THE STATUS OF THE GENUS *ULMERITUS* (EPHEMEROPTERA: LEPTOPHLEBIIDAE: ATALOPHLEBIINAE) AND RELATED TAXA

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ABSTRACT

The genus *Ulmeritus* is redefined and new generic status is given to one of its former subgenera *Ulmeritoides* based on new evidence from nymphal characters described here for the first time. *Ulmeritus* now includes the species *U. balteatus* Thew, *U. carbonelli* Traver, *U. haarupi* (Esben - Petersen) and *U. saopaulensis* (Traver), which are briefly discussed. *U. (Pseudulmeritus) flavopedes* (Spieth) will be placed in *Ulmeritoides* and will be discussed in the second paper of this study, along with the other species of this genus. The phylogeny of these genera are briefly discussed.

INTRODUCTION

The genus *Ulmeritus* was established by Traver in 1956, based on nymphs and adults of the type species *Ulmeritus carbonelli*. In the same paper she described a second species as *Ulmeritus* sp. and transferred to this genus *Atalophlebioides saopaulensis* Traver, both known only from adults. In 1959, the same author divided the genus in three subgenera: *Ulmeritus* s.s. including the three named species and *U. (U.) haarupi*, known only from females; *Pseudulmeritus* with a single species *U. (P.) flavopedes* (Spieth) known from male imagos and *Ulmeritoides* with two new species: *U. (U.) uruguayensis* known from male and female imagos and *U. (U.) luteotinctus* known only from female imagos and subimagos. In 1960, Thew named Traver's *Ulmeritus* sp. as *U. (Ulmeritus) balteatus*, and described *U. (Ulmeritoides) adustus* from male and female imagos and *Ulmeritus patagiatus* from subimagos, that he did not assign to any subgenera. I have been able to rear for the first time a species of the subgenus *Ulmeritoides*, and based on its characteristics, plus the adult ones, I am here giving a new generic status to *Ulmeritoides*. I am redescribing the genera *Ulmeritus* and *Ulmeritoides* and including the synonymy of the known species of *Ulmeritus*. The new species and synonyms of *Ulmeritoides* will be described in another paper.

Genus *Ulmeritus* Traver

Ulmeritus Traver 1956: 2; Traver 1959: 4; Traver 1960: 24; Thew 1960: 126.

Imago. Length of male: body, 8.5-10 mm; fore wings, 9-10 mm; hind wings, 2-2.7 mm. Length of female: body, 9-9.7 mm; fore wings, 11-11.5 mm; hind wings, 2.2-2.4 mm. Eyes of male meeting or separated on meson of head, in lateral view lower portion 0.5-0.6 length of upper portion; eyes of female separated on meson of head by a length 4-4.5 times maximum width of lateral ocelli. Wings (figs. 1-2): maximum width of fore wings slightly more than 1/3 their maximum length; maximum width of hind wings slightly less than 2/3 their maximum length; maximum length of hind wings 1/5-1/4 maximum length of forewings. Vein Rs of fore wings forked around 1/5 distance from base of vein to margin (fig. 1), forming two triangles; vein MA forked at or slightly less than 1/2 distance from base of vein to margin, fork symmetrical, cross vein above fork in MA oblique; vein MP forked slightly less than 1/2 distance from base to margin, fork asymmetrical; vein ICu1 attached at base to vein CuA; vein ICu^2 attached at base to ICu^1 and CuP by cross veins. 127-154 cross veins; 8-15 basal to bulla, 13-17 distally; marginal intercalaries numerous along posterior margin of fore wings. Hind wings (fig. 2) with costal projection well developed, rounded, located slightly less than 1/3 distance from base to apex of wings. Vein MP forked; apex of wings broadly rounded; vein Sc 9/10 maximum length of hind wings; 30-55 cross veins present. Legs: ratios of segments in male fore legs, 0.8: 1.00 (2.5 mm): 0.05: 0.16: 0.15: 0.10: 0.11. Claws of a pair dissimilar, one apically hooked, the other blunt, pad-like. Male genitalia (fig. 3): maximum length of styliger plate approximately 1/3 of maximum width. Forceps segments II and III subequal and 1/6-1/5 length of segment I; segment I narrow and strongly curved with 1/6 basal strongly broadened. Penes divided from the base, apex of penis lobes rounded, each lobe with a digitiform ventral projection basally directed. Ninth sternum of female amply cleft apically. Terminal filament longer than cerci.

