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Aquatic Macroinvertebrate Taxa Present in Two Ozark Springs in Randolph County, Arkansas

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AQUATIC MACROINVERTEBRATE TAXA PRESENT IN TWO OZARK SPRINGS IN RANDOLPH COUNTY, ARKANSAS

Previous studies concerning the aquatic macroinvertebrates found in the Ozark Plateau of Arkansas have dealt only with stream populations (Sublette, 1956; Van Kirk, 1962; Aggus and Warren, 1965; Robison and Harp, 1971; McGary and Harp, 1972; Cather and Harp, 1975). None have involved aquatic macroinvertebrate communities in cold water springs. The Salem Plateau section of the Ozark Plateau province supplies many cold water springs of varying size. This is largely due to the abundance of limestone and dolomite, which provides a good geologic base for the development of springs (Croneis, 1930; Thornbury, 1965). Spring basins provide a slightly different habitat for aquatic macroinvertebrate communities. Temperatures and water levels generally are confined to a more narrow range than in a stream and experience minimal seasonal variations with regard to several other physiochemical parameters (Clifford, 1966). However, temperatures are not so limiting as in cold water discharges from main stem reservoirs (McGary and Harp, 1972).

The springs that were sampled were designated Spring I and Spring II. Spring I is located in S7, T20N, R1E in Randolph County, Arkansas, and is considered to be a permanent spring. It is at an elevation of 110 m and has an average volume flow of 65.5 cc/sec that flows in a southward direction. This spring is surrounded by grassy pastureland which has not had any domestic grazing for more than eight years. The spring is shaded by one sycamore tree *(Plantanus occidentalis)* with one eastern red cedar *(Juniperus virginiana)* located about 15 m to the west. A small, spring-fed pond occurs about 100 m to the west. The spring basin was dredged over a year ago and its greatest depth is 1 m. The north end has an almost vertical drop, and this deep end covers approximately 25 percent of the basin's surface area. The rest of the basin ranges in depth from 0.08 to 0.23 m. The basin has a mean width of 2.13 m.

Spring II is located in S27, T20N, R2W, Randolph Co., Arkansas. It is a smaller spring in terms of volume flow and basin size. The volume flow ceased temporarily during the driest part of the 1980 summer drought, but the spring was still able to maintain most of its basin size. This spring lies at an elevation of 140 m and has an average volume flow of 57.8 cc/sec. Spring II is not nearly as open as Spring I, but rather is surrounded by an oak-hickory forest with thick undergrowth which provides shade throughout the entire day. It has been free of domestic animals for more than eight years and is about 200 m from a small creek. This spring varies in depth from 0.08 to 0.18 m. Its basin has a mean width of 1.22 m.

Data were collected biweekly from each spring from 26 April through 13 June 1981. Ambient and water temperatures were taken using a standard Celsius thermometer. Water was tested for pH, nitrate (NO_3), carbon dioxide, ammonium nitrogen and phosphate (PO_4) using Hach water test kits 17-N, NI-11, CA-23, NI-8 and PO-19/PO-19A, respectively. Spatial measurements were made by using a standard yardstick an converting values to metric units. Spring volume flow was measured at the outflow from the basin by a modification of the mean-sectional metho (Butler, 1957). The first and third macroinvertebrate samples were collected by use of a fine mesh aquatic dip net. The second and fourth macroinvertebrate samples were obtained by use of a 12 volt-DC BioQuip blacklight collecting light. Two adult odonates were obtained using an aerial net. Samples were preserved in 70 percent ethanol. Aquatic organisms were identified according to Pennak (1978), with the exception of Gerridae which were identified according to Kittle (1980). All samples were quantified by standardizing the length of the sampling period, specifically one hour.

