Journal of the Arkansas Academy of Science

Volume 37 Article 34

1983

Aquatic Macroinvertebrates of the Hiatt Prairie Region, Franklin County, Arkansas

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in eliminating tedious least-square manipulations), and ease of making judgments about reliability of data. Student reaction has been enthusiastic, but some effort must be expended by instructional personnel to prevent rote manipulation of "black boxes" and permit understanding of the logic involved.

The spectrophotometer used is the B & L Spectronic 70, although the ubiquitous Spectronic 20 is interchangeable. Any of a number of similar digital or non-digital instruments could be adapted with the proper interfacing arrangement. The interface used is one of several built during an annual workshop on microcomputer interfacing (Wisman, Chemistry Department, University of Arkansas, Fayetteville, AR 72701. Circuit used with permission.) The program requires 6K on the 4032-N PET microcomputer. The program runs on both new (4.0) and older (2.0) RAM in PET BASIC. The 301 lines (58 comments) in the program are capable of being greatly reduced, but are presented so as to permit modification and ease of understanding. Transfer to other brands of microcomputer would require modification of the graphics portion of the program, as well as some changes in the interface adapter. The program is written for the small-screen PET, but minimal changes would accommodate the new 12" (80 column) screen. The modified Day/Underwood experiment, a schematic of the interface, a program listing, and a sample execution are available from the author.

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AQUATIC MACROINVERTEBRATES OF THE HIATT PRAIRIE REGION, FRANKLIN COUNTY, ARKANSAS

At one time significant disjunct expanses of natural grassland or prairie occurred in all quarters of Arkansas. These were predominantly tall grass prairies with scattered areas of wetlands or marsh. Most have been destroyed by agricultural practices (Ark. Dept. Planning, 1974). Only two prairie tracts remain in Arkansas that are associated with permanent water. One of these is Hiatt Prairie. Little work has been done on the aquatic macroinvertebrates of prairie-associated streams in Arkansas. It was the primary intent of this study to establish a species list of aquatic macroinvertebrates for the Hiatt Prairie region.

Hiatt Prairie is located 2 km N of Charleston in the SW¼ S25, R29W, T8N, Franklin County, Arkansas. Hiatt Creek, formerly called Prairie Creek, is a first order stream that meanders to the west across the Prairie, approximately 1 km. Recently beaver have invaded the area and caused a drastic change in stream flow. Six large beaver dams cross the stream channel at approximately 140 m intervals, and smaller dams are occasionally interspersed between them. As a result, the typically narrow, shallow stream has become deeper and more sluggish at the beaver pools established behind each dam.

The main channel width varies from 0.9 to 2.4 m and the depth varies from 20 to 91 cm, dependent on the beaver dams. The substrate of the channel is typified by silt several cm deep in areas of little current, whereas broken slate and rock predominate where the current is more rapid. Compacted clay is typically found at each bend in the stream. Substrate in the beaver pools is characterized by a thick silt, augmented by detrital material from the surrounding watershed.

An oval-shaped stock pond is located approximately 0.1 km NE of the St Hwy 217 bridge over Hiatt Creek. The pond was constructed in the early 1900's and has maintained a supply of water since that time (Hiatt, pers. comm.). During periods of excessive rainfall, the pond overflows its east bank creating excellent habitat for aquatic macroinvertebrates in the surrounding grasses and low shrubs. Several kinds of aquatic vascular plants abound in this low flooded area where the effect of siltation is minimal. The substrate within the normal boundaries of the pond consists of a very deep layer of silt, with the complete absence of vegetation.

Thirty-four collections were made during 15 trips from 24 May 1980 to 21 February 1982. Seventeen collections were made from the stream channel, 10 from the beaver pools and seven from the stock pond. Collections were made monthly from spring through fall and bi-monthly during the winter. Temperature, pH and turbidity were measured on each sampling date. Dissolved oxygen, carbon dioxide and alkalinity were measured only on the final trip. Chemical determinations were made by standard limnological methods. Aquatic macroinvertebrates were collected with an aquatic dip net. The stream channel was sampled at approximately 20 pace intervals. Each microhabitat was sampled proportionately in the beaver pools. The circumference and overflow area of the stock pond were sampled randomly, although dense silt accumulations were avoided. On each trip an ultraviolet light was used for one hour after dusk to collect emerging adults. Dip net and ultraviolet light specimens were preserved in 70% ethanol. Adult Odonata were collected by aerial net, placed in paper triangles, and immersed in acetone for 18-24 hours. All specimens are housed in the Arkansas State University Museum of Zoology (ASUMZ) Aquatic Macroinvertebrate Collection.

