SPECIES COMPOSITION OF ALGAE AND BENTHIC MACROINVERTEBRATES IN THE BLUE AND KIAMICHI RIVERS

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The species compositions of algae and benthic macroinvertebrates were determined at two stations each in the Blue and Kiamichi rivers in late summer. Dissolved oxygen was relatively abundant in both streams and total organic carbon was low. Conductivity was over four times as great in the Blue River. The Blue River generally contained more species than the Kiamichi River — 55 to 47 species of phytoplankton and 53 and 30 kinds of benthic macroinvertebrates, respectively.

INTRODUCTION

Relatively few studies have been published on the biota of the Blue and Kiamichi rivers. Duffer and Dorris (1) measured primary productivity in the Blue River, while Hornuff (2) collected 35 species of benthos. Twenty-four species of mussels were collected in the Kiamichi River Basin by the Oklahoma Biological Survey (3). It is the objective of the present paper to report the species composition of the phytoplankton and benthic macroinvertebrates of the Blue and Kiamichi rivers during late summer. The rivers and collection stations are described by Miller (4).

Dissolved oxygen was measured with a Yellow Springs Instrument (YSI) polarographic probe and calibrated and corrected for temperature and atmospheric pressure. Total specific conductance and water temperature were measured with a YSI combination conductivity and temperature probe unit. An Orion Model 409 portable pH-specific ion unit was used to measure pH. Total organic carbon was determined by collecting a water sample at each station at a depth of 0.3 m, acidifying to pH 2 with nitric acid, transporting in an ice chest to the laboratory, and analyzing on a Beckman TOC analyzer.

Samples were taken from the stations on 30 August and 1 September 1976. Algae were sampled qualitatively by filtering three samples of 100 *l* of water from each station through a No. 30 Wisconsin plankton net. In addition, periphyton was scraped into the net from logs and rocks. Species identification was determined by observing organism on two different types of slides. Wet mounts were prepared by placing a drop of the sample on a slide, covering with a cover slip, and scanning. The membrane filter technique was also used by filtering samples through a 0.45-μ Millpore HA filter, clearing with immersion oil, covering, and counting organisms in 50 fields. Organisms were classed as abundant (occurred in at least 5 fields), common (1-4 fields), or rare (not present in fields but observed in scans).

Benthic macroinvertebrates were surveyed at each station by washing 10 grab samples collected with an Ekman dredge into a #30 mesh (U.S. Soil Series) wash bucket. Invertebrates were also collected with a forceps from logs, rocks, and debris in the Blue River; however, the water depth and steep banks in the Kiamichi River limited this type of collection.

Field chemical measurements made on 31 August 1976 indicated that total dissolved solids and total organic carbon were low in the Blue River (Table 1). Conductivity was higher than in the Kiamichi River. The stream contained a relatively high concentration of dissolved oxygen.

Fifty-five taxa of phytoplankton and periphyton were collected in the Blue River on 30 August 1976 (Table 2). *Nitzschia* and *Navicula* were the most common genera, as has typically been observed in Oklahoma streams (5). A relatively large number of taxa collected in the Blue River have been reported to prefer water of high salinity or high mineral content (6). However, as mentioned above, specific conductance was low.

TABLE 1. *Water quality measurements made on 31 August and 1 September 1976.*

Variable	Blue River		Kiamichi River	
	Upstream	Downstream	Upstream	Downstream
Time (h)	1200	1300	1935	1020
Temperature (C)	24	23.5	25	26
Conductivity (mhos/cm)	400	390	95	95
Dissolved oxygen (mg/*l*)	6.8	7.3	6.4	4.1
pH	7.9	8.1	6.5	*
TOC (mg/*l*	2.6	7.2	4.7	5.3

*Not measured (meter malfunctioned)

TABLE 2. *Relative abundance* of algae collected in the Blue and Kiamichi rivers.*

