

Proceedings of the United States National Museum



SMITHSONIAN INSTITUTION • WASHINGTON, D.C.

Volume 114

1963

Number 3473

STUDIES OF NEOTROPICAL CADDIS FLIES, I: RHYACOPHILIDAE AND GLOSSOSOMATIDAE (TRICHOPTERA)

By OLIVER S. FLINT, JR.

Introduction

The caddis flies of the Neotropical region, though quite numerous, have received intermittent and often superficial attention. Ulmer in 1913 published the first catalog of Neotropical Trichoptera; he listed 162 species. Since then many species have been described, notably by Navas, Banks, Mosely, and Schmid, and the names available have probably trebled. There still remains much to be done in providing figures adequate by present standards of many of the species described before the mid-thirties, and in describing the many species as yet unnamed. The immature stages are almost completely unworked, although Ulmer and Müller published some valuable work on these stages around the turn of the century. It is hoped that this series of papers will fill in some of these gaps in our knowledge of all stages of the Neotropical Trichoptera. In this paper no attempt has been made to discuss all the described species; only those I have seen are treated.

For convenience, I am defining the Neotropical region as the part of North America south of the United States, South America, and all the Antillean islands. This classification is admittedly not

exactly correct, for in the caddis flies a weak Neotropical element enters the southwestern United States, and a Nearctic element extends into the highlands of central Mexico and possibly even farther in the mountains of Central America.

The terms "metamorphotype" and "pharate adult" that will be used in this series of studies are defined as follows: In the pupal stage most caddis flies are enclosed in either a sealed case or a silken cocoon and the sclerites of the last larval instar are retained with the pupa. Just prior to emergence the adult, except for the wings, is fully formed and hardened; hence the genitalia and many other structural characters are available for positive specific determination. Thus with one specimen are to be found the larval sclerites, pupal skin, and adult structures that give absolute proof of the correct association of all stages. Such a specimen was named a metamorphotype by Milne (1938). The adult found in a metamorphotype is here called a pharate adult, a term proposed by Hinton (1946) for a stage which has become free from the cuticle of the preceding instar, although the cuticle has not yet been cast off.

The material used in this study is from the following sources: The Cornell University (CU) collection, for the loan of which I am grateful to Dr. H. Dietrich and Dr. J. G. Franclemont; the undetermined material in the collection of the Museum of Comparative Zoology (MCZ) at Harvard University, for which I am indebted to Dr. P. J. Darlington, Jr.; a collection made in Ecuador by Dr. R. W. Hodges while on an expedition supported by a National Science Foundation grant to Dr. G. W. Prescott; the holotypes and allotypes of the species described from Dr. Hodges' collection are being deposited in the United States National Museum; and the collection of the U.S. National Museum (USNM).

Family Rhyacophilidae

The typical subfamily Rhyacophilinae is absent in the Neotropical region, its place being taken by the Hydrobiosinae. To date, 16 hydrobiosine genera have been described from the Neotropical region. Of these genera, *Atopsyche* Banks is the largest in included species (30 described to date) and occupies the greatest range, from southwestern United States to northern Argentina. The southern tip of South America, however, contains a great number of smaller genera, some members of which are found at least as far north as Ecuador.

Because I have not seen examples of most genera, the following key is based on the published figures of their venation. The male genitalia are often sources of characters supplementary to the venational characters. For an explanation of the venational terminology used, see Ross (1956, fig. 154).

Key to Neotropical Genera of Hydrobiosinae

1. R_3 of forewing apparently arising from R_4 rather than R_{2+3} .
Neatopsyche Schmid
- R_3 arising from R_{2+3} 2
2. R_{2+3} of forewing forked at r or s, cell R_2 long 3
 R_{2+3} forked nearer margin, cell R_2 short 9
3. R_{4+5} of forewing forked near wing margin and pedicel longer than either branch **Metachorema** Schmid
 R_{4+5} forked slightly basad of fork of R_{2+3} 4
4. Forewing with crossvein m present 5
Forewing lacking m 8
5. Two m-cu crossveins present in forewing **Rheochorema** Schmid
Only 1 m-cu crossvein 6
6. R_{2+3} of hindwing unforked **Microchorema** Schmid
 R_{2+3} of hindwing forked 7
7. R_{2+3} of hindwing forked at r, m-cu arcuate. **Australobiosis** Schmid
 R_{2+3} forked beyond r, m-cu straight **Clavichorema** Schmid
8. In forewings, crossvein s present **Neochorema** Schmid
Crossvein s absent **Iguazu** Ross
9. Crossvein m present in forewing **Pseudoradema** Schmid
Crossvein m absent 10
10. R_{4+5} unforked in hindwing 11
 R_{4+5} forked in hindwing 12
11. M_{3+4} of forewing bowed sharply toward Cu_1 ; M_4 and Cu_{1a} close together.
Atopsyche Banks
 M_{3+4} not bowed sharply toward Cu_1 **Dolochorema** Banks
12. R_{2+3} of hindwing apparently arising from R_4 13
 R_{2+3} arising independently from R_s 15
13. R, R_s , M, and Cu in forewing bearing double rows of hairs, in male at least.
Stenochorema Schmid
These veins not abnormally hairy. 14
14. Crossvein s present in forewings **Cailloma** Ross
Crossvein s absent **Parachorema** Schmid
15. Crossvein r lacking in forewing, R_{4+5} about half length of R_{2+3} in hindwings.
Australochorema Schmid
Crossvein r present, R_{4+5} and R_{2+3} of equal length.
Neopsilochorema Schmid

Genus *Atopsyche* Banks

Atopsyche Banks, Tran. Amer. Ent. Soc., vol. 32, p. 17, 1905.

Two additional species of this genus, discovered in material from South America, are described below. I have also studied larvae, representing four species, that belong to this genus. Although the larva of only one species is tentatively correlated with the adult, the larvae of all four species are described in order to indicate the type of interspecific variation likely to be found in the genus. A rather complete description is given of the larva and pupa of one species so that material may be provided that may be useful in phylogenetic work.

Atopsyche clarkei, new species

FIGURE 1, a-d

That this most interesting species fits best in the *batesi* group of the subgenus *Atopsaura* is attested by the articulated dorsal appendage of the aedeagus and the apicomeral projection of the basal clasper segment. However, the odd invaginations of the third and fourth terga of the male are known only in the *kingi* complex of the subgenus *Atopsyche*, which group the species further resembles in the shapes of the basal segment of the clasper and of the paracercus.

ADULT.—Length of forewing, ♂ 7 mm., ♀ 8 mm. General structure typical of the genus. Color of specimens in alcohol yellowish brown; wing membrane brown with 3 whitish streaks on forewing, (1) from base of cell R_4 to base of cell M_3 , (2) obliquely from fork of R_{2+3} and R_{4+5} to $m-cu$, and (3) inwardly from notch in posterior margin along curve of Cu_2 . Abdomen with posteroventral processes mesally on segments 6 and 7, both reaching nearly to posterior margin of segment 8. Third and fourth terga of the male with an anterolateral ovoid invagination, each appearing to bear many short hairs internally. Male genitalia (fig. 1, a, b): Paracercus roughly quadrate, with apical angle produced, and bearing a number of short broad setae along dorsal margin; flicercus short, 2–3 times as long as cercus and bearing a long seta apically; clasper with basal segment rather broad, about $3\frac{1}{2}$ times as long as broad, with an apicomeral projection that bears numerous short, stout setae mesally; apical segment slender and curving ventromesally; aedeagus (fig. 1, c, d) with a ribbonlike, freely articulated dorsal appendage, a simple internal rod, and narrow body bearing lateral flanges.

Holotype ♂, allotype ♀, paratype ♂: Colombia: Cundinamarca, Chicó, 2800 m., Jan. 24, 1959, J. F. G. Clarke (USNM Type 66016).

Atopsyche neolobosa, new species

FIGURE 1, e-h

This species is very closely related to *lobosa* Ross, which is known from Bolivia, but differs in a number of small characteristics. The apex of the paracercus is not rolled outwardly, nor is the tip of the flicercus strongly clavate. The aedeagus also seems to be shorter and broader, with the dorsal process of a different shape.

ADULT.—Length of forewing, ♂ 7–9 mm., ♀ 11–12 mm. Coloration and wing maculation of specimens in alcohol much as in *clarkei*. Abdomen with ventral posteromesal projections from segments 6 and 7, that of 6 barely reaching posterior margin of segment 7, that of 7 only one-half as long as segment 8; male with a short lateral filament on segment 5, 2–3 times as long as wide. Male genitalia (fig. 1, e, f): Paracercus slender, with a high, slightly recurved point at midlength,

apex slightly flattened and twisted, filicercus long, slender, slightly widened apically; clasper with basal segment about 5 times as long as broad and with an apicoventral lobe; apical segment cylindrical, curving mesad; aedeagus (fig. 1, *g, h*) with a pair of dorsomesal processes produced into a strong recurved hook, and a cluster of spicules dorsally, internal rod simple, body enlarged basally, with thin lateral flanges.

