

The Genus *Baetodes* (Ephemeroptera: Baetidae) in South America with the Description of New Species from Argentina, Bolivia and Peru

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Abstract

Nine new species of *Baetodes* are described, five from Argentina: *B. cochunaensis* sp. n., *B. copiosus* sp. n., *B. pehuenche* sp. n., *B. huaico* sp. n., *B. uruguayi* sp. n., based on nymphs, and the last two species also on male imagines. Three species from Bolivia: *B. gibbus* sp. n., *B. rutilus* sp. n., *B. yuracare* sp. n., are also described based on nymphs and in *B. yuracare* from nymphs and a male subimago; and one from Peru: *B. pseudogibbus* sp. n., based on nymphs. The first keys for the adults and nymphs of the South American species are included.

Resumen

Se describen e ilustran nueve especies nuevas de *Baetodes*: cinco para Argentina: *B. cochunaensis* sp. n., *B. copiosus* sp. n., *B. pehuenche* sp. n., *B. huaico* sp. n., *B. uruguayi* sp. n., todas basadas sobre ninfas y en los dos últimos casos también en imagos machos. Tres especies para Bolivia: *B. gibbus* sp. n., *B. rutilus* sp. n., *B. yuracare* sp. n., se describen de ninfas y en el último caso también de subimago macho; y una para Perú: *B. pseudogibbus* sp. n. descrita de ninfa. Se incluyen por primera vez claves para separar los adultos y las ninfas de todas las especies de América del Sur.

Keywords: Baetidae, *Baetodes*, Ephemeroptera, Neotropics, taxonomy.

Introduction

Baetodes was originally described by Needham and Murphy (1924) from South America. The original description was based on nymphs from Brazil. In 1943, Traver described the adults of the genus for the first time.

Since then many authors, such as Edmunds (1950), Demoulin (1955), Mayo (1968, 1972, 1973), Cohen and Allen (1972, 1978), Koss (1972), Flowers (1987), McCafferty and Provonsha (1993) and Lugo-Ortiz and McCafferty (1995), described new species for the genus, sometimes redescribing some generic characteristics. This genus was characterized by: (1) gills on segment 1–5 (Needham & Murphy, 1924); (2) middle tail rudimentary, cerci with only a few inconspicuous setae (Edmunds, 1950); (3) dorsal edge of femora with a compact row of fine setae intercalated with clavate setae (Figs. 6, 18, 26); (4) each tibia with a continuous longitudinal and transverse break or articulation on the anterior and ventral surfaces (Figs. 5, 17, 25); (5) high dorsal crest on each coxa (Koss, 1972, Mayo, 1972); (6) ventrally, each side of labrum with a sublateral row of spine-like setae (Koss, 1972) (Figs. 2, 11, 22).

Until now *Baetodes* had thirty nominal species described, distributed from Arizona to Argentina, making it one of the most species-rich genera in the neotropics. Thirteen species were described from South America, distributed in Bolivia, Brazil, Colombia (Lugo-Ortiz & McCafferty, 1996), Ecuador, Peru, and Venezuela; eleven of them described from nymphs and two from adults. The genus has been reported

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from Argentina (Domínguez et al., 1994), but no specific record is available from this country.

In this paper five new species from Argentina, three from Bolivia and one from Peru are described, seven of them from nymphs and two from male imagines. A key for the nymphs and male imagines of known South American species is included. Koss (1972) proposed some new terms for structures that have been previously described as spines. This terminology is used in this paper.

The material is housed in the following institutions: Fundación-Instituto Miguel Lillo, Tucumán, Argentina (IFML); Florida A & M University, Tallahassee, Florida, U.S.A. (FAMU); Museum of Zoology, Lausanne, Switzerland (MZL); and Instituto de Ecología, Unidad de Limnología, Universidad Mayor de San Andrés, La Paz, Bolivia (ULUMSA).

Key to the male imagines of South American species

1. Abdominal tubercles present on segments 2–5
 *Baetodes spiniferum*
 – Abdominal tubercles absent 2
2. Turbinate eyes large, erect, upper surface contiguous apically (Fig. 71) *Baetodes uruguayi* sp. n.
 – Turbinate eyes moderately large and erect, upper surface not contiguous apically (Fig. 29) 3
3. Genitalia as in Traver, 1943: Fig. 6, second segment with a constriction, appearing as two segments.
 *Baetodes arawak*
 – Genitalia as in Fig. 31, second segment without constriction *B. huaico* sp. n.

Key to the nymphs of South American species

1. Ocelli lacking *Baetodes itatiayanus*
 – Ocelli present 2
2. Coxal gills present (Fig. 25) 3
 – Coxal gills absent (Fig. 5) 15
3. One finger-like gill on each coxa (Fig. 80) 4
 – Two finger-like gills on each coxa (Fig. 25) 6
4. No tubercles on the abdomen
 *Baetodes sancticatarinae*
 – Tubercles on the abdomen present (Fig. 83) 5
5. Each tergum with a clavate tubercle directed posteriorly (Fig. 83), two pectinate bladeli-like setae on each glossa, and without nonpectinate blade-like seta on paraglossa (Fig. 79) *Baetodes uruguayi* sp. n.
 – Each tergum with a prominent, pointed tubercle directed posteriorly (Mayo, 1973: Fig. 14); one pectinate bladeli-like seta on the tip of each glossa (Mayo, 1973: Fig. 13), and one nonpectinate bladeli-like seta medially on each paraglossa *Baetodes peniculus*
6. Abdominal tubercles present (Fig. 24) 7
 – Abdominal tubercles absent 13

7. First abdominal tubercle twice the length of the others (Figs. 24, 58) 8
 – First abdominal tubercle same size as the others (Fig. 41) 9
8. Pronotum with tubercle (Fig. 24), ventral edge of femora with long spines (Fig. 25) *Baetodes gibbus* sp. n.
 – Pronotum without tubercle, ventral edge of femora with short spines (Fig. 55) *Baetodes pseudogibbus* sp. n.
9. Pronotum with tubercle 10
 – Pronotum without tubercle 11
10. Pronotum and mesoscutellum with two tubercles, abdominal tubercles large and erect (Mayo, 1968: Fig. 13), long spines on apical segment of labial palpi (Mayo, 1968: Fig. 15) *Baetodes spiniae*
 – Pronotum with a single tubercle, mesoscutellum without tubercle; abdominal tubercle less prominent and pointed posteriorly (Mayo, 1973: Fig. 10), short spine on apical segment of labial palpi (Mayo, 1973: Fig. 7)
 *Baetodes proiectus*
11. Dorsal edge of femora with clavate spines slender and short, half the length of setae (Fig. 91); apical segment of labial palpi rounded (Fig. 89), apex of lingua rounded as in Fig. 88 *Baetodes yuracare* sp. n.
 – Dorsal edge of femora with clavate spines long and slender, subequal to setae (Fig. 39); apical segment of labial palpi oval (Fig. 37); apex of lingua broadly pointed as in Fig. 35 12
12. Dorsal edge of femora with 6–7 clavate spines, tarsal claws with 5–6 denticles *Baetodes levis*
 – Dorsal edge of femora with 10–11 clavate spines (Fig. 38), tarsal claws with 10–11 denticles (Fig. 40)
 *Baetodes huaico* sp. n.
13. Mandibles with two small lobes on the incisors at the inner margin (Mayo, 1972: Fig. 25), glossae with two short, blunt spines at base of one long bladeli-like spine (Mayo, 1972: Fig. 23) *Baetodes andamagensis*
 – Mandibles without small lobes on the incisors, glossae not as above 14
14. Dorsal edge of femora with 6–7 clavate setae, glossae with no pectinate bladeli-like setae *Baetodes chilloni*
 – Dorsal edge of femora with 10–11 clavate setae (Fig. 48), glossae with two pectinate bladeli-like setae (Fig. 47)
 *Baetodes pehuenche* sp. n.
15. Abdominal tubercles although small present (Figs. 8, 68) 16
 – Abdominal tubercles absent 18
16. Labrum with a dorsal row of subequal spine-like setae as in Figs. 11a, 60a; external margin of mandible with long setae (Figs. 61, 62) *Baetodes rutilus*
 – Labrum with a dorsal row of spine-like setae varying in length, alternating one long, one short (Fig. 2a); external margin of mandible without long setae as in Figs. 12, 13 17
17. Tubercle on the metanotum, segment one of labial palpi without a distomedial projection (Mayo, 1968: Fig. 17) *Baetodes serratus*

- Tubercle absent on the metanotum, segment one of labial palpi with a distomedial projection (Fig. 4)
 *Baetodes cochunaensis*
 18. Terminal filament very short, less than half of abdominal segment X (Mayo, 1972: Fig. 7); glossae short, less than half the length of paraglossae (Mayo, 1972: Fig. 12) *Baetodes traverae*
 – Terminal filament at least as long as abdominal segment X; glossae at least $\frac{3}{4}$ length of paraglossae 19
 19. Glossae without pectinate blade-like seta, one wide non-pectinate bladelike seta distally near inner margin of each paraglossae (Mayo, 1972: Fig. 15), gills oblong like in Mayo, 1972: Fig. 19 *Baetodes solus*
 – Glossae with one pectinate bladelike setae (Fig. 16); paraglossae without wide non pectinate bladelike seta; gills lanceolate, wider at base, apically acute (Fig. 21)
 *Baetodes copiosus* sp. n.

Baetodes andamagensis Mayo

Baetodes andamagensis Mayo, 1972: 231, Figs. 20–26 (nymph).

This species is known only from the nymphs and can be distinguished by the following combination of characters: (1) two finger-like gills on each coxa; (2) abdominal tubercles lacking; (3) tip of each glossa with two short, blunt spines at base of one long bladelike spine; (4) two small lobes on the incisors at the inner margin of the mandibles; (5) abdominal gills smoky in basal half.

Distribution: Peru.

Baetodes arawak (Traver)

Pseudocloeon arawak Traver, 1943: 90, Fig. 6 (male).

Baetodes arawak; Flowers, 1987: 8, Fig. 7 (male).

This species known only from male imagines, can be distinguished by the following combination of characters: (1) turbinate eyes moderately large, erect, upper surface almost round, not contiguous apically; (2) without abdominal tubercles; (3) basal segment of forceps with apical projection.

