Received 20 October 2003; revised and accepted 29 March 2004

Heteragrion makiritare sp. nov., with descriptions of hitherto unknown females and larvae of other species from Venezuela (Odonata: Megapodagrionidae, Lestidae)

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Key words: Odonata, dragonfly, *Heteragrion*, *Philogenia*, *Sciotropis*, *Archilestes*, *Lestes*, larva, Venezuela.

Abstract

Heteragrion makiritare sp. nov. is described from two males from the Pantepui region – holotype: Venezuela, Amazonas State, Marahuaka, Sima (3°43'N, 65°31'W), 1,140 m a.s.l., MIZA, no. 17250. It belongs in the species group whose paraprocts are absent in the male sex. The identity of *H. macilentum* is elucidated by examining its lectotype and a syntype, which resulted to be not conspecific. The females of *H. breweri* and *Philogenia ferox* are described for the first time. The ultimate instar exuviae of *H. bariai*, *H. breweri*, *H. chlorotaeniatum* and *H. mitratum* are figured and compared. Figures of the female intersternite of these species, and of *H. pemon*, are provided. The larva of *Sciotropis cyclanthorum*, as well as the ultimate instar exuviae of *Archilestes tuberalatus* and *Lestes apollinaris* are described and illustrated.

Introduction

This paper updates the knowledge on various species of Megapodagrionidae and Lestidae from Venezuela. In my paper on the Odonata of Cerro de la Neblina (De Marmels 1989) I stated that larvae of Odonata found there would be described later. A few Anisoptera larvae were already described since then (De Marmels 1990), and here the description of some megapodagrionid (Zygoptera) larvae is added. I also include descriptions of the female sex of *Heteragrion breweri* (De Marmels) and *Philogenia ferox* (Rácenis) for which only the male was known. Once more (De Marmels 1999), a new species of *Heteragrion* from Pantepui raises questions about the identity of the mysterious *H. macilentum* Hagen in Selys. Comparison of the larval stage of four species of *Heteragrion* does not reveal reliable morphological characters to separate them. On the other hand, adult females of this

genus show differences in the intersternite, specifically a tubercle or rim-like structure at its dorsal end, which may be present or absent and, may vary in shape interspecifically when present. The curious larva of *Sciotropis cyclanthorum* Rácenis points to an isolated taxonomic position of that genus. The larva of *Archilestes tuberalatus* Williamson differs little from that of *A. grandis* (Rambur), while the larva of *Lestes apollinaris* Navás is easily diagnosed from that of other *Lestes* species, which may coexist with this Andean species.

Methods

Wing vein nomenclature follows Riek & Kukalová-Peck (1984). Right wing features are given in parentheses, if differing from left wing. Length of pterostigma refers to maximum proximal-distal extension. Total length and length of abdomen do not include the cerci of the imagoes, nor the lateral caudal gills (paraprocts) of the larvae; the terminal filament of the gills in larvae of *Heteragrion* was not measured, because of its proneness to be incomplete. Length of femur includes trochanter. The intersternite is a more or less sclerotized structure located laterally between pro- and mesothorax. It has been used in the taxonomy of *Hetaerina* (Calopterygidae) by Garrison (1990) and also in the Megapodagrion complex (Megapodagrionidae) by De Marmels (2001). All dimensions are given in millimeters. The illustrations were made with the help of a camera lucida coupled to a Wild M-8 stereoscope. The specimens are deposited at the Museo del Instituto de Zoología Agrícola "Francisco Fernández Yépez" (MIZA), Maracay, except where indicated otherwise.

Megapodagrionidae: *Heteragrion bariai* De Marmels, 1989
(Figs 25, 30, 38, 42)

Specimen examined

Larva: 1 ♂, ultimate instar exuvia from reared specimen, Venezuela, Amazonas State, upper Río Baría (0°49'50"N, 66°09'40"W), 140 m a.s.l., 24 vi - 11 vii 1984, J. De Marmels leg. (MIZA).

Notes on the exuvia

Body: Overall pale brown, without markings. Essentially identical to exuvia of *H. breweri* described below. The lateral gill (Fig. 38) bears a much longer terminal filament, but this may be incomplete in the single gill preserved on the exuvia of *H. breweri*.
Dimensions: Total length 10.1; lateral gill 4.0; maximum width of head 3.0; hind femur 3.1; hind tibia 3.1.

Heteragrion breweri De Marmels, 1989
(Figs 20-23, 26, 31, 34, 35-37, 39)

Specimens examined

4 ♀: Venezuela, Bolívar State, Minas de Los Pijiguaos, Quebrada La Solanera, 90 m a.s.l., 03-13 vi 1992. Larva: 1 ♂ ultimate instar exuvia from reared specimen, same data. All J. De Marmels leg. (MIZA).

Description of adult female

Head: Labium creamy, labrum pale brown with darker markings; clypeus dorsally pale brown with dark brown free margin, this margin suddenly expanded proximad in middle; frons with dark line along dorso-frontal angle; remaining head pattern as in Figure 20; rear of head pale with black comma-shaped spot at half-length of eye margin; compound eyes dark brown above, yellow green below (in live individual).
Thorax: Pronotum as in Figure 21; intersternite a little higher and broader than setifer (Fig. 26). Pterothorax with black median carina separated by bright olivaceous yellow from line from broad, dark brown antehumeral stripe, which covers most of mesepisternum and is separated humeral suture by olivaceous yellow stripe; a brown mesepimeral stripe and a little-defined, narrow metepisternal stripe of same color; metepimeron almost white, a poorly-defined brown spot near dorsal end of sclerite, or this spot absent. Legs pale brown, femora with dark subapical ring.
Wings: hyaline; pterostigma pale brown; petiolation ceasing shortly after CuP. 16-19 Px in Fw; R3 beginning at Px 4-7, IR2 at Px 8-10. Hw with 14-15 Px; R3 beginning at or slightly beyond Px 5, IR2 at Px 7 or after Px 8.
Abdomen: S7 without black apical ring; S8-9 pale laterally, with individually variable, brown markings dorsally; S10 pale, or with brown dorsal marking. Valves of ovipositor pale, just reaching end of S10, valves with single row of robust teeth along distal third (Fig. 23).
Dimensions: Total length 32.5-35.1; abdomen 25.7-27.9; cercus 0.5; Fw 21.0-22.3; Hw 20.5-21.8.

Description of exuvia

An unpatterned, pale brown exuvia.
Head: triangular with concave occipital margin; occipital lobes prominent, beset with short spines (Fig. 35); antenna with seven segments (Fig. 31); labium reaching backwards to first pair of coxae; median lobe convex, palps as in Fig. 37; mandibles (Fig. 34) as for *H. bariai*, *H. chlorotaeniatum* and *H. mitratum*.
Thorax: Pronotum laterally with convexly rounded rim armed with spines; wing sheaths extending to end of S4. Legs unicolorous, hind tibia with row of setae ventrally.
Abdomen: S7-10 with row of spines dorsally along distal margin. Only left lateral gill preserved; triquetral, flat ventrally, with all carinae beset with spines (Fig. 39).
Dimensions: Total length 10.0; lateral gill 4.0; maximum width of head 2.7; hind femur 3.6; hind tibia 4.1.

