Journal of Natural History
Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/tnah20

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Published online: 20 Jan 2014.

To cite this article: Paulo Vilela Cruz, Frederico Falcão Salles & Neusa Hamada (2014): Callibaetis Eaton (Ephemeroptera: Baetidae) from Brazil, Journal of Natural History, DOI: 10.1080/00222933.2013.791883

To link to this article: http://dx.doi.org/10.1080/00222933.2013.791883

Journal of Natural History, 2013
http://dx.doi.org/10.1080/00222933.2013.791883

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(*Received 12 December 2011; accepted 29 March 2013*)

Callibaetis Eaton remains poorly known in South America. Some of the species in the genus are difficult to identify with confidence and most are known only at the adult stage. In this paper we increase the number of species known to occur in Brazil from 11 to 18; diagnoses of species are improved; five new species are described based on nymphs and reared adults of both genders (*C. calloventer* sp. nov., *C. cruentus* sp. nov., *C. gelidus* sp. nov., *C. itannae* sp. nov., *C. nigracyclus* sp. nov.); first records of two species are reported from Brazil (*C. gonzalezi* and *C. sellacki*); descriptions of unknown stages are made (*C. gonzalezi* male imago and *C. jocosus* nymph); redescriptions of known stage are provided for male and female imago of *C. jocosus*. Based on these data, keys for nymph, male and female imago are proposed for Brazil.

http://www.zoobank.org/urn:lsid:zoobank.org:pub:019D55A5-8979-4D9A-BB16-CB1451C8DF1B

Keywords: aquatic insects; mayfly; taxonomy; new species; neotropics

Introduction

Callibaetis Eaton, 1881 (Ephemeroptera: Baetidae), has a pan-American distribution (Salles et al. 2003) and was one of the first genera established in the family. Currently this genus includes 28 valid species, 13 of which are recorded from North America, five from Central America and 14 from South America (McCafferty 1996; Domínguez et al. 2004; Salles et al. 2004). In Brazil, 11 species have been previously recorded: *C. capixaba* Cruz et al., 2009; *C. fasciatus* (Pictet), 1843; *C. fluminensis* Cruz et al., 2009; *C. gregarius* Navás, 1930; *C. guttatus* Navás, 1915; *C. jocosus* Navás, 1912; *C. pollens* Needham and Murphy, 1924; *C. radiatus* Navás, 1920; *C. viviparus* Needham and Murphy, 1924; *C. willineri* Navás, 1933 and *C. zonalis* Navás, 1915 (Salles et al. 2004; Cruz et al. 2009).

Despite the number of *Callibaetis* species that have been described, this genus can be considered taxonomically problematic. Most of its species (six of 11 recorded in Brazil) were described by Navás between 1912 and 1934 (Navás 1912, 1915a, 1915b, 1916, 1920a, 1920b, 1920c, 1922, 1923, 1930a, 1930b, 1930c, 1932, 1933, 1934). Most of these were described inadequately; some of the descriptions were based on

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subimagos and most of the types were either lost or stored under poor conditions (Hubbard & Peters 1981).

Gillies (1990) reviewed the species of *Callibaetis* from Argentina and found that only eight of the 19 species he studied were valid. Other studies on this genus were carried out by Da-Silva (1991), who described the nymph of *C. guttatus* and variation in the wings of female adults; Salles et al. (2003) described the nymph of *C. radiatus* and redescribed the imagos; Domínguez et al. (2006) presented a key of South American species; Nieto (2008) described some nymphs from Argentina, and Cruz et al. (2009) described two new species from Brazil.

Many species of *Callibaetis* were first described at the end of the nineteenth century and in the first decades of the twentieth century, a time when mayfly taxonomy was based almost exclusively on alate stages, so most species were described based on adults. Given the conspicuous colour pattern of wings of several species, most were described exclusively based on female imagos. To date, the nymphs of only eight of the 14 valid species known from South America have been described: *C. willineri*, *C. guttatus*, *C. radiatus*, *C. gonzalezi* (Navás), 1934, *C. pollens*, *C. sellacki* (Weyenbergh), 1883, *C. capixaba* and *C. fluminensis*. However, given that the most useful and solid characteristics for distinguishing species in this family are observed at the nymph stage (Lugo-Ortiz & McCafferty 1999), descriptions of nymphs are essential to improving the taxonomy of the genus *Callibaetis* (Salles et al. 2003). Despite recent descriptions of nymphs and male imagos (Traver 1944; Gillies 1990; Da-Silva 1991; Salles et al. 2003; Nieto 2008; Cruz et al. 2009), identification of most species remains difficult because of deficiencies in the descriptions and illustrations, and the small number of known nymphs. All of these problems represent obstacles to identification at the species level and, consequently, to the description of new species.

The main objective of this paper is to improve the taxonomic knowledge of the species of *Callibaetis* reported from Brazil. For this, we describe five new species based on nymphs and adults of both genders, all reared; *C. gonzalezi* and *C. sellacki* are recorded for the first time from the country; descriptions of the male imago of *C. gonzalezi* and nymphs of *C. jocosus* are provided; redescriptions of male and female imagos of *C. jocosus* are also presented; the diagnoses of all species reported from Brazil are improved, and keys for nymphs, and male and female imagos are proposed.

Material and methods

Descriptions followed the standardization proposed by Hubbard (1995) with the aid of DELTA (DEscription Language for TAxonomy) open software (Dallwitz 1980). The drawings were made using a ZEISS Standard 20 microscope with camera lucida, and photographs were taken using a stereoscopic ZEISS Stemi 2000-C microscope with a Nikon CoolPix 5700 camera; the pictures were combined using the COMBINEZ5 (Hadley 2010) open software.

The figures cited in this paper can be consulted on the Ephemeroptera Galactica web site: http://www.ephemeroptera-galactica.com.

The symbols "I" and "N" in known stages mean "imago" and "nymph", respectively. To indicate gender we use the universal symbols: ♀ for female and ♂ for male.

All stage associations were made using the rearing technique suggested by Edmunds et al. (1976).

To calculate the ratio of the nymph foreleg, femur, tarsus and claw were compared with the tibia. Being represented in the following pattern: Femur: (Tibia mm): Tarsus: Claw. In some species the costal process of the hind wing is compound, i.e. they are formed by two peaks. The proximal peak is usually turned outward, while the distal process is turned inward. While mounting the slides one or both peaks usually remain turned, and for this reason interpretation of hind wings must be performed with caution. To describe the pigmentation properly the term "spot" is used to describe circular pigmentation, while the term "mark" is used to describe pigmentation without defined form (not circular).

The material examined is housed in the following institutions: Invertebrate Collection of the Instituto Nacional de Pesquisas da Amazônia, Manaus, Brazil (INPA), Coleção Zoológica Norte Capixaba (CZNC), São Mateus, Brazil, and Coleção Zoológica Prof. José Alfredo Pinheiro Dutra, Departamento de Zoologia, Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil (DZRJ).

Results

Callibaetis Eaton

Callibaetis Eaton, 1881; Gillies, 1990, p. 15.
(Type-species: *Callibaetis pictus* Eaton, original designation).

Diagnosis

Male imago. (1) Body usually with small red spots; (2) dorsal portion of turbinate eyes oval or circular, not touching each other; (3) forewing hyaline, sometimes pigmented; (4) marginal intercalary veins single or paired; (5) hind wing with three longitudinal veins; (6) costal process of hind wing located on basal third; (7) forceps segment II narrow medially (Domínguez et al. 2006, adapted).

Female imago. (1) Body usually with small red spots; (2) forewing usually pigmented; (3) marginal intercalary veins single or paired; (4) hind wing with three longitudinal veins; (5) costal process of hind wing located on basal third (Domínguez et al. 2006, adapted).

