Mayflies (Ephemeroptera: Tricyrhythidae) of the Southwestern United States and Northern Mexico

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ABSTRACT Species of Leptotheyses Eaton and Tricyrhythodes Ulmer from the southwestern United States and northern Mexico are reviewed. The nymphal stage of Tricyrhythodes explicitus (Eaton), type of the genus, is described and as a result the subgenera Tricyrhythodes, n. subg. and Homoleptotheyses, n. subg. are erected for Tricyrhythodes condylus Allen and T. dimorphus Allen, respectively. The subgenus Homoleptotheyses is divided into the dimorphus- and corpulentus-groups. Description of a new species, L. tarsos, Allen & Murvosh is presented, and collection records extend the known range of T. explicitus, T. minutus Traver, T. corpulentus Allen, L. ferruginus Allen & Brusca, L. mirus Allen, and L. packeri Allen. A distribution map is included for T. explicitus and T. minutus.

KEY WORDS Ephemeroptera, taxonomy, distribution, Tricyrhythidae, new subgenus

A recent collection study of mayflies in southwestern Mexico revealed the previously undescribed nymphal stage and new distribution records of Tricyrhythodes explicitus (Eaton), the type of the genus, which now makes it possible to describe new subgenera and species-groups in the family. This, and previous collection studies, also includes the discovery of a new species of Leptotheyses, and new distribution records of T. minutus and three species of Leptotheyses Eaton. Illustrations were prepared by the senior author and collections are labeled R.K.A. and C.M.M. Types are deposited in the California Academy of Sciences, San Francisco.

Family Tricyrhythidae

Genus Leptotheyses Eaton

There are now six described species of Leptotheyses known from the southwestern United States and northern Mexico.

Leptotheyses apache Allen

Distribution. This species is known from southern Arizona and New Mexico to southwestern Utah.

Leptotheyses ferruginus Allen & Brusca

Distribution. This species was described from Honduras and is now known to occur as far north as Sonora and Arizona.


Remarks. In the key to the species in Allen (1978), couplet 8 reads as follows:

8(7). Known geographic distribution North America north of Mexico (fig. 51–54) ............. 9
9(8). Known geographic distribution Mexico and Central America (fig. 51–54) .................. 13

Now that this species is known from Arizona, this couplet no longer has utility. When keying nymphs of this species from the Southwest, one will come to an impasse at couplet 12; when this happens, proceed to couplet 13. Nymphs of L. ferruginus are readily distinguished from those of all other species by the red color of the body and gills, but often the color has faded to a pale pink. Faded specimens are distinguished from all others by the following combination of characters: 1) claws are the brunneus-type with 6–7 median and 1 subapical denticles; 2) the body possesses distinctive short spicules; 3) the operculate gills have a basal spine; and 4) the head, thorax, and abdomen are without markings.

Leptotheyses mirus Allen

Distribution. This species is now known from Chihuahua to Sonora and from southern Arizona to southwestern Texas.

Leptohyphes packeri Allen

Distribution. This species was described from Honduras and is now known to occur in northern Mexico, Texas, and Arizona.


Leptohyphes quercus Kilgore & Allen

Distribution. This species is known only from the type locality in Arizona.

Leptohyphes tarsos Allen & Murvosh, n. sp.

Mature Nymph. Length: body 3.0-4.0 mm; caudal filaments 2.5-3.5 mm. General color light brown. Head brown, mottled with pale dots, distinctive black markings form occiput to posterior margin of compound eyes, and black mark between compound eyes and median ocellus; maxillary palpi 3-segmented; mandibles with delicate spines on outer margin. Thoracic nota light brown to brown, without distinctive markings; fore femora with moderately long spines; femoral band of spines moderately long; fore femora with ventral spines; fore tibiae and tarsi with spines on inner margins; middle and hind femora with short spines on dorsal and ventral margins, and anterior surface with scattered short spines; middle and hind tibiae and tarsi with spines on inner and outer margins; hind femora 35% longer than fore femora; claws with 4-6 median and 1 subapical denticles. Abdominal terga light brown to brown; terga 1-7 or 2-7 with indistinct small brown median macula; segments 7-9 without posterolateral projections; operculate gills pale, suffused with brown, without marginal spines, but with basal spine; abdominal sternum pale. Caudal filaments pale.