Heteragrion chlorotaeniatum De Marmels, 1989
(Figs 27, 32, 40)

Specimen examined

Larva: 1♂ ultimate instar exuvia from reared specimen, Venezuela, Amazonas State. Upper Río Baría (0°49'50"N, 66°09'40"W), 140 m a.s.l., 24 vi - 11 vii 1984, J. De Marmels leg. (MIZA).

Notes on exuvia

Body: Similar to two preceding species but with antenna more slender with third segment longer (Fig 32). Left lateral gill (the only one preserved) lacking terminal filament, but this probably broken off (Fig. 40).
Dimensions: Total length 10.0; lateral gill 3.8; maximum width of head 2.5; hind femur 3.3; hind tibia 3.0.

Heteragrion macilentum Hagen in Selys, 1862
(Figs 14-17)

Specimen examined

Lectotype ♂: "Brésil", [before 1862], Kummel leg. (Naturh. Mus. Wien, no. 617); designation of lectotype: St. Quentin (1970: 259); examined by R.W. Garrison. A paralectotype ♂ in MCZ (Fig. 13) belongs to another species; see below under *Heteragrion* sp.

Descriptive notes

A very pale colored species.
Wings: Fw with 17 Px, Hw with 16 (17); the three antenodal spaces of costal field subequal in length; arculus at second Ax; CuP as much basally to arculus as latter is high; two antenodal cells in discoidal field in all wings; RP3+4 originating just distal to arculus; IR2 originating at Px 5 (between Px 5 and 6) in Fw and in left Hw, at Px 6 in right Hw; RP2 branching between Px 8 and 9 (between Px 9 and 10) in Fw, at Px 8 (between Px 9 and 10) in Hw; IR1 branching at Px 11 (between Px 11 and 12) in FW, between Px 10 and 11 (at Px 12) in Hw.
Cercus: Tip of the medial lobe (= internal branch) more pointed (Fig. 14) than in the Venezuelan paralectotype (Fig. 13).
Dimensions: Total length 52.0; abdomen 46.0; Hw 22.0.

Comments

The true specific identity of this species is still uncertain. *H. macilentum* was described from Puerto Cabello, Venezuela, and "Brésil", the latter locality with a question mark (Selys 1886). According to Hagen in Selys (1862), the collector of this male from Venezuela was Karl Ferdinand Appun, a German, who lived in that

country from 1848 to 1859 and who collected supposedly mainly around San Esteban, a village at the southern outskirts of Puerto Cabello, on the Caribbean coast, where he spent about five years in the mountains. However, Appun never mentioned Odonata in his travel reports (Appun 1871, 1872). His other trips were to neighboring states in northern Venezuela and to the delta of the Orinoco river, and he also visited the Río Branco and the Río Negro in northern Brazil, and reached the Peruvian frontier traveling along the Amazon River. Finally, he lived nine years, from 1859 to 1868, in British Guyana. Appun visited Venezuela at the encouragement of Alexander von Humboldt. His interests were mainly botanical, but he published a short paper on the insects of Venezuela (Appun 1872). Appun was a keen observer and his book 'Unter den Tropen' (Appun 1871) is a splendid picture of Venezuela, its people and nature around 1850. Nevertheless, it is doubtful whether Appun collected the specimen of *H. macilentum* attributed to him by Selys, and if so, whether he caught it in northern Venezuela.

A suggestive example of confusion with the locality labels is the case of *H. icterops* Selys, 1862. This species was described from a unique male from "Santarém" on the Amazon River (Brazil) by Selys (1862). Later, Selys (1886) simply added "S. Esteban (Venezuela)" to the range of *H. icterops*, a biogeographical impossibility. This mislabeling, however, shows that Appun probably collected specimens during his Amazonian journey and later he or Hagen, or Selys, mixed them up with Odonata from San Esteban. The same could have happened to Appun's specimen of *H. macilentum* from Puerto Cabello, more so as this species has never been found again. Interestingly, a hitherto unknown and unrelated species, *H. palmichale* Hartung, 2002, turned up recently in the same region.

But what exactly is *H. macilentum*? This species was apparently described from two males and one female. One male syntype from "Porto Cabello", Appun's specimen, is in the Museum of Comparative Zoology (MCZ), at Harvard, the others, from "Brésil", are at the Naturhistorisches Museum Wien (Vienna), Austria. St. Quentin (1970) designated the male in Vienna as lectotype. Rosser Garrison kindly examined the lectotype and the male paralectotype and made numerous illustrations showing their diagnostic features, which are reproduced here (Figs 9-17). As might be expected, the lectotype from Brazil and the paralectotype from Venezuela are not conspecific, and they do not correspond either with *H.* makiritare described here. Thus, *H. macilentum* must be deleted from the Venezuelan checklist. Rosser Garrison wrote (in litt., 20 August 2003), that the lectotype *H. macilentum* "is similar, very, very similar to a male I have here given me by Janira [Martins Costa] identified as *H. ochraceum*. But since no one has probably compared type material, I am hesitant to apply this name to the lectotype of *macilentum*. The other male, the MCZ one, is still difficult to place though it (by my drawings) is very close to *H. aurantiacum* Selys, 1862, which is from southern Brazil and Argentina! The more and more I look at the '*macilentum*' question, the more I begin to think that both of these [lectotype and syntype] might have come from SE Brazil, not up in your area [Venezuela]".

Range: Brazil.

Heteragrion makiritare sp. nov.
(Figs 1-8)

Specimens examined

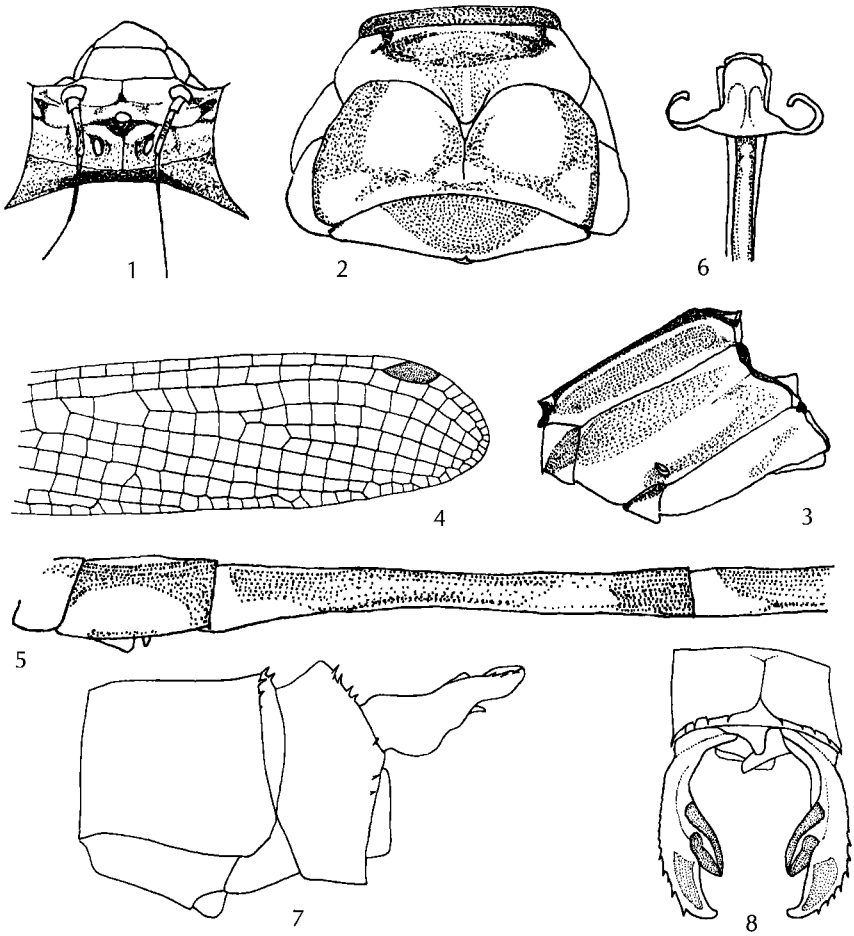
Holotype ♂: Venezuela, Amazonas State, Marahuaka, Sima, 1,140 m a.s.l., Duida-Marahuaka National Park (3°43'N, 65°31'W), 10-17 iii 1985, *A.* Chacón leg. (MIZA, no. 17250). Paratype: 1 ♂ Bolívar State, km 119 road El Dorado-Santa Elena de Uairén, 1,000 m a.s.l., Canaima National Park, 14 iv 1957, F. Fernández Yépez & C.J. Rosales leg. (MIZA).

