

A NEW *NEOPHYLAX* (TRICHOPTERA: UENOIDAE) FROM MIDDLE TENNESSEE

DAVID A. ETNIER

Department of Ecology and Evolutionary Biology, University of Tennessee,
Knoxville, TN 37996-1610, U.S.A. (e-mail: dipnet@utk.edu)

Abstract.—*Neophylax lewisae*, n. sp., is described based on adults and larvae from three localities in the Nashville Basin physiographic province of Clay, Cannon, and Williamson counties, Tennessee, and from two localities from the Barrens Plateau (Highland Rim physiographic province) of Moore County, Tennessee. A larva presumably representing the same species is known from an additional locality in Smith County, Tennessee. Males are most similar to those of *N. atlanta* Ross and *N. toshioi* Vineyard and Wiggins, differing from these and all nominal *Neophylax* of eastern North America in having the posterior margin of the inferior appendages sharply keeled in caudal view.

Key Words: Trichoptera, Uenoidae, *Neophylax*, middle Tennessee

In May 1997 numerous *Neophylax* McLachlan larvae were collected from Kelley Creek, Williamson County, Tennessee, in the Nashville Basin physiographic province. When carefully examined in 1998, several of these were found to differ from those of the known Tennessee species of *Neophylax*. Suspecting that they might represent an undescribed species, the site was revisited on 30 September–1 October 1998, and two mature pupae from this collection confirmed that an undescribed species was involved. Very similar larvae located at two additional Nashville Basin streams and two Barrens Plateau (Highland Rim physiographic province) streams of Moore County, Tennessee, were subsequently reared, and found to represent the same species.

METHODS

Larvae, prepupae, and pupae were preserved in 70% isopropanol. Adults

from the five known localities were obtained by rearing prepupae and pupae collected in late summer or early fall. These were returned to the laboratory in sealed 4-oz jars filled with creek water and placed in a cooler containing crushed ice. Prepupae and pupae were left in their pebble cases, 1–3 specimens barely covered with stream water per loosely covered 4-oz jar, and placed in an incubator set to approximate water temperatures at estimated emergence time. Adjusting photoperiod in the incubator was not necessary for successful emergence of a high percentage of specimens. Three additional adults were hand-picked from white sheets suspended vertically near a black light at the Wet Mill Creek site on 29 October 2002.

Neophylax lewisae Etnier, new species (Figs. 1–5)