Physicochemical parameters of both the stream and stock pond were within the known limits of tolerance for freshwater organisms and caused no visible detrimental effects. The aquatic macroinvertebrate fauna of the Hiatt Prairie region was quite diverse, with 138 taxa representing 18 orders, 55 families and 115 genera (Table). Of these, 126 taxa were collected in Hiatt Creek; 104 and 95 taxa in the beaver pools and channel, respectively. Seventy-one taxa were collected from the stock pond. The three major zones had 42 taxa in common, while 31 taxa were shared by the channel and beaver pools only, 15 taxa by the beaver pools and stock pond only, and five taxa by the channel and stock pond only. Seventeen taxa were found in the channel only, 16 in the beaver pools only, and nine in the stock pond only. Coleoptera was the most diverse order with representatives from eight families and 51 species. The most frequently collected orders were Isopoda, Coleoptera, Decapoda, Hemiptera, Amphipoda, and Ephemeroptera, respectively. Most of the taxa are adapted to a variety of habitats and environmental conditions (Pennak, 1978).

The beaver activity has increased the diversity of aquatic macroinvertebrates in Hiatt Creek by increasing the diversity of microhabitats, introducing instability, or a combination of the two. The beaver pools provide a greater range of water depth, current speed (absent to moderate), and substrate types (particulate organic matter to decomposing leaf litter). The beaver pools also have gradually sloping bottoms which are conducive to the establishment of a greater variety and density of aquatic vegetation and associated fauna. During the study period the beaver pools were in the process of being established, and thus were areas of transition. Such transitions are marked by temporary instability. Increased species diversity can result, as some new species will be developing, others will be at population peaks, and yet others will be declining (Reed, 1978).

The aquatic macroinvertebrate fauna of the channel was qualitatively similar to that of the beaver pools, with 95 and 104 taxa, respectively. Of these, 73 taxa were collected from both zones. Fewer taxa were collected from the channel than the beaver pools despite more intensive collection in this zone (17 samples vs 10 from the beaver pools). In many areas of the channel the substrate was compacted clay, and the stream banks were of vertical, eroded clay, providing little suitable habitat. Most of the taxa found in the channel only (e.g. *Hagenius, Pycnopsyche, Stenelmis crenata*) are characteristically stream inhabitants (Needham and Westfall, 1955; Brown, 1976; Wiggins, 1977).

Aquatic macroinvertebrate diversity was least in the stock pond. This primarily resulted from the homogeneity of its silt substrate (Harrell, 1969). The fewest samples were taken from this zone, and this also reduced the number of taxa collected. Most taxa were obtained in the overflow

Table. Aquatic macroinvertebrates collected from the channel (Ch), beaver pools (BP), and stock pond (SP), Hiatt Prairie region, 24 May 1980 - 21 February 1982.