Etymology

The new species is named after the Ye'Kwana Amerindians, who are popularly known as the "Makiritare". This term is here used as a noun in apposition. The type locality lies within the territory of this riverine tribe.

Description of male holotype

Head: Labium pale yellow orange; labrum, clypeus, mandibles and frons anterior to median ocellus, bright orange. Frons obtusely angled; top of head with diffuse pale to dark brown markings (Fig. 1); rear of head pale yellow. Compound eyes of live specimen black above, pale olivaceous below.
Thorax: Prothorax largely yellow; anterior lobe of pronotum dark, some diffuse brown shading also on middle lobe and on center of posterior lobe, the latter with a minute central notch on distal margin (Fig. 2). Pterothorax yellow, median carina black, bordered on each side by a dark brown line and, more externally, by a yellow line of same width, both sharply defined; remainder of mesepisternum brown, diffusely separated from humeral suture by a yellow stripe; mesepimeron with diffuse brown stripe which continues basally across mesokatepisternum). Metepisternum with diffuse brown stripe across spiracle and into metakatepisternum; metepimeron yellow; ventral part of thorax and coxae bright yellow (Fig. 3). Legs olivaceous; femora with diffuse dark band across basal half and a second one near tip; hind tibiae armed with 7-8 long setiform spines (outer row). Wings hyaline; pterostigma uniformly dark brown covering less than two cells (Fig. 4); petiolation reaching beyond level of arculus; antenodal costal spaces subequal; two postdiscal cells before subnodus (three in left forewing). Fw with 20(21) Px; RP2 branching at Px 10(9), IR2 at Px 6(5). Hw with 18 Px; RP2 branching at Px 8 (before 8), IR2 at Px 5 (before 5).
Abdomen: S1 yellow; S2 yellow laterally, dark brown dorsally, with yellow median longitudinal line; S3-6 with yellow basal ring and diffuse subapical crossband of same color; central parts and broad apical ring almost black (Fig. 5); S7 black with yellow basal ring only; S8 black in basal half blurring into brown toward middle of segment, distal half orange dorsally, yellow ventrally; S9 with yellow basal ring, otherwise black dorsally, yellow laterally and ventrally; S10 black dorsally, yellow laterally and ventrally. Cerci dark, directed rearwards and slightly upwards, ventrally inflated near base, this part hollowed-out internally; terminal branch with external spines, internal branch with strong dorsal ridge. Paraprocts poorly developed (Figs 7-8).
Dimensions: Total length 52.4; abdomen 43.4; cerci 1.3; Fw 29.0; Hw 27.9; pterostigma 1.6.



Figures 1-8: *Heteragrion makiritare* sp. nov. ♂ (Figs 1-5 and 7-8 of holotype, Fig. 6 of paratype) — (1) head, dorsal view; (2) pronotum, dorsal view; (3) pterothorax, left lateral view; (4) tip of left forewing; (5) basal abdominal segments, left lateral view; (6) penis, ventral view; (7) tip of abdomen with caudal appendages, left lateral view; (8) same, dorsal view. Figures not to scale.

Description of male paratype

Body: Face deep orange; top of head behind lateral ocelli more uniformly dark brown throughout; general color pattern otherwise much as in holotype. Petiolation ceasing at level of arculus in Fw, slightly beyond in Hw; two postdiscal cells before subnodus (one in right Hw); pterostigma noticeably longer and narrower than in holotype; Fw with 17(18) Px, RP2 branching near Px 8, IR2 at Px 6; Hw with 14 Px, RP2 branching close to Px 7, IR2 closer to Px 6 (at Px 5). Penis with small internal fold (Fig. 6).
Dimensions: Total length 53.6; abdomen 44.1; cerci 1.2; Fw 27.5; Hw 27.0; pterostigma 1.9.

Comments

H. makiritare belongs to the group of species lacking paraprocts in the male. Female and larva are unknown. In the key by Williamson (1919) the new species keys out together with *H. ictericum* Williamson, 1919 and *H. melanurum* Williamson, 1919. Both differ from *H. makiritare* by their much smaller size as well as cercal morphology and color pattern. All other species of the group are known only from southern South America, except for *H. cooki* Daigle & Tennessen, 2000, *H. macilentum*, and *H. pemon*. *H. cooki* (Figs 18-19) is known only from western Ecuador (Daigle & Tennessen 2000). In spite of some similarity in color pattern with *H. makiritare* , this latter is a much larger species. Finally, the Venezuelan *H. pemon* is smaller than *H. makiritare* and has vividly black and yellow patterned head, thorax and abdomen. The internal branch of the cerci is truncated in *H. pemon*, but pointed in *H. makiritare* . Both species are probably endemics of the Pantepui region (Guayana highlands). While *H. pemon* is more commonly collected, the seemingly rare *H. makiritare* has wider distribution within that region.

