

***Paraleptophlebia calcarica*, n. sp.**  
**(Ephemeroptera: Leptophlebiidae) from Western Arkansas<sup>1, 2</sup>**

CARA D. ROBOTHAM AND ROBERT T. ALLEN<sup>3</sup>

**ABSTRACT:** *Paraleptophlebia calcarica*, n. sp., is described from Magazine Mountain in Logan County, Arkansas. The new species is compared with the morphologically similar *Paraleptophlebia sticta* and *Paraleptophlebia jeanae* from which it differs by the presence of slender reflexed spurs on the penis lobes in the males.

In North America the mayfly family Leptophlebiidae consists of eight genera. *Paraleptophlebia* Lestage is the largest genus with 35 species (Day, 1952, 1954; Berner, 1955; Edmunds et al., 1976; Harper and Harper, 1986). *Paraleptophlebia* are small frail mayflies whose naiads typically inhabit leaf-drifts in slow to moderately flowing water. Adults are distinguished from other Leptophlebiidae by (1) characters associated with the wing veins, (2) the three subequal caudal filaments, (3) the deeply cleft terminal sternite of the females and (4) the protarsi of the males. Male genitalia are also distinctive for the genus, consisting of a pair of four-segmented forceps and a pair of slender penis lobes that are more or less mesially fused toward the base. Each penis lobe bears one or two appendages whose shape and arrangement, along with the shape of the penis lobes themselves, are diagnostic for males of different species. Adults of most species can be identified using keys presented by Traver (1935), Mayo (1939), Day (1956), Berner (1950), Burks (1953), and Kilgore and Allen (1973).

Nine of the 35 species of *Paraleptophlebia* have been reported from the central United States (Edmunds et al., 1976); however, only two have been collected in the Ozark/Ouachita mountain region of Arkansas (McCafferty and Provonsha, 1978). These records may not accurately reflect the variety of *Paraleptophlebia* species present in the uplands of Missouri and Arkansas since many areas have not been adequately collected. Small streams in the Ozark/Ouachita mountains support a rich aquatic fauna. McCafferty and Provonsha (1978) reported 70 species of Ephemeroptera from northern and western Arkansas, but recent collecting has revealed several additional species. The new *Paraleptophlebia* described in this paper was collected by David Bowles in a blacklight trap located at the base of Magazine Mountain on 13 May 1986. Gutter Rock Creek, the stream nearest to where the new species was collected, originates as a spring at the top of the mountain and runs down the northern face, terminating approximately four miles downstream at its confluence with Cove Creek. This stream has intermittent flow that is heavy in the spring, decreases in discharge during mid to late June and has only a few separated pools remaining by August. Only one adult male, one

---

<sup>1</sup> Published with the approval of the Director, Arkansas Agricultural Experiment Station, University of Arkansas, Fayetteville, Arkansas 72701.

<sup>2</sup> Supported, in part, by a grant from the Arkansas Nongame Preservation Committee.

<sup>3</sup> Graduate Research Assistant and Professor Entomology, respectively, Entomology Department, University of Arkansas, Fayetteville, Arkansas 72701.

Accepted for publication 22 April 1988.

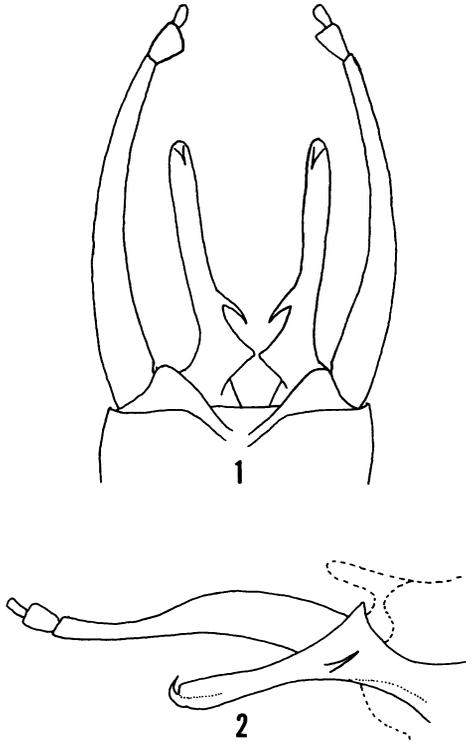


Fig. 1. Ventral view of penis lobes and forceps, *Paraleptophlebia calcarica*.

Fig. 2. Lateral view of left half of genitalia, *P. calcarica*.

male subimago, and four female subimagos were collected. In repeated visits to the locality no additional adult or larval specimens have been taken.

*Paraleptophlebia calcarica*, new species  
(Figs. 1, 2)

**HOLOTYPE:** Male. Arkansas, Logan Co., 17 miles southwest of Paris, northern base of Magazine Mountain, Gutter Rock Creek, 13 May 1986. David Bowles, collector. University of Arkansas Insect Collection (UAIC). Four paratypes, UAIC; one paratype female, American Museum of Natural History, New York. All specimens in alcohol.

