



THE LARVA OF *AMPHINEMURA ALABAMA* BAUMANN AND NEW RECORDS OF NEMOURIDAE (PLECOPTERA) FROM MISSISSIPPI, U.S.A.

Bill P. Stark¹ & Audrey B. Harrison²

¹Department of Biology, Box 4045, Mississippi College, Clinton, Mississippi, 39058, U.S.A.

E-mail: stark@mc.edu

²U.S. Army Engineer Research and Development Center, 3909 Halls Ferry Road, Vicksburg, Mississippi 39180, U.S.A.

E-mail: Audrey.b.harrison@usace.army.mil

ABSTRACT

Larvae of *Amphinemura alabama* Baumann are described and compared with those of *A. nigritta* (Provancher), new Mississippi distribution records are given for *A. nigritta*, *Prostoia completa* (Walker) and *Shipsa rotunda* (Claassen), and the first records for *A. alabama* and *Soyedina alexandria* Grubbs are presented for the state. An updated checklist of 57 Mississippi stonefly species is included.

Keywords: *Amphinemura*, *Prostoia*, *Shipsa*, *Soyedina*, Mississippi, New records, Larval descriptions

INTRODUCTION

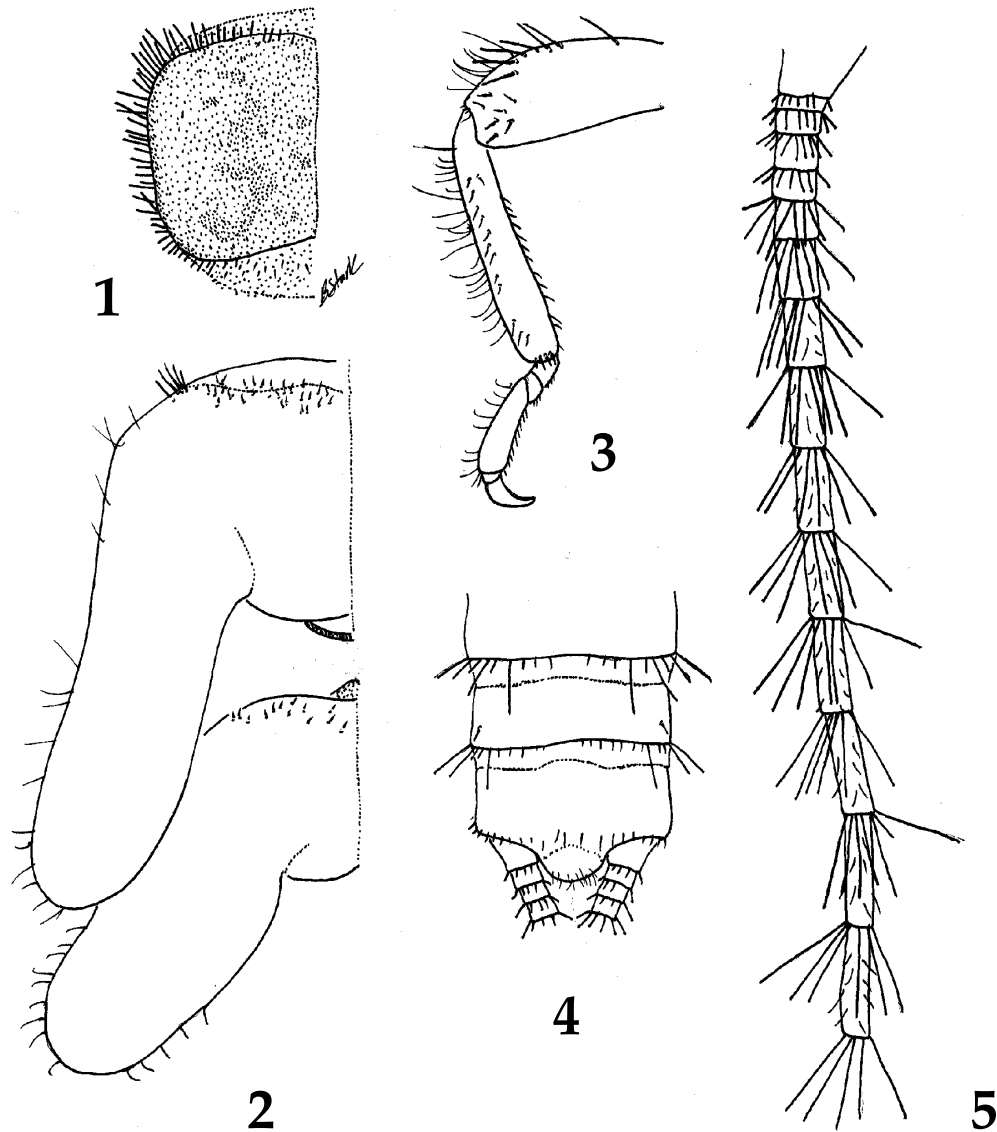
Larval *Amphinemura* remain poorly known in the southeastern region of the United States with four of seven regional species currently described (Claassen 1931; Frison 1935; Harper & Hynes 1971; Nelson 1997). In addition, only four species of Nemouridae are recognized as occurring in Mississippi (Stark 1979; Stark & Hicks 2004). One of these species records, *Amphinemura delosa* (Ricker), is based on a single female specimen and should be deleted until male specimens are available for verification. This specimen was identified based on the key in Ricker (1952) which includes only one species, *A. delosa*, with a distinctive four-lobed subgenital plate. Subsequently described females of *A. mockfordi* (Ricker) and *A. alabama* Baumann are now known to also share this feature (Baumann 1996; Nelson 1997). With this deletion the Mississippi nemourid list is reduced to *Amphinemura nigritta* (Provancher) from seven sites in three counties, *Prostoia completa*