Mature nymph. (1) Head without frontal keel; (2) anterior margin of labrum with small or deep medial emargination; (3) mandibles with incisors deeply cleft; (4) inner set of incisors at oblique angle with outer set; (5) mandibles always with tuft of setae between prostheca and mola; (6) lingua with rounded projection apically, longer than superlingua; (7) maxillary palp with two segments; (8) second segment of labial palp without distomedial projection; (9) third segment of labial palp concave; (10) hind wing pads present; (11) tibio-patellar suture present in all legs; (12) tarsal claws of foreleg with two rows of long denticles; (13) small spines present at the rear margins of abdominal terga II to X; (14) gills on abdominal segments I to VII; (15) gills, at least on segments I to VI with folds; (16) posterior margin of paraprocts with spines; (17) terminal filament shorter than cerci; (18) body without scales or base of scales (Domínguez et al. 2006, adapted).

Callibaetis calloventer sp. nov.
(Figures 1–4)

urn:lsid:zoobank.org:act:8EAC97D4-43C9-4C74-AE70-0275176EB574
Known stages: I♀♂, N

Diagnosis

Male imago. (1) Dorsal portion of turbinate eyes oval (Figure 1A); (2) forewing hyaline with black bands transversally, medially with transversal band complete, apical third little or not pigmented (Figure 1D); (3) marginal intercalary veins paired (Figure 1D); (4) hind wing hyaline with brown mark medially and apically (Figure 1E–G); (5) costal process of hind wing compound (Figure 1E–G); (6) abdominal sterna brown with one mark sublaterally; (7) forceps segment I wide at base (Figure 1C).

Female imago. (1) Forewing completely dark brown, meeting of longitudinal veins with the posterior margin white (Figure 1I); (2) marginal intercalary veins paired (Figure 1I); (3) hind wing completely dark brown with white veins (Figure 1J–L); (4) costal process of hind wing compound (Figure 1J–L); (5) abdominal sterna anterolaterally with red mark; submedially on middle region with two brown marks; sublaterally on anterior region with one reddish mark (Figure 1M); (6) abdominal terga III, V and VII with two oblique red marks (Figure 1H).

Mature nymph. (1) Antenna without spines or fine, simple setae (Figure 2A); (2) distal margin of labrum with deep medial emargination (Figure 2B); (3) lateral and anterolateral margin of labrum with long, fine simple setae; distal margin medially with short, robust frayed setae (Figure 2B); (4) maxillary palp short, less than two-thirds length of galea-lacinia (Figure 2F); (5) glossa longer than paraglossa (Figure 2G); (6) labial palp segment I with spine-like setae (Figure 2G, H); (7) anterior surface of forefemur with robust spine-like setae near dorsal margin and without setae near ventral margin (Figure 3B); (8) fore tarsus ventrally with one row of short and long spine-like setae (Figure 3C); (9) mid and hind femora similar to foreleg; (10) mid and hind tarsal claw without minute spines on surface (Figure 3F); (11) gills VII with one fold (Figure 4G); (12) cerci with short spines on all segments (Figure 4I); (13) terminal filament with spines on every three segments (Figure 4J).

Description

Male imago. Length: body, 5.4 mm; forewing, 4.8 mm; hind wing, 0.8 mm; antenna, 1.2 mm; tibia, 1 mm. ($n = 2$) **Head** (Figure 1A, B). Coloration brown. Turbinate portion of compound eyes dorsally yellowish brown, stalk yellowish brown, basally brown. Antenna with scape, pedicel and flagellum dark brown. Dorsal portion of turbinate eyes oval; length (L in Figure 1A) 1.4 × width (W in Figure 1A); stalk height (SH in Figure 1B) 1.1 × dorsal portion height (DPH in Figure 1B); inner margins parallel, not reaching each other. **Thorax** (Figure 1A, B). Anteronotal protuberance medially light brown, submedially brown, laterally light brown; mesoscutum brown; submesoscutum light brown; posterior scutal protuberance and scutellum brown. Anteronotal and metascutellar protuberance rounded. Legs. Femur I with trachea

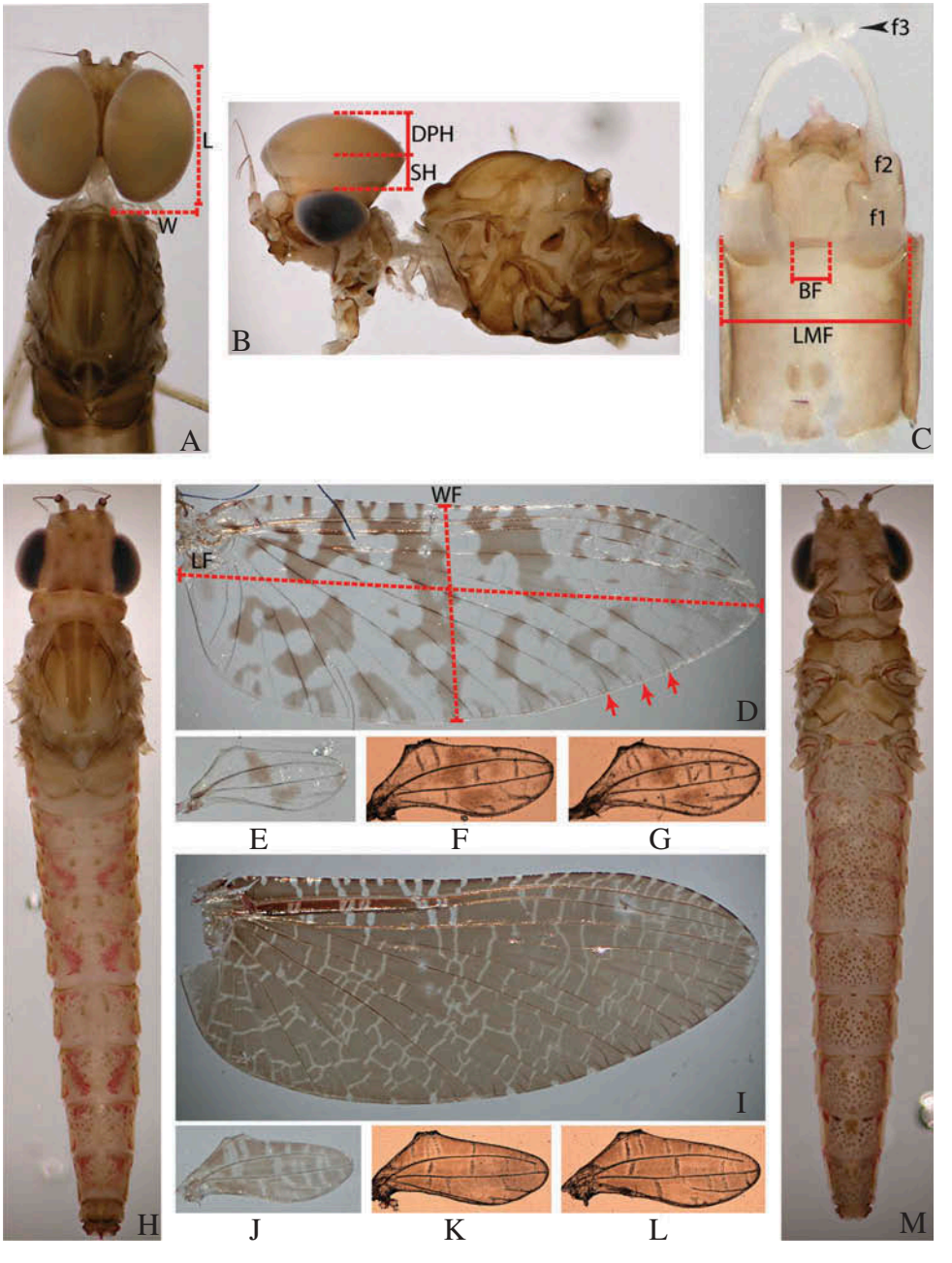

Figure 1. (colour online) *Callibaetis calloventer* sp. nov. (A) male imago dorsal view; (B) male imago lateral view; (C) genitalia; (D) male imago forewing (red arrows indicate marginal intercalary veins); (E), male imago hind wing; (F), variation of male imago hind wing; (G), detail of male imago hind wing; (H) female imago dorsal view; (I) female imago forewing; (J) female imago hind wing; (K) detail of female imago hind wing; (L) variation of female imago hind wing; (M) female imago ventral view. Abbreviations: W, width; L, length; DPH, dorsal portion height; SH, stalk height; BF, base of forceps; LMF, lateral margins of forceps; f1, forceps segment I; f2, forceps segment II; f3, forceps segment III; LF, length of forewing; WF, width of forewing.

