



A NEW SPECIES OF *PERLESTA* (PLECOPTERA: PERLIDAE) FROM NORTH CAROLINA WITH ADDITIONAL RECORDS FOR NORTH CAROLINA AND VIRGINIA

Boris C. Kondratieff¹, Robert E. Zuellig², and David R. Lenat³

¹Department of Bioagricultural Sciences and Pest Management, Colorado State University, Fort Collins, Colorado, U.S.A. 80523

E-mail: Boris.Kondratieff@Colostate.edu

²U.S. Geological Survey, Denver Federal Center, MS 415, Denver, Colorado, U.S.A. 80225

E-mail: rzuellig@usgs.gov

³David Lenat, Lenat Consulting, 3607 Corbin Street, Raleigh, NC, U.S.A. 27612

E-mail: lenatbks@mindspring.com

ABSTRACT

The male of *Perlesta beatyi* n. sp. is described from Robeson County, North Carolina, U.S.A. and is distinguished by truncate paraprot apices with a small obscure tooth. New species records for *Perlesta* of North Carolina and Virginia are also given with comments on the distribution of the species in this area.

Keywords: Plecoptera: Perlidae, *Perlesta*, new species, U.S.A., new records, North Carolina, Virginia

INTRODUCTION

Twenty-eight species of Nearctic *Perlesta* are currently recognized (Stark 1989, 2004; Kondratieff et al. 2006, 2008; Grubbs and DeWalt 2008, Grubbs and DeWalt 2011, Kondratieff and Myers 2011). Interestingly, but needing confirmation, *Perlesta* has been recently recorded from Central America (Gutiérrez-Fonseca and Springer 2011). Continued collecting and study of *Perlesta* from North Carolina by the authors revealed one additional undescribed species. Ten species of *Perlesta* currently have been recorded from North Carolina (Stark 1989, 2004, Kondratieff et al. 2006, 2008, Grubbs and DeWalt 2008). Additionally, new *Perlesta* species records are given for Virginia. The terminology used in the description of the male adult follows Stark (1989, 2004).

