

The Caddisflies (Insecta: Trichoptera) of the Buck Creek System, Pulaski County, Kentucky

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ABSTRACT

Seventy nine species of caddisflies, representing 15 families, were identified from collections obtained from the Buck Creek system, Pulaski County, Kentucky. Ten species, *Hydroptila gunda*, *Oxyethira forcipata*, *O. zeronia*, *Polycentropus centralis*, *Brachycentrus nigrosoma*, *Lepidostoma pictile*, *Ceraclea nepha*, *C. protonepha*, and *Ptilostomis postica*, were new distributional records for Kentucky. Four species of the family Hydroptilidae were new to science. Some species showed a preference for stream size, and an average of 37 species was found at each station. Flight periods of some species were characterized by continuous emergence and no cohort structure, some by short periods of synchronous emergence, and others by two or more periods of emergence.

INTRODUCTION

Very little is known about the distribution of Trichoptera in Kentucky. The only attempt at a complete list of Kentucky Trichoptera was by Resh (1), who reported 175 species from the state. The majority of these records came from the Salt River watershed, Kentucky River system, Cumberland River drainage, and the Levisa Fork of the Big Sandy River system, Ohio River drainage. Other systems, such as the Green River, Licking River, and Tygarts Creek, have been sparsely studied or completely overlooked by investigators.

Since 1975, an additional 13 species have been reported by Picazo and DeMoss (2), Thoeny and Batch (3), Haag and Hill (4), and Phillippi and Schuster (5), bringing the trichopteran fauna of Kentucky to 188 species. This is greater than the 153 species reported from Arkansas (6), but is smaller than the 219 species reported from Ohio (7, 8), the 239 species reported from Virginia (9), and the 298 species reported from Tennessee (10). It is clear that additional collecting of caddisflies in Kentucky is needed, and future investigations throughout Kentucky will likely yield new distributional records.

Objectives of this study included the following: (1) determine the trichopteran fauna of the Buck Creek system; (2) examine the longitudinal distribution of Trichoptera in the

Buck Creek mainstem; and (3) determine the flight periods of all species. Although there have been numerous collections of Trichoptera from the Cumberland River drainage, many of the major tributaries (e.g., Buck Creek) have not been investigated. This study further expands on the distributional records given by Resh (1), which included no records from Buck Creek. Because Buck Creek was considered to be a stream of high water quality (11, 12) and is considered to be one of the least impacted streams of the Cumberland River drainage, as reflected by the diversity of species in such groups as freshwater mussels (13) and fishes (14), it showed the potential to support a diverse Trichoptera fauna.

STUDY AREA

Buck Creek is a fifth order tributary of the Cumberland River and lies almost entirely in Pulaski County, Kentucky, with the exception of its headwaters in Lincoln County, Kentucky and additional tributaries arising in Rockcastle County (13). The stream drains 767 km² and has a length of 107.2 km before emptying into the Cumberland River (Lake Cumberland) at river km 858. The mean width of Buck Creek is less than 20 m, and the mean depth is less than 2 meters (14). The stream's gradient is 1.25 m/km (14), and the mean flow is estimated to be 11.7 km³/m (16). Buck Creek has high water quality, is well oxygenated, and is well buffered (11, 12).

Almost the entire length of Buck Creek lies within the Eastern Highland Rim subsection

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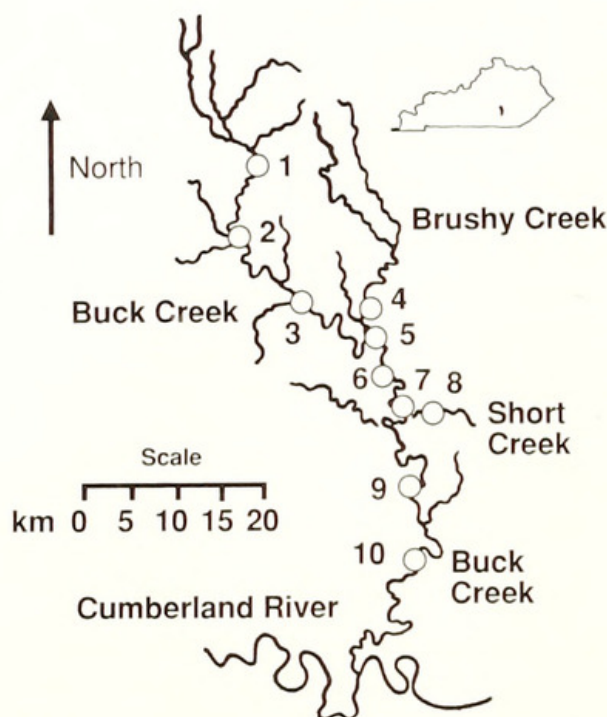


