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A CHECK LIST OF THE BENTHIC MACROINVERTEBRATES OF THE BLACKBURN FORK DRAINAGE IN PUTNAM AND JACKSON COUNTIES, TENNESSEE

STEVE C. BAKER[1]
Tennessee Technological University
Cookeville, Tennessee

ABSTRACT

Eight stations in the Blackburn Fork drainage basin were sampled bimonthly for benthic macroinvertebrates from September, 1981 to August, 1982. A total of 162 taxa were collected throughout the study. Calculated values of the Shannon-Weaver diversity index indicated that no severe pollution or other stream degradation existed at any sampling station. This project represents the first intensive study of the benthic macroinvertebrate fauna of this drainage area.

INTRODUCTION

The Blackburn Fork drainage arises in Putnam County west of Cookeville, Tennessee, and flows north into Roaring River (a tributary of the Cumberland River) in Jackson County near Gainesboro, Tennessee. Located in the Cumberland Plateau region of Middle Tennessee, Blackburn Fork is a fourth-order intermittent stream system having two main branches, the east and west forks. Blackburn Fork drains a varied landscape ranging from rolling farmland in the south to mountainous topography along its northern reaches. The area encompassing the drainage is used for both agricultural and recreational purposes.

Previous studies of the Blackburn Fork drainage have dealt only with water quality, fish community structure, and fish parasites (Hooper 1976; Bulow et al. 1979). Hynes (1970) discussed the value of benthic macroinvertebrate studies in understanding the overall makeup of stream ecosystems. This study was conducted to provide additional biological data for the Blackburn Fork drainage.

METHODS

Eight stations (Figure 1) were sampled bimonthly for benthic macroinvertebrates from September, 1981 to August, 1982. Quantitative Surber samples were conducted as described by Surber (1969). Initially three Surber samples were taken in riffle areas using a stratified random sampling design. This number was later increased to four to provide more complete data concerning the community diversity of riffle-dwelling organisms. Qualitative kick samples were taken in pool areas near each station. All representative habitat areas were sampled in the qualitative sample to supplement information obtained by quantitative sampling and to provide more complete data concerning species composition.

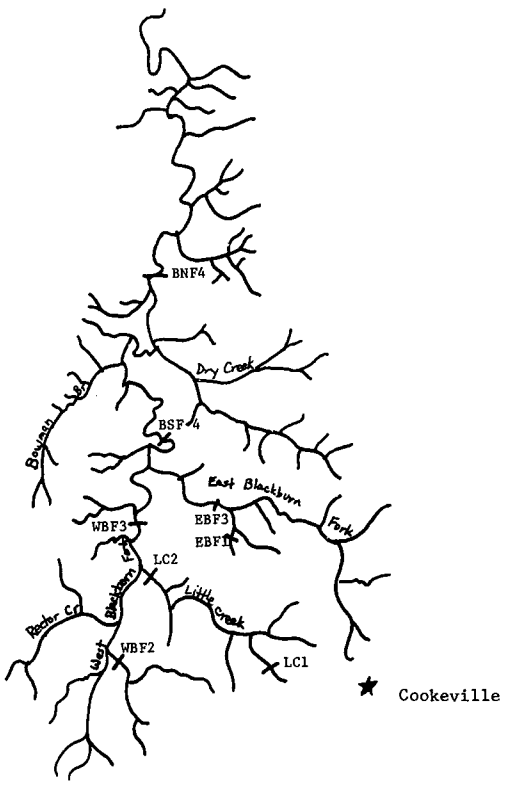

FIG. 1. *Sampling Site Locations in the Blackburn Fork Drainage Basin, Putnam and Jackson Counties, Tennessee.*

All samples were initially preserved in 10 percent formalin in zip-loc plastic bags in the field. Samples were returned to the lab, washed through a U. S. Standard No. 30 Sieve, sorted, and stored in 70 percent ethyl alcohol.

Specimens were identified to the lowest possible taxonomic level (usually genus). Specimens now reside in the personal collection of the author. Some specimens, especially insects, were identified to the the species level as taxonomic keys were available. Taxonomic keys used most frequently included those by Ross (1944), Needham and Westfall (1955), Sinclair (1964), Wiggins (1972), Mason (1973), Hitchcock (1974), Parrish (1975), Brown (1976), Edmunds et al, (1976), Hobbs (1976), Beck (1979), Bednarik and McCafferty (1979), Hilsenhoff (1981). Due to their small size, some organisms (generally Dipterans) were mounted on microscope slides using CMC-10 mounting media for later identification.