Taxa	Ch	BP	SP
GORDIOIDEA			
Paragordius	X		
OLIGOCHAETA	X		
HIRUDINEA			
Erpobdella	X		X
Placobdella	X		X
GASTROPODA			
Ferrissia rivularis (Say)	X		
Lymnaea columella Say	X	X	
Lymnaea obrussa Say		X	
Menetus dilatatus (Gould)	X		X
Physa gyrina Say	X	X	X
PELECYPODA			
Musculium securis (Prime)	X	X	X
CRUSTACEA			
Bapinia	X	X	X
Lirceus garmani Hubricht and Mackin	X	X	X
Crangonyx gracilis Smith	X	X	X
Orconectes palmeri longimanus (Faxon)	X	X	X
Procambarus acutus acutus (Girard)	X	X	X
Procambarus liberorum Fitzpatrick		X	X
INSECTA			
Collembola			
Isotomurus palustris (Muller)		X	X
Sminthurides aquaticus (Bour.)	X	X	
Hemiptera			
Belostoma fluscventre (Dufour)	X	X	X
**Lethocerus griseus* (Say)			
Neoperocoriza nitida (Fieber)	X	X	
Palmacorixa buenoi Abbott	X	X	
Trichocorixa kanza Sailer	X	X	X
Gelastocoraus oculatus oculatus (Fabricius)		X	
Limnoporus canaliculatus (Say)	X	X	
Neogerris hesione (Kirkaldy)	X	X	X
Rheumatobates palosi Blatchley	X	X	
Trepobates subnitidus Esaki	X	X	X
Nehrus consolidus Uhler	X		
Hydrometra martini Kirkaldy	X	X	X
Mesovelia mulsanti White	X	X	X
Ranatra buenoi Hungerford	X	X	
Buenoa margaritacea Bueno		X	
Notonecta indica Linnaeus	X	X	
Neoplea notana Drake and Chapman	X		X
Microvelia hinei Drake	X	X	X
Plecoptera			
Taeniopteryx	X		
Ephemeroptera			
Callibaetis fluctuans (Walsh)	X	X	
Caenis	X	X	X
Heptagenia limbata (Serville)	X	X	
Odonata			
Calopteryx maculata (Beauvois)	X	X	
Anomalagrion hastatum (Say)			X
Argia fumipennis violacea (Hagen)	X	X	
Argia tibialis (Rambur)	X	X	
Enallagma basidens Calvert	X	X	X
Enallagma civile Hagen	X	X	X
Enallagma divagans Selys	X	X	X
Enallagma signatum Hagen	X	X	X
Ischnura posita (Hagen)	X	X	X
Dromogomphus spoliatus Hagen	X	X	X
Gomphus externus Hagen		X	
Hagenius brevistylus Selys	X		
Anax junius Drury	X	X	
Boyeria vinosa Say	X	X	
Epitheca princeps (Hagen)	X	X	X
Celithemis elisa Hagen			X
Erythemis simplicicollis Say	X	X	X
Ladona deplanata Rambur			X
Libellula cyanea Fabricius	X	X	X
Libellula incesta Hagen	X	X	X
Libellula pulchella Drury	X	X	X
Libellula semifasciata Burmeister			X
Pachydeplax longipennis Burmeister	X	X	X
Perithemis tenera Say		X	X
Plathemis lydia Drury	X		
Sympetrum ambiguum Rambur	X	X	X
Sympetrum vicinum Hagen	X	X	
Tramea lacerata Hagen		X	X
Megaloptera			
Chauliodes pectinicornis (Linnaeus)	X	X	
Sialis	X	X	
Trichoptera			
Chewatopsyche	X	X	
Pycnopsyche	X		
Chimarra	X	X	
Coleoptera			
Hyperodes	X		
Dietronotus		X	
Phytobius		X	X
Acilius fraternus Harris		X	
Agabus disintegratus (Crotch)		X	
Rhantus	X	X	X
Celina angustata Aube			X
Copelatus chevrolati removatus Guignot	X	X	
Coptotomus venustus (Say)	X	X	
Cybister fimbriolatus (Say)		X	
Hydroporus	X	X	X
Hydroporus rufilabris Sharp		X	X
Hydrovatus pustulatus pustulatus Melsheimer		X	X
Ilybius			X
Laccophilus fasciatus rufus Melsheimer		X	X
Laccophilus pictus insignis Sharp			X
Laccophilus proximus proximus Say	X	X	X
Neobidessus	X		
Thermonectus basillaris (Harris)	X	X	X
Uvarus		X	X
Dubiraphia vittata (Melsheimer)	X		
Stenelmis crenata (Say)	X		
Dineutus assimilis (Kirby)	X		
Dineutus carolinensis LeConte	X		
Dineutus ciliatus (Forsberg)	X	X	
Dineutus emarginatus (Say)	X	X	
Gyrinus pachycomus Fall	X	X	
Haliplus	X	X	X
Peltodytes dunavani Young		X	X
Peltodytes muticus (LeConte)			X
Peltodytes sexmaculatus Roberts	X	X	X
Cyphon	X	X	
Microcara	X		
Berosus		X	X
Cymbiodyta		X	
Dibolocelus ovatus (Gemminger and Harold)		X	
Enochrus ochraceus (Melsheimer)		X	X
Helophorus	X	X	X
Hydrochara obtusata Say	X		
Hydrochus	X	X	X
Hydrophilus		X	
**Neohydrophilus castus* (Say)			
Paracymus subopacus (Say)	X	X	X
Phaenonotum exstriatum (Say)	X		X
Tropisternus blatchleyi blatchleyi D'Orch		X	X
Tropisternus elliptipes (LeConte)	X	X	
Tropisternus lateralis nimbatus Say	X	X	X
Tropisternus mexicanus mexicanus LaPorte	X	X	
Tropisternus natator D'Orch	X	X	
Hydrocanthus iricolor Say		X	X
Suphisellus			X
Diptera			
Allusudomyia	X		
Palpomyia	X	X	X
Probezzia	X	X	X
Chironomidae	X	X	X
Aedes vexans (Meigen)		X	
Anopheles quadrimaculatus Say	X	X	X
Culex territans Walker		X	
Culiseta inornata Williston		X	
Psorophora columbiae Dyer and Knab		X	
Stratiomye	X	X	
Chrysops		X	X
Tabanus	X	X	
Tipula		X	
Bittacomorpha clavipes (Fabricius)			

*Collected by black light only

area, where the substrate was a fine particulate organic material, with a dense accumulation of aquatic vegetation and interspersed algae. The faunal composition was more similar to that of the beaver pools than that of the channel, having 57 and 47 taxa in common, respectively.