Remarks. In keying nymphs of L. tarsos in Allen (1978), one either comes to an impasse at couplet 26, or the nymph will key to L. sabinas Traver, known only from eastern Mexico. Nymphs of this species are distinguished from L. sabinas, and all other described species, by the distinctive markings around the compound eyes and by the brown median macula on the abdominal terga. Nymphs of L. sabinas are without a marking on the head, have a triangular macula on the pronotum, the abdominal terga have a pale median transverse line and pale margins, and the species are geographically isolated. The distribution of L. sabinas is eastern Mexico, Nuevo Leon to Veracruz, not western Mexico as stated in Allen (1978).

Genus Tricorythodes Ulmer

This genus was erected by Ulmer (1920) to accommodate Tricorythus explicatus (Eaton, 1892), which he designated as the type of the genus. Because the nympha! stage of T. explicatus was undescribed, Allen (1977) divided the genus into two species-groups, the albilineatus-group and the curvatus-group. The discovery of the nympha! stage of the type allows the elevation of these species-groups to subgeneric status, as it belongs to the albilineatus-group. The genus is now divided into Tricorythodes s.s.; Tricorythodes, n. subg. and Homoleptohyphes, n. subg. The nymphs of T. allocus (Needham), T. atratus McDunnough, T. fuctus Traver, T. peridius Traver, T. stigiatus McDunnough, and T. texanus Traver are undescribed.

Subgenus Tricorythodes Ulmer

Nymph. Head without frontal shelf and genal projections; maxillary palpi 2- or 3-segmented. Femoral band of spines moderately long, delicate to heavy (Fig. 1 and 3); fore femora only 20-40% as broad as long; operculate gills triangular, anteromesal corner rather sharply angled (Fig. 2).

Type Species. Tricorythodes (Tricorythodes) explicatus (Eaton).


Tricorythodes (T.) explicatus (Eaton)

McDunnough (1931) reported this species from Ft. Davis, Tex.; Yellowstone National Park, Wyo.; Prince Albert National Park, Saskatchewan; and southern Alberta. The Wyoming, Alberta, and Saskatchewan specimens are unquestionably T. minutus, and the Texas specimens are probably T. explicatus. Traver (1935) reported a female imago from Ft. Davis, she questioned McDunnough's identification of the Alberta specimens, and she reported specimens as questionably being T. explicatus from Cimarron Canyon and Therma, N. Mex. The known distribution of this species (Fig. 9) suggests that these northern New Mexico specimens are T. minutus.

The type locality of this species may be the Rio Sonora, as this is the only river in Sonora in which
Fig. 1–8. Nymphal structures of Tricorythodes. (1) T. explicatus fore leg, (2) T. explicatus operculate gill, (3) T. minutus fore leg, (4) T. condylus operculate gill, (5) T. condylus fore and hind legs, (6) T. dimorphus operculate gill, (7) T. dimorphus fore and hind legs, (8) T. corpulentus fore and hind legs.
all three of Eaton's species, _Choroterpes inornata_, _Isonychia intermedia_, and _T. explicatus_ were collected together.