(Walker) from five sites in three counties and *Shipsa rotunda* (Claassen) from a single site in Marshall County (Stark 1979; Stark & Hicks 2004).

Following collection of a small series of *A. alabama* in Tishomingo County in May 2009, the collection of additional adults and a series of mature larvae of that same species in May 2010, and the collection of the first specimens of genus *Soyedina* in the state in February 2010, it seemed an opportune time to re-evaluate and update the Mississippi nemourid fauna, and to provide the first larval description for *A. alabama*.

MATERIALS AND METHODS

Specimens were borrowed from the Mississippi Entomological Museum at Mississippi State University, Starkville, Mississippi (MEM), the University of Mississippi, Oxford, Mississippi (UM) and the Illinois Natural History Survey, Center for Biodiversity, Champaign, Illinois (INHS). Additional



Figs. 1-5. *Amphinemura alabama* larval structures 1. Pronotum. 2. Mesonotum and metanotum. 3. Foreleg. 4. Abdominal terga 8-10. 5. Basal 15 cercal segments, lateral aspect.

specimens are deposited in the Stark Collection, Mississippi College, Clinton, Mississippi (BPS) and in the Monte L. Bean Life Science Museum, Brigham Young University, Provo, Utah (BYU).

RESULTS AND DISCUSSION

Amphinemura alabama Baumann (Figs. 1-5)

Amphinemura alabama Baumann, 1996:249. Holotype ♂ (United States National Museum), Alabama, Limestone Co., Cairo Branch, Elk River

Material examined. MISSISSIPPI: Tishomingo Co.: Clear Creek, Hwy 172, 34.37° N, 88.12° W, 18 May 2009, B. Stark, 3♂, 1♀ (BYU). Same site, 12 May 2010, B. Stark, 1♂, 3♀, 6 larvae (BPS). Clear Creek, Blythe Crossing, 12 May 2010, B. Stark, 1♀ (BPS).