Holotype ♂, allotype ♀, paratypes 1 ♂, 5 ♀: Ecuador: Papallacta, 10,500 ft., Jan. 28, 1958, R. W. Hodges (USNM Type 66017).

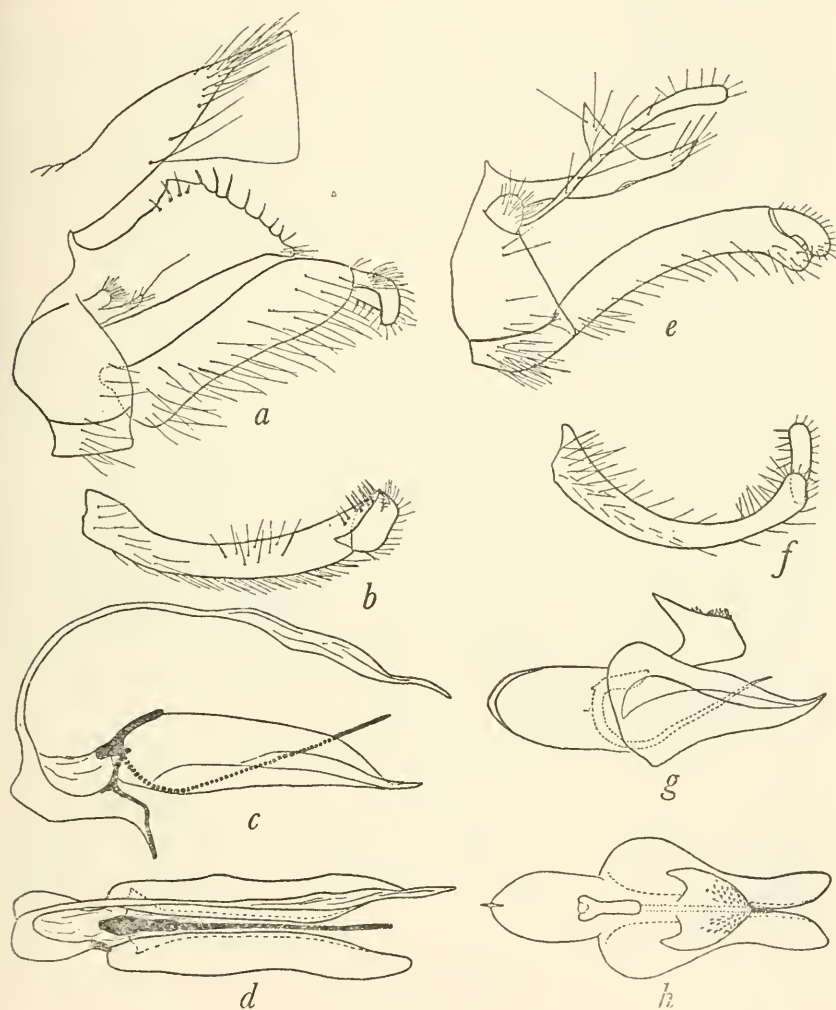


FIGURE 1.—*a-d*, *Atopsyche clarkei*: *a*, male genitalia, lateral view; *b*, right clasper, ventral; *c*, aedeagus, lateral; *d*, aedeagus, dorsal. *e-h*, *Atopsyche neolobosa*: *e*, male genitalia (ninth and tenth terga omitted), lateral; *f*, right clasper, ventral; *g*, aedeagus, lateral; *h*, aedeagus, dorsal.

Atopsychealconura Ross (?)FIGURE 2,*a-d*

Of this species, I have several larvae and a single pupa in which the male genitalia are developed enough to be suggestive of *alconura*, but not enough to be certain. The other larvae are associated with this specimen by means of the included larval sclerites in the metamorphotype.

The larva agrees in structural characteristics with the detailed description given that of *Atopsyche* species 1.

LARVA.—Length 7 mm., width 1 mm. Head (fig. 2,*a*) yellowish, with a dark brown area dorsomesally extending anteriorly on the frontoclypeus (lacking on 1 larva) and a narrow band extending around the sides to meet and greatly enlarge midventrally; dark areas with conspicuous pale muscle scars. Pronotum yellowish, with brown on posterior half, black on posterior margin, and anterolateral angle (fig. 2,*a*). Anal proleg lacking basoventral spine in 1 specimen.

PUPA.—Length 6 mm.; specimen considerably deformed. Mandibles long, slender, and toothed and serrate over entire inner margin (fig. 2,*c*). Labrum roughly semicircular with 7 pairs of setae (fig. 2,*d*). Head capsule with 3 pairs of setae below antennae, 1 above base of each mandible, 1 pair between antennal bases, 4 pairs posterior to antennae and 3 on rear of each eye. Pronotum and metanotum each with 2 pairs of setae, mesonotum with 3 pairs. Foreleg with 1 seta near apex of coxa, 2 near apex of femur. Midleg with 1 seta near base and 2 near apex of coxa, 2 setae near apex of femur, and 2 contiguous near apex of tibia; hair fringe well developed on both sides of tarsal segments. Hindleg with 1 small seta on coxa. Abdominal segments 1-8 with a pair of setae dorsally, another laterally, and 4-5 ventrally (possibly lacking on 1-4). Hook plates anteriorly on segments 2-7, posteriorly on 4 and 5; actual number of hooks per plate obscure. Apex of abdomen with lobes containing genitalia; dorsal lobes each with 3 stout setae posterolaterally (fig. 2,*b*).

MATERIAL.—Ecuador: Río San Daly, 3.3 miles east of Puyo, 2500 ft., Apr. 16, 1958, R. W. Hodges, 1 pupa. Río Saloya, north of Chiriboga, 6500 ft., Mar. 31, 1958, R. W. Hodges, 1 larva.; Río Rebadiniera, 10 miles north of Puyo, 3000 ft., Apr. 18, 1958, R. W. Hodges, 1 larva.

Atopsyche species 1

FIGURE 3

The larva of this species was chosen for detailed description only because it is relatively large and the structures are more distinct.

The structure of the mouth parts, legs, and other sclerotized areas of the body seem to be generically constant, at least in the other larvae of this genus known to me. Inasmuch as the larva of only one other Neotropical hydrobiosine genus (described on p. 462) is known, it is impossible to prepare generic keys to the larvae.

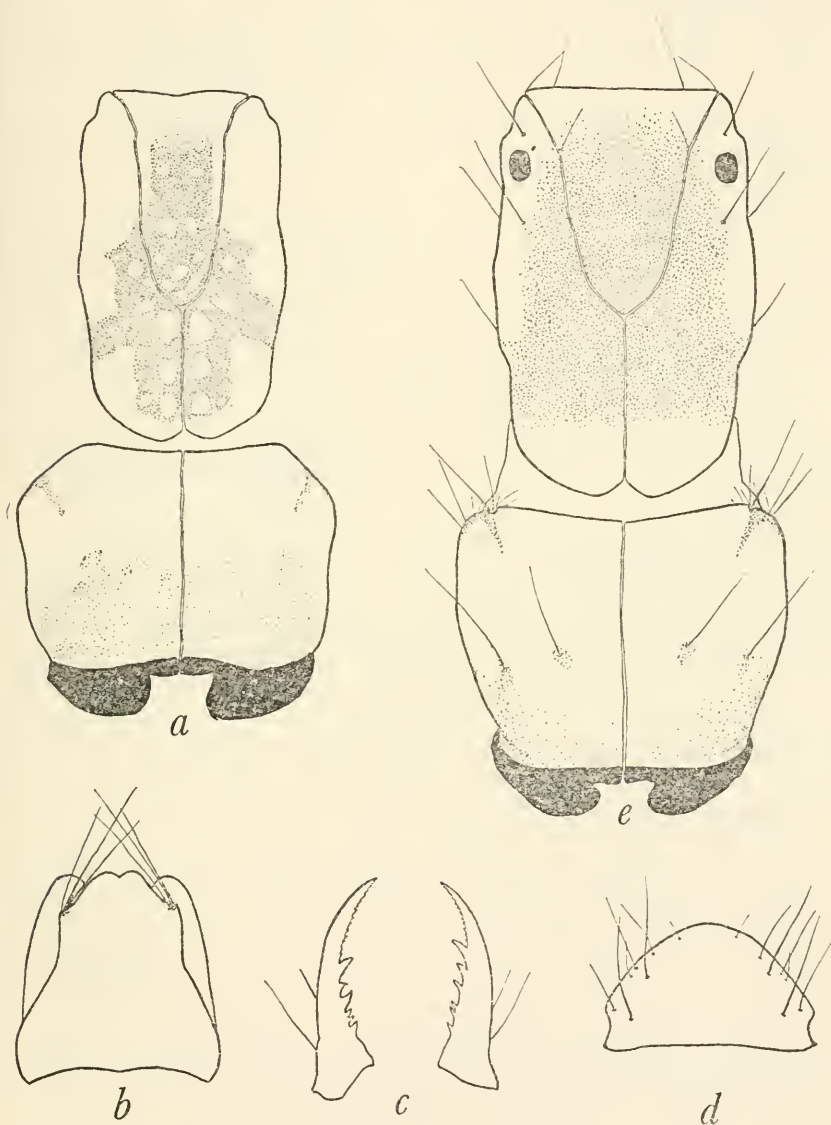


FIGURE 2.—*a-d*, *Atopsychealconura?*: *a*, larval head and pronotum, dorsal view; *b*, apex of pupal abdomen, dorsal; *c*, pupal mandibles, dorsal; *d*, pupal labrum, dorsal; *e*, *Atopsyche* species 2, larval head and pronotum, dorsal.

