



## The Family Baetidae (Insecta: Ephemeroptera) from Venezuelan Guayana's Uplands

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### Abstract

The family Baetidae is still poorly known from Venezuela, particularly in the South of this country. Three field trips were carried out in La Gran Sabana region (Bolívar State). As a result of these trips, four genera (*Cryptonympha*, *Harpagobaetis*, *Spiritiops* and *Zelus*) and nine species are reported for the first time from this region. A discussion of each taxon is included as well as drawings when it is necessary. Keys with all known genera of Baetidae and all known species of *Camelobaetidius* from Venezuela are included too. With this analysis, the number of the genera and species reported is duplicated improving the knowledge of this family from this country.

**Key words:** Baetidae, Venezuela, *Cryptonympha*, *Harpagobaetis*, *Spiritiops*, *Zelus*

### Resumen

La familia Baetidae es poco conocida en Venezuela, particularmente en el sur del país. Tres viajes fueron realizados en región de La Gran Sabana (Estado Bolívar). Como resultado de estos viajes, cuatro géneros (*Cryptonympha*, *Harpagobaetis*, *Spiritiops* y *Zelus*) y nueve especies son reportadas por primera vez para esta región. Una discusión para cada taxón es incluida, así como también dibujos cuando es necesario. Son incluidas también para Venezuela, una clave para todos los géneros de Baetidae y otra clave para todas las especies de *Camelobaetidius*. Con este trabajo, el número de géneros y especies reportadas se duplica mejorando el conocimiento de la **esta** familia para este país.

**Palabras claves.** Baetidae, Venezuela, *Cryptonympha*, *Harpagobaetis*, *Spiritiops*, *Zelus*

### Introduction

The knowledge of Ephemeroptera, and especially the family Baetidae, is still poor in Venezuela. Particularly, little work has been done on the Ephemeroptera fauna from Guyana Shield region, in southern Venezuela, where a very high endemism is expected (Domínguez *et al.* 2006), because this area is one of the largest biodiversity and endemism reserves in the world (Huber 1995). In 2003, Segnini *et al.* reported for Venezuela six species of Baetidae, belonging to three genera, five of them known from adults and one from nymph. In 2009, Chacón *et al.* reported the same species although some of them have changed its taxonomic status. Finally, Chacón *et al.* (2010) described a new species of *Prebaetodes* Lugo-Ortiz & McCafferty, reporting for the first time this genus from this country. This work is the result of three field trips carried out in La Gran Sabana region (Bolívar State), an undulating elevated plateau (750–1450 m), grass-dominated, localized in the Canaima National Park, in southern Venezuela. Two trips were carried out at the end and the beginning of the rainy season, in November 2005 and June 2007, respectively. One more trip was made during the dry season in March 2006.

The main objective of this paper is to report for the first time four genera from Venezuela: *Cryptonympha*, *Harpagobaetis*, *Spiritiops* and *Zelusia* and nine species: *Baetodes proiactus*; *Camelobaetidius billi*; *C. janae*; *C. leentvaari*; *C. mathuriae*; *Cryptonympha copiosa*; *Harpagobaetis gulosus*; *Spiritiops silvudus*; *Zelusia principalis*. Moreover, discussion of each taxon is included as well as drawings when it is necessary.

## Material and methods

The material was collected from numerous rivers through the eastern part of the Canaima National Park, Gran Sabana region (Bolívar state), southern Venezuela (Fig. 1). The Gran Sabana is an undulating plain grass-dominated upland savanna covering close to 18 000 km<sup>2</sup>, with altitudes ranging from about 750 to 1450 m (Huber 1995). Most of the Gran Sabana uplands have a humid submontane climate, with average annual temperatures ranging between 18 and 24°C, average annual rainfall between 2 000 and 3 000 mm, and a short dry season occurring from December to March (Huber 1995). It is located in the area of influence of the lower Orinoco River Basin and upper Caroní River Basin (Venezuelan part of the igneous metamorphic Guyana Shield), with numerous watercourses present in the area, most of them black-water rivers with very acidic and low mineral waters (Huber 1995).

Nymphs were collected from all submerged substrates or microhabitats (stones, gravels, bed-rocks, macrophytes, leafs, woody debris and trailing vegetation) in selected sections of each river by manually picking the specimens or using a D-net.

Dissected parts of the specimens studied were mounted on microscope slides using Canada Balsam as mounting media. All the material is preserved in ethyl alcohol 75°-96°. Line drawings were done using a camera lucida attached to a microscope. Pictures were taken using a NIKON SMZ-10 stereomicroscope or a microscope, with a Nikon D5000 digital camera. For some of the pictures a series of partially focused images were processed with the program Combine ZP to produce final images with enhanced quality.

Collectors are abbreviated as follows: EG (Edmundo Guerrero), Ana-María Oliveira Pes (AMO), María-Eugenia Grillet (MEG), Carlos Augusto da Silva Azevedo (CA). The specimens are deposited in: 1) MLBV, the Invertebrate Collection of Laboratorio de Biología de Vectores (Instituto de Zoología y Ecología Tropical, Universidad Central de Venezuela, Caracas) and 2) IML (Instituto M. Lillo, UNT, Tucumán).

## Key to the nymphs of Venezuelan Baetidae (modified from Domínguez *et al.* 2006)

- |      |   |                        |
|------|---|------------------------|
| 1    | Tarsal claws spatulated (Fig. 24) . . . . .   | <i>Camelobaetidius</i> |
|      | Tarsal claws pointed towards the apex (Fig. 64) . . . . .   | 2                      |
| 2(1) | Gills on abdominal segments I–V . . . . .   | <i>Baetodes</i>        |
|      | Gills on abdominal segments I–VII or II–VII . . . . .   | 3                      |
| 3(2) | Tarsal claws with 1 or 2 strong setae on the base of subapical denticle of the external margin (Figs. 64) . . . . .   | 4                      |
|      | Tarsal claws without strong setae (Fig. 74) . . . . .   | 5                      |
| 4(3) | Tarsal claws with 2 rows of denticles (Fig. 64); hind wing pads well developed; terminal filament $\geq 0.5$ the length of cerci . . . . .  | <i>Spiritiops</i>      |
|      | Tarsal claws with 1 row of denticles; hind wing pads if present rudimentary; terminal filament $< 0.25$ the length of cerci . . . . .   | <i>Prebaetodes</i>     |
| 5(4) | Tarsal claws without denticles; tibiae with an arc of long setae basally (Fig. 45C, Domínguez <i>et al.</i> 2006) . . . . .   | <i>Cloeodes</i>        |
|      | Tarsal claws with denticles although can be small (Figs. 64, 74); tibiae without an arc of long setae (Fig. 63) . . . . .   | 6                      |
| 6(5) | Mandibles long and broad with very broad and protruding molar region (Figs. 49D–G, Domínguez <i>et al.</i> 2006); maxillary canines strongly protruding, the second one half the length of the others (carnivorous kind) (Fig. 49K, Domínguez <i>et al.</i> 2006) . . . . . | <i>Harpagobaetis</i>   |
|      | Mandibles rather triangular, molar region wide and not protruding (Figs. 9–10); maxillary canines normal and subequal in length (herbivorous kind) (Fig. 12) . . . . .  | 7                      |
| 7(6) | Gills present on abdominal segments II–VII; right mandible with prosthema bifid and without transverse seta (Fig. 69) . . . . .   | <i>Zelusia</i>         |
|      | Gills present on abdominal segments I–VII; right mandible with prosthema robust and with a bipectinate transverse seta (Figs. 46D–E, Domínguez <i>et al.</i> 2006) . . . . .  | <i>Cryptonympha</i>    |