Mature nymph: Head prognathous. Antennae 2-2 1/2 times length of head. Mouthparts (figs. 7-14): lateral margins of clypeus nearly parallel, maximum width of labrum equal to slightly wider than maximum width of clypeus; length of labrum approximately 1/2 maximum width, lateral margins rounded (fig. 7); anteromedian emargination broad, deep and U-shaped with lateral margins almost straight, 5 shallow denticles present (fig. 8); a divided row of numerous long dorsal setae on basal 1/5 of labrum, short setae scattered on apical 4/5 of labrum, lateral and anterolateral margins lined with short setae. Outer margin of mandibles strongly and evenly curved, dense row of setae on apical 1/3 and a weak tuft of long setae at median area (fig. 11), incisors and prostheca of right mandible as in fig. 12. Maxillae (fig. 9): outer margin and dorsum of cardo with thick setae, stipes with thin, long setae on outer margin; a prominent tusk present on inner apical angle. Segments II and III of maxillary palpi subequal and approxi-

mately twice the length of segment I; setae on outer margin of segment I and long setae on segments II and III. Palpifer greatly enlarged; articulation of maxillary palpi in median area of galea-lacinia. Lingua of hypopharynx with well developed lateral processes, anterior margin with a median V-shaped cleft; superlinguae as in fig. 10. Segment I of labial palpi 5/6 length of segment II, segment III approximately 1/5 length of segment II; a row of thick setae (fig. 14) from the apex of segment II (4-6) to segment III (2); segment II elbowed with dorsal setae as in fig. 13; glossae straight, with short spines on anterior margin; paraglossae as in fig. 13; submentum with thick setae laterally. Anterolateral margins of pronotum with spines. Legs (fig. 15): trochanters with a row of spines on apico-dorsal surface; anterior femora with long and short setae along posterior (dorsal) margin and anterior area; tibiae with rows of plumose setae on basal 3/5 and apex of inner surface and a few setae along outer margins; tarsi with few setae along margins; apex of claws hooked and narrow, denticles progressively larger apically (fig. 16). Gills on segments I-VII fimbriate (similar to fig. 29), dorsal and ventral portions similar, progressively smaller posteriorly, trachea branched from the base . Posterolateral projections on abdominal segments VI-IX. Lateral margins of terga with short spines, posterior margins with small and large spines alternated (fig. 17). Terminal filament longer than cerci.

Eggs: Oval, with thread-like filaments as in figs. 30-31.

Type species: *Ulmeritus carbonelli* Traver, original designation.

DISCUSSION

Ulmeritus can be distinguished from all the other genera of Leptophlebiidae by the following combination of characters. In the imagos: 1) fork of vein MA symmetrical, with an oblique cross vein above fork; fork of vein MP asymmetrical (fig. 1); 2) vein MP of hind wings forked (fig. 2); 3) vein Sc 9/10 maximum length of hind wings; 4) penes divided from the base, apex of penis lobes rounded (fig. 3), each lobe with a digitiform ventral projection; 5) forceps segment I strongly broadened in the basal 1/6; 6) ninth sternum of female amply cleft apically. In the nymph: 1) setae on labrum in two rows (fig. 7); 2) anteromedian emargination of labrum with 5 shallow denticles (fig. 8); 3) outer margin of mandibles (fig. 11) with a dense row of setae on apical 1/3 and a weak tuft of long setae at median area; 4) a row of thick setae from apex of segment II to segment III of labial palpi (fig. 14); 5) abdominal gills fimbriate, trachea branched from the base (as in fig. 29).