Jewell (1927) observed that the streams of Iowa, northern Missouri, and eastern Kansas and Nebraska, are not prairie streams, because their valleys are wooded. Such streams are shaded in the summer and receive much organic allochthonous material from the watershed. In contrast, prairie streams receive little organic allochthonous material and have a substrate composition of gravel, sand and clay. The streams of eastern Kansas are transitional in that their banks are wooded, but swift currents and periodic flooding remove organic deposits (Jewell, 1927). Basically, Hiatt Creek is such a transitional stream, particularly in the channel zone.

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This research was supported in part by a grant from the Arkansas Water Resources Research Center. We thank Thomas Bowman, Mark Gordon and Horton Hobbs, Jr., for identification of Isopoda, Mollusca and Decapoda, respectively. Bill Hiatt kindly granted permission to collect on his property, and John Huggins was of great assistance in collecting field data.

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Neviusia alabamensis: A PHYTOGEOGRAPHIC ANALYSIS

Neviusia alabamensis is an extremely rare plant endemic to only a few southeastern states. Arkansas has representative populations in three counties: Conway, Pope, and Newton (Fig.). Other identified populations are located in Alabama, where the species was first recognized, and in Missouri, Tennessee, and Mississippi. In three states, Alabama, Arkansas, and Missouri, the genus is listed as an endangered species (Ayensu and Defilips, 1978) and in the two remaining states it has just recently been discovered. The purpose of this paper are to describe the distribution of *Neviusia alabamensis* in Arkansas and to examine the physical environments in which the Arkansas species are found.

To develop a plant description of *Neviusia alabamensis,* 16 herbarium specimens were measured and published information was examined (Chapman, 1897; Dean et al., 1973; Dean, 1961; Greene and Blomquist, 1953; Small, 1903; Lounsberry, 1901; Moldenke, 1949; Small, 1933; Steyermark, 1975). The physical environment was described in terms of soil, slope direction, slope percentage, solar exposure, and dominant vegetation. Soil samples were taken from each of the ecosystems in Arkansas in which *Neviusia alabamensis* is found and soil nutrient, soil texture, and pH tests were conducted. The soil was gathered from depths of 4 to 10cm at three different areas within each population and mixed before testing.

Neviusia alabamensis is a perennial shrub with numerous slender primary stems and short lateral branches. The bright green leaves (approximately 3cm X 4cm) are simple and alternating. The flowers are odorless and lack petals, however, the stamens are numerous (usually over 100) and showy. Flowering may occur between March and May.

Neviusia alabamensis seems to be able to exist on relatively dry sites. Two of the populations, Conway and Newton Counties, are located on southeast facing slopes, whereas the population in Pope County is located on a northwest facing slope (Table). The percentage of the slope varied a great deal among the populations. The slope in Conway County was the greatest, 80%, and the slope in Newton County was the least, 35%. It would seem that the Conway County population would be much drier as a result of the steeper slope. However, the soil at Newton County was very sandy. These two populations may be approximately equal in what seems to be the most critical factor, soil moisture.

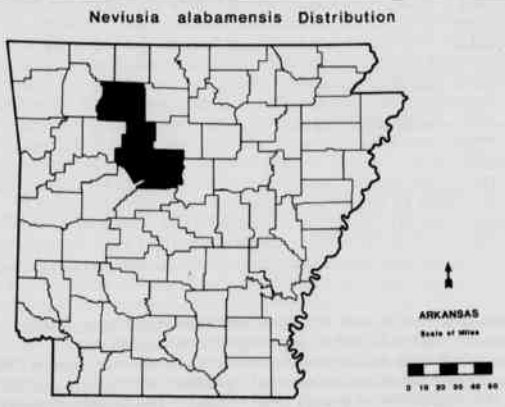

Figure. The three Arkansas counties in which *Neviusia alabamensis* is found.

Table. Comparison of the physical environments in which *Neviusia alabamensis* exists. The soil nutrients are given in kilograms per hectare.

	Conway County	Pope County	Newton County
Slope Direction	155° SE	325° NW	120-135° SE
Slope Percentage	80%	65%	35%
Size of Population	80m X 10m	15m X 40m	270m X 15m
Nitrogen	0	0	0
Phosphorus	34-45	34-45	5
Potassium	135	135	90-100
pH	6.0	6.2	6.8
Texture	Loamy sand	Loamy sand Sandy loam	Sandy grit