LARVA.—Length 23 mm., width 3 mm. Head yellowish, with brown area middorsally and extending anteriorly along frontal sutures and with conspicuous pale muscle scars; slightly darker laterally with indistinct pale muscle scars (fig. 3,*a*). Setae arranged as in figure 3,*a*, most greatly reduced in length. Labrum dorsally with seta 5 erect and pigmented, remainder decumbent and colorless, lateral brush weak; ventrally with an apicomeral patch of posteriorly directed spicules and a pair of ovoid sclerites submesally (fig. 3,*c*). Mandibles with dorsal cutting edge completely overhanging ventral, each mandible with 2 dorsal subapical teeth; ventral edge poorly developed, with 1 small subapical tooth (fig. 3,*d*). Maxilla as seen from ventral surface with typical cardo; stipes angulate near middle, appearing jointed here; palpifer typical; first and second palpal segments short, third and fourth each about twice as long as second; galea cylindrical (fig. 3,*b*). Labium in ventral view with the submentum apparently fused to praegula, whole elongate and bifurcate anteriorly; palpal segment about twice as long as broad (fig. 3,*b*). In dorsal view the membrane basal to galea, with 2 large flattened setae and numerous hairs; labium with a large apicolateral lobe bearing many normal and flattened setae; mentum with a row of strong teeth along posterior margin; hypopharyngeal rods bearing a row of strong teeth on their apicomeral margins (fig. 3,*b*).

Pronotum yellowish brown, darker laterally, with dark muscle scars and black posterior margin (fig. 3,*a*). Mesonotum and metanotum membranous, each with 3 pairs of setae. Prosternum with a large mesal sclerite bearing a pair of small anterolateral sclerites (fig. 3,*e*), area between legs almost completely filled by these sclerites. Femur of foreleg with apicoventral angle produced into a thumblike process against which reduced tibia, tarsus, and claw closes (fig. 3,*f*); femur twisted at 90° to axis of coxa so that normal posterior face is dorsal. Midleg and hindleg normally developed and nearly identical, except hind tibia and tarsus slightly longer.

Abdominal segments 2–9 with 1 pair of long setae ventrally; segments 1–9 with a long setae laterally (much shorter on 1 and 9); segments 1–8 with a pair of setae posterodorsally, and more anteriorly another pair which are minute except on 7 and 8. Ninth tergite brown, straplike, with 3 pairs of long and 1 pair of short setae posteriorly (fig. 3,*g*). Anal proleg yellowish brown marked with black, bearing a stout basoventral spine; claw lacking ventral teeth (fig. 3,*h*).

MATERIAL.—Ecuador: stream about 5 miles south of Antisana, 13,500 ft., Apr. 28, 1958, R. W. Hodges, 2 larvae.

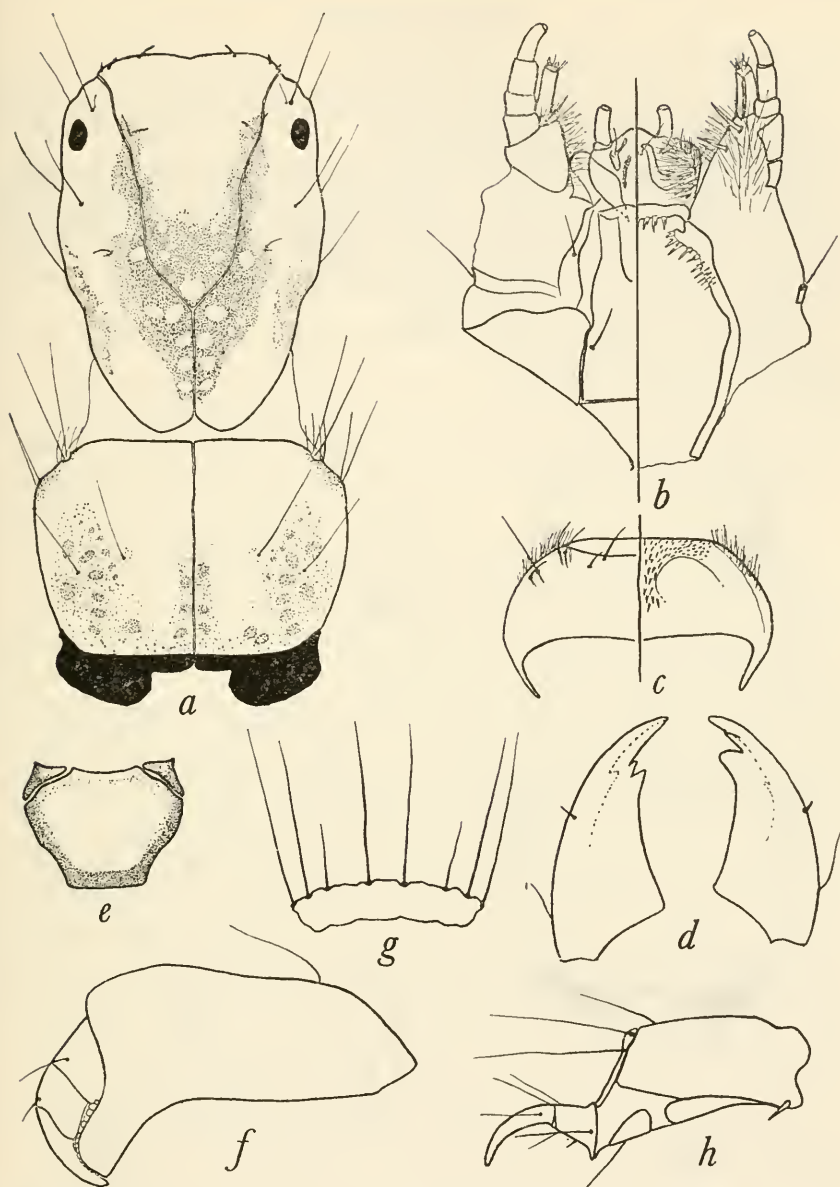


FIGURE 3.—*Atopsyche* species 1: *a*, larval head and pronotum, dorsal view; *b*, larval maxillo-labium, ventral side to left, dorsal side to right; *c*, larval labrum, dorsal side to left, ventral side to right; *d*, larval mandibles, dorsal; *e*, larval prosternum, ventral; *f*, femur through tarsal claw of larval foreleg, posterior face; *g*, larval ninth tergite, dorsal; *h*, right anal proleg of larva, lateral.

Atopsyche species 2FIGURE 2,*e*

The larva here described agrees in structural details with that of species 1, but is colored differently.

LARVA.—Length 12 mm. Head reddish brown, yellowish along anterior margin, around eyes, and posteriorly (fig. 2,*e*). Pronotum almost uniformly golden-yellow, with darkened spots at setal bases, posterior margin, and anterolateral angle black (fig. 2,*e*). Anal proleg appearing to lack basoventral spine.

MATERIAL.—Panama: Río Chiriquí, Volcán, Mar. 1, 1924, F. J. Foster, 1 prepupa (USNM).

