

TWO NEW SPECIES OF *LEPTOHYPHES*
(EPHEMEROPTERA:LEPTOHYPHIDAE) FROM ECUADOR

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ABSTRACT

Leptohyphes liniti New Species and *Leptohyphes nicholsae* New Species are described from larvae taken in Ecuador. *Leptohyphes liniti* has a highly developed ridge on the hind femora and otherwise is most similar to *Leptohyphes tacajalo* Mayo, also from Ecuador. *Leptohyphes nicholsae* is closely related to *L. curiosus* Lugo-Ortiz and McCafferty, described from Costa Rica, but differs in the presence of abdominal tubercles and color pattern.

Key Words: Ephemeroptera, Leptohyphidae, *Leptohyphes liniti*, *Leptohyphes nicholsae*, New Species

RESUMEN

Leptohyphes liniti Nueva Especie y *Leptohyphes nicholsae* Nueva Especie son descritas a través de larvas colectadas en Ecuador. *Leptohyphes liniti* tiene una cresta muy desarrollada en los fémures posteriores, pero es muy similar a *Leptohyphes tacajalo* Mayo, también de Ecuador. *Leptohyphes nicholsae* está cercanamente relacionada a *Leptohyphes curiosus* Lugo-Ortiz & McCafferty, descrita de Costa Rica, pero difiere en la presencia de proyecciones abdominales y en el color del abdomen.

Leptohyphes Eaton is a New World mayfly genus with 73 currently recognized species and has been treated by Eaton (1882, 1892), Navás (1920, 1931), Ulmer (1920), Needham and Murphy (1924), Traver (1943, 1958), Allen (1967, 1973, 1978), Mayo (1968), Brusca (1971), Allen and Roback (1969), Allen and Brusca (1973), Kilgore and Allen (1973), Allen and Murvosh (1987), and Lugo-Ortiz and McCafferty (1995). Most species of *Leptohyphes* are known from only larvae or only adults, and thus the taxonomy of the genus will remain difficult until stage associations are established (Lugo-Ortiz and McCafferty 1995). The various and sometimes unreliable characters (e.g., apical spine on abdominal gill 2, which actually originates from underlying gill filament of gill 2) used to describe species of *Leptohyphes* in the past suggest that the status of several species requires further review.

Recently, one of us (RWS) collected mayflies from northern Ecuador, including two distinctive new species of *Leptohyphes*. These species are named after M. L. Linit and B. J. Nichols, who helped to collect the material upon which the descriptions herein are based. Except where noted, the materials examined are deposited in the Wilbur R. Enns Entomology Museum at the University of Missouri-Columbia, USA. All materials examined were collected by the three collectors indicated above.

Leptohyphes liniti Wang, Sites and McCafferty, New Species
(Figs. 1-8)

Larva: Body length 4.5-6.0 mm; caudal filaments ca 3.0-4.0 mm. General color reddish brown to light brown. Head patterned and setae as in Fig. 1. Body with scattered minute spicules and without tubercles. Labrum dorsally with scattered, simple setae and two to three rows of branched setae along the anterior margin (Fig. 2); mandible with partially fused incisors (Figs. 3-4); hypopharynx with poorly developed superlinguae, superlinguae with simple and branched setae (Fig. 5); maxillary palpi three-segmented (Fig. 6); labium with well-developed postmentum, labial palpi with long setae, glossae reduced and with several branched setae (Fig. 7). Pronotum with lateral margins rounded and produced in anterior half (Fig. 1). Fore femora with well-developed median transverse ridge with spines (Fig. 1); mid- and hind femora with elevated longitudinal ridge (highly developed in hind femora) extending from near base to apex of femur, dorsal margins with prominent flat, long, blunt spurs (socketed) and minute setae (Fig. 1); hind femora about 40% longer than fore femora, with ridge width more than one-half length; hind tibiae with row of hairlike setae on ventral and dorsal margins; hind tarsi about one-third length of hind tibiae; tarsal claws with single row of four to six denticles. Abdomen with scattered spicules; lateral flanges developed on segments 2-7 (anterior margins of hind femora fitting on lateral flanges); segments 6-9 with posterolateral projections; sterna reddish brown except hyaline laterally on sterna 2-7. Abdominal gills 2 with basal spine (or projection) (Fig. 8). Caudal filaments with narrow dark brown bands near base in female (Fig. 1), and with broad dark brown area near middle in male.

Adult: Unknown.