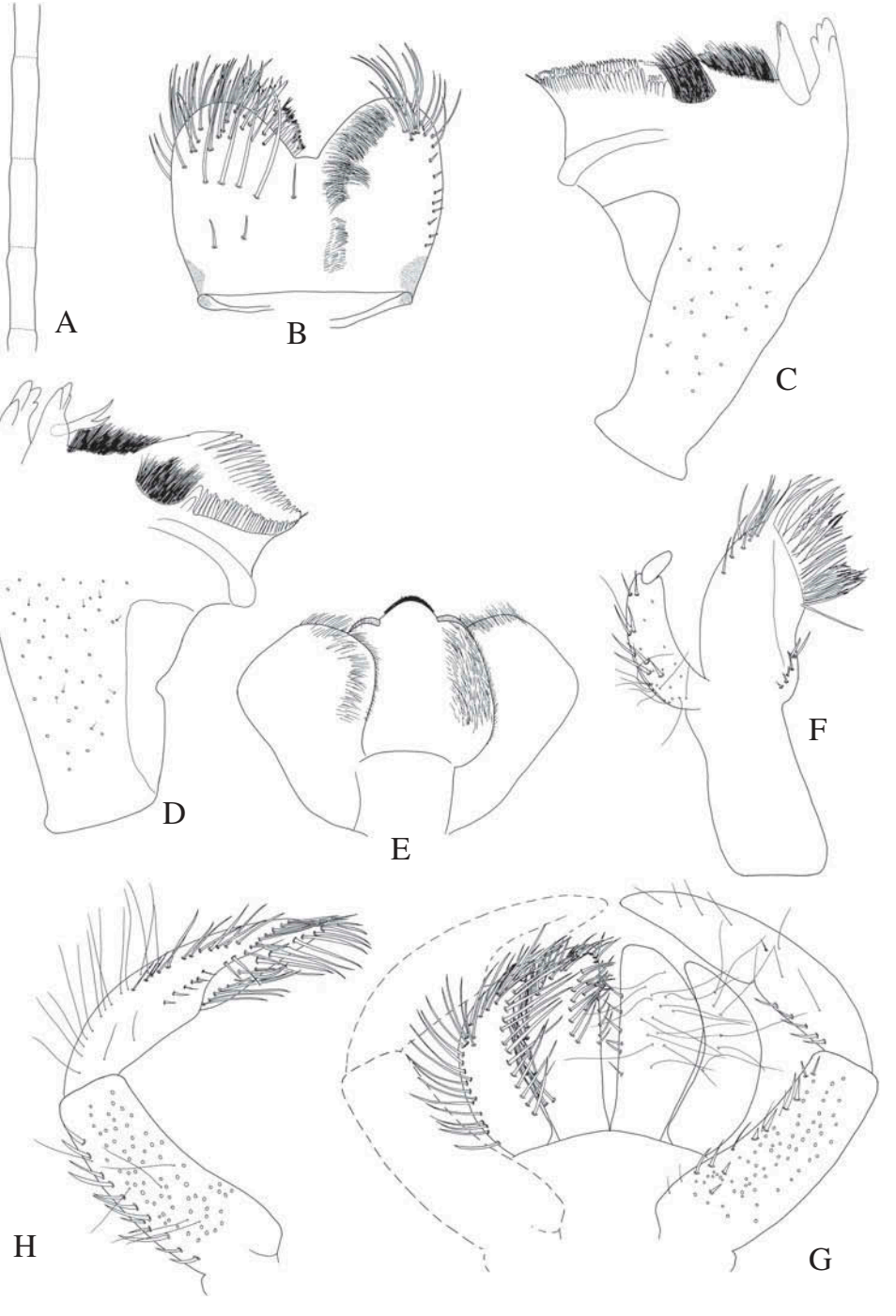

Figure 2. *Callibaetis calloventer* sp. nov. Nymph: (A) antenna; (B) labrum (left, d.v.; right, v.v.); (C) right mandible; (D) left mandible; (E) hypopharynx; (F) maxilla; (G) labium (left d.v.; right v.v.); (H) labial palp (dorsal).

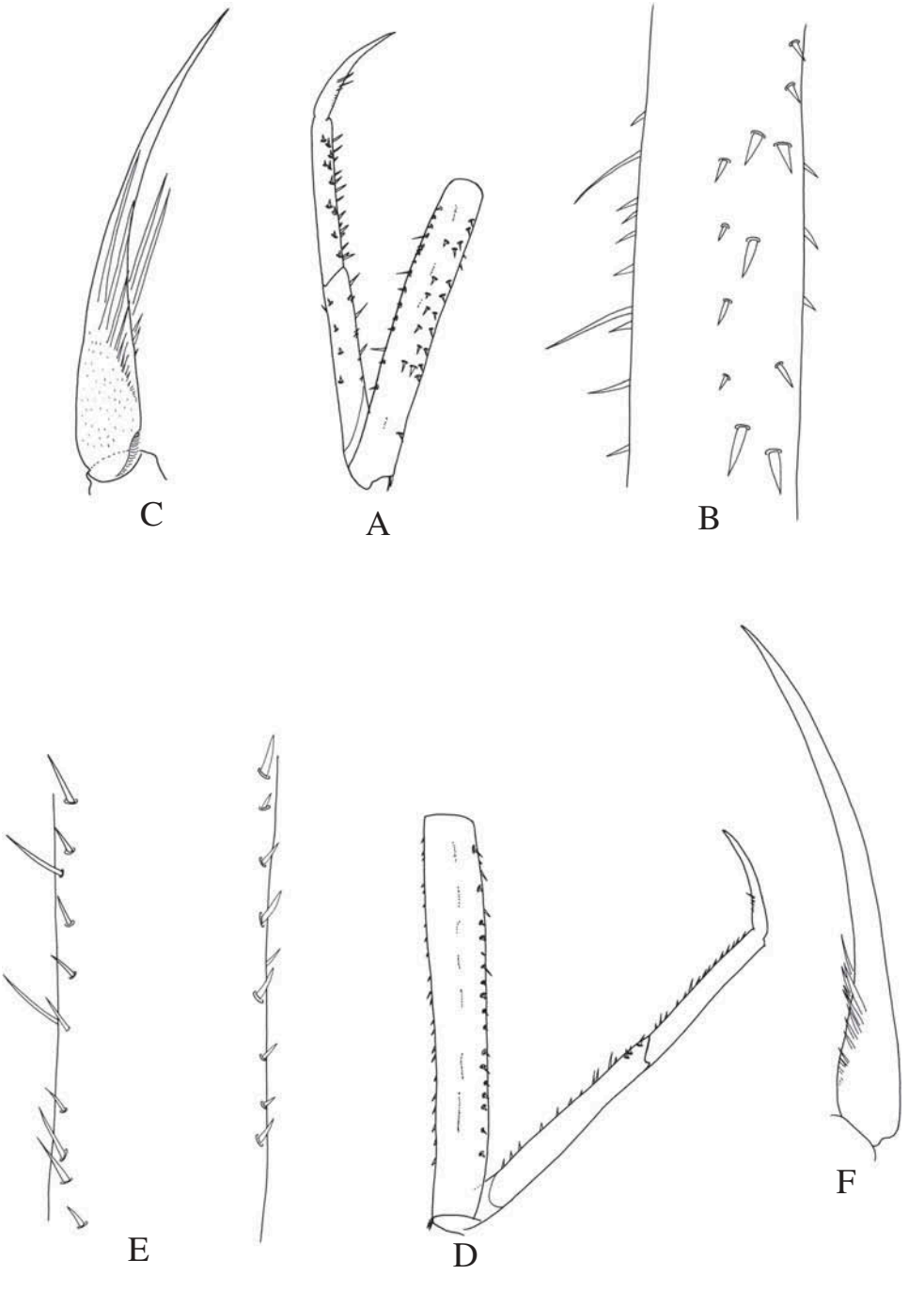

Figure 3. *Callibaetis calloventer* sp. nov. Nymph: (A) foreleg; (B) detail of anterior surface of forefemur; (C) foreclaw; (D) hind leg; (E) detail of anterior surface of fore femur; (F) hind claw.

