

**ADULT DESCRIPTIONS AND COMMENTARY FOR
TWO SPECIES OF SOUTHEASTERN NEARCTIC
EPHEMERELLA (EPHEMEROPTERA:
EPHEMERELLIDAE)¹**

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ABSTRACT: Reared and associated materials from Florida and the Great Smoky Mountains provide the bases for the first adult descriptions of *Ephemerella choctawhatchee* and *E. rossi*. Male adults of the two species are shown to be morphologically distinctive among congeners, based on characters associated with the male genitalia. The relatively similar larvae of *E. choctawhatchee* and *E. invaria* are possibly ecologically and geographically distinct. The first records of *E. rossi* from Georgia are provided.

Recent studies of Nearctic Ephemerellinae (Ephemerellidae) have led to the discovery of reared material of two southeastern species previously undescribed in the adult stage. Manny Pescador (Tallahassee, FL) kindly provided us with adults of *Ephemerella choctawhatchee* Berner from Florida that had been reared by J. Jones (Tallahassee, FL). *Ephemerella choctawhatchee* had been reported in the adult stage, but was not described (Berner and Pescador 1988). Adults of *Ephemerella rossi* Allen and Edmunds from Great Smoky Mountains National Park (GSMNP) were kindly provided to us by Chuck Parker (Gatlinburg, TN). John Cooper (Durham, NC) reared this material as part of the current All Taxa Biodiversity Inventory project underway in the Park (Kaiser 1999, Pedersen 1999). Based on these newly available adults, we herein provide the first formal adult descriptions of *E. choctawhatchee* and *E. rossi*. We have included commentary on adult diagnosis, various notes on the larvae, and distributional data.

***Ephemerella choctawhatchee* Berner**

Male adult.—Length: body 7.2 mm, forewings 7.5 mm. Head light brown, dark spots on vertex; postfrontal and frontal sutures pale margined. Antennae with scape and pedicel brown. Ocelli white with black base. Upper portion of dioptic compound eyes pale orange, lower portion black. Thorax brown, with darker lateral areas; pronotum dark brown. Wings hyaline; costa and subcosta brown; most veins, intercalaries, and crossveins light brown; stigmatic area lightly clouded in white. Mid- and hindlegs uniformly pale; forelegs light brown, paler distally. Length of segments of foreleg in millimeters: trochanter = 0.3, femur = 1.5, tibia = 2.0, tarsus I = 0.1, tarsus II = 0.9, tarsus III = 1.0, tarsus IV = 0.8, tarsus V = 0.4. Abdomen brown, shaded with gray; middle segments slightly translucent. Each tergum with pale medial stripe and single pair dark brown sublateral dashes. Pleural margins dark gray. Sterna with pair of submedial dark brown small spots; angled brown dash present between spot and pleural margin. Genitalia (Fig. 1) with four to six lateral, stout spines and no ventral stout spines on penes; mesoapical lobe present on

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forceps segment 2. Caudal filaments light brown with dark brown annulations at apex of segments, moderately covered with short, intersegmental setae.

Female adult.—Length: body 7.0 mm; forewings 7.5 mm. Body coloration much lighter than male, but otherwise very similar.

Adult diagnosis. The male adult of *E. choctawhatchee* appears most similar to those of the North American species *E. invaria* (Walker) and *E. rotunda* Morgan. This observation was previously noted by Berner and Pescador (1988). Allen and Edmunds (1965) even suggested that *E. choctawhatchee* and *E. invaria* might be synonymous; however, the two species differ in the number and placement of the spines on the penes. *Ephemerella choctawhatchee* has fewer dorsal spines on the penes than *E. invaria* or *E. rotunda*, and lacks ventral spines.

