

Range extensions for recently described North American species of *Acentrella* Bengtsson (Insecta: Ephemeroptera: Baetidae)

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Abstract. New state records are provided for two recently described species of North American *Acentrella* Bengtsson, 1912. *Acentrella nadineae* McCafferty, Waltz & Webb, 2009 is newly reported from Connecticut, Massachusetts, and Minnesota, and *A. rallatoma* Burian & Myers, 2011 is reported from Minnesota.

Key words. Range extension; Nearctic; new records; mayfly

The Holarctic small minnow mayfly genus *Acentrella* Bengtsson, 1912 (Ephemeroptera: Baetidae) is a commonly encountered mayfly in lotic systems throughout North America. Of the 9 species known from North America, 3 were described within the last 10 years (JACOBUS & MCCAFFERTY 2006, MCCAFFERTY et al. 2009, BURIAN & MYERS 2011), and DNA evidence suggests additional undescribed species are present (WEBB et al. 2012). Species-level identification keys are available for nymphs that include all 9 species (JACOBUS & MCCAFFERTY 2006, BURIAN & MYERS 2011) and for male imagos that includes 7 of the 9 species (BURIAN & MYERS 2011). Herein, we present first US state records for 2 of the recently described species, *A. nadineae* McCafferty, Waltz & Webb, 2009 and *A. rallatoma* Burian & Myers, 2011.

Specimens were obtained from processing aquatic biomonitoring samples collected by the Minnesota Pollution Control Agency (MPCA) and the Connecticut Department of Energy and Environmental Protection (CTDEEP) as well as collecting by the authors. Specimens were collected using a variety of standard methods and preserved in 80% ethanol. Locality details are presented in Table 1. Specimens are deposited in the Purdue Entomological Research Collection, Purdue University, West Lafayette, IN, USA (PERC), Northeast Ephemeroptera Laboratory, Department of Biology, Southern Connecticut University, New Haven, CT (NEL), and with the MPCA and CTDEEP.

Nymphs of *A. nadineae* (Fig. 1) are distinguished from those of other North American *Acentrella* by the combination of an absence of hind wingpads, shortened fore tarsi and tibiae, and large, asymmetrical gills with basal brown shading (MCCAFFERTY et al. 2009). The adults of *A. nadineae* are not described. Nymphs of *A. rallatoma* (Fig. 2) are identified by the combi-

nation of cerci with alternating light and dark segments, the absence of hind wingpads, mandibles with outer incisors fused into a scraping blade, brown abdominal terga with a median pale spot, and the absence of brown coloration in the gills. The adult males of *A. rallatoma* are differentiated from other North American *Acentrella* by the combination of the absence of hind wings, lack of raised posterior margins on the abdominal terga, penes cover trapezoidal with straight apical margin and brown hour-glass shaped marking, white abdominal terga with complex markings, and forewings > 4.0 mm in length (BURIAN & MYERS 2011).

Acentrella nadineae has previously been reported from the US states of Kentucky, North Carolina, Ohio, Oklahoma, Pennsylvania, Tennessee, Virginia, and West Virginia (Fig. 3; previous records lack geocoordinates and are frequently imprecise,



Figure 1. Dorsal habitus of *Acentrella nadineae*.



Figure 2. Dorsal habitus of *Acentrella rallatoma*.

