

# NEW SPECIES AND RECORDS OF NEW WORLD LEPTOHYPHINAE (Ephemeroptera: Tricorythidae)<sup>1</sup>

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## ABSTRACT

Descriptions and figures are presented for *Leptohyphes spinosus*, n. sp., *L. hirsutus*, n. sp., *L. echinatus*, n. sp., *L. myllonotus*, n. sp., and *Tricorythodes ocellus*, n. sp. A redescription and notes are included for *Leptohyphes maculatus* Allen, new records are included for *L. maculatus*, *L. setosus* Allen, and *L. tuberculatus* Allen, and new records extend the ranges of *L. dolani* Allen and *L. robacki* Allen in North America.

An assemblage of mayfly nymphs collected by the Catherwood Foundation Peruvian-Amazon Expedition from the vicinity of Tingo Maria, Peru, included eight species of Leptohyphinae. Three species, *Leptohyphes setosus*, *L. maculatus*, and *L. tuberculatus*, were described by Allen in 1967. The remaining five are described herein and were reported by Roback (1966) as *Leptohyphes* sp. 1, 2, 4, 5, and *Tricorythodes* sp.

The genus *Leptohyphes*, including the following new species, now contains 42 species, only six of which are known to occur in North America. Specimens from the Academy of Natural Sciences of Philadelphia collection extend the range of two of these Nearctic species, *L. robacki* Allen and *L. dolani* Allen, in eastern and central North America.

All types are deposited in the collection of the Academy of Natural Sciences of Philadelphia. The illustrations were prepared by Jerry J. Battagliotti, California State College at Los Angeles.

## *Leptohyphes spinosus*, n. sp.

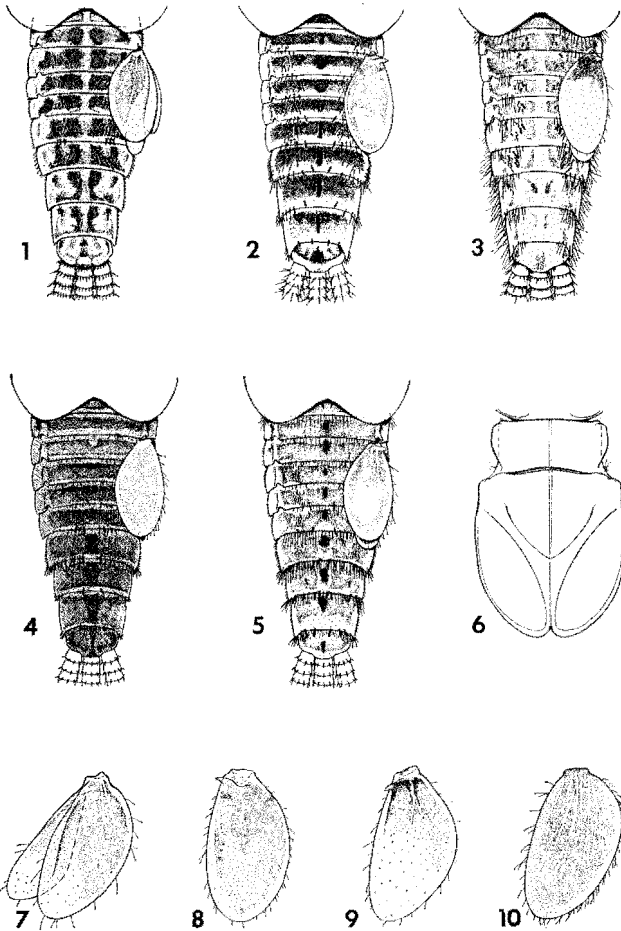
*Leptohyphes* sp. 1 Roback, 1966:150.