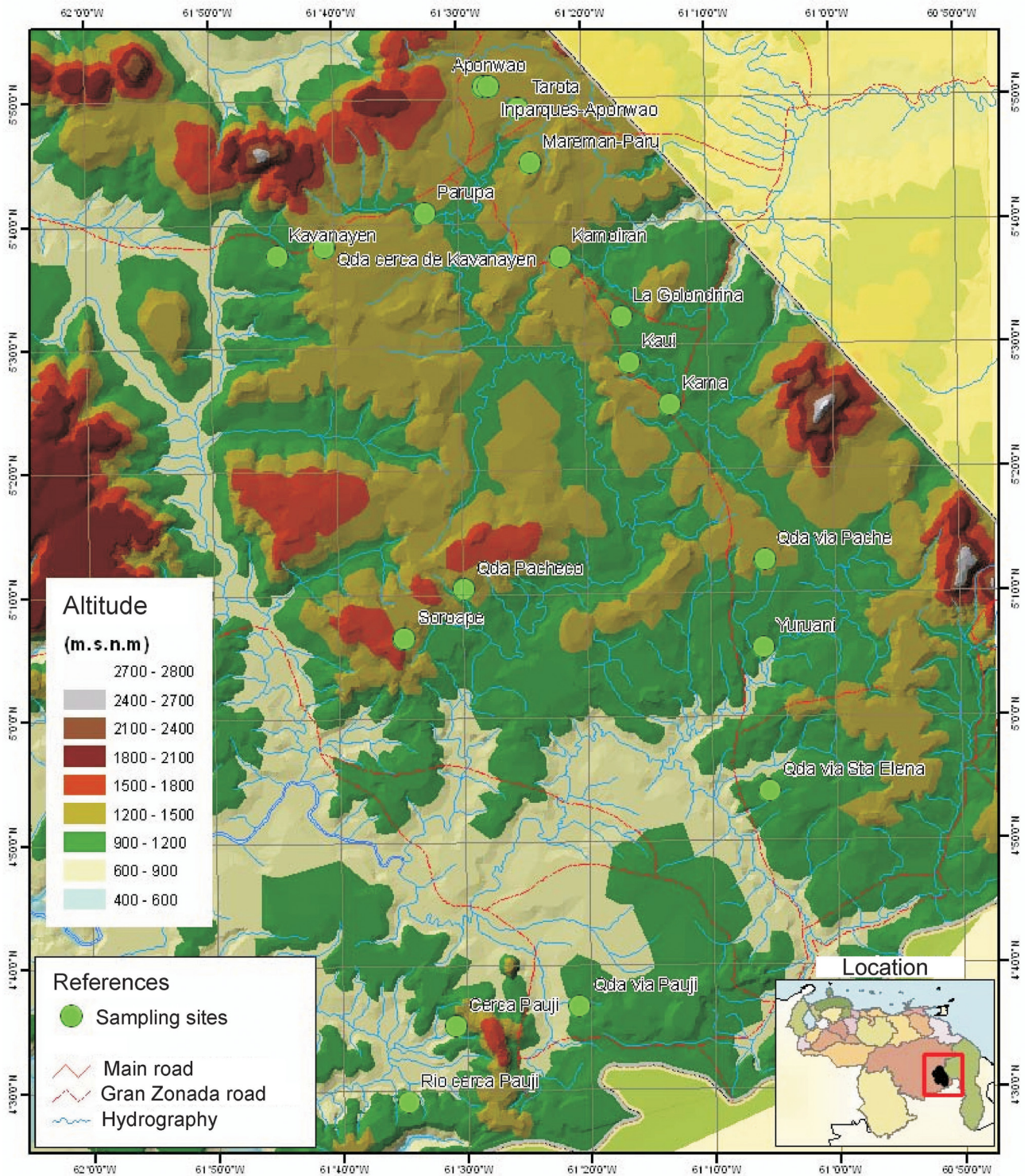


FIGURE 1. Map. Sampling sites, Gran Sabana, Canaima National Park, Bolívar State, Venezuela.

### *Baetodes* Needham & Murphy 1924

This genus, originally described by Needham & Murphy (1924) from Brazil, is the most species-rich genus in the Neotropics. *Baetodes* is distributed from Arizona to Argentina, including more than forty species (Edmunds, 1950, Demoulin, 1955, Mayo, 1968, 1972 & 1973, Cohen & Allen, 1972, 1978, Koss, 1972, Flowers 1987, McCafferty & Provonsha, 1993, Lugo-Ortiz & McCafferty, 1995, Nieto, 2004 and Salles & Polegatto, 2008). Three spe-

cies were described from Venezuela, two of them from adults: *Baetodes arawak* (Traver) and *Baetodes spinifer* Traver and one from nymphs: *Baetodes peniculus* Mayo. Herein, *Baetodes proiectus* Mayo is firstly reported.

### ***Baetodes proiectus* Mayo 1973**

(Figs. 2, 8–16)

**Taxonomy.** This species, described based on nymphs from Bolivia, can be distinguished from the other species of the genus by the following combination of characters: 1) two finger-like gills on each coxa (Fig. 14); 2) abdominal terga with tubercles posteromedially (Fig. 2); 3) labrum with dorsal surface with a subapical row of 7–9 spine-like setae near midline, alternating one long and one short (Fig. 8a), anterior margin with bipectinate setae (Fig. 8b); 4) hypopharynx with lingua subequal to superlinguae (Fig. 11); 5) maxillae with palpi subequal to galea-lacinia (Fig. 12); 6) labium with glossae shorter than paraglossae (Fig. 13); 7) dorsal edge of femora with 7–8 setae (Fig. 14); 8) tarsal claws with 8–9 denticles (Fig. 15); 9) paraprocts as in Fig. 16.

**Variation.** The original description mention pronotum and metanotum with tubercles. Some nymphs examined have tubercles clearly defined, while others not.

**Distribution.** Bolivia and Venezuela.

**Material examined.** 35 nymphs: Tarotá river, 5° 49' 15" N, 61° 25' W, 1324 m, 27/ 6/ 2007, EG, AMO, CA and MEG cols.; 5 nymphs same locality except EG, AMO, and MEG cols., 18/3/2006. Four nymphs: river close to Paují locality, 4° 29' N, 61° 34' W, 917 m, 17/ 3/ 2006, EG, AMO, and MEG cols. Six nymphs: Kaimorán river, 5° 37' N; 61° 21' W, 1313 m, 29/ 6/ 2007, EG, AMO, CA and MEG cols. One nymph: Aponwao river, 5° 51' N; 61° 27' W, 1340 m, 18/ 3/ 2006, EG, AMO, and MEG cols. One nymph: Kako-Parú stream, 4° 54' N, 61° 05' W, 913 m, 21/ 3/ 2006, EG, AMO, and MEG cols. One nymph: stream close to Paují locality, 4° 36' N, 61° 05' W; 942 m, 17/ 3/ 2006, EG, AMO, and MEG cols. One nymph: Maramán-Parú river, 5° 44' N, 61° 24' W; 1308 m, 28/ 6/ 2007, EG, AMO, CA and MEG cols. Material housed at IML except 10 nymphs housed at MLBV.

### ***Camelobaetidius* Demoulin 1966**

The genus *Camelobaetidius*, originally described by Demoulin in 1966, is one of the most species rich genera in Neotropics (Domínguez *et al.* 2006). In Venezuela, only *Camelobaetidius alcyoneus* (Traver) was described (Chacón *et al.* 2009). Here, four species are reported from Venezuela.

