Reprinted from ANNALS OF THE ENTOMOLOGICAL SOCIETY OF AMERICA
Vol. 51, No. 5, September, 1958

THE SUBFAMILY LEPTOHYPHINAE (EPHEMEROPTERA: TRICORYTHIDAE)[1]

PART I[2]

JAY R. TRAVER
University of Massachusetts, Amherst

ABSTRACT

Brief characterizations are given of the subfamily and of each of its six genera: *Tricorythafer* (Africa), *Tricorythodes* and *Leptophyphes* (North and South America), *Leptohyphodes* (Brazil), *Bruchella* (Argentina), and the new genus **Tricorythopsis**, type **T. artigas** (Uruguay). One other species, *Leptohyphes* **mithras** (Costa-Rica) is described as new, and redescriptions based on type material are given for *Tricorythafer fugitans* (Needham) and *Tricorythodes* **australis** (Banks), n. comb. (*Tricorythus a.* Banks). Also, additions and emendations are given to earlier descriptions of *Leptohyphes indicator* and *L. mollipes*. The nymph originally associated with *Tricorythafer fugitans* is found to belong instead to the family Caenidae.

The present paper is one of several now in press or in preparation which, together, will constitute a revisional study of the Leptohyphinae. This part includes characterizations of the subfamily and its genera, with a key to the latter; descriptions of some new forms, and redescriptions from type material of some others described by earlier authors; and a generic re-assignment of one of these.

As constituted at present, the Leptohyphinae includes five genera. Of these, *Tricorythafer* is African, *Tricorythodes* and *Leptohyphes* have been reported from both the Nearctic and Neotropical faunas, while *Leptohyphodes* and *Bruchella* are Neotropical only. *Tricorythafer*, *Bruchella*, and *Leptohyphodes* are each represented by a single known species (see, however, notes under *Leptohyphodes*), and only males are known for *Tricorythafer* and *Bruchella*. The last-named genus is very imperfectly known and may prove to be synonymous with *Leptohyphes*. Nymphs of *Tricorythodes* and *Leptohyphes* are known also, and what may well be the nymph of *Leptohyphodes* has been reported from Brazil (Traver, 1944). To these five genera is now added a sixth one, *Tricorythopsis*, described below. This new genus is Neotropical and is known only from males.

The subfamily Leptohyphinae may be characterized as follows: (1) Tails three, in both sexes as far as known; (2) Hind wing absent except in males of *Leptohyphes* and females of at least one species of that genus; (3) MP of fore wing *not* forming a complete triangle (MP_2 ending free in membrane, or joined only by cross veins to MP_1 or CuA), this being probably what Demoulin (1954) refers to as "Ailes à triade de MP irrégulière"; (4) Stem of MA of fore wing (at least in male) considerably shorter than distance from fork to wing margin, often in ratio of 2:3. Due to the slight but evident sexual dimorphism in wing shape, most noticeable in *Tricorythodes*, this latter character may not hold true for females of some genera. The following key may be of use in separating the genera of this subfamily.

KEY TO GENERA OF THE SUBFAMILY LEPTOHYPHINAE[3]

1. IMP of fore wing joined basally to CuA, forming with it a triangle and producing a sag in CuA at point of union; MP_2 shorter than IMP and appearing as an intercalary within this triangle (fig. 8) ..... **Tricorythopsis**
— IMP not so joined to CuA, hence no such triangle and no sag in CuA (IMP often joined by cross vein to MP_1); MP_2 at least as long as, usually longer than IMP 2
2. Fore wing of male with well-developed cubito-anal lobe, the wing widest in this region; CuP only slightly arcuate; hind wing absent; no membranous processes from mesonotal scutellum 3
— Fore wing of male without such prominent cubito-anal lobe, wing longer and narrower, widest in region of MA-MP; CuP strongly arcuate; hind wing present or absent; membranous mesonotal processes generally present 4
3. Forceps apparently four-jointed, basal joint not longer than wide; fore tibia of male 3 times as long as third tibia, 4⅔ times second tibia ..... **Tricorythafer**
Forceps three-jointed, basal joint at least twice as long as wide, second joint generally with prominent basal swelling; fore tibia of male not more more than 2½ times as long as third tibia, 2 to 3 times second tibia ..... **Tricorythodes**
4. Hind wing present in males (absent in females of most species), usually with two longitudinal veins, with no cross veins, and with prominent costal angulation; eyes of both sexes relatively small and well separated ..... **Leptohyphes**
Hind wing absent in both sexes; eyes of males large, almost concealing the head ..... **Leptohyphodes**

Genus **Tricorythopsis**, new genus

Small but rather robust mayflies, superficially resembling *Caenis* and its allies but with venation more like *Tricorythodes*. Hind wings absent.

[1]Classification according to Edmunds and Traver (1954).

[4]Accepted for publication March 31, 1958.

[3]This key omits the genus *Bruchella*, which may not be distinct from *Leptohyphes* and which, if included, would fall next to that genus. Navás reported *Bruchella* as having three longitudinal veins in hind wing, the costal angulation blunt. Nothing is known of the male genitalia, nor of the fore wing other than the cubito-anal region.

Genitalia reminiscent of *Leptohyphodes*. Only the male (fig. 1) is known.

Eyes of male separated by a distance at least three times the diameter of an eye. Middle ocellus *very* small. Second joint of antenna rather large, widest at middle, slightly more than twice as long as basal segment. Pronotum wider than long, emarginate posteriorly. Fore legs set somewhat apart, separated by a distance slightly exceeding diameter of an eye, their length approximately four-sevenths that of a wing. Fore femur subequal to tarsus in length, five-eighths as long as tibia; tibia about one-half longer than tarsus; tarsal joints ranking in descending order as: 2, 5, 4, 3 subequal to 1. Hind femur equal in length to tibia, which is almost twice as long as tarsus; basal tarsal joint fused with apex of tibia; tarsal joints ranking as 5, 4 subequal to 2, 3, 1, *or* as 5, 4, 2 and 3 subequal to 1. Claws of fore legs similar, blunt; claws of other legs dissimilar, one blunt and one sharp-pointed (see figs. 2 and 10).

Venation approaching that of *Tricorythodes* but differing in certain important features. MA_2 usually ending blindly in the wing membrane, connected by cross veins to MA_1; the intercalary may seem to arise from MA_1. Sag in stem of MA somewhat more pronounced than in *Tricorythodes*. IMP longer than MP_2 and united basally with CuA, forming a triangle, with a sag in stem of CuA at the point of union; within this triangle is the short MP_2, looking like an intercalary. Cubito-anal region resembling that of *Tricorythodes* in disposition of veins, but lacking the pronounced lobe present in males of that genus; wing widest in MA–MP regions; MA seemingly set farther back in disc of wing (i. e., nearer to posterior border) than in *Tricorythodes* (fig. 8). Short, blunt processes on either side of mesonotal scutellum extending somewhat beyond it, but not prolonged into long, thin filaments as in most species of *Leptohyphes*.

Abdominal segments bulging outward slightly between joinings, giving the lateral margins a scalloped appearance. Middle tail fully three times as long as body; laterals shorter, about twice as long as body. Genitalia unique among described species, approaching nearest to *Leptohyphodes* but differing considerably from that genus. Basal joint of forceps rather stout, distinctly bowed, appearing as though fused partially with forceps base; second joint shorter, slightly stouter; distal segment conical, set laterally into apex of second, turned outward at tip; forceps base bulging outward along center of apical margin, whereas it is excavated in this area in *Tricorythodes*. Penes rather conical, narrowing toward apex and widening again beyond this narrow portion, excavated quite deeply at apex, the whole structure (fig. 6) having somewhat the appearance of an hourglass with the two halves of unequal size; in general, reminiscent of *Tricorythodes* but more elongate and slender, the excavated apical portion much less extensive.

Genotype: *Tricorythopsis artigas*, described below.