Types.—Holotype: Mature ♂ pupa, Kelley Creek approximately 0.8 km up-

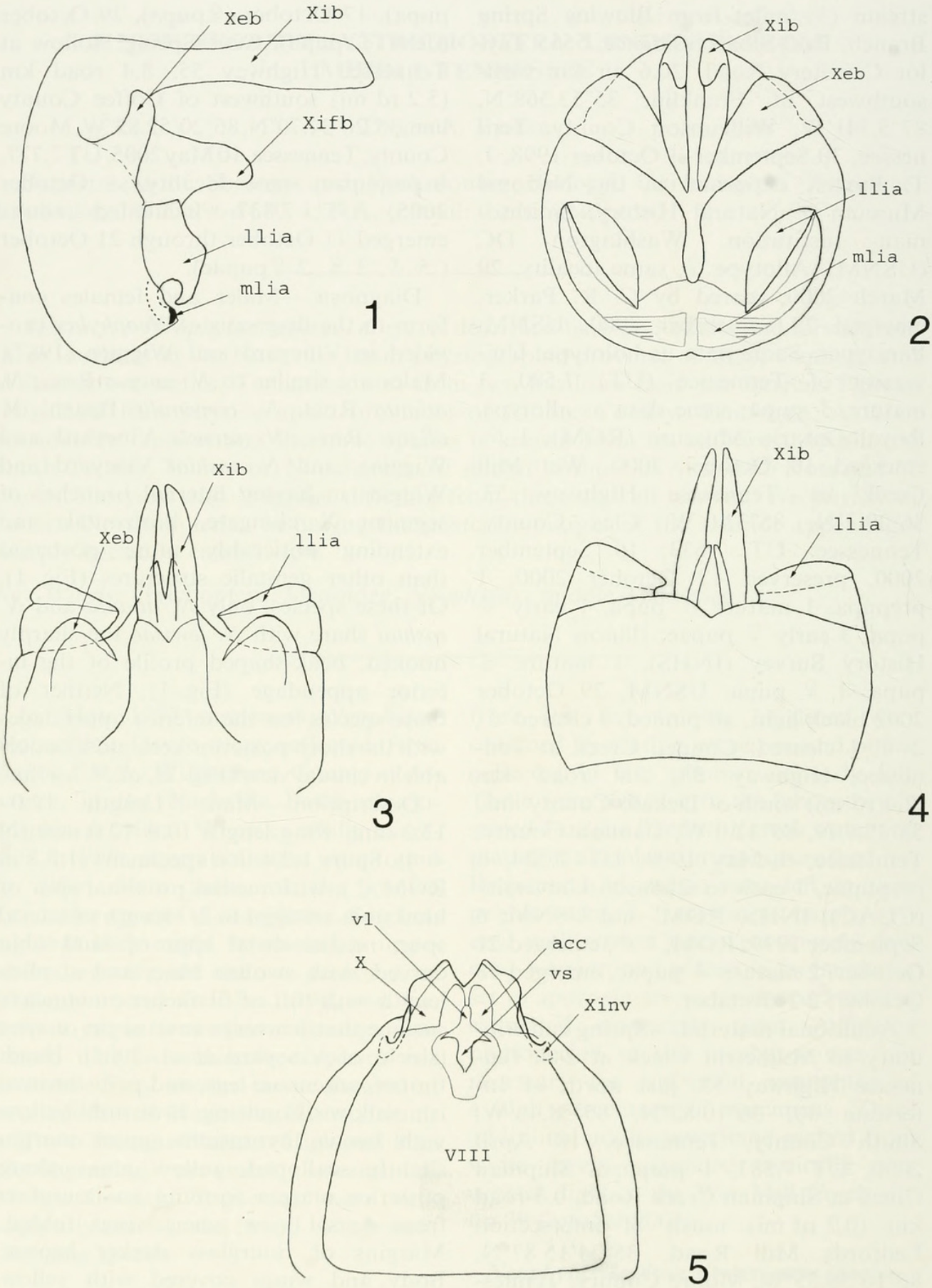
stream (½ mile) from Blowing Spring Branch, Paul Sloan residence, 5565 Taylor Cemetery Road, 20.6 air km west-southwest of Franklin, 35°53.368'N, 87°5.741'W, Williamson County, Tennessee, 30 September–1 October 1998, J. T. Baxter, deposited in the National Museum of Natural History, Smithsonian Institution, Washington DC (USNM). Allotype ♀, same locality, 29 March 2000, reared by C. R. Parker, emerged 29 September 2000, USNM. Paratypes: Same data as holotype, University of Tennessee (UT) 7.580, 1 mature ♂ pupa; same data as allotype, Royal Ontario Museum (ROM), 1 ♀, emerged 10 October 2000. Wet Mill Creek at Tennessee Highway 53, 36°29.7'N, 85°33.0'W, Clay County, Tennessee: UT 7.633, 10 September 2000, preserved 12 October 2000, 1 prepupa, 1 mature ♂ pupa, 1 early ♂ pupa, 3 early ♀ pupae; Illinois Natural History Survey (INHS), 1 mature ♂ pupa, 1 ♀ pupa; USNM, 29 October 2002 black light, all pinned, 1 cleared ♂, 2 ♀, 1 cleared. Connell Creek at Tennessee Highway 53, 3.9 road km (2.4 rd mi) south of Dekalb County line, 33°29.7'N, 85°33.0'W, Cannon County, Tennessee; 9 May 1999, UT 7.534, 4 prepupae, 1 each to Clemson University (CUAC), INHS, ROM, and USNM; 6 September 1999: ROM, 1 ♂, emerged 21 October, 2 mature ♂ pupae, emerged 18 October, 2 November.

Additional material.—Spring run tributary to Mulherrin Creek at 244 Tennessee Highway 53, just north of Interstate 40, 36°10.83'N, 85°58.46'W, Smith County, Tennessee, 18 April 2000, UT 7.583, 1 prepupa. Shipman Creek at Shipman Creek Road, 0.3 road km (0.2 rd mi) north of intersection Ledfords Mill Road, 35°24'15.87"N, 86°16'38.55"W, Moore County, Tennessee, 24 May 1988, UT 7.500, 3 prepupae; same locality, 5 October 2005, UT 7.835, incubated adults emerged 7 October (♂

pupa), 17 October (♀ pupa), 29 October (dead ♂ pupa). Cave Spring Hollow at Tennessee Highway 55, 8.4 road km (5.2 rd mi) southwest of Coffee County line, 35°20'34.70"N, 86°20'52.82"W, Moore County, Tennessee, 10 May 2005, UT 7.777, 6 prepupae; same locality, 5 October 2005, UT 7.837, incubated adults emerged 11 October through 21 October (5 ♂, 3 ♀, 2 ♀ pupae).