Distribution: Venezuela.

Baetodes chilloni Mayo

Baetodes chilloni Mayo, 1972: 228, Figs. 1–5 (nymph).

This species, known only from nymphs, can be distinguished by the following combination of characters: (1) two finger-like gills on each coxa; (2) without abdominal tubercles; (3) femora with 6–7 clavate setae; (4) tarsal claws with 5–6 denticles; (5) glossae with no pectinate setae.

Distribution: Peru.

Baetodes cochunaensis sp. n. (Figs. 1–9)

Nymph. Length: body 4.5–4.6 mm; cerci 4.8–4.9 mm; terminal filament 0.4–0.5 mm. General coloration brownish. Head orange brown, compound eyes orange brown. Antennae (Fig. 1) yellowish brown. Mouthparts (Figs. 2–4): labrum (Fig. 2) expanded laterally, dorsal surface with a row of 8–9 spine-like setae near midline, alternating one long, one short (Fig. 2a), 3–4 long ones near lateral margin. Mandibles and maxillae as in Figs. 12, 13, 15. Hypopharynx: apex of lingua broadly pointed as in Fig. 3. Labium (Fig. 4), glossae $\frac{2}{3}$ length of paraglossae and with one pectinate bladelike seta, segment one of palpi with a distomedial projection.

Thorax brownish, anterior margin of mesothorax dark brown. Pleura brownish, dark lines preceding and above leg bases. Sterna pale yellow. Legs (Fig. 5) yellowish brown, dorsal edge of femora with 7–8 clavate setae (Fig. 6); tarsal claws (Fig. 7) brownish with 11–12 denticles. Coxal gills lacking.

Abdomen brownish, anterior margin of terga 1–4 tinged with dark brown. Posterior margin of terga as in Fig. 20. Tubercles very small, only observed in dorsal view (Fig. 8). Sterna pale yellow. Gills (Fig. 9) whitish, oblong and asymmetrical, wider at base, apically acute. Caudal filaments yellowish brown.

Adults. Unknown.

Etymology

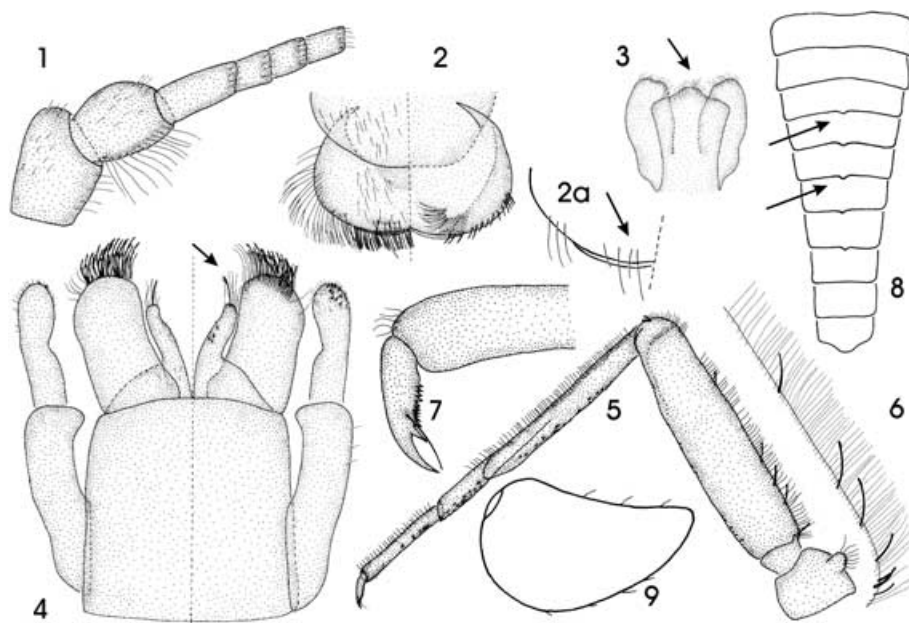
Cochunaensis: Cochuna is the name of one of the rivers where this species was collected.

Discussion

B. cochunaensis sp. n. can be distinguished from the other species of *Baetodes* by the followings combination of characters: (1) labrum (Figs. 2, 2a) expanded laterally, with particular pattern of subapical spine-like setae; (2) coxal gills lacking; (3) segment one of labial palpi with a distomedial projection (Fig. 4); (4) dorsal edge of femora with 7–8 clavate setae (Fig. 6); (5) abdominal tubercles very small only observed in dorsal view (Fig. 8).

Material

Holotype: male nymph; ARGENTINA: Tucumán: Depto. Tafi del Valle, Apeadero Muñoz, arroyo efluente río Los Sosa, 27°00'42"S, 65°41'18"W, 1650 m, 30/VIII/2000, Domínguez, Molineri, Flowers & Nieto colls. Paratypes: seven nymphs same locality and collectors; two nymphs same date and collectors except locaty: río Los Sosa, 900 m; 45 nymphs: río Cochuna, 2/XII/1999, Nieto col.; four nymphs: Jujuy: Hosteria Termas de Reyes, Arroyo, 24°10'19"S, 65°29'27"W, 25/III/1999, Molineri & Romero colls. The holotype and all paratypes except 10 nymphs are



Figs. 1–9. *Baetodes cochunaensis* sp. n. Nymph: (1) Antennae; Mouthparts: (2) Labrum, left d.v., right v.v.; (2a) Detail of dorsal setae on anterior margin (pinnate setae omitted); (3) Hypopharynx v.v.; (4) Labium, left d.v., right v.v.; Leg: (5) Hind leg v.v.; (6) Detail of dorsal edge of femora; (7) Tarsal claws detail; (8) Abdomen; (9) Gill.

deposited at IFML. Other paratypes are housed half in MZL and half in FAMU.

Baetodes copiosus sp. n. (Figs. 10–21)

Nymph. Length 4.9–5.0 mm; cerci 6.5–6.6 mm; terminal filament 0.5–0.6 mm. General coloration brownish. Head dark brown, compound eyes orange brown. Antennae (Fig. 10) yellowish. Mouthparts (Figs. 11–16): labrum (Fig. 11) expanded laterally, dorsal surface with a row of spine-like setae along subapical margin (Fig. 11a), ventral surface with a row of pectinate spine-like setae. Mandibles (Figs. 12, 13) robust. Hypopharynx: apex of lingua broadly pointed as in Fig. 14. Maxillae like in Fig. 15. Labium (Fig. 16), glossae 2/3 length than paraglossae, with one pectinate bladeli-like seta.

Thorax: brownish, mesothorax dark brown. Pleura brownish, dark lines anterior to and above leg bases. Sterna pale yellow. Legs (Fig. 17) brownish, dorsal edge of femora with 7–8 short and slender clavate setae (Fig. 18); tarsal claws (Fig. 19) dark brown with 11–12 denticles. Coxal gills lacking.

Abdomen brownish, anterior margin of segments 1–9 dark brown. Posterior margin of terga serrated (Fig. 20). No tubercles present. Sterna yellowish. Gills (Fig. 21) whitish, lanceolate, wider at base, apically acute. Caudal filaments yellowish brown and without setae.

Adults. Unknown.

Etymology

Copiosus: Latin word that means abundant, related to the great number of spine-like setae present on the labrum.

Discussion

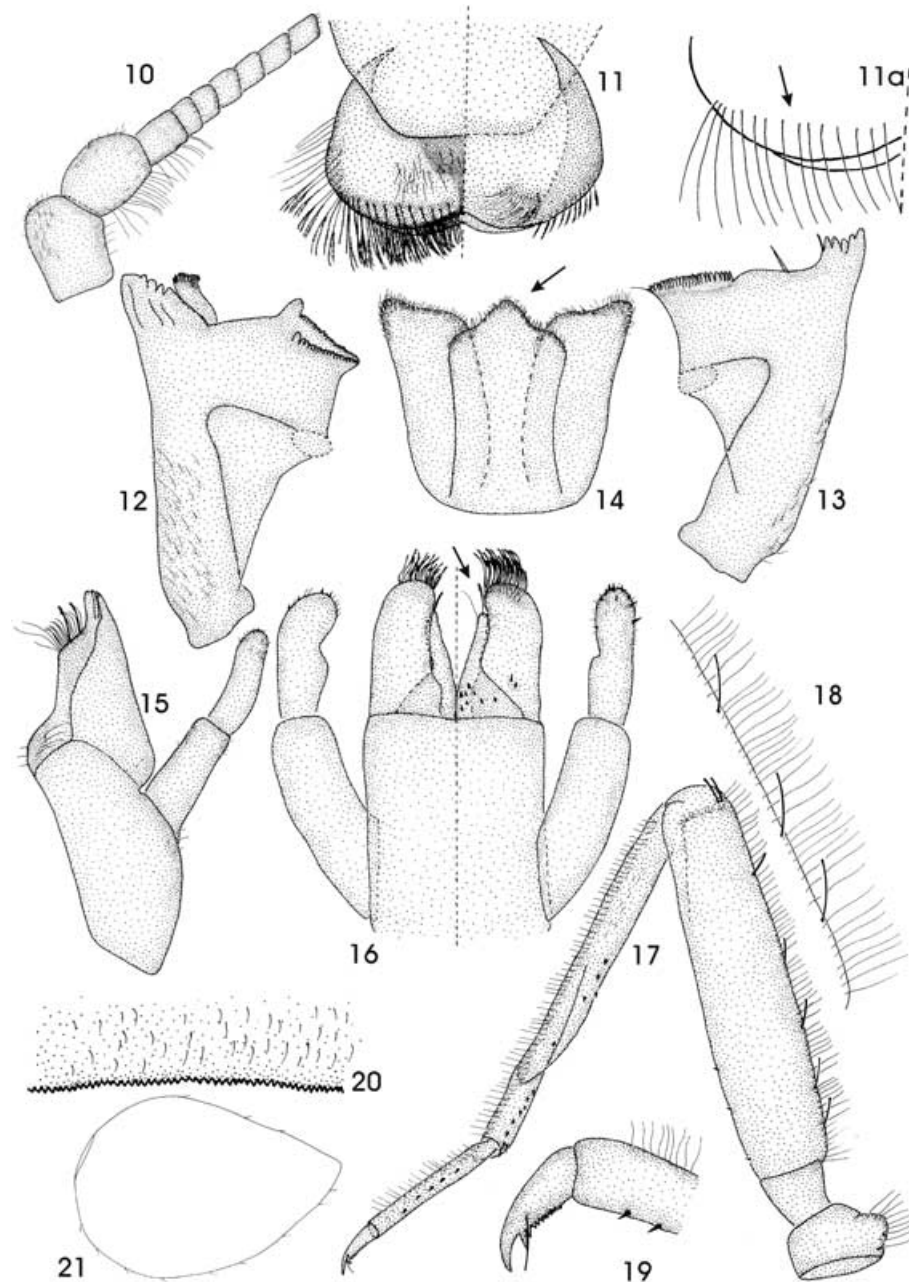
Baetodes copiosus sp. n. can be distinguished from the other species of *Baetodes* by the following combination of characters: (1) labrum (Figs. 11, 11a) expanded laterally, with particular pattern of subapical spine-like setae and ventral surface with a row of pectinate spine-like setae; (2) coxal gills lacking; (3) tarsal claws (Fig. 19) with 11–12 denticles; (4) abdominal tubercles absent.