FIG. 1. Map of Buck Creek mainstem, Kentucky, showing collection sites (modified after Butler 1985).

of the Interior Low Plateau Physiographic Province. The surface rock is composed primarily of Mississippian Age limestone with some exposed shale bedrock in the northern and eastern part of the basin (13). Karst topography and sinking creeks (e.g., Short Creek) are common here, especially south of latitude $37^{\circ}17'00''$. The lower mainstem, south of State Route (SR) 80, is entrenched in the western limit of the Cumberland Plateau Physiographic Province, and erosion-resistant, Pennsylvanian-age sandstone is found on the surface (14).

The upper portions of Buck Creek are composed of numerous braids that become stagnant pools or completely dry up in the summer. The substrate is coarse sand, gravel, and small cobbles. Further downstream, the substrate is composed of coarse limestone rubble and slab boulders with some cracked bedrock (13). The watershed is mostly farmland, but much of the stream margin is forested. Forests are most common in the lower one third of the system, some of which are included in the Daniel Boone National Forest. Coal strip-mining and limestone quarries are found south of SR 80, but comprise less than 1% of the watershed. Some gravel-mining has occurred in the upper one third of the system, especially near the SR 39

crossing. The Soil Conservation Service has constructed 2 small flood control reservoirs (15 and 11 ha) on Buck Creek in Lincoln County (13, 14).

MATERIALS AND METHODS

Adult caddisflies were collected from 8 stations on Buck Creek and from additional sites on Brushy Creek and Short Creek (Fig. 1). Exact localities for these 10 stations are given in Table 1. Collections were made biweekly from each station beginning 22 April 1988, and ending 25 October 1988. Caddisflies were collected with light traps consisting of a camping lantern (Dorcy) equipped with a 6 W fluorescent black light bulb (power supplied by six "D" cell rechargeable batteries) and a plastic tray (35 cm \times 20 cm \times 5 cm) filled with approximately 500 ml of 70% ethanol. Collections were begun approximately 30 minutes before sunset and continued for 2 hours.

Based on sight identification, caddisflies were separated into distinct groups, and many samples contained far too many individuals for complete separation, so subsamples were taken. Adult males were identified to species, but females were identified only to the generic level (some females were identified to species if identification was certain). It is estimated that a total of 10,000 caddisfly adults were examined.

Many of the male genitalia had to be cleared in a concentrated solution of potassium hydroxide (KOH) in order to make a positive identification. This was done according to the method described by Schuster and Etnier (17).

RESULTS AND DISCUSSION

Seventy nine species of caddisflies, representing 15 families, were identified from collections from Buck Creek, Brushy Creek, and Short Creek (Tables 2, 3). The family Leptoceridae was represented by the largest number of species, 19, followed by the Hydroptilidae, 18, Hydropsychidae, 10, Polycentropodidae, 7, and the Glossosomatidae, 5.

Ten species, *Polycentropus centralis* Banks, *Brachycentrus nigrosoma* (Banks), *Lepidostoma pictile* (Banks), *Ceraclea nepha* (Ross), *C. protonepha* Morse and Ross, *Ptilostomis postica* (Walker), *Hydroptila gunda* Milne, *Oxyethira forcipata* Mosely, *O. zeronia* Ross, and *Neophylax acutus* Vineyard and Wiggins

TABLE 1. Localities for collecting stations on Buck Creek, Brushy Creek, and Short Creek.