**Mature Nymph.** Length: 4.0–7.0 mm; caudal filaments 2.5–4.0 mm. Head brown, without distinctive markings; occiput usually darker brown; outer head margin below compound eye with cluster of long spines; clypeus with transverse row of long spines; mandible outer margin with long spines; maxillary palpi 2-segmented, apical segment poorly developed. Thoracic nota pale to brown; pronotum pale to brown, usually with dark sublateral lateral maculae; legs pale to brown, tibiae base with black macula; coxae with marginal spines; fore femora with row of long spines on ventral margin; fore femoral subapical band of spines interrupted; long spines from femoral band to apex (Fig. 1); middle and hind femora with long spines on anterior surface and dorsal and ventral margins; fore and middle tibiae with double row of numerous long spines on inner margin, outer margin with setae; hind tibiae with double row of long spines on inner margin, outer margin with single row of long spines; all tarsi with single row on inner margin; claws with 10–14 marginal denticles. Abdominal terga 1–9 pale to brown with black transverse marking: tergum 10 pale; abdominal segments 7–9 without posterolateral projections; posterior margins of terga 1–9 with transverse row of long setae; operculate gills black with large pale macula (Fig. 2). Caudal filaments pale.


**Remarks.** The nymphs of this species are distinguished from those of _T. minitus_ by the length and number of spines on the legs, but generally the spines on the head and body are also longer and more numerous. The following key will serve to distinguish the nymphs of these species:

1. Fore and middle tibiae with double row long heavy spines on inner margin; hind tibiae with double row long heavy spines on inner margin; tibial spines numerous (60–70); all tarsi with short, heavy spines on inner margin (Fig. 1)
   - Fore and middle tibiae without spines on inner margin; hind tibiae with single row of long delicate spines on inner margin; tibial spines moderate in number (30–35); fore and middle tarsi without spines, hind tarsi with row of short spines on inner margin (Fig. 3) .......... _minitus_ Traver

**Tricorythodes (T.) minitus** Traver

The nymph of this species was described by Kilgore & Allen (1973).

We have examined specimens from >100 localities, of which the following are marginal and representative.


**Subgenus Tricorythodes** Allen & Murvosh, n. subg.

**Nymph.** Body 4.0–5.50 mm. Head with frontal shelf and genal projections; maxillary palpi 3-segmented. Femoral band subapical spines long and delicate (Fig. 5); fore femora 40–50% as broad as long. Operculate gill triangular, antero-mesal corner rounded (Fig. 4).

**Type Species.** _Tricorythodes (Tricorythodes) condylus_ Allen.

_Tricorythodes papayanicus_ Dominquez, from Argentina, may be assignable to this subgenus.

**Tricorythodes (T.) condylus** Allen

**Distribution.** This species is known only from Arizona and southwestern New Mexico.
Subgenus Homoleptohyphes Allen & Murvosh, n. subg.

Nymph. Body 2.5–6.0 mm. Head without frontal shelf or genal projections; maxillary palpi 1-segmented or absent. Femoral band of subapical spines long and delicate (Fig. 7 and 8); fore femora 50–70% as broad as long. Operculate gill obovate (Fig. 6).

Type Species Tricorythodes (Homoleptohyphes) dimorphus Allen.

This subgenus is composed of four species, which
are divided into the *dimorphus*- and *corpulentus*-groups.

**dimorphus-group**

Two species, *T. (H.) dimorphus* Allen and *T. (H.) curvatus* Allen, known only from Arkansas, are included in this group. Nymphs are distinguished from those of the *corpulentus*-group by possessing 1-segmented maxillary palpi, femora with sparse and irregularly spaced marginal spines (Fig. 7), and claws with median denticles and a single subapical denticle.

**Tricorythodes (H.) dimorphus Allen**

**Distribution.** This species has a disjunct distribution. It is known from southern California and eastern Arizona and New Mexico.

**corpulentus-group**

This group includes two species, *T. (H.) corpulentus* Kilgore & Allen and *T. (H.) edmundsi* Allen, known from northern Utah and northeastern Mexico. Nymphs are distinguished from those of the *dimorphus*-group by possessing maxillae that are without palpi, femora with numerous, regularly spaced spines (Fig. 8), and claws with median denticles and paired subapical denticles.

**Tricorythodes (H.) corpulentus Allen**

**Distribution.** This species is known only from southern New Mexico.

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**References Cited**


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