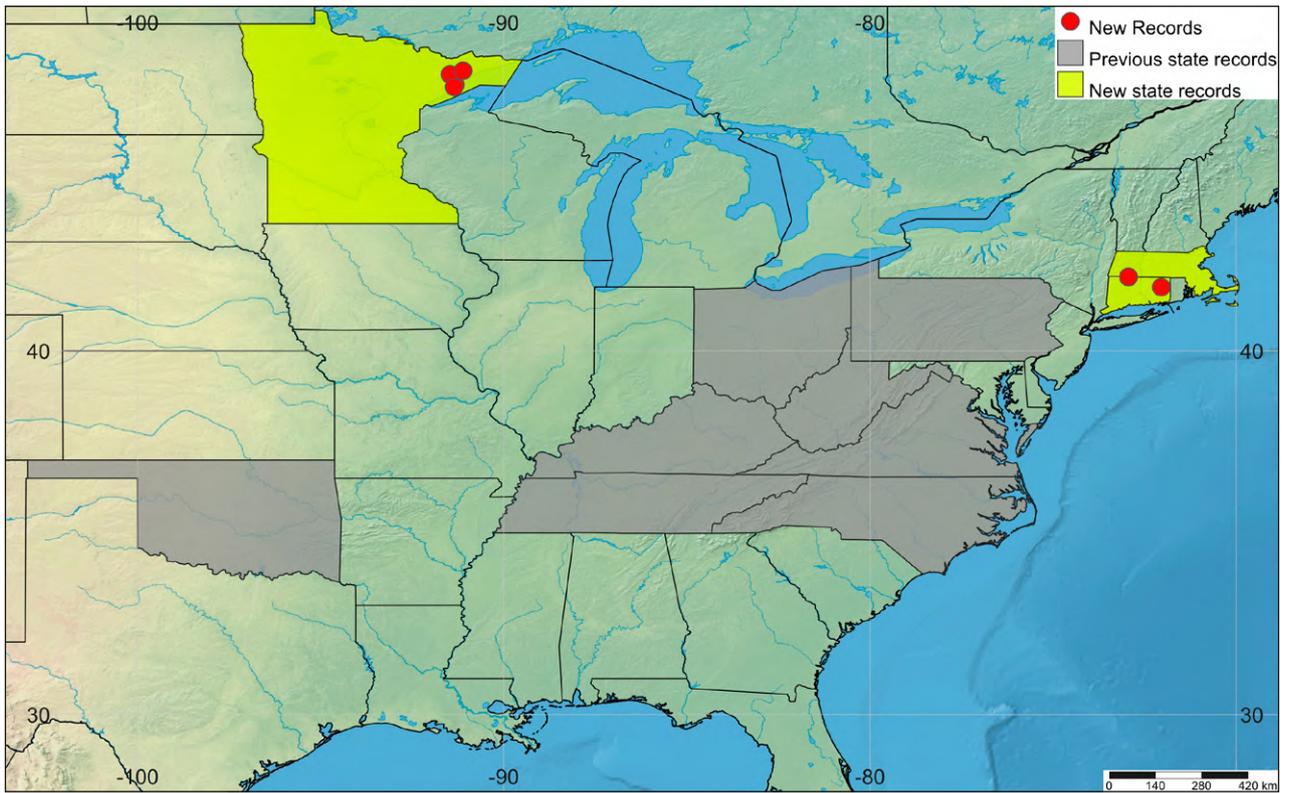


Figure 3. Point map of localities of *Acentrella nadineae*. New state records are represented by yellow fill, with localities indicated with red circles; states from which the species has previously been reported are filled in with solid grey.