Tricorythopsis artigas, new species

Synopsis.—Yellowish white (thorax with reddish tinge), with reddish and black markings, the red tending to fade out completely in specimens stored for some time in alcohol. Tibia of fore leg distinctly bowed, second tibia slightly so. Legs whitish, femora with either an incomplete subapical band or merely a short, black streak. Abdomen pale yellowish white; markings of tergites variable, according to whether pale or darker forms are involved. Sternites unmarked. Tails white, not darker at joinings. Pale forms and darker forms, all of which have similar genitalia, are described separately.

Size.—Male imago: body 1½ to 2 mm., wing 2 mm., fore leg very slightly over 1 mm.

Male imago, holotype (in alcohol).—Intermediate in color between the palest and the darkest forms. Head white, shaded with black ventrally next to prosternum. Antennae white. Eyes black, relatively small and remote. Ocelli ringed at base with black. Posterior margin of head, next to eye, with a very narrow, short, black line.

Prothorax translucent whitish, quite heavily shaded with black along all margins and on a narrow midline. Meso- and metanota yellowish to pale yellowish-brown, with black markings anterior and posterior to wing roots and around these roots, behind bases of legs on pleural region, and on margins of scutella. Mesonotum (except anterior lobe) with a narrow median and with submedian and transverse dark streaks forming a median triangle, these markings probably reddish

EXPLANATION OF PLATE I

FIG. 1.—*Tricorythopsis artigas*. Male imago, dorsal view. At left, apical abdominal segments, enlarged.

FIG. 2.—Same. Fore claw of male imago, enlarged.

FIG. 3.—*Leptohyphes indicator*. Genitalia (in part) of holotype male.

FIG. 4.—*Tricorythafer fugitans*. Genitalia of holotype male.

FIG. 5.—Same. Fore claw of holotype, enlarged.

FIG. 6.—*Tricorythopsis artigas*. Genitalia of male imago.

FIG. 7.—*Leptohyphes mithras*. Wings of male imago.

FIG. 8.—*Tricorythopsis artigas*. Wing of male imago.

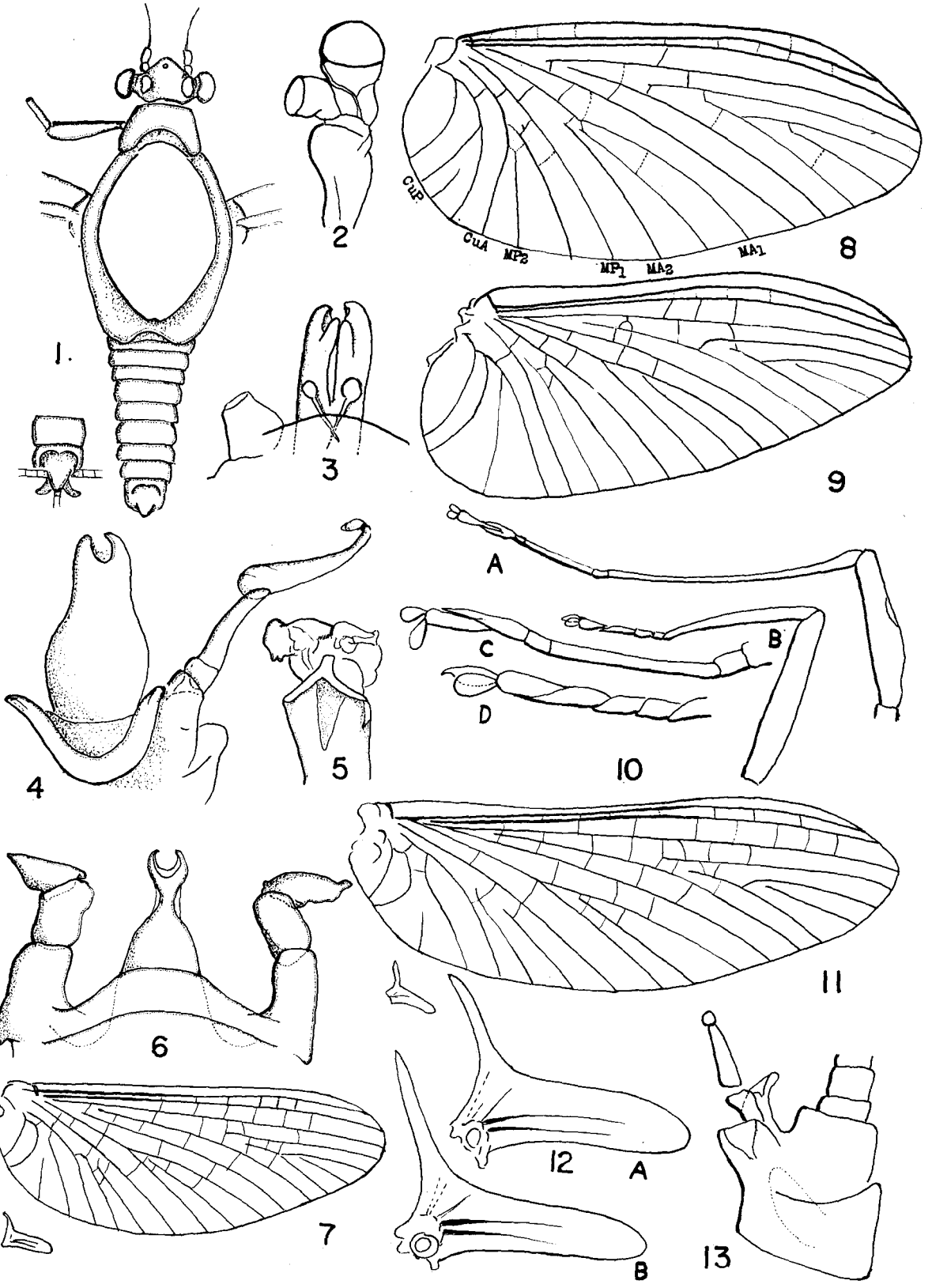
FIG. 9.—*Tricorythafer fugitans*. Wing of holotype male.

FIG. 10.—*Tricorythopsis artigas*. Legs 1 and 3 of male imago, with tarsi of same, enlarged: A and C, leg 1; B and D, leg 3.

FIG. 11.—*Leptohyphes mithras*. Wings of female imago (to same scale as fig. 7).

FIG. 12.—Same. Hind wings, enlarged: A, of male; B, of female.

FIG. 13.—*Tricorythodes australis* (specimen from British Guiana). Male genitalia, lateral aspect (see fig. 20 also).


1.
2
3
4
5
6
7
8
CuP
CuA
MP2
MP1
MA2
MA1
9
A
B
C
D
10
11
12
A
B
13

in life, but now faded to brownish shading. Thoracic sternum pale, except for narrow, dark shading across anterior margin of mesosternum. Legs yellowish white; each femur with a short, black, subapical, longitudinal streak on outer surface, second femur with another black streak paralleling the first one. Humeral cross vein and basal two-thirds of Sc and R purplish brown, barely if at all margined. One or two cross veins faintly visible in radial space and another in space below it; all other veins and cross veins silvery white.

Mid-abdominal segments whitish translucent, basal and apical ones more yellowish, opaque, with dark markings as follows: Posterior margins of all tergites except 6 and 7 narrowly blackish, at least laterally, widest on lateral part of segment 4, reduced to dark submedian dots on 5; median dark dots on tergites 4 and 5, and on basal part of 6; a dark transverse band across basal part of 8 in middle region and on 7 laterally, forming here a hammer-shaped mark with handle directed toward pleural fold; narrow dark marks below stigmatic area on 5 to 8; a longitudinal black streak on 9, and a black streak along pleural fold on 7 to 9. Tails white, not darker at joinings. Genitalia whitish, similar to those of one of the other males shown in figure 6.