Heteragrion mitratum Williamson, 1919

(Figs 28, 33, 41, 41a, 43, 44)

Specimens examined

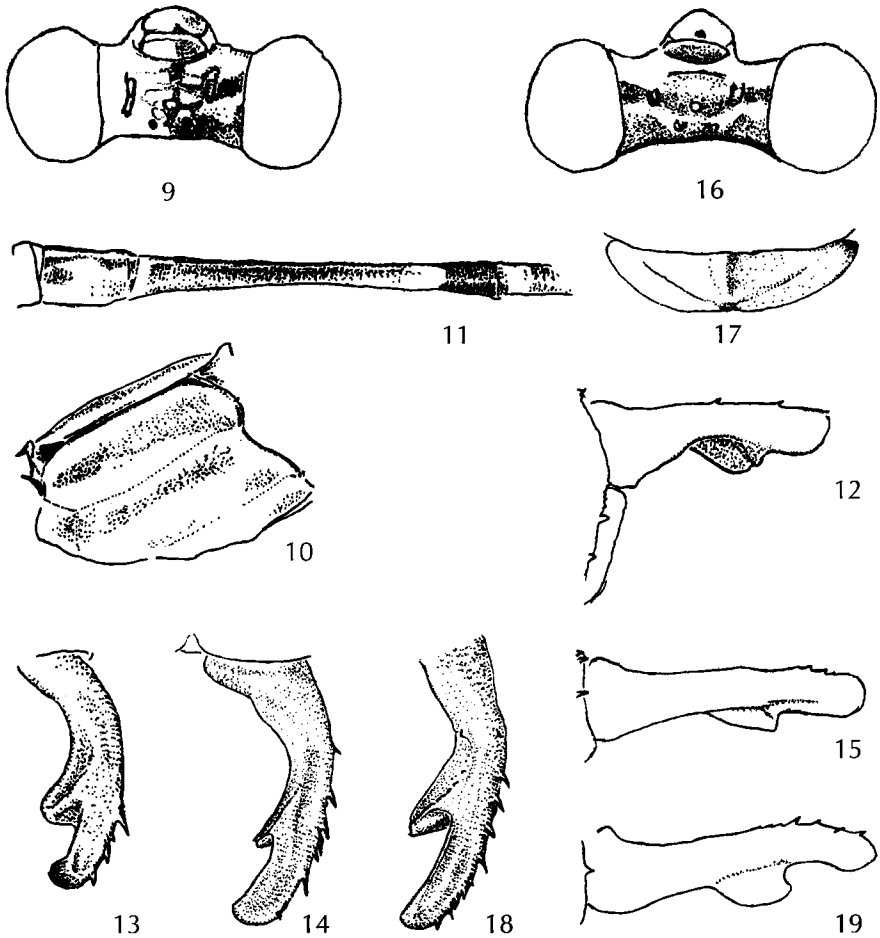
Larvae (ultimate instar exuviae): 1 ○ from reared specimen, Venezuela, Táchira State, San Félix, Quebrada Cara de Perro, 16-23 vi 1998; 1 ♂ (reared), Quebrada La Resbalosa, 19 v 1999; 1 ♀ (reared), 18 v 1999; 2 ♂, 2 ♀ 18 v 1999; 2 ♀ 11 vii 2000 (not reared). All J. De Marmels leg. (MIZA).

Notes on exuvia

Body: Very similar to *H. bariai*, *H. breweri* and *H. chlorotaeniatum*. Female gonapophyses just surpassing hind margin of S10 (Fig. 44).
Dimensions: Total length 9.7-12.1; lateral gill 4.3-4.9; maximum width of head 2.7-3.0; hind femur 3.3-4.0; hind tibia 3.5-4.0.

Comments

I have been unable to find any external morphological characters with which to discriminate larvae among the four species of *Heteragrion* described here. The incompleteness of the male singletons and the unavailability of female exuviae of the three Amazonian species render their separation yet more difficult. The striking intraspecific variability of the caudal gills, especially the terminal filament in *H. mitratum* (Figs 41, 41a), suggests difficulties in general for easy distinction of the larvae within this genus.



Figures 9-19 (by R.W. Garrison): Details of three *Heteragrion* spp. — 9-13: ♂ paralectotype of *H. macilentum* from Venezuela no. 12157 in MCZ – (9) head, dorsal view; (10) pterothorax, left dorsolateral view; (11) basal abdominal segments, left lateral view; (12) caudal appendages, left lateral view; (13) right cercus, dorsal view — 14-17: *H. macilentum*, ♂ lecto-type from Brazil no. 617 in Naturhistorisches Museum Wien – (14) right cercus, dorsal view; (15) left cercus, lateral view; (16) head, dorsal view; (17) pronotal hind lobe, dorsal view — 18, 19: *H. cooki*, ♂ from Ecuador (Río Palenque) in Coll. Garrison – (18) right cercus, dorsal view; (19) left cercus, lateral view.

Heteragrion pemon De Marmels, 1987
(Figs 24, 29)

The female of this species was described by De Marmels (1992). I include additional illustrations (Figs 24, 29) of head and intersternite, from the same specimen previously illustrated (De Marmels 1992).

Heteragrion sp.
(Figs 9-13)

Specimen examined

1 ♂: Venezuela, Carabobo State, Puerto Cabello, [before 1859], Appun leg. (MCZ, No. 12157); examined by R. Garrison.

This male is a paralectotype of *H. macilentum* Hagen in Selys, 1862. It is not conspecific with the lectotype described above.

Descriptive notes

Body: Similar in color pattern to *H. macilentum*, but with shorter abdomen. Cercal morphology is quite distinct: internal branch much broader, more robust in *H.* sp. than in the lectotype of *H. macilentum* (see Figs 12-15).
Dimensions: Abdomen 37.0; Hw 24.0 (after Selys 1862).

Comments

As pointed out by R. Garrison (see comment under *H. macilentum*, above), the true geographical origin of this male is probably southeastern Brazil. It may indeed belong in an already described species, perhaps *H. aurantiacum* (see above).
Range: supposedly Venezuela.

Philogenia ferox Rácenis, 1959
(Figs 45, 47, 49)

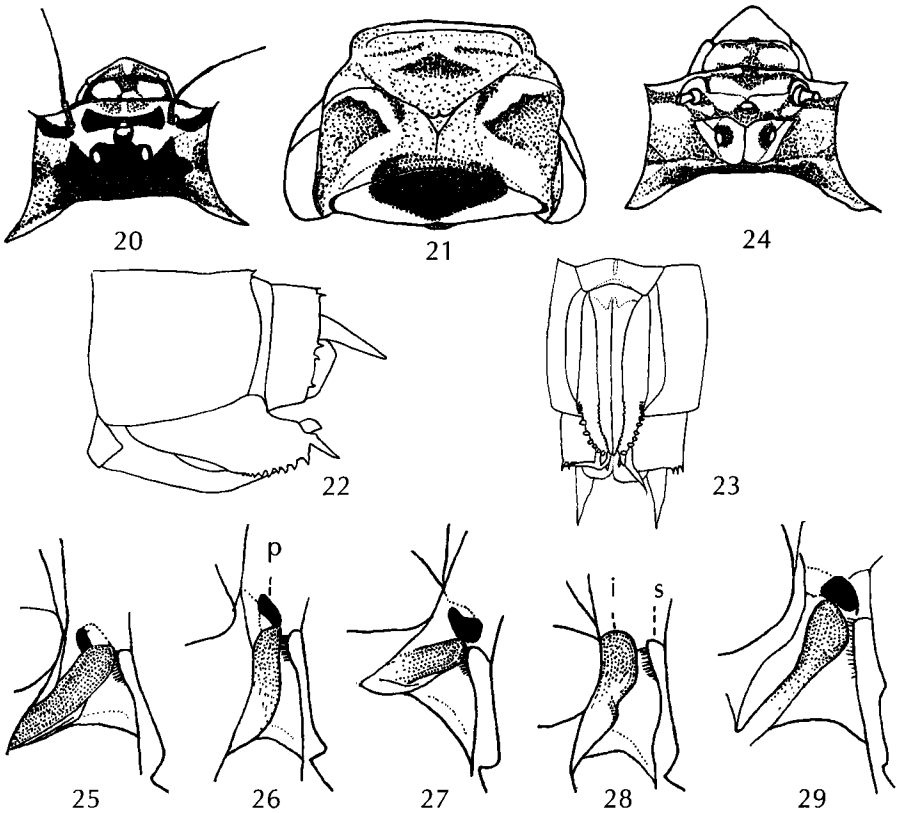
When Rácenis (1959) described this species he had only a single male. Since then a few more males could be secured, but the female described below is the sole one collected so far. The larva is still unknown.

