OCCURRENCE AND DISTRIBUTION OF ARTHROPODS IN TRAVERTINE CREEK, PLATT NATIONAL PARK, MURRAY COUNTY, OKLAHOMA

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Fifty taxa of immature and adult arthropods were collected in Travertine Creek, Platt National Park, Murray County, Oklahoma during 1968 and 1969 in an attempt to characterize the arthropod fauna of the creek system, parts or all of which periodically dry up. Lack of certain forms in the stream in general (*e.g.*, Plecoptera), and of others in the upstream areas (especially long-lived forms, such as *Sialis sp.*) may be indicative of stresses brought about by the relative impermanency of Travertine Creek as an aquatic habitat.

Comprehensive lists and collections of aquatic invertebrates and ecologically oriented studies are neither published nor otherwise available for the streams in Platt National Park, a unique area in the Arbuckle Mountains of Central Oklahoma near the city of Sulphur. The chemicophysical diversity of the numerous springs and streams in the park is considerable, *e.g.*, some of the springs in the area have high concentrations of bromides, others are rich in sulfides, and still others are low in mineral content. Sections of some streams, and sometimes entire streams, dry up during some years. It may be found, after a more comprehensive study, that the biological diversity between these streams is correspondingly great. The potential is great for using streams in Platt National Park for analyzing such biological phenomena as recolonization, after a dry period, by invertebrate fauna (1), drift and upstream movement (2-5), and population stresses produced by desiccation and/or variations in water quality as affected by alterations in discharge.

The present study, conducted in July, 1968 and June and July, 1969, was undertaken to begin the characterization of the aquatic arthropod fauna in Travertine Creek.

Travertine Creek, a marly freshwater stream, is approximately three miles long. It originates in two springs: Antelope Springs, a rheocrene, and Buffalo Springs, a limnocrene with a man-made pool (Fig. 1). Cold Spring, another spring in the system, is located under a bedrock outcrop ten yards below Sycamore Crossing (Station VII below). Travertine Creek is confluent with Rock Creek, the most prominent stream in the park. Periodically, Antelope and Buffalo Springs cease to flow for varying lengths of time (Fig. 2); however, according to unpublished park records.

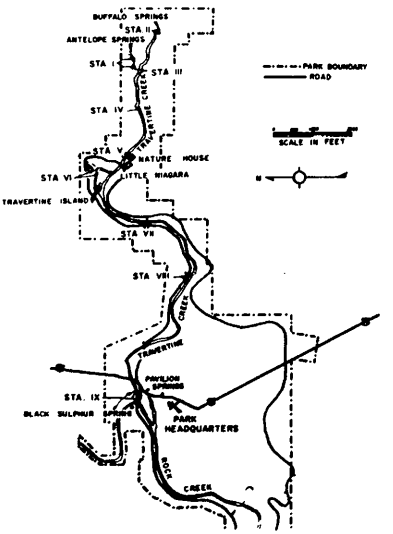

FIGURE 1. Platt National Park, Murray County, Oklahoma, and environs, showing Travertine Creek and principal collecting stations.

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they flowed continuously during 1968 and 1969.

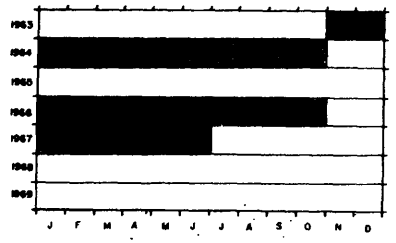

FIGURE 2. Years and months when Antelope and Buffalo Springs were not discharging, or when Travertine Creek was essentially dry from Station VII to spring sources, as represented by the dark stippled bands. (Data from unpublished monthly and annual precipitation records for Platt National Park, 1919-1968.)

METHODS

Collections were made at nine stations along the length of the stream system (Fig. 1) at least twice a week for six weeks during June and July, 1969. Collections were made twice during 1968 in the upper areas only. Organisms were collected with a fine-mesh (11 meshes per inch), 3 x 4 foot seine, dip nets, and by hand. Collected specimens were immediately preserved in 80% ethanol. They were identified by using appropriate keys; most identifications were confirmed by specialists. Reference specimens were deposited in the invertebrate collection of the University of Oklahoma Biological Station, Willis, Oklahoma.

Collecting stations

Station I. Antelope Springs from source to approximately 80 yards downstream (Fig. 1) was Station I. The upstream 20-yard section was lotic, about 3 feet wide and 10 inches deep, and generally gravelly with conglomerate rocks at the source. This portion flowed into two pools, each about 15 x 20 yards in size, with maximum depths of about 3 feet in the upstream pool and 6 feet in the other pool. The pools were connected by a shallow riffle about 15 feet long, consisting of a bedrock outcrop. The pool substrates were mud and sediments. Common aquatic plants included *Eleocharis* sp., *Nasturtium* sp., *Ludwigia* sp., and *Myriophyllum* sp.

