

## *Maccaffertium wudigeum*, A New Species of Ephemeroptera (Heptageniidae) From North Carolina

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### ABSTRACT

A new species of flat-headed mayflies (Heptageniidae) is described as *Maccaffertium wudigeum* McCafferty and Lenat, n. sp. The species is based on larvae taken from western North Carolina. It is morphologically most similar to some *M. mediopunctatum* (McDunnough) larvae, but does not possess any of the distinguishing markings associated with the latter and also differs from it in habitat.

### INTRODUCTION

Peculiar specimens of the flatheaded mayfly genus *Maccaffertium* have been taken from some small, high quality streams in Burke and Caldwell Counties in western North Carolina by DRL and the North Carolina Division of Water Quality for several years. These populations represent a new species that we describe here. The new species brings the total number of species currently known of the exclusively North American genus *Maccaffertium* to 17. All 17 *Maccaffertium* species are known exclusively or in part from the southeastern USA (McCafferty 2009), and 14 are now known from North Carolina.

### *Maccaffertium wudigeum*, NEW SPECIES

*Larva*.— Mature body length: 8-10mm. General coloration: brown dorsally, pale ventrally without distinctive maculation on the abdomen. Head capsule brown (Figs. 1, 2), except for small white spots adjacent to median and lateral ocelli, and lateral margin just anterior to anterior margin of compound eyes. Antennal bases also appearing as small white spots on head dorsally. Maxillae galealacinia with five robust pectinate setae on crown, and no hairlike

setae on crown; 18-20 setae in submedial row of setae. Thoracic nota (Figs. 1, 2) brown, with few darker small spots at most. Pronotum with large white or translucent spots at lateral edge. Legs of mature individuals (Fig. 1) with femora dorsally light brown often grading into cream, and pale ventrally (legs rotated to ventral side or posterior edge in legs of Fig. 1). Legs of younger individuals (Fig. 2) with light brown femora dorsally and darker tibiae and tarsi, with distinctive white bands medially and distally on tibiae and distally on tarsi (such banding somewhat less striking or barely apparent in mature larvae). Foreclaws denticulate (two minute denticles). Abdomen brown dorsally (Figs. 1, 2), with terga 8-10 somewhat darker, and in younger individuals (Fig. 2) terga 1-3 often lighter brown; pair of small dark submedial spots sometimes apparent on terga. Abdominal sterna pale, sometimes with slight darkening laterally on sternum 9. Posterolateral projections developed on abdominal segments 3-9; projection 9 much shorter than projection 8. Caudal filaments generally uniformly pale in mature individuals, or multicolored with white and blackish bands alternating about every two or more segments in younger individuals.

*Adult*.— Unknown.

*Material*.— HOLOTYPE: middle instar larva, NORTH CAROLINA, Caldwell County, Wilson Creek, off SR 1328, ca 2 mi S Mortimer, 1-IV-2003, deposited in the Purdue Entomological Research Collection (PERC). PARATYPES: One middle instar (1-IV-2003) and one mature larva (22-VIII-2002), same locale [deposited in PERC]. In addition to Wilson Creek in Caldwell County, specimens have also been examined from Burke County, Linville R, at NC 126, 8-VIII-1989, 7-VIII-2002. Additional

materials are deposited with the North Carolina Division of Water Quality, Raleigh, NC.

*Etymology.*— The species name is taken from the Cherokee word for brown: “wudige”.

*Discussion.*— Larvae of the new species are similar structurally to *M. mediopunctatum* (McDunnough), falling within the range of variation of mouthpart, abdominal, and claw morphology known for that species (Bednarik and McCafferty 1979). They differ considerably from the latter, however, in coloration, mainly by not demonstrating any of the bold cross-band maculation associated with abdominal sterna in *M. mediopunctatum*. *Maccaffertium carlsoni* (Lewis) is another species that will key out very near *M. mediopunctatum*; however, *M. carlsoni* differs considerably from the new species in morphology. For example, *M. carlsoni* has adenticulate foreclaws, two to four robust crown setae on maxillary crown, 25-40 setae in the submedial row of galealacinia, an abdominal posterolateral projection 9 that is subequal to that of 8, and it is somewhat larger with a mature body length of 10-12mm.

In addition to vast differences in coloration and apparently less structural variability, *M. wudigeum* also differs from its most closely related species *M. mediopunctatum* in habitat, at least in North Carolina, where the latter is associated with larger streams and rivers (usually over 28m wide) along the western border of the state. Wilson Creek and Linville River, where *M. wudigeum* occur, are parallel streams best known for narrow gorge areas in their lower reaches and are different in geology and morphology from the more western mountain streams. Other *Maccaffertium* species that have been found to co-occur with the *M. wudigeum* include *M. modestum* (Banks), *M. pudicum* (Hagen) and *M. lenati* (McCafferty).