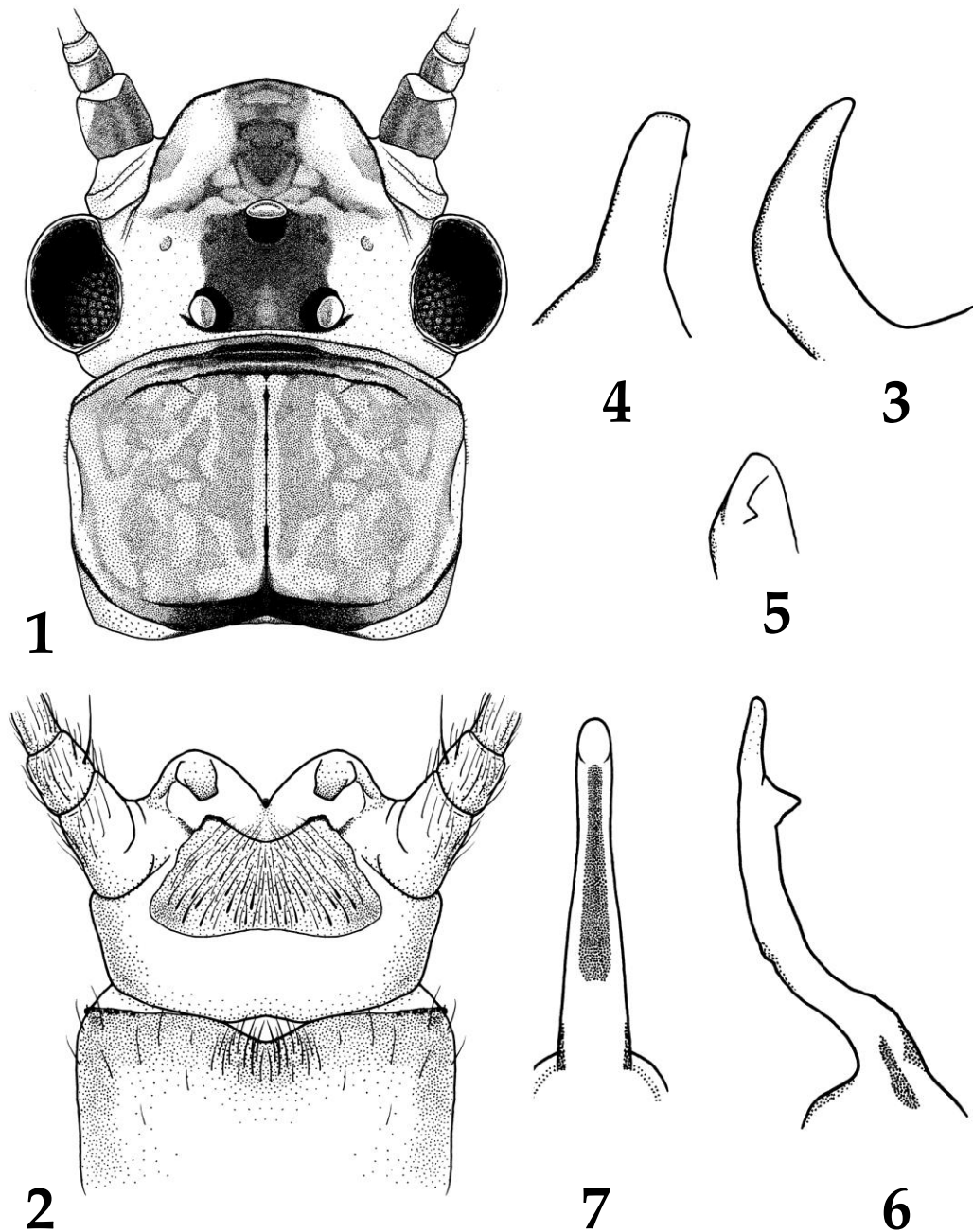
RESULTS

Perlesta beatyi sp. n. Kondratieff, Zuellig & Lenat (Figs. 1-7)

Material examined. Holotype ♂, North Carolina: Robeson Co., Raft Swamp, Old Lowery Rd @ bridge, 2 mi E Red Springs, 2 May 2003, B. Kondratieff & R. F. Kirchner. Paratype: Same data as Holotype, 1♂.

The Holotype is deposited at the National Museum of Natural History, Smithsonian Institution, Washington, D. C and the paratype ♂ in the C.P. Gillette Museum of Arthropod Diversity, Colorado State University.

Male. Forewing length 12 mm. General body color light yellow to yellow-brown. Head yellow except for brown quadrangular area over ocelli and brown



Figs. 1-7. *Perlesta beatyi*. 1. Adult head and pronotum. 2. Male terminalia, dorsal. 3. Paraproct, lateral. 4. Paraproct caudal. 5. Paraproct apex indicating spine. 6. Penis, lateral. 7. Penis, dorsal.

triangular area forward of median ocellus, prothorax brown with a slight dark sutural line (Fig. 1). Wings light amber, veins brown. Femora with a distinct apical black transverse band. Abdomen yellowish with

brown posterior patches. Tergum 10 mesal sclerite brown, not divided, sensilla basiconica sparse (Fig. 2). Paraproct broad of medium length, with small tooth obscure in lateral view (Figs. 3), in caudal view,

medium length, truncate at apex with the tooth at upper lateral margin (Figs. 4, 5). Penis tube + sac long, caecum small, wider than long; lateral sclerite weakly developed; dorsal patch broad basally covering most of tube surface (Figs. 6, 7).

Female. Unknown.

Egg. Unknown.

Etymology. The patronym honors Steven R. Beaty, Environmental Biologist, North Carolina Division of Water Quality. His on-going efforts to associate the adult and immature stages of North Carolina aquatic insects are noteworthy.