**NYMPH.** Length: body 4 mm, caudal filaments 2 mm. General color brown with black and dark brown markings. Head brown with irregular black markings; lateral ocelli small; maxillary palpi 3-segmented. Thoracic nota brown with irregular black markings; wing pads light brown with a dark band on lateral margin; legs brown with black and dark brown markings; coxae brown with a large black macula; femora with moderately long spines (Fig. 11b); fore femoral band of spines as in Figure 11a; hind femora broken; anterior surface of middle femora without setae or spines; ventral (leading) margin of

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FIGS 1-10. Genus *Leptohiphes*. Figs. 1-5, abdominal terga: 1, *L. spinosus*; 2, *L. hirsutus*; 3, *L. echinatus*; 4, *L. myllonotus*; 5, *L. maculatus*. Fig. 6, Thoracic nota, *L. myllonotus*. Figs. 7-10, operculate gills: 7, *L. spinosus*; 8, *L. hirsutus*; 9, *L. echinatus*; 10, *L. myllonotus*.

middle femora with long spines; tarsi with a brown basal band; tarsal claws with 6 to 8 marginal denticles, and a palisade of 4 to 7 submarginal denticles near apex (Fig. 11c). Abdominal terga brown with black markings blending to form two longitudinal bands (Fig. 1); posterior margin of terga 2 to 9 with small spicules; dorsal surface of terga 3 to 7 with clusters of moderate to long submedian spines (Fig. 1); operculate gill with a lateral flap; gills dark at base and pale at apex (Fig. 7);

abdominal sterna pale with a median and paired sublateral dark maculae. Caudal filaments pale.

Types. Holotype (on slide), mature nymph, Rio Rondos nr Tingo Maria, Peru, 29-IX-1955 (S. S. Roback). Paratype: mature nymph, Rio Tulumayo, Puerto Nuevo nr Tingo Maria, Peru, 25-IX-1955 (S. S. Roback).

The nymphs of *Leptohyphes spinosus*, n. sp., has characters in common with several Peruvian *Leptohyphes*, and they appear to be most closely related to those species with clusters of dorsal submedian abdominal spines. This species is distinguished from these species, and all other described species in the genus, by the following combination of characters: (1) the shape and the length of the fore femoral spines; (2) the possession of a unique flap on the operculate gill and the absence of an apical spine on the gill; (3) the number and arrangement of the denticles on the tarsal claws; and (4) the distinctive color pattern on the abdominal terga.

### ***Leptohyphes hirsutus*, n. sp.**

*Leptohyphes* sp. 4 Roback, 1966:151.

NYPH. Length: body 4–5 mm, caudal filaments 4–5 mm. General color brown with dark brown markings. Head brown with dark brown submedian maculae on occiput; head covered with long setae; maxillary palpi 3-segmented. Thoracic nota brown with irregular dark brown markings; thoracic nota with long setae; legs brown with dark brown markings; femora with moderately long spines (Fig. 12b); fore femoral band of spines as in Figure 12a; hind femora 40% longer than fore femora; anterior surface of middle and hind femora without a median ridge; ventral (leading) margin of femora with small spines; femora, tibiae, and tarsi with long setae (Fig. 12a); tarsal claws with 3 to 4 small marginal denticles (Fig. 12c). Abdominal terga brown with dark brown markings; abdominal color pattern variable, but often terga 1 to 10 with dark brown transverse bands and terga 5 to 10 with a black median macula (Fig. 2); dorsal surface of terga 2 to 7 with clusters of submedian spines; posterior margins of terga 2 to 10 with moderate to heavy spines (Fig. 2); operculate gill brown at base, pale at apex; operculate gill with an apical spine (Fig. 8); abdominal sterna pale with brown median markings. Caudal filaments pale.

Types. Holotype (in alcohol), mature nymph, Quebrada de Puente Perez nr Tingo Maria, Peru, 1/2-X-1955 (S. S. Roback). Paratopotypes: 2 nymphs (parts on slides).