Material

Holotype: male nymph: ARGENTINA: Tucumán: Depto. Tafi del Valle, río Los Sosa, 30/VIII/2000, Domínguez, Flowers, Molineri & Nieto colls. *Paratypes:* 26 nymphs same locality and collectors; three nymphs: río Cochuna, 2/XII/1999, Nieto col; eight nymphs: Salta: San Lorenzo, 24°43'09"S, 65°30'20"W, 1321 m, 4/V/2001, Orce & Nieto colls. The holotype and all paratypes except six nymphs are deposited at IFML. Other paratypes are housed half in MZL and half in FAMU.

Baetodes gibbus sp. n. (Figs. 22–28)

Nymph. Length body: 4.1–4.2 mm; cerci 2.6–2.7 mm; terminal filament 0.3–0.4 mm. General coloration yellowish brown. Head yellowish brown, compound eyes orange brown. Antennae yellowish brown. Mouthparts (Figs. 22, 23): labrum (Fig. 22), dorsal surface with a row of 6–7 spine-like setae near midline alternating one long, one short as in Fig. 2a; 2–3 long ones near lateral margin. Mandibles, hypopharynx and maxillae as in Figs. 33–36. Labium (Fig. 23), glossae little shorter than paraglossae with two pectinate bladeli-like setae.



Figs. 10–21. *Baetodes copiosus* sp. n. Nymph: (10) Antennae; Mouthparts: (11) Labrum, left d.v., right v.v.; (11a) Detail of dorsal setae on anterior margin (pinnate setae omitted); (12) Left mandible v.v.; (13) Right mandible v.v.; (14) Hypopharynx v.v.; (15) Maxilla; (16) Labium, left d.v.; right v.v.; Leg: (17) Hind leg v.v.; (18) Detail of dorsal edge of femora; (19) Tarsal claws, detail; (20) Posterior margin of terga; (21) Gill.

Thorax yellowish brown; anterior margin of mesothorax brownish, mesoscutellum yellowish. Pronotum with a single tubercle, metanotum with small tubercle (Fig. 24). Pleura yellowish brown. Sterna yellowish brown. Legs (Fig. 25) yellowish brown, dorsal edge of femora (Fig. 26) with 7–8 clavate setae little shorter than fine setae, ventral edge with long spines. Claws (Fig. 27) with six denticles. Two finger-like gills on each coxa, gills at least $1\frac{1}{2}$ length of coxa (Fig. 25).

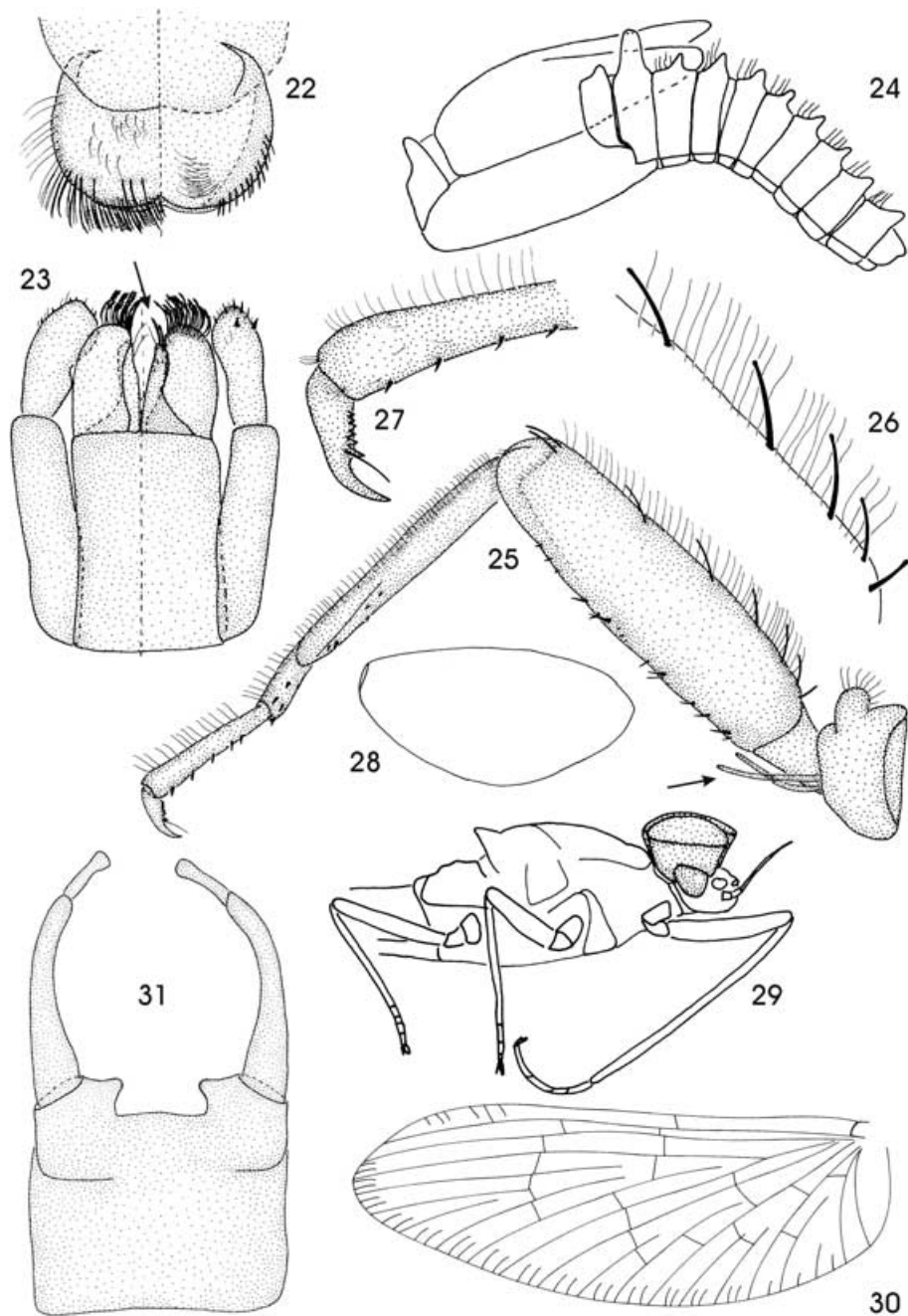
Abdomen brownish, segments 5 and 6 with a yellow spot on the midline, segment 10 pale yellow. Tubercle on each

segment, first tubercle twice the size of the others (Fig. 24). Posterior margin of terga as in Fig. 20. Sterna yellowish brown. Gills (Fig. 28) whitish and oblong. Cerci pale yellow.

Adults. Unknown.

Etymology

Gibbus: Latin word that means hump, like the tubercle that this species present in the pronotum.



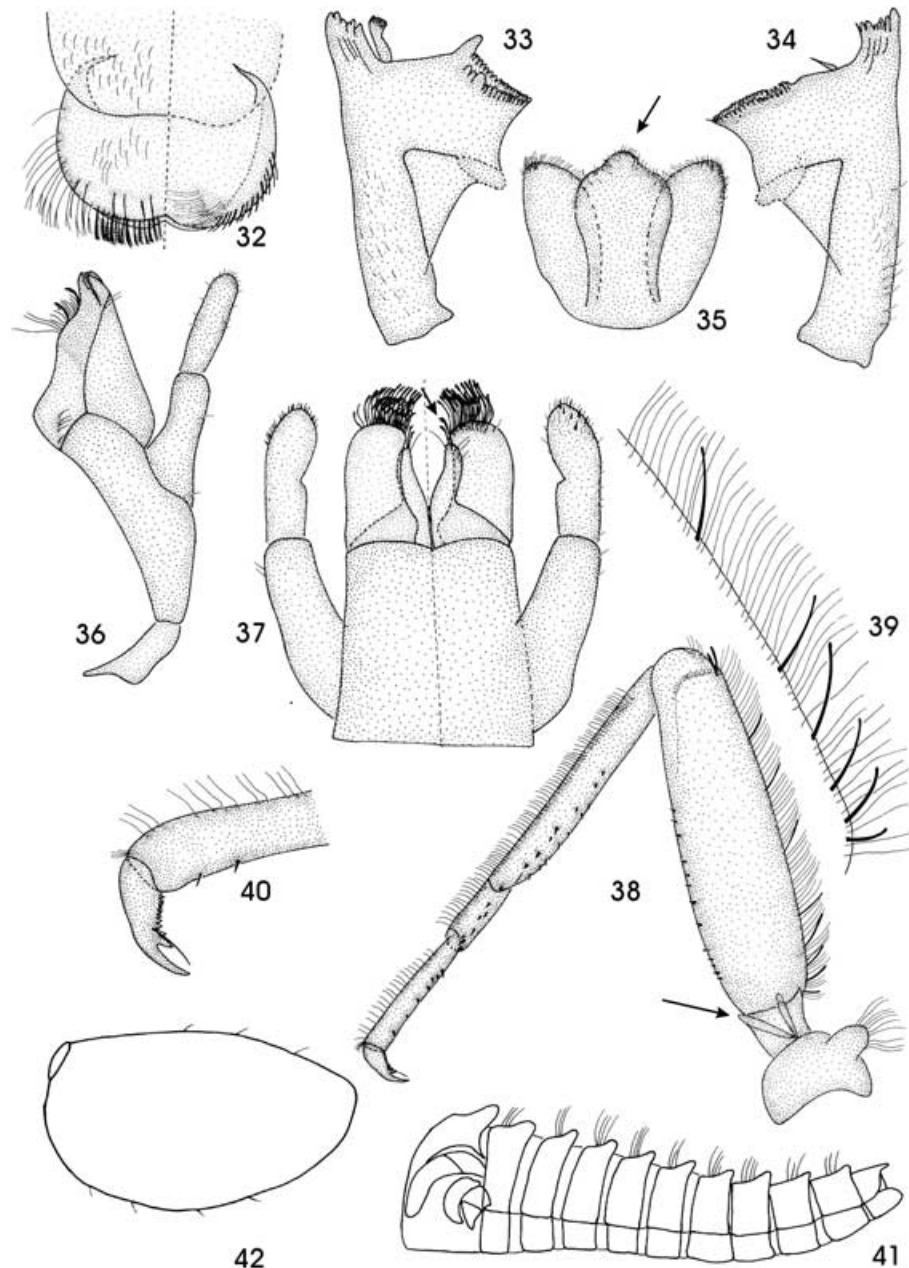
Figs. 22–31. *Baetodes gibbus* sp. n. Nymph: Mouthparts: (22) Labrum, left d.v., right v.v.; (23) Labium, left d.v., right v.v.; (24) Lateral view of thorax and abdomen; Leg: (25) Hind leg v.v.; (26) Detail of dorsal edge of femora; (27) Tarsal claws detail; (28) Gill. *Baetodes huaico* sp. n. Male imago: (29) Lateral view of male imago; (30) Forewing; (31) Male genitalia v.v.