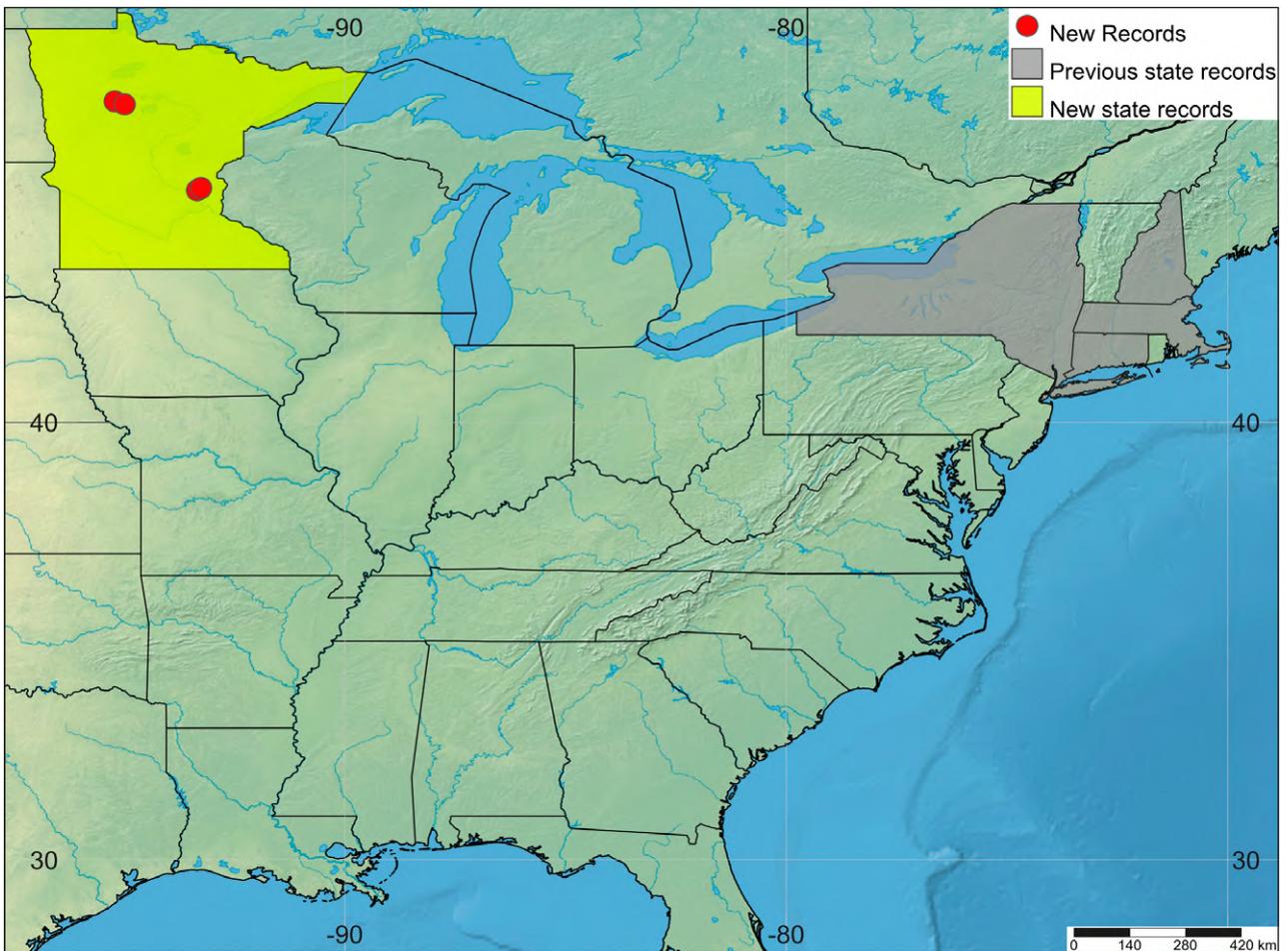


Figure 4. Point map of localities of *Acentrella rallatoma*. New state records are represented by yellow fill, with localities indicated with red circles; states from which the species has previously been reported are filled in with solid grey.

Table 1. Collection locality and deposition data for *Acentrella nadineae* and *A. rallatoma*