Species included:

Ulmeritus balteatus Thew

Ulmeritus sp. Traver, 1956: 11.
Ulmeritus (Ulmeritus) balteatus Thew, 1960: 124; Hubbard, 1982: 268.

Distribution: Uruguay and Southeastern Brazil.

Discussion: This species is characterized by the ventral projections of penis shorter than in *U. carbonelli* and by the brown spots forming bands on the wings. I have studied nymphs and adults from the same localities and the gills are always grayish brown.

Ulmeritus carbonelli Traver

Ulmeritus carbonelli Traver, 1956:5; Thew, 1960: 123.
Ulmeritus (Ulmeritus) carbonelli, Traver, 1959: 5; Hubbard, 1982: 268.

Distribution: Uruguay and Northeastern Argentina.

Discussion: This species is characterized by the long ventral projections on the penes (fig. 3) and the spots on the the wings do not form bands (fig. 1-2). The gills are gray.

Ulmeritus haarupi (Esben-Petersen)

Thraulus haarupi Esben-Petersen, 1912: 337; Navás, 1917: 188.
Deleatidium haarupi, Ulmer, 1920: 115; Ulmer, 1938: 105; Ulmer, 1943: 15.
Atalophlebioides haarupi, Traver, 1946: 423.
Ulmeritus (Ulmeritus) haarupi, Traver, 1959: 5; Hubbard, 1982: 268.

Distribution: Northeastern Argentina.

Discussion: The description of this species was based on a single damaged female. Later Traver redescribed the species based on a female from Uruguay, but with several differences. Until we can obtain more material, especially males, we can not be sure about its characteristics.

Ulmeritus saopaulensis (Traver)

Atalophlebioides saopaulensis Traver, 1946: 424.
Ulmeritus saopaulensis, Traver, 1956: 12; Thew, 1960: 23.
Ulmeritus (Ulmeritus) saopaulensis, Traver, 1959: 6; Hubbard, 1982: 268.

Distribution: Brazil.

Discussion: This species is known from imagos of both sexes and is characterized by the ventral projections of the penes shorter than the ones of *U. carbonelli* and the spots do not form bands on the wings.

Genus ***Ulmeritoides*** Traver, New Status

Ulmeritus (Ulmeritoides) Traver, 1959: 8; Thew, 1960: 125.

Imago. Length of male: body, 8-10 mm; fore wings, 8-10 mm; hind wings,

1.6-2.7 mm. Length of female: body, 8-12 mm; fore wings, 11-12 mm; hind wings, 2.2-2.4 mm. Eyes of male meeting or separated on meson of head, in lateral view lower portion 0.5-0.6 length of upper portion; eyes of female separated on meson of head by a length 4 times maximum width of lateral ocelli. Wings (figs. 4-5): maximum width of fore wings slightly more to slightly less than 1/3 their maximum length; maximum width of hind wings slightly more than 3/5 their maximum length; maximum length of hind wings 1/5-1/4 maximum length of fore wings. Vein Rs of fore wings forked around 1/5 distance from base of vein to margin (fig. 4), forming two triangles; vein MA forked at or slightly less than 1/2 distance from base of vein to margin, fork symmetrical, cross vein above fork in MA oblique; vein MP forked slightly less than 1/2 distance from base to margin, fork asymmetrical; vein ICu^1 attached at base to vein CuA; vein ICu^2 attached at base to ICu^1 and CuP by cross veins. 100-120 cross veins; 7-13 basal to bulla, 10-20 distally; marginal intercalaries numerous along posterior margin of fore wings. Hind wings (fig. 5) with costal projection well developed, rounded, located slightly less to slightly more than 1/3 distance from base to apex of wings. Vein MP forked; apex of wings broadly rounded; vein Sc 6/10 maximum length of hind wings; 15-19 cross veins present. Legs: ratios of segments in male fore legs, 0.7: 1.00 (1.9 mm): 0.04: 0.22: 0.18: 0.10: 0.08. Claws of a pair dissimilar, one apically hooked, the other blunt, pad-like. Male genitalia (fig. 6): maximum length of styliger plate approximately 1/3 of maximum width. Forceps segments II 1/4 longer than segment III and 1/6-1/5 length of segment I; segment I narrow and strongly curved with 1/6 basal strongly broadened. Penes divided from the base, apex of penis lobes rather straight, with one or more spines. Ninth sternum of female amply cleft apically. Terminal filament longer than cerci.