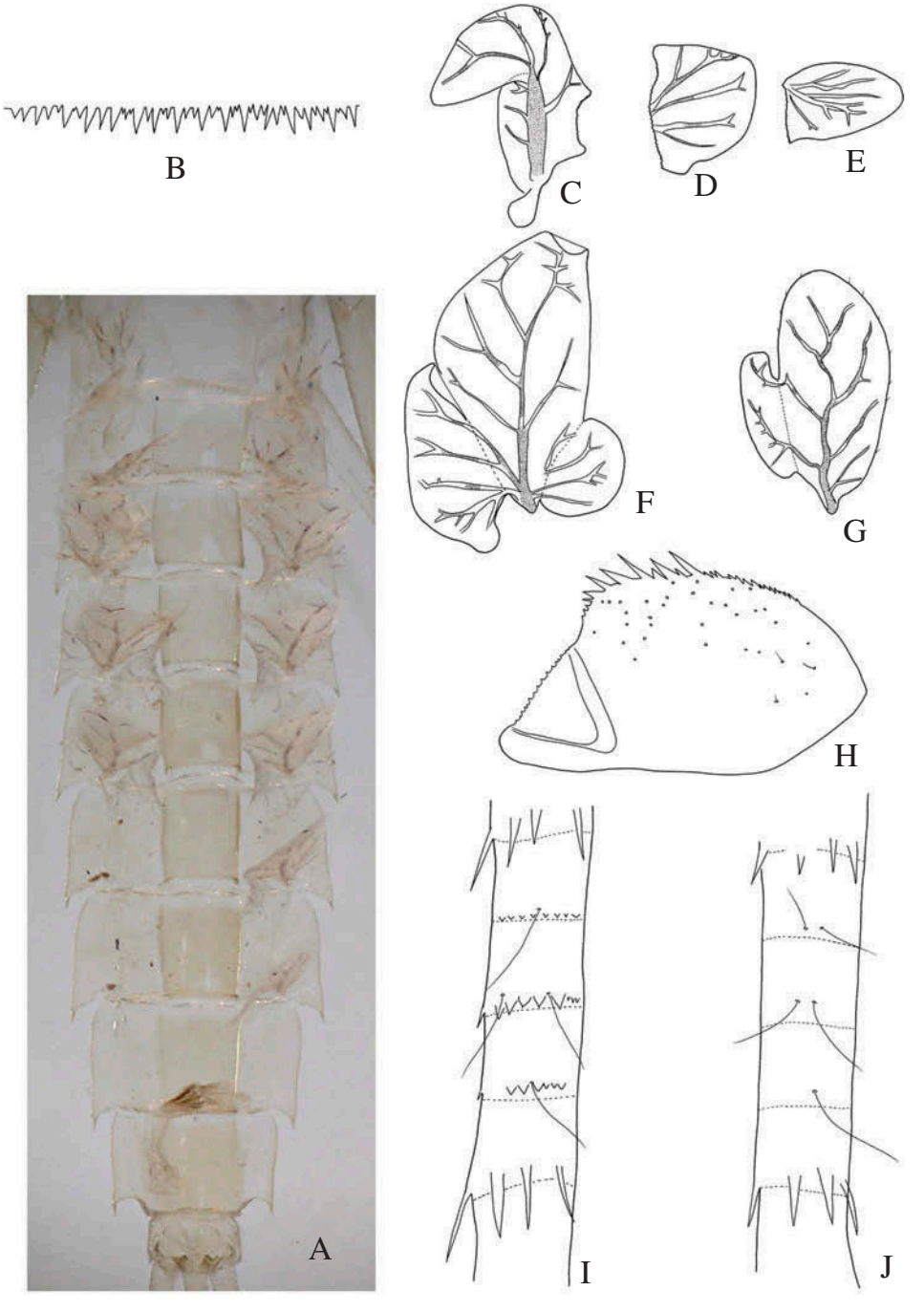

Figure 4. (colour online) *Callibaetis calloventer* sp. nov. Nymph: (A) dorsal body view (exuviae); (B) posterior margin of abdominal tergum IV; (C) fold I of gill I; (D) fold II of gill I; (E) fold III of gill I; (F) gill IV; (G) gill VII; (H) paraproct; (I) cercus; (J) terminal filament.

black pigmented in posterior surface, tibia I with brown mark basally on ventral margin and other apically on dorsal margin, tarsus I brown; femora II and III similar femur I; tibiae II and III with light brown mark basally on ventral margin and other apically on dorsal margin, tarsi II and III light brown. Leg I: tibia 0.7 × length of femur; tarsus 0.5 × length of femur. Leg III: tibia 0.7 × length of femur; tarsus 0.4 × length of femur. Wings. Forewing (Figure 1D) hyaline with black bands transversally, medially with transversal band complete; apical third with little or no pigmentation; veins white; stigmatic area with 10 cross veins touching subcostal vein; marginal intercalary veins (red arrow in Figure 1D) paired; length of each intercalary vein 0.5–0.8 × distance between adjacent longitudinal veins; length of forewing (LF in Figure 1D) about 2.7 × width (WF in Figure 1D). Hind wing (Figure 1E–G) hyaline with brown mark medially and apically; with nine cross veins; costal process compound. **Abdomen.** Terga brown with two light brown marks submedially; tracheation not pigmented. Sterna brown with one mark sublaterally. Caudal filaments lost. Genitalia (Figure 1C). Forceps whitish brown. Forceps segment I wide at base; 0.4 × length of segment II; distance between base of forceps (BF in Figure 1C) 0.25 × distance between lateral margins of forceps (LMF in Figure 1C). Forceps segment III oval, 1.5 × as long as wide; 0.1 × length of segment II. Posterior margin of styliger plate with small medial projection.

Female imago. Length: body, 6.9 mm; cercus, 7.2 mm; forewing, 5.4 mm; hind wing, 2.2 mm; antenna, 0.8 mm; tibia I, 1 mm; tibia II, 1.2 mm; tibia III, 1.2 mm. ($n = 2$). **Head** (Figure 1H). Coloration brown, with dark brown areas; compound eyes black. Antenna with scape brown, pedicel dark brown and flagellum dark brown with base white. **Thorax** (Figure 1H, M). Pronotum with two red marks sublaterally; anteronotal protuberance dark brown; mesoscutum light brown; submesoscutum dark brown; posterior scutal protuberance dark brown and brown; scutellum white. Anteronotal and metascutellar protuberance rounded. Legs. Femora I, II and III with trachea black pigmented in posterior surface, one red mark in base of posterior surface; tibiae I, II and III light brown with one dark brown mark on base ventrally and other on apex dorsally; tarsi I, II and II light brown. Leg I: tibia 1.1 × length of femur; tarsus 0.75 × length of femur. Leg II: tibia 0.9 × length of femur; tarsus 0.5 × length of femur. Leg III: tibia 0.8 × length of femur; tarsus 0.3 × length of femur. Wings. Forewing (Figure 1I) completely dark brown, meeting of longitudinal veins with the posterior margin white; veins white; stigmatic area with 10 cross veins touching subcostal vein; marginal intercalary veins paired; length of each intercalary vein 0.5–0.7 × distance between adjacent longitudinal veins; length of forewing about 2.3 × width. Hind wing (Figure 1J–L) completely dark brown with white veins; one incomplete, not reaching apex of hind wing and two complete longitudinal veins; one or two marginal intercalary veins; wing with 11–17 cross veins; costal process compound. **Abdomen** (Figure 1H, M). Terga white with many brown spots and two brown marks submedially; laterally and sublaterally with red marks, terga III, V and VII with two oblique red marks. Tracheation black. Sterna light brown with many brown spots; anterolaterally with red mark; submedially on middle region with two brown marks; sublaterally on anterior region with one reddish mark. Caudal filaments white with base of segments dark brown.