	Blue River	Kiamichi River
Cyanophyta (Bluegreen algae)		
Merismopedia sp.	–	R
Amphanizomenon flos-aquae	–	R
Anabaena sp.	R	R
Oscillatoria sp.	C	A
Euglenophyta (Euglenoids)		
Euglena sp	–	R
Chlorophyta (Green algae)		
Closterium sp.	R	R
Cosmarium sp.	R	–
Hydrodictyon sp.	R	–
Pediastrum simplex Meyen	C	–
Scenedesmus sp.	R	–
Spirogyra sp.	R	–
Staurastrum sp.	R	–
Chrysophyta (Diatoms)		
Amphora ovalis Kutz.	R	–
Amphipleura pellucida Kutz.	R	–
Asterionella formosa Hass.	R	R
Biddulphia laevis Ehr.	A	–
Caloneis bacillum (Grun.) Cl.	R	R
Caloneis ventricosa (Ehr.) Meist.	R	R
Cocconeis pediculus Ehr.	R	–
Cocconeis placentula Ehr.	A	R
Cyclotella meneghiniana Kutz.	R	R
Cymatopleura elliptica (Breb.) W. Sm.	R	–
Cymatopleura solea (Breb.) W. Smith	R	–
Cymbella turgida (Greg.)	R	C
Cymbella ventricosa Kutz.	R	C
Cymbella sp.	R	–
Diatoma vulgare Bory	R	R
Diploneis smithii (Breb. ex W. Sm.) Cl.	C	R
Epithemia sorex Kutz.	–	R
Eunotia curvata (Kutz) Lagerst	–	R
Fragilaria crotenensis Kitton	–	R
Fragilaria sp.	R	–
Frustulia vulgaris (Thwaites) DeToni	–	R
Gomphonema acuminatum	–	R
Gomphonema olivaceum (Lyngb.) Kutz.	A	C
Gyrosigma spenceri Grif. and Henfr.	C	C
Melosira distans (Ehr.) Kutz.	R	A
Melosira granulata (Ehr.) Ralfs	R	A
Navicula capitata Kutz.	R	R
Navicula cryptocephala (Kutz.)	C	C
Navicula cuspidata (Kutz.)	R	R
Navicula exigua Greg. ex Grun.	C	R
Navicula pupula Kutz.	R	R
Navicula tripunctata (O. F. Mull.) Bory	C	R
Navicula sp.	–	R
Neidium sp.	R	–
Nitzschia acicularis (Kutz.) W. Smith	–	R
Nitzschia amphibia Grun.	R	–
Nitzschia angustata	R	R
Nitzschia dissipata (Kutz.) Grun.	A	A
Nitzschia filiformis (W. Sm.) Hust.	R	A
Nitzschia hungarica Grun.	C	–
Nitzschia lorenziana	R	–
Nitzschia paradoxa Gnel.	R	R
Nitzschia parvula Levis	–	R
Nitzschia sigma (Kutz.) W. Smith	–	R
Nitzschia sigmoidea (Ehr.) W. Smith	R	R
Nitzschia tryblionella Hantz.	C	–
Nitzschia sp. 1	R	R
Nitzschia sp. 2	R	–
Pinnularia brauni (Grun.) Cl.	–	R
Rhoicosphenia curvata (Kutz.) Grun. ex Rabh.	C	–
Rhopalodia gibba (Ehr.) O. Mull.	C	–
Rhopalodia gibberula (Ehr.) O. Mull	C	–
Stauroneis anceps Ehr.	–	R
Surirella anceps Ehr.	–	R
Surirella angus	–	R
Surirella angustata	–	R
Surirella brightwellii W. Sm.	R	–
Surirella ovata Kutz.	R	–
Synedra ulna (Nitz.) Ehr.	C	R
Terpsinoe americana	R	–

*A = *Abundant;* observed in five or more fields on most of the membrane filter mounts
C = *Common;* observed in one to four fields
R = *Rare;* observed on scans of wet mounts but not on membrane filter mounts

Fifty-three taxa of benthic macroinvertebrates were collected in the Blue River (Table 3). Twenty-one taxa (40%) were Diptera and eight (15%) were mayflies. Sixteen of the 21 taxa of dipterans were chironomids. Five taxa each of Odonata and Coleoptera and only one species of Plecoptera were collected. The species composition is similar to that reported in other Oklahoma streams (7, 8).

Field measurements of conductivity, dissolved oxygen, pH, and total organic carbon do not indicate adverse water conditions in the Kiamichi River below Hugo Dam (Table 1). The dissolved oxygen concentration at the downstream station was only 50% of saturation at 1020 hours. The TOC concentration was not high enough to indicate excessive biochemical oxygen demand; therefore, the low dissolved oxygen concentration may have been caused by a release of reduced species of sulfur, iron, and manganese from the hypolimnion of Hugo Reservoir. No analyses for these reduced chemical species were performed; however, the distinct odor of hydrogen sulfide was observed at the Kiamichi River stations below Hugo Reservoir.