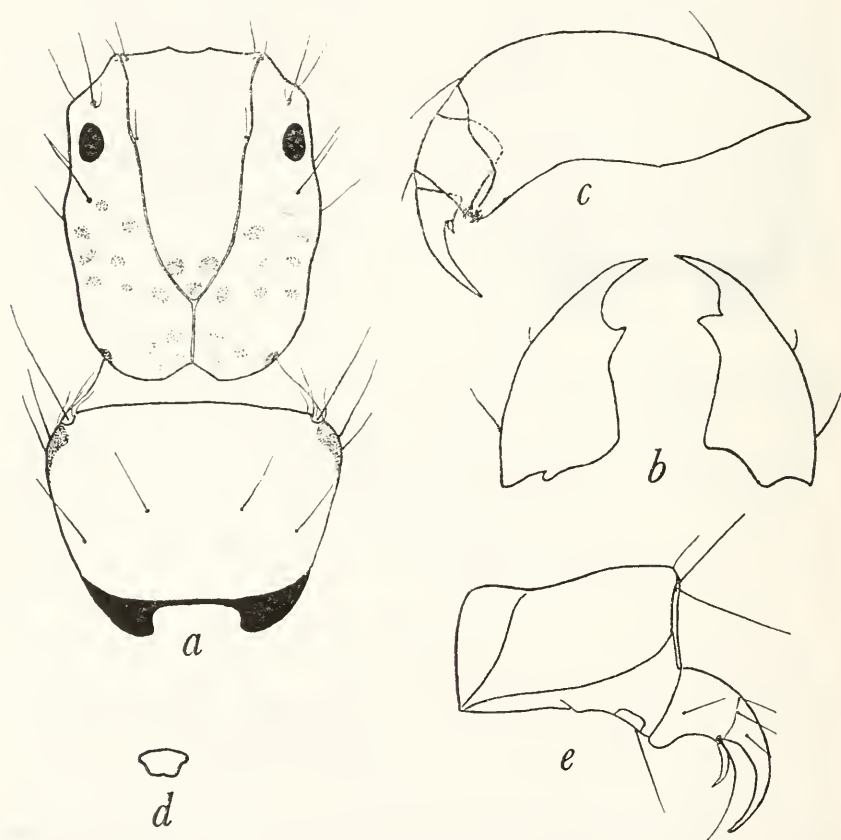


FIGURE 4.—Hydrobiosinae genus A: *a*, larval head and pronotum, dorsal view; *b*, larval mandibles, dorsal; *c*, femur through tarsal claw of larval foreleg, posterior face; *d*, larval prosternum, ventral; *e*, left anal proleg of larva, lateral.

Atopsyche species 3

This larva is very similar to that assigned to *alconura*, but differs in lacking the ventral dark marks on the head.

LARVA.—Length 10 mm. Coloration as in *alconura*, except central stripe on frontoclypeus narrower and no dark marks ventrally.

MATERIAL.—Venezuela: Río Cobre of the Catatumbo system below La Grita, Mar. 31, 1942, L. P. Schultz, 2 larvae (USNM).

Hydrobiosinae genus A

FIGURE 4

In the material from Ecuador are two hydrobiosine larvae that differ in many structural characteristics from the larvae of *Atopsyche*. The most important differences are the fusion of the pronotal halves, the reduction of the prosternite to a minute sclerite, and the disappearance of a segment in the forelegs.

No genus other than *Atopsyche* is known to occur in Ecuador, so I can not even speculate as to the generic placement of these larvae.

LARVA.—Length 6 mm. Head yellowish, muscle scars darker, posterior margin black (fig. 4,*a*). Labrum as in *Atopsyche*. Maxilla about the same, except lateral part of stipes almost completely membranous except at seta and mesal part strongly sclerotized toward base and closely united with cardo. Labium as in *Atopsyche*, except dorsally where mesal strap lacks teeth and hypopharyngeal rods with only 5 or 6 teeth on strongly angulate apical portion. Mandibles with only a single dorsal subapical tooth (fig. 4,*b*). Pronotum yellowish, posterior and lateral margins black; lacking mesal suture (fig. 4,*a*). Prosternum very small (fig. 4,*d*), in width only one-fifth of the distance between legs. Forelegs chelicerate, but femur not twisted; femoral process much narrower than that of *Atopsyche*; apparently tibia and tarsus fused (at least only 1 segment obviously present); claw extending beyond tip of femoral process (fig. 4,*c*). Abdomen generally as in *Atopsyche*. Anal proleg lacking basoventral spine; claw sharply curved ventrad, basal segment with a broad curved spine arising apicovertrally and a normal seta arising laterally at its base (fig. 4,*e*).

MATERIAL.—Ecuador: Stream 5 miles south of Antisana, 13,500 ft., Apr. 28, 1958, R. W. Hodges, 1 larva; stream 11 miles west of Pujili, 12,500 ft., Mar. 15, 1958, R. W. Hodges, 1 larva.

Family Glossosomatidae

The subfamily Glossosomatinae is present in the New World only in the Nearctic region; the Protoptilinae, also widely distributed in North America, is the only subfamily present in the Neotropics.

Eight genera have been recognized for the South and Central American species. The wing venation used here is explained in Ross (1956, figs. 365-367).

Key to Neotropical Genera of Glossosomatidae

1. Wings, especially hind, reduced in size and venation . . . **Merionoptila** Schmid
Wings not reduced 2
2. All four branches of M present in forewing **Culoptila** Mosely
Only two or three branches of M present in forewing 3
3. Two branches of M in forewing 4
Three branches of M in forewing 6
4. Cu_1 branched apically in hindwing **Mortoniella** Ulmer
 Cu_1 unbranched in hindwing 5
5. Branching of M in forewing at about same level as branching of R_{4+5} .
 Scotitrichia Mosely
 M branching much nearer wing margin than R_{4+5} **Mexitrichia** Mosely
6. R_{4+5} branching nearer forewing margin than R_{2+3} **Canoptila** Mosely
 R_{4+5} and R_{2+3} branching at nearly same level 7
7. Cu_1 in hindwing branching apically **Antoptila** Mosely
 Cu_1 simple **Protoptila** Banks

The larvae of the Protoptilinae are very poorly known at present. Ross (1944) has described some particulars of the larva and pupa of *Protoptila lega* Ross, and Flint (1962) the immatures of *Matrioptila jeanae* (Ross). The larvae of *Mortoniella angulata*, *M. apiculata*, *M. hodgei*, and *Mexitrichia aries* are described herein. The larvae of these species and of *Protoptila alexanderi* Ross differ strikingly from those of the Glossosomatinae in the structure of the anal claw. The larvae of the glossosomatines have one large ventral hook and 1 or 2 dorsal accessory teeth. In the protoptilines the dorsal accessory teeth apparently are divided longitudinally, hence there are 2 or more pairs of accessory teeth, one row on each side of the ventral central hook. In addition to the differences in the anal claw, there are differences between the subfamilies in the apical spurs of the tibiae, the sclerotization of the thoracic notae, and the symmetry of the mandibles.

The larvae appear to show generic differences, although criteria for the separation of the species have yet to be found. The tarsal and anal claws, apical spurs of the tibiae, and ninth tergite show some of the most marked generic differences found so far.

The following key is presented only as a guide to the characters found in the previously mentioned species and will probably require much modification when more species and genera become known.

Key to the Genera of Protoptiline Larvae

1. Tarsal claws trifid; ninth tergite with 3 pairs of setae; 3 pairs of accessory anal teeth **Matrioptila** Ross

- Tarsal claws with a single apical hook; ninth tergite with 2 pairs of long setae 2
2. Anal claw with 2 pairs of well-developed accessory teeth; seta of tarsal claw short and very broad (fig. 7,e) **Mortoniella** Ulmer
 Anal claw with 3 or more pairs of accessory teeth; seta of tarsal claw normal 3
3. Ninth tergite concave apically; seta of tarsal claw arising from base of cuticular outgrowth (fig. 7,i) **Mexitrichia** Mosely
 Ninth tergite convex apically; seta of tarsal claw arising from posterior face of cuticular outgrowth (fig. 7,j) **Proptila** Banks

Genus *Mortoniella* Ulmer

Mortoniella Ulmer, Notes Leyden Mus., vol. 28, pp. 95-97, 1906.

Ulmer described the genotype, *bilineata*, from Ecuador in 1906. Subsequently he added a second species, *albolineata*, from Brazil. The latter, however, was removed from the genus by Mosely in 1939 and placed tentatively in *Antoptila*. Martynov (1912) described *tranquilla* from Peru; however, this description, based on a female and unaccompanied by any illustration, is unrecognizable. Such is the present state of our knowledge of the genus.

In the Cornell University collection is a male specimen from Ecuador that perfectly matches Ulmer's description and figures of the genotype and permits the genitalia to be refigured. A second species present in both the adult and the immature material from Ecuador is congeneric on both genitalic and venational characters. Two additional species of *Mortoniella* are described from pharate adults that agree closely in genitalic structure. *Mexitrichia wygodzinskii* Schmid from Argentina apparently also belongs in *Mortoniella* on genitalic considerations, though Schmid's comments on the venation indicate that Cu_1 in the hindwing is unforked in this species. If Schmid's comments are accurate, *Mexitrichia* Mosely may have to be synonymized with *Mortoniella*, because the genitalic differences alone do not seem to justify a generic separation. Until more species and their venation become known, however, I prefer to regard the two genera as distinct.