This species is most closely related to *L. echinatus*, n. sp., as both species have several characters in common. The nymphs of both have clusters of dorsal submedian abdominal spines, 3-segmented maxillary palpi, 3 to 4 marginal denticles on the tarsal claws, an apical spine on the operculate gill. They are the same general size, and the proportion of the fore femora to the hind femora is the same. *Leptohyphes hirsutus*,

n. sp., is distinguished from *L. echinatus*, and the nymphs of all other described species, by the following combination of characters: (1) the possession of long setae on the head and thorax; (2) the shape, length, and arrangement of the spines on the fore femora; (3) the number and development of the dorsal submedian abdominal spines; (4) the development of the setae and spines on the legs; and (5) the abdominal color pattern.

***Leptohyphes echinatus*, n. sp.**

*Leptohyphes* sp. 5 Roback, 1966:151.

**NYMPH.** Length: body 4–5 mm, caudal filaments 3.5–4.5 mm. General color light brown with dark markings. Head light brown with a dark band on frons between compound eyes; lateral ocelli small; head with scattered small spines; maxillary palpi 3-segmented. Thoracic nota light brown with irregular dark markings; thoracic nota with scattered small spines; legs light brown; femora with a dark subapical macula; femora with short spines (Fig. 13b); fore femoral band of spines as in Figure 13a; hind femora 40% longer than fore femora; anterior surface of middle and hind femora with a median ridge (Fig. 13d); ventral (leading) margin of femora with small spines and setae as in Figure 13a; tarsal claws with 3 to 4 small marginal denticles (Fig. 13c). Abdominal terga light brown with submarginal black bands or markings (Fig. 3); dorsal surface of terga 2 to 7 with numerous submedian spines; posterior margins of terga 1 to 5 with delicate spines; posterior margins of terga 6 to 9 with heavy spines; lateral margins of terga 7 to 9 with long spines; operculate gill pale, brown at base; operculate gill with an apical spine (Fig. 9); abdominal sterna pale. Caudal filaments pale.

**Types.** Holotype (on slide), mature nymph, Rio Tulumayo, Puerto Nuevo nr Tingo Maria, 25-IX-1955 (S. S. Roback). Paratopotypes: 7 nymphs (on slides and in alcohol).

*Leptohyphes echinatus*, n. sp., appears to be closely related to the previously described species, and it is distinguished from it by characters of the legs, head and thorax, and abdomen.

***Leptohyphes myllonotus*, n. sp.**

*Leptohyphes* sp. 2 Roback, 1966:151.

**NYMPH.** Length: body 3.5–4.5 mm, caudal filaments 4–5 mm. General color light brown with dark brown markings. Head brown with a black band on frons between compound eyes; lateral ocelli moderately large; maxillary palpi 3-segmented. Thoracic nota light brown with dark brown markings; pronotum with a posterior constriction (Fig. 6); legs dark brown; femora with moderately long spines (Fig. 14b); fore femoral band of spines as in Figure 14a; hind femora 40% longer than fore femora; anterior surface of middle and hind femora with a median ridge; ventral (leading) margin of femora without spines; tarsal claws

with 3 to 4 blunt, marginal denticles (Fig. 14c). Abdominal terga dark brown; terga 7 to 10 with a darker brown median macula; dorsal surface of terga 4 to 8 with clusters of submedian spines (Fig. 4); operculate gill dark brown with pale margins; abdominal sterna pale. Caudal filaments pale.

Types. Holotype (on slide), mature nymph, Rio Tulumayo, Puerto Nuevo nr Tingo Maria, Peru, 25-IX-1955 (S. S. Roback). Paratopotypes: 3 nymphs, 24-IX-1955, other data same as holotype. Paratypes: 1 nymph, Rio Rondos nr Tingo Maria, Peru, 30-IX-1955 (S. S. Roback); 2 nymphs (1 on slide), Rio Bella nr Tingo Maria, Peru, 4-X-1955 (S. S. Roback); 2 nymphs, Rio Monzon nr Tingo Maria, Peru, 27-IX-1955 (S. S. Roback); 1 nymph, Rio Huallaga nr Tingo Maria, Peru, 29-IX-1955 (S. S. Roback).