To analyze the diversity of the benthic macroinverte-

[1]Present address: Arkansas Game and Fish Commission, 1519 Lamar, Jonesboro, Arkansas 72401

TABLE 1. *A Checklist of the Benthic Macroinvertebrate Fauna Collected at Eight Sampling Stations along the Blackburn Fork Drainage in Putnam and Jackson Counties, Tennessee.*

Taxa	Station Numbers							
	LC1	EBF1	LC2	WBF2	WBF3	EBF3	BFS4	BFN4
Arthropoda								
Isopoda								
Asellus sp.	X							
Lirceus sp.				X				
Amphipoda								
Hyallela azteca	X							
Gammarus sp.		X	X	X	X	X	X	X
Decapoda								
Cambarus bartonii		X		X				
Orconectes sp.	X		X	X	X	X		
Procambarus sp.			X					
Insecta								
Ephemeroptera								
Baetis spp.	X	X	X	X	X	X	X	X
Pseudocloeon sp.	X	X	X	X	X	X	X	X
Caenis sp.	X		X	X	X	X	X	X
Danella simplex		X				X		
Ephemerella dorothea		X	X	X		X	X	X
Ephemerella invaria		X	X					
Ephemerella subvaria		X	X	X	X	X	X	X
Ephemerella sp.	X	X	X	X	X	X		X
Eurylophella bicolor	X	X				X	X	
Eurylophella temporalis	X	X		X	X			
Eurylophella sp.				X				X
Serratella serratoides					X		X	
Serratella sp.	X	X	X		X	X	X	X
Ephemera sp.		X	X	X	X	X	X	X
Hexagenia sp.		X						
Stenacron interpunctatum	X		X	X		X		X
Stenonema femoratum	X		X	X	X	X	X	X
Stenonema integrum	X	X		X				
Stenonema mediopunctatum		X	X	X	X	X	X	X
Stenonema merirvulanum			X		XX	XX	X	X
Stenonema modestum								X
Stenonema pudicum								X
Stenonema pulchellum	X		X	X	X	X	X	X
Stenonema terminatum			X	X	X	X	X	X
Stenonema vicarium	X	X		X		X		
Stenonema sp.	X	X	X	X	X	X	X	X
Choroterpes sp.					X			X
Habrophleboides sp.	X	X	X	X		X		X
Leptophlebia sp.				X		X		
Paraleptophlebia sp.	X	X	X			X		
Ameletus sp.		X						
Isonychia sp.	X	X	X	X	X	X	X	X
Tricorythodes sp.		X			X	X	X	X
Odonata								
Anisoptera								
Boyeria grafiana		X						
Cordulegaster maculatus		X						
Gomphus sp.				X				
Ophiogomphus sp.		X		X			X	
Stylogomphus sp.		X						
Zygoptera								
Calopteryx sp.	X	X	X	X	X	X		
Argia sp.					X	X		X
Collembola								
Isotomurus palustris	X	X		X				
Plecoptera								
Allocapnia sp.	X		X	X	X		X	
Paracapnia angulata	X	X	X	X	X	X	X	X
Lecutra ferruginea		X	X	X	X			X
Amphinemura sp.	X	X	X	X	X	X	X	X
Nemoura sp.							X	X
Paranemoura perfecta		X	X	X		X	X	X
Acroneuria abnormis		X						
Acroneuria carolinensis		X						
Acroneuria spp.		X						
Perlesta placida	X	X	X	X	X		X	X
Isogenus decisus			X					
Isoperla clio						X		
Isoperla namata				X				
Isoperla spp.		X			X			
Neoperla sp.		X		X				
Taeniopteryx burski			X	X	X	X	X	X
Hemiptera								
Gerris sp.	X	X	X	X	X	X	X	X
Microvelia sp.	X	X		X				
Rhagovelia obesa	X	X		X	X			