Larvae of the three new species described here are known to me. They are all similar, in fact, as yet I can find no specific differences, and they are easily separated from the larvae of the other genera. The structure of the tarsal and anal claws is characteristic. The anal claw has only 2 pairs of accessory teeth, and the seta on the tarsal claw has become greatly modified into a short, broad, thumblike process. It must be admitted, however that *Mexitrichia aries*, on which the larval differences are based, may not be congeneric with the genotype and when larvae of other species in this genus become known these apparent differences may not prove to be valid.

Tentatively then, the genus *Mortoniella* differs from *Mexitrichia* in that: Cu_1 in the hindwing is forked; in the male genitalia the tenth tergum is elongate, the ventral surface of the aedeagus is often sclerotized in the form of paired processes, and there are comparatively simple basoventral processes; in the larvae there are only 2 pairs of accessory teeth on the anal claw, and the seta on the tarsal claw is a short, broad, thumblike process; and in the pupa the distal tooth on the inner margin of the mandibles is long and arises far from the apex.

Mortoniella bilineata Ulmer

FIGURE 5,a

Mortoniella bilineata Ulmer, Notes Leyden Mus., vol. 28, pp. 97-98, 1906.

A figure of the lateral aspect of the male genitalia is given from a cleared specimen to supplement the figures of Ulmer. The only difference to be noted is in the tenth tergum which Ulmer shows to be slightly longer and slightly different in shape. Otherwise the genitalia, venation, and coloration are an excellent match with the original description.

MATERIAL.—Ecuador: Huigra, 4500 ft., June 13, 1914, 1 ♂, Parish (CU).

Mortoniella apiculata, new species

FIGURES 5,b-d; 6; 7,a-e

This species is closely related to *angulata* from which it differs most conspicuously in the expanded apex of the dorsal process of the aedeagus and in the greater proportionate length of the genital capsule.

ADULT.—Length of forewing 5 mm., length of body 4.5 mm. Wings of specimens in alcohol brown, with a pale streak in membrane at anastomosis; venation as shown (fig. 5,c). Male genitalia (fig. 5,b): Ninth segment almost quadrate in lateral view, very oblique; tenth segment with an elevated basomesal area, extending about half length of lateral arms which are separated by a deep narrow mesal incision (fig. 5,d); dorsal process of aedeagus angulate dorsally shortly before apex, apex widened into a thin triangular structure; lateral processes of aedeagus simple, slightly angulate rods extending about two-thirds the length of dorsal process; ventrally to aedeagus a pair of short rods basally and 2 paired processes near midlength, ventralmost pair longer than dorsal pair; venter of aedeagus sclerotized in form of paired spatulate process.

Holotype ♂, allotype, paratype ♀: Ecuador: 1 mile east of Papallacta, Jan. 29, 1958, R. W. Hodges (USNM Type 66018). Additional paratypes: Ecuador: 6 ♂, 4 ♀ pharate adults, Río Papallacta, 1 mile east of Papallacta, Jan. 30, 1958, R. W. Hodges; 1 ♂, 1 ♀ pharate

adults, Río San Carlos, 18 miles northwest of Cotacollao, 8500 ft., May 17, 1958, R. W. Hodges.

LARVA.—Length 5 mm., width 1 mm. Head pale brown, slightly paler around eyes (fig. 6,*a*). Mouth parts as in figures 6,*c,d*; sclerites of maxillo-labium too indistinct to permit accurate illustration. Pronotum yellow on anterior third, pale brown posteriorly (fig. 6,*b*). Mesonotum with a brown mesal sclerite, and a pair of more lateral indistinct sclerites: metanotum with a pair of indistinct submesal sclerites (fig. 6,*b*). Seta 1 of mesonotum and metanotum pale, short, and decumbent. Thoracic sternites typical of family. Legs yellowish brown; all legs similar (fig. 6,*e*) except apicoventral seta of tibia of midleg and hindleg not feathered (fig. 6,*f*). Tarsal claws with basal projection small, seta short and greatly enlarged; almost oval (fig. 7,*e*). Abdominal segments 1 and 8 dorsally with 3 pairs

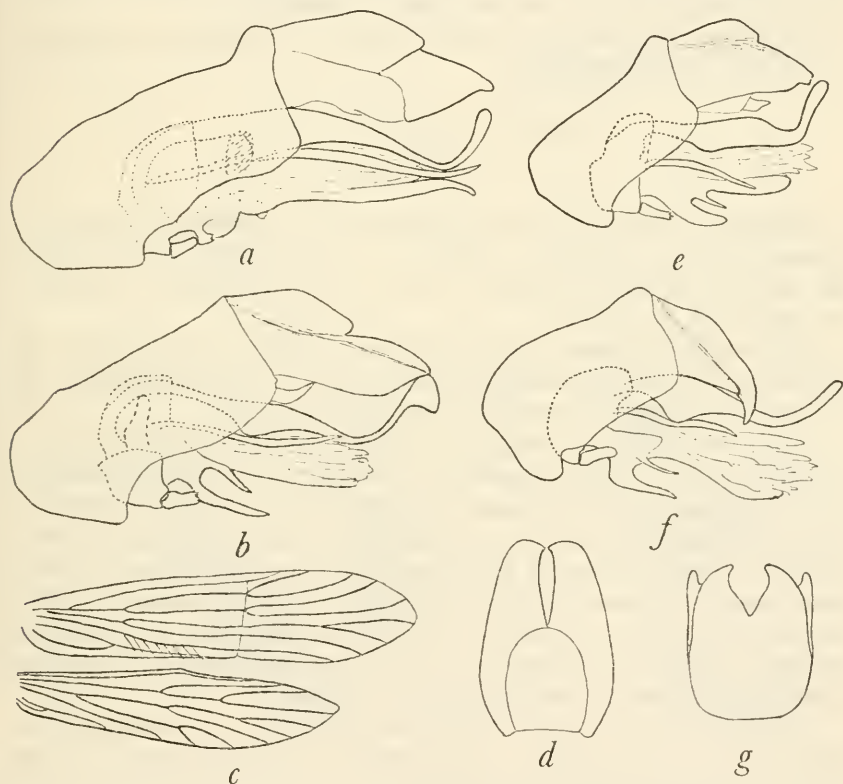


FIGURE 5.—*a*, *Mortoniella bilineata*, lateral view of male genitalia. *b-d*, *Mortoniella apiculata*: *b*, male genitalia, lateral; *c*, venation; *d*, tenth tergum, dorsal; *e*, *Mortoniella angulata*, lateral view of male genitalia. *f*, *g*, *Mortoniella hodgesi*: *f*, male genitalia, lateral; *g*, tenth tergum, dorsal.

of well-developed setae, segments 2-7 with only 2 pairs. Ventrally segments 1 and 2 with 2 pairs of setae, 3-9 with 1 pair. Ninth tergum brown, with 2 pairs of setae. Anal sclerite brown (fig. 6,*h*); claw with 2 pairs of accessory teeth (fig. 6,*g*).

PUPA.—Length 4.5 mm., width 1 mm. Labrum quadrate; apical bristle group with 4 setae, basal with 3 setae. Mandibles identical; inner margin with a strong distal tooth and serrate edge below (fig. 7,*d*). Hook plates anteriorly on segments 2-8 (eighth very small, often absent on females), posteriorly on 4 (fig. 7,*c*). Apex of abdomen without setae.

CASE.—Typically glossosomatid (fig. 7,*a,b*). Anterior and posterior ventral openings firmly formed of silk with small embedded sand grains, projecting further ventrad than middle of case. Lateral surface generally formed of 1 larger sand grain. Respiratory openings left irregularly between sand grains dorsally.

MATERIAL.—Larvae and pupae from type localities in Río Papalacta and in Río San Carlos.

Mortoniella angulata, new species

FIGURE 5,*e*

Because I have only pharate adults of this species, I can give no diagnosis of the venation. However, the genitalia show it to be so closely related to *apiculata* that I have no hesitation in placing the species in *Mortoniella*.

The species is closest to *apiculata* but is readily separated by the dorsal process of the aedeagus, which is not expanded apically, and by the proportionate shortness of the genital capsule.

ADULT.—Length of body 3-4 mm. Male genitalia (fig. 5,*e*): Ninth segment almost quadrate in lateral view, slightly oblique; tenth tergum with an elevated basomesal area extending about two-thirds length of lateral lobes which are divided by a deep narrow incision; dorsal process of aedeagus sharply angulate dorsally before apex which is terete, lateral processes of aedeagus simple, rodlike; ventrad to aedeagus 2 short basal rods, and near midlength 2 paired processes which are subequal in length; ventral surface of aedeagus sclerotized in form of paired spatulate processes.