Holotype: Female larva, Ecuador, Carchi Prov., Río San Juan, 1.8 km E Maldonado, 2198 m, 16 July 1993. Paratypes: Nine larvae, same data as holotype; nine larvae, Napo Prov., 6.2 km S Baeza (old town), 1865 m, 21 July 1993 (two housed in the Purdue Entomological Research Collection, West Lafayette, Indiana; two housed in the Museo Ecuatoriano de Ciencias Naturales, Quito, Ecuador; and two housed in Universidad Católica, Quito, Ecuador).

Other material examined: 14 larvae, same data as holotype; 20 larvae, Napo Prov., 6.2 km S Baeza (old town), 1865 m, 21 July 1993; three larvae, Pichincha Prov. Río Toachi nr footbridge, 0.3 km E Tinalandia, 741 m, 19 July 1993; one larva, Pichincha Prov., tributary of Río Toachi, 2.6 km S La Unión del Toachi at dirt rd S from new Quito Rd, 975 m, 19 July 1993; two larvae, Pichincha Prov., Río Dos Ríos at Dos Ríos, 7.0 km NE on old Quito Rd, 1292 m, 19 July 1993; 42 larvae, Napo Prov., Río Quebrada Juve, 1996 m, 20 July 1993.

Discussion: *Leptohyphes liniti* appears similar to *Leptohyphes tacajalo* Mayo from Ecuador, but differs in the highly developed hind femora with marginal spurs and the well-developed marginal rows of hairlike setae on the hind tibiae.

Larvae were taken in small to large streams with substrates consisting of stones, stones in sand, and stones in vegetation. Elevations of the collection sites ranged from 741 to 2195 m and water temperatures ranged from 15-22°C.

Leptohyphes nicholsae Wang, Sites and McCafferty, New Species
(Figs. 9-16)

Larva: Body length 3.0 mm; caudal filaments ca 1.0 mm. Color pattern as in Fig. 9. Head pale brown, fringed with numerous long, fine, simple setae; ocelli raised slightly on rudimentary tubercles; antennae pale yellow, nearly as long as head width.