This species is easily distinguished from the nymphs of all other described species of the genus as the posterior half of the prothorax is constricted. *Leptohyphes myllonotus*, n. sp., is further distinguished from all other species by characters of the operculate gill, femora, and by the abdominal color pattern.

#### *Leptohyphes maculatus* Allen

*Leptohyphes* sp. 3 Roback (in part), 1966:151.

*Leptohyphes maculatus* Allen, 1967:360.

A re-examination of nymphal material of this species revealed abdominal characters omitted from the original description.

**NYMPH.** Abdominal terga brown, suffused with black; terga 2 to 10 with distinctive black macula, maculae most conspicuous on terga 5 to 10; posterior margins of terga 1 to 10 with long setae; posterior margins of terga 2 to 9 with heavy spines; dorsal surface of terga 2 to 8 with spines or clusters of spines (Fig. 5); operculate gills brown, pale in middle; operculate gills with an apical spine (Fig. 10).

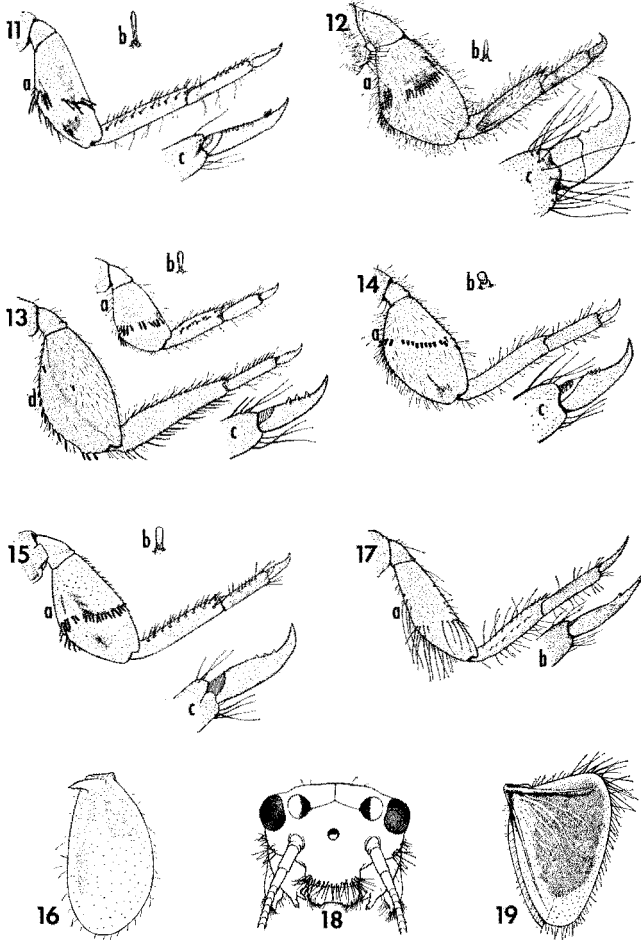
New Records. Rio Tulumayo, Puerto Nuevo nr Tingo Maria, Peru, 24-IX-1955 (S. S. Roback); Quebrada de Puente Perez nr Tingo Maria, Peru, 1/2-X-1955 (S. S. Roback); Rio Rondos nr Tingo Maria, Peru, 30-IX-1955 (S. S. Roback); Rio Bella nr Tingo Maria, Peru, 4-X-1955 (S. S. Roback).

*Leptohyphes maculatus* appears to be closely related to those species with clusters of dorsal submedian abdominal spines, and the nymphal color pattern is very similar to that of *L. hirsutus*, n. sp. The nymph of this species is distinguished from the latter species, and all described *Leptohyphes*, by characters of the operculate gills (Fig. 16) and the legs (Figs. 15a-c).

#### *Leptohyphes dolani* Allen

*Leptohyphes dolani* Allen, 1967:351.