Holotype ♂, allotype ♀, paratypes 4 ♂, 1 ♀, all pharate adults: Ecuador: stream 11 miles west of Pujilí, 12,500 feet, Mar. 15, 1958, R. W. Hodges (USNM Type 66019).

LARVA.—Except for their slightly smaller size, no differences found between this species and *apiculata*.

PUPA.—Appears identical to that of *apiculata*.

CASE.—Appears identical to that of *apiculata*.

MATERIAL.—Larvae and pupae from type locality.

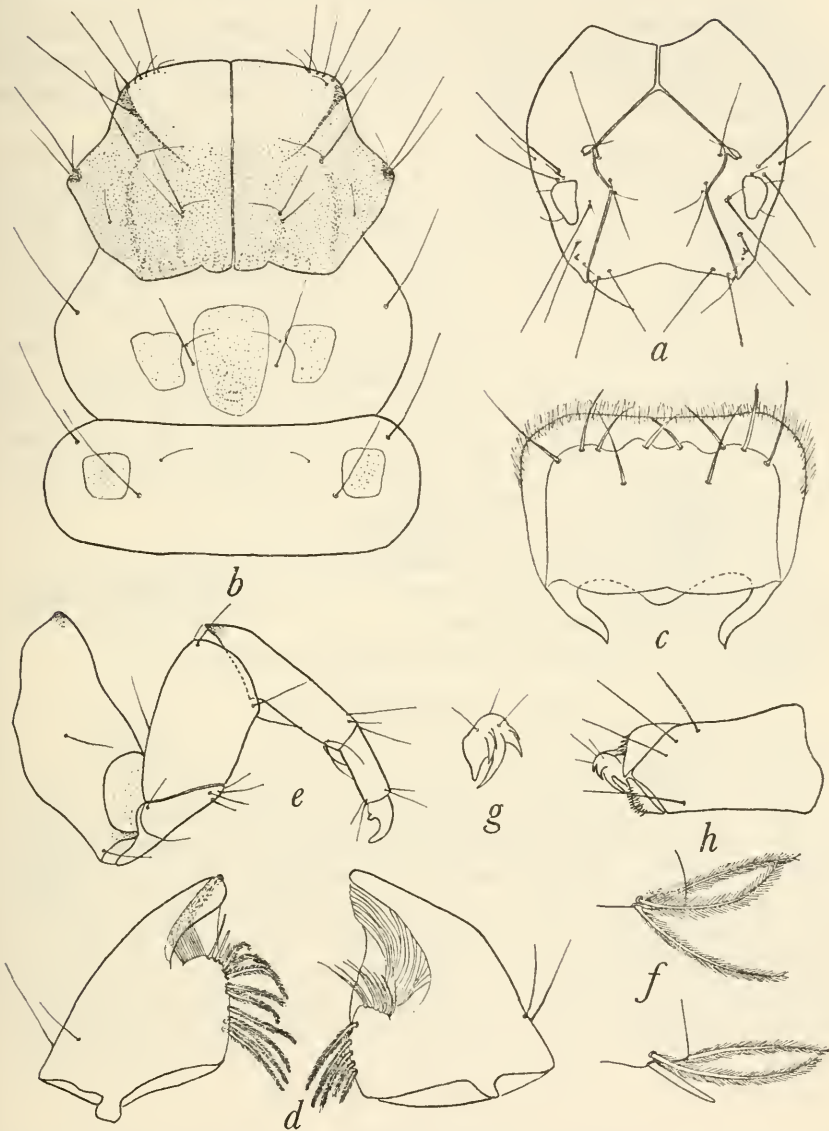


FIGURE 6.—*Mortoniella apiculata*: a, larval head, frontal view; b, larval thorax, dorsal; c, larval labrum, dorsal; d, larval mandibles, dorsal; e, larval foreleg, posterior; f, (upper figure) apex of tibia of larval foreleg, (bottom) same of midleg; g, larval anal claw, postero-lateral; h, right anal proleg of larva, lateral.

Mortoniella hodgesi, new species

FIGURE 5, f, g

As with *angulata*, this species is also represented only by pharate adults. The genitalia show considerable similarity to those of *angulata*, but the tenth tergum is very different and the dorsal process of the aedeagus is only slightly upturned before the apex.

ADULT.—Length of body 4 mm. Male genitalia (fig. 5, f): Ninth segment quadrate and oblique in lateral view; tenth tergum with lateral lobes narrow, surpassed by decurved apex of dorsal lobe which is divided by a U-shaped incision (fig. 5, g); dorsal process of aedeagus with apex slightly upturned and terete; lateral process of aedeagus rod-like, extending for little more than half length of dorsal process; ventrad to aedeagus a pair of short basal rods, and two processes near midlength, ventral one scoop-shaped and undivided, inner one slender and paired; ventral surface of aedeagus only lightly sclerotized.

Holotype ♂, allotype ♀, paratypes 2 ♂, 2 ♀, all pharate adults: Ecuador: stream 5 miles south of Antisana, 13,500 ft., Apr. 28, 1958, R. W. Hodges (USNM Type 66020).

LARVA.—No differences from *apiculata* found.

PUPA.—No differences from *apiculata* found.

CASE.—The anterior and posterior openings are not as firmly rimmed with silk as in *apiculata*.

MATERIAL.—Larvae and pupae from type locality.

Genus *Mexitrichia* Mosely

Mexitrichia Mosely, Trans. Ent. Soc. London, vol. 86, p. 158, 1937.

There appear to be two very distinct groups of species in *Mexitrichia*. The typical group is characterized by the presence of three branches of M in the hindwing; the second group differs in possessing only two branches of M. To the former belong *M. leroda* Mosely, *M. meralda* Mosely, *M. rancura* Mosely, *M. bolivica* Schmid, *M. wygodzinskii* Schmid, and *M. elongata*, new species. To the latter belong *M. ormina* Mosely, *M. teutonia* Mosely, *M. unota* Mosely, *M. aries*, new species, *M. attenuata*, new species, and *M. aequalis*, new species.

Mexitrichia aries, new species

FIGURES 7, f-i; 8, c

This species apparently is related to *attenuata* and *aequalis*, but may be distinguished by the unique spiral process on the aedeagus.

ADULT.—Length of forewing 3 mm. Brown, membrane at anastomosis pale. Venation apparently the same as that of *attenuata*. Sixth sternum with a long pointed apicomeral process. Male genitalia

(fig. 8,c): Ninth segment slightly oblique, anterior margin rounded, posterior straight; tenth tergum almost quadrate laterally, with a ventral process, and cleft on midline dorsally for half its length by a V-shaped incision; dorsal process of aedeagus upturned apically, a ventral straplike process near midlength (in Peruvian specimen this is rounder, and nearly as wide as long); lateral processes not