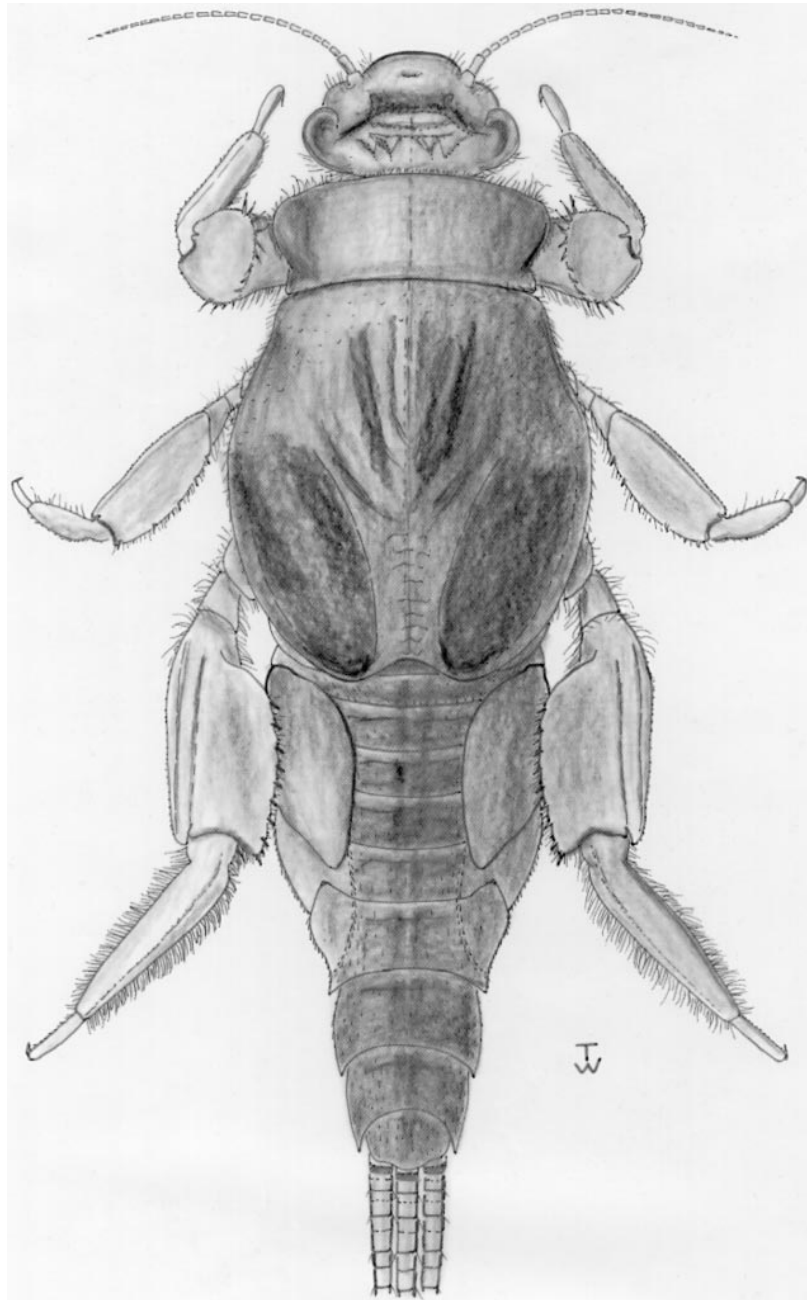
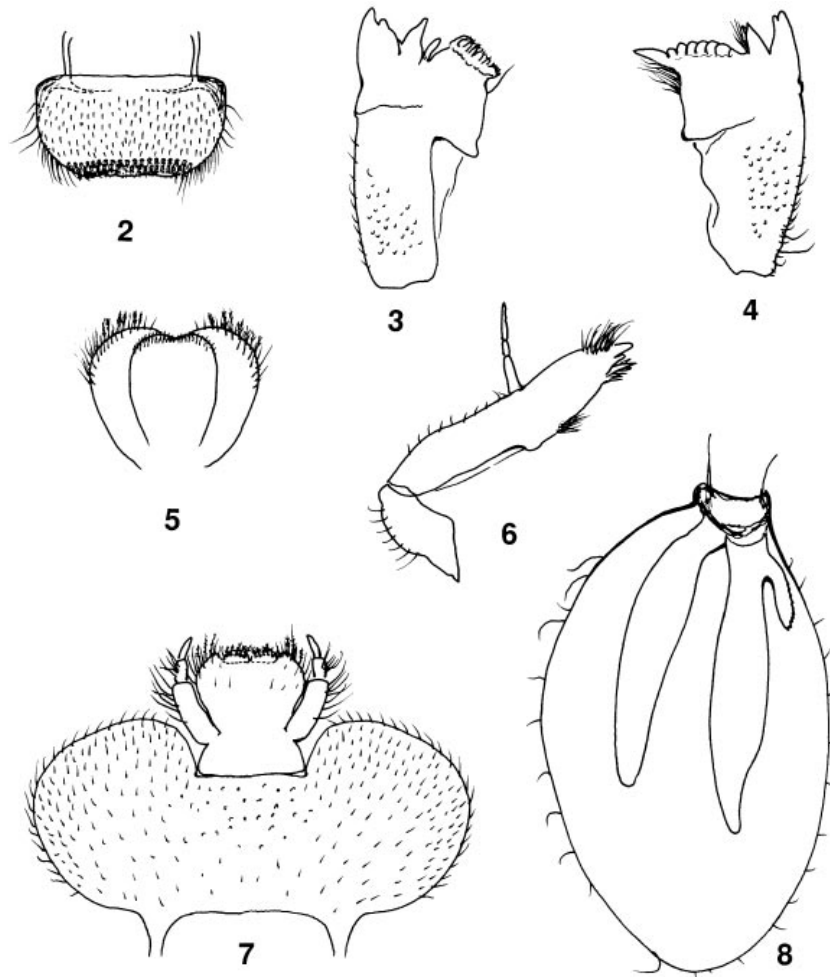


Fig. 1. *Leptohyphes liniti* Wang, Sites and McCafferty, New Species, larva, dorsal view.



Figs. 2-8. *Leptohiphes liniti* Wang, Sites and McCafferty, New Species, larva. 2. Labrum; 3. Left mandible; 4. Right mandible; 5. Hypopharynx; 6. Maxilla; 7. Labium; 8. Gill 2, ventral.