Ephemerella choctawhatchee male adults could have previously been identified as either *E. catawba* Traver or *E. inconstans* Traver, because of the sequence of characters used in the adult key to *Ephemerella* species by Allen and Edmunds (1965). Also, use of the key to Florida *Ephemerella* species by Berner and Pescador (1988) could have led to misidentification of *E. choctawhatchee* male adults as *E. dorothea* Needham. In light of these observations, certain southeastern North American *Ephemerella* male adults may require re-identification, particularly in light of the observed absence of ventral penes spines in *E. choctawhatchee* male adults.

Larval diagnosis. Allen and Edmunds (1965) separated mature larvae of *E. choctawhatchee* from *E. invaria* based on body length and geographic distribution, with *E. choctawhatchee* indicated as the smaller and more southern of the two species. It has been shown that size differences can be unreliable when making species identifications in *Ephemerella* (Berner and Pescador 1988). It is therefore conceivable that some small mature larvae of *E. invaria* have been previously misidentified as *E. choctawhatchee*. Our preliminary studies of the larvae of the two species have as of yet not revealed any consistent morphological differences. The more widespread *E. invaria* is generally considered a cool water species throughout its eastern and midwestern range (Randolph and McCafferty 1998), whereas *E. choctawhatchee* has not been reported from such streams, at least in Florida. Larvae from Georgia and South Carolina (see below) may be ecologically segregated, but this can be demonstrated only if additional specimens of the two species from varied habitats are reared and associated.

Distribution. *Ephemerella choctawhatchee* is apparently restricted in distribution to the extreme southeastern United States. It has only been reported from Florida (Berner 1946, Berner 1950, Berner 1958, Allen and Edmunds 1965, Schneider 1967, Pescador and Peters 1974, Berner 1977, Berner and Pescador 1988), Georgia (Berner 1958, Berner 1977), and South Carolina (Berner 1977, Unzicker and Carlson 1982, Pescador et al. 1999). Some Geor-

gia and South Carolina records may be questionable (see remarks above) and will require re-evaluation in the future.

Material examined. One male adult, associated exuviae, Florida, Gadsden Co., Flat Cr. at Co. Rd. 270A, 8 km south of Chattahoochee, 5-IV-1996, J. Jones [Florida A&M Univeristy (FAMU)]; one female adult, associated exuviae, Florida, Gadsden Co., Monroe Cr. at Co. Rd. 268, 6 km west of Midway, 14-II-1996, J. Jones [FAMU]; one male adult (genitalia on slide), associated exuviae, same data, except 8-II-1996 [FAMU]; twelve larvae, Florida, Gadsden Co., Monroe Cr., 12-II-1997, J. Jones [FAMU]; three larvae, Florida, Gadsden Co., L. Berner.

Ephemerella rossi Allen and Edmunds

Male adult.—Length: body 6.5 mm, forewings 6.2 mm. Head brown; postfrontal and frontal sutures pale margined. Antennae with scape and pedicel brown; scape pale margined; flagella brown. Ocelli white with dark brown base. Upper portion of dioptic compound eyes orange, lower portion black. Thorax dark brown, with lighter lateral areas. Wings hyaline, wing base and most veins brown; intercalaries and crossveins pale; stigmatic area lightly clouded in white. Mid- and hindlegs uniformly pale; forelegs uniformly light brown. Length of segments of foreleg in millimeters: trochanter = 0.2, femur = 1.1, tibia = 1.9, tarsus I = 0.1, tarsus II = 0.8, tarsus III = 0.8, tarsus IV = 0.7, tarsus V = 0.3. Abdomen light brown, with middle segments translucent. Each tergum stained with brown; posterior margin with dark brown crossband. Pleural margins pale. Sterna with pair of brown submedian spots. Genitalia (Fig. 2) with four to six, middorsal, stout spines and no ventral, stout spines on penes; no mesoapical lobe on forceps segment 2. Caudal filaments light brown with brown annulations at apex of segments, relatively densely covered with short, intersegmental setae.