Station II. Buffalo Springs from source (pool) to 15 yards downstream was Station II. The pool was approximately 3 feet deep and 15 feet in diameter and the stream below was 6 inches or less in depth by 3 feet wide. Substrates at this station consisted primarily of gravel with pebbles and some rocks. *Nasturtium* sp. was the dominant plant in the shallow stream segment downstream from the pool. Little vegetation occurred in the pool.

Station III. This station was located at the confluence of Antelope and Buffalo Springs (Travertine Creek proper). The stream was sampled for a distance of 20 yards below the confluence, a reach which was about 10 feet wide. Substrates were mud in the eddy, rocks and gravel in the main channel, with a bedrock outcrop at the lower end. The dominant plants were *Nasturtium* sp. and two kinds of Charophytes.

Station IV. Selected as Station IV was a stepping-stone crossing located approximately ¼ mile upstream from the nature center, 25 feet wide and about 6 inches deep. Substrates were gravel, rocks and sediments. *Nasturtium* sp. was present at the downstream end of the station.

Station V. A 30-yard segment (20 feet wide) located downstream from the duct passing under the nature center served as Station V. Substrates were mud, coarse rocks and some rubble. Vegetation was sparse.

Station VI. This station was a sluggish backwater north of Travertine Island. Substrates were rocks and debris. Vegetation was very sparse.

Station VII. This location was at a concrete low-water bridge known as Sycamore Crossing. The station extended 15 yards upstream and 15 yards downstream from the bridge, a reach that was about 30 feet wide. The substrates upstream were mud covered with decaying allochthonous vegetation. Downstream the substrates were sand gravel, rocks, and bedrock outcrops. Vegetation was sparse. Cold Spring was located about 10 yards downstream from this station.

Station VIII. A broad pool, 2 feet deep, that extended from a riffle near the Cold Spring Campground sign to approximately 50 yards downstream to a low falls, was the

TABLE 1. *Arthropods in Travertine Creek, Platt National Park, Murray County, Oklahoma.*

Isopoda	*Asellus acuticarpus* (Mackin and Hubricht)
Amphipoda	*Hyalella azteca* (Saussure)
	Stygonectes alabamensis occidentalis Holsinger
Decapoda	*Procambarus simulans simulans* (Faxon)
	Orconectes nais (Faxon)
Ephemeroptera	*Hexagenia limbata* (Serville)
	Baetis sp.
	Tricorythodes sp.
	Caenis simulans (McDunnough)
	Siphlonurus sp.
	Callibaetis sp.
	Stenonema tripunctatum (Banks)
Odonata	*Hetaerina americana* (Fabricius)
	Argia plana Calvert
	Agrion maculatum Beauvais
	Enallagma basidens Calvert
	Archilestes grandis Rambur
	Brechmorhoga mendax (Hagen)
	Erpetogomphus designatus Hagen
Hemiptera	*Sigara grossolineata* Hungerford
	Gerris remigis Say
	Gerris sp.
	Rhagovelia choreutes Hussay
	Microvelia sp.
	Gelastocoris oculatus (Fabricius)
Neuroptera	*Sialis* sp.
Coleoptera	*Paracymus digestus* (LeConte)
	Cymbiodyta toddi (Spanglin)
	Enochrus pygmeus (Fabricius)
	Tropisternus ellipticus (LeConte)
	Heliophorus sp.
	Hydroporus diversicornis (Sharp)
	Hydroporus dimidiatus (Gemm. & Har.)
	Copelatus glyphicus (Say)
	Agabus semivittatus texanus (Sharp)
	Peltodytes lengi Roberts (?)
	Haliplus deceptus Matheson
	Dineutus ciliatus (Forsberg)
	Lutrochus luteus ((LeConte) (?)
	Helodidae (?)
	Elmidae
Trichoptera	*Helicopsyche borealis* (Hagen)
	Hydropsyche sp.
	Cheumatopsyche sp.
	Leptocella sp.
Diptera	*Stictochironomus* sp.
	Tabanus sp.
	Tipula caloptera Loew.
	Dixa sp.
	Simuliidae

site of this station. Substrates were clay along the banks with small size gravel in mid-channel. Vegetation was sparse.

Station IX. This station extended from the Sulphur Falls confluence downstream to the confluence of Travertine and Rock Creeks. The section sampled was approximately 100 yards long and 25 feet wide. The substrates were sand, rocks, bedrock outcrops and mud. Vegetation was sparse.

RESULTS

A comprehensive list of organisms found is presented in Table 1. The general distribution and abundance of the more noteworthy forms is indicated below. Stream sections upstream from and including Station VII, which periodically dry up due to the lack of flow from the spring sources (see Fig 2), are referred to collectively as the "upper area." The lower area (below Station VII) rarely dries up because discharge from Cold Spring below Station VII rarely ceases. However, when Cold Spring and the two headwater springs dry up the entire stream is usually dry.