Labrum mostly with branched setae (Fig. 10); mandible with partially fused incisors (Figs. 11-12); hypopharynx with well-developed superlinguae and marginal setae (Fig. 13); maxillary palpi absent (Fig. 14); labium with regularly developed postmentum, labial palpi with sparse setae, glossae small and with apical branched setae (Fig. 15). Lateral margins of pronotum nearly parallel, fringed with fine, simple setae; fore femora with well-developed, curved, setose transverse ridge in basal half of anterior surface (Fig. 9); mid- and hind legs with color pattern as shown in Fig. 9; mid- and hind femora and tibiae with long, fine, simple setae on ventral and dorsal margins; hind femora subequal in length to fore femora; hind tibiae and hind tarsi subequal in length; tarsal claws about half as long as tibiae, and with single row of four to six den-

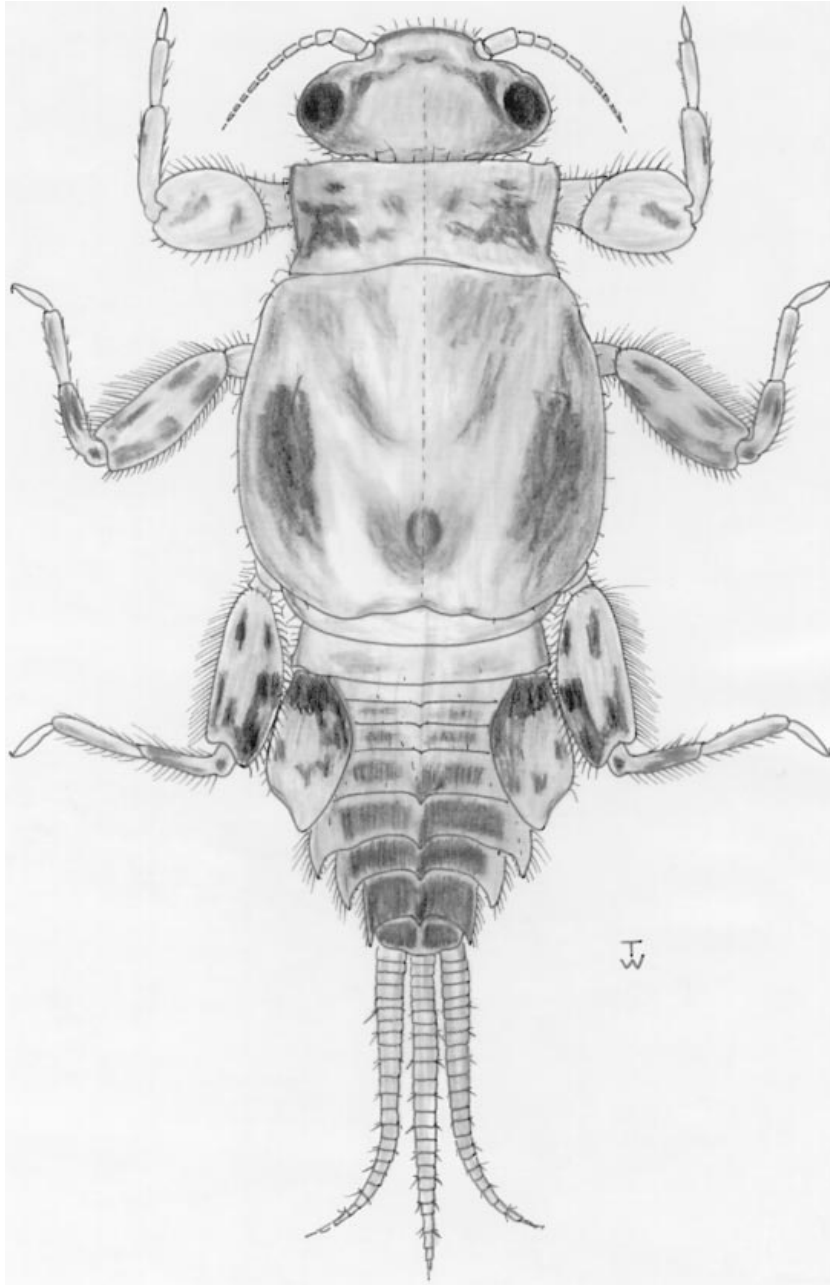
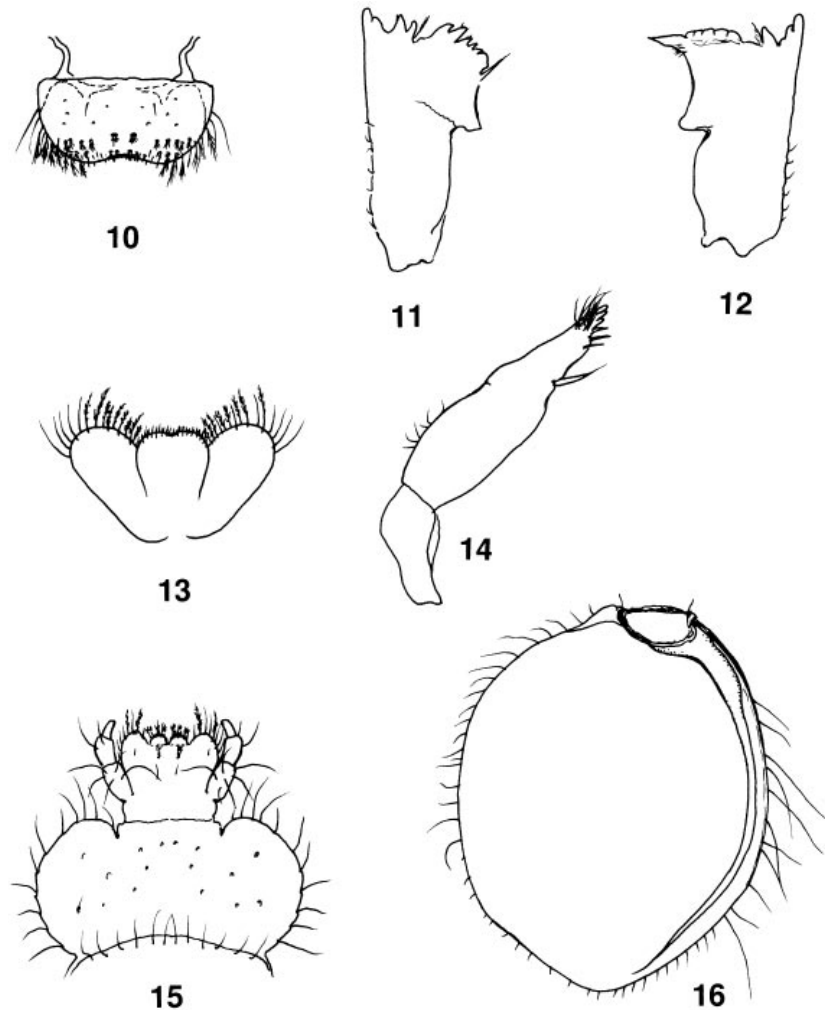