| Taxon | State | County | Locality | Latitude | Longitude | Date | Count | Collector | Specimen ID | Deposition |
|---------------------|-------|----------------------------|--|----------|-----------|-------------|-------------|-------------|----------------|------------|
| <i>A. nadineae</i> | CT | Hartford | Hubbard River, ~150m dnstr. of MDC weir, from swift water chutes between large cobble and small boulders, Hartland | 42.036 | -72.9387 | 20-Jun-2012 | 1 nymph | S.K. Burian | ACE-NAD0002 | NEL |
| <i>A. nadineae</i> | CT/MA | Hartford (CT)/Hampden (MA) | Hubbard River, ~65m upstr. USGS gauge sta., from swift water chutes | 42.0385 | -72.9405 | 2-Aug-2015 | 1 ♂ & 1 Nex | S.K. Burian | ACE-NAD0010 | NEL |
| <i>A. nadineae</i> | CT/MA | Hartford (CT)/Hampden (MA) | Hubbard River, ~65m upstr. USGS gauge sta., from swift water chutes | 42.0385 | -72.9405 | 2-Aug-2015 | 1 ♀ & 1 Nex | S.K. Burian | ACE-NAD0011 | NEL |
| <i>A. nadineae</i> | CT/MA | Hartford (CT)/Hampden (MA) | Hubbard River, ~65m upstr. USGS gauge sta., from swift water chutes | 42.0385 | -72.9405 | 2-Aug-2015 | 1 ♀ & Nex | S.K. Burian | ACE-NAD0012 | NEL |
| <i>A. nadineae</i> | CT/MA | Hartford (CT)/Hampden (MA) | Hubbard River, ~65m upstr. USGS gauge sta., from swift water chutes | 42.0385 | -72.9405 | 2-Aug-2015 | 5 nymphs | S.K. Burian | ACE-NAD0013 | NEL |
| <i>A. nadineae</i> | CT/MA | Hartford (CT)/Hampden (MA) | Hubbard River, ~50m upstr. USGS gauge sta., from swift water chutes | 42.0385 | -72.9405 | 30-Jul-2013 | 1 ♂ & 1 Nex | S.K. Burian | ACE-NAD0003 | NEL |
| <i>A. nadineae</i> | CT/MA | Hartford (CT)/Hampden (MA) | Hubbard River, ~50m upstr. USGS gauge sta., from swift water chutes | 42.0385 | -72.9405 | 30-Jul-2013 | 1 ♂ & 1 Nex | S.K. Burian | ACE-NAD0004 | NEL |
| <i>A. nadineae</i> | CT/MA | Hartford (CT)/Hampden (MA) | Hubbard River, ~50m upstr. USGS gauge sta., from swift water chutes | 42.0385 | -72.9405 | 30-Jul-2013 | 1 ♂ & 1 Nex | S.K. Burian | ACE-NAD0005 | NEL |
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| <i>A. nadineae</i> | CT/MA | Hartford (CT)/Hampden (MA) | Hubbard River, ~50m upstr. USGS gauge sta., from swift water chutes | 42.0385 | -72.9405 | 30-Jul-2013 | 5 nymphs | S.K. Burian | ACE-NAD0009 | NEL |
| <i>A. nadineae</i> | MN | Lake | Beaver River | 47.2594 | -91.3567 | 12-Aug-2015 | 1 nymph | MPCA | MN15BL025 | MPCA |
| <i>A. nadineae</i> | MN | Lake | Cedar Creek | 47.32 | -91.3198 | 26-Aug-2013 | 5 nymphs | MPCA | MN13JC200-0001 | PERC |
| <i>A. nadineae</i> | MN | Lake | Harriet Creek | 47.7055 | -91.1126 | 13-Aug-2015 | 2 nymphs | MPCA | MN15BL015 | MPCA |
| <i>A. nadineae</i> | MN | Lake | Stony River | 47.6033 | -91.4695 | 19-Aug-2014 | 1 nymph | MPCA | MN14BL037-0001 | PERC |
| <i>A. nadineae</i> | MN | Lake | Stony River | 47.6033 | -91.4695 | 17-Aug-2015 | 6 nymphs | MPCA | MN15BL108 | MPCA |
| <i>A. rallatoma</i> | MN | Anoka | Cedar Creek | 45.3027 | -93.3455 | 8-Aug-2013 | 31 nymphs | MPCA | MN13JC370-0001 | PERC |
| <i>A. rallatoma</i> | MN | Anoka | Cedar Creek | 45.356 | -93.2576 | 5-Aug-2013 | 12 nymphs | MPCA | MN13JC408-0001 | PERC |
| <i>A. rallatoma</i> | MN | Clearwater | Mississippi River | 47.339 | -95.2092 | 3-Sep-2013 | 1 nymph | MPCA | MN13JC207 | MPCA |
| <i>A. rallatoma</i> | MN | Hubbard | Hennepin Creek | 47.3984 | -95.0866 | 31-Jul-2013 | 6 nymphs | MPCA | MN13JC136-0001 | PERC |
| <i>A. rallatoma</i> | MN | Hubbard | Schoolcraft River | 47.2682 | -94.9879 | 27-Aug-2013 | 13 nymphs | MPCA | MN13JC131-0001 | PERC |
| <i>A. rallatoma</i> | MN | Hubbard | Schoolcraft River | 47.2682 | -94.9879 | 28-Aug-2013 | 9 nymphs | MPCA | MN13JC132-0001 | PERC |
| <i>A. rallatoma</i> | MN | Mille Lacs | Rum River, West Branch | 45.581 | -93.6145 | 19-Aug-2013 | 3 nymphs | MPCA | MN13JC379 | MPCA |
| <i>A. rallatoma</i> | MN | Watonwan | Watonwan River | 44.0567 | -94.504 | 15-Aug-2013 | 1 nymph | MPCA | MN13JC430 | MPCA |

so are only illustrated at the state level) (McCAFFERTY 2009, 2011, McCAFFERTY et al. 2009, WEBB et al. 2012). New records include localities in northeastern Minnesota, Connecticut, and Massachusetts (Fig. 3, Table 1) and represent northwestern and northeastern range extensions. It is likely that *A. nadineae* will also occur in nearby areas such as southern Ontario and Quebec as well as in other eastern states. Specimens may have already been collected from these areas, but misidentified as *A. turbida* McDunnough, 1924 because specimens of *A. nadineae* would terminate on *A. turbida* in identification keys available prior to 2009.

Acentrella rallatoma was previously thought to be restricted to second- and third-order streams in Connecticut, Massachusetts, New Hampshire, and New York (BURIAN & MYERS 2011) (Fig. 4). The occurrence of the species in Minnesota (Table 1) represents a range extension of > 1500 km. Given the historical misidentification of nymphs of *A. rallatoma* as *A. parvula* (BURIAN & MYERS 2011), it is possible that *A. rallatoma* is more widespread than our data show. Alternatively, it may be that the Minnesota populations of *A. rallatoma* are actually a different, but highly similar allopatric species than those found in the New England region of North America.

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