Mature nymph. Length: body, 6.8 mm; cercus, 4.9 mm; terminal filament, 2.4 mm; antenna, 6 mm. ($n = 2$) **Head**. Coloration: light brownish yellow. Turbinate portion

of male compound eyes yellowish brown. Antenna white, without spines or fine, simple setae (Figure 2A). Labrum (Figure 2B). Excavate medially; length about 0.8 × maximum width; distal margin with deep medial emargination; lateral and anterolateral margins with long, fine simple setae; distal margin medially with short and robust frayed setae; dorsally with many, long, fine, simple setae scattered over anterolateral surface; submarginal row of setae absent; ventrally with short, spine-like setae near lateral margin and many long, simple setae near anterolateral margin. Right mandible (Figure 2C) with 4 + 3 denticles; prostheca slender and simple; margin between prostheca and mola convex; tuft of spine-like setae at base of mola present. Denticles of mola apically constricted. Tuft of setae at apex of mola present; lateral margins slightly convex; basal half with short, fine, simple setae and pores scattered over dorsal surface. Left mandible (Figure 2D) with 4 + 3 denticles; prostheca robust and bifid; margin between prostheca and mola concave; tuft of spine-like setae at base of mola present; subtriangular process wide, at the same level as area between prostheca and mola; denticles of mola not constricted; tuft of setae at apex of mola present; lateral margins slightly convex; basal half with short, fine, simple setae and pores scattered over dorsal surface. Hypopharynx (Figure 2E). Lingua with three lobes in distal margin; superlingua not expanded; short, fine, simple setae scattered over distal margin of lingua and superlingua. Maxilla (Figure 2F). Double row of setae with spines on outer margin,two denti-setae with spines and one bipectinate. Medial protuberance of galea with 1 + 5 spine-like setae. Maxillary palp short, less than two-thirds length of galea-lacinia; palp segment II 0.2 × length of segment I; outer margin of segment I scattered with robust, short, pointed setae and long, fine, simple setae; segment II without setae. Labium (Figure 2G, H). Glossa basally narrow and longer than paraglossa; inner margin with 14 spine-like setae; apex with three to five long spine-like setae; outer margin with many long spine-like setae. Ventral surface scattered with short, fine, simple setae. Paraglossa curved inward; apex bare. Ventrally with many long, fine, simple setae. Labial palp with segment I 0.8 × length of segments II and III combined; segment I covered with micropores, near outer margin with robust simple setae; segment II without distomedial protuberance; inner and outer margin, respectively, with five robust, short spine-like setae and simple, fine and long setae; dorsally with row of six short spine-like setae; segment III concave; length 2.3 × width; covered with spine-like simple setae along margins and fine, simple setae, scattered over outer surface. **Thorax.** Light brownish yellow. Foreleg (Figure 3A–C). White with black spots on posterior surface. Ratio of foreleg 1.6 : (0.6 mm) : 0.8 : 0.6. Forefemur. Length about 6 × maximum width; dorsally with row of short, spine-like setae; apex with two robust spine-like setae; length of setae about 0.2 × maximum width of femur; ventrally with one row of short spine-like and long spine-like setae. Anterior surface with robust spine-like setae near dorsal margin and without setae near ventral margin. Tibia. Dorsally with one or four short spine-like setae and with many long, fine, simple setae; ventrally with one row of short and long spine-like setae. Anterior surface with row of short, robust spine-like setae. Tarsus. Dorsally bare; ventrally one row of short and long spine-like setae. Tarsal claw with two rows of denticles increasing in size distally, many minutes spines on surface. Hind leg (Figure 3D–F) similar foreleg except tarsal claw, without minute spines on surface. **Abdomen** (Figure 4A). Light brownish yellow. Terga. Posterior margin with regular spines, 3 × as long as wide (Figure 4B). Sterna. Surface with scattered fine, simple setae. Gills (Figure 4C–G). Margin with short, fine and simple setae; trachea black pigmented, extending from

main trunk to outer margin. Gill I about 2 × length of segment II, with two folds; trachea black pigmented. Gill IV as long as length of segments V to VI combined, with two folds. Gill VII as long as length of segments VIII to half IX combined, with one fold. Paraproct (Figure 4H) with 25–30 marginal spines; surface with micropores and short, fine, simple setae; posterolateral extension with marginal spines. Terminal filament (Figure 4J) light brownish yellow; posterior margin of segments with spines on every three segments. Cerci (Figure 4I) with short spines on all segments.

Etymology

The specific epithet is a reference to the beauty of the abdominal colour pattern (*calloventer*, from Greek and Latin, meaning "beautiful abdomen").

Comments

The adults of *C. calloventer* sp. nov. and *C. cruentus* sp. nov. are similar, female imago of *C. calloventer* sp. nov. has two red marks on abdominal terga III, V and VII (Figure 1H), while these marks are absent in *C. cruentus* sp. nov. (Figure 5G); male imago of *C. calloventer* sp. nov. has forceps segment I wide at base (Figure 1C), while *C. cruentus* sp. nov. has forceps segment I cylindrical (Figure 5C).

Material examined

Holotype. female imago, BRAZIL, Rondônia, Porto Velho, Lake of Reserva Kaiari (8°51′7.38″ S, 63°57′33.72″ W), 26/v/2007, P.V. Cruz col. (INPA).

Paratypes. male imago, two female subimagos, nymph, Lake of Reserva Kaiari, 26/v/2007, P.V. Cruz col. (CZNC). Nymph, Lake of Reserva Kaiari, 8/vi/2007, P.V. Cruz col. (INPA). Male imago, BRAZIL, Roraima, Boa Vista, 13/xi/2006, illuminated sheet, J. N. Falcão col. (INPA). Female imago, BRAZIL, Amazonas, Presidente Figueiredo, Igarapé Pantera (1°28′29.82″ S, 60°16′26.52″ W), AM 240 – Km 20, 20/x/2008, illuminated sheet, P.V. Cruz col. (INPA). Seven exuviae, 11 female subimagos, female imago, 10 nymphs, BRAZIL, Amazonas, Manaus, Reserva Biológica de Cuieiras – ZF2 (03°10′59.9 S, 060°05′17.7″ W), sheet and reared, 06/vi/2008, P.V. Cruz col. (INPA). Eight male imagos, seven male subimagos, 25 female imagos, six female subimagos, BRAZIL, Amazonas, Manaus, Reserva Biológica de Cuieiras – ZF2, sheet and reared, 14/vii/2008, P.V. Cruz col. (INPA).

Distribution

Brazil: Rondônia state, Porto Velho county; Roraima state, Boa Vista county; Amazonas state, Presidente Figueiredo county and Manaus county.

Callibaetis capixaba Cruz, Salles and Hamada

Callibaetis capixaba Cruz et al., 2009, p. 31.