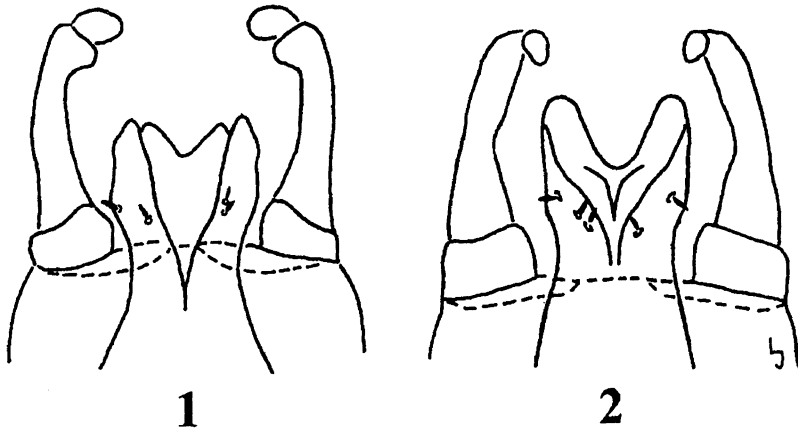


Fig. 1. *Ephemerella choctawhatchee*, male genitalia (dorsal view).

Fig. 2. *Ephemerella rossi*, male genitalia (dorsal view).

Female adult.—Length: body 6.5 mm; forewings 7.1 mm. Coloration lighter than male, otherwise very similar.

Adult diagnosis. The male adult of *E. rossi* appears superficially similar to the male adult of *E. excrucians* Walsh. If using the key of Allen and Edmunds (1965), *E. rossi* will be misidentified as *E. excrucians*. However, the shape of the penes and the absence of an apical expansion on forceps segment 2 (Fig. 2) will distinguish *E. rossi* from *E. excrucians* and other known *Ephemerella* adults in North America.

Distribution. *Ephemerella rossi* was described from larvae collected in the Great Smoky Mountains of Tennessee (Allen and Edmunds 1965), and had been previously referred to as *Ephemerella* sp. No. 5 by Traver (1937). There have been subsequent published reports from Tennessee (Berner 1977, Long and Kondratieff 1996) and North Carolina (Berner 1977, Stoneburner 1977, Penrose et al. 1982, Unzicker and Carlson 1982). We have not been able to substantiate reports from South Carolina (Unzicker and Carlson 1982, Pescador et al. 1999), because the authors did not include any accompanying data. Our material examined, however, does provide the first records of this species from Georgia.

Material examined. Five larvae, Georgia, Rabun Co., Becky Branch in Warwoman Dell Picnic Area, 3 mi. east of Clayton on S 884, elev. 574 m., 02-V-1969, J. B. Wallace, et al. [Purdue Entomological Research Collection (PERC)]; two larvae, Georgia, Rabun Co., Chattooga R. at Forest Service Rd. 646, elev. 579 m., 02-V-1969, J. B. Wallace et al. [PERC]; six larvae, Georgia, Rabun Co., Reed Cr. at Forest Service Rd. 646, elev. 518 m., 11-V-1969, J. B. Wallace, et al. [PERC]; two male adults, one female adult, associated exuviae, North Carolina, Swain Co., GSMNP, Taywa Cr., 14-VI-1999 (emerged 16-VI-1999), D. Noon, A. Sekeres, L. Shugart (male genitalia on slides) [PERC]; one male adult (genitalia on slide), one female adult, one male subimago, associated exuviae, Tennessee, Sevier Co., GSMNP, LeConte Cr. at Twin Creeks, from Apple Barn upstream 55 m to old mill dam, 35°41'11"N, 83°30'02"W, 590 m, LCLC0101, 9-VI-1999, NPS Crew [GSMNP Museum, Gatlinburg, TN].