Isopoda. *Asellus acuticarpus*, a hypogean isopod, was found only in and near Antelope Springs source under large rocks.

Amphipoda. *Hyalella azteca* occurred sporadically in the lower reaches of the stream, never in abundance. Only one specimen of *Stygonectes alabamensis occidentalis* was obtained (in 1968) from Antelope Springs near its confluence with Buffalo Springs (near Station III).

Decapoda. *Procambarus s. simulans* occurred generally throughout Travertine Creek, but was not found in Antelope Springs. *Orconectes nais* was found only in the very lowest reaches of Travertine Creek near Rock Creek.

Ephemeroptera. Four of the seven kinds of mayfly nymphs were unidentifiable as to species. Two species, *Hexagenia limbata* and *Caenis simulans*, occurred commonly throughout the system while others, notably *Stenonema tripunctatum*, occurred more commonly in the lower reaches (Station VI and downstream). Still others, *Baetis* sp., *Siphlonurus* sp., and *Callibaetis* sp., occurred primarily in the pools of the upper area (Station I).

Odonata. Immature forms occurred generally throughout the system, except for *Archilestes grandis*, which occurred predominantly in the headwater areas. Only adults of *Agrion maculatum* were collected in the upper reaches (Stations II - IV); however, nymphs were obtained from Station IX. Although *Argia plana* was the only species of the genus found throughout the system in 1969, three other species have been found in Rock Creek by M. J. Westfall in late August, 1956; *A. apicalis*, *A. moesta*, and *A. sedula* (personal communication). Un-

less the environment has changed since that time, these probably occur in Travertine Creek, also; they were not found by us in June or July, 1968-1969.

Hemiptera. Adults of three of the six genera of these insects occurred generally throughout the system. *Gelastocoris oculatus* (actually not aquatic) was collected only at the nature center (Station V); *Microvelia* sp. was collected only in the lower reaches of the system (Stations VI - IX).

Neuroptera. *Sialis* sp. only, occurred sporadically in the lower reaches of the system (Station VI and downstream).

Coleoptera. Representatives of this order were obtained almost exclusively as adults. Immature forms were rarely encountered. Adults were found fairly uniformly throughout the system; they were the most prominent insect fauna of Travertine Creek during the brief study period and were represented by at least 15 species.

Trichoptera. All caddisfly larvae occurred most commonly in the upper areas, except at Station II, where none were found. An unidentified species of *Leptocella* was found only at Station IV. *Helicopsyche borealis* was found above Station VI; *Hydropsyche* sp. was found upstream from Station V. *Cheumatopsyche* sp. was the most cosmopolitan.

Diptera. *Tabanus* sp., *Dixa* sp. and Simuliidae were most common in the upper reaches, but the other dipterans, particularly *Stichtochironomus* sp. and *Tipula caloptera*, were common throughout the system.

DISCUSSION

Travertine Creek was dry upstream from Station VII from January through October, 1966 and from January through June, 1967 because Antelope and Buffalo Spring ceased discharging (Fig. 2). Periodically, in extended dry periods, Cold Springs (Station VII) also ceases to flow. When this happens, Travertine Creek usually dries up in its entire length to Rock Creek. According to unpublished park records, the last time this occurred was in 1967.

Casual collecting in the upper regions during July, 1968 revealed an abundance of aquatic fauna in all areas. At that time preliminary data were obtained on drift rates from Antelope Springs near its confluence with Buffalo Springs. Using paired drift nets (9 meshes per cm), each one-foot wide, totals of 139 individual Ephemeroptera and 245 individual specimens of Simuliidae (these groups representing the prominent drifters) were obtained during a 24-hr period. Although not great compared to numbers found in other drift studies, *e.g.*, Waters, 1962 (4), they possibly indicate ongoing recovery following the 1967 dry period (Fig. 2). The impermanency of the aquatic environment may be indicated by the lack of long-lived forms (*e.g.*, Neuroptera) from the upper areas, by the absence of Plecoptera (*e.g., Perlesta placida*), which have been found in the more permanent streams in and around the park, and even by the scarcity of immature stages of Coleoptera, an otherwise well-represented group (as adults) in the system. There was an abundance of other forms (*e.g., Hetaerina americana, Argia plana, Archilestes grandis*, to name a few) in the pools at Station I in 1968. In the previous year the upper area had been dry through June (Fig. 2). This suggests the occurrence of rapid recolonization, seemingly made possible only by adults ovipositing in those areas. Other possibilities, such as burrowing or aestivating, to withstand dry periods were not investigated.

Periodic drying of Travertine Creek provides ideal, reoccurring opportunities for studies of recolonization rates of invertebrate fauna, and effects of desiccation on a creek ecosystem (1-5). A more quantitative and long-term study should reveal even greater differences in distributions, to which a cursory study such as the present one can only allude.

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