Male imagos, pale forms.—Head as in holotype. Thorax differing from holotype as follows: Interrupted purplish-red longitudinal streak laterally on pronotum. In well-marked specimens, a brownish-red transverse band behind anteromedian lobe; more posteriorly, a median reddish triangle with apex toward scutellum and with a dark red dot at each of its anterior corners (such may have been present on holotype before its immersion in alcohol), this triangle reduced on some specimens to a narrow median line with a dot on each side. Ganglionic areas of thoracic sternum paler; two to four black dots sometimes present on each side of metathorax. Black subapical streak often absent from third femur. Black dots and dashes on abdominal tergites as follows: a small submedian dot on each side of tergites 3, 4, 7, and 8, largest on 4; a tiny spiracular dot on 2 to 6; two such dots, one above the other, on 7 to 9; an interrupted median line on middle tergites.

Male imagos, dark forms.—Differing from pale forms as follows: Thorax light red-brown; mesonotum with a brown median band; central areas of meso- and metasterna heavily shaded with gray. Femora usually margined with brown; second and third femora marked with fine dark dots which sometimes form a partial subapical band; fore tibia and tarsus pale gray. Abdominal markings more extensive, more as in holotype, with a tendency to formation of narrow dark bands across basal and apical tergites, these tergites likewise shaded with gray; an incomplete second series of dark stigmatic dots below pleural fold.

This species is represented by 50 specimens, all male imagos, of which 6 are mounted permanently in Hoyer's modification of Berlese's medium and all the others are in alcohol. These were all collected in Uruguay during field trips organized by the Departments of Zoology and Entomology of the Faculted de Humanidades y Ciencias of Uruguay, under the direction of Dr. Carlos S. Carbonell and his coworkers.

Holotype.—Male imago, in alcohol. Sepultras, Department of Artigas, Uruguay, January 13, 1952, collected by Dr. C. S. Carbonell and party; in entomological collection of the Facultad de Humanidades y Ciencias of Uruguay.

Other Specimens.—Forty-eight male imagos, same data as for holotype, attracted by light at night on bank of the Cuareim River, which forms part of the boundary between Uruguay and Brazil; also, one male imago, Arequita, Department of Lavalleja, January 2, 1951, attracted by light at night on bank of the Río Santa Lucía. These specimens are divided between the entomological collection of the Facultad de Humanidades y Ciencias of Uruguay and the private collection of J. R. Traver.

Genus **Bruchella** Navás

Bruchella Navás, 1920, Anal. Soc. Cient. Argentina 90: 56; Demoulin, 1952, Bull. Ann. Soc. Ent. Belgique 88(11–12): 281–85.

This genus, which includes the single species *B. nigra* Navás, is most imperfectly known. Only the male is described. Navás placed the genus in the family Baetidae and several others have followed him in this, even though recognizing that it was atypical for a member of that family. Demoulin (1952) set forth interesting arguments in favor of its transfer to the family Tricorythidae, pointing out that the complete absence of marginal intercalaries in the fore wing seems to debar *Bruchella* from the family Baetidae. That portion of the fore wing figured by Navás bears a striking resemblance to the same region in the wing of *Leptohyphes*, but the hind wing does not agree as well. However, an imperfect specimen might have lost the distinctive acute portion of the costal angulation of the hind wing, and a fold in this wing may have appeared to Navás as a third vein. I have seen specimens of *Leptohyphes* from Central America in which it is not difficult to imagine a third longitudinal vein in the hind wing. It may well be that *Bruchella* is synonymous with *Leptohyphes*. It is here retained as a genus in its own right until such time as the type specimen can be located and studied.

Type species: *Bruchella nigra* Navás, 1920.

Genus **Tricorythafer** Lestage

Caenopsis Needham, 1920, Bull. Amer. Mus. Nat. Hist. 43: 39 (name preoccupied: Bach, 1854, Coleoptera, Curculionidae).

Tricorythafer Lestage, 1942, Bull. Mus. R. Hist. Nat. Belgique 18(48): 4.

Needhamocoenis Lestage, 1945, Bull. Ann. Soc. Ent. Belgique 81: 85; Demoulin and Edmunds, 1954, Bull. Ann. Soc. Ent. Belgique 90(1–2): 46–48.

Needham's synopsis of this genus (as *Caenopsis*) is brief: "Allied to *Caenis*. Tails three, middle one longest. Forceps of the male at least three-jointed, the third joint very long and flexible. Claws dissimilar, one sharply hooked, one blunt. Terminal tarsal segment as long as the three basal segments. Wings two. Venation as shown in Plate V, figure 3, differing from *Caenis* in better preservation of typical forks and in a wider band of cross veins."

Needham based this genus on two specimens, one a male imago and the other a nymph, both of which were "loosened from some place of concealment" underneath the body of a stonefly from the Belgian Congo, when this stonefly was "boiled for study." This imago and the nymph, he believed, belonged to the same species and represented a new genus, "one closely allied to the cosmopolitan genus *Caenis*." However, his figures of the wing and genitalia of the male imago indicate that the affinities of the adult insect are with *Tricorythodes* and its allies rather than with *Caenis*, though the nymph, from the figures and description, evidently does belong to the family Caenidae.

Since there seems to be no probability that the imago and the nymph are related, the characters of the genus should be based solely upon the male imago. A study of the type material makes it possible to add somewhat to the original description of the type species and to emend the synopsis of the genus *Tricorythafer* as follows, the emendations being based upon the adult insect only.

Allied to *Tricorythodes*, but not close to *Tricorythus*. Tails three, the middle one longest. Genitalia bearing considerable resemblance to those of typical members of *Tricorythodes*, but differing in respect to the numbers and appearance of joints of the forceps which is apparently four-jointed; basal joint short, as wide as long; second joint considerably longer than first; third only slightly swollen at base, tapering toward apex; an apparent fourth joint, much as in *Tricorythodes* and not very similar to Needham's figure; sclerotized "collar" at apex of forceps base likewise not typical of *Tricorythodes* though bearing a superficial resemblance to that structure. Claws of leg 1 similar, blunt (see fig. 5); claws of legs 2 and 3 dissimilar, one sharply hooked, the other blunt. Terminal tarsal segment of legs 2 and 3 as long as the three basal segments, respectively; tarsal joints of leg 1 ranking as 2, 5, 4, 3, 1. Tibia of leg 1 three to four times as long as the other tibiae. Wings two, venation quite similar to that of *Tricorythodes*. Eyes of male well separated, as in *Tricorythodes*. May be distinguished from *Tricorythodes* by (1) the four-jointed forceps and (2) the greater relative length of the tibia of leg 1.

Type species: *Tricorythafer fugitans* (Needham, 1920), described in *Caenopsis;* represented by one male imago, its parts dissected and mounted permanently on a slide in Cornell University Entomological Collection.

Tricorythafer fugitans (Needham)

Caenopsis fugitans Needham, 1920, Bull. Amer. Mus. Nat. Hist. 43: 39.

On the slide of this type specimen are found: the head, the wings (one badly crumpled, the other torn in region of MA), portions of the thorax, both of the third legs (one attached to the metathorax, the other free), one second leg, bases of the two fore legs attached to the prothorax, the remaining parts of one of these legs free, the abdomen, and the genitalia.

Head reddish brown, with two black transverse bands and black shading next the eyes. Thorax reddish brown. Wings quite heavily fringed, though there is no indication on other parts of the body that the specimen is a subimago—indeed, the length of the fore leg and of its respective joints seem to preclude such a possibility. Leg 1 almost twice as long as leg 2 and nearly three times as long as leg 3; fore leg only slightly shorter than wing. Femur of leg 1 yellowish brown; a narrow black longitudinal streak along one margin, a patch of minute black dots forming a transverse band near base, and another band of minute dots near apex, these mostly red but with a few black ones intermingled. Tibia of leg 1 whitish or very pale yellowish, margined (on one side mostly) with minute black dots interspersed with occasional reddish ones; near its mid-length these dots form an irregular scattered band of separated clusters of dots; "knee" spot black; apex reddish brown where it joins basal tarsal joint; tarsus wholly pale, terminal joint yellowish, a pale brown triangle and darker brown braces at base of claws; fore claws as in figure 5 (apparently similar, blunt). Femora of legs 2 and 3 reddish brown, with whitish longitudinal streaks, and with many small blackish freckles tending to form quite definite preapical and postbasal bands; some black dots occur the length of each femur also; tibiae and tarsi of these legs yellow, tibiae with black basal "knee" patch, third tibia with a wide band on middle region formed of reddish freckles or minute dots with an occasional black one intermingled, second tibia with but a very few blackish dots in this region. Proportions of leg joints as follows:

Leg 1—femur shortest, tarsus only slightly longer; tibia 2¾ times length of femur, 3 times length of third tibia, 4⅔ times length of second tibia. Tarsal joints: 2, 5, 4, 3, 1.