Mature nymph: Head prognathous. Antennae 2-2 1/2 times length of head. Mouthparts (figs. 18-25): lateral margins of clypeus nearly parallel, maximum width of labrum equal to slightly wider than maximum width of clypeus; length of labrum between 1/2-1/3 maximum width, lateral margins rounded (fig. 18); anteromedian emargination broad, deep and U-shaped with lateral margins oblique, 5 denticles present, the medial one well developed (fig. 19); a continuous sinusoidal row of long dorsal setae on apical 1/3 of labrum, setae scattered on dorsum of labrum, lateral and anterolateral margins lined with strong setae. Outer margin of mandibles evenly curved, dense row of setae on apical 1/3, long setae on remainder of margin, longer in median area (fig. 22), incisors and prostheca of right mandible as in fig. 23. Maxillae (fig. 20): outer margin and dorsum of cardo with thick setae, stipes with thin, long setae on outer margin; a prominent tusk present on inner apical angle. Segments I and III of maxillary palpi subequal and approximately 1/3 the length of segment II; setae on outer margin of segment I and long setae on segments II and III. Palpifer enlarged; articulation of maxillary palpi in 3/4 apical area of galea - lacinia. Lingua of hypopharynx with well developed lateral processes, anterior margin with a median V-shaped cleft; superlinguae as in fig. 21. Segment I and II of labial palpi subequal,

segment III approximately 1/6 length of segment II; a row of thick setae (fig. 25) from the apex of segment II (4-6) to segment III (2); segment II elbowed with dorsal setae as in fig. 24; glossae straight, with short spines on anterior margin; paraglossae as in fig. 24; submentum with thick setae dorsal and laterally. Anterolateral margins of pronotum with spines. Legs (fig. 26): trochanters with a row of spines on apico-dorsal surface; anterior femora with long setae along posterior (dorsal) margin and some pointed and some plumose setae on anterior area; tibiae with a continuous row of plumose setae on inner surface; tarsi with thick setae along inner margin; apex of claws hooked and narrow, denticles progressively larger apically (fig. 27). Gills (fig. 29): gills on segments I-VII fimbriate, dorsal and ventral portions similar, progressively smaller posteriorly, trachea branched from the base. Posterolateral projections on abdominal segments VI-IX. Lateral margins of terga with short spines, posterior margins with spines and setae alternated (fig. 28). Terminal filament longer than cerci.

Eggs: Oval, with sculpture and filaments as in fig. 32-33.

Type species: *Ulmeritus (Ulmeritoides) uruguayensis* Traver, original designation.

Species included: *Ulmeritoides adustus* (Thew), *Ulmeritoides luteotinctus* (Traver), *Ulmeritoides patagiatus* (Thew), *Ulmeritoides uruguayensis* (Traver).

