

***ACENTRELLA NADINEAE*, A NEW SPECIES OF SMALL MINNOW
MAYFLIES (EPHEMEROPTERA: BAETIDAE)**

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Abstract.—A new species of the two-tailed small minnow mayfly genus *Acentrella* Bengtsson (Ephemeroptera: Baetidae) is described as *Acentrella nadineae*, new species, based on highly distinctive larvae taken from high quality streams in southern and eastern Ohio. The species is differentiated by a short tibia + tarsus of the forelegs; long, evenly spaced, moderately dense setae along the dorsal edge of the femora; highly asymmetric gills with mediobasal markings; no dorsomedial abdominal projections; no developed hindwingpads; and typically a relatively dark abdominal tergum 7 and light abdominal tergum 8. The new species is also reported from North Carolina, and sometimes co-occurs with the more common and widespread, but similarly sized *A. turbida* (McDunnough).

Key Words: mayflies, new species, eastern North America, Baetidae

The status of the two-tailed Baetidae mayfly genus *Acentrella* Bengtsson in North America was recently reviewed by Jacobus and McCafferty (2006) and included a revised larval key and description of the species *A. barbarae* Jacobus and McCafferty, which was added to the previously known North American species *A.alachua* (Berner), *A. feropagus* Alba-Tercedor and McCafferty, *A. insignificans* (McDunnough), *A. lapponica* Bengtsson, *A. parvula* (McDunnough), and *A. turbida* (McDunnough). The Jacobus and McCafferty (2006) paper was the latest contribution to the growing body of knowledge on *Acentrella* in North America, being

preceded by Morihara and McCafferty (1979), Waltz and McCafferty (1987), McCafferty et al. (1994), Alba-Tercedor and McCafferty (2000), Wiersema (2000), Randolph and McCafferty (2005), and McCafferty et al. (2005).

In 2006, Mike Bolton of the Ohio Environmental Protection Agency, sent WPM material of a distinctive new species of *Acentrella* that had been collected from numerous locales in relatively high gradient, high quality streams in southern and eastern Ohio. Some years earlier, RDW had seen similar material from North Carolina. A thorough examination of this material confirmed that it represented a new species of *Acentrella*, and that the new species differed substantially from other North

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American species of *Acentrella*. It is our purpose here to describe and diagnose this new species.

Acentrella nadineae McCafferty, Waltz
and Webb, new species
(Figs. 1–3)

Mature Larva.—Body length 5.0–5.8 mm. Cercus length 4.0–4.6 mm. Median caudal filament highly reduced, reaching about distance of basal segments 1–3 of cercus. General coloration typical of other *Acentrella* species, with pale cream and dark brown markings on yellow-brown base. Head with occiput light with darker, broad, submedial, somewhat broken and blotchy longitudinal markings (Fig. 1); frons slightly convex. Antenna unicolorous, usually pale throughout. Labrum dorsally with one medial seta and 5–6 sublateral setae on each side. Planate mandible (Fig. 2) with incisors divided apically; angulate mandible with incisors fused. Maxillary palp reaching, or nearly reaching, tip of galealacinia when parallel. Thoracic nota generally patterned as in Fig. 1, but with more profuse dark markings in some; hindwingpad absent or represented by minute scalelike flap; thoracic sterna light cream, sometimes with dark, oblique, subdermal line or shading associated with small pits sublaterally near each coxa, and without wedge-shaped, thin spines projecting from near small sublateral pits. Legs with dorsal patterning as in Fig. 1, subequal in length, with each leg somewhat less than one-third body length; femoral dorsal setal row (Fig. 3) with moderately dense, evenly spaced, hairlike setae ranging in length from about one-half femur width to subequal to femur width; tibia with two rows of dorsal setae (Fig. 3), one row with moderately dense, long setae and other row with short, sparse setae (discernible as separate rows only under high magnification); tarsus with moder-