Mature Larva. Body length ca. 7-7.5 mm. General color pale brown to brown, without distinctive pattern. Outer prosternal gills consisting of 6-7 long, robust branches arranged in a apical whorl from a basal trunk. Pronotal margins almost entirely fringed with stout setae; anterior margin with short setae near median suture with longer ones near anterolateral corners. Lateral pronotal margins with mostly longer setae; posterior margins poorly fringed (Fig. 1). Mesonotum without conspicuous basolateral setae but fine outer marginal setae occur in the apical area (Fig. 2). Fore femur with a few apical fringe hairs and a cluster of thick setae beyond midlength (Fig. 3); ventral margin without conspicuous setation; tibial fringe sparse. Abdominal terga 8-9 with several long setae in posterior segmental fringe, but intercalary setae sparse or absent (Fig. 4). Cerci with ca. 23 segments, setal whorls well developed from about segment 6 to apical segment with longest setae on segments 12-19 (Fig. 5); longest cercal setae reach almost entire length of segment; segments beginning with ca.12 have intermediate fine setae arranged in irregular whorl pattern.

Comments. This species was previously known from Alabama (Baumann 1996) and Kentucky (Tarter et al. 2006), and, as indicated in the introduction, we suspect the female specimen from Tupelo determined as *A. delosa* by Stark (1979) might also represent this species. Unfortunately, that specimen was in the Bryant Mather collection and we are not certain where it was deposited after his death.

The larvae of *A. alabama* are very similar to those of *A. nigritta* but, in specimens examined, the setal whorls on most segments are comprised almost entirely of long setae, whereas in *A. nigritta* specimens, the smaller number of long setae are interspersed with a few short setae. In addition, the posterior setal whorls on abdominal terga 8-9 are more robust in *A. alabama* than in *A. nigritta*. Because the sample size for associated larvae of each of these species is small, these setal characters will need to be evaluated as more material becomes available.

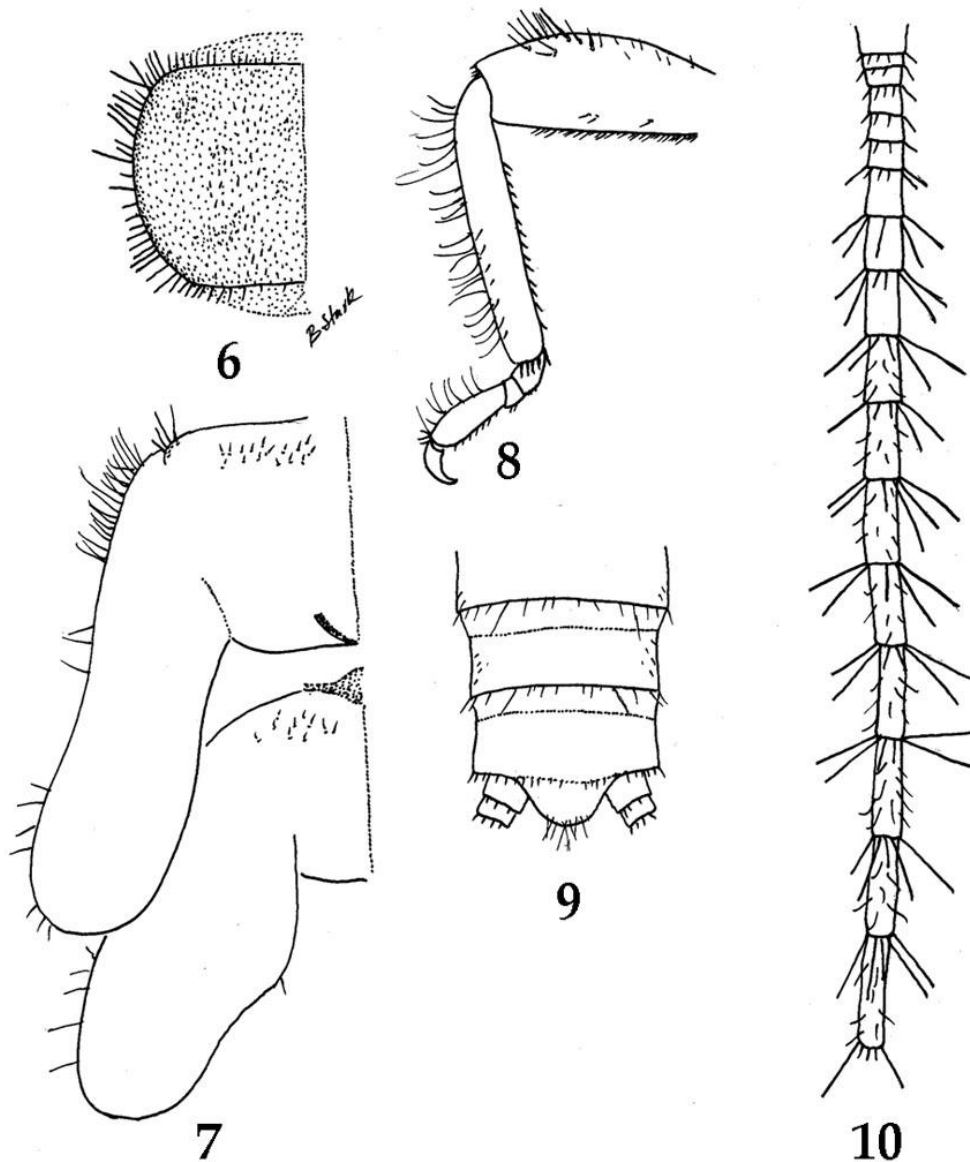
***Amphinemura nigritta* (Provancher)**
(Figs. 6-10)