Discussion

Baetodes gibbus can be distinguished from the other species of *Baetodes* by the following combination of characters: (1) first abdominal tubercle twice the size of the others (Fig. 24); (2) pronotum with a single tubercle (Fig. 24); (3) ventral edge of femora with long spines (Fig. 25); (4) tarsal claws with six denticles (Fig. 27).

Material

Holotype: male nymph: BOLIVIA: Depto. La Paz, río Huarinillas, 16°11'45"S, 67°45'05"W, 1250 m, 21/XI/2000, Domínguez, Molineri & Nieto colls. Paratypes: five nymphs same locality and collectors; four nymphs: río Suapi, 16°06'41"S, 67°47'09"W, 1200 m, 29/XI/2000, same collectors; one nymph: Colonia San Pedro, río Copacabana,



Figs. 32–42. *Baetodes huaico* sp. n. Nymph: Mouthparts: (32) Labrum, left d.v., right v.v.; (33) Left mandible v.v.; (34) Right mandible v.v.; (35) Hypopharynx v.v.; (36) Maxilla; (37) Labium, left d.v., right v.v.; Leg: (38) Hind leg v.v.; (39) Detail of dorsal edge of femora; (40) Tarsal claws, detail; (41) Lateral view of abdomen; (42) Gill.

16°00'51"S, 67°35'57"W, 1000 m, 26/XI/2000, same collectors; 20 nymphs: río San Rafael, near Villa Tunari, 17°03'54"S, 65°28'21"W, 480 m, 12/VI/2000, E. Domínguez col. The holotype and 10 paratypes are deposited at ULUMSA. Other paratypes are housed at IFML.

***Baetodes huaico* sp. n.** (Figs. 29–42)

Male imago (Fig. 29). Length body: 5.3–5.4 mm; forewings 6.1–6.2 mm. Head orange brown; antennae yellowish brown. Turbinate eyes yellowish brown, orange brown at base,

medium apical surface subcylindrical, height of stalk half length than eye diameter, eyes not contiguous apically, bases of ocelli black.

Thorax orange brown, legs yellowish; foretibiae twice length of forefemora, tarsi subequal to forefemora. Forewing hyaline, except costal and subcostal spaces translucent (Fig. 30).

Abdomen, segments 1–2 and 7–9 yellowish brown, segments 3–6 translucent. Genitalia as in Fig. 31, base of forceps yellowish brown, apex yellowish, second segment without constriction. Cerci yellowish.

Nymph. Length body: 4.8–4.9 mm; cerci: 5.0–5.1 mm; terminal filament 0.3–0.4 mm. General coloration yellowish brown. Head yellowish brown, compound eyes orange brown. Antennae yellowish. Mouthparts (Figs. 32–37): labrum (Fig. 32), dorsal surface with a row of 8–9 spine-like setae near midline alternating one long, one short as in Fig. 2a; 2–3 long ones near lateral margin. Mandibles and maxillae as in Figs. 33, 34, 36. Hypopharynx: apex of lingua broadly pointed as in Fig. 35. Labium (Fig. 37), glossae little shorter than paraglossae with two pectinate bladelike setae.

Thorax brownish, mesoscutellum yellowish. Metanotum with a small tubercle. Pleura yellowish brown, dark lines preceding and above leg bases. Sterna pale yellow. Legs (Fig. 38) yellowish brown, posterior margin of tarsi and tarsal claws orange brown. Dorsal edge of femora with 10–11 clavate setae (Fig. 39). Claws (Fig. 40) with 11 denticles. Two finger-like gills on each coxa little longer than coxae (Fig. 38).

Abdomen (Fig. 41), segments 1–3, 7–9 brownish, segments 4–6, 10 pale yellow. Small but distinct tubercles and fine setae in the midline. Posterior margins of terga as in Fig. 20. Sterna pale yellow. Gills (Fig. 42) whitish and oblong. Caudal filaments yellowish.

Etymology

Huaico is the name of one of the rivers where this species was collected.

Variations

Some individuals are bigger (5.5–6.0 mm) and the abdomen are brownish.

Discussion

Baetodes huaico sp. n. can be distinguished from the other species of *Baetodes* by the following combination of characters: Imago: (1) turbinate eyes moderately large and erect, upper surface not contiguous apically (Fig. 29); (2) genitalia as in Fig. 31, second segment without constriction.

Nymph: (1) labrum (Fig. 32) dorsal surface with a row of 8–9 spine-like setae near midline alternating one long, one short; 2–3 long ones near lateral margin; (2) abdomen with small but distinctive tubercles (Fig. 41); (3) coxal gills little longer than coxae (Fig. 38); (4) abdominal coloration pattern: segments 1–3, 7–9 dark, segments 4–6, 10 light.

Material

Holotype: male nymph: ARGENTINA: Tucumán: arroyo effluente río Los Sosa, 27°01'02"S, 65°39'21"W, 1250 m, 14/X/2000, Manzo, Orce & Nieto colls. Paratypes: 12 nymphs: same locality and collectors; 13 nymphs: arroyo Artaza, 26°36'13"S, 65°02'36"W, 7/VII/1999, Molineri col.; 27

nymphs: arroyo Tranqueritas, 26°38'06"S, 65°03'35"W, same date and collector; 50 nymphs: río Cochuna, 2/XII/1999, Nieto col.; 30 nymphs: Salta, Vaqueros, río Chiricote, 24°40'44"S, 65°25'50"W, 1330 m, 1–2/III/2000, Romero, Manzo & Molineri colls.; one male (reared, with subimaginal exuvia) and nine male imagines: río Huaico Grande, Los Toldos, 26–27/X/1999, Molineri col. Additional material from different localities of Tucumán, Catamarca, Salta and Jujuy Provinces. The holotype and paratypes are deposited at IFML.

Baetodes itatiyanus Demoulin

Baetodes itatiyanus Demoulin, 1955: 22, Figs. 13, 14 (nymph); Mayo, 1968: 256.

This species is known only from nymphs. In the original description Demoulin studied 12 nymphs and considered the absence of ocelli, as the distinctive character for this species. Two syntypes were studied here and although they were in poor condition, the ocelli or any sign of their presence could not be observed. Demoulin also did not make any reference to coxal gills. Mayo (1968) considered that a sign that they were absent. In the material studied they could not be observed either. A redescription of this species, based on fresh material would be very important to determine its other characters. This species can be distinguished by the following combination of characters: (1) ocelli absent; (2) abdominal tubercles present; (3) coxal gills absent.

Distribution: Brazil.

Material

Syntypes studied: two nymphs from Brésil, Itatiaya, Marumba, forêt, 1170 m, 17/X/1922. Mouthparts, head, legs, and abdomen of one syntype on slides. This material is housed in Institut Royal des Sciences Naturelles de Belgique, Bruxelles, Belgique.