Diagnosis.—Males and females conform to the diagnosis of *Neophylax* provided in Vineyard and Wiggins (1987). Males are similar to *N. aniqua* Ross, *N. atlanta* Ross, *N. consimilis* Betten, *N. oligius* Ross, *N. securis* Vineyard and Wiggins, and *N. toshioi* Vineyard and Wiggins in having internal branches of segment X elongate, horizontal, and extending noticeably more posteriad than other genitalic structures (Fig. 1). Of these species, only *N. atlanta* and *N. toshioi* share with *N. lewisae* the sharply hooked, beak-shaped profile of the inferior appendage (Fig. 1). Neither of these species has the inferior appendages with the sharp posterior keel, most noticeable in caudal view (Fig. 2), of *N. lewisae*.

Description.—*Male*: Length 12.0–13.2 mm, wing length 10.9–12.0 mm (N = 4). Spurs 1,2,4 in 6 specimens (1,2,3 in ROM ♂), with medial proximal spur of hind tibia vestigial to 2/3 length of lateral spur; medial distal spur of hind tibia curved, with swollen base, and at mid-length with tuft of filaments on concave surface that converge toward tip of spur (shield of Vineyard et al. 2005). Head, thorax, antennae, legs, and palps brownish yellow. Forewing brownish yellow with brown irrorations, outer margin slightly scalloped, yellow areas along posterior margin forming an hourglass from dorsal view when wings folded. Margins of hourglass darker brown. Body and wings covered with yellow setae except setae dark brown margining hourglass, and at wing margin at ends of veins, M1, M2, and from M3 to hind



Figs. 1-5. *Neophylax lewisae*. 1, Male genitalia, lateral; 2, Male genitalia, caudal; 3, Male genitalia, dorsal; 4, Male genitalia, ventral; 5, Female genitalia, ventral. Abbreviations: X, segment ten; Xeb, external branch of segment X; Xib, internal branch of segment X; Xifb, inferior branch of segment X; llia, lateral lobe of inferior

angle of wing. Segment VII with sharply pointed ventromedian posterior process that is three times as long as its basal width. Segment IX with shallow, ventral, posteromedian emargination. Male genitalia (Fig. 1–4) with internal branches of segment X (Xib) long and slender, about twice length of inferior branches (Xifb). Lateral lobes of inferior appendages (llia) with beak-shaped ventromesal projection (lateral view), and with sharp posterior keel in caudal view. Median lobes of inferior appendages (mlia) narrowly separated on midline, weakly separated from segment IX, and with horizontal, sclerotized, striations anterior to ventromesal projection of llia.

Female: length 12.8–15.2 mm, wing length 11.4–14.0 mm ($N = 5$). Spurs consistently 1, 2, 4, median spurs on hind tibia subequal to lateral partner in length and shape. Coloration as in males, but with fringe of setae margining outer end of wing more uniformly dark. Female genitalia (Fig. 5) with sclerotized outer margins of segment X continuing anteriorly to form a sclerotized invagination dorsal to the posterior corners of segment VIII. Posterior margin of VIII sclerotized, and setose on the more heavily sclerotized outer one-third. Posterolateral corners of segment IX not produced posteriorly. Accessory lobes of vaginal sclerite parallel, rounded on outer margin, straight on inner margin, and in contact with vulval lobe for about half their length. Vaginal sclerite acutely narrowed anteriorly (appearing pointed but tip absent or not sclerotized), with wing-shaped lateral projections anterior to vaginal opening. Segment VII with short, blunt, median projection near its posterior margin.

Females key to couplet 28, *N. toshioi*, in Vineyard et al. (2005), but differ from that species in having posterior corners

of segments VIII + IX lightly sclerotized, and in having the accessory lobes of the vaginal sclerite as described above (convergent at their tips, rounded both laterally and medially, and not in direct contact with the tip of the vulval lobe in *N. toshioi*).