Discussion: The revision of the species of *Ulmeritoides* along with the discussion of the status of *U. (Pseudulmeritus) flavopedes* (Spieth) that is now transferred to this genus, will be published in a second paper of this study. *Ulmeritoides* can be distinguished from all the other genera of Leptophlebiidae by the following combination of characters. In the imagos: 1) fork of vein MA symmetrical, with an oblique cross vein above fork; fork of vein MP asymmetrical (fig. 4); 2) vein MP of hind wings forked (fig. 5); 3) vein Sc 6/10 maximum length of hind wings; 4) penes divided from the base, apex of penis lobes rather straight (fig. 6), with one or more spines; 5) forceps segment I strongly broadened in the basal 1/6; 6) ninth sternum of female amply cleft apically. In the nymph: 1) long setae on labrum in a continuous sinusoidal row (fig. 18); 2) anteromedian emargination of labrum with 5 denticles, the median one well developed (fig. 19); 3) outer margins of mandibles (fig. 22) with a dense row of setae on apical 1/3 and long setae on remainder of margin, longer in median area; 4) a row of thick setae from apex of segment II to segment III of labial palpi (fig. 25); 5) abdominal gills fimbriate, trachea branched from the base (fig. 29).

Phylogeny: *Ulmeritus* and *Ulmeritoides* are clearly sister groups. They have the following synapomorphies: 1) maxillary palpifer enlarged, 2) a row of thick setae from apex of segment II to segment III of labial palpi and 3) forceps segment I narrow, strongly curved and with a distinct swelling at basal 1/6. *Ulmeritoides* has as an autapomorphy the length of Sc 6/10 the length of hind wings. *Ulmeritus* has the following: 1) dorsal row of setae on basal 1/5 of labrum and 2) maxillary palpi articulated in median area of galea - lacinia. Grant (1985) proposed that the *Thraulus-Ulmeritus* group is a monophyletic group based on the existence of unique derived characters.

These characters are: 1) an oblique cross vein located between veins R^{4+5} and MA^1 apical to vein MA fork, 2) fork of MA symmetrical and 3) gills fimbriate. In the reconstruction of the phylogeny of the *Hermanella* complex, Flowers and Dominguez included several other genera in the cladogram. Although *Ulmeritus* and *Ulmeritoides* were not the subject of the study and therefore *Thraulus* was not included, they proved to be very stable and are gathered by the synapomorphies mentioned above. The phylogeny of the Atalophlebiinae is far from being resolved, mainly because its size, complexity and cosmopolitan distributions and for these reasons the phylogenetic reconstruction is being completed in parts by various scientists. This could lead to paraphyletism because the groups to be analyzed must be chosen in advance and normally it is impossible to determine the components of the monophyletic groups based on completed cladograms.