The Wilson Creek site for *M. wudigeum* (lat 35.98, long -81.76) is about 15m wide with a substrate consisting of 20% boulders, 40% rubble, 15% gravel, and 25% sand. The headwaters of Wilson Creek are protected, lying within the Pisgah Forest in Avery and Caldwell Counties. The middle section is lightly developed with some residential areas adjacent to the stream. The lower section includes the gorge and below gorge area that is protected and used for kayaking and fishing. The Linville River

site (lat 35.79, long -81.89) is about 20m wide with a substrate consisting of 30% boulders, 30% rubble, 25% gravel and 15% sand. Headwaters of the Linville River are heavily developed, but the area below the Linville gorge and just above Lake James, where *M. wudigeum* occurs, has excellent water quality.

Both Wilson Creek and the lower Linville River are areas of exceptional water quality and are known to support many rare aquatic species and remarkably high macroinvertebrate diversity. The discovery of a unique and possibly endemic species of mayfly, *Maccaffertium wudigeum*, from these particular environments certainly adds credence to the necessity of preserving these streams in their natural state.

*Maccaffertium wudigeum* is the third species of *Maccaffertium* discovered since the revision of Bednarik and McCafferty (1979). The other two are *M. bednariki* (McCafferty) and *M. lenati* (McCafferty). These latter two were also described originally only as larvae (McCafferty 1981, 1990) and only later were adults reared and described (Sarver and Kondratieff 1997, Kondratieff et al. 2006). We fully expect *M. wudigeum* to be reared to adults in the future.

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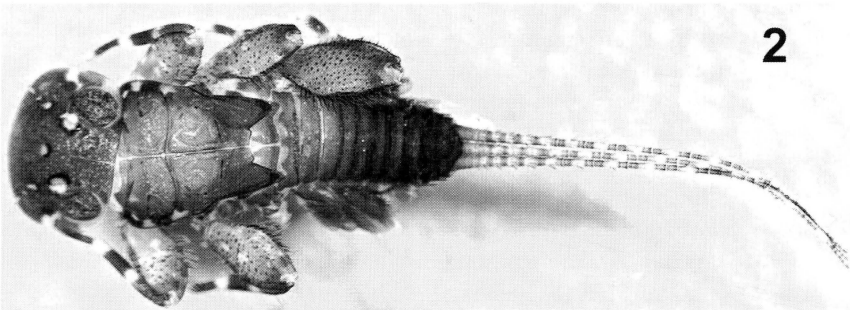
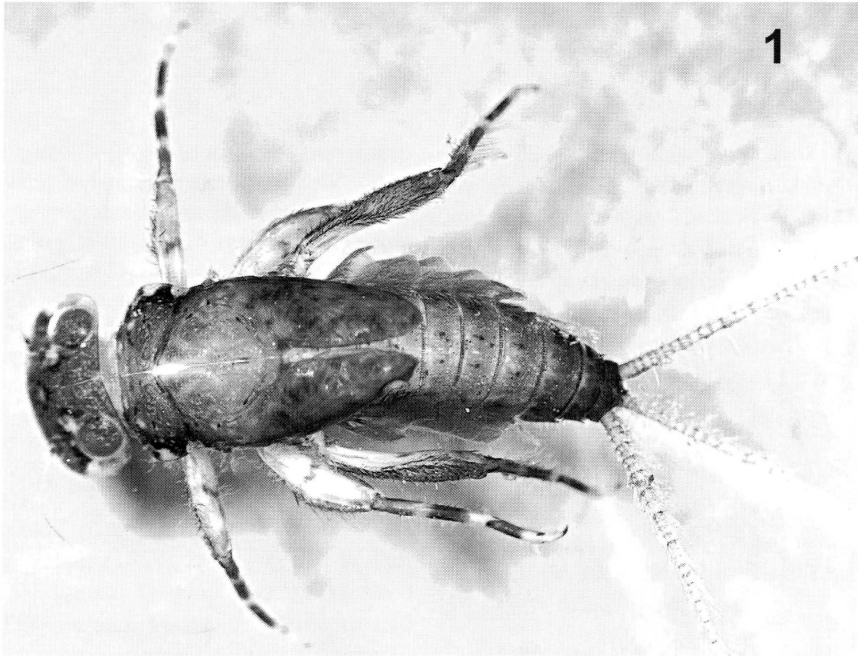
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Figs. 1 – 2. 1. *Maccaffertium wudigeum*, mature larva, dorsal habitus. 2. *M. wudigeum*, premature larva, dorsal habitus.