To minimize the effects of extrinsic factors, springs were sampled under similar logistic conditions. Water quality was quite similar for both springs, and little fluctuation occurred in the physicochemical parameters measured during the study period (Table 1). This is typical of springs (Clifford, 1966), and is derived from the ground waters flowing through similar geologic formations. Carbon dioxide, ammonium nitrate and phosphate were never present in detectable concentrations in either spring. A total of 225 organisms representing 13 taxa was collected from Spring I, while only 80 organisms of 8 taxa were collected from Spring II (Table 2). The reduced taxonomic diversity resulted primarily from the limiting factor of a rather low constant water temperature. Numerical standing crop was moderate, considering the small basin size of these two springs. The lower numerical standing crop and reduced diversity in Spring II were probably derived from its less constant discharge (which ceased during the height of the 1980 drought). Further, this spring is shaded throughout the day, thus reducing photosynthesis and therefore autochthonous food materials. The smaller size of this basin may also have been a contributing factor. *Crangonyx* was the most abundant organism in both springs, constituting 67 and 51 percent of the organisms in Springs I and II, respectively. *Isoperla* was the second most abundant organism in Spring I (11%), while *Gerris* was second most abundant in Spring II (29%). *Crangonyx* is an omnivorous, general scavenger. *Gerris* usually eat a variety of crustaceans and aquatic insects that they catch just below the water surface, but alternatively may consume terrestrial insects that fall into the water. *Isoperla* is polyphagous, but is primarily predatory on other aquatic insects (Pennak, 1978). The dominance of these organisms implies that primary production and other autochthonous food sources were minimal in these two springs.

General Notes

Table 1. Physicochemical parameters for Springs I and II, Randolph County, Arkansas (26 April-13 June 1981).

Date	Spring	Air Temp. °C	Water Temp. °C	pH	nitrate ppm
26-IV	I	31	18	7.5	20
	II	30	15	7.5	22
10-V	I	23	15	8.0	20
	II	22	14	7.7	20
23-V	I	26	17	8.0	20
	II	26	15	7.2	20
13-VI	I	27	17	8.0	20
	II	27	16	7.5	20

Table 2. Aquatic macroinvertebrates, expressed as relative abundance, for Springs I and II, Randolph County, Arkansas (26 April-13 June 1981).

TAXA	Spring I	Spring II
GASTROPODA	0	7
AMPHIPODA		
Crangonyx forbesi (Hubricht Mackin)	150	41
Gammarus pseudolimnaeus Bousfield	18	0
Hyalella azteca (Saussure)	2	0
DECAPODA	0	1
HEMIPTERA		
Gerris remigis Say	8	23
Sigara grossolineata Hungurford	1	0
Microvelia americana (Uhler)	0	2
Microvelia austrina Buano	0	4
PLECOPTERA		
Perlesta placida (Hagan)	1	0
Isoperla	25	0
EPHEMEROPTERA		
Heptagenitidae	7	0
ODONATA		
Calopteryx maculata (Beauvois)	1	0
Argia plana Calvert	1	0
Plathemis lydia Drury	0	1
COLEOPTERA		
Laccophilus pictus Sharp	4	0
DIPTERA		
Culiseta inornata (Williston)	4	1
Tabanus atratus Fabricius	3	0
Total	225	80

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DARK REPAIR OF LETHAL DAMAGE INDUCED IN A HYBRID MAMMALIAN TISSUE CULTURE CELL LINE BY ULTRAVIOLET LIGHT*

Dark (non-photoreactivation) intracellular mechanisms that repair ultraviolet light (UV)-induced lesions in nuclear DNA are known to contriburte significantly to the resistance shown by many prokaryotic cells to such UV-induced effects as loss of colony forming ability, mutations, and division delay (Rupert and Harm, 1966; Smith, 1977). A number of studies indicate that at least two such mechanisms function in some mammalian cells (Cleaver, 1974). HeLa cancer tissue culture cells possess a mechanism that may be analogous to the "excision" repair mechanism found in many UV-resistant bacteria (Regan et al., 1968). Another mechanism has been detected in rodent cells (Cleaver, 1974) that is a post DNA replication repair process similar to "recombinational" (recom) repair found in some UV-resistant bacteria (Rupp and Howard-Flanders, 1968). A study by Meyn et al. (1974) suggests that both of these mechanisms function in many mammalian cells, but with varying efficiencies. For example, V79 hamster cells exhibit both excision and recom repair but the recom repair mechanism dominates, while HeLa cells appear to exhibit efficient exci-