Taxa	Station Numbers							
	LC1	EBF1	LC2	WBF2	WBF3	EBF3	BFS4	BFN4
Megaloptera								
Corydalus cornutus					X		X	X
Nigronia fasciatus	X	X						
Nigronia serricornis		X	X	X	X	X	X	X
Nigronia spp.		X	X	X	X	X	X	X
Sialis sp.	X	X	X	X	X	X	X	X
Trichoptera								
Glossosoma intermedium		X	X	X	X	X	X	X
Helicopsyche borealis		X				X	X	
Cheumatopsyche sp.	X	X	X	X	X	X	X	X
Hydropsyche sp.	X	X	X	X	X	X	X	X
Symphitopsyche sp.	X	X	X	X	X	X	X	X
Agraylea multipunctata	X							
Leucotrichia pictipes						X		
Apatania sp.	X	X	X	X	X	X	X	
Neophylax sp.	X	X	X	X	X	X	X	
Pycnopsyche sp.							X	X
Chimarra atterima	X	X	X	X	X	X	X	X
Dolophiloides distinctus		X	X		X	X	X	
Polycentropus sp.		X	X	X	X	X		X
Lype diversa			X		X		X	
Psychomia flavida				X	X		X	X
Rhyacophila glabberima			X					
Rhyacophila fuscula					X			X
Rhyacophila spp.		X	X	X	X		X	X
Coleoptera								
Agabus sp.			X					
Hygrotus sp.			X					
Dubiraphia bivitatta	X					X		
Optioservus sp.	X	X	X	X	X	X	X	X
Oulimnius latuisculus					X			
Promoresia elegans						X	X	
Promoresia tardella			X			X		
Stenelmis sp.	X	X	X	X	X	X	X	
Cyphon sp.								X
Ectopria nervosa	X	X	X	X		X		
Psephenus herricki	X	X	X	X	X	X	X	X
Diptera								
Atherix variegata			X	X	X	X	X	X
Silobezzia sp.								X
Ablabesmyia mallochi			X				X	
Ablabesmyia parajanta					X			
Ablabesmyia ornata			X					
Brillia sp.			X		X		X	X
Cardiocladius sp.		X	X	X	X	X	X	X
Cladotanytarsus sp.							X	X
Clinotanypus sp.		X	X					
Chironomus sp.				X				X
Conchopelopia sp.	X	X	X	X	X	X	X	X
Corynoneura sp.		X			X	X	X	X
Cricotopus sp.	X	X	X	X	X	X	X	X
Cryptochironomus blarina		X						
Cryptochironomus fulvus			X					
Cryptochironomus spp.	X		X		X			X
Diamesa sp.	X	X	X	X		X	X	
Epicocladius sp.	X							
Eukiefferiella coerulescens	X	X	X	X	X	X	X	X
Eukiefferiella sp.	X	X		X	X	X	X	
Heterotrissocladius sp.				X				
Krenosmittia sp.		X						
Microcricotopus sp.				X				
Microspectra sp.						X	X	
Microtendipes sp.	X		X	X	X	X	X	
Orthocladius sp.		X						
Pagastiella sp.			X					
Parakiefferiella	X	X						
Paralauterborniella nigrohalteralis			X				X	
Parametriocnemus sp.	X	X	X	X	X	X	X	X
Paratanytarsus sp.			X					
Paratendipes connectens			X	X		X		
Paratendipes sp.					X	X		X
Pentaneura sp.		X	X	X	X	X	X	X
Phaenospectra flavipes		X	X		X			
Phaenospectra obediens		XX						
Psectrotanypus sp.			X	X	X	X		
Psectrocladius sp.			X	X				
Pseudoorthocladius sp.							X	
Polypedilum convictum	X	X	X	X	X	X	X	X
Polypedilum illinoense			X		X	X	X	
Rheocricotopus sp.	X			X				
Rheotanytarsus sp.	X	X	X	X	X	X	X	X
Stictochironomus sp.				X				X
Tanytarsus sp.	X	X	X	X	X	X	X	X

TABLE 1. *(continued).*

Taxa	Station Numbers							
	LC1	EBF1	LC2	WBF2	WBF3	EBF3	BFS4	BFN4
Thienenmaniella sp.	X	X	X	X	X	X	X	X
Tribelos sp.			X					
Zavrelia sp.		X	X	X		X	X	X
Psychoda sp.			X					
Simulium sp.	X	X	X	X	X	X	X	X
Chrysops sp.	X							
Tabanus sp.		X				X		
Protoplasa sp.					X			
Antocha sp.	X	X	X	X	X	X	X	X
Hexatoma sp.	X	X	X		X	X	X	
Tipula sp.	X	X	X	X		X	X	
Mollusca								
Gastropoda								
Goniobasis sp.	X	X	X		X	X	X	
Pleurocera sp.	X	X	X			X	X	
Laevipex sp.	X	X	X	X	X	X	X	X
Physa sp.					X			
Promenetus sp.								X
Pelecypoda								
Corbicula manilensis								X
Sphaerium sp.	X		X			X	X	X

TABLE 2. *Mean annual values of Shannon-Weaver diversity and ranges of values at each of eight sampling stations in the Blackburn Fork drainage, 1981-1982.*

	Station Numbers							
	EBF1	LC1	LC2	WBF2	WBF3	EBF3	BFS4	BFN4
Mean Annual Diversity	2.75	2.67	2.69	2.70	2.71	2.84	2.76	2.66
Range	2.39-3.02	2.00-3.03	2.42-2.96	2.26-3.23	2.44-2.84	2.33-3.29	2.45-3.01	2.34-3.05

brate community, the Shannon-Weaver diversity index was calculated by the following formula (Green 1979):

$$H = - \frac{n_i}{N} (\ln \frac{n}{N})$$

where

N = total number of individuals in the sample

n_i = total number of individuals in the ith taxa

The Shannon-Weaver diversity is widely used by biologists and is recommended for use by the Environmental Protection Agency (Weber 1973).

Results

Sampling of the benthic macroinvertebrates of the Blackburn Fork drainage resulted in the collection of 162 taxa. A checklist of the taxa collected at each sampling station appears in Table 1.

The occurence of *Ephemerella (Ephemerella) subvaria* in the sampling area indicates a significant range extension for this species of the Ephemeroptera. Allen and Edmunds (1965) previously report this species only from southern Canada and the midwestern United States. The occurrence of individuals of other species may also serve to extend their geographic ranges since little benthic macroinvertebrate sampling has previously been conducted in this region of Middle Tennessee.

Diversity indices are designed to be a numerical measurement of both the number of taxa of organisms and distribution of the organisms among the various taxa (Pielou 1969). Wilhm (1970) found that diversity values in pristine waters were generally between 3 and 4, while in polluted waters diversity was less than 1. Mean annual values for Shannon-Weaver diversity among the sampling stations ranged from 2.66 at BFN4 to 2.84 at EBF3 (Table 2). These values indicate that there seems to be no severe impact by pollution or other degrading factors at any sampling station.

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