ately dense row of median length setae as shown in Fig. 3. Foreleg (Fig. 1) with tibia and tarsus together only slightly longer than femur, and thus larvae with unusually short forelegs relative to other species; forefemur somewhat rounded along ventral edge. Abdomen with terga with distinctive patterning as in Fig. 1, with some variation with age and among individuals, but with terga 2–9 with submedian pair of small, dark spots, and terga 1, 5, 8–10 consistently primarily light; terga 2–10 with broad-based triangulate posterior marginal spines; all terga with no development of postero-medial projections. Abdominal sterna light cream and in some with sublateral, subdermal, linear shading, and sometimes with transverse penciling at medial two-thirds or more of segmental margins of some or most sterna; paraprocts without marginal spines. Abdominal gills (Fig. 1) relatively large, with gills 2–7 length nearly as long as, to slightly longer than, two succeeding terga combined, asymmetrically broadened posteriorly from near base, with branching lateral tracheation usually well developed asymmetrically, posterior to main trunk only, and with pigmented, somewhat amorphous to narrow-oblong blotch in basal half of gill. (Gill marking subject to fading, and in older specimens sometimes reduced to grayish longitudinal bar with no gill tracheae apparent). Cercus without distinctive intersegmental banding or broad areas of banding, but slightly graying distally in some.

Material examined.—Holotype: mature larva, OHIO, Scioto Co, Bear Cr, at river mile 3.5, Big Spruce Rd, nr Alum Rock, 5-VIII-2006, C. McKnight, deposited in the Purdue Entomological Research Collection. Paratypes: 2 mature larvae, same data and deposition as the holotype. Other material examined, with same deposition as holotype: NORTH CAROLINA: 2 larvae, Burke Co, Linville R, VII-1990; 1 larva, McDowell Co,

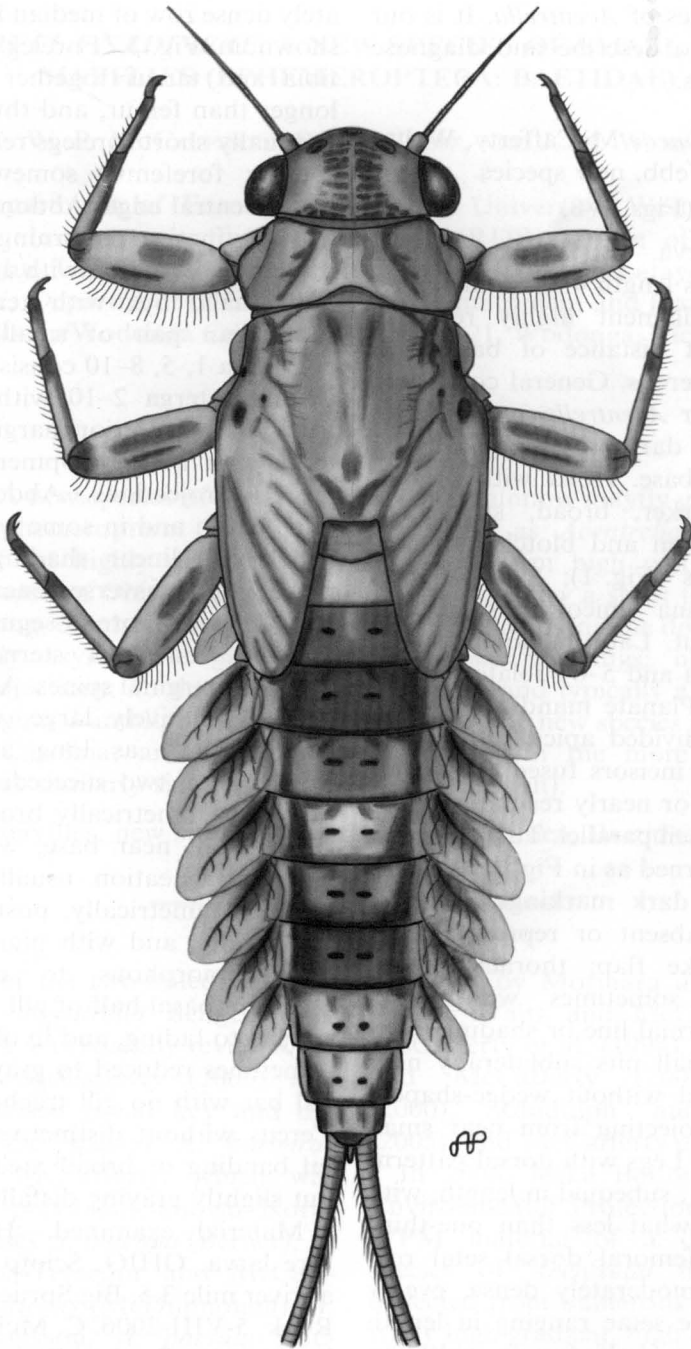
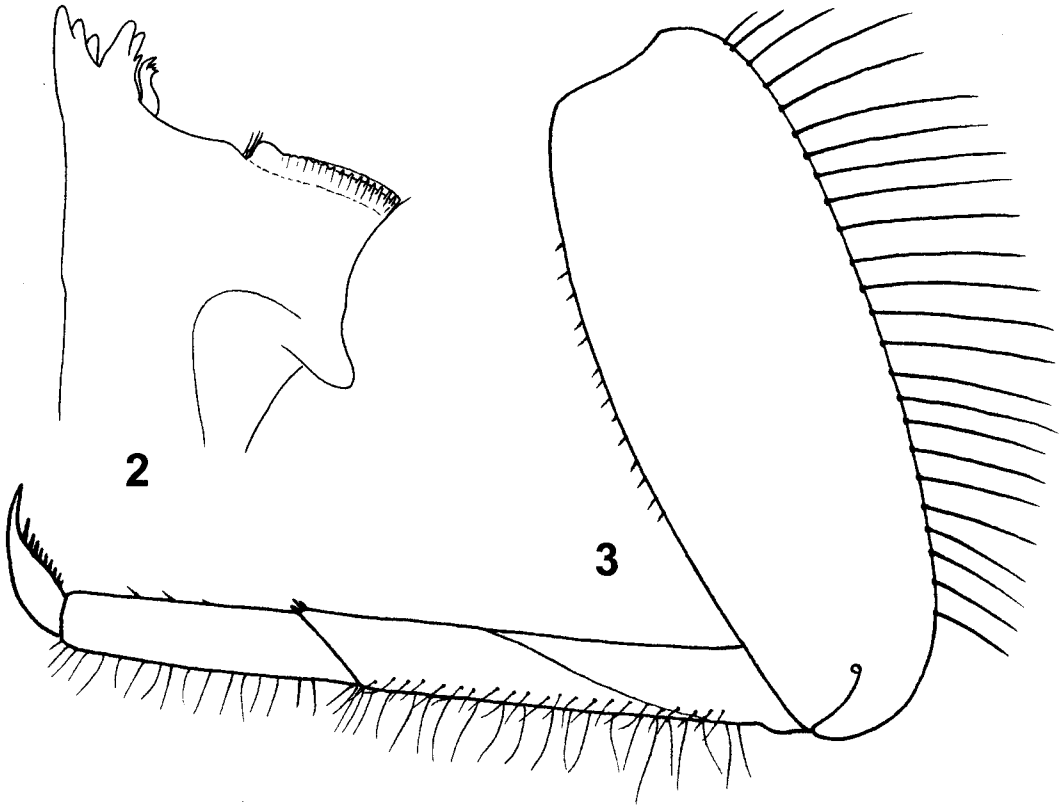