#### **Key to the nymphs of Venezuelan *Camelobaetidius* (modified from Domínguez *et al.* 2006)**

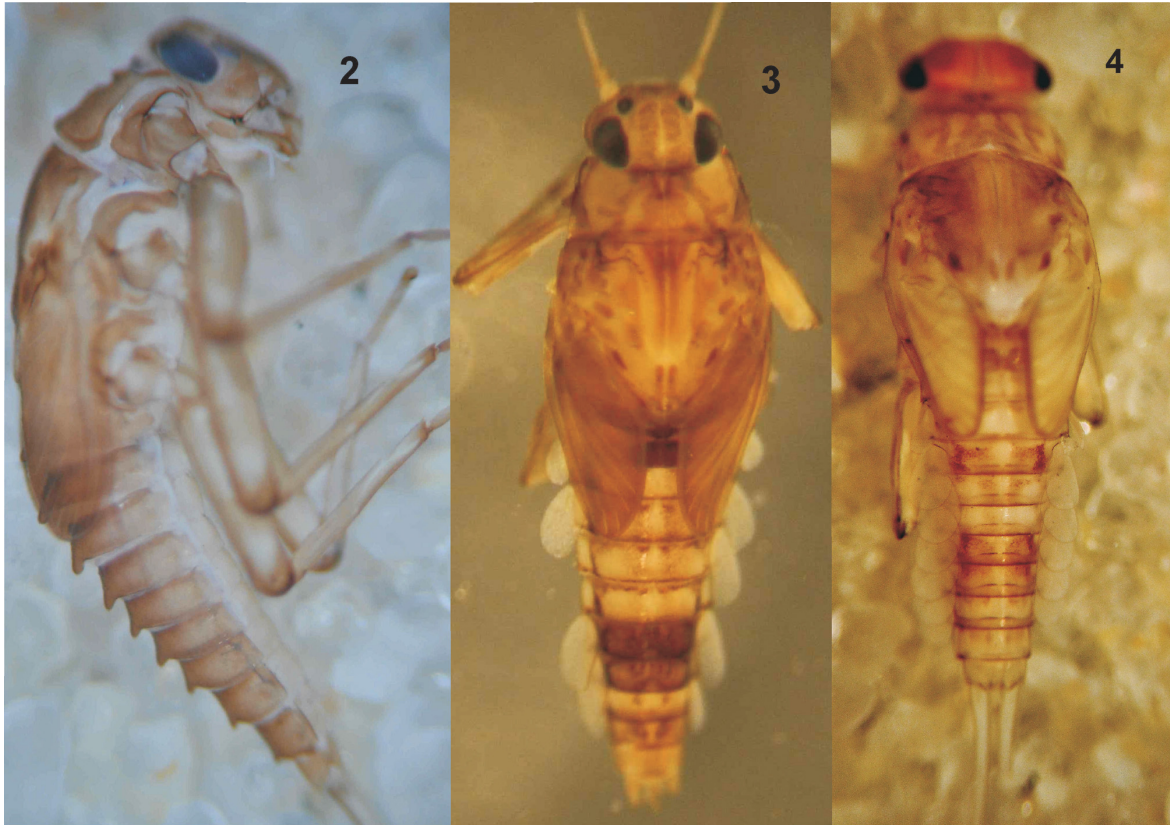
- 1 Femur I with a tubercle on ventral margin at base (Fig. 43); apical margin of tibia with an excavation and a patch of short spines (Fig. 43) ..... *Camelobaetidius leentvaari*
- Femur I without tubercles on ventral margin (Fig. 53); apical margin of tibia without excavation or patch of spines ..... 2
- 2 (1) Coxal gills absent (Fig. 33); maxillae with segment II of palpi bifid (Fig. 31) ..... *Camelobaetidius janae*
- Coxal gills present (Fig. 53); maxillae with segment II of palpi simple (Fig. 21) ..... 3
- 3 (2) Terminal filament short, subequal in length to abdominal segment X (Fig. 3); segment II of labial palpi rounded medially (Figs. 22a and b); tarsal claws with 30–31 denticles (Fig. 24) ..... *Camelobaetidius billi*
- Terminal filament long, subequal in length to cerci (Fig. 5); segment II of labial palpi with a bluntly rounded distomedial projection (Fig. 52); tarsal claws with 25 to 28 denticles (Fig. 54) ..... *Camelobaetidius mathuriae*

### ***Camelobaetidius billi* Thomas & Dominique in Dominique *et al.* 2000**

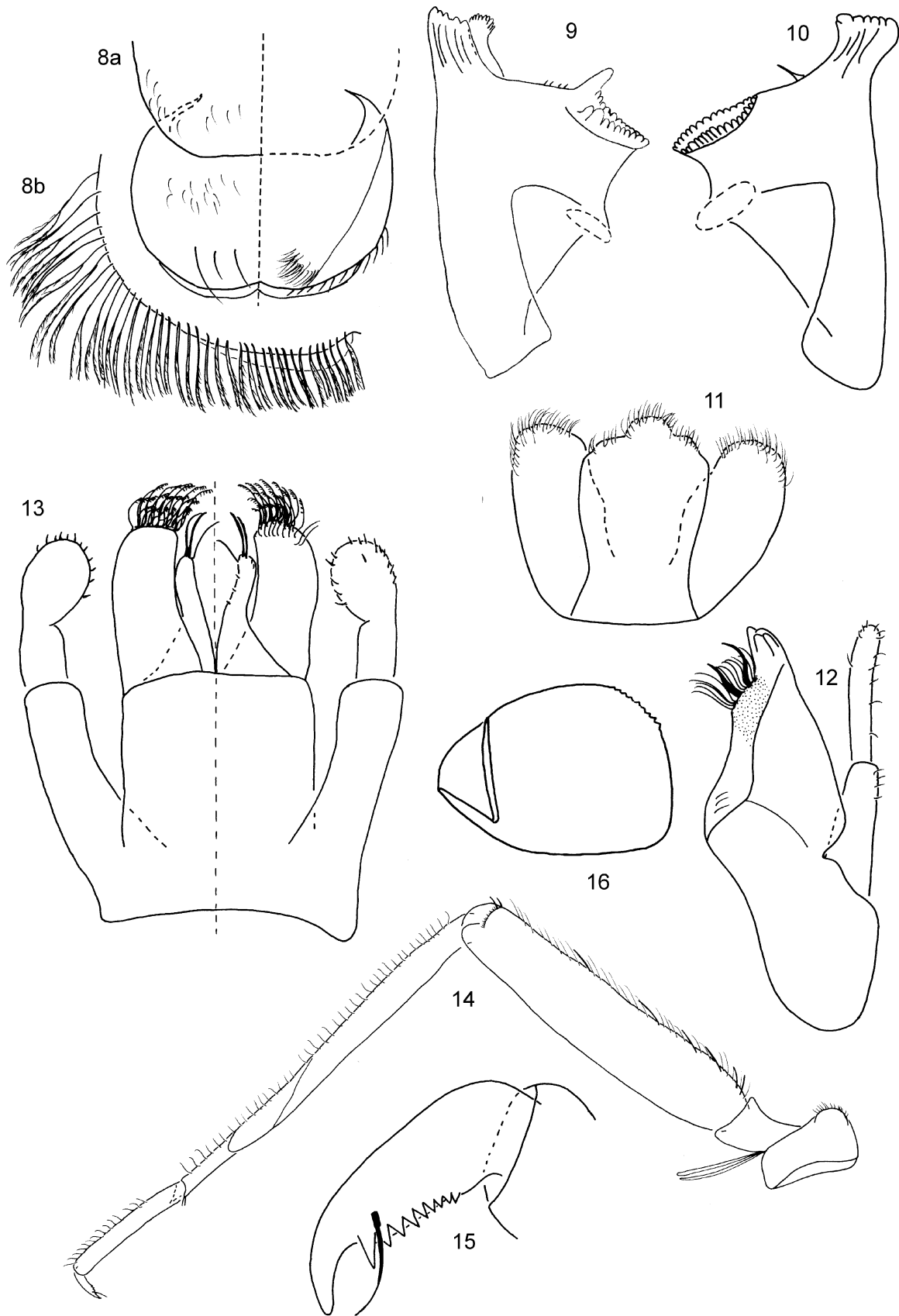
(Figs. 3, 17–26)

**Taxonomy.** The specimens collected in Venezuela, only nymphs, have a particular color pattern in the abdominal terga, with segments I and VI–VII brownish, the other segments yellowish as in Fig. 2. The original description did not mention this coloration. However the other characters are similar so we consider these specimens as belonging to *Camelobaetidius billi*.