This species was described from a small series of nymphs collected in South Carolina and the Savannah River on the South Carolina-



FIGS 11-19. Fig. 11, *Leptohyphes spinosus*: a, right fore leg; b, fore femoral spine; c, tarsal claw. Fig. 12, *L. hirsutus*: a, right fore leg; b, fore femoral spine; c, tarsal claw. Fig. 13, *L. echinatus*: a, right fore leg; b, fore femoral spine; c, tarsal claw; d, right hind leg. Fig. 14, *L. myllonotus*: a, right fore leg; b, fore femoral spine; c, tarsal claw. Figs. 15-16, *L. maculatus*: 15a, right fore leg; 15b, fore femoral spine; 15c, tarsal claw; 16, operculate gill. Figs. 17-19, *Tricorythodes ocellus*: 17a, right fore leg; 17b, tarsal claw; 18, head, front view; 19, operculate gill.

Georgia border. Additional nymphal material examined by the authors extends the range of *L. dolani* south into Georgia and west into Texas.

New Records. Georgia: Brigham's Landing, 30-VI-1951 (S. S.

Roback and T. Dolan, IV). South Carolina: Savannah River above Little Hell's Landing, 3-VII-1951 (T. Dolan, IV). Texas: Guadalupe River nr Victoria, 25-VIII-1962 (S. S. Roback).

*Leptohyphes robacki* Allen

*Leptohyphes robacki* Allen, 1967:351.

This species is presently known from the Potomac River in Maryland and the Savannah River on the South Carolina-Georgia border. Nymphs have been examined from an additional locality in South Carolina.

New Record. South Carolina: Savannah River, Station 1, Dikes above Ellenton, 26-VI-1951 (T. Dolan, IV).

*Leptohyphes setosus* Allen

*Leptohyphes* sp. 3 Roback (in part), 1966:151.

*Leptohyphes setosus* Allen, 1967:362.

This species was described from a long series of nymphs and sub-imagoes from several localities in Peru. Nymphs from an additional Peruvian locality have been examined by the authors.

New Record. Rio Rondos nr Tingo Maria, Peru, 30-IX-1955 (S. S. Roback).

*Leptohyphes tuberculatus* Allen

*Leptohyphes* sp. 6 Roback, 1966:152.

*Leptohyphes tuberculatus* Allen, 1967:369.

This species was described from nymphs collected in Peru, and specimens from two additional localities have been examined by the authors.

New Records. Rio Rondos nr Tingo Maria, Peru, 29/31-IX-1955 (S. S. Roback); Rio Huallaga nr Tingo Maria, Peru, 24-IX-1955 (S. S. Roback).

***Tricorythodes ocellus*, n. sp.**

*Tricorythodes* sp. Roback, 1966:150.

**NYMPH.** Length: body 4-5 mm, caudal filaments 1-2 mm. General color light brown with black markings. Head light brown; clypeus and genae with long setae (Fig. 18); lateral ocelli large, nearly as large as compound eyes (Fig. 18); maxillary palpi 2-segmented. Thoracic nota light brown with scattered black maculae; legs light brown; fore femora more than twice as long as broad; fore femoral band of spines as in Figure 17a; hind femora 30% longer than fore femora; tarsal claws with a single marginal denticle (Figure 17b). Abdomen light brown with irregular black markings on tergum 7 and a median black macula on terga 8 to 10; operculate gill triangular; median angle of gill with heavy spines; gill with pale margins, dark medially (Fig. 19); abdominal sterna light brown. Caudal filaments pale.

Types. Holotype, mature nymph, Rio Tulumayo, Puerto Nuevo nr Tingo Maria, 25-IX-1955 (S. S. Roback). Paratopotype: 1 nymph, same data as holotype.

## LITERATURE CITED

- Allen, R. K. 1967. New species of New World Leptohiphinae (Ephemeroptera: Tricorythidae). *Canad. Entomol.* 99:350-375, 64 figs.
- Roback, S. S. 1966. The Catherwood Foundation Peruvian-Amazon Expedition. VI. Ephemeroptera nymphs. *Monogr. Acad. Natur. Sci., Phila.* 14:129-199, 295 figs.