Specimen examined

1 ♀ Venezuela, Aragua State, road Maracay-Choroní, regresiva del diablo, 1,280 m a.s.l. (type locality!), 22 vii 1996, R. Colmenares leg. (MIZA).

Description of female

Head: Antenna brown black, labium pale brown, middle lobe dark; labrum black with pale anterior margin, mandibles white. Top of head black, except for brown, triangular spot between each lateral ocellus and corresponding antenna; posterior border of occipital lobes and rear of head pale brown.
Thorax: Prothorax black, median lobe of pronotum posteriorly with pale transverse streak on each side; posterior lobe brown black, shaped as in Figure 45. Intersternite surpassing dorsally end of setifer (Fig. 47). Mesostigmal lamina not modified. Pterothorax black with narrow, pale line along humeral suture and along first and second lateral sutures; pale line at first lateral suture enlarging above coxa and forming pale spot which occupies more than one fourth of width of mesepimeron.



Figures 20-29: Details of five *Heteragrion* spp. — 20-23: *H. breweri*, ♂ – (20) head, dorsal view; (21) pronotum, dorsal view; (22) tip of abdomen with ovipositor, left lateral view; (23) same, ventral view; figures not to scale — 24: *H. pemon*, ♂ – (24) head, dorsal view — 25-29: ♂ intersternite in comparison – (25) *H. bariai*; (26) *H. breweri*; (27) *H. chlorotaeniatum*; (28) *H. mitratum*; (29) *H. pemon*; figures to scale. i: intersternite (stippled); s: setifer; p: tubercle- or rim-like protuberance (black, if present).

Legs pale, femora and tibiae with dark tip. Wings slightly infumated, especially near tip; pterostigma black, overlying about three cells.
Abdomen: Black with pale basal lateral spot on each side of S3-7. S8-10, as well as cerci and ovipositor, black; only S9 paler brown dorsally. Ovipositor just surpassing tip of cerci (Fig. 49).
Dimensions: Total length 50.0; abdomen 38.7; Fw 35.6; Hw 35.5.

Comments

This extremely rare species occurs together with *P. cassandra* Hagen in Selys, 1862. While *P. ferox* is a blackish species, *P. cassandra* has an overall paler brown thorax with only some dark brown markings. In *P. cassandra* the pronotal hind lobe is regularly rounded posteriorly (Fig. 46), but undulated in *P. ferox*. The intersternite surpasses the setifer dorsally in *P. ferox* (Fig. 47), but is about as high as the setifer in *P. cassandra* (Fig. 48).

Sciotropis cyclanthorum Rácenis, 1959
(Figs 50-54)

Specimen examined

Larva: 1 ♂ penultimate instar (supposition), Venezuela, Aragua State, road Maracay-Choroní, regresiva del diablo, 1,280 m a.s.l., "Henri Pittier" National Park, 16 vi 2002, J. De Marmels leg. (MIZA). The larva is kept in 75% alcohol.

Description of larva

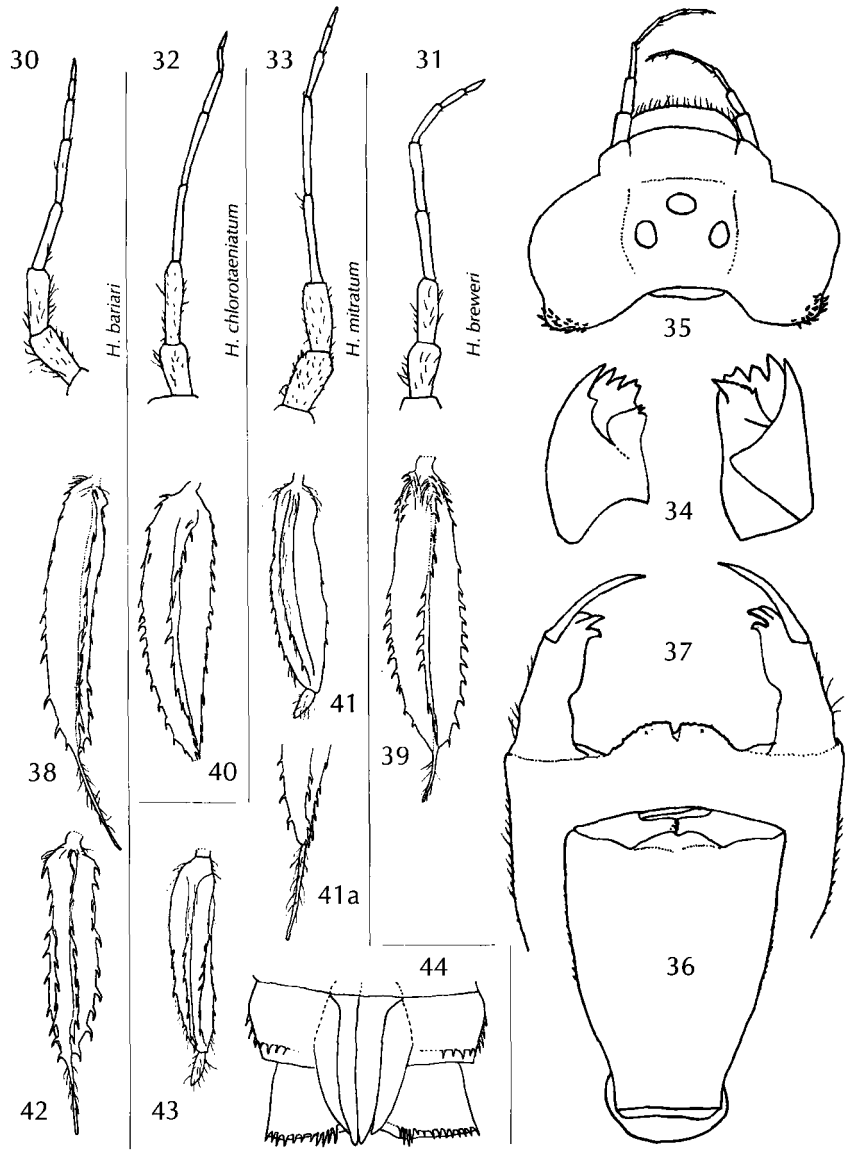
This is a strongly patterned larva (Fig. 50).
Head: As broad as metathorax, dark colored; antenna apparently seven-jointed, with apical segment partly fused to sixth; mostly pale, two basal segments darker, beset with short setae and some longer hairs (Fig. 51). Labium pale, reaching to near hind border of first coxae; median lobe strongly convex with median cleft small, narrow; palp with usual tridentate pattern: middle hook longest, basal hook shortest and apically truncated; there are no setae either on labium or on palp (Figs 52, 53).
Thorax: Prothorax black laterally, armed anterolaterally with strong spine-like supracoxal process. Mesotorax with two supracoxal processes of which the proximal one is short, obtuse, triangular, while the distal process is digitiform and curved dorsad. Wing cases reaching to end of S4 (penultimate instar). Legs short with flattened femora and swollen tibiae, beset with spines and setae (Fig. 54).
Abdomen: With contrasting pattern dorsally and also ventrally. S10 little excised dorsally at middle, but with small comb of spinules at each side of excision. Caudal gills not petiolated; epiproct with well-developed dorsal and ventral keel, and with lateral margins beset with minute spines and longer hairs. Paraprocts ventrally flat bearing an articulated, spindle-shaped apical process, laterally with dense hair cover. Male gonapophyses not obvious.
Dimensions: Total length 7.2; lateral caudal gill (including apical process) 2.8; maximum width of head 2.6; hind femur 1.9; hind tibia 2.0.