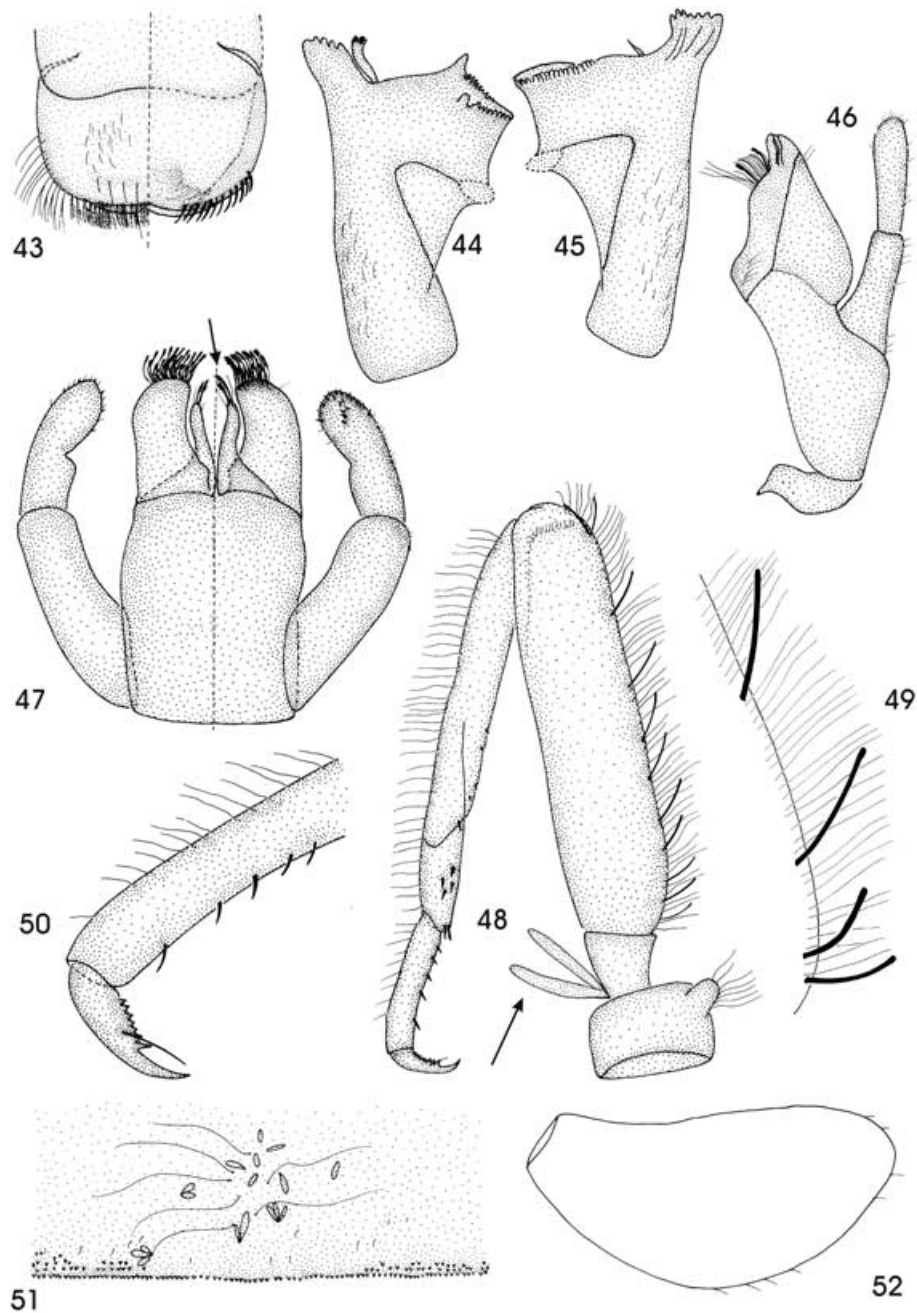
Baetodes levis Mayo

Baetodes levis Mayo, 1968: 253, Figs. 3, 4, 12, 16, 18, 19, 21, 22 (nymph).

This species is known only from nymphs. Five paratypes were studied but they were in poor condition. The original description is adequate, however some new characters are included in the key and in the discussion.

This species can be distinguished by the following combination of characters: (1) abdominal tubercles pointed posteriorly; (2) two finger-like gills on each coxa; (3) glossae robust, with two pectinate setae; (4) dorsal edge of femora with 6–7 clavate spines; (5) tarsal claws with 5–6 denticles; (6) labrum with a row of 10–11 spine-like setae near midline.

Distribution: Ecuador.



Figs. 43–52. *Baetodes pehuenche* sp. n. Nymph: Mouthparts: (43) Labrum, left d.v., right v.v.; (44) Left mandible v.v.; (45) Right mandible v.v.; (46) Maxilla; (47) Labium, left d.v., right v.v.; Leg: (48) Hind leg v.v.; (49) Detail of dorsal edge of femora; (50) Tarsal claws, detail; (51) Posterior margin of terga; (52) Gill.

Material

Paratypes studied: five nymphs from Ecuador, Macuchi, Rio Amayo, 30 June 1943, V. K. Mayo col. One paratype with mouthparts and legs on slides. Material housed in FAMU.

Baetodes pehuenche sp. n. (Figs. 43–52)

Nymph. Length: body 3.8–3.9 mm; cerci 3.3–3.4 mm; terminal filament 0.3–0.4 mm. General coloration yellowish brown.

Head orange brown, compound eyes brownish. Antennae yellowish. Mouthparts (Figs. 43–47): labrum (Fig. 43), dorsal surface with a row of 8–9 spine-like setae near midline alternating one long, one short as in Fig. 2a. Mandibles and maxillae as in Figs. 44–46. Hypopharynx: apex of lingua broadly pointed as in Fig. 35. Labium (Fig. 47), glossae little shorter than paraglossae, with two pectinate bladlike setae.

Thorax: prothorax yellowish brown, mesothorax orange brown, metathorax pale yellow. Pleura brownish, sterna yellowish. Metanotum with small hind wing pads. Legs

(Fig. 48): yellowish brown, dorsal edge of femora with 10–11 clavate setae as long as fine setae (Fig. 49); tarsal claws (Fig. 50) brownish with 6–7 denticles. Two elongate finger-like gills on each coxa, gills at least $1\frac{1}{2}$ length of coxae (Fig. 48).

Abdomen brownish, tergum 10 yellowish, posterior margin of terga serrate as in Fig. 51. Sterna yellowish. Tubercles absent. Gills (Fig. 52) whitish, semi-transparent, oblong and asymmetrical. Caudal filaments yellowish and without setae.

Adults. Unknown.

Discussion

Baetodes pehuenche can be distinguished from the other species of *Baetodes* by the following combination of characters: (1) labrum (Fig. 43) with dorsal surface with a row of 8–9 spine-like setae near midline, alternating one long and one short as in Fig. 2a; (2) tarsal claws with 6–7 denticles (Fig. 50); (3) two finger-like gills on each coxa, at least $1\frac{1}{2}$ length of coxae; (4) gills (Fig. 52) oblong and asymmetrical; (5) abdominal tubercles absent; (6) abdominal coloration pattern: segments 1–9 dark, segment 10 light.

Etymology

Pehuenche was a culture that inhabited Neuquen province, in Patagonia where this species was collected.

Material

Holotype male nymph, ARGENTINA: Neuquén: Arroyo La Teresa, ruta 237, km 1433, 10 km NE Piedra del Aguila, 2/XII/1997, C. Molineri col. Paratypes: 27 nymphs same locality and collector; 29 nymphs: ruta 40, 21 km N. Buta Ranquil, cerca de Butaco, Arroyo s/n, 13/XII/1997, C. Molineri col. The holotype and all paratypes except six nymphs are deposited at IFML. Other paratypes are housed half in MZL and half in FAMU.

Baetodes peniculus Mayo

Baetodes peniculus Mayo, 1973: 310, Figs. 9, 11–14 (nymph).

This species, known only from nymphs, can be distinguished by the following combination of characters: (1) one finger-like gill on each coxa; (2) glossae with one pectinate seta and paraglossae with one nonpectinate long seta; (3) each tergum with prominent, pointed tubercle directed posteriorly.

Baetodes spiniferum and *B. arawak*, known only from adults, have been found in the same area of *B. peniculus*, and for this reason they could constitute the unknown adult of *B. peniculus*. Nevertheless, due to the high diversity found in the area, until the nymph of *B. peniculus* can be reared, this cannot be proved.

Distribution: Venezuela.

Baetodes proiectus Mayo

Baetodes proiectus Mayo, 1973: 308, Figs. 1–8, 10 (nymph).

This species, known only from nymphs, can be distinguished by the following combination of characters: (1) pronotum, metanotum and abdominal terga with prominent tubercles; (2) two finger-like gills on each coxa; (3) sternum II of immature specimens with a projection from the rim of the sclerotized area around the apodeme on each side forming a small, erect, round-tipped lobe.

Distribution: Bolivia.

Baetodes pseudogibbus sp. n. (Figs. 53–59)

Nymph. Length body: 4.1–4.2 mm, cerci 4.2–4.3, terminal filament 0.3–0.4 mm. General coloration yellowish brown. Head yellowish brown, compound eyes reddish brown. Antennae yellowish brown. Mouthparts (Figs. 53–54): labrum (Fig. 53), dorsal surface with a row of 6–7 spine-like setae near midline alternating one long, one short as in Fig. 2a; two long spine-like setae near lateral margin. Mandibles, hypopharynx and maxillae as in Figs. 33–36. Labium with glossae little shorter than paraglossae, with two pectinate blade-like setae, segments 2–3 of palpi as in Fig. 54.

Thorax brownish, forewing pads yellowish brown. Metanotum with a small tubercle. Pleura yellowish brown. Sterna yellowish. Legs (Fig. 55) yellowish brown, posterior margin of tarsi and tarsal claws brownish. Dorsal edge of femora with 6–7 clavate setae (Fig. 56). Tarsal claws (Fig. 57) with 6–7 denticles. Two finger-like gills on each coxa, more than $1\frac{1}{2}$ length of coxa (Fig. 55).

Abdomen (Fig. 58) yellowish brown, tubercles acute directed towards posterior margin, first tubercle twice the size of the others. Sterna yellowish. Gills (Fig. 59) whitish, oblong and asymmetrical. Cerci yellowish.

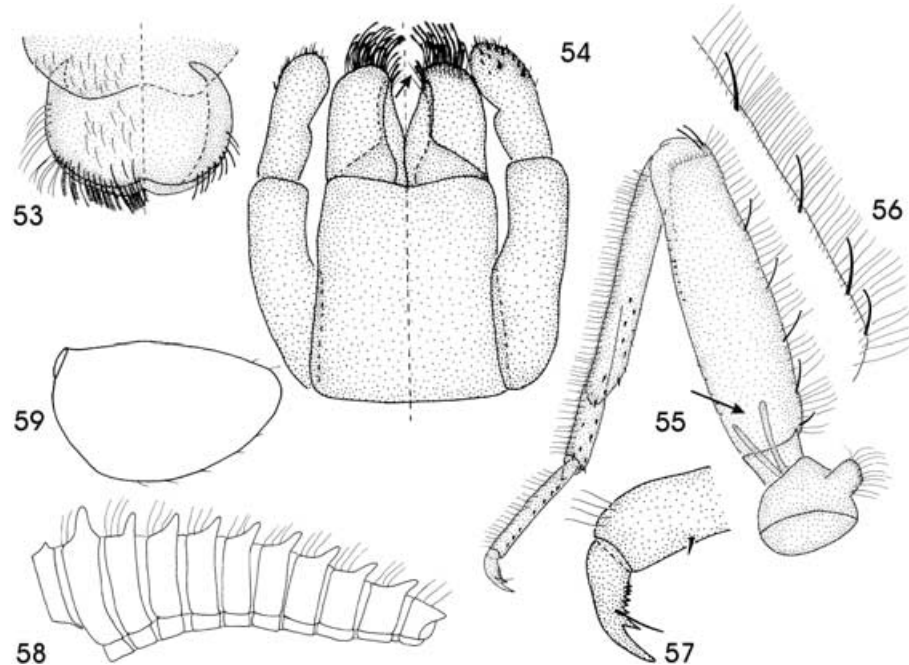
Adults. Unknown.

