsus	PT	4	
Ceratopogonidae			1

Plate Sample Collections, 1979
Station 7, Pipeline Crossing

Organism	Tolerance	Av. No./ft^2 A (7-11)	Av. No./ft^2 B (8-7)
Acari		T	
Insecta			
Ephemeroptera			
Baetidae	PT	T	24
Caenis	I	4	
Heptagenia	I	T	1
Isonychia	I	T	
Stenonema	PT	6	3
Tricorythodes	I	3	
Unidentified		1	
Megaloptera		T	
Trichoptera			
Brachycentrus		T	
Chimarra	PT	1	
Hydropsyche	PT	24	131
Hydropsychidae		16	76
Leptoceridae		T	
Macronema	T	1	
Nectopsyche	PT	T	
Neureclipsis	I	1	
Oecetis	I	3	
Unidentified		4	
Plecoptera			
Acroneura	I	T	
Coleoptera			
Elmidae	PT	1	
Diptera			
Simuliidae	T	8	72
Chironomidae			
Cricotopus	PT	2	
Corynoneura	PT	2	
Dicrotendipes	PT	3	
Orthocladiinae	PT	5	24
Polypedilum	PT	8	24
Psectrocladius	PT	T	
Rheotanytarsus	PT	14	24
Tanypodinae		T	
Tanypus	PT	5	
Tanytarsus	PT	11	
Thienemanniella	PT	T	24

Plate Sample Collections, 1979
Station 7A, Century, FL Bridge

Organism	Tolerance	Av. No./ft^2 A (7-11)	B (8-7)
Acari			
Mollusca			
Physa	PT	T	
Insecta			
Ephemeroptera			
Baetis	PT	T	5
Caenis	I	10	1
Heptagenia	I		1
Heptageniidae			3
Isonychia	I	1	
Stenonema	PT	17	6
Tricorythodes	I	4	24
Megaloptera			
Sialis	PT		T
Trichoptera			
Cheumatopsyche	PT	8	
Chimarra	PT	12	T
Hydropsyche	PT	37	3
Hydropsychidae		5	T
Leptoceridae		T	
Nectopsyche	PT	T	
Neureclipsis	I	T	
Oecetis	I	1	
Polycentropodidae		T	
Polycentropus	I	T	
Unidentified		10	48
Coleoptera			
Dineutes	PT	T	
Odonata			
Anisoptera	PT	T	
Diptera			
Simuliidae	T		
Chironomidae			
Ablabesmyia	PT	2	
Cladotanytarsus	PT	2	
Corynoneura	PT	17	
Cricotopus	PT	4	
Dicrotendipes	PT	6	
Orthocladiinae	PT	T	13
Pentaneura	PT		T
Polypedilum	PT	8	30
Psectrocladius	PT	29	
Rheotanytarsus	PT	33	9
Tanypus	PT	1	
Tanytarsus	PT	41	

Plate Sample Collections, 1979
Station 8, Pine Barren

Organism	Tolerance	Av. No./ft^2 A (7-11)	B (8-7)
Acari		T	
Mollusca			T
Oligochaeta		T	
Insecta			
Ephemeroptera			
Baetidae	PT	3	8
Caenis	I	7	
Heptagenia	I	T	2
Heptageniidae			4
Isonychia	I	4	
Stenonema	PT	5	4
Tricorythodes	I	1	
Unidentified		1	
Megaloptera			
Corydalus	PT	T	
Trichoptera			
Cheumatopsyche		6	1
Chimarra	PT	9	1
Hydropsyche	PT	63	35
Hydropsychidae		22	13
Hydroptila		T	
Nectopsyche	PT	T	
Oecetis	I	1	
Polycentropus	I	T	
Plecoptera			
Perlidae	I	1	
Coleoptera			
Elmidae	PT	T	1
Odonata		T	
Diptera			
Simuliidae	T	180	6
Chironomidae			
Abalbesmyia	PT	T	
Cladotanytarsus	PT	T	
Cricotopus	PT	9	
Cryptochironomus	PT	1	
Orthocladinae	PT		3
Polypedilum	PT	37	2
Psectrocladius	PT	11	1
Rheotanytarsus	PT	20	15
Tanypus	PT	3	
Tanytarsus	PT	11	
Thienemanniella	PT	2	7

Plate Sample Collection, 1979
Station 9, Molino, FL

Organism	Tolerance	Av. No./ft^2 A (7-11)
Insecta		
Ephemeroptera		
Baetidae	PT	11
Caenis	I	5
Heptagenia	I	T
Isonychia	I	3
Stenonema	PT	3
Tricorythodes	I	T
Megaloptera		
Corydalus	PT	T
Trichoptera		
Chimarra	PT	8
Hydropsyche	PT	4
Hydropsychidae		13
Macronema	T	T
Nectropsyche	PT	1
Plecoptera		
Acroneuria	I	T
Coleoptera		
Elmidae	PT	1
Diptera		
Simuliidae	T	15
Chironomidae		
Cricotopus	PT	1
Orthocladiinae	PT	T
Polypedilum	PT	6
Psectrocladius	PT	5
Rheotanytarsus	PT	9
Tanypus	PT	1
Tanytarsus	PT	1
Thienemanniella	PT	2

Plate Sample Collection, 1979
Station 10, Cottage Hill Landing

Organism	Tolerance	Av. No./ft^2 B (8-7)
Mollusca		
Laevapex		240
Insecta		
Ephemeroptera		
Heptagenia	I	1
Heptageniidae		24
Trichoptera		
Cheumatopsyche		1
Chimarra	PT	30
Hydropsyche	PT	2
Unidentified		24
Diptera		
Chironomidae		
Polypedilum	PT	24
Rheotanytarsus	PT	24