Habitat and habits

The larva was found on a cliff at the eastern side of a twelve meter high cascade in cloud forest. The cliff is kept wet by the permanent damp caused by the waterfall. The rocky wall is partly covered by moss, small ferns and other plants, the roots of which retain some sand and leaf litter. The larva was clinging to the wet rock concealed by hanging roots and dead leaves. When disturbed, the larva made jerky lateral movements using only its middle and hind legs for locomotion, while the fore legs were kept in the air much as is known for Protura (Parainsecta Ellipura). Three adult males of *S. cyclanthorum* were also observed. They settled, always in the shade, with their wings outspread on leaves and sticks close to the ground.

Comments

The larva was identified by exclusion: the only other Megapodagrionidae in range are *Philogenia cassandra* and *Teinopodagrion venale* (Hagen in Selys, 1862), both



Figures 30-44: Details of ultimate instar ♂ exuvia of four species of *Heteragrion* — 30-33: antenna – (30) *H. bariai*; (31) *H. breweri*; (32) *H. chlorotaeniatum*; (33) *H. mitratum*; figures to scale — 34-37: *H. breweri* – (34) mandibles (left mandible, at left); (35) head, dorsal view; (36) labium, ventral view; (37) distal portion of labium, dorsal view — 38-43: caudal gills, dorsal view – (38) left paraproct of *H. bariai*; (39) same of *H. breweri*; (40) same of *H. chlorotaeniatum*; (41) same of *H. mitratum*; (41a) same of other specimen; (42) epiproct of *H. bariai*; (43) same of *H. mitratum* — 44: tip of abdomen ♂ *H. mitratum*, ventral view. Figures showing same structure in different species are to scale.

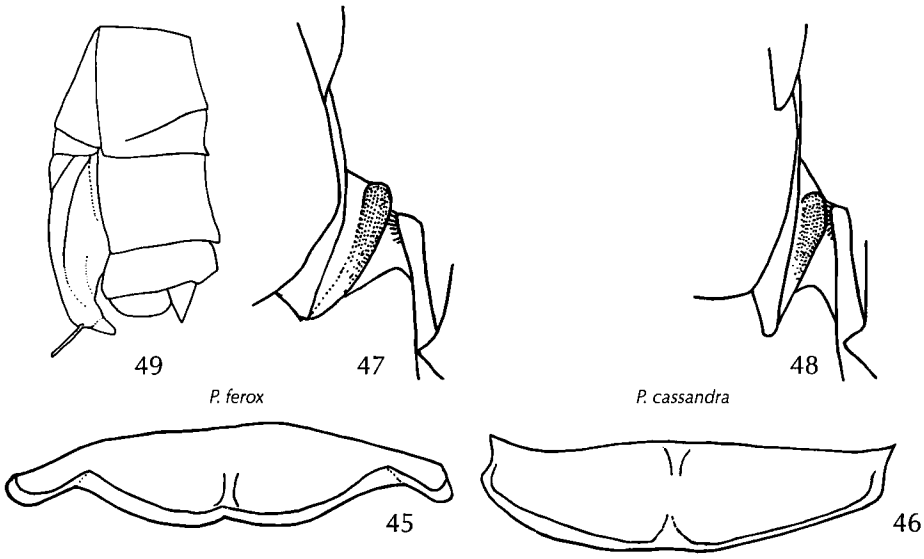
with known larvae (De Marmels 1982), and *P. ferox*, the larva of which can be expected to be similar to its congener. General body shape, antenna, labium, labial palp and short legs in the larva of *Sciotropis* are similar to *Argiolestes pectitus* Lieftinck, 1949 (Lieftinck 1976), but these features appear to be probably symplesiomorphies. The same characters, together with head shape, hairiness of the legs and the presence of a strong ventral keel on the epiproct may remind one of the larva of *Caledargiolestes uniseries*, the "unknown terrestrial Megapodagrionid" described by Lieftinck (1976: 183, figs 44-53); see Winstanley (1983).

Adult characters of *Sciotropis* do not point, however, towards any closer affinity with that New Caledonian genus. The larva of *Sciotropis* seems unique due to the curious development of the pro- and mesothoracic supracoxal processes, as well as the articulated appendix of the lateral caudal gills (Fig. 50).