Leg 2—femur twice as long as tarsus, 1⅓ times length of tibia. Tarsal joints: 5, 2 equals 4, 3, 1.

Leg 3—femur 2¼ times as long as tarsus, 1⅛ times length of tibia. Tarsal joints: 5, 4, 2, 3, 1.

Wing as shown in figure 9, which represents a reconstruction of the more perfect of the two wings; Sc margined with reddish brown in basal

half; C, R, and Rs likewise brownish in same region; a faint tinge of same color on membrane between C and Sc. Cross veins pale, except those behind R_1 which are light tan. All veins in cubito-anal region pale. Greatest length of wing, 4½ mm.

Abdomen pale reddish brown with black markings; a pale mid-dorsal line, with black submedian lines present on middle tergites which are likewise rather heavily shaded laterally with blackish; lateral and sub-median areas of apical segments only slightly black-tinged; last segment with a black longitudinal streak at base of middle tail. A black line along pleural fold. Tails quite dark gray at base, becoming paler beyond. Genitalia as in figure 4.

Habitat: Belgian Congo.

Since Needham's description of the same specimen differs considerably from the above on certain points, I can only conclude that his description was drawn from the specimen before it was cleared and mounted.

CAENINE NYMPH TAKEN WITH IMAGO OF *Tricorythafer fugitans*

This nymph is dissected, its parts permanently mounted on a slide. In general appearance, as well as in the structure of its parts, it appears to be distinctly caenine. The body structures are so separated from one another that it is almost impossible now to reconcile certain discrepancies between the description of this nymph and the figure of it given by Needham. These discrepancies concern the position of the elytroid gills, the location of the succeeding pairs of gills, and the position of the mid-dorsal spine. This spine is described as located on segment 2, and is so shown in figure 5, plate V, of Needham's paper. However, the elytroid pair of gills, shown also on segment 2, are said to be located on segment 3, covering the gills on segments 4 to 7.

On examining Needham's figure 5, it will be noticed that but nine abdominal segments are shown and that the elytroid gills do not extend back far enough to cover any gills that might be present on segment 7. It seems probable that one transverse line, between segments 3 and 4, was accidentally omitted from the drawing. If such were indeed the case, the flat lateral spines described as occurring on segments 4 to 9 would accord with the figure. Yet there still remains the question of the disposition of those gills following the elytroid pair, and of the location of the elytroid gills themselves. In known nymphs of the family Caenidae, as far as I am aware, the elytroid gills occur on segment 2, and cover the gills on segments 3 to 6. It is my belief that such is indeed the case in this particular nymph, and that the location of the elytroid and the following pairs of gills was inadvertently recorded incorrectly. The mouthparts, legs, claws, and gills are quite typically caenine in appearance, although the elytroid gills do not so appear in the original figure.

This nymph does not accord well with the figure and description of that of *Austrocaenis* given by Barnard (1932). Is it perhaps the nymph of *Caenodes?*

Genus **Leptohyphodes** Ulmer

Leptohyphodes Ulmer, 1920, Arch. Naturgesch. 1919, 85A(11): 50; Ulmer, 1921, Arch. Naturgesch. 87A(6): 244.

The principal characters of this genus seem to be the following. Hind wing lacking in both sexes; structure and venation of fore wing very similar to that of *Leptohyphes*. Forceps three-jointed, in ventral view "breit lanzettförmig"; distal joint sharp-pointed at tip, thin and leaf-like in lateral aspect, fully twice the length of the two basal joints together; second joint short and thick, excavated at apex, the narrowed base of the distal joint inserted into this excavation, outer apical angle of second joint drawn out into a point; basal joint likewise short and thick, not distinctly separated from the second. Penis "bildet eine breite Platte mit wulstig erhabenem Seitenrande und gespaltenem oder tief ausgeschnittenem Apex; die schüsselartige Vertiefung zwischen den beiden Seitenwülsten wird wenigstens nach dem Apex hin von einer dünnen Haut überspannt, . . . so dass dann der apikale Spalt tiefer erscheint." Eyes of male large, almost covering head. Fore leg of male long and thin, almost as long as body, a little shorter than wing; femur little more than one-third the length of the tibia, which in turn is about five times as long as the tarsus. Leg 2 of male somewhat shorter than hind leg; femur about three-fourths the length of tibia, which is about four times as long as tarsus. Leg 3 of male almost as long as body; femur about as long as tibia, which is three times as long as tarsus. Claws of middle and hind legs unlike, those of fore leg "wahrscheinlich gleich (stumpf)." Tarsal joints of leg 1 of male ranking as: 2 equals 3, 5, 4, 1; of hind leg, 5, 4, 2, 3, 1. Legs of female also slender; fore leg not longer than hind leg, about as long as middle leg. All legs rather similar in form to those of *Leptohyphes*. Tails three in both sexes, the middle one somewhat longer than the laterals.

Type species: *Potamanthus ? inanis* Pictet.

Besides the genotype, Ulmer also transferred *Tricorythus australis* Banks to this genus at the time it was founded. I have been permitted to examine Banks' type material of *T. australis* in the Museum of Comparative Zoology at Cambridge, Massachusetts, and am entirely convinced that this species does not belong in *Leptohyphodes*. Rather, it is probably an aberrant *Tricorythodes*, and will be discussed more fully under that genus.

Nymphs believed to be those of *Leptohyphodes* were discussed by Traver (1944), at which time

some of the parts were figured. Since then, the nymphs have again been studied carefully, with especial reference to the wing venation, which shows them to belong in the *Leptohyphes-Leptohyphodes* division of the subfamily Leptohyphinae. The very large eyes of the nearly mature male nymphs and the unusually long legs in both sexes, together with the type of venation and the complete absence of hind-wing buds, seem to indicate that these nymphs may well be those of the genus *Leptohyphodes*. The body of these nymphs is stiff-looking, the legs long, the overall picture reminiscent of such Nearctic species (*Neoephemera*, some *Ephemerella*) as are found dwelling among trash in fairly swift waters. Claws relatively long and slender, without denticles. Gills on segments 2 to 6, elytroid on 2, this gill having a square appearance dorsally, set laterally on segment so that the elytroid portions do not meet dorsally. Lower portion of gill on segment 2, and all of those following, composed of two or more lamellae which, in turn, often bear finger-like processes. A more detailed account of this nymph is reserved for a future paper.

Genus **Leptohyphes** Eaton

Leptohyphes Eaton, 1882, Ent. Mon. Mag. 18: 208; Eaton, 1883, Revis. Monogr. Pl. XV, fig. 25*bis*, and 1884, op. cit. 140.