Fig. 1. *Acentrella nadineae*, dorsal habitus of larva.

Swannanoa Cr, VI-1994; 1 larva, McDowell Co, North Fork Catawba R, VII-1992; 2 larvae McDowell Co, Linville R, VII-1992; 1 larva, McDowell Co, Catawba R at I-40, VII-1990; 2 larvae,

Stokes Co, Dan R, VIII-1994. OHIO: 1 larva dissected on slide, Adams Co, Turkey Cr, river mile 0.4, S.R. 781, 21-VIII-2006; 2 larvae, Clark Co, Mad R, at St. Paris Pike, river mile 29.5, 10-IX-



Figs. 2–3. *Acentrella nadineae*, larva. 2, Planate mandible. 3, Foreleg.

1993, M. Bolton; 1 larva, Columbiana Co, Little Yellow Cr, river mile 3.3, at Forbes Rd, 28-VII-2005, J. Freda; 1 larva, Coshocton Co, Walhonding R, at U.S. 36/S.R. 83, river mile 8, 16-IX-1994, J. Freda, and 1 larva, Walhonding R, at U.S. 36, 6.2 mi NW Coshocton, 9-IX-1994, C. McKnight; 1 larva, Miami Co, Lost Cr, at Urbana Rd, river mile 9.8, 30-VIII-1994, M. Bolton; 1 larva, Monroe Co, Witten Fork, river mile 9.0, old S.R. 255, 11-VII-2000, and 5 larvae, Rock Camp Run, at Township Rd, river mile 1.1, 15-VIII-2000, C. McKnight.

Etymology.—The new species is named for Nadine McCafferty, who has enthusiastically supported Ephemeroptera research, and acted as field assistant to WPM for over 40 years in North America and South Africa.