Known stages: I♀♂, N

Diagnosis

Male imago. (1) Dorsal portion of turbinate eyes oval, inner margins parallel (fig. 27 in Cruz et al. 2009); (2) forewing hyaline (fig. 29 in Cruz et al. 2009); (3) marginal intercalary veins paired, except between veins ICu_1 and A (fig. 29 in Cruz et al. 2009); (4) hind wing hyaline (fig. 30 in Cruz et al. 2009); (5) costal process of hind wing compound (fig. 30 in Cruz et al. 2009); (6) abdominal sterna light brown with many red spots, two red marks laterally and other sublaterally, medially with brown mark; (7) forceps segment I wide at base (fig. 31 in Cruz et al. 2009).

Female imago. (1) Forewing hyaline (fig. 33 in Cruz et al. 2009); (2) marginal intercalary veins paired, except between veins CuA and A (fig. 33 in Cruz et al. 2009); (3) hind wing hyaline, two complete longitudinal veins and one incomplete (fig. 34 in Cruz et al. 2009); (4) costal process of hind wing compound (fig. 34 in Cruz et al. 2009); (5) abdominal sterna reddish brown with many red spots, one mark laterally and sublaterally (fig. 35 in Cruz et al. 2009); (6) abdominal terga with red spots medially.

Mature nymph. (1) Antenna with spines and fine simple setae on apex of each segment (fig. 36 in Cruz et al. 2009); (2) distal margin of labrum (fig. 37a in Cruz et al. 2009) with deep medial emargination, laterally with long, fine and simple setae (fig. 37a in Cruz et al. 2009); (3) distal margin of labrum medially with long, fine and apically bifid setae; (4) maxillary palp reaching apex of galea-lacinia (fig. 41b in Cruz et al. 2009); (5) glossa broad and shorter than paraglossa (fig. 42a in Cruz et al. 2009); (6) outer margin of labial palp with few short, fine, simple setae (fig. 42a in Cruz et al. 2009); (7) anterior surface of forefemur with robust spine-like setae near dorsal margin and robust three- and two-pointed spine-like setae near ventral margin (fig. 43b in Cruz et al. 2009); (8) fore tarsus dorsally bare; ventrally one row of spine-like setae and one row of trifid spine-like setae (fig. 43c in Cruz et al. 2009); (9) mid and hind femora without robust trifid spine-like setae near ventral margin (fig. 44a in Cruz et al. 2009); (10) mid and hind claws with two rows of minute denticles (fig. 44b in Cruz et al. 2009); (11) gill VII subequal in length to segment VIII, with one fold (fig. 49 in Cruz et al. 2009); (12) cerci with spines on each segment (fig. 51 in Cruz et al. 2009); (13) terminal filament with spines on each segment (fig. 52 in Cruz et al. 2009).

Material examined

Female imago with corresponding nymphal exuviae, BRAZIL, Espírito Santo, Santa Teresa, (19°52′30.9″ S, 40°32′07.4″ W), pool, sand, 26/x/2008, Salles, F.F. col. (INPA). One male imago (reared), 20 nymphs, BRAZIL, Espírito Santo State, Santa Teresa County, (19°52′30.9″ S, 40°32′07.4″ W), pool, sand, 26/x/2008, Salles, F.F. col. (CZNC). One male imago and one female imago (both reared), Espírito Santo, Santa Teresa, Reserva Biológica Augusto Ruschi (19°55′30.1″ S; 40°33′21.9″ W), pool, sand, 26/ii/2009, Salles, F.F. col. (INPA). One female imago, Santa Catarina, Vargem Bonita (26°53′48.27″ S, 51°42′12.24″ W), 2005, Raimundi, E. col. (CZNC).

Distribution

Brazil: Espírito Santo state, Santa Teresa county; Santa Catarina state, Vargem Bonita county.

Callibaetis cruentus sp. nov.
(Figures 5–8)

urn:lsid:zoobank.org:act:863C8C1D-4175-42E3-B1FC-2E9004B26F8B
Known stages: I♀♂, N

Diagnosis

Male imago. (1) Dorsal portion of turbinate eyes oval (Figure 5A); (2) forewing hyaline with black bands transversally, medially with transverse band complete (Figure 5D); (3) marginal intercalary veins paired, except between veins ICu_2 and A (Figure 5D); (4) hind wing hyaline with brown marks basally, medially and apically (Figure 5E, F); (5) costal process of hind wing compound (Figure 5E, F); (6) abdominal sterna with many reddish spots, laterally with reddish brown spot, medially one brown mark and submedially with two light black marks; (7) forceps segment I cylindrical (Figure 5C).

Female imago. (1) Forewing completely dark brown, meeting of longitudinal veins with the posterior margin white (Figure 5H); (2) marginal intercalary veins paired, except between veins ICu_2 and A (Figure 5H); (3) hind wing completely dark brown with white veins (Figure 5I, J); (4) costal process of hind wing compound (Figure 5I, J); (5) abdominal sterna yellowish with brown spots; laterally with one black mark; submedially with brown mark on anterior margin (Figure 5K); (6) abdominal sterna yellowish with brown spots; laterally with one black mark; submedially with brown mark on anterior margin (Figure 5K).

Mature nymph. (1) Antenna with spines and fine, simple setae on apex of each segment (Figure 6A); (2) distal margin of labrum with deep medial emargination (Figure 6B); (3) distal margin of labrum with long simple setae (Figure 6B); (4) maxillary palp reaching apex of galea-lacinia (Figure 6F); (5) glossa longer than paraglossa (Figure 6G); (6) labial palp segment I with spine-like setae (Figure 6G); (7) anterior surface of fore femur with robust spine-like setae near dorsal margin and with one row of robust trifid and bifid spine-like setae near ventral margin (Figure 7B); (8) fore tarsus ventrally with one row of spine-like setae and trifid spine-like setae (Figure 7C); (9) hind femur posterior surface near ventral margin with one row of robust, curved, pectinate setae (Figure 7G); (10) hind claw similar with foreclaw (Figure 7I); (11) gills VII with one fold (Figure 8G); (12) cerci with spines on all segments (Figure 8I); (13) terminal filament with spines on all segments (Figure 8J).

Description

Male imago. Length: body, 4.8 mm; forewing, 4.2 mm; hind wing, 0.7 mm; antenna, 0.9 mm; tibia I, 1 mm; tibia II, 0.7 mm; tibia III, 0.7 mm. ($n = 2$) **Head** (Figure 5A, B). Coloration brown. Turbinate portion of compound eyes dorsally reddish orange, stalk reddish orange with black base. Antenna. Scape and pedicel with apex brown, flagellum brown with white base. Dorsal portion of turbinate eyes oval; length 1.2 × width; stalk height 0.9 × dorsal portion height; inner margins parallel, not reaching each other. **Thorax** (Figure 5A, B). Anteronotal protuberance, mesoscutum, submesoscutum, posterior scutal protuberance and scutellum black. Anteronotal and