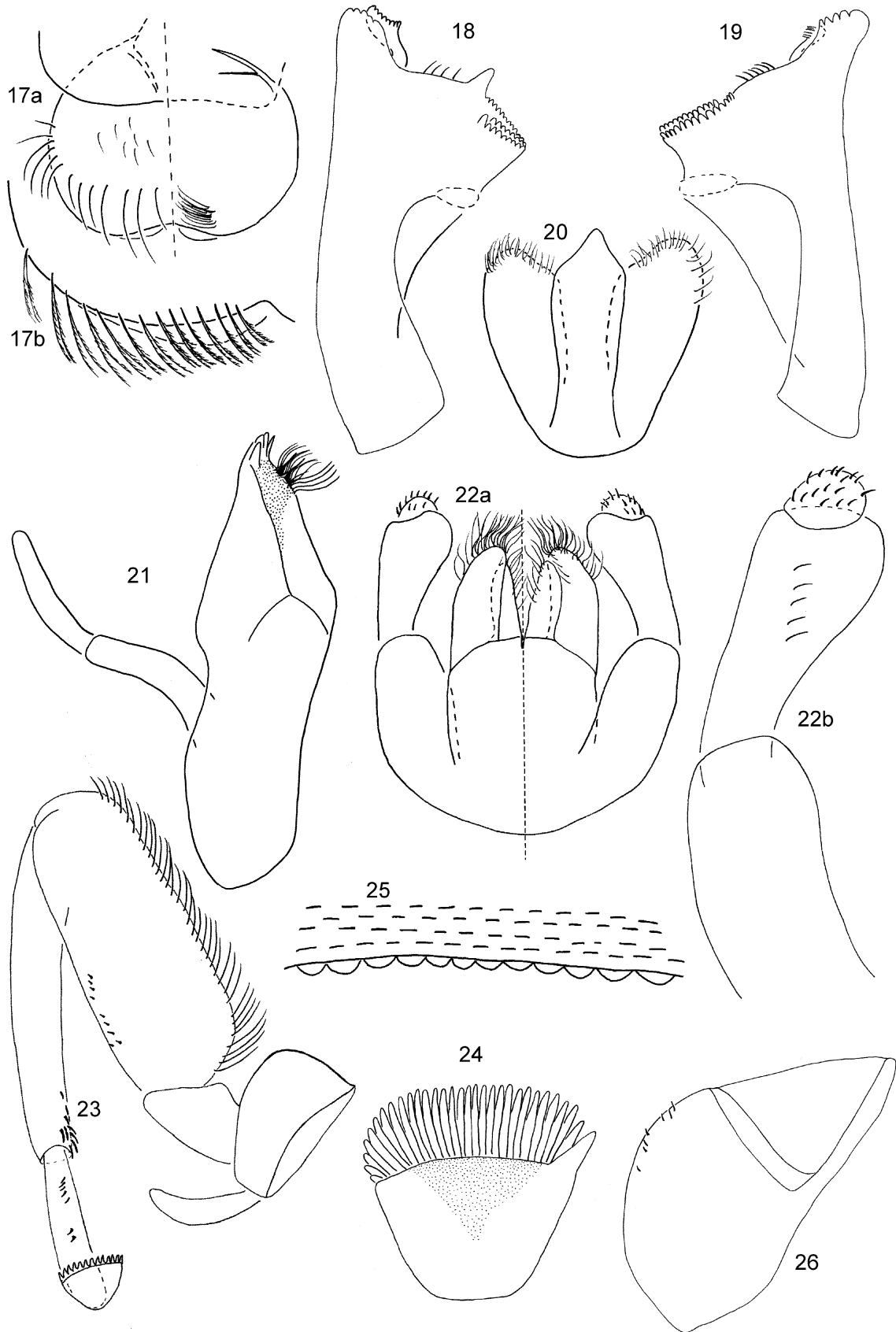




**FIGURES 2–7.** Nymphs, dorsal habitus. 2, *Baetodes proiectus*. 3, *Camelobaetidium billi*. 4, *Camelobaetidium leentvaari*. 5, *Camelobaetidium mathuriae*. 6, *Harpagobaetis gulosus*. 7, *Spiritiops silvudus*.



**FIGURES 8–16.** *Baetodes proiectus*. Nymph. Mouthparts (Figs. 8–13): 8a, labrum, left d.v., right v.v.; 8b, labrum, anterior margin; 9, left mandible v.v.; 10, right mandible v.v.; 11, hypopharynx v.v.; 12, maxilla v.v.; 13, labium, left v.v., right d.v. 14, leg I; 15, tarsal claw I. 16, paraproct.



**FIGURES 17–26.** *Camelobaetidius billi*. Nymph. Mouthparts (Figs. 17–22): 17a, labrum, left d.v., right v.v.; 17b, labrum, anterior margin; 18, left mandible v.v.; 19, right mandible v.v.; 20, hypopharynx v.v.; 21, maxilla v.v.; 22a, labium, left v.v., right d.v.; 22b, labial palp. 23, leg I; 24, tarsal claw I. 25, posterior margin of tergum IV. 26, paraproct.

This species, described based on nymphs and adults, can be distinguished from the other species of the genus by the following combination of characters, in the adults: 1) abdominal color pattern with spots frequently on segments V–VI; 2) basal segment of forceps short, as long as wide, segment II slightly curved; 3) hind wings with posterior margin convex and with two longitudinal veins. In the nymphs: 1) labrum, dorsally with a subapical row of long setae (Fig. 17a), anterior margin with bipectinate setae (Fig. 17b); 2) mandibles with setae between prostheca and mola (Figs. 18–19); 3) lingua longer than superlinguae (Fig. 20); 4) maxillary palpi subequal to galea-lacinia (Fig. 21); 5) segment II of labial palpi rounded medially (Figs. 22 a and b); 6) coxal gills shorter than coxa (Fig. 23); 7) tarsal claws with 30–31 denticles (Fig. 24); 8) posterior margin of abdominal terga with rounded projections (Fig. 25); 9) abdominal gills whitish; 10) paraproct as in Fig. 26; 12) terminal filament subequal in length to abdominal segment X.

**Distribution.** Brazil, French Guiana, Venezuela.

**Material examined.** One nymph: Maremán-Parú river, 5° 44' N, 61° 24' W, 1308 m, 23/ 11/ 2005, EG, AMO, CA and MEG cols.; 6 nymphs same locality and same collectors, 28/ 6/ 2007; 2 nymphs, same locality, 19/ 3/ 2006, EG, AMO, and MEG cols. Two nymphs: river close to Paují locality, 4° 29' N, 61° 34' W; 917 m, 17/ 3/ 2006, EG, AMO, and MEG cols. 7 nymphs: Kako-Parú stream, 5° 12' N, 61° 05' W; 1194 m, 24/ 11/ 2005, EG, AMO, CA and MEG cols.; 2 nymphs same locality, 20/ 3/ 2006, EG, AMO, and MEG cols. Three nymphs: Soroape river, 5° 06' N; 61° 34' W, 935 m, 25/ 11/ 2005, EG, AMO, CA and MEG cols. Two nymphs: Kamoirán river, 5° 37' N; 61° 21' W, 1313 m, 20/ 3/ 2006, EG, AMO, and MEG cols. Material housed at IML except 5 nymphs housed at MLBV.

### ***Camelobaetidius janae* Dominique & Thomas in Dominique *et al.* 2000**

(Figs. 27–36)

**Taxonomy.** This species, described based on nymphs, can be distinguished from the other species of the genus by the following combination of characters: 1) labrum with 2 subapical setae near midline and 3–4 setae near lateral margin (Fig. 27); 2) left mandible without setae between prostheca and mola (Fig. 28), right mandible with setae between prostheca and mola (Fig. 29); 3) lingua subequal to superlingua and rounded apically (Fig. 30); 4) maxillary palpi bifid (Fig. 31); 5) segment II of labial palpi with a rounded distomedial projection (Fig. 32); 6) coxal gills absent (Fig. 33); 7) tarsal claws with 21–25 denticles (Fig. 34); 8) posterior margin of terga with rounded projections (Fig. 35); 9) posterior margin of paraproct with 3–4 spines (Fig. 36); 10) terminal filament subequal in length to cerci.

**Distribution.** Brazil, French Guiana and Venezuela.

**Material examined.** One nymph: Yuruaní river, 5° 5' N, 61° 5' W, 880 m, 25/ 11/ 2005, EG, AMO, CA and MEG cols. Material housed at IML.