STATION	LOCALITY
1	Buck Creek, SR 328 bridge crossing, approx. 8.3 km NW of Woodstock and .8 km SSW of OK, Pulaski County, Kentucky.
2	Buck Creek, SR 70 bridge crossing, approx. 2.5 km SW of Clarence and 5.8 km WNW of Woodstock, Pulaski County, Kentucky.
3	Buck Creek, KY SR bridge crossing, approx. 3.2 km S of Woodstock and 7.7 km ESE of Eubank, Pulaski County, Kentucky.
4	Brushy Creek, Elrod Road bridge crossing, Elrod, Pulaski County, Kentucky.
5	Buck Creek, old SR 461 bridge crossing, approx. 1 km SSE of Elrod and 3.3 km ENE of Welborn, Pulaski County, Kentucky.
6	Buck Creek, SR 1677 bridge crossing, approx. 2.2km W of Dahl and 4 km NW of Stab, Pulaski County, Kentucky.
7	Buck Creek, old SR 80 bridge crossing, Stab, Pulaski County, Kentucky.
8	Short Creek, along Short Creek Road near Pleasant Run Church, 1 km ESE of Stab, Pulaski County, Kentucky.
9	Buck Creek, SR 1003 bridge crossing, approx. 7.2 km S of Stab and 5 km N of Dykes, Pulaski Copunty, Kentucky.
10	Buck Creek, SR 192 bridge crossing, approx. 16.5 km E of Somerset and 5.2 km NW of Mt. Victory, Pulaski County, Kentucky.

were new distributional records for the state of Kentucky. With the exception of *H. gunda* and *N. acutus*, none of these represented range extensions. Collection of *N. acutus* in Kentucky represents a northern range extension of this species, as it had been reported only from northeastern Alabama and 2 sites southeast of Nashville, Tennessee (18). *Hydroptila gunda* was known from Georgia, New Hampshire, Virginia, South Carolina, Alabama, and northeastern Ohio (8, 19), and its collection in Kentucky represents a western range extension. Forty species (Tables 2, 3) represented new distributional records for the Cumberland River drainage.

Three species of *Hydroptila* and one species of *Ochrotrichia* were found to be new to science (Table 2). Two of these new *Hydroptila* species, *Hydroptila* sp. 1 and *Hydroptila* sp. 2, were the most common and abundant members of the family Hydroptilidae in the Buck Creek system. A species of *Orthotrichia* was found to be near that of *O. curta* Kingsolver and Ross, but its true identity remains to be determined. The 4 undescribed species, plus 10 new Kentucky distributional records reported here, brings the state's Trichoptera fauna up to 202 species.

Examination of the longitudinal distribution of Trichoptera (Tables 4, 5) revealed that 9

TABLE 2. Seasonal occurrence of adults of the suborder *Annulipalpia* from the Buck Creek Drainage.