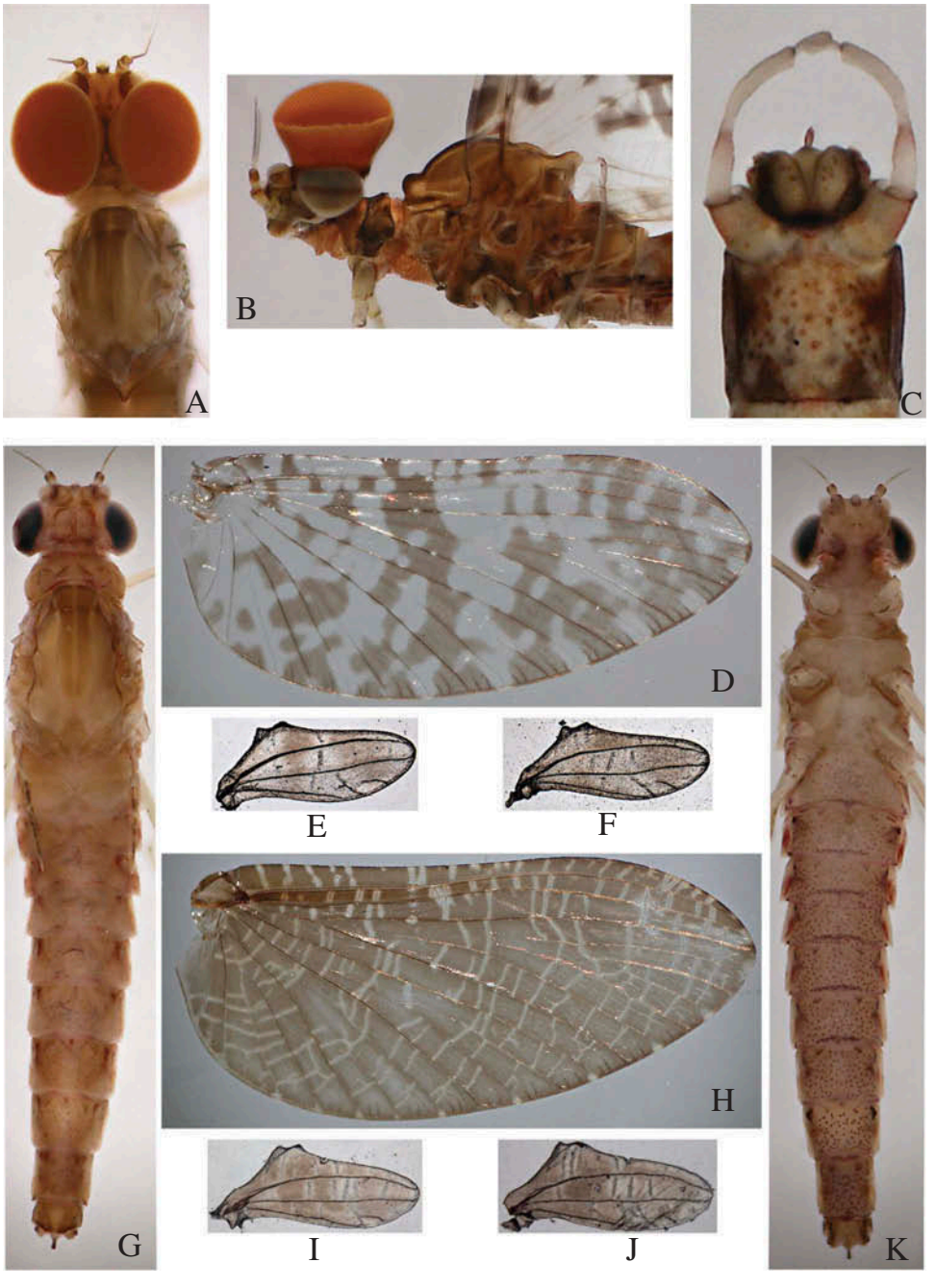

Figure 5. (colour online) *Callibaetis cruentus* sp. nov. (A) male imago dorsal view; (B) male imago lateral view; (C) genitalia; (D) male imago forewing; (E) detail of male imago hind wing; (F) variation of male imago hind wing; (G) female imago dorsal view; (H) female imago forewing; (I) female imago hind wing; (J) variation of female imago hind wing; (K) female imago ventral view.

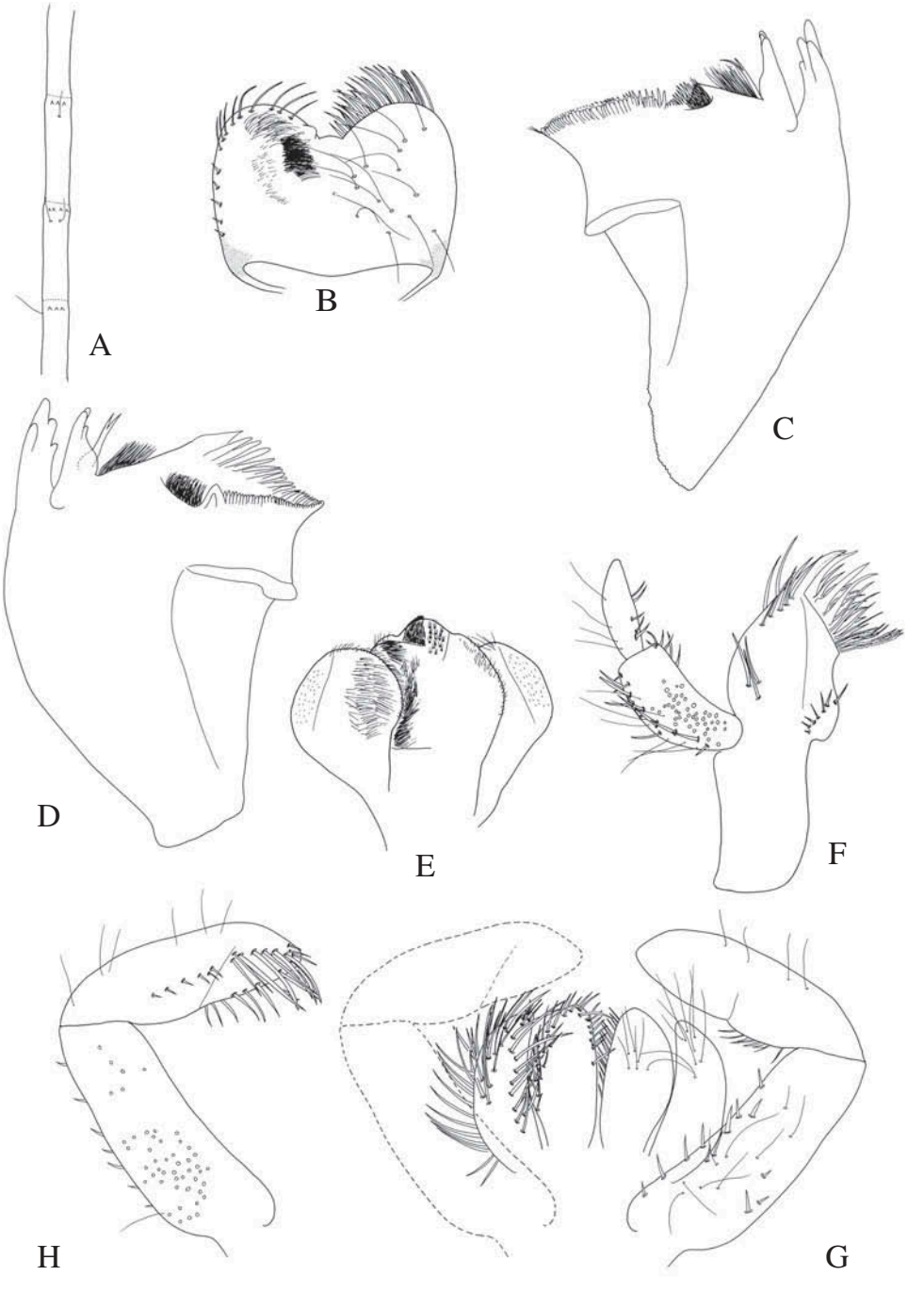

Figure 6. *Callibaetis cruentus* sp. nov. Nymph: (A) antenna; (B) labrum (left v.v.; right d.v.); (C) right mandible; (D) left mandible; (E) hypopharynx; (F) maxilla; (G) labium (left d.v.; right v.v.); (H) labial palp d.v.