### ***Camelobaetidius leentvaari* Demoulin 1966**

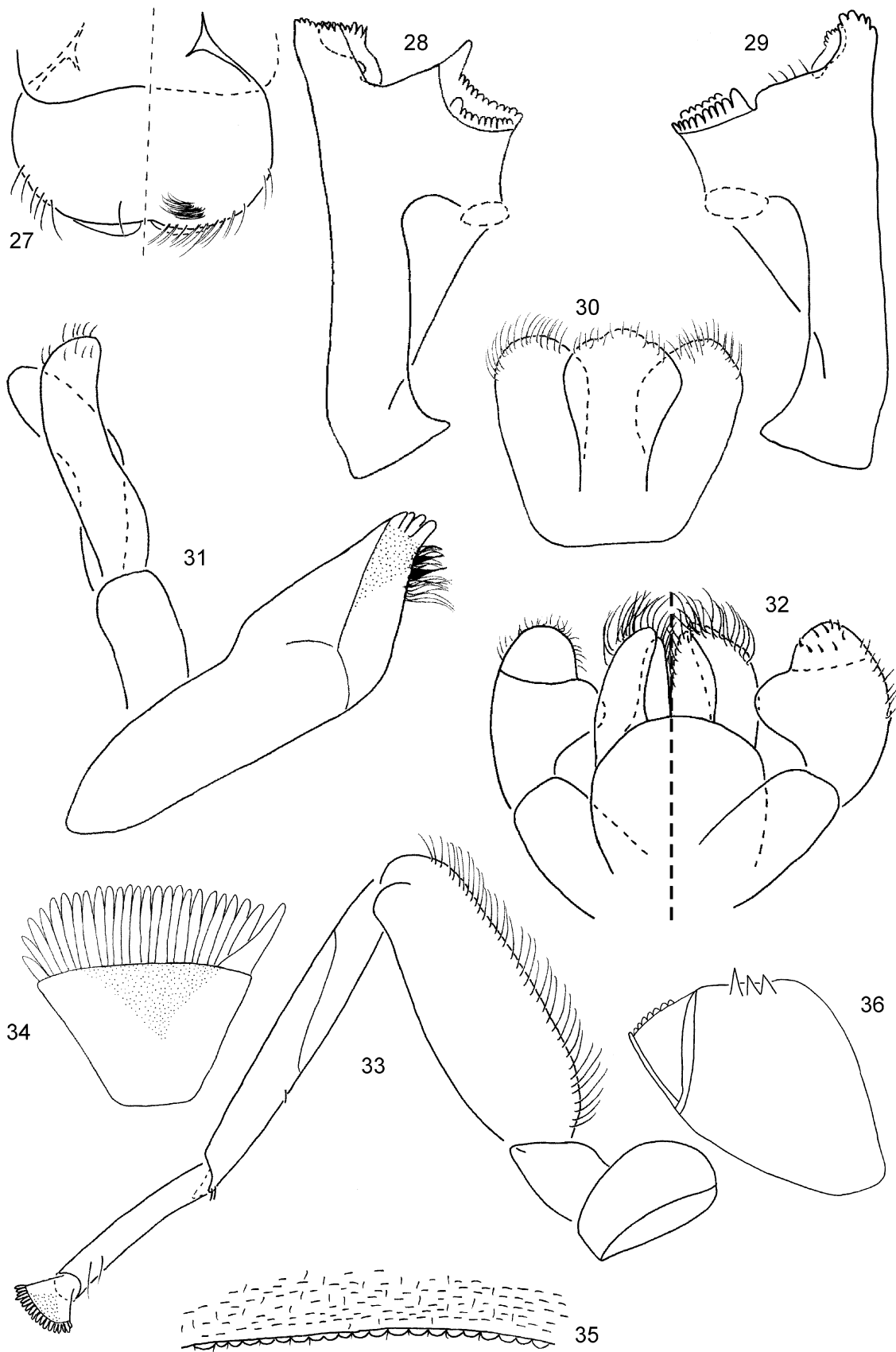
(Figs. 4, 37–46)

**Taxonomy.** The specimens collected here are placed in *C. leentvaari*, presenting a single difference: tarsal claws with 28 denticles instead of 17–23. This species can be distinguished from the other species of the genus by the following combination of characters: 1) labrum, dorsally with a subapical row of setae (Fig. 37); 2) mandibles with setae between prosthecae and molae (Figs. 38–39); 3) lingua subequal to superlinguae (Fig. 40); 4) maxillary palpi shorter than galea-lacinia (Fig. 41); 5) segment II of labial palpi rounded (Figs. 42 a and b); 6) coxal gills small; 7) prosternum with single, medial protuberance; 8) femur I with a tubercle on ventral margin (Fig. 43); 9) apical margin of tibia with an excavation and a patch of short spines (Fig. 43); 10) tarsal claws with 17–28 denticles (Fig. 44); 11) posterior margin of terga with rounded projections (Fig. 45); 12) paraprocts as in Fig. 46; 14) terminal filament subequal in length to abdominal segment X.

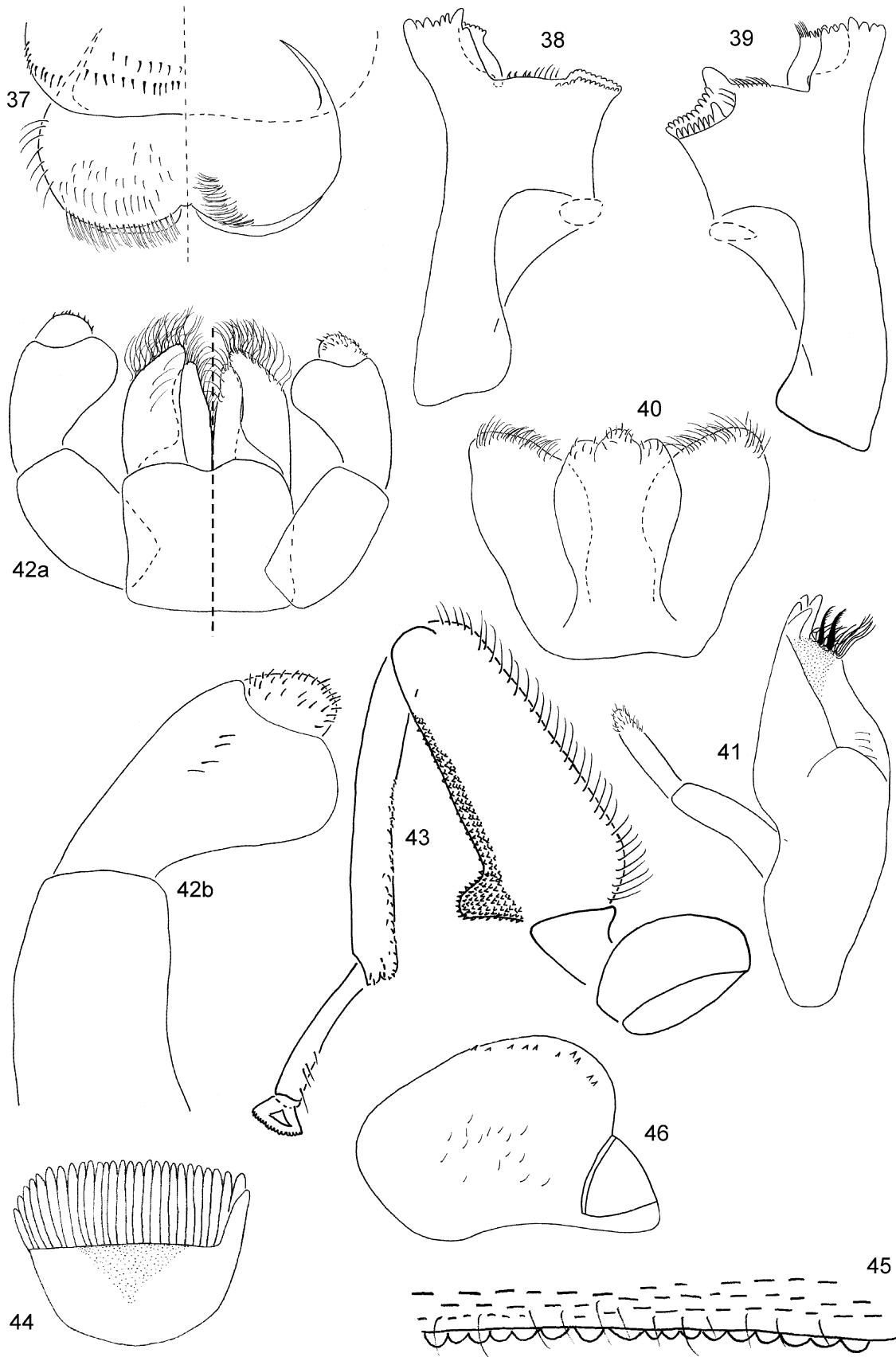
**Distribution.** Brazil, Surinam and Venezuela.

**Material examined.** Two nymphs: Kamoirán river, 5° 37' N, 61° 21' W, 1313 m, 20/ 03/ 2006, EG, AMO, and MEG cols. Material housed at IML.





**FIGURES 27–36.** *Camelobaetidius janae*. Nymph. Mouthparts (Figs. 27–32): 27, labrum, left d.v., right v.v.; 28, left mandible v.v.; 29, right mandible v.v.; 30, hypopharynx v.v.; 31, maxilla v.v.; 32, labium, left v.v., right d.v. 33, leg I; 34, tarsal claw I. 35, posterior margin of tergum IV. 36, paraproct.