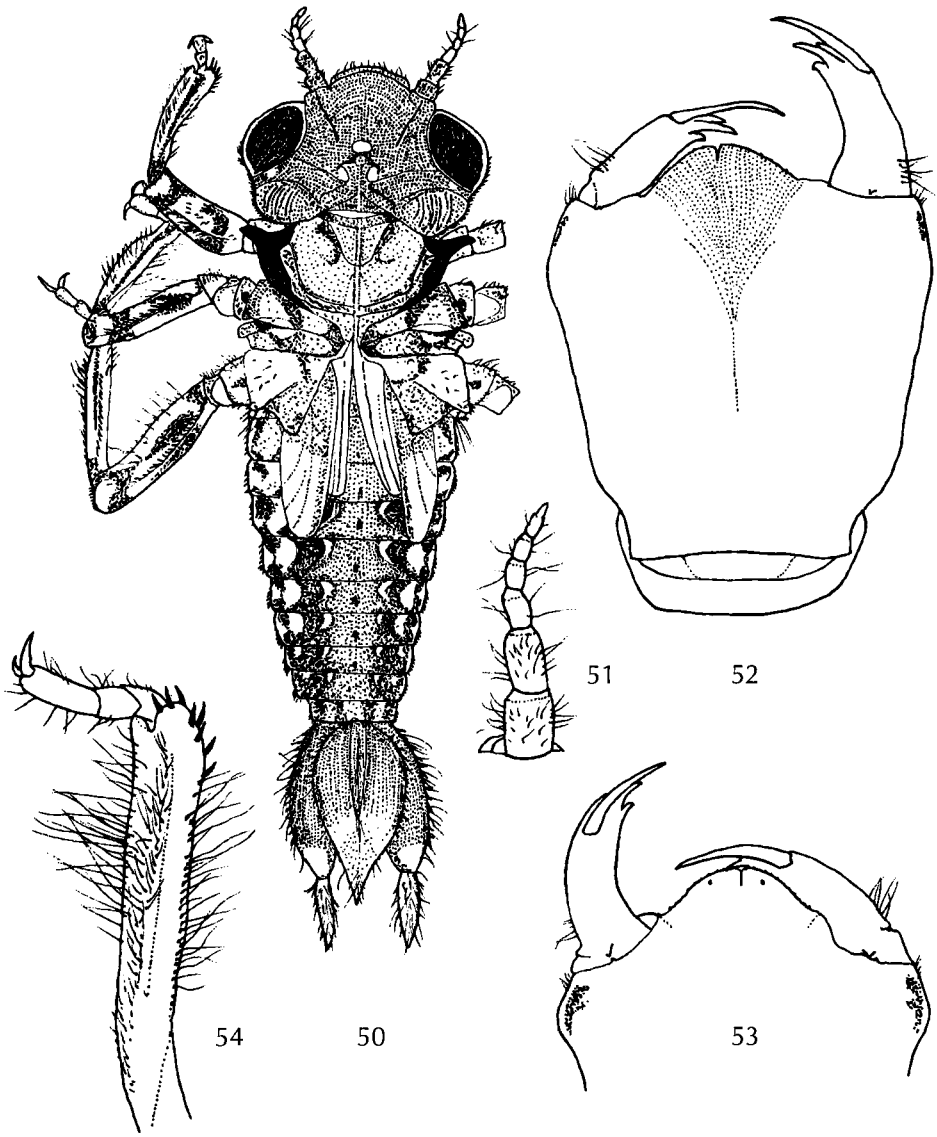
LESTIDAE:
Archilestes tuberalatus Williamson, 1921
(Figs 55-60)

Specimens examined

Larvae (ultimate instar exuviae, by supposition): 1 ♀ Venezuela, Aragua State, path between "Museo de CADAFE" and the village of Chuao, 350 m a.s.l., 05 v 1997; 3 ♂, 4 ♀ same locality, but 18 xii 2002, all J. De Marmels leg. (MIZA).



Figures 45-49: ♀ structures of two species of *Philogenia* — (45) pronotal hind lobe of *P. ferox*, dorsal view; (46) same of *P. cassandra*; (47) left intersternite of *P. ferox*, left lateral view; (48) same of *P. cassandra*; (49) tip of abdomen with ovipositor of *P. ferox*. Figures comparing same structures are to scale.



Figures 50-54: Penultimate instar larva of ♂ *Sciotropis cyclanthorum* — (50) larva, dorsal view; (51) antenna; (52) labium, ventral view; (53) distal portion of labium, dorsal view; (54) left middle tibia and tarsus. Figures not to scale.

Description of exuvia

Pale, semitransparent, with weakly indicated dark pattern, or overall darker, grey brown.
Head: Antenna with 7 segments; occipital lobes beset with tubercle-like spinules posteriorly; rest of head glabrous. Labium reaching backwards to behind metacoxae; prementum on each side with 4 long setae, accompanied mesally by 1-3 small setae [one female has 6 long setae and 3 small mesal setae, on right side of prementum (Fig. 56)]; there are 3 palpal setae, 2 of which are on the movable hook.
Thorax: Pronotum with laterally straight margin; wing sheaths reaching to end of S3. Legs pale, femora and tibiae dark apically, both with rows of minute spinules.
Abdomen: granulose, usually with white medio-dorsal longitudinal line and a white triangular laterodorsal spot on S2-7; lateral spines on S5-9; on S4 only a short apical denticle. Male gonapophyses with 3-4 small tubercles in basal half of each process; male cercus as long or longer than S10, robust, with blunt tip (Fig. 58a); female cercus slightly shorter than S10, conical (Fig. 58b); ovipositor surpassing end of S10, valves with irregular double-row of ventral spinules. Caudal gills foliaceous (Figs 59-60); dorsal crest of S10 ending on a single or double spine, continuing posterior margin of S10 with a variable number of bigger and smaller spines, on each side of median carina.
Dimensions: Total length 24-28; maximum width of head 5.5-6.0; abdomen 16.5-19.0; lateral gill 9.8-10.5; median gill 8.5-10.0; hind femur 8- 8.5; hind tibia 6.8-8.0.

Comments

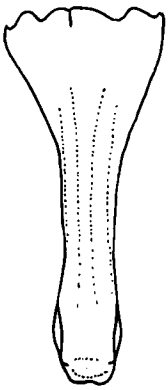
This rare species occasionally occurs together with *A. grandis*, the latter generally preferring higher elevations. At the collecting spot I observed a single male *A. grandis* on 8 December 2003. It was perching on a twig at a fast-flowing and sun-exposed stretch of the small creek, while all *A. tuberalatus* were collected at somber pools formed by the same creek (De Marmels 1999).

Male larvae of *A. tuberalatus* can be diagnosed from those of *A. grandis* by cercal morphology: in *A. tuberalatus* the cercus is thick and blunt-tipped, whereas it is more slender and sharply pointed in *A. grandis*. Female larvae of *A. tuberalatus* have denticles along ventral border of genital valves becoming more robust near tip; these denticles are smaller and of more regular size in *A. grandis*. Larvae of *A. grandis* have lateral spines on S4-9, while *A. tuberalatus* larvae bear lateral spines only on S5-10.

Lestes apollinaris Navás, 1934
(Figs 61-68)

Specimens examined

Larvae (ultimate instar exuviae): 1 ♂, 1 ♀, Venezuela, Trujillo State, 9 km E of Mosquey, Laguna Negra, 1,650 m a.s.l., 02 ix 1991; 1 ♀ 17 x 1991; 3 ♀ (reared), Táchira State, San Vicente de La Revancha, Las Copas, 1,900 m a.s.l., 13-17 i 1999; 1 ♂ Zumbador, 2,600 m a.s.l., 12 vii 2000. All J. De Marmels leg. (MIZA).



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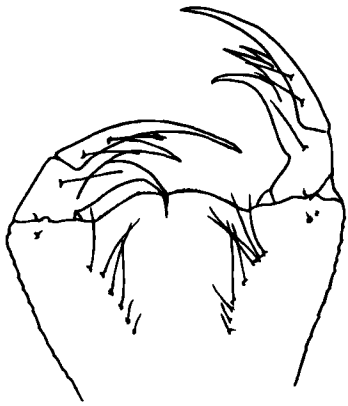

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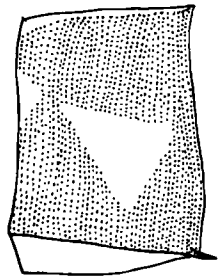

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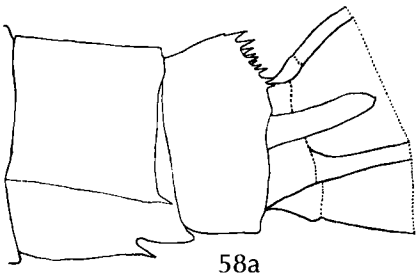
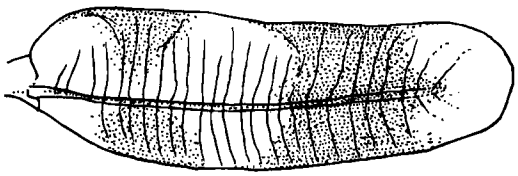