	APRIL				MAY				JUNE				JULY				AUGUST				SEPTEMBER				OCTOBER			
	a ₁	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
GLOSSOSOMATIDAE																												
Agapetus hessi Leonard and Leonard																												
Agapetus illini Ross +																												
Glossosoma nigrior Banks																												
Matrioptila jeanae (Ross)																												
Protoptila maculata (Hagen)																												
HYDROPSYCHIDAE																												
Ceratopsyche cheilonis (Ross)																												
Ceratopsyche sparna (Ross)																												
Cheumatopsyche campyla Ross																												
Cheumatopsyche harwoodi harwoodi Denning																												
Cheumatopsyche oxa Ross +																												
Cheumatopsyche pettiti (Banks)																												
Hydropsyche betteni Ross																												
Hydropsyche dicantha Ross																												
Hydropsyche frisoni Ross																												
Macrostemum zebratum (Hagen)																												
HYDROPTILIDAE																												
Dibusa angata Ross																												
Hydrotilla armata Ross																												
Hydrotilla consimilis Morton																												
Hydrotilla gunda Milne *+																												
Hydrotilla hamata Morton																												
Hydrotilla sp. 1 *+																												
Hydrotilla sp. 2 *+																												
Hydrotilla sp. 3 *+																												
Hydrotilla waubesiana Betten																												
Ochrotrichia shawnee (Ross)																												
Ochrotrichia sp. 1 *+																												
Orthotrichia aegerfasciella (Chambers)																												
Orthotrichia nr. curta Kingsolver and Ross																												
Oxyethira forcipata Mosely *+																												
Oxyethira pallida (Banks)																												
Oxyethira zeronia Ross *+																												
Stactobiella delira (Ross)																												
Stactobiella palmata (Ross)																												
PHILOPOTAMIDAE																												
Chimarra obscura (Walker)																												
Wormaldia shawnee (Ross) +																												
POLYCENTROPIDAE																												
Cymellus fraternus (Banks) +																												
Nyctiophylax affinis (Banks) +																												
Phylocentropus placidus (Banks)																												
Polycentropus centralis Banks *+																												
Polycentropus cinereus (Hagen) +																												
Polycentropus confusus Hagen																												
Polycentropus elarus Ross																												
PSYCHOMYIIDAE																												
Lype diversa (Banks)																												
Psychomyia flava Hagen																												
RHYACOPHILIDAE																												
Rhyacophila carolina Banks																												
Rhyacophila carpenteri Milne +																												
Rhyacophila lobifera Betten +																												

* = New distributional record for Kentucky. a = Numbers represent collection periods, not dates. + = New distributional record for the Cumberland River Drainage.

TABLE 3. Seasonal occurrence of adults of the suborder *Integripalpia* from the Buck Creek Drainage.

	APRIL				MAY				JUNE				JULY				AUGUST				SEPTEMBER				OCTOBER			
	a ¹	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
BRACHYCENTRIDAE																												
<i>Brachycentrus nigrosoma</i> (Banks) *+																												
<i>Micrasema rusticum</i> (Hagen)																												
GOERIDAE																												
<i>Goera calcarata</i> Banks																												
HELICOPSYCHIDAE																												
<i>Helicopsyche borealis</i> (Hagen)																												
LEPIDOSTOMATIDAE																												
<i>Lepidostoma pictile</i> (Banks) *+																												
<i>Lepidostoma togatum</i> (Hagen)																												
LEPTOCERIDAE																												
<i>Ceraclea ancylus</i> (Vohries) +																												
<i>Ceraclea cancellata</i> (Betten)																												
<i>Ceraclea maculata</i> (Banks) +																												
<i>Ceraclea nepha</i> (Ross) *+																												
<i>Ceraclea protonepha</i> Morse and Ross *+																												
<i>Ceraclea resurgens</i> (Walker)																												
<i>Ceraclea tarsipunctata</i> (Vohries)																												
<i>Ceraclea transversa</i> (Hagen) +																												
<i>Mystacides sepulchralis</i> (Walker)																												
<i>Nectopsyche exquisita</i> (Walker)																												
<i>Oecetis cinerascens</i> (Hagen) +																												
<i>Oecetis ditissa</i> Ross +																												
<i>Oecetis inconspicua</i> (Walker)																												
<i>Oecetis nocturna</i> Ross +																												
<i>Oecetis persimilis</i> (Banks) +																												
<i>Trienodes ignitus</i> (Walker) +																												
<i>Trienodes injustus</i> (Hagen)																												
<i>Trienodes melacus</i> Ross +																												
<i>Trienodes tardus</i> Milne +																												
LIMNEPHILIDAE																												
<i>Pycnopsyche guttifer</i> (Walker) +																												
<i>Pycnopsyche lepida</i> (Hagen) +																												
PHRYGANEIDAE																												
<i>Agrypnia vestita</i> (Walker) +																												
<i>Phryganea sayi</i> Milne +																												
<i>Ptilostomis postica</i> (Walker) *+																												
UENOIDAE																												
<i>Neophylax acutus</i> Vineyard and Wiggins *+																												
<i>Neophylax fuscus</i> Banks +																												

* = New distributional record for Kentucky. a = Numbers represent collection periods, not dates. + = New distributional record for the Cumberland River Drainage.

species were found at all stations, 13 species were found only in the fourth order portion (stations 1, 2, and 3) of Buck Creek, and 15 species were found only in the fifth order portion (stations 5, 6, 7, 9, and 10) of Buck Creek. Two species, *Ceratopsyche sparna* (Ross) and *Hydropsyche dicantha* Ross, were collected only from Short Creek (station 8). Both species were likely present in Buck Creek, since both

were reported from Buck Creek by Butler (15) at the SR 1677 bridge crossing (station 6).