Synopsis.—Eyes of both sexes rather small and remote, those of male somewhat the larger. Hind wing present in male, usually absent in female; two longitudinal veins commonly present, indistinct except near base; often a shorter vein runs upward from base toward costal angulation. Costal angulation on hind wing well developed, often long, slender, and more or less arcuate. Subimaginal cuticle apparently not shed from hind wing, which is therefore more or less opaque and heavily fringed. Fore wing widest in region of MA–MP, cubito-anal area of male not forming a prominent lobe such as occurs in male of *Tricorythodes;* relatively longer and narrower in both sexes than in *Tricorythodes* and with more numerous cross veins whose number ranges from about 136 behind R_1 in *L. eximius* Etn. to not more than 43 in same area in *L. mithras* n. sp. CuP strongly arcuate. Legs shorter than wing in both sexes. Claws unlike (one sharp-pointed, one blunt) on all legs of female, on second and third legs of male, and in some species on fore leg also of male; in other species, however, claws on fore leg of male are similar, blunt. Leg 1 of male longest, leg 2 shortest. Tibia of fore leg of male two to three times as long as femur, three to four times as long as tarsus; tarsal joints ranking in descending order as: 5 subequal to 2, 4 subequal to 3, 1; *or* as 5, 4 subequal to 3 and to 2, 1. Tibia of leg 3 of male subequal to or very slightly shorter than femur, 2½ to 4 times as long as tarsus. In female, leg 3 longest, leg 2 shortest; tibia of leg 1 subequal to femur, 2½ times tarsus; tarsal joints ranking as: 5, 4, 2, 3, 1. Third tibia also subequal to femur, but 3⅔ times as long as tarsus; tarsal joints ranking as: 5, 4, 1, 2, 3. In most species, membranous continuations of the wing margin extend beyond the mesonotal scutellum as long, slender, arcuate processes, in imago as well as in subimago; these perhaps represent persistent subimaginal structures.

Subanal plate of female very slightly emarginate at center of apical margin. Genitalia of males seem to fall into three main categories: (a) *peterseni* type, with penes shaped like a tuning fork, each branch of the fork again divided into two parts near apex, the forceps definitely three-jointed, its second joint long and slender (fig. 15); (b) *mithras* type, with quite similar penes, but forceps two-jointed only, its second joint slightly shorter than basal one and set obliquely upon apex of basal joint, appearing sausage-shaped from ventral view (fig. 14); (c) *indicator* type, with forceps much as in (a), but penes as shown in figures 3 and 17. Tails three in both sexes; in male imago, laterals 2 to 2½ times as long as wing, middle tail somewhat longer, about 3 times as long as wing; in female imago all tails only about as long as wing.

Type species: *Leptohyphes eximius* Eaton, 1882.

Leptohyphes mithras, new species

Synopsis.—Relatively few cross veins in fore wing. Hind wing *present in both sexes*, rather short, somewhat rounded at apex, its lower margin concave as compared to upper margin; costal angulation barely if at all arcuate, relatively longer in female than in male. *No membranous processes* extending beyond mesonotal scutellum in either sex. Genitalia rather short and chunky; forceps two-jointed, distal joint blade-like in form, almost as long as basal joint; penes relatively short; genitalia bearing some resemblance to those of *Leptohyphodes inanis* as figured by Ulmer, but the present species can not be placed in *Leptohyphodes* as that genus is constituted at present. Abdomen distinctly darker below than above, and distinctly banded with reddish brown. Tails yellowish, usually not darker at joinings. Fore claws of male similar, blunt.

Size.—Male imagos: body 4 to 4½ mm., fore wing 3¾ to 4 mm. Female imagos: body 4½ to 6 mm., fore wing 5 to 5½ mm.

Male imago, holotype (and some other dark specimens).—Head very dark reddish brown above. Antennae yellowish brown. Thorax quite bright reddish brown; pronotum extensively marbled with blackish and margined by black. Mesonotal scutellum and area on each side of median lobe of mesonotum somewhat paler; anterior lobe itself brighter chestnut brown. Middle region of thoracic sternum paler red-

brown than lateral areas; a few indistinct darker streaks on pleura. Femora of legs 1 and 2 pale reddish brown; fore femora narrowly margined by a black hairline on upper and lower edges. Coxae of all legs bright reddish brown; trochanter with two tiny black dots at joining with femur. Fore tibia smoky; fore tarsus yellow with faint smoky tinge; tarsi of legs 2 and 3 yellowish; third femur faintly tinged with reddish brown. Fore femur not much more than one-half as long as tibia, and approximately equal in length to fore tarsus (fig. 21, A–D). Fore leg much shorter than body, only slightly longer than head and thorax combined.

Relatively few cross veins behind R_1, the number varying between 43 and 55 (figs. 7 and 11). Membrane of fore wing very faintly tinged with yellow in most specimens. Costal margin light purplish gray in basal half, paler distally. Sc and R in basal half, and humeral cross vein, purplish to reddish brown. Longitudinal veins (against white background) very pale reddish or purplish brown; cross veins pale. Hind wing relatively short, usually slightly rounded at apex, approximately one-third as wide as long; costal angulation sometimes almost straight, sometimes slightly arcuate; lower margin very slightly concave in relation to upper margin (fig. 12, A and B). Most of each abdominal segment, both above and below, occupied by rather dark reddish to purplish brown bands; sternites distinctly darker than tergites; posterior margins of both tergites and sternites narrowly darker; dark red longitudinal streaks on each sternite immediately below pleural fold, most prominent on middle and basal segments, interrupted at each segmental margin, giving effect of a broken, dark, longitudinal line along side of abdomen. Lateral margins of tergites slightly paler than middle areas. Ganglionic area of sternite 7 with a prominent deep orange patch; ganglionic areas preceding this one may have faint patches. Tails yellowish, sometimes faintly tinged with pale reddish brown. Genitalia as described in synopsis and as shown in figure 14.

Male imagos (other specimens).—On some pale specimens, abdomen appearing less distinctly banded than in holotype, tails usually narrowly darker at joinings, and thorax somewhat paler, as are likewise all femora and tibiae. Dark specimens resemble the holotype more closely than the pale forms; abdomen distinctly purplish brown against a white background, light reddish brown against a black background; tails darker at joinings.

Female imago.—In general, quite similar to well-marked males. Abdomen, when filled with eggs, deep orange to light wine-red in color. Sternites quite heavily washed with purplish gray. Posterior margins of tergites narrowly purplish-gray to blackish, most distinct on middle segments. Abdomen of a spent female more or less uniformly gray, tinged with purplish brown above and below, the difference between upper and lower surfaces much less distinct than in those filled with eggs. A considerable variation in size and in depth of color exists among these females.

Holotype.—Male imago. Rio Pedregoso, Costa Rica, February, 1939, D. L. Rounds; in private collection of J. R. Traver. *Allotype.*—Female; same data. *Other specimens.*—Forty males and thirty-five females; same data as holotype.

In the fore leg of the male imago of *Leptohyphes mithras* the tibia is 2 to 2¼ times as long as femur, and 2½ to 3 times as long as tarsus; in third leg the length of tibia is about ⅚ that of femur, and 3⅓ times that of tarsus; the tarsal joints of leg 1 seem to rank, in descending order, 5 subequal to 2, 4, 1, 3; of hind leg, 5, 4, 3 equals 2 equals 1. In the female, the fore tibia is either very slightly shorter or very slightly longer than femur, and 2½ times as long as tarsus, tarsal joints ranking 5, 4, 1, 2, 3; in hind leg, tibia subequal to femur and 3⅔ times as long as tarsus, tarsal joints ranking 5, 4, 1, 2 equals 3.

This species appears to be an aberrant member of the genus *Leptohyphes*. It bears a considerable resemblance to *L. costaricanus* Ulmer in the absence of membranous processes beyond the scutellum and in the relatively small number of cross veins. However, these are considerably more numerous in *mithras* than in *costaricanus*, the female of *mithras* having at least 40 cross veins behind R_1 while Ulmer's figure of the female *costaricanus* (this sex alone being known to date) shows not more than 20 cross veins in this area. Moreover, *costaricanus* lacks hind wings in the female, and these structures are present in all females of *mithras* that have been seen. A further difference concerns the coloration: the abdomen of *mithras* is darker ventrally than dorsally, while the reverse is true for *costaricanus*. The proportions of leg 3 do not accord

---

EXPLANATION OF PLATE II

FIG. 14.—*Leptohyphes mithras*. Genitalia of male imago.

FIG. 15.—*Leptohyphes mollis*. Genitalia of holotype male (subimaginal cuticle indicated by stippling).