**FIGURES 37–46.** *Camelobaetidius leentvari*. Nymph. Mouthparts (Figs. 37–42): 37, labrum, left d.v., right v.v.; 38, left mandible v.v.; 39, right mandible v.v.; 40, hypopharynx v.v.; 41, maxilla v.v.; 42a, labium, left v.v., right d.v.; 42b, labial palp. 43, leg I; 44, tarsal claw I. 45, posterior margin of tergum IV. 46, paraproct.

### ***Camelobaetidium mathuriae* Dominique & Thomas in Dominique *et al.* 2001**

(Figs. 5, 47–56)

**Taxonomy.** This species, described based on nymphs, can be distinguished from the other species of the genus by the following combination of characters: 1) labrum with 2 subapical setae near midline and 3–4 setae near lateral margin (Fig. 47a), apical margin with bipectinate setae (Fig. 47b); 2) left mandible without setae between prostheca and mola (Fig. 48), right mandible with setae between prostheca and mola (Fig. 49); 3) lingua slightly longer than superlinguae (Fig. 50); 4) maxillary palpi subequal in length to galea-lacinia, segment II with a medial projection (Fig. 51); 5) segment II of labial palpi with a bluntly rounded distomedial projection (Fig. 52); 6) coxal gills short (Fig. 53); 7) tarsal claws with 24–28 denticles (Fig. 54); 8) posterior margin of terga with rounded projections; 9) paraprocts as in Fig. 56; 10) terminal filament subequal in length to cerci.

**Distribution.** Colombia and Venezuela.

**Material examined.** Nine nymphs: Maremán-Parú river, 5° 44' N, 61°24' W, 1308 m, 27/ 6/ 2007, EG, AMO, CA and MEG cols. ; one nymph, same locality, 19/ 3/ 2006, EG, AMO, and MEG cols. Seventeen nymphs: Tarotá river, 5° 49' N, 61° 25' W, 1324 m, 28/ 6/ 2007, EG, AMO, CA and MEG cols. Three nymphs: Kavanayén stream, 5° 37' N, 61° 44' W, 1355, 21/ 11/ 2005, EG, AMO, CA and MEG cols. One nymph: Kauí stream, 5° 28' N, 61°16' W, 1196 m, 24/ 11/ 2005, EG, AMO, CA and MEG cols. One nymph: Pacheco river, 5° 10' N, 61° 29' W, 21/3/ 2006, EG, AMO, and MEG cols. One nymph: small stream close to Pacheco river, 5° 12' N, 61° 5' W, 24/11/ 2005, EG, AMO, CA and MEG cols. Two nymphs: Aponwao river, 5° 51' N, 61° 27' W, 1340 m, 20/ 11/ 2005, EG, AMO, CA and MEG cols. Material housed at IML except 5 nymphs housed at MLBV.

### ***Cryptonympha* Lugo-Ortiz & McCafferty 1998**

This genus was described based on nymphs from Brazil. Presently, it is distributed in Brazil, Colombia, and French Guiana including two species (Domínguez *et al.*, 2006). With the finding of the species *Cryptonympha copiosa*, this genus is reported here for the first time for Venezuela.

### ***Cryptonympha copiosa* Lugo-Ortiz & McCafferty 1998**

**Taxonomy.** This species, can be distinguished from the other species of the genus by the following combination of characters: 1) labrum with a pair of long subapical setae on dorsal surface; 2) mandibles with a tuft of setae between prostheca and mola, prosthecae robust; 3) right prosthecae with a bipectinate transverse seta; 4) segment II of labial palpi with a thumb-like distomedial projection; 5) hind wing pads absent; 6) tarsal claws with one row of denticles; 7) gills I strongly narrowed basally.

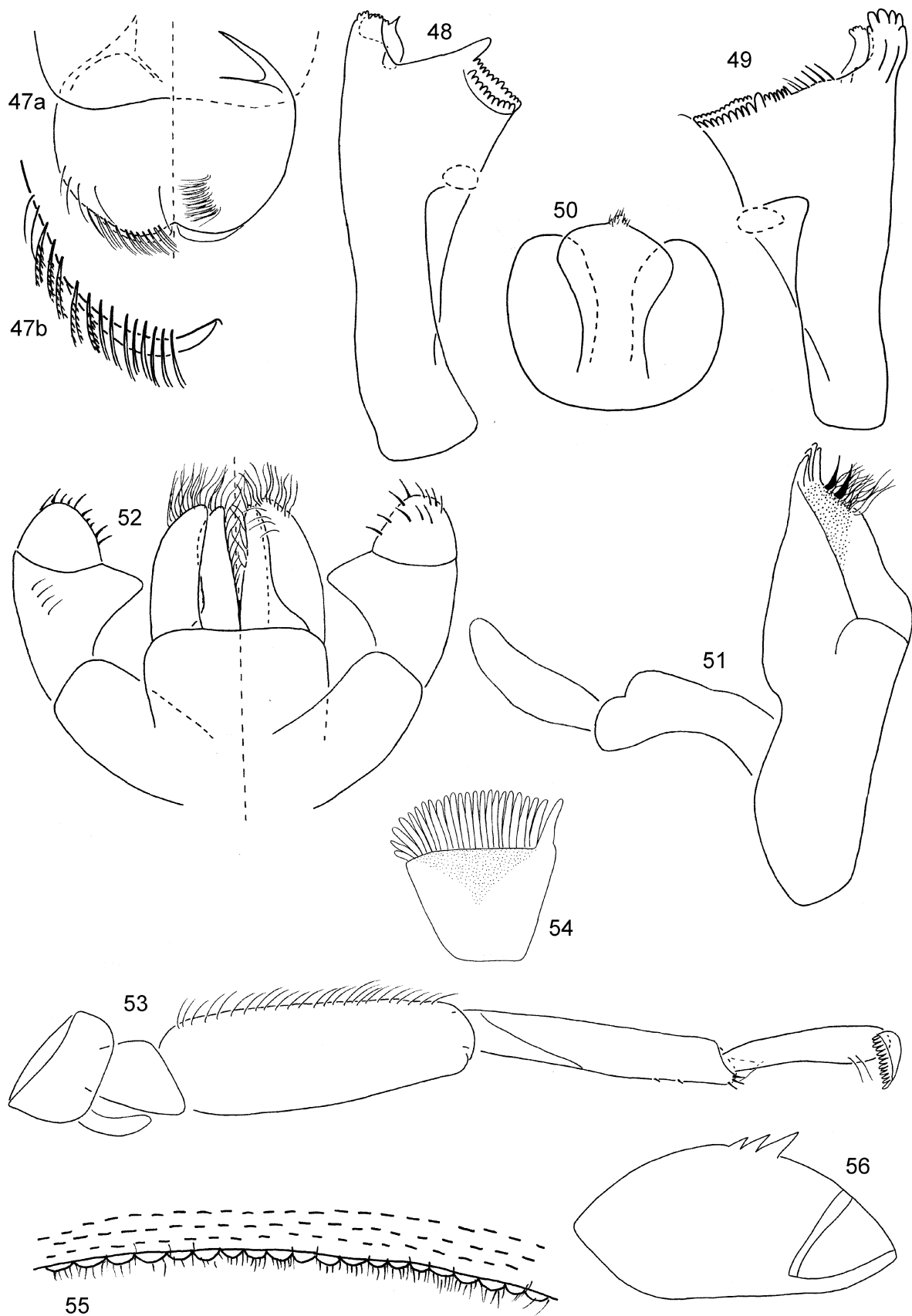
**Distribution.** Brazil, Colombia and Venezuela

**Material examined.** Two nymphs: Kauí stream, 5° 28' N, 61° 16' W; 1196 m; 24/ 11/ 2005; EG, AMO, CA and MEG cols. Material housed at IML.

### ***Harpagobaetis* Mol 1986**

(Fig. 6)

This is the only carnivorous baetid genus in the Neotropics. It was established for one species from Surinam by Mol (1986). Afterward, it was reported from Brazil and French Guiana (Orth *et al.* 2000; Salles & Lugo-Ortiz 2002).



**FIGURES 47–56.** *Camelobaetidius mathuriae*. Nymph. Mouthparts (Figs. 47–52): 47a, labrum, left d.v., right v.v.; 47b, labrum, anterior margin; 48, left mandible v.v.; 49, right mandible v.v.; 50, hypopharynx v.v.; 51, maxilla v.v.; 52, labium, left v.v., right d.v. 53, leg I; 54, tarsal claw I. 55, posterior margin of tergum IV. 56, paraproct.