Fig. 9. *Leptohyphes nicholsae* Wang, Sites and McCafferty, New Species, larva, dorsal view.



Figs. 10-16. *Leptohyphes nicholsae* Wang, Sites and McCafferty, New Species, larva. 10. Labrum; 11. Left mandible; 12. Right mandible; 13. Hypopharynx; 14. Maxilla; 15. Labium; 16. Gill 2, ventral.

ticles. Abdominal terga 3-9 each with midposterior tubercle (strongly developed on terga 6-9); abdominal segments 3-9 with well developed posterolateral projections, and 3-8 with moderately developed lateral flanges (Fig. 9); sterna pale yellow. Operculate gills with underlying gill filament longer than operculate gill (Fig. 16), without basal spine, pale yellow, ovate, weakly pointed distally, with distinct basal and median blackish markings (Fig. 9). Caudal filaments without dark brown banded segments, with whorls of short, simple setae at alternating articulations (Fig. 9).

Adult: Unknown.

Holotype: Male larva, Ecuador, Pichincha Prov., Rio Peripa at Puerto Limon, 314 m, 18 July 1993. Paratype: Female larva, same data as holotype.

DISCUSSION

Leptohyphes nicholsae appears to be closely related to *Leptohyphes curiosus* Lugo-Ortiz and McCafferty from Costa Rica because both species possess the following attributes: small size, similar operculate gill shape, ridge and setal arrangements on the legs, and the well-developed posterolateral projections on abdominal segments 7 and 8 (see Lugo-Ortiz and McCafferty 1995). It differs from *L. curiosus* by possessing tergal tubercles and a different color pattern on the legs and operculate gills. Lugo-Ortiz and McCafferty (1995) noted the unique characteristics of *L. curiosus* and commented that it did not exactly fit the traditional definitions of either *Tricorythodes* Ulmer or *Leptohyphes*. They further suggested that it was representative of a distinct Neotropical lineage within *Leptohyphes*. The discovery of *L. nicholsae* shows indeed that the lineage consists of more than one species.

The new species is known from only one collecting site. The Rio Peripa, where it was taken, was at low elevation (314 m) at Puerto Limon. The collecting site was approximately 30 m wide, had a stony substrate, and a water temperature of 24°C.

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