FIG. 16.—*Tricorythodes australis* (from British Guiana). Head of male imago, dorsal aspect.

FIG. 17.—*Leptohyphes indicator*. Penes of holotype male, enlarged.

FIG. 18.—*Tricorythodes australis* (from British Guiana). Wing of male imago.

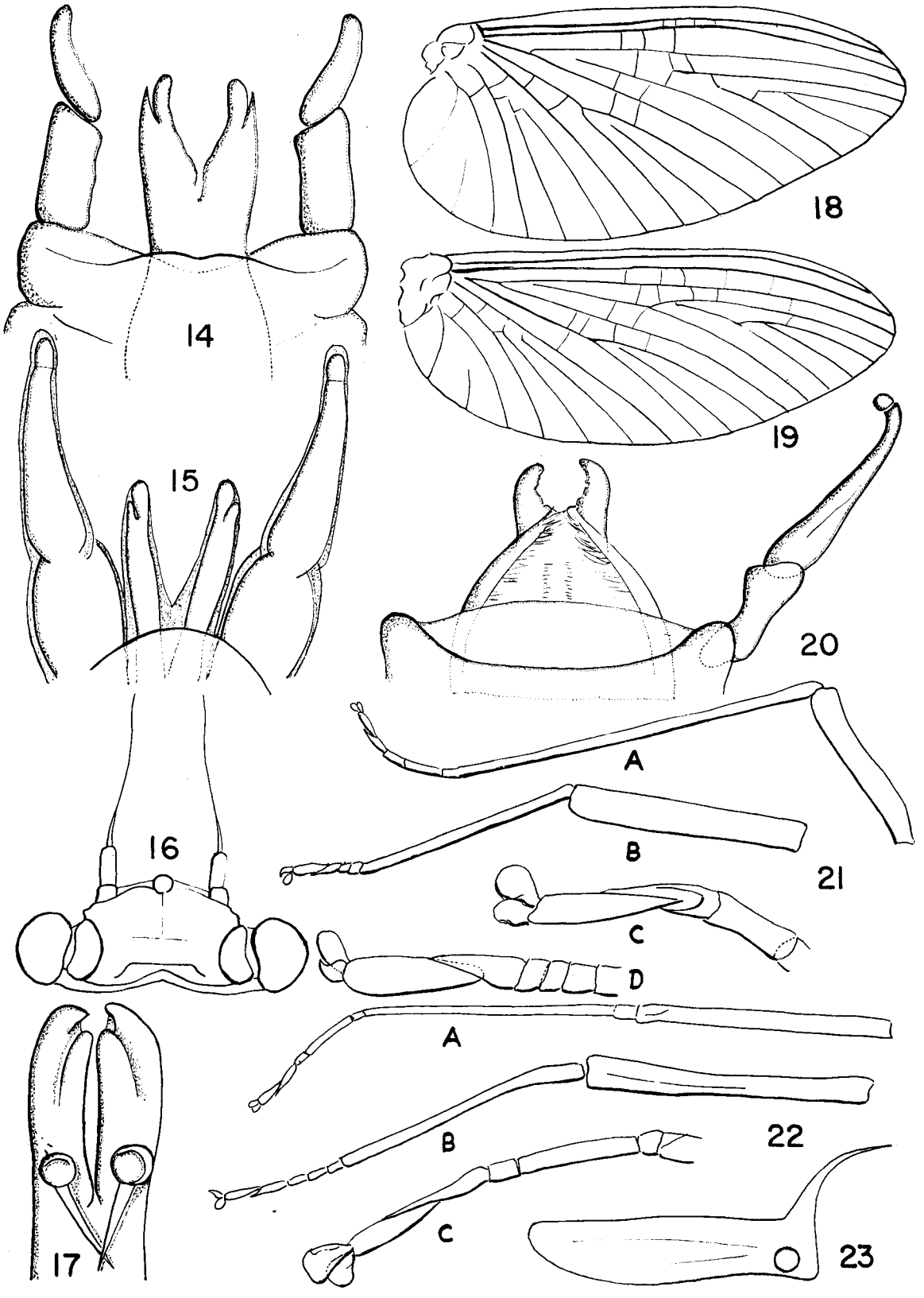
FIG. 19.—Same. Wing of female imago.

FIG. 20.—Same. Genitalia of male imago.

FIG. 21.—*Leptohyphes mithras*. Legs 1 and 3 of male imago, with tarsi of same, enlarged: A and C, leg 1 (basal joints of tarsus omitted in C); B and D, leg 3.

FIG. 22.—*Tricorythodes australis* (from British Guiana). Legs 1 and 3 of male imago, enlarged tarsus of leg 1; A and C, leg 1; B, leg 3.

FIG. 23.—*Leptohyphes indicator*. Hind wing of holotype male.


14
15
16
17
18
19
20
A
B
21
C
D
A
B
22
C
23

very well: in *costaricanus* the femur is somewhat longer than the tibia, which in turn is more than twice as long as the tarsus; in *mithras* the relation of femur and tibia is very similar, but the tibia is fully 3⅔ times as long as the tarsus. There remains also the possibility that *costaricanus* is in reality a *Tricorythodes*, not a *Leptohyphes*.

From all other known species of *Leptohyphes* (including several in my collection which have not yet been described), *L. mithras* differs in the following points: (1) General shape and appearance of hind wing, and in particular its presence in adults of both sexes; (2) The lack of membranous processes from the mesonotal scutellum; and (3) The structure of the forceps of the male genitalia.

In the Museum of Comparative Zoology at Cambridge, Massachusetts, there is a series of small mayflies from Honduras, collected by Stadelmann, and placed (presumably by Dr. Banks) under the heading *Caenis*. These specimens are probably all female subimagos. Examination of them showed the presence of a hind wing rather similar to that of *L. mithras;* apparent absence of membranous scutellar processes; a general body color (head, legs, and body) of grayish black; the abdominal segments, above and below, narrowly dark on posterior margins; the pleural fold also blackish. The total number of cross veins seemed to be about 55. These specimens are in reality members of the genus *Leptohyphes*, and may very well be of the species *mithras* described above.

Leptohyphes indicator Needham and Murphy

Leptophyphes indicator Needham and Murphy, 1924, Bull. Lloyd Libr. 24, Ent. Ser. 4: 33.

The original description was based on a single male specimen, an imago, which I have examined. This holotype is in the entomological collection of Cornell University. Genitalia, one fore wing, one hind wing, and parts of one leg are mounted on slides; the body of the specimen is in alcohol, and is too faded after long immersion to show any color pattern. I offer a few notes on the holotype, and present new figures of the unique genitalia and the hind wing (figs. 3, 17, and 23).

Cross veins in fore wing about 50 in number behind R_1. Hind wing shows two longitudinal veins clearly, the upper one the longer. Membranous processes present, extending beyond mesonotal scutellum. Posterior margins of sternites seem to be narrowly darker. The forceps are broken near the base, but the penes are in good condition. The important and unusual spear-like processes near the base of the penes, with the associated bulbous structures, are not even suggested in the original drawing of the genitalia.

This species seems to be represented by many hundreds of specimens of both sexes taken in Uruguay; unfortunately all are in the subimaginal state, though many are almost ready to shed the subimaginal cuticle. These will be described in detail in a subsequent paper. All were collected during field trips organized by the Departments of Zoology and Entomology of the Facultad de Humanidades y Ciencias of Uruguay, under the auspices of Dr. C. S. Carbonell and his associates.

Leptohyphes mollipes Needham and Murphy

Leptohyphes mollipes Needham and Murphy, 1924, Bull. Lloyd Libr. 24, Ent. Ser. 4: 32.