58a



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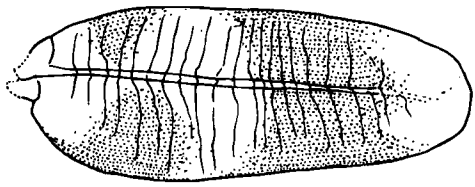

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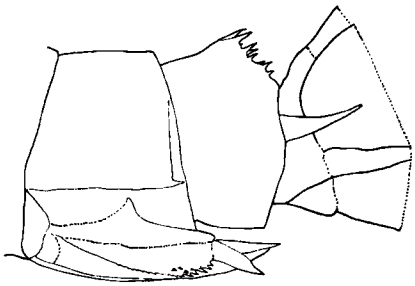

58b

Figures 55-60: Ultimate instar exuvia of *Archilestes tuberalatus* (all showing ♀ except 58a) — (55) labium, ventral view; (56) distal portion of labium, dorsal view; (57) pattern of S6, left lateral view; (58a) tip of abdomen (male) left lateral view; (58b) same of female; (59) left lateral gill, left lateral view; (60) median gill, left lateral view. Figures not to scale.

Description of exuvia

Pale brown without any definite pattern.
Head: Antenna with seven segments (Fig. 61). Labium reaching backwards to behind metacoxae; usually six large mental setae plus one or two smaller setae mesally; few specimens with five or seven large mental setae, on one side (Figs 63-64). Occipital lobes beset with scattered tuberculiform spinules posteriorly.
Thorax: Legs pale, femora apically narrowly dark. Wing sheaths reaching to middle or end of S3.
Abdomen: Lateral spines on S5-9; male gonapophyses with irregular patch o spinules in basal half (Fig. 65); female gonapophyses just surpassing end of S10 (Fig. 66). Valves with irregular single or double row of minute spinules ventrally. Caudal lamellae as illustrated (Figs 67-68).
Dimensions: Total length (incl. gills) 15.8-18.5; abdomen 10.3-13.5; lateral gill 8.7-9.5; median gill 8.5-9.0; hind femur 5.3-5.5; hind tibia 5.0.

Comments

L. apollinaris is usually the only species of this genus present at high altitude Andean sites. Larvae of *L. tenuatus* Rambur, 1842 have only 4+1 mental setae, lateral abdominal spines on S6-9, and only one regular row of spinules in the basal half of male gonapophyses. Larvae of *L. forficula* Rambur, 1842 have four to five large mental setae, accompanied mesally by one or two small setae. Additionally, *L. forficula* larvae have lateral abdominal spines on S6-9 (occasionally a small spine also on S5), and there are irregular rows of spinules, or no spinules at all, on male gonapophyses. The lateral caudal gill is much longer and more slender in *L. forficula* than in L. *apollinaris*.

Acknowledgements

I thank Rosser Garrison, who kindly furnished extensive comments and illustrations on the lectotype of *Heteragrion macilentum* borrowed from the Naturhistorisches Museum Wien and on a paralectotype at the MCZ. Quintin Arias (MIZA) is acknowledged for scanning and editing the figures. Francisco Cerda allowed me to read his copy of the book by Appun. Rosser Garrison, Martin Schorr, and Luis Joly helped with literature.

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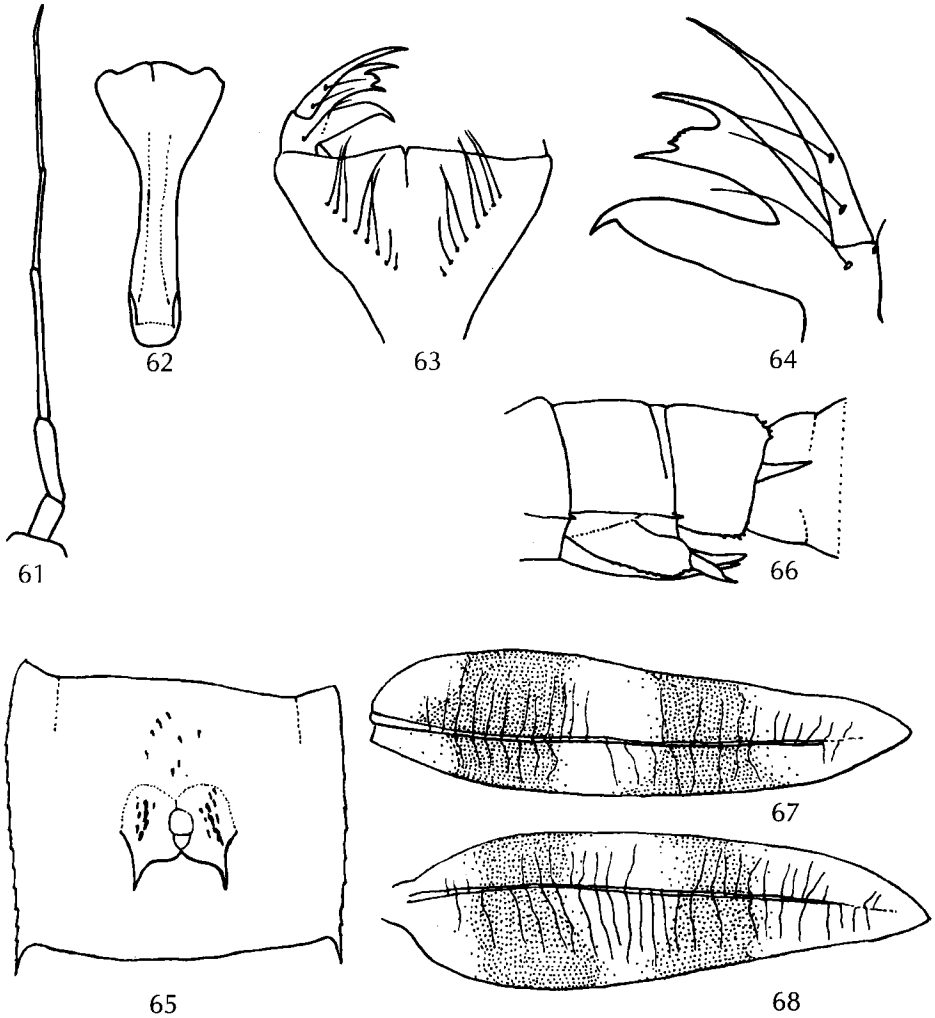

Figures 61-68: Ultimate instar exuvia of *Lestes apollinaris* (Figs 61-64 and 66-68 of ♀ from Las Copas; Fig. 65 of ♂ from Laguna Negra) — (61) right antenna; (62) labium, ventral view; (63) distal portion of labium, dorsal view; (64) right palp, dorsal view; (65) ♂ gonapophyses, ventral view; (66) tip of abdomen with ovipositor, left lateral view; (67) left paraproct, left lateral view; (68) epiproct, left lateral view. Figures not to scale.

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