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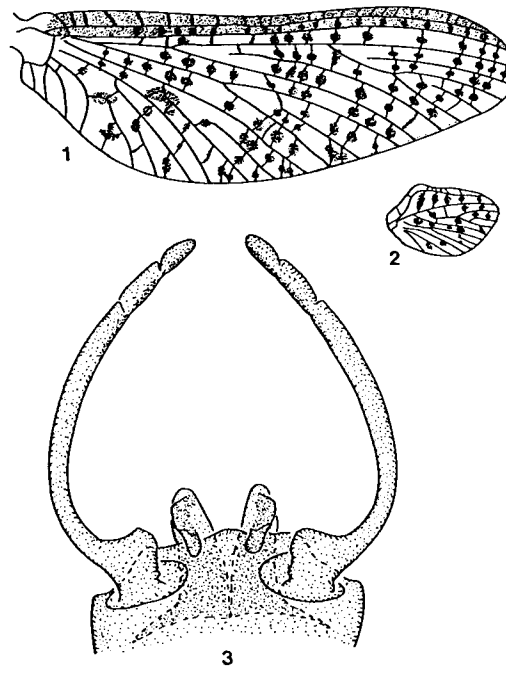
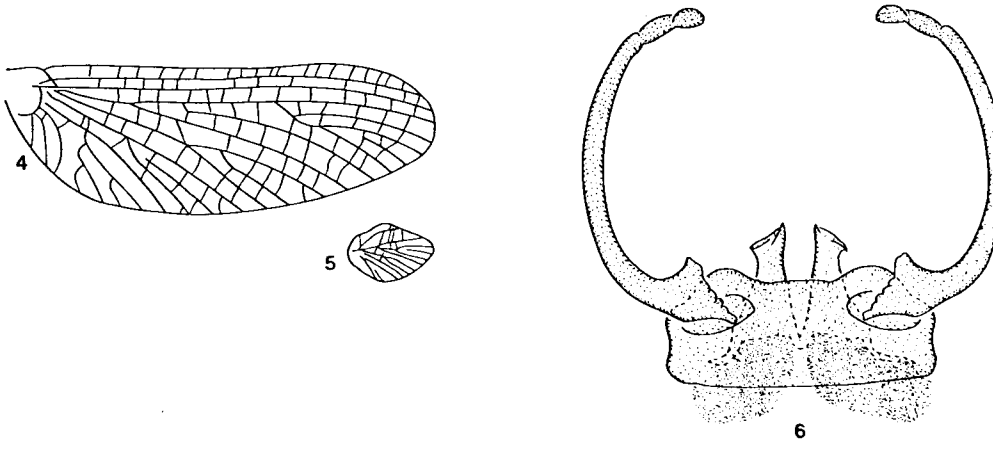
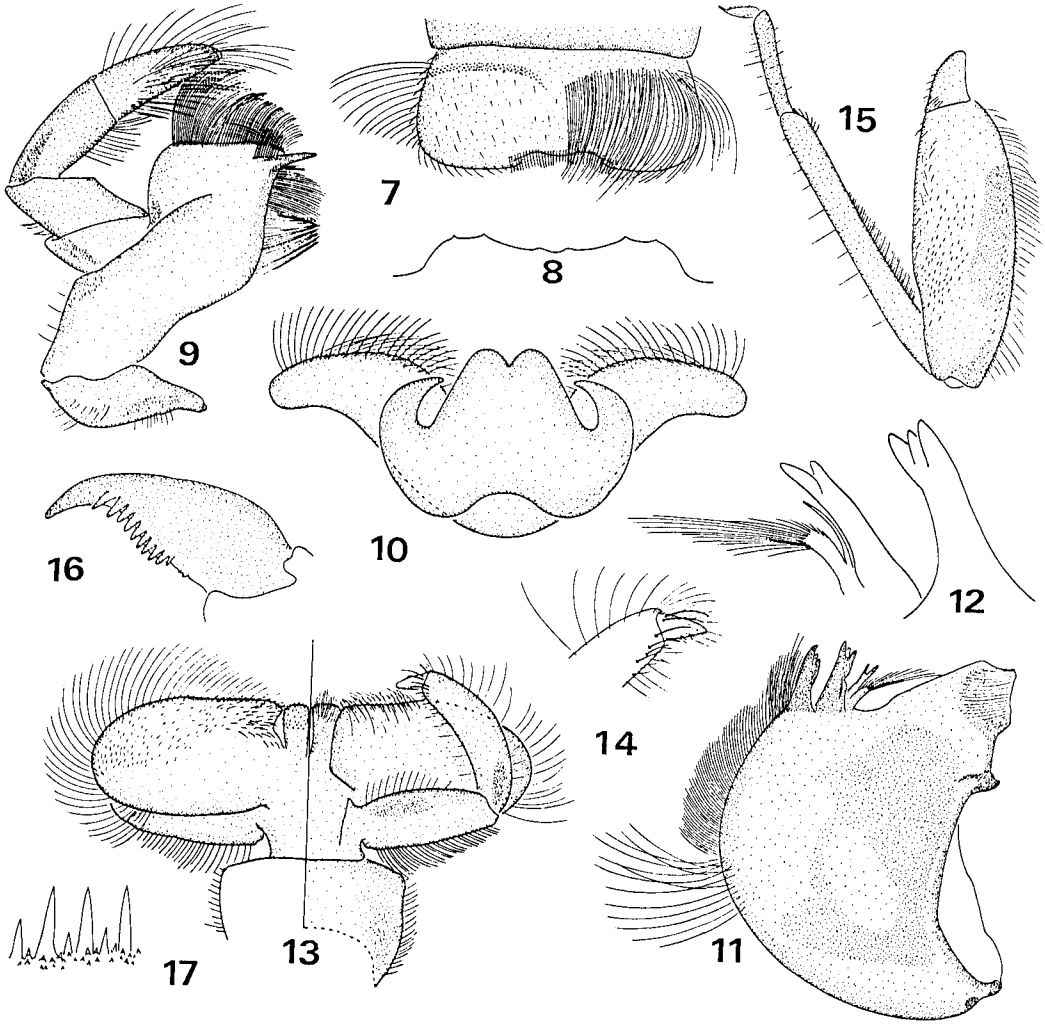