Examination of the type material in the Cornell University entomological collection enables me to add somewhat to the original description of the species. The holotype is a male subimago, rather teneral; the fore wings, one hind wing, and the genitalia are mounted on a slide. Figure 89 in the above-cited publication was presumably made from this hind wing. This wing, as now seen on the slide, has the costal angulation bent downward, but otherwise it is not unlike the figure. I believe that *there are two longitudinal veins* in the hind wing of this species, in spite of the statement made by the authors, "There are no veins at all in the hind wings." Since the specimen is quite teneral and the hind wing very opaque, it is not possible to be absolutely certain of this; but I feel fairly sure that I did see indications of two such veins, near the base only, on both the holotype and the paratype hind wings. It would indeed be unusual if no such veins were present in members of this genus. The allotype female is a rather teneral subimago. Wings and genitalia of one of the subimago paratypes are likewise mounted on slides. All the type specimens, except such parts as have been mounted, are preserved in alcohol in one vial. Unfortunately, all are stained reddish from dye on the red type labels placed inside the vial. I saw no specimen in this vial that was other than a subimago. The authors state the imagos and subimagos of both sexes were among the type material, but at present only the subimagos can be located.

Membranous processes from mesonotal scutellum present in both sexes. Females without hind wings. Prothorax appearing unusually wide for the width of head, as noted by the authors; eyes of male appearing rather large. Perhaps because of the reddish stain, these specimens show more color pattern than is the case with *L. indicator*. Three black curved markings present on each side of pronotum; middle line of mesonotum paler than adjoining areas; two blackish transverse dashes preceding mesonotal scutellum. Abdomen appearing distinctly banded with brownish, above and below, intersegmental areas paler; anterior margins of tergites very narrowly darker, these markings intensified on lateral parts of the apical segments; rectangular dark patches noticeable in lateral areas on some, but not all, of the specimens. Tergites and

sternites with little or no indication of rows of dark spots, as in *peterseni* Ulmer; one male specimen, however, with a single row of dark dashes next to the pleural fold. Ganglionic areas distinct on venter of both thorax and abdomen, in some lights appearing whitish, in others darker than surrounding parts. Abdomen of female much darker than that of male, showing little or no color pattern. Genitalia of the *peterseni* type, as seen in figure 15.

Genus **Tricorythodes** Ulmer

Tricorythodes Ulmer, 1920, Arch. f. Naturgesch., 1919, 85A(11): 51; Needham, Traver, and Hsu, 1935, Biol. Mayflies 630.

Synopsis.—Eyes remote, well separated in both sexes, those of male slightly the larger. Hind wing absent in both sexes. Fore wing of males with well-developed cubito-anal lobe, the wing widest in this region; fore wing of female widest in region of MA, hence a slight sexual dimorphism in shape of wing. Cross veins relatively few, most of them in basal and middle areas of wing. No membranous processes extending backward from mesonotal scutellum in male imagos and subimagos; female subimagos of at least two species studied may have short processes here, these usually absent in imagos. MP_2 and IMP usually ending blindly in the wing membrane, attached by cross veins to adjacent longitudinals; MP_2 longer than IMP. A slight sag in stem of MA at origin of fork. CuP only slightly arcuate.

In most species, fore leg of male with claws similar, blunt; middle and hind legs of male (and all legs of female) with claws unlike, one sharp-pointed, the other blunt; however, in *T. albilineatus* Berner and in two other as yet undescribed species, fore legs of males with dissimilar claws as on other legs. Male imagos with fore tibia ranging in different species from 1⅕ to 2½ times as long as femur, and 1¼ to 1⅘ times tarsus; tarsal joints in type species ranking as 2, 3, 4 equals 5, 1, other species with some variation from this formula. Hind tibia of male, in most species, ⅝ to $^{15}/_{16}$ as long as femur, and 1¼ to 2½ times as long as tarsus; joints of hind tarsus ranking as 5, 4, 3 equals 2, 1, or with slight variation therefrom. Tibia of fore legs 2⅗ times as long as third tibia and 2 to 3½ times second tibia (except in *australis* Banks, as noted in discussion of that species). Leg 1 of male longest, almost as long as body; leg 2 shortest. In some species at least, fore tibia of female ⅘ to $^{10}/_{11}$ as long as femur, and 1⅓ to 1⅗ times as long as tarsus; tarsal joints ranking 5, 4, 2, 1, 3, or a slight variant of this formula. Hind leg of female with tibia ⅚ as long as femur or subequal to it, and 2 to 2¼ times as long as tarsus; tarsal joints ranking 5, 4, 2, 1, 3. Hind leg of female longest, first leg shortest.

Subanal plate of female well developed, rounded or slightly obtuse apically. Basal joint of male forceps longer than wide, slightly concave on inner margin; second joint longer and more slender, usually with a prominent swelling basally; third joint short, rounded to ovate, sometimes not clearly set off from preceding joint. Apical margin of forceps base more or less deeply excavated between forceps limbs in most species. Penes fused basally, forming a somewhat vase-shaped structure more or less deeply excavated apically between the two free lobes, which may look like thick fingers slightly incurved. Tails three in both sexes; in males, about three times as long as body, middle tail slightly longer than laterals; in females, all tails only slightly longer than body.

Type species: *Tricorythodes explicatus* (Eaton, 1892); described in *Tricorythus*.

Tricorythodes australis (Banks), new combination

Tricorythus australis Banks, 1913, Psyche 20: 85.
Leptohyphodes australis (Banks), Ulmer, 1920, Arch. f. Naturgesch., 1919, 85A(11): 50.

Permission was granted me to examine the type material of this species in the Museum of Comparative Zoology at Cambridge, Massachusetts. It consists of three slides, No. 14883, in the Museum's collection. On one slide are three female specimens, one male is on a second, and four more females on the third. All specimens are mounted *in toto*, in some medium resembling Canada balsam. I present such points as could be made out from a study of these specimens.

It seems evident that Banks' figure of the wing is from one of the female specimens, as the wing of the male has an anal lobe which is more prominent, though not as pronounced as in many species of this genus. The other small figure in Banks' paper is indeed of the male genitalia. Both forceps are broken off near the base, and it is impossible to make out any detail of the forceps base from the type slide. The short lateral processes shown in his figure may well represent part of the apical portion of the forceps base to which the forceps were attached. Legs 1 and 3 of the male are missing; a portion of what appears to be leg 2 is folded back against the body and can be seen only in part. It is, therefore, impossible to determine anything of the structure of the fore claws of the male from the type material. In neither sex are hind wings present, nor are there any membranous processes from the mesonotal scutellum. The eyes of the male are relatively small and remote, as in typical members of the genus *Tricorythodes*. A feature worthy of note is that, in Banks' sketch of the wing and in most of the type specimens, there is one less short vein in the cubito-anal region than is customary for members of this genus. In at least one of the females the number of veins in this area seemed normal for *Tricorythodes*, but it is possible that this apparent vein was but a fold in the wing membrane. Whether

the missing vein was CuP or 1st anal could not be determined. Both of the usual intercalaries seemed to be present, following CuA.

The species *australis* is admittedly an aberrant member of the genus *Tricorythodes*. That it belongs there, instead of in *Leptohyphodes* as Ulmer suggested, is borne out by these facts: (1) Eyes of male relatively small and remote, not covering most of head as in *Leptohyphodes;* (2) No membranous processes from mesonotal scutellum present in either sex; (3) Cross veins essentially as in Banks' figure, much fewer in number than in Ulmer's figure of the wing of *Leptohyphodes;* (4) Penes of the *Tricorythodes* type; (5) No strongly arcuate vein in cubito-anal region; (6) Shape and proportions of wing as seen in Banks' figure due to the fact that the female, not the male, wing was apparently used as the basis for his sketch. To Banks' description I add the following notes.

Head of male pale reddish brown, with black lateral crescents, and with three small dark dots between ocelli. Pronotum yellowish, with considerable black marking laterally. Meso- and metanota reddish brown, with some black margining. Femur (apparently of leg 2) tinged faintly with reddish brown, with a few fine black dots near base, forming a partial post-basal band; black dots at apex of trochanter; femur a little longer than tibia. Sc of wing margined with gray in basal half. Abdomen pale yellowish white; basal tergites rather heavily shaded with blackish, middle tergites shaded thus in lateral portions only, apical ones almost without dark shading. Two large brown "blobs" (testes?) on or within sternite 9. Genitalia yellowish, deeper in color than preceding parts. Tails grayish at base, broken beyond this.