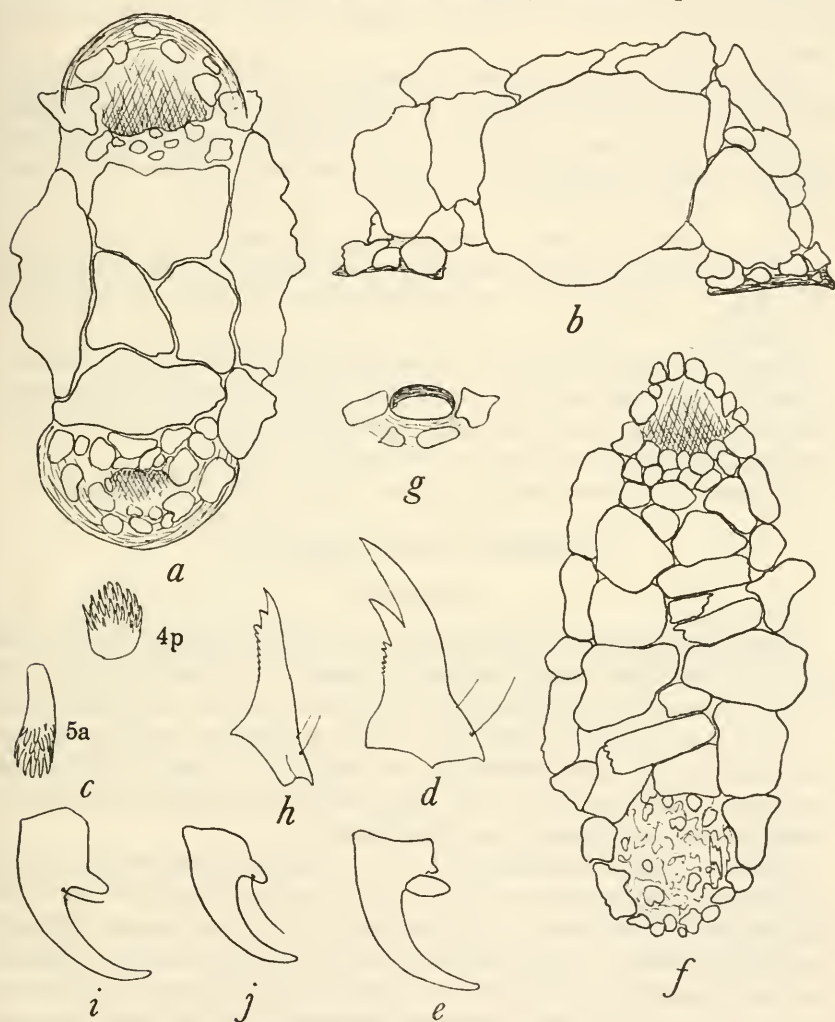


FIGURE 7.—*a-e*, *Mortoniella apiculata*: *a*, larval case, ventral view; *b*, larval case, lateral; *c*, pupal hook plates, dorsal view of abdominal segments 4, posterior, and 5, anterior; *d*, right pupal mandible, dorsal; *e*, larval tarsal claw, lateral; *f-i*, *Mexitrichia aries*: *f*, larval case, ventral; *g*, dorsal respiratory opening of larval case, dorsolateral; *h*, right pupal mandible, dorsal; *i*, larval tarsal claw, lateral; *j*, *Protoptila alexanderi*, lateral view of larval tarsal claw.

obviously present; a slender mesal process dorsally on aedeagus; aedeagus with a pair of short rods basally, and 2 pairs of processes near midlength, ventral pair a straight pointed process, lateral pair spiraling dorsally.

Holotype, paratype ♂: Ecuador: Napo-Pastaza Province, Río Chingual, 8 miles east of El Pun, 8000 ft., May 4, 1958, R. W. Hodges (USNM Type 66021). Paratype ♂: Peru: Chosica, 2800 ft., June 9, Parish (MCZ).

LARVA.—None fully grown. Structure generally the same as in *Mortoniella apiculata*, differing as follows: Tarsal claws with basal projection large, seta small arising near its base (fig. 7,*i*); posterior margin of ninth tergum concave; anal claw with 3 pairs of accessory teeth.

PUPA.—Mandibles with distal tooth small near apex of inner margin; inner serrate margin proportionately longer than in *Mortoniella* (fig. 7,*h*). Remainder of pupal structures lacking on specimen available.

CASE.—Basically the same as in *Mortoniella*, differing as follows: More slender; anterior and posterior openings not projecting ventrad and formed loosely of silk and sand (fig. 7,*f*); dorsal respiratory opening cylindrical and rimmed with silk (fig. 7,*g*).

MATERIAL.—Larvae and pupa from type locality in Ecuador.

Mexitrichia aequalis, new species

FIGURE 8,*d*

The male genitalia of this species are unlike those of any other in the genus; indeed the genitalia approach those of the type of *Mortoniella* in several respects. The shape of the tenth tergum, the dorsal and lateral processes of the aedeagus, and the 2 pairs of ventral processes are indicative of this relationship, although the shape of the ventral processes is different. However, the venation of *aequalis*, although not entirely clear, is definitely not *Mortoniella*.

ADULT.—Length of forewing 2 mm. Color of specimen in alcohol pale brown, with membrane pale at anastomosis. Venation about as figured for *M. attenuata*. Abdomen with a pointed process apically on sixth sternum. Male genitalia (fig. 8,*d*): Ninth segment oblique, anterior margin rounded, posterior straight; tenth tergum composed of dorsal and ventral lobes extending posteriorly for the same distance, with a ventral rodlike thickening and posterior margin scalloped; dorsal process of aedeagus of uniform thickness, sharply upcurved before apex, lateral process slender extending as far posteriorly as dorsal process; aedeagus ventrally with a pair of rounded processes basally and 2 pairs of elongate processes near midlength, one pair

arising on midline curving laterally and then posteriorly, the other pair contiguous mesally and extending straight posteriorly.

Holotype ♂: Peru: Río Pichis, Puerto Bermudez, July 17, 1920, Cornell University Expedition lot 569, sub 261 (CU Type 3892).

Mexitrichia attenuata, new species

FIGURE 8, a-b

This species seems quite isolated within the genus, but may perhaps be closest to *M. aries*. The pair of slender processes rising laterally on the aedeagus is distinctive.

ADULT.—Length of forewing 3 mm. Color of specimen in alcohol pale brown. Venation as in figure 8, a. Sixth sternum with an

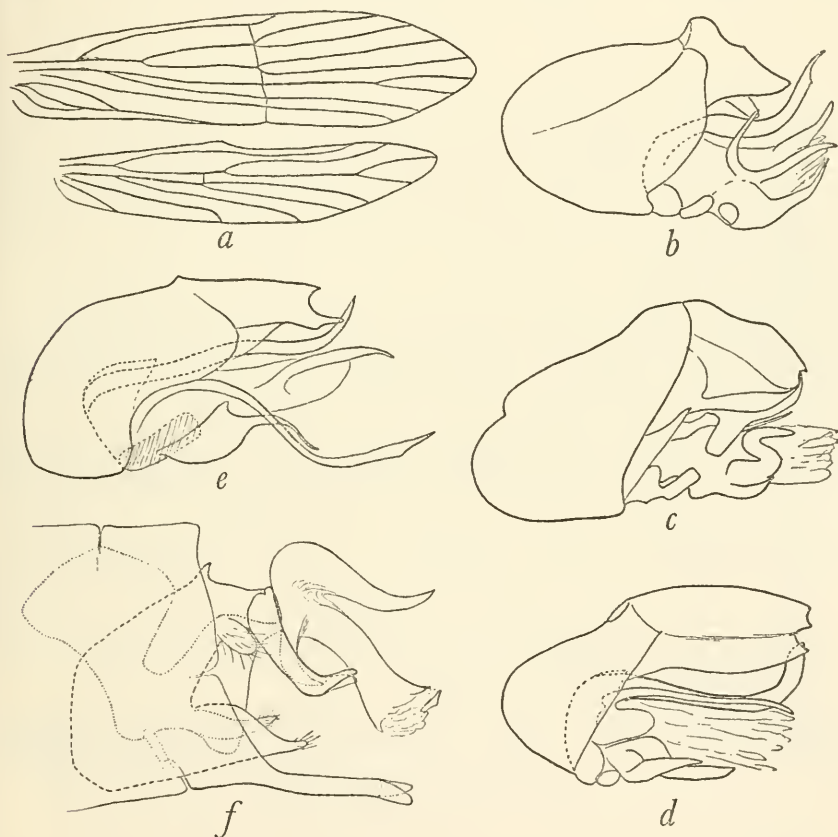


FIGURE 8.—a, b, *Mexitrichia attenuata*: a, venation; b, male genitalia, lateral; c, *Mexitrichia aries*, lateral view of male genitalia; d, *Mexitrichia aequalis*, lateral view of male genitalia; e, *Mexitrichia elongata*, lateral view of male genitalia; f, *Protoptila bicornuta*, lateral view of male genitalia.

apicomesal pointed projection. Male genitalia (fig. 8,*b*): Ninth segment almost circular in lateral aspect; tenth tergum declivous, in dorsal aspect broadly and deeply excavate mesally, with lateral flap-like extensions and with a ventromesal projection; dorsal process of aedeagus sharply upcurved from near base, tapering to a sharp point, lateral processes arising near middle of aedeagus and divided into 2 rods, basal one directed more laterally, apical one more posteriorly; aedeagus with a pair of divergent apicomesal spines arising on upper surface; ventrad to aedeagus a pair of short rods basally, and a large structure developed into a pair of slender divergent apical rods.

Holotype ♂, paratypes 14 ♂: Peru: Río Pichis, Puerto Bermudez, July 15, 1920, Cornell University Expedition lot 569, sub 255 (CU Type 3893).

Mexitrichia elongata, new species

FIGURE 8,*e*

M. elongata is related to *M. meralda* Mosely which is known from Mexico. The two are very similar in the shape of the tenth tergum, the dorsal process of the aedeagus, and the elongate lateral processes of the aedeagus. However, *elongata* is easily recognized by the presence of a spine in the aedeagus and by the paired processes ventrad to the aedeagus.

ADULT.—Length of forewing 4 mm. Color brown; wings clothed with golden brown hairs, with a pale streak in the membrane at the anastomosis. Venation is figured by Mosely (1954, fig. 80), for *M. rancura*. Sixth sternum with a short apicomesal process. Male genitalia (fig. 8,*e*): Ninth segment somewhat oblique, anterior margin rounded, posterior very sinuate; tenth tergum with an apicodorsal point and a pair of apicolateral arms separated by a U-shaped mesal incision; dorsal process of aedeagus upturned near apex, which is pointed, lateral process of aedeagus very long, decurved near midlength, widened before apex, with a sharp apicodorsal point; aedeagus with a single apicodorsal spine, ventrally with a dark obscure basal structure, at midlength with a pair of processes each bearing a decurved twisted filament apically.