Diagnosis. The male of the new species can be immediately distinguished from all other known described *Perlesta* by the broad truncate paraprocts with a small lateral tooth (Figs. 2-5). The authors were reluctant to describe this species because of the lack of positively associated females with mature eggs, but the male paraprocts are so distinctive that the males cannot be confused with any other described North American species.

North Carolina and Virginia New Records

The following additional species records for *Perlesta* are reported from North Carolina and Virginia. With the above-described new species, 11 species of *Perlesta* are now known from North Carolina (Stark 1989, 2004, Kondratieff et al. 2006, 2008, Grubbs and DeWalt 2008). With the addition of *P. browni* Stark 1989 and *P. nelsoni* Stark 1989, 11 species also are known from Virginia (Stark 1989, 2004, Kondratieff et al. 2006, 2008, Grubbs and DeWalt 2008).

North Carolina

Perlesta puttmanni Kondratieff & Kirchner 2003

Lee/Chatham Co. Deep River, Hwy 42 NW Sanford, 35.52011 -79.34873, 15 May 2010, B. Kondratieff, R. E. Zuellig & D. Lenat, 1♂ (CSUC).

Kondratieff et al. (2006) reported *P. puttmanni* from the Little River (Harnett/Cumberland Co., Little River, Hwy 401, Lillington, 18 May 2004), as a new state record for North Carolina. Re-examination of this material indicated that the specific status of these *P. decipens* complex specimens is uncertain requiring study of the entire complex. Such a study is outside the scope of this paper. However, the Lee/Chatham Co., Deep River specimen is clearly *P. puttmanni*

validating the occurrence of this species in North Carolina.

Perlesta roblei Kondratieff & Kirchner 2003

Northampton Co., Kirby's Creek, Watson Mill Road, W Murfreesboro, 36.46840 -77.14343, 31 May 2006, B. Kondratieff, R. F. Kirchner & R. E. Zuellig, 11♂, 6♀ (CSUC).

Kondratieff et al. (2006) previously reported *P. roblei* from Edgecombe Co., North Carolina.

Perlesta shawnee Grubbs 2005

North Carolina: Caldwell Co., Wilson Creek, Brown Mountain Beach Rd, W Lenoir, 35.89937 -81.71568, 12 July 2008, B. Kondratieff, R.E. Zuellig & D. Lenat, 1♂ (CSUC); Cleveland Co., First Broad River, Mt. Zion Church Rd, S New Hope, 35.47546 -81.67378, 13 July 2007, B. Kondratieff, R.E. Zuellig & D. Lenat, 1♂, 6♀ (CSUC); Macon Co., Cullasaja River, Peeks Creek Rd, SE Franklin, 35.12515 -83.28508, 13 July 2008, B. Kondratieff, R.E. Zuellig & D. Lenat, 7♂, 3♀ (CSUC); Polk Co., Pacolet River, Edney Rd, W Tyron/Lynn, 35.22422 -82.27082, 14 July 2008, B. Kondratieff, R.E. Zuellig & D. Lenat, 2♂, 3♀ (CSUC); Wilkes Co., Hunting Creek, Hwy 115, SE Maravian, 36.07869 -80.97765, 11 July 2008, B. Kondratieff, R.E. Zuellig & D. Lenat, 5♂, 3♀ (CSUC); North Prong Lewis Fork, Stanton Loop Rd, (Nichols Rd, NC 1300), W Fairplains, 36.19429 -81.31668, 11 July 2008, B. Kondratieff, R.E. Zuellig & D. Lenat, 1♂ (CSUC).

Grubbs and DeWalt (2008) reported *P. shawnee* (originally described from Illinois and Indiana) from North Carolina based on our material. The above records indicate that this species is apparently a common summer-emerging species in western North Carolina.