The number of species per station ranged from 33 (station 1) to 43 (station 2) and averaged 37. It is likely that most species in the Buck Creek system were univoltine. The limnephilid species *Pycnopsyche guttifer* (Walker) and *Pycnopsyche lepida* (Hagen) represented 2 possible semivoltine species. Periods

TABLE 5. Longitudinal distribution of the suborder *Integripalpia* in the Buck Creek Drainage.

	STATION									
	1	2	3	4	5	6	7	8	9	10
Brachycentrus nigrosoma										
Micrasema rusticum										
Goera calcarata										
Helicopsyche borealis										
Lepidostoma pictile										
Lepidostoma togatum										
Ceraclea ancylus										
Ceraclea cancellata										
Ceraclea maculata										
Ceraclea nepha										
Ceraclea protonepha										
Ceraclea resurgens										
Ceraclea tarsipunctata										
Ceraclea transversa										
Mystacides sepulchralis										
Nectopsyche exquisita										
Oecetis cinerascens										
Oecetis ditissa										
Oecetis inconspicua										
Oecetis nocturna										
Oecetis persimilis										
Trienodes ignitus										
Trienodes injustus										
Trienodes melacus										
Trienodes tardus										
Pycnopsyche guttifer										
Pycnopsyche lepida										
Agrypnia vestita										
Phryganea sayi										
Ptilostomis postica										
Neophylax acutus										
Neophylax fuscus										

of emergence (Tables 2, 3) seemed to follow 3 patterns. Some species (e.g., *Chimarra obscura*, *Oecetis inconspicua*) were collected during almost every collecting period. This suggested continuous emergence with no cohort structure. Other species (e.g., *Hydropsyche dicantha*, *Wormaldia shawnee*) had single, short periods of synchronous emergence thereby displaying one evident cohort. Still other species (e.g., *Cheumatopsyche oxa*, *Polycentropus confusus*) displayed 2, short periods of synchronous emergence which suggested the presence of 2 cohorts. An aquatic mite, *Albia* sp. (Aturidae), was present on 3 leptocerid species, *Oecetis inconspicua*, *O. ditissa*, and *O. cinerascens*. It was also present on females

of *Ceraclea* and *Trienodes*. These mites have been reported to parasitize members of the Hydropsychidae, Leptoceridae, Molannidae, and Leptoceridae (20).
Although Buck Creek is one of the least impacted tributaries of the Cumberland River and contains a diverse array of aquatic organisms (11, 12, 13, 14, 15), it has been significantly impacted (13). There has been extensive gravel-mining activities in Buck Creek at the SR 39 bridge crossing (station 3). Butler (15) reported decreased diversity of macroinvertebrates at this site, and Schuster et al. (13) found very few species of unionids. Surprisingly, this site produced 40 species of Trichoptera, the second highest number in the

study. The lower portions of Buck Creek are impounded due to Lake Cumberland. Schuster et al. (13) reported only two unionid species from this segment. Other activities such as agriculture have led to the use of herbicides and pesticides which enter Buck Creek as surface runoff, and clearcutting of riparian vegetation has increased siltation. Finally, a series of low level dams has been proposed for the entire length of Buck Creek by the Soil Conservation Service (14). All of these could have a serious effect on the caddisfly fauna of Buck Creek. In order to maintain the high diversity of Trichoptera and other aquatic organisms in the Buck Creek system, it is suggested that periodic measuring of water quality parameters and sampling of aquatic organisms be carried out.

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