Species composition of the algae was similar to that in the Blue River. Forty-seven taxa of phytoplankton and periphyton were collected in the Kiamichi River on 1 September 1976 (Table 2), eight fewer than in the Blue River. Samples were collected near the bank in the Kiamichi River instead of across the stream

TABLE 3. *Benthic macroinvertebrates collected in the Blue and Kiamichi rivers*

	Blue River	Kiamichi River
Nematoda (roundworms) -		
unid. organisms	–	x
Oligochaeta (aquatic earthworms)		
Dero digitata (Muller)	–	x
Pristina sp.	–	x
Branchiura sowerbyi Beddard	x	x
Bothrioneurum vejdovkyanum Stolc	x	x
Aulodrilus pigueti Kowalewski	x	–
Unid. organisms	x	–
Hirudinea (leeches) -		
unid. organisms	–	x
Amphipoda (scuds)		
Hyalella azteca (Saussure)	x	x
Hydracarina (water mites) -		
unid. organisms	–	x
Plecoptera (stone flies)		
Acroneuria sp.	x	–
Ephemeroptera (mayflies)		
Stenonema luteum (Clemens)	x	–
Stenonema heterotarsale (McDunnough)	x	–
Hexagenia limbata (Serville)	x	x
Centroptilum sp.	x	–
Isonychiinae	x	–
Siphlonurus sp.	x	–
Tricorythodes sp.	x	–
Caenis sp.	x	–
Unid. organisms	–	x
Odonata (dragonflies, damselflies)		
Hetaerina sp.	x	–
Macromia sp.	x	–
Argia sp.	x	x
Erpetogomphus sp.	x	–
Gomphus sp.	x	–
Progomphus sp.	–	x
Hemiptera (bugs)		
Gerridae - unid. organisms	–	x
Corixidae - unid. organisms	x	x
Saldidae - unid. organisms	x	–
Megaloptera (dobsonflies)		
Corydalus sp.	x	–
Trichoptera (caddis flies)		
Oecetis sp.	x	x
Smicridea	x	x
Polycentropis cinereus Hagen	x	–
Psychomyiid genus A Ross	–	x
Coleoptera (beetles)		
Elmini sp. 1	x	–
Elmini sp. 2	x	–
Heterelmis sp.	x	–
Berosus sp.	x	–
Gyrinidae - unid. organisms	x	–
Diptera (flies)		
Dolichopodidae - unid. organisms	x	–
Palpomyia sp.	-	x
Ablabesmyia janta Beck	–	x
Ablabesmyia mallochi Beck	x	x
Ablabesmyia ornata Beck	x	–
Chironomus sp.	–	x
Cladotanytarsus sp.	x	–
Clinotanypus sp.	x	–
Cricotopus sp.	x	–
Cryptochironomus sp.	x	x
Dicrotendipes modestus Mason	x	–
Dicrotendipes sp.	–	x
Demicryptochironomus sp.	x	–
Diplocladius sp.	x	–
Einfeldia sp.	–	x
Glyptotendipes sp.	–	x
Larsia sp.	x	–
Micropsectra sp.	x	x
Polypedilum fallax Beck	–	x
Polypedilum sp.	x	x
Procladius sp.	–	x
Psectrocladius sp.	x	–
Stempella sp.	x	–
Stictochironomus sp.	x	–
Tribelos sp.	x	–
Xenochironomus sp.	–	x
Palpomyia sp.	x	–
Tipulidae - unid. organisms	x	–
Ceratopogonidae - unid. organisms	x	–
Gastropoda		
Physidae - unid. organisms	x	–
Pelecypoda (clams)		
Pelecypoda sp. 1	x	–
Pelecypoda sp. 2	x	–

as in the Blue River. As in the Blue River, *Nitzschia* and *Navicula* contained more species than any other genus. Several species that were generally common at both stations in the Blue and Kiamichi rivers are the diatoms *Gomphonema olivaceum, Gyrosigma spenceri, Navicula cryptocephala, Nitzschia dissipata,* and *Synedra ulna.* The diatoms *Melosira distans* and *Melosira granulata* and the bluegreen alga *Oscillatoria* sp. were abundant in the Kiamichi River.

Despite the limitations of being restricted in sampling to one bank and the lack of large numbers of rocks and logs, 30 species of benthic macroinvertebrates were taken from the Kiamichi River (Table 4). Most taxa were Diptera (14 species, 45%); 13 of these species were chironomids. No other group was common in the Kiamichi River. As in the Blue River, little difference existed in numbers of taxa between stations (18 and 21).

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