Discussion

Baetodes pseudogibbus can be distinguished from the other species of *Baetodes* by the following combination of characters: (1) first abdominal tubercle twice the size of the others (Fig. 58); (2) tarsal claws with 6–7 denticles (Fig. 57); (3) no tubercle on the pronotum; (4) two finger-like gills on each coxa, more than $1\frac{1}{2}$ length of coxae (Fig. 55); (5) gills (Fig. 59) whitish, oblong and asymmetrical.

Etymology

Pseudogibbus: pseudo, Latin word that means false (because this species resembles *B. gibbus*).



Figs. 53–59. *Baetodes pseudogibbus* sp. n. Nymph: Mouthparts: (53) Labrum, left d.v., right v.v.; (54) Labium, left d.v., right v.v.; Leg: (55) Hind leg v.v.; (56) Detail of dorsal edge of femora; (57) Tarsal claws detail; (58) Lateral view of abdomen; (59) Gill.

Material

Holotype: male nymph: PERU: Rio San Pedro nr. bridge, at 2.5 mi. down from river (Puente Union), 1445 m, 13°03.30'S, 71°32.78'W, 24/VI/1993, M. L. Pescador coll. Paratypes: seven nymphs same locality and collector. The holotype and all paratypes except three nymphs are deposited at FAMU. Other paratypes are housed at IFML.

Baetodes rutilus sp. n. (Figs. 60–70)

Nymph. Length: body: 6.1–6.2 mm, cerci 6.4–6.5 mm; terminal filament 0.5–0.6 mm. General coloration reddish brown. Head orange brown. Antennae yellowish brown. Mouthparts (Figs. 60–64): labrum (Figs. 60a and b) greatly expanded laterally, dorsal surface with a row of spine-like setae along subapical margin as in Fig. 11a. Mandibles (Figs. 61, 62), external margin curved and with a row of long fine setae. Maxillae robust (Fig. 63). Labium (Fig. 64), glossae short, little longer than half the length of paraglossae and with one pectinate blade-like seta.

Thorax orange brown, anterior margin of pro- and mesothorax dark brown, forewing pads yellowish. Metanotum with a small tubercle. Pleura yellowish brown. Sterna pale yellow. Legs (Fig. 65) yellowish brown, coxa with a brownish spot, dorsal edge of femora with 10–11 short and robust clavate setae (Fig. 66). Tarsal claws (Fig. 67) orange brown, with 7–8 denticles. Coxal gills lacking.

Abdomen (Fig. 68) segments 1–5 reddish brown, segments 6–9 with anterior margin reddish brown, segment 10 yellowish. Tubercles spine-like, directed towards posterior margin. Posterior margin of terga as in Fig. 69. Sterna yellowish.

Gills (Fig. 70) reddish brown and rounded. Cerci yellowish brown.

Adults. Unknown.

Etymology

Rutilus: Latin word that means red, related to the abdominal color.

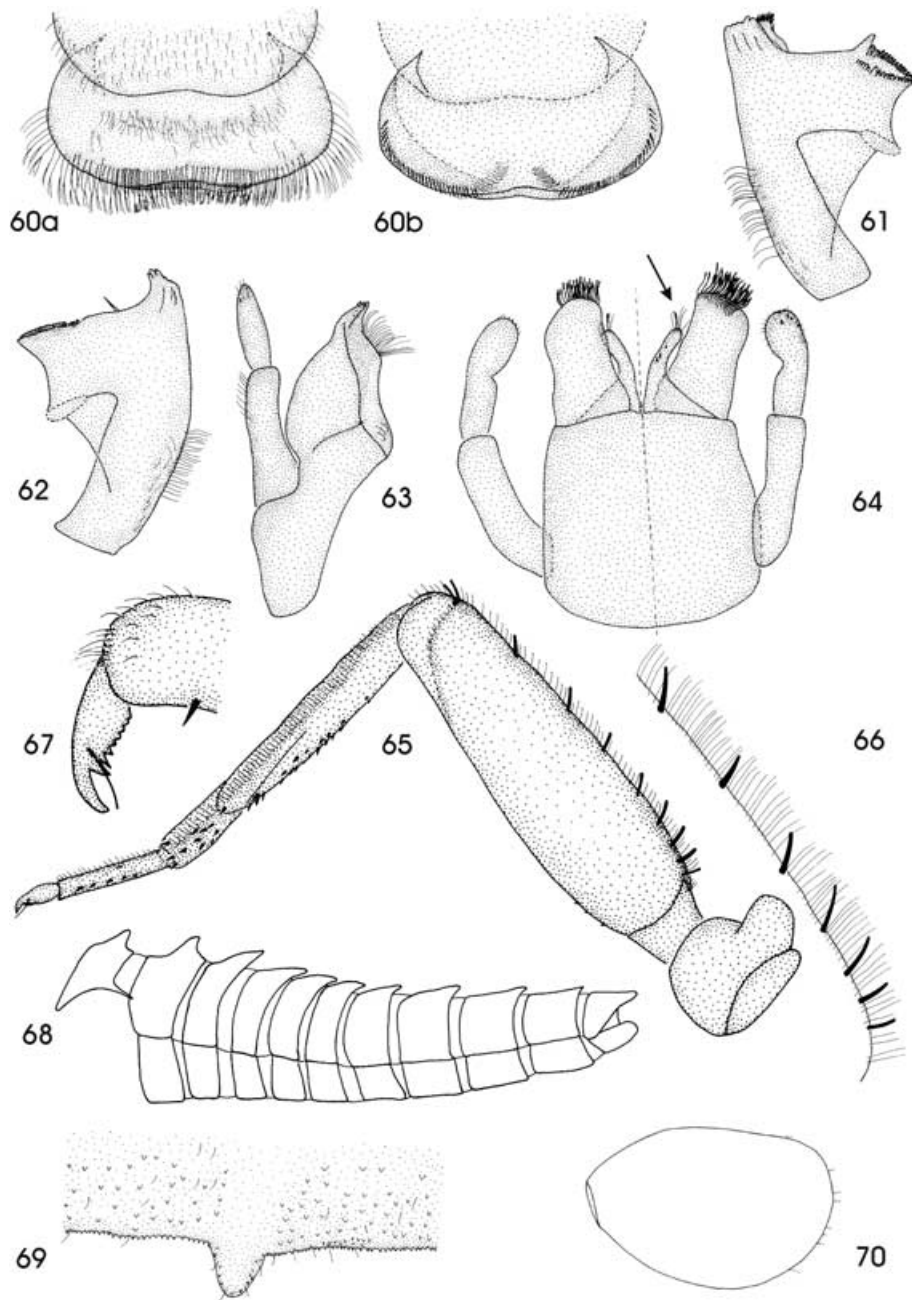
Discussion

Baetodes rutilus can be distinguished from the other species of *Baetodes* by the following combination of characters: (1) labrum (Figs. 60a and b) greatly expanded laterally, dorsal surface with a row of spine-like setae along subapical margin; (2) mandibles (Figs. 61, 62) external margin curved and with a row of long fine setae; (3) labium (Fig. 64): glossae short, little longer than half the length of paraglossae and with one pectinate blade-like seta; (4) dorsal edge of femora with 10–11 short and robust clavate setae (Fig. 66); (5) coxal gills lacking; (6) abdominal spine-like tubercles directed towards posterior margin (Fig. 68); (7) gills (Fig. 70) rounded.

B. rutilus was found in a waterfall, on the surfaces of vertical rocks where water flows, in the same habitat where a species of *Mayobaetis* was collected.

Material

Holotype: female nymph: Bolivia, cascada camino a Coroico, San Pedro arriba, Depto. La Paz, 16°16'15"S, 67°47'06"W, 2400 m, 25/XI/2000, Domínguez, Molineri &



Figs. 60–70. *Baetodes rutilus* sp. n. Nymph: Mouthparts: (60) Labrum, (60a) d.v., (60b) v.v.; (61) Left mandible v.v.; (62) Right mandible v.v.; (63) Maxilla; (64) Labium, left d.v., right v.v.; Leg: (65) Hind leg v.v.; (66) Detail of dorsal edge of femora; (67) Tarsal claws detail; (68) Lateral view of abdomen; (69) Posterior margin of terga; (70) Gill.

Nieto colls. Paratype: one nymph same locality and collectors. The holotype is deposited at ULUMSA. The paratype is housed at IFML.

***Baetodes sancticatarinae* Mayo**

Baetodes sancticatarinae Mayo, 1972: 240, Figs. 42–43 (nymph).

This species, known only from nymphs, can be distinguished by the following combination of characters: (1) one finger-

like gill on each coxa; (2) no abdominal tubercle; (3) glossae with pectinate bladlike setae and one non-pectinate blade-like setae on each paraglossa.

Distribution: Brazil.

***Baetodes serratus* Needham & Murphy**

Baetodes serratus Needham & Murphy, 1924: 55, pl. 13, Figs. 166, 168–170, 175, 176, 178, 184, 185 (nymph); Traver, 1944: 20, Fig. 11 (nymph); Mayo, 1968: 255 (nymph).

This species, known only from nymphs can be distinguished by the following combination of characters: (1) no coxal gills; (2) metanotum and abdominal terga with tubercles; (3) labrum with a row of 8–9 spine-like setae varying in length, one long, one short, near midline.

Distribution: Brazil.

***Baetodes solus* Mayo**

Baetodes solus Mayo, 1972: 231, Figs. 15–19 (nymph).

This species, known only from nymphs, can be distinguished by the following combination of characters: (1) coxal gills lacking; (2) abdominal tubercles absent; (3) glossae without pectinate bladellike setae, one wide non-pectinate bladellike seta distally near inner margin of each paraglossae.