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LITERATURE CITED

- Allen, R. K. and G. F. Edmunds, Jr. 1965. A revision of the genus *Ephemerella* (Ephemeroptera, Ephemerellidae) VIII. The subgenus *Ephemerella* in North America. Misc. Publ. Entomol. Soc. Am. 4: 243-282.
- Berner, L. 1946. New species of Florida mayflies (Ephemeroptera). Fla. Entomol. 28: 60-82.
- Berner, L. 1950. The mayflies of Florida. University of Florida Press, Gainesville.
- Berner, L. 1958. A list of mayflies from the lower Apalachicola River drainage. Quart. J. Fla. Acad. Sci. 21: 25-31.
- Berner, L. 1977. Distributional patterns of southeastern mayflies (Ephemeroptera). Bull. Fla. State Mus., Biol. Sci. 22: 1-56.

- Berner, L. and M. L. Pescador.** 1988. The mayflies of Florida, revised edition. Florida A&M University Press, Tallahassee.
- Kaiser, J.** 1999. Great Smokies species census under way. *Science* 284: 1747-1748.
- Long, L. S. and B. C. Kondratieff.** 1996. The mayflies (Ephemeroptera) of Tennessee, with a review of the possibly threatened species occurring within the state. *Gr. Lakes Entomol.* 29: 171-182.
- Penrose, D. L., D. R. Lenat, and K. W. Eagleson.** 1982. Aquatic macroinvertebrates of the Upper French Broad River basin. *Brimleyana* 8: 27-50.
- Pedersen, D.** 1999. The search for hidden life: Scientists are trying to identify every living thing in the Smokies National Park. *Newsweek* 133(21): 82-83.
- Pescador, M. L. and W. L. Peters.** 1974. The life history and ecology of *Baetisca rogersi* Berner (Ephemeroptera: Baetiscidae). *Bull. Fla. State Mus., Biol. Sci.* 17: 151-209.
- Pescador, M. L., D. R. Lenat, and M. D. Hubbard.** 1999. Mayflies (Ephemeroptera) of North Carolina and South Carolina: an update. *Fla. Entomol.* 82: 316-332.
- Randolph, R. P. and W. P. McCafferty.** 1998. Diversity and distribution of the mayflies (Ephemeroptera) of Illinois, Indiana, Kentucky, Michigan, Ohio, and Wisconsin. *Ohio Biol. Surv. Bull. NS* 13 (1): vii + 1-188.
- Schneider, R. F.** 1967. Mayfly nymphs from northwestern Florida. *Quart. J. Fla. Acad. Sci.* 29: 202-206.
- Stoneburner, D. L.** 1977. Preliminary observations of the aquatic insects of the Smoky Mountains: altitudinal zonation in the spring. *Hydrobiologia* 56: 137-143.
- Traver, J. R.** 1937. Notes on mayflies of the southeastern states (Ephemeroptera). *J. Elisha Mitchell Sci. Soc.* 53: 27-86.
- Unzicker, J. D. and P. H. Carlson.** 1982. Ephemeroptera. pp. 3.1-3.97. In: A. R. Brigham, W. U. Brigham, and A. Gnilka, eds. *Aquatic insects and oligochaetes of North and South Carolina.* Midwest Aquatic Enterprises, Mahomet, Illinois.
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BOOK RECEIVED AND BRIEFLY NOTED

FROGS, FLIES, AND DANDELIONS. The Making of Species. M. Schilthuizen. 2001. Oxford University Press. 245 pp. Hard. \$25.00.

Possibly the most long standing question in evolutionary biology concerns the origin of species. From looking at how we define a species, to exploring how geographical isolation and sexual selection contribute to the making of new species, to showing how new species may appear either gradually or instantaneously, this small volume offers a comprehensive account of this evolutionary drama, and we get a clearer picture of some of the conditions that are necessary for one species to evolve into another. A major emphasis of the book is a discussion of how speciation occurs other than by geographical isolation. The author reviews the voluminous scientific literature on evolution, reduces it to a manageable size, and presents it in a form that is easily accessible for the non-specialist.