Holotype ♂, paratype ♂: Colombia: Valle, Tablones, Finca la Florida, 1300 m., Jan. 7, 1959, J. F. G. Clarke (USNM Type 66022).

Mexitrichia teutonia Mosely

Mexitrichia teutonia Mosely, Novitates Zoologicae, vol. 41, p. 223, 1939.

The type locality of this species is Brazil. I have seen additional specimens from Brazil.

MATERIAL.—Brazil: Nova Teutonia, 3 to 500 m., July 1945, 1 ♂; 194?, 1 ♂, 1 ♀, F. Plaumann (USNM). Cordisburgo, Minas Gerais, trap light, November 1919, 1 ♂, 19 ♀ (CU).

Genus *Protoptila* Banks

Protoptila Banks, Proc. Ent. Soc. Washington, vol. 6, p. 215, 1904.

Protoptila bicornuta, new species

FIGURE 8,f

The structure of the apical half of the aedeagus is totally unlike any other described species. Because there are no lateral spines on the aedeagus, the species will fall in Mosely's group 2, but differs from the other species in this group in the shape of the process of the eighth sternum and in the structure of the aedeagus.

ADULT.—Length of forewing 3 mm. Wings covered with brown hair, and with an indication of an irrorate pattern of more golden hairs. Sixth sternum with usual blunt apicomeral lobe. Male genitalia (fig. 8,f): Almost entirely retracted within eighth segment; eighth sternum produced into a long slender process, bifid for apical fourth; ninth sternum produced into a shallow scoop, with an emarginate apical margin; small ovoid cercus present near base of tenth tergite; tenth tergum divided into lateral decurved lobes, apices divided into internal and external points. Aedeagus complex: Base dorsally with usual halberd-shaped mesal lobe; 2 short rods ventrally near base, beyond these an obscure complex from which 2 hirsute lobes extend; constricted to a very narrow neck below tenth tergum beyond which 3 structures arise, a pair of curving dorsal processes, a central tube with membranous end bearing 2 short spines, and 2 strong ventral hooks.

Holotype ♂: Honduras: Lancetilla, August, Stadelmann (MCZ Type 30410).

Protoptila salta Mosely

Protoptila salta Mosely, Trans. Ent. Soc. London, vol. 86, pp. 154-156, 1937.

Originally described from a series taken in Chiapas, Mexico, the species is now recorded from another nation.

MATERIAL.—Guatemala: Guatemala City, at light, Mar. 29, 1961, 1 ♂, 1 ♀, T. and F. Ruhoff (USNM).

Protoptila cardela Mosely

Protoptila cardela Mosely, Bull. British Mus., Ent. series, vol. 3, no. 9, p. 336, 1954.

Several additional specimens of this species are recorded from the type locality.

MATERIAL.—Mexico: La Gloria, Cardel, Veracruz, January 1938, 2 ♂, 1 ♀; May 1937, 2 ♀, J. Carmelo G. (USNM).

Protophila dubitans Mosely

Protophila dubitans Mosely, Novitates Zoologicae, vol. 41, p. 221-222, 1939.

A species originally described from Nova Teutonia, Brazil, that is now recorded from Minas Gerais.

MATERIAL.—Brazil: Cordisburgo, Minas Gerais, November 1919, 4 ♂ (CU).

Protophila tojana Mosely

Protophila tojana Mosely, Bull. British Mus., Ent. series, vol. 3, no. 9, pp. 331-333, 1954.

Mosely described the species from 1 ♂ collected in Chiapas, Mexico. In the material from the MCZ are 2 ♂ from Honduras that are identical with Mosely's figures of the type. In addition, a series collected in Lima, Peru, greatly extends the known range of the species. The Peruvian specimens differ in that the tenth tergite has a slender process dorsally to the lateral arms which are sharply angulate near their apices. In the Central American material the dorsal processes are almost completely fused to the lateral arms which are more evenly curved near their apices. These differences, however, are so slight, considering the similarity of the remainder of the genitalia, that I believe they are conspecific.

MATERIAL.—Honduras: Lancetilla, August, 2 ♂, Stadelmann (MCZ). Peru: Lima, July 3, 1914, 1 ♂, 1 ♀ (MCZ); July 8, 1914 (CU); Aug. 20, 1914, 2 ♂, 1 ♀ (MCZ, CU); Aug. 24, 1914, 1 ♂ (MCZ); Aug. 30, 1914, 1 ♀ (MCZ); Aug. 31, 1914, 1 ♂ (CU) (all collected by Parish).

Genus *Antoptila* Mosely

Antoptila Mosely, Novitates Zoologicae, vol. 41, p. 219, 1939.

Antoptila brasiliiana Mosely

Antoptila brasiliiana Mosely, Novitates Zoologicae, vol. 41, pp. 220-221, 1939.

An additional male from the type locality was seen.

MATERIAL.—Brazil: Nova Teutonia, Aug. 20. 1932, 1 ♂, F. Plau-
mann (MCZ).

Genus *Scotiotrichia* Mosely

Scotiotrichia Mosely, Trans. Ent. Soc. London, vol. 82, p. 160, 1934.

Scotiotrichia ocreata Mosely

Scotiotrichia ocreata Mosely, Trans. Ent. Soc. London, vol. 82, pp. 160-162, 1934.

Scotiotrichia acreata Schmid, Mitt. Zool. Mus. Berlin, vol. 34, p. 194 (misspelling of *ocreata* Mosely), 1958.

Recently I was able to study a series of this species and discovered that the original figure (Mosely, 1934, fig. 52) of the venation is not correct. The venation shown for the hindwing and the anterior half of the forewing is correct. However, the venation in the forewing posterior to M is not as shown, but is essentially as in figure 8,a; that is, Cu_1 arises from M basally and runs free to the wing margin, Cu_2 is also free to the margin, and 1A and 2A are looped together basally.

MATERIAL.—Chile: Río Tres Pasos, Magallanes, Dec. 11, 1960, 4 ♂, T. Cekalovic K. (USNM).

Literature Cited

BANKS, NATHAN

1904. A list of neuropteroid insects, exclusive of Odonata, from the vicinity of Washington, D.C. Proc. Ent. Soc. Washington, vol. 6, pp. 201-217.

1905. Description of new Nearctic neuropteroid insects. Trans. Amer. Ent. Soc., vol. 32, pp. 1-20.

FLINT, OLIVER S.

1962. The immature stages of *Matrioptila jeanae* (Ross) (Trichoptera: Glossosomatidae). Journ. New York Ent. Soc., vol. 70, pp. 64-67.

HINTON, H. E.

1946. Concealed phases in the metamorphosis of insects. Nature, vol. 157, pp. 552-553.

MARTYNOV, A. B.

1912. On two collections of Trichoptera from Peru. Ann. Mus. Zool. Acad. Sci. St. Pétersbourg, vol. 17, pp. 1-40.

MILNE, MARGERY J.

1938. The "metamorphotype method" in Trichoptera. Journ. New York Ent. Soc., vol. 46, pp. 435-437.

MOSELY, MARTIN E.

1934. New exotic Hydroptilidae. Trans. Ent. Soc. London, vol. 82, pp. 137-163.

1937. Mexican Hydroptilidae (Trichoptera). Trans. Ent. Soc. London, vol. 86, pp. 151-190.

1939. The Brazilian Hydroptilidae (Trichoptera). Novitates zoologicae, vol. 41, pp. 217-239.

1954. The *Protoptila* group of the Glossosomatinae (Trichoptera: Rhyacophildae). Bull. British Mus. (Nat. Hist.), Entomology Series, vol. 3, pp. 317-346.

ROSS, HERBERT H.

1944. The caddis flies, or Trichoptera, of Illinois. Bull. Illinois Nat. Hist. Survey, vol. 23, pp. 1-326.
1956. Evolution and classification of the Mountain caddisflies. 213 pages, Univ. Illinois Press, Urbana, Ill.

SCHMID, FERNAND

1958. Contribution à l'étude des trichoptères Néotropicaux III. Mitt. Zool. Mus. Berlin, vol. 34, pp. 183-217.

ULMER, GEORG

1906. Neuer Beitrag zur Kenntnis Ausseuropaeischer Trichopteren. Notes Leyden Mus., vol. 28, pp. 1-116.
1913. Verzeichnis der Südamerikanischen Trichopteren, mit Bemerkungen über einzelne Arten. Deutsch. Ent. Zeitschr., 1913, pp. 383-414.