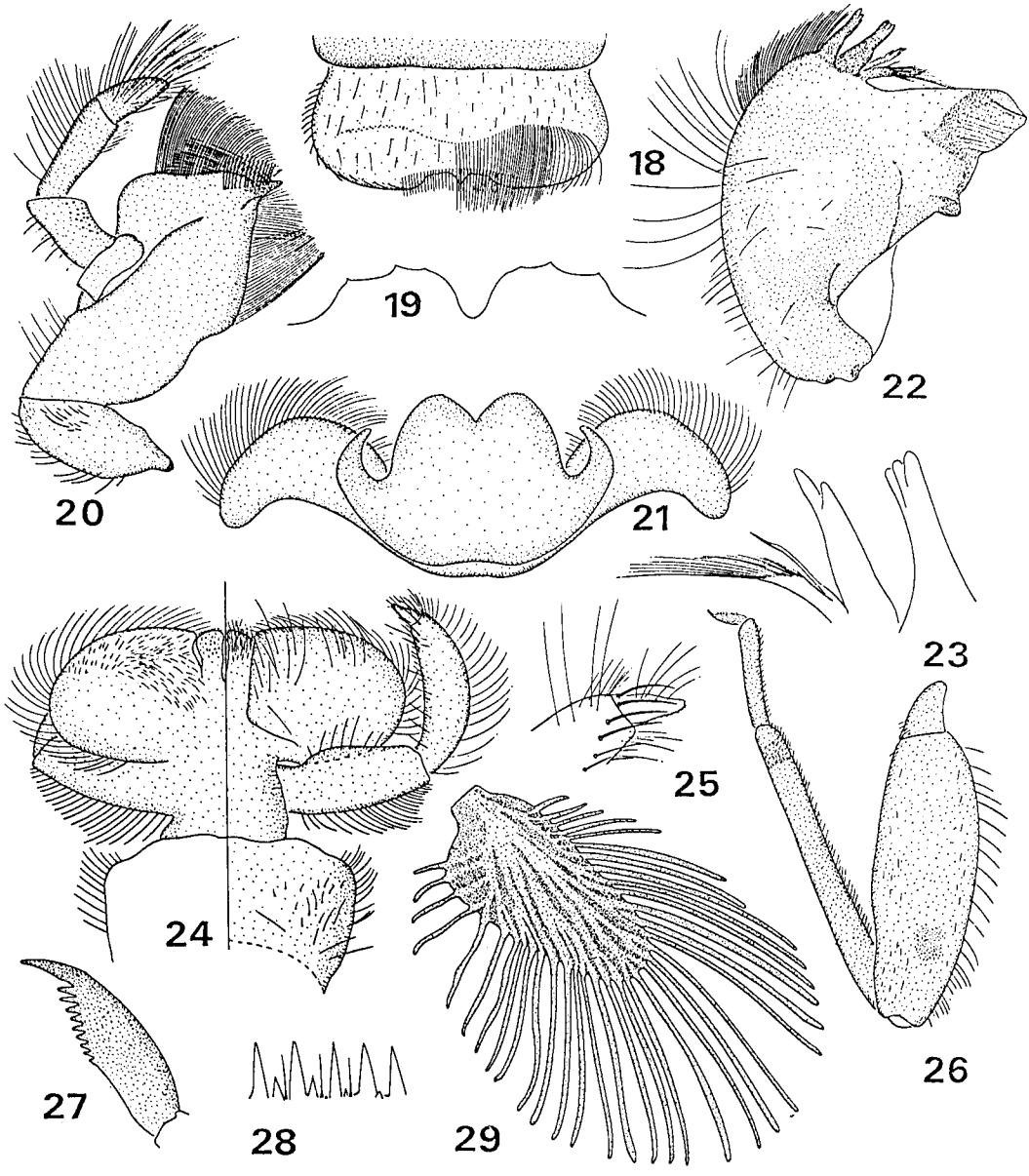
Figs. 1-3. Male imago of *Ulmeritus carbonelli*: 1, fore wing; 2, hind wing; 3, genitalia, ventral view.