Nemoura nigritta Provancher, 1876:217. Lectotype ♂, designation Ricker, 1952 (Quebec Provincial Museum), vicinity of Quebec City

Nemoura venosa Banks, 1897:21. Synonymy, Ricker, 1952

Nemoura stylata Banks, 1920:324. Synonymy, Ricker, 1952

Material examined. MISSISSIPPI: Claiborne Co.: Hwy 18, 2 miles north of Jones Village, 31 March 1978, B. Stark, 1♂ reared (BYU). Little Sand Creek, Old Port Gibson Road, 32.06° N, 90.48° W, 9 March 1991, B. Stark, 10 larvae (BPS). Little Sand Creek, Rocky Springs, Natchez Trace Parkway, 1 April 1978, B. Stark, 1♂ (BYU). Same site, 22 April 1978, B. Stark, 1♂ (BYU). Natchez Trace Parkway (no other locality data), 13 April, 1997, R.E. DeWalt, 5♂, 3♀ (INHS). Owens Creek, Owens Creek Natural Area, Natchez Trace Parkway, 31 March 1978, B. Stark, 2♂, 1♀ reared (BYU). Same site, 8 April 1978, B. Stark, 2♂ (BYU). Same site, 22 April 1978, B. Stark, 2♂ (BYU). Ragsdale Creek, Regan Road, 32.05° N, 90.50° W, 24 February 1993, B. Stark, 7 larvae (BPS). Same site, 17 April 1993, B. Stark, 1♀ (BPS). Tributary Sand Creek, 1.5 miles north of Rocky Springs, Natchez Trace Parkway, 1 April 1978, 7♂, 9♀ reared (BYU). Same site, 7 April 1978, B. Stark, 10♂, 14♀ (BYU). Same site, 22 April 1978, B. Stark, 2♂, 3♀ (BYU). **Grenada Co.:** T22N, R3E, Sec 31NW, 5-18 April 1992, G. Snodgrass, Malaise trap, 1♂, 1♀ (MEM). **Lafayette Co.:** Yellow Leaf Creek, Hwy 334, 13 April 1997, R.E. DeWalt, 1♂, 1♀ (INHS). 3 miles SE Oxford, 28 April 1985, G. Dick, 1♂ (UM). **Lincoln Co.:** 1 mile NE New Sight, 31.40° N, 90.26° W, 22-29 March 2002, T.L. Schiefer, R.E. Wise, Malaise trap, 1♂, 1♀ (MEM). Same site, 29 March-5 April 2002, T.L. Schiefer, R.E. Wise, Malaise trap, 1♀ (MEM). Same site, 19-27 April 2002, T.L. Schiefer, R.E. Wise, Malaise trap, 1♀ (MEM). **Newton Co.:** Tonacana Creek, I-20, 15 April 1978, 6♂ reared (BYU). **Perry Co.:** DeSoto National Forest, 30.58° N, 89.04° W, 11-19 April 2002, T.L. Schiefer, J. Schonewitz, Malaise trap, 1♀ (MEM). **Smith Co.:** 1 mile N Raleigh, 32.03° N, 89.31° W, 27 March-3 April 2002, T.L. Schiefer, J. Burrows, Malaise trap, 1♀ (MEM). Same site, 1-8 May 2002, T.L. Schiefer, J. Burrows, Malaise trap, 2♀ (MEM). **Tishomingo Co.:** Rock Quarry Creek, Tishomingo