### *Harpagobaetis gulosus* Mol 1986

**Taxonomy.** This species described based on nymphs, can be distinguished from by the following combination of characters: 1) labrum laterally expanded, anteriorly W-shaped and with short spines on margin at middle, laterally with palmately branched setae; 3) mandibles with 4 cleft incisors, molars pointed and strongly protruding; 4) left prostheca narrowed and with 2–3 denticles apically, right prostheca reduced to a simple seta; 5) maxillae with 4 long canines, second canine half length of others, palpi three-segmented; 6) segment II of labial palpi without projection, segment III conical; 7) tarsal claws with 2 rows of denticles and a pair of subapical setae; 8) hind wing pads present; 9) dorsal surface of body with brownish spots.

**Distribution.** Brazil, Surinam and Venezuela.

**Material examined.** One nymph: Parupa river, 5° 40' N; 61° 32' W; 1281 m, 19/ 3/ 2006, EG, AMO, and MEG cols. Material housed at IML.

### *Spiritiops Lugo-Ortiz & McCafferty 1998*

This genus was established by Lugo-Ortiz & McCafferty (1998), based on nymphs. Later, Salles & Nieto (2008) described the adult based on material collected in Brazil. Here, the only known species, *Spiritiops silvudus* is reported for Venezuela.

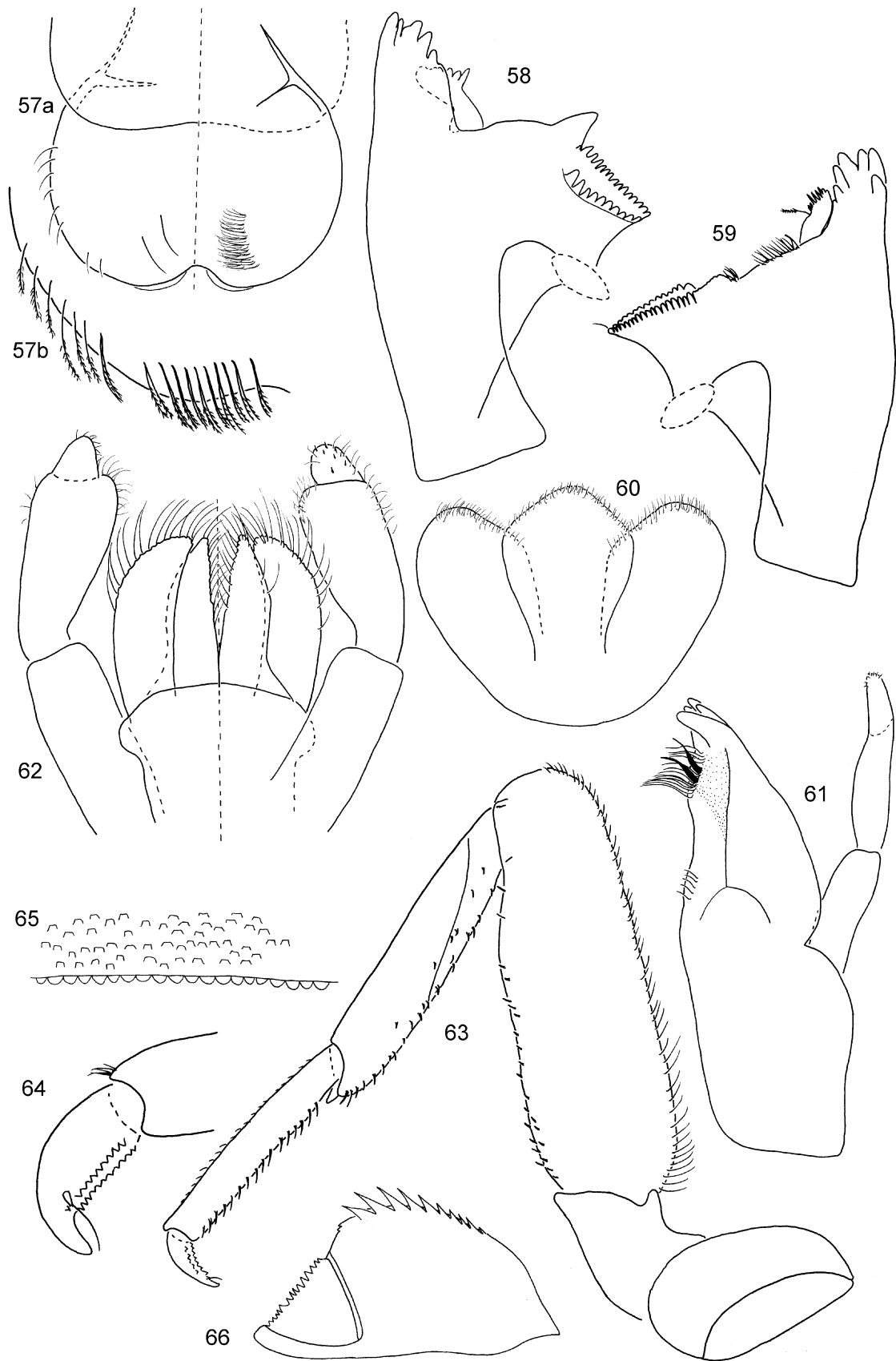
### *Spiritiops silvudus* Lugo-Ortiz & McCafferty 1998

(Figs. 7, 57–66)

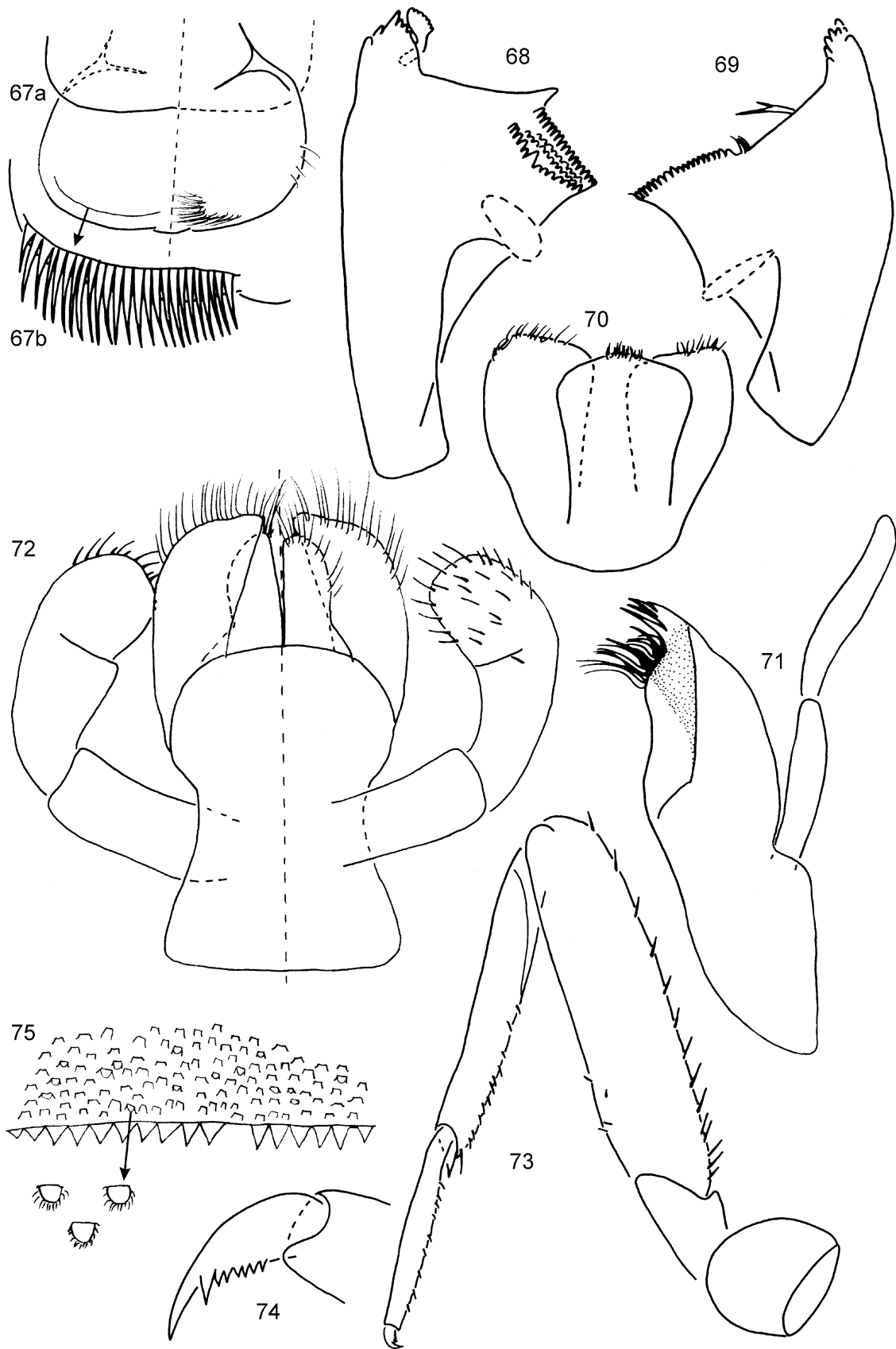
**Taxonomy.** This species can be distinguished by the following combination of characters, in the nymph: 1) labrum dorsally with two pairs of long subapical setae (Fig. 57a), anterior margin with bifid bipectinate setae (Fig. 57b); 2) mandibles (Figs. 58–59) with incisors fused and with prostheca robust; 3) right mandible with setae between prostheca and mola, and prostheca with transverse bipectinate seta (Fig. 59); 4) hypopharynx with lingua subequal in length to superlinguae (Fig. 60); 5) maxillae with palpi two-segmented, segment II with a constriction (Fig. 61); 6) labium with glossae subequal to paraglossae, glossae with a row and paraglossae with 3 rows of spine-like setae, segment II of palpi with slight distomedial projection, segment III small and conical (Fig. 62); 7) legs robust, dorsal edge of femora with a row of spine-like setae (Fig. 63); 8) tarsal claws with two rows of denticles and with a strong subapical seta (Fig. 64); 7) hind wing pads present; 8) terminal filament 0.8 times the length of cerci; 9) abdominal color pattern as in Fig. 7; 10) posterior margin of abdominal terga with rounded projections (Fig. 65); 11) posterior margin of paraprocts with spines (Fig. 66).