Discussion.—*Acentrella nadineae* is currently the eighth valid species of the Holarctic and Oriental genus *Acentrella* that has been found in North America. The new species currently is known only from hilly regions of the Ohio Valley in Ohio, and Appalachian areas of eastern Ohio and western North Carolina. We suspect that it may have been previously misidentified as the similarly sized larvae of *A. turbida* in other parts of the Appalachians. The range of *A. nadineae* is much smaller compared to that of *A. turbida*, which has been known to be a transcontinental North American species (see McCafferty and Meyer 2007), but in fact may be Holarctic if the Eastern Hemisphere species *A. sibirica* (Kazlauskas) and *A. inexpectata* (Tshernova), which apparently do not differ from

variants of North American *A. turbida*, prove to be junior synonyms of *A. turbida*.

Characteristics that make *A. nadineae* larvae distinctive among North American species are the relatively short forelegs (compared to other species' forelegs), especially as defined by the short combined foretibia and foretarsus that are only subequal to the femur rather than distinctly longer than the femur; the large, asymmetrical, basally broadened gills with mediobasal markings; the long to very long, moderately dense and regularly spaced row of dorsal setae on the femur, along with moderately dense medium to long, regularly spaced rows of setae associated with the dorsal margin of the tibiae and tarsi; and less obviously, the partially divided incisors of the planate mandible. Early instar larvae of other *Acentrella* species may exhibit a tibia and tarsus that is about the same length as the femur, as well as other size differences that are not typical of older larvae, and therefore more mature larvae may be needed for a valid comparison.

More specifically, it should be noted that *Acentrella nadineae* is one of five North American species of *Acentrella* that do not have hindwings in alate stages and thus do not have well-developed hindwingpads as larvae. These other four species are *A.alachua*, *A. barbarae*, *A. parvula*, and *A. turbida*; and the distributional ranges of all of them overlap with at least part of the known range of *A. nadineae* in eastern North America (e.g., see Jacobus and McCafferty 2006). The hindwingpads in these *Acentrella* are either entirely absent or represented by scalelike vestiges that are often difficult to detect. Of these, the southeastern species *A.alachua* and the relatively widespread species *A. parvula* tend to have smaller larvae (generally less than 4.00 mm at maturity) than *A. nadineae*, and both of the latter have

many light and dark bands associated with their cerci (Ide 1937), whereas *A. nadineae* has no banding associated with the cerci. *Acentrella parvula* may have gill pigmentation, but it is unlike that of *A. nadineae* because it is a small blotch and is concentrated in the distal half of the gill rather than mediobasally. The Appalachian species *A. barbarae* is distinctive because of the presence of well-developed medioapical projections on terga 2–6, and short dorsal setae on the tibiae and tarsi (Jacobus and McCafferty 2006). All four hindwingless species, including the relatively common *A. turbida*, do not possess the distinctive features associated with *A. nadineae* as indicated above.

The most meaningful comparisons for the new species from a practical standpoint may be those with *A. turbida* larvae, which have sometimes been found to co-occur with the similarly sized larvae of *A. nadineae*. (For example, of 31 locales across Ohio where *A. turbida* has recently been taken by the Ohio EPA, the two species were taken together twice.) Field characteristics that can be used for distinguishing larvae of *A. nadineae* and *A. turbida* include the short forelegs of *A. nadineae* [compare Figs. 1 and 3 herein with the longer *A. turbida* forelegs shown by figs. 4–8 in McCafferty et al. (1994)]; the pigmented, highly asymmetric gills of *A. nadineae* [compare Fig. 1 herein with the more symmetrical and unmarked gills of *A. turbida* shown by figs. 6–8 of McCafferty et al. (1994)]. Both species have unbanded cerci, which help set them apart from other hindwingless North American *Acentrella* larvae, and their dorsal abdominal color pattern is quite similar, as it tends to be through much of the genus. Nevertheless, based on the larvae that we have examined, there appears to be a noticeable difference in the coloration of terga 8–10 in the two species in well-marked individuals, with only terga

9 and 10 (and sometimes only the distal portion of tergum 8) lighter compared to tergum 7 and 8 (or compared to tergum and 7 and the base of tergum 8) in *A. turbida* [see figs. 6 and 7 of McCafferty et al. (1994)], and all of terga 8, 9, and 10 lighter compared to tergum 7 in *A. nadineae* (Fig. 1). Although this condition in *A. turbida* larvae was noted originally by Ide (1930), under the junior synonym *Pseudocloeon carolina* (Banks), and has been typically what we have continued to see in samples of *A. turbida* from across North America, we are cognizant that such pattern characteristics may be subject to variability, especially in far ranging species such as *A. turbida*.

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