Perlesta shubuta Stark 1989

North Carolina: Caldwell Co., unnamed tributary of Wilson Creek, upstream from Harper Creek, Trail 260, Brown Mountain Road, 35.98058 -81.76446, 16 May 2004, B. Kondratieff, R. Zuellig, & D. Lenat, 1♂ (CSUC). Halifax Co., Bear Swamp, Hwy 561, NW of Enfield, 36.27821 -77.88365, 31 May 2006, B. Kondratieff, R.F. Kirchner, R.E. Zuellig, & D. Lenat, 1♂, 1♀ (CSUC)

This species was originally described from Mississippi and subsequently recorded from Arkansas, Illinois, Missouri, and Oklahoma (Stark 2004).

Virginia

Perlesta browni Stark 1989

Sussex Co., Nottoway River, Nottoway Rd, CR 651, N Emporia, 36.84694 -077.56083, 19 May 2004, B. Kondratieff, R.F. Kirchner & R.E. Zuellig, 5♂, 1♀ (CSUC); same data, 1 June 2006, 1♂, 1♀ (CSUC).

This record is an apparent substantial range extension for a species previously reported from Arkansas, Missouri, and Oklahoma (Stark 1989, Poulton and Stewart 1991). The Virginia material appears indistinguishable from typical *P. browni* from the Ozarks, although this species was considered an "endemic to the region" by Poulton and Stewart (1991). Further studies, especially of the eggs of this disjunct Virginia population may help resolve the status of this taxon. The type locality for *P. cranshawi* Kondratieff and Kirchner, 2006 is from this same site on the Nottoway River.

Perlesta nelsoni Stark 1989

Amherst Co. Otter Creek, above culvert, Blue Ridge Parkway, 17-18, July 2007, C.R. Parker, 2♂, 4♀ (CSUC); Floyd Co., Blue Ridge Parkway, MP 146.0, 18-19 July 2007, C.R. Parker, 2♀ (CSUC); Patrick Co. Little Rock Castle Creek, Blue Ridge Parkway, MP 165.3, 18-19 July 2007, C.R. Parker, 3♀ (CSUC).

Originally described from North Carolina, South Carolina, and Tennessee (Stark 1989), *P. nelsoni* is apparently a widespread species of the higher Appalachians and has been recorded as far north as New York (Myers et al. 2011).

DISCUSSION

The distribution of *Perlesta* species in North Carolina and Virginia is affected by ecoregion, stream size, and emergence period. The most obvious difference is the separation by ecoregion, with six species confined to the mountain (M) and Piedmont (P) areas: *P. frisoni* (Banks 1948) (M), *P. nelsoni* (M), *P. shawnee* (M), *P. lagoi* (M), *P. placida* (M, P), and *P. puttmanni* (P). An additional seven species are confined to the sandhills (SH) and coastal plain (C) regions: *P. cranshawi* (C), *P. roblei* (C), *P. durfeeii* (C), *P. bjostadi* (SH, C), *P. georgiae* (SH), *P. leathermani* (SH), and *P. beatyi* (SH). Of particular interest, here is the surprising number of species largely confined to the sand hills ecoregion. Only one species, (*P. shubuta*) has been collected in both mountain and coastal plain

regions.

There is still insufficient evidence to make firm conclusions about the influence of stream size, largely due to the relatively few collections in small streams. Many species, however, seem to show some preference for stream size. For example, *P. cranshawi*, *P. bjostadi*, *P. placida*, *P. nelsoni* and *P. shawnee* are more likely encountered in rivers than in smaller streams. Furthermore, in the Lower Little River system (NC sand hills), *P. leathermani* dominated an upstream site, while *P. bjostadi* dominated a downstream site. Emergence time also may separate species where some appear confined to emergence in May while others continue to emerge well into July. It is not clear if there are any differences due to habitat, but we have observed that *Perlesta* nymphs are most abundant in leaf packs in smaller streams, but are also found in submerged aquatic macrophytes (mostly *Podostemum ceratophyllum* Michx.) and on wood in larger streams and rivers. Typically, only 1-2 *Perlesta* species were collected at a single site. In the mountain and piedmont, the second species was usually *P. placida*, but species pairs were less predictable in sand hills and coastal plain drainages.