Figs. 6-10. *Amphinemura nigrutta* larval structures. 6. Pronotum. 7. Mesonotum and metanotum. 8. Foreleg. 9. Abdominal terga 8-10. 10. Basal 17 cercal segments, lateral aspect.

State Park, 34.37° N, 88.12° W, 25 May 2006, B. Stark, I. Sivec, 1♀ (BPS). Same site, 18 May 2009, B. Stark, 2♂ (BPS). Same site, 18 April 2004, J.G. King, 1♂, 1♀ (BYU). **Webster Co.:** Tributary Lindsay Creek, The Cove, 7 miles west of Walthall, 30 March 1995, R.W. Baumann, T.L. Schiefer, 5♂, 3♀ (BYU). **Winston Co.:** Tombigbee National Forest, 33.10° N, 89.04° W, 12 April 1999, T.L. Schiefer, 1♀ (MEM). Tombigbee National Forest, 33.13° N, 89.05° W, 5-12 April 1999,

J. MacGown, T.L. Schiefer, Malaise trap, 3♂ (MEM). **Mature Larva.** Body length ca. 6.0-7.0 mm. General color pale brown without distinctive pattern. Outer prosternal gills with 6-8 long slender branches arising in a whorl from a basal trunk. Pronotal margins almost completely fringed with thick setae of variable length (Fig. 6). Pronotal disk with short thick spinules scattered over surface. Mesonotum with basolateral cluster of ca. 4-5 thick setae and fine

marginal setae clustered basally and extending in a sparse row to apex (Fig. 7). Fore femora bearing an outer grouping of thick setae from beyond midlength to near apex; finer setae occur apically and basally (Fig. 8); femur without outer fringe setae, but ventral margin with fine short setae present; tibiae with sparse outer fringe and numerous thick setae along inner margin. Abdominal terga 8-10 with very poorly formed posterior whorls and few intercalary setae (Fig. 9). Cerci with ca. 21 segments; setal whorls well developed from about segment 7 to apex, with longest setae on segments 12-18 (Fig. 10). Longest cercal setae ca. three fourths as long as cercal segments; intermediate setae present beginning on about segment 10.

Comments. This species was previously known from five sites in Claiborne Co., one site in Hinds Co. and one site in Newton Co. The new records show the species is widely distributed throughout much of the state in areas of suitable habitat, typically from cool headwater streams with extensive riparian zones. The larval habitus has previously been illustrated (e.g. Frison 1935) and Harper & Hynes (1971) provide details of significant chaetotaxic characters and figures of the cerci and abdominal apex for Quebec and Ontario specimens. Our Claiborne County specimens have somewhat longer cercal setae and less conspicuous setae on the abdominal terga than specimens studied by Harper & Hynes (1971).

Prostoia completa (Walker)

Nemoura completa Walker, 1852:191. Holotype ♂ (British Museum of Natural History), Nova Scotia

Nemoura glabra Claassen, 1923:281. Holotype ♂ (Cornell University), Truro, Nova Scotia, synonymy Ricker, 1938

Material examined. Mississippi: Lafayette Co.: Yellow Leaf Creek, Hwy 334, 20 February 2004. J.G. King, 1♂ (BPS).

Comments. Stark & Hicks (2004) reviewed the Ricker (1952) report based on a male from Potts Camp, Marshall Co. Mississippi in the Illinois Natural History Survey, and gave additional records for Alcorn, Lee and Marshall counties.