Distribution: Peru.

***Baetodes spinae* Mayo**

Baetodes spinae Mayo, 1968: 251, Figs. 1, 2, 11, 13–15, 25 (nymph).

This species, known only from nymphs can be distinguished by the following combination of characters: (1) pronotum and mesonotum with a pair of tubercles, abdomen with prominent tubercles; (2) two finger-like gills on each coxa; (3) long spines on apical segment of labial palpi.

Distribution: Ecuador.

***Baetodes spiniferum* Traver**

Baetodes spiniferum Traver, 1943: 94, Fig. 8 (male, female).
Baetodes spinifer Mayo, 1972: 226; Flowers, 1987: 8.

This species, known only from male imago and female subimago can be distinguished by the following combination of characters: (1) abdominal tubercles on segments 2–5; (2) foretibia more than twice as long as femur; (3) turbinate eyes very large, cylindrical, erect, apical surface round, eyes contiguous apically; (4) basal segment of forceps with a mesal projection.

Distribution: Venezuela.

***Baetodes traverae* (Mayo)**

Baetodes traverae Mayo, 1972: 230, Figs. 6–14 (nymph).

This species is known only from nymphs. One paratype was studied. The original description is adequate, with the exception that Mayo omitted the absence of coxal gills.

This species can be distinguished by the following combination of characters: (1) terminal filament extremely

short; (2) glossae very short, less than half the length of paraglossae, paraglossae quadrangular; (3) labrum expanded laterally and with a group of spine-like setae behind apical margin; (4) coxal gills lacking; (5) without abdominal tubercles.

Distribution: Peru.

Material

Paratype studied: one nymph from Perú, Rio Chillón, Station III, 3 May 1958, J. Illies col. It is housed in FAMU.

***Baetodes uruguayi* sp. n. (Figs. 71–85)**

Male imago (Fig. 71). Length body: 3.6–3.7 mm; forewings: 3.3–3.4. Head yellowish brown, antennae yellowish. Turbinate eyes yellowish, large, cylindrical and erect; apical surface rounded, height of stalk almost double length of eye diameter, eyes contiguous apically; bases of ocelli black.

Thorax orange brown, legs pale yellow, foretibiae twice length of forefemora, tarsi subequal to forefemora. Forewings hyaline, except costal and subcostal spaces translucent (Fig. 72).

Abdomen brownish. Genitalia as in Fig. 73; base of forceps yellowish brown, apex pale yellow. Cerci yellowish.

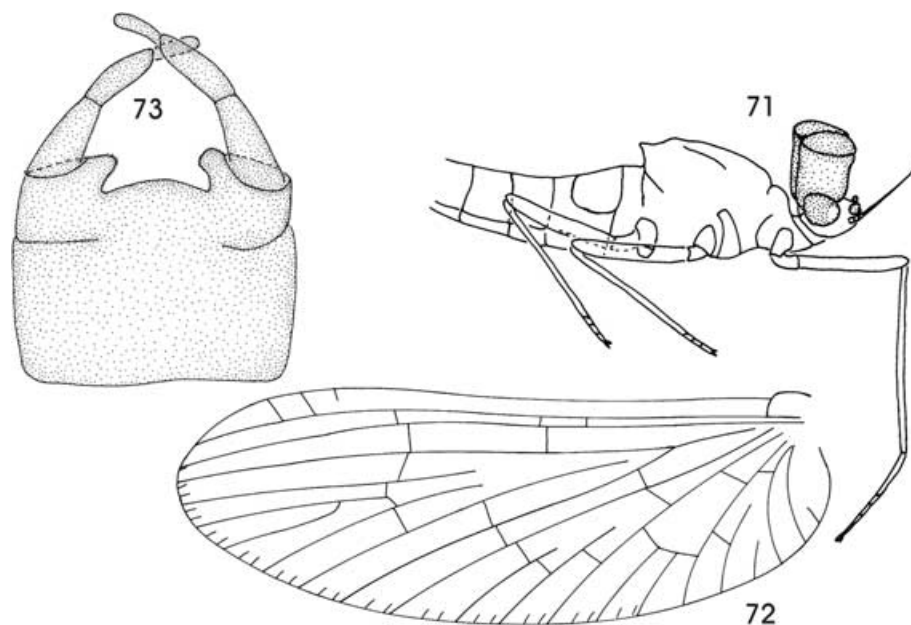
Nymph. Length body: 3.1–3.2 mm; cerci: 3.8–3.9 mm; terminal filament: 0.3–0.4 mm. General coloration brownish. Head yellowish brown, compound eyes brownish. Antennae pale yellow. Mouthparts (Figs. 74–79): labrum (Fig. 74), dorsal surface with a row of 8–9 spine-like setae near midline alternating one long, one short as in Fig. 2a; 2–3 long ones near lateral margin. Mandibles and maxillae as in Figs. 75, 76, 78. Hypopharynx: apex of lingua broadly pointed as in Fig. 77. Labium (Fig. 79), glossae little shorter than paraglossae, and with two pectinate bladellike setae.

Thorax yellowish brown, anterior margin of pro- and mesothorax brownish, mesoscutellum yellowish. Metanotum with median tubercle. Pleura yellowish brown. Sterna pale yellow. Legs (Fig. 80) yellowish brown, dorsal edge of femora with 8–9 clavate setae slender, at least as long as fine setae (Fig. 81). Tarsal claws (Fig. 82) with nine denticles. One long finger-like gill on each coxa (Fig. 80).

Abdomen (Fig. 83) yellowish brown, anterior margin of each segment brownish. A medium tubercle and fine setae in the middle of each segment. Posterior margin of terga as in Fig. 84. Sterna pale yellow. Gills (Fig. 85) whitish, transparent, basally wider, apically acute, anterior margin straight.

Discussion

Baetodes uruguayi can be distinguished from the other species of *Baetodes* by the following combination of characters: Imago: (1) turbinate eyes large, cylindrical and erect;



Figs. 71–73. *Baetodes uruguayi* sp. n. Male imago: (71) Lateral view of male imago; (72) Forewing; (73) Male genitalia v.v.

height of stalk almost twice the length of eye diameter, eyes contiguous apically (Fig. 71); (2) forceps second segment with a constriction, appearing as bi-segmented (Fig. 73). Nymph: (1) only one finger-like gill on each coxae (Fig. 80); (2) abdominal tubercles present (Fig. 83); (3) dorsal edge of femora with 8–9 clavate setae longer than fine setae (Fig. 81).

Etymology

Uruguay: Guarani word, meaning snail, is the name of the park where this species was collected.

Material

Holotype: male nymph: ARGENTINA: Misiones: ruta prov. 19, Pque. Prov. Uruguay-í, Arroyo Uruzú, 25°51'29"S, 54°10'10"W, 322 m, 25/XI/–2/XII/2001, Domínguez & Nieto colls. Paratypes: one male nymph (reared), seven nymphs, same locality and collectors; two subimaginal reared females, two nymphs: same locality, 7–11/XII/1999, Molineri col.; three nymphs: same locality, 23–24/XI/1998, Domínguez, Molineri & Nieto colls.; four nymphs and one subimaginal reared female: Depto. Candelaria, 2 km E de Bompland, río del camping, 18/XI/1998, same collectors; nine nymphs: Puerto Mado, 3 km W Ma. Magdalena, Arroyo Yacutinga, 19–20/XI/1998, same collectors; three nymphs, Arroyo San Juan, ruta prov. 203, 15 km E San José, 17/XI/1998, same collectors; five nymphs: arroyo 25 km S El Soberbio, 21/XI/1998, same collectors; three nymphs, río Uruguay, 28/XI/1980, Domínguez col. The holotype and all paratypes except six nymphs are deposited

at IFML. Other paratypes are housed half in MZL and half in FAMU.

Baetodes yuracare sp. n. (Figs. 86–95)

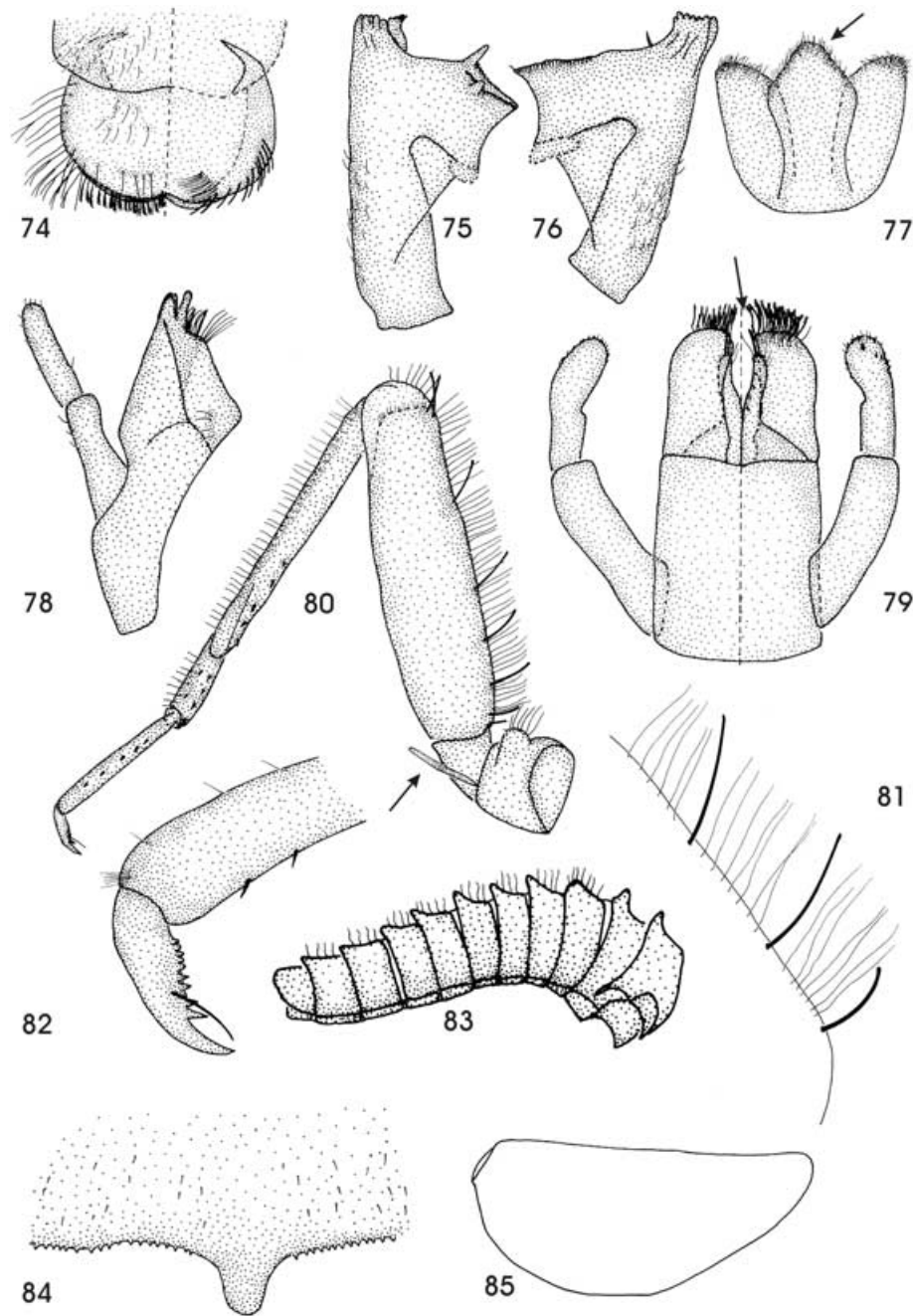
Male subimago (Fig. 86). Length, body: 4.0–4.1 mm; forewing 4.1–4.2 mm. Head yellowish brown, antennae yellowish. Turbinate eyes yellowish orange, very large, cylindrical, erect, apical surface round, eyes contiguous apically.