**ETYMOLOGY:** This species is named for the reflexed spur (calcar) on the penis lobes.

**DESCRIPTION:** Body length, 5.56 mm (5.37–5.73); caudal filaments, 6.59 mm (6.10–6.23). *Head:* Eyes large, contiguous dorsally; upper half orange brown, lower half black. Vertex dark brown. Lateral ocelli pale, much larger than median ocellus. Black marks extended medially from each lateral ocellus, forming a broad, inverted “V” on the vertex. Antennae pale brown, apex hyaline. *Thorax:* Dark brown; no distinctive marks present. *Wings:* Forewings hyaline; stigmatic area milky. Longitudinal veins colorless; crossveins indistinct. Light brown shading at extreme bases. Hindwings hyaline. *Legs:* Foreleg pale, femur with a slight brownish

tint at the distal end; tibia pale; tarsi pale; claws pale. Middle and hind legs pale. Coxae of all legs brown. *Abdomen*: Brown with segments 2–6 white, with black dashes in the posterolateral angles; posterior margins with narrow black band across entire margin. Tergite 7 white and brown; posterior  $\frac{1}{3}$  shaded brown with black dashes in the posterolateral angles. Tergites 8–10 brown; 8 with a longitudinal black line down the meson; 9 shaded with black at lateral margins. Sternites 2–6 hyaline; sternite 7 white; 1, 8–10 brown.

**GENITALIA**: Forceps pale; penis lobes tan, lighter at tips, each lobe with slender reflexed mesal spur; apex with a small hook. In profile, there is a distinct elbow-like curve in the middle of each penis lobe; each lobe with a distinct, thin process directed ventrally as a platelike structure, beginning near the base of the forceps and extending distally to just beyond the elbow-like curve, as in *P. jeanae*. Caudal filaments white.

### Discussion

The external characters of *Paraleptophlebia calcarica* present an interesting combination when compared with certain other described species of *Paraleptophlebia*. The external color pattern of the abdomen is very similar to that of *P. stricta* Burks from Illinois. Both species have the middle abdominal tergites white, with black markings in the posterolateral angles and a transverse band across the posterior margin. However, the shape of the male genitalia of *P. calcarica* is almost identical to that of *P. jeanae* Berner, from the Blue Ridge Province of the Appalachian Highlands and the Coastal Plain in Alabama. Despite the close similarity of structure, the genitalia of *P. calcarica* is easily distinguished from that of *P. jeanae* by the presence of the slender reflexed spurs, which are entirely absent in the latter species (Berner, 1955).

Based on a consideration of all characters, it is our opinion that *Paraleptophlebia jeanae* and *Paraleptophlebia calcarica* are sister species. We note that this east-west, disjunct geographical pattern also occurs in a number of other insect taxa (Ross, 1956; Allen, 1983) as well as in higher animal taxa (Highton, 1962) and in many plant groups (Steyermark, 1968). A "generalized track" is evident between the interior highlands of Arkansas and Missouri and the Appalachian Mountains. The time and nature of the vicariant event that separated the ancestral populations whose present day lineages form the generalized track between Arkansas/Missouri and the Appalachians is unclear at this time.

### Acknowledgments

We would like to thank the following individuals in the University of Arkansas Department of Entomology for reading the manuscript and rendering valuable suggestions: J. R. Phillips, Phillip Tugwell, and C. E. Carlton. Our special thanks to David E. Bowles for collecting the specimens and offering valuable comments during the manuscript preparation.

### Literature Cited

- Allen, R. T. 1983. Distribution patterns among arthropods of the north temperate deciduous forest biota. *Ann. Missouri Bot. Gard.* 70:616–628.
- Berner, L. 1950. The Mayflies of Florida. *Univ. Florida Studies, Biol. Sci. Ser.*, No. 4. 267 pp.
- Berner, L. 1955. A new species of *Paraleptophlebia* from the southeast (Ephemeroptera: Leptophlebiidae). *Proc. Entomol. Soc. Washington* 57(5):245–247.

- Burks, B. D. 1953. The mayflies, or Ephemeroptera, of Illinois. *Bull. Ill. Nat. Hist. Surv.* 26(1):216 pp.
- Day, W. C. 1952. New species and notes on California mayflies (Ephemeroptera). *Pan-Pac. Entomol.* 28:17-39.
- Day, W. C. 1954. New species and notes on California mayflies. II. *Pan-Pac. Entomol.* 30:15-29.
- Day, W. C. 1956. Ephemeroptera. In R. L. Usinger (ed.), *Aquatic Insects of California*, pp. 79-105. Univ. Calif. Press, Berkeley. 508 pp.
- Edmunds, G. F., Jr., S. L. Jensen, and L. Berner. 1976. *The Mayflies of North and Central America*. Univ. Minn. Press, Minneapolis, Minn. 330 pp.
- Harper, F., and P. P. Harper. 1986. An annotated key to the adult males of the northwestern Nearctic species of *Paraleptophlebia* Lestage with the description of a new species. *Can. J. Zool.* 64(7): 1460-1468.
- Highton, R. 1962. Revision of North American salamanders of the genus *Plethodon*. *Bull. Florida State Mus.* 6:235-367.
- Kilgore, J. I., and R. K. Allen. 1973. Mayflies of the Southwest: new species, descriptions, and records (Ephemeroptera). *Ann. Entomol. Soc. Amer.* 66:321-332.
- Mayo, V. K. 1939. New western Ephemeroptera. *Pan-Pac. Entomol.* 15:145-154.
- McCafferty, W. P., and A. V. Provonsha. 1978. The Ephemeroptera of mountainous Arkansas. *Journ. Kansas Entomol. Soc.* 51(3):360-379.
- Ross, H. H. 1956. Evolution and classification of the mountain caddisflies. Univ. Illinois Press, Urbana, Ill. 158 pp.
- Steyermark, J. A. 1968. *Flora of Missouri*. The Iowa State Univ. Press, Ames, Iowa. 1728 pp.
- Traver, J. R. 1935. North American mayflies, a systematic account of North American species in both adult and nymphal stages. In J. G. Needham, J. R. Traver, and Yin-Chi Hsu (eds.), *The Biology of Mayflies*, pp. 237-739. Comstock, Ithaca, N.Y. 759 pp.