Shipsa rotunda (Claassen)

Nemoura rotunda Claassen, 1923:290. Holotype ♂ (Cornell University), Waldeboro, Maine

Material examined. Mississippi: Monroe Co.: Buttahatchie River, Buttahatchie Road, 2 February 2009, M. Hicks, D. Burt, 1♂ (BPS).

Comments. Stark & Hicks (2004) previously reported this species from Marshall County from three adult and two larval specimens.

Soyedina alexandria Grubbs

Soyedina alexandria Grubbs, 2006:43. Holotype ♂ (INHS), Tennessee, Williamson Co., Spring into Pinewood Branch, Leipers Fork, West Fork Harpeth River

Material examined. Mississippi: Tishomingo Co.: tributary Sandy Creek, CR 355, Sandy Creek Hunting Club, 6 February 2010, A. Harrison, L. Little, 2♂ (BPS).

Comments. These specimens represent the first record for any *Soyedina* species in Mississippi. An attempt was made to collect additional specimens at this site on 13 March 2010, but no specimens were found.

Systematic List of Mississippi Plecoptera

Stark & Hicks (2004) updated a list of 55 stonefly species thought to occur in Mississippi, and subsequently the Capniidae (Nations et al. 2007; Stark & Hicks 2009a), Chloroperlidae (Willett & Stark 2009), Leuctridae (Harrison & Stark 2010) and Taeniopterygidae (Stark & Hicks 2009b) have been re-examined. With changes listed above the list includes 57 species, but the *Isoperla* list is expected to undergo significant modification as a result of an ongoing study of the species of eastern North America (Szczytko & Kondratieff, pers. com.).

SYSTELLOGNATHA

Family Chloroperlidae

Alloperla caudata Frison

Alloperla natchez Surdick & Stark

Haploperla brevis (Banks)
Haploperla chukcho (Surdick & Stark)

Allocapnia virginiana Frison
Nemocapnia carolina Banks

Family Perlidae

Acroneuria abnormis (Newman)
Acroneuria arenosa (Pictet)
Acroneuria carolinensis (Banks)
Acroneuria evoluta Klapálek
Aagnetina annulipes (Hagen)
Attaneuria ruralis (Hagen)
Eccoptura xanthenes (Newman)
Neoperla carlsoni Stark & Baumann
Neoperla clymene (Newman)
Neoperla coxi Stark
Neoperla occipitalis (Pictet)
Neoperla robisoni Poulton & Stewart
Neoperla stewarti Stark & Baumann
Paragnetina fumosa (Banks)
Paragnetina kansensis (Banks)
Perlesta lagoi Stark
Perlesta placida (Hagen)
Perlesta shubuta Stark
Perlinella drymo (Newman)
Perlinella ephyre (Newman)
Perlinella zwicky Kondratieff, Kirchner & Stewart

Family Perlodidae

Clioperla clio (Newman)
Diploperla duplicata (Banks)
Helopicus bogaloosa Stark & Ray
Isogenoides varians (Walsh)
Isoperla bilineata (Say)
Isoperla couchatta Szczytko & Stewart
Isoperla dicala Frison

Family Pteronarcyidae

Pteronarcys dorsata (Say)

EUHOLOGNATHA

Family Capniidae

Allocapnia aurora Ricker
Allocapnia granulata (Claassen)
Allocapnia mystica Frison
Allocapnia polemistis Ross & Ricker
Allocapnia rickeri Frison
Allocapnia starki Kondratieff & Kirchner

Family Leuctridae

Leuctra carolinensis Claassen
Leuctra colemanorum Harrison & Stark
Leuctra ferruginea (Walker)
Leuctra hicksi Harrison & Stark
Leuctra rickeri James

Family Nemouridae

Amphinemura alabama Baumann
Amphinemura nigritta (Provancher)
Prostoia completa (Walker)
Shipsa rotunda (Claassen)
Soyedina alexandria Grubbs

Family Taeniopterygidae

Strophopteryx fasciata (Burmeister)
Taeniopteryx burksi Ricker & Ross
Taeniopteryx lita Frison
Taeniopteryx lonicera Ricker & Ross
Taeniopteryx maura (Pictet)
Taeniopteryx parvula Banks

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