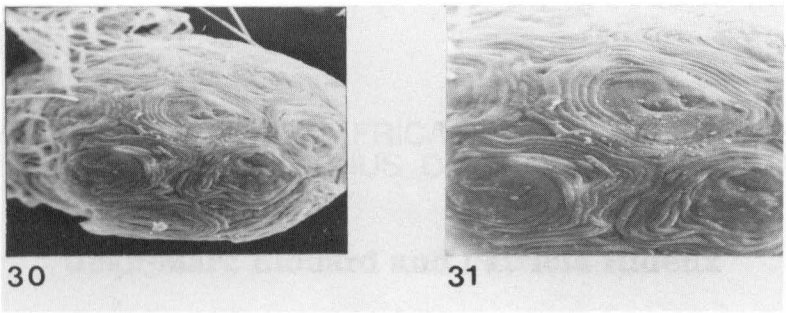
Figs. 4-6. Male imago of *Ulmeritoides uruguayensis*: 4, fore wing; 5, hind wing; 6, genitalia, ventral view.



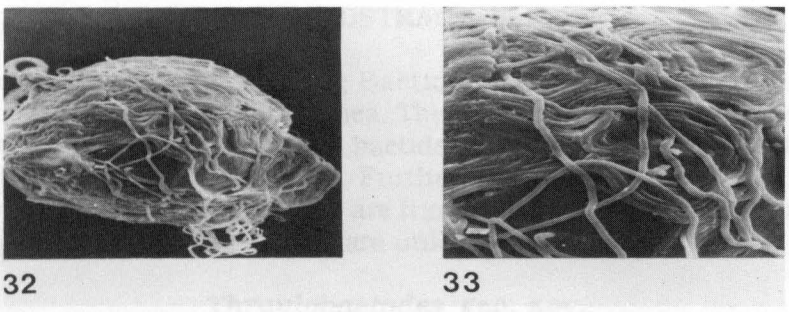
Figs. 7-17. Nymph of *Ulmeritus carbonelli*: 7, labrum dorsal; 8, detail of anteromedian emargination; 9, left maxilla; 10, hypopharynx; 11, left mandible; 12, detail incisors and prostheca of right mandible; 13, labium, (left dorsal, right ventral); 14, detail segment I labial palpi, dorsal; 15, leg I, dorsal; 16, tarsal claw; 17, posterior margin of tergum V.



Figs. 18-29. Nymph of *Ulmeritoides* sp. : 18, labrum dorsal; 19, detail of anteromedian emargination; 20, left maxilla; 21, hypopharynx; 22, left mandible; 23, detail incisors and prostheca of right mandible; 24, labium, (left dorsal, right ventral); 25, detail segment III labial palpi, dorsal; 26, leg I, dorsal; 27, tarsal claw; 28, posterior margin of tergum V; 29, gill 2.



Figs. 30-31. Eggs of *Ulmeritus carbonelli*: 30, general view, 600 X; 31, detail, 1.000 X.



Figs. 32-33. Eggs of *Ulmeritoides luteotinctus*: 32: general view, 440 X; 33, detail, 1.000 X.