Head of female distinctly reddish. Mesonotal scutellum black-tipped. Meso- and metanota red-tinged on a reddish brown background; mesonotum with grayish black shading on middle portion preceding the dark scutellum, and with black areas also laterally and across anterior margin. Humeral cross vein of wing black; a sooty patch at base of anal lobe. One female with considerable dark shading on middle of femur and a narrow blackish pre-apical band; this specimen also with more extensive black shading on tergites. Femur of leg 1 equal to tibia, which is about twice as long as tarsus. Third leg very long, femur almost reaching tip of body and slightly longer than tibia, which is about 1½ times as long as tarsus. Second leg also quite long. Legs yellowish, without femoral bands except in the one female mentioned above. Basal tergites gray-shaded, tergites 8 and 9 each with a somewhat oval, gray, submedian patch. Subanal plate can not be seen. Tails of all specimens broken at or near base.

Habitat: Rio Madeira, Brazil.

A series of specimens of both sexes from British Guiana, collected by the Cornell Entomological Expeditions of 1924 and 1927, are similar enough to Banks' type material to indicate that they may well belong to this species. Figures are presented of the head, wings, legs, and genitalia of some of these specimens (figs. 13, 16, 18, 19, 20, and 22). Most of these specimens have been in alcohol for many years, and discrepancies in coloration noted between them and Banks' types may be due to this long immersion. The principal differences are noted below.

The British Guiana specimens are somewhat smaller than the types of *australis*, having a wing expanse of less than 8 mm. Males, body length 2 to 2½ mm., wing length 2½ to 3 mm.; females, body length 2 to 3 mm., wing length 2 to 3 mm. All have conspicuous black pre-apical spots on all femora, usually not forming a complete band. Females largely reddish brown, while Banks' types are yellowish with tinge of reddish. All legs of male noticeably slender, legs 2 and 3 unusually long, third femur extending back as far as seventh segment of extended abdomen; the fore leg, however, seemingly relatively shorter than in many species of *Tricorythodes*. Legs pale yellowish, all femora very faintly tinged with pale reddish brown; apical margin of trochanter narrowly dark; outer surface of femora with narrow, black, longitudinal pencilings and, in some specimens, minute black dots. Humeral cross vein occasionally dark; C and Sc before this vein dark-margined, as are remainder of Sc and R. Principal longitudinal veins appearing purplish black. A faint sooty spot on inner anal margin. Abdomen yellowish white, basal and apical segments tinged with reddish brown; each middle tergite with rather wide, deep smoky band covering posterior half, slightly narrower near mid-dorsal line; basal tergites with narrower and paler posterior bands; apical tergites without dark bands or with a few interrupted dark dashes along posterior margins. Straight black dashes long pleural fold, darkest on middle segments, longest on apicals. Mid-dorsal line usually very narrowly blackish. Sternites largely yellow, with very faint reddish brown tinge, basal ones sometimes faintly tinged with smoky; ganglionic areas appearing orange in color on some specimens. Tails white, faintly grayed near base, silvery beyond; a few of the basal joinings may be narrowly darker; laterals fully 2½ times as long as body, middle tail 3 times the body length. Genitalia very pale reddish brown. Forceps base not deeply excavated (fig. 20). Unique features: not much swelling at base of second forceps joint, and an unusual number and arrangement of minute hair-like or spinous processes on apical third of penes, the tips of which are usually bent upwards. Subanal plate of female well developed, slightly obtuse apically. Fore leg of male with claws similar, blunt.

This aberrant species, which seems best placed

in *Tricorythodes*, differs from other known members of that genus in these respects: (1) Less prominent cubito-anal lobe of fore wing of male, and absence in both sexes of one vein customarily present in anal area (figs. 18, 19); (2) Long, slender legs in both sexes; (3) Absence of conspicuous swollen basal portion on second joint of male forceps; (4) Penes stouter, spinous area more conspicuous. In no other species of this genus that I have studied are the femora so slender, the femur and tibia of the fore leg so nearly equal in length, and the tibia of the hind leg so nearly equal to that of the fore leg (fig. 22, A–C). Femur and tibia are almost subequal in both the fore and the hind legs of the male. The tarsal joints in the fore leg seem to rank 2 equals 5, 4, 3, 1; in the hind leg, 5, 4, 1, 2 equals 3. It is difficult to determine the third joint on the fore leg, but I believe it to be relatively shorter than in other species studied, and the fifth joint to be relatively longer.

REFERENCES CITED

Banks, Nathan. 1913. Neuropteroid insects from Brazil. (The Stanford Expedition to Brazil, 1911.) Psyche 20: 83–9, pl. 4.

Barnard, K. H. 1932. South African may-flies (Ephemeroptera). Trans. R. Soc. South Africa 20(3): 201–59, 48 figs.

Demoulin, Georges. 1952. Un faux Baëtide, *Bruchella* Navás (Insectes Éphéméroptères). Bull. Ann. Soc. Ent. Belgique 88(11–12): 281–5, 7 figs.

1954. Recherches critiques sur les Éphéméroptères Tricorythidae d'Afrique et d'Asie. Bull. Ann. Soc. Ent. Belgique 90(9–10): 264–77, 3 figs.

Demoulin, Georges, and **G. F. Edmunds, Jr.** 1954. Note à propos des noms et auteurs de deux genres d'Éphéméroptères. Bull. Ann. Soc. Ent. Belgique 90(1–2): 46–8.

Eaton, A. E. 1882. An announcement of new genera of the Ephemeridae. Ent. Mon. Mag. 18: 207–8.

1883–88. A revisional monograph of recent Ephemeridae or mayflies. Trans. Linn. Soc. London (Zool.) 3: 1–352, 65 pls. (Issued in six parts. Part 1, pp. 1–76, pls. 1–24, 1883; Part 2, pp. 77–152, pls. 25–44, 1884.)

Edmunds, George F., Jr., and **J. R. Traver.** 1954. An outline of a reclassification of the Ephemeroptera. Proc. Ent. Soc. Washington 56(5): 236–40.

Lestage, J. A. 1942. Contribution à l'étude des Éphéméroptères. XXV.—Notes critiques sur les anciens Caenidiens d'Afrique et sur l'indépendence de l'évolution tricorythido-caenidienne. Bull. Mus. Hist. Nat. Belgique 18(48): 1–20, 20 figs.

1945. Contribution à l'étude des Éphéméroptères. XXVI.—Étude critique de quelques genres de la faune éthiopienne. Bull. Ann. Soc. Ent. Belgique 81: 81–9.

Navás, L. 1920. Insectos sudamericanos (1a, 2a y 3a serie). Anal. Soc. Cien. Argentina 90: 33–72, 11 figs.

Needham, J. G. 1920. African stoneflies and mayfiies collected by the American Museum Congo Expedition. Bull. Amer. Mus. Nat. Hist. 43(4): 35–40, pl.5.

Needham, J. G., and **H. E. Murphy.** 1924. Neotropical mayflies. Lloyd Library Bull. 24, Ent. Ser. 4: 5–79, 13 pls.

Needham, J. G., J. R. Traver, and **Y.-C. Hsu.** 1935. The biology of mayflies. Ithaca, N. Y.: Comstock Publ. Co. xiv+759 pages.

Traver, Jay R. 1944. Notes on Brazilian mayflies. Bol. Mus. Nac., Rio de Janeiro, N.S., Zool. No. 22: 2–53, 20 figs.

Ulmer, Georg. 1920. Neue Ephemeropteren. Arch. Naturgesch. 1919, 85A(11): 1–80, 56 figs.

1921. Über einige Ephemeropteren-Typen älterer Autoren. Arch. Naturgesch. 87A(6): 229–67, 21 figs.