Thorax orange brown, legs yellowish. Forewing translucent.

Abdomen, segments 1–5 yellowish, segments 6–9 brownish. No abdominal tubercles. Genitalia yellowish.

Nymph. Length body: 3.8–3.9 mm; cerci: 2.8–2.9 mm; terminal filament: 0.3–0.4 mm. General coloration yellowish brown. Head yellowish brown, compound eyes brownish. Antennae pale yellow. Mouthparts (Figs. 87–89): labrum (Fig. 87) twice as wide as long, dorsal surface with a row of 6–7 spine-like setae near midline alternating one long, one short as in Fig. 2a; 2–3 long ones near lateral margin. Hypopharynx: apex of lingua rounded as in Fig. 88. Mandibles and maxillae as in Figs. 75, 76, 78. Labium (Fig. 89), glossae little shorter than paraglossae, with two pectinate blade-like setae, segments 2–3 of palpi rounded.

Thorax yellowish, mesothorax yellowish brown. Small hind wing pads. Pleura yellowish brown. Sterna reddish brown. Legs (Fig. 90) yellowish, claws yellowish brown; dorsal edge of femora with 6–7 short clavate setae, less than half length of fine setae (Fig. 91). Tarsal claws (Fig. 92) with 5–6 denticles. Two long finger-like gills on each coxa, at least twice the length of coxa (Fig. 90).



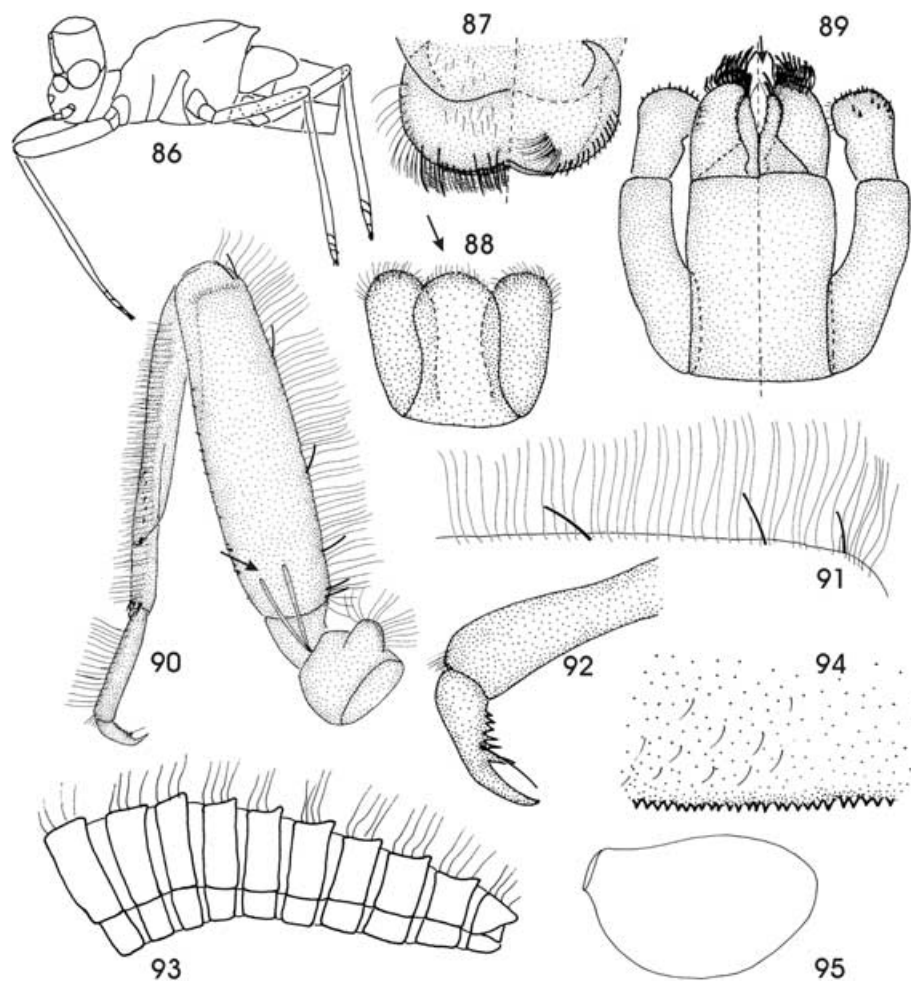
Figs. 74–85. *Baetodes uruguayi* sp. n. Nymph: Mouthparts: (74) Labrum, left d.v., right v.v.; (75) Left mandible v.v.; (76) Right mandible v.v.; (77) Hypopharynx v.v.; (78) Maxilla; (79) Labium, left d.v., right v.v.; Leg: (80) Hind leg v.v.; (81) Detail of dorsal edge of femora; (82) Tarsal claws, detail; (83) Lateral view of abdomen; (84) Posterior margin of terga; (85) Gill.

Abdomen (Fig. 93) yellowish brown. Small tubercles on each segment. Posterior margin of terga as in Fig. 94. Sterna brownish. Gills (Fig. 95) whitish, first third brownish, oblong with regular margin. Cerci pale yellow.

Discussion

Baetodes yuracare can be distinguished from the other species of *Baetodes* by the following combination of char-

acters: (1) labrum twice as wide as long (Fig. 87); (2) segments 2–3 of labial palpi rounded as in Fig. 89; (3) apex of lingua rounded as in Fig. 88; (4) dorsal edge of femora with 6–7 short clavate setae, less than half length to fine setae (Fig. 91); (5) tarsal claws with 5–6 denticles (Fig. 92); (6) small abdominal tubercles on each segment; (7) two finger-like gills on each coxa, at least twice the length of coxae.



Figs. 86–95. *Baetodes yuracare* sp. n. Male subimago: (86) Lateral view. *Baetodes yuracare* sp. n. Nymph: Mouthparts: (87) Labrum, left d.v., right v.v.; (88) Hypopharynx v.v.; (89) Labium, left d.v., right v.v.; Leg: (90) Hind leg v.v.; (91) Detail of dorsal edge of femora; (92) Tarsal claws, detail; (93) Lateral view of abdomen; (94) Posterior margin of terga; (95) Gill.

Etymology

Yuracare was a culture that inhabited the area where this species was collected.

Material

Holotype: female nymph: BOLIVIA: río San Rafael, near Villa Tunari, 17°03'54"S, 65°28'21"W, 480 m, 12/VI/2000, E. Domínguez col. Paratypes: six nymphs same locality and collector; four nymphs: Depto. La Paz, río Suapi, 16°06'41"S, 67°47'09"W, 1200 m, 29/XI/2000, Domínguez, Molineri & Nieto colls.; one subimaginal reared male and five nymphs, Colonia San Pedro, río Copacabana, 16°00'51"S, 67°35'57"W, 1000 m, 26/XI/2000, same collectors; four nymphs: río Huarinillas, 16°11'45"S, 67°45'05"W, 1250 m, 21/XI/2000, same collectors. The holotype and 15 paratypes are deposited at ULUMSA. Remaining paratypes are housed at IFML.

Discussion

All the species herein described present the generic characteristics mentioned in previous papers. Nevertheless, there is another character not mentioned until now that is considered important:

- Coxal gills, placed between coxae and trochanters (Figs. 25, 38, 48) and not between the body and coxae as in other Baetidae like *Camelobaetidius*.

Cohen and Allen (1978) discussed the importance of intraspecific character variation, such as number of spine-like setae on the labrum, length of glossae, presence or absence of coxal gills (Mayo, 1972). They considered these characters as variable from specimen to specimen. In all the species here examined, these characters appeared constant in all the specimens of the same species, and are important for distinguishing one species from another.

Flowers (1987), discussed other characters with potential phylogenetic significance: (1) labrum with heavily sclerotized lateral margins on ventral surface; (2) paraprocts lacking marginal spines; (3) rudimentary hind wing pads. These characters were also present in all examined nymphs. For this reason, all the characters mentioned above were not included in the specific descriptions and keys. Moreover, all the species described herein have antennae with scape and pedicel with longitudinal row of fine setae on outer margin, labrum with apical margin with pinnate setae, femora with a transverse row of small setae apically and ventrally, and tarsal claws with one stout subapical seta on lateral margin. These characters, although not diagnostic for the genus, are useful to study its phylogenetic relationship with the other genera of the family.

All the species described herein were found on the upper surfaces of rocks in fast-flowing water. They inhabit well-oxygenated rivers, mainly located in the mountains. It seems that the highest specific richness of *Baetodes* is found in mountain rivers in the Andean basal rain forest (Yungas biogeographic province).

Acknowledgements

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