Larva: Legs and head dark brown, head with about 7 pale muscle scars on posterior portion of frontoclypeus and with 2 scars behind inner margin of eye. Two rows of scars under eye, the upper row with 4–5 scars, a gap, and 2–3 additional scars behind eye. The lower row has 2–3 scars, the most anterior of which is slightly anterior to the anterior scar in the upper row. Frontoclypeal tubercle, when present, approximating an equilateral triangle in anterior view, slanted backward, but not sharply pointed, and rarely conspicuous. Thoracic nota yellow to tan, each pronotal sclerite with about 15 moderately robust, blade-like spines along lateral two-thirds of anterior margin and about 8 smaller spines on medial one-third of margin; about 20 shorter spines are present in a poorly defined second row posterior-dorsal to the marginal row. Each pronotal sclerite with 40 or more erect black setae. Frontoclypeus covered with microspicules. Genae, pronotum, and mesonotum mostly covered with microscutes. Microspicules present on genae near eye, on pronotum in midlateral area, and on mesonotum on lateral and posterior margins. Ventral gills present on abdominal segment 1; lateral gills typically present on posterior portion of segment 2 (2p), anterior portion of segment 3 (3a), and on 4a, with gill on 3p present on at least one side in 3 of 14 larvae, resulting in 4 lateral gills per side (no other *Neophylax* of eastern North America has lateral gills on 3p). Dorsal gills

←
appendage; mlia, median lobe of inferior appendage; acc, accessory lobe of vaginal sclerite; vl, vulval lobe of vaginal sclerite; vs, vaginal sclerite; Xin, sclerotized invaginations of tenth sternum; VIII, eighth sternum.

present from 2a through 7p, occasionally absent from 2a, 6a, 7a, and 7p; ventral gills present from 2a through 6p, occasionally absent from 2a and 6a, occasionally present on 7p.

In Vineyard et al (2005), the larva keys to couplet 11 (*N. mitchelli* Carpenter and *N. etnieri* Vineyard and Wiggins) if the frontoclypeus is interpreted as having a tubercle. *N. lewisae* larvae differ from the former in consistently having lateral gills, from the latter in lacking a pale eye stripe and a pale spot under the frontoclypeal tubercle and from both in that the frontoclypeal tubercle is absent to tiny and slanted posteriad, not erect. Specimens lacking an apparent frontoclypeal tubercle will key to *N. consimilis* Betten (couplet 16). The very similar larva of this species lacks prominent pale muscle scars on the frontoclypeus, has only about 20 black spines on each pronotal sclerite (40 or more in *N. lewisae*), and has 3 or 4 rows of spines covering the thickened anterior border of the frontoclypeus (2 rows, both marginal, in *N. lewisae*). In *N. lewisae* the entire frontoclypeus is covered with microspicules/micronodules, while only the posterior half of that sclerite is spiculate/nodulate in *N. consimilis*. The unusual *N. consimilis*-like larvae (Vineyard et al. 2005: 50–51) from Wellington Mills, Franklin County, Tennessee (ROM 700336, 700337) very likely represent an additional Barrens Plateau locality for *N. lewisae*.

Variation.—The only variation noted in adults is in segment X in the female, with the margin of the posterior emargination straight-sided (V-shaped) in Nashville Basin specimens, and slightly convex in Moore County specimens. Only 1 of 9 larvae examined from Moore County had a visible frontoclypeal tubercle, and only one of those had a lateral gill on segment 3p. The frontoclypeal tubercle is much more prominent and erect in the single Smith County prepupa (UT 7.583) than in other specimens examined.

Discussion.—Nashville Basin streams are low gradient, shallow, and with smooth, horizontal Ordovician limestone substrates interspersed with slabrocks and some gravel. Streams on the Barrens Plateau portion of the Highland Rim physiographic province have slightly higher gradients, and substrates are primarily chert gravel and cobbles interspersed with occasional limestone cobbles and small boulders. We have taken this species syntopically with *Neophylax acutus* Vineyard & Wiggins and *N. fuscus* Banks.

Etymology.—With pride and affection, I name this species in honor of my wife, Elizabeth Lewis Etnier, frequent contributor to my zoological endeavors.

ACKNOWLEDGMENTS

Charles R. Parker provided rearing facilities for spring-collected prepupae that needed to be held throughout the summer. Patricia W. Schefter was very helpful in providing insights into morphology and homologies of the female genitalia, and confirming my guess that this species was not the same as one being described from Alabama in Vineyard et al. (2005) prior to the appearance of that monograph. J. T. Baxter, Elizabeth L. Etnier, Oliver S. Flint, Jr., and Chris E. Skelton participated in the collection efforts. E. L. Etnier and C. D. Hulsey formatted the illustrations for publication. J. K. Moulton graciously provided his copy of Vineyard et al. (2005) while mine was in absentia.

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