**Distribution.** Brazil, Colombia, French Guiana, Surinam and Venezuela.

**Material examined.** One nymph: Aponwao river, 5° 51' N, 61° 27' W, 1340 m, 27/ 6/ 2007, EG, AMO, CA and MEG cols.; 6 nymphs same locality and collectors, 18/ 3/ 2006. 12 nymphs: Tarotá river, 5° 49' N, 61° 25' W, 1324 m, 18/ 03/ 2006, EG, AMO, and MEG cols; 10 nymphs same locality and collectors, 28/ 6/ 2007. Two nymphs: Golondrina river, 5° 32' N, 61°16' W, 1143 m, 23/ 11/ 2005, EG, AMO, CA and MEG cols. 10 nymphs: Maremán-Parú, 5° 44' N, 61° 24' W, 1308 m, 23/ 11/ 2005, EG, AMO, CA and MEG cols.; 6 nymphs same locality and collectors, 19/ 3/ 2006; 8 nymphs same locality and collectors, 27/ 6/ 2007. Two nymphs: Kaimorán river, 5° 37' N; 61° 21' W, 1313 m, 23/ 11/ 2005, EG, AMO, CA and MEG cols.; 13 nymphs same locality and collectors, 20/ 3/ 2006; 3 nymphs, same locality and collectors, 29/ 6/ 2007. Two nymphs: Kauí stream, 5° 28' N, 61°16' W, 1196 m, 24/ 11/ 2005, EG, AMO, CA and MEG cols.; one nymph, same locality and collectors, 20/ 3/ 2006. Two nymphs: Kako-Parú stream, 4° 54' N, 61° 5' W, 913 m, 25/ 11/ 2005, EG, AMO, CA and MEG cols. Two nymphs: stream close to Kavanayén locality, 5° 38' N, 61° 40' W, 1355 m, 22/ 11/ 2005, EG, AMO, CA and MEG cols.; 5 nymphs same locality and collectors, 19/ 3/ 2006. 15 nymphs: Kavanayén stream, 5° 37' N; 61° 44' W, 1355 m, 21/ 11/ 2005, EG, AMO, CA and MEG cols. Eight nymphs: Pacheco river, 5° 10' N, 61° 29' W, 1144 m, 24/ 11/ 2005, EG, AMO, CA and MEG cols.; 2 nymphs, same locality and collectors, 21/ 3/ 2006. Seven nymphs: river close to Paují locality, 4° 29' N, 61° 34' W, 917 m, 17/ 3/ 2006, EG, AMO and MEG cols. Two nymphs: Parupa river, 5° 40' N, 61° 32' W, 1281 m, 29/ 6/ 2007, EG, AMO, CA and MEG cols. Seven nymphs: stream close to Paují locality, 4° 36' N, 61° 5' W, 942 m, 17/ 3/ 2006, EG, AMO, and MEG cols. Material housed at IML except 10 nymphs housed at MLBV.



**FIGURES 57–66.** *Spiritiops silvudus*. Nymph. Mouthparts (Figs. 57–62): 57a, labrum, left d.v., right v.v.; 57b, labrum, anterior margin; 58, left mandible v.v.; 59, right mandible v.v.; 60, hypopharynx v.v.; 61, maxilla v.v.; 62, labium, left v.v., right d.v. 63, leg I; 64, tarsal claw I. 65, posterior margin of tergum IV. 66, paraproct.



**FIGURES 67–75.** *Zelus principalis*. Nymph. Mouthparts (Figs. 67–72): 67a, labrum, left d.v., right v.v.; 67b, labrum, anterior margin; 68, left mandible v.v.; 69, right mandible v.v.; 70, hypopharynx v.v.; 71, maxilla v.v.; 72, labium, left v.v., right d.v. 73, leg I; 74, tarsal claw I. 75, posterior margin of tergum IV.

## ***Zelus* Lugo-Ortiz & McCafferty 1998**

(Figs. 67–75)

This genus was established by Lugo-Ortiz & McCafferty (1998) to include one species, *Zelusio principalis*, known from nymphs.

## ***Zelusio principalis* Lugo-Ortiz & McCafferty 1998**

(Figs. 67–75)

**Taxonomy.** This species, described based on nymphs, can be distinguished by the following combination of characters: 1) labrum medially raised, dorsally with a row of long robust subapical setae on either side of midline (Figs. 67 a and b); 2) mandibles with incisors fused (Figs. 68–69); 3) left mandible with prosthema robust (Fig. 68); 4) right mandible with prosthema bifid (Fig. 69); 5) lingua rounded with tuft of setae apically (Fig. 70); 6) maxillae with palpi two-segmented and longer than galea-lacinia (Fig. 71); 7) glossae subequal in length to paraglossae, the last one subquadrate and with 2 rows of spine-like setae, segment II of palpi without lateral projection (Fig. 72); 8) legs elongate, dorsal edge of femora with a row of spine-like setae (Fig. 73); 9) tarsal claws with a row of denticles (Fig. 74); 10) hind wing pads absent; 11) terga dorsal surface with scales, posterior margin with pointed projections (Fig. 75).

**Distribution.** Brazil, Colombia and Venezuela

**Material examined.** One nymph: Tarotá river, 5° 49' N, 61° 25' W, 1324 m, 18/ 03/ 2006, EG, AMO, and MEG cols. One nymph: stream close to Paují locality, 4° 36' N, 61° 5' W, 942 m, 17/ 3/ 2006, EG, AMO, and MEG cols. One nymph: Kako-Parú stream, 4° 54' N, 61° 5' W, 913 m, 25/ 11/ 2005, EG, AMO, CA and MEG cols. Two nymphs: river close to Paují locality, 4° 29' N, 61° 34' W, 917 m, 17/ 3/ 2006, EG, AMO, and MEG cols. One nymph: Parupa river, 5° 40' N, 61° W, 1281 m, 28/ 6/ 2007, EG, AMO, CA and MEG cols. One nymph: Kauí stream, 5° 28' N, 61° 16' W, 1196, 24/ 11/ 2005, EG, AMO, CA and MEG cols. Material housed at IML.

## **Conclusion**

This research has improved the knowledge of the family from Venezuela. Four genera are reported for the first time from the Gran Sabana, therefore the number of the known genera has increased from four to eight. In the case of the species, the number has increased from seven to sixteen. This is the first step in order to recover the knowledge from this country, especially to the Gran Sabana.

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