ACKNOWLEDGEMENTS

We thank Bill P. Stark of Mississippi College for examining material and providing valuable comments on the taxa included in this paper. Dr. Charles R. Parker, Smoky Mountain National Park provided specimens for this study. We thank also Ralph F. Kirchner, Huntington, West Virginia for assisting in the collection of material.

REFERENCES

- Banks, N. 1948. Notes on Perlidae. *Psyche*, 12:55-57.
- Grubbs, S.A. 2005. *Perlesta shawnee* (Plecoptera: Perlidae), a new stonefly species from Eastern North America. *Aquatic Insects*, 27:63-69.
- Grubbs, S.A. & R.E. DeWalt. 2008. Taxonomic and distributional notes on *Perlesta teaysia*, *P. golconda*, and *P. shawnee* (Plecoptera: Perlidae). *Illiesia*, 4:143-149.
- Grubbs, S.A. & R.E. DeWalt. 2011. *Perlesta ouabache*, a new species of stonefly (Plecoptera: Perlidae) from Indiana, U.S.A. *Aquatic Insects*, 33:75-79.

Kondratieff, B.C., R.E. Zuellig, and D.R. Lenat. 2011. A new species of *Perlesta* (Plecoptera: Perlidae) from North Carolina with additional records for North Carolina and Virginia.

Illiesia, 7(27):297-301. Available online: <http://www2.pms-lj.si/illiesia/papers/Illiesia07-27.pdf>

Kondratieff, B.C. & R.F. Kirchner. 2003. Two new species of *Perlesta* Banks (Plecoptera: Perlidae) from eastern North America. *Proceedings of the Entomological Society of Washington*, 105:933-939.

Received 14 November 2011, Accepted 22 November 2011,
Published 29 November 2011

Kondratieff, B.C. and L.W. Myers. 2011. A new species of *Perlesta* (Plecoptera: Perlidae) from New York. *Illiesia*, 7:197-201.

Kondratieff, B.C., R.E. Zuellig, R.F. Kirchner, & D.R. Lenat. 2006. Three new species of *Perlesta* (Plecoptera: Perlidae) from eastern North America and notes on new state records. *Illiesia*, 2:31-38.

Kondratieff, B.C., R.E. Zuellig, R.F. Kirchner, and D.R. Lenat. 2008. Two new species of *Perlesta* (Plecoptera: Perlidae) from eastern North America. *Proceedings of the Entomological Society of Washington*, 110:668-673.

Gutiérrez-Fonseca, P.E. & M. Springer. 2011. Description of the final instar nymphs of seven species from *Anacroneuria* Klapálek (Plecoptera: Perlidae) in Costa Rica, and first record for an additional genus in Central America. *Zootaxa*, 2965:16-38.

Myers, L.W., B.C. Kondratieff, T.B. Miluc, and D.E. Ruiter. 2011. The mayflies (Ephemeroptera), stoneflies (Plecoptera), and caddisflies (Trichoptera) of the Adirondack Park (New York). *Transactions of the American Entomological Society*, 137:63-140.

Poulton, B.C. and K.W. Stewart. 1991. The stoneflies of the Ozark and Ouachita Mountains (Plecoptera). *Memoirs of the American Entomological Society*, 38:1-116.

Stark, B.P. 1989. *Perlesta placida* (Hagen), an eastern Nearctic species complex (Plecoptera: Perlidae). *Entomologica Scandinavica*, 20:263-286.

Stark, B.P. 2004. Perlidae (The Stones). Pages 61-148. *In* B.S. Stark & B.J. Armitage, editors. *The Stoneflies (Plecoptera) of Eastern North America. Volume II. Chloroperlidae, Perlidae, and Perlodidae (Perlodinae)*. *Bulletin of the Ohio Biological Survey, New Series Volume 14*, Columbus, Ohio. 192 pp.