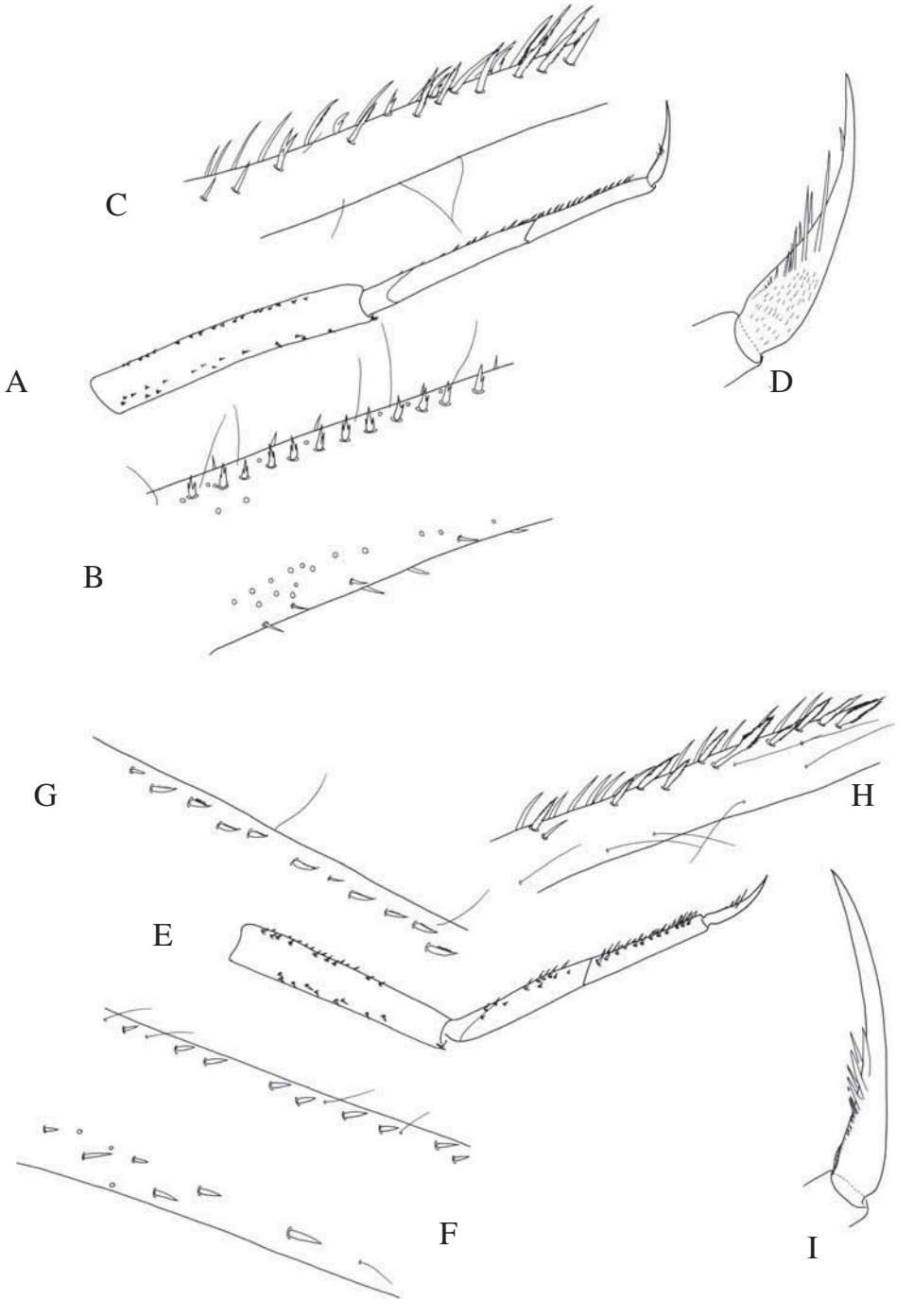

Figure 7. *Callibaetis cruentus* sp. nov. Nymph: (A) foreleg; (B) detail of anterior surface of forefemur; (C) detail of ventral margin of tarsus; (D) foreclaw; (E) hind leg; (F) detail of anterior surface of hind femur; (G) detail of posterior surface of hind femur, near ventral margin; (H) detail of anterior surface and ventral margin of tarsus; (I) hind claw.

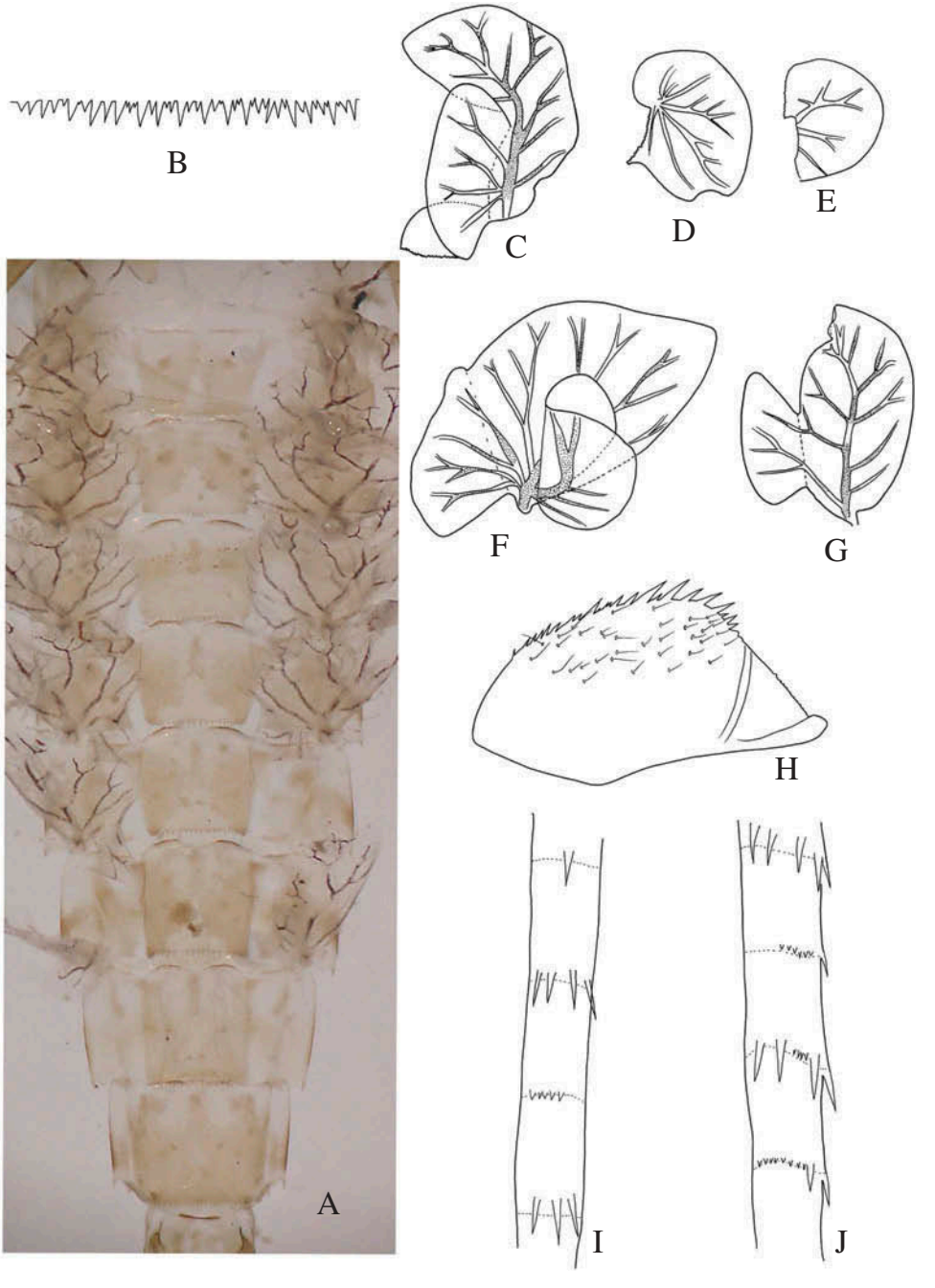

Figure 8. (colour online) *Callibaetis cruentus* sp. nov. Nymph: (A) dorsal body view (exuviae); (B) posterior margin of abdominal tergum IV; (C) fold I of gill I; (D) fold II of gill I; (E) fold III of gill I; (F) gill IV; (G) gill VII; (H) paraproct; (I) cercus; (J) terminal filament.

metascutellar protuberance rounded. Legs: Femur I with continuous longitudinal black line on external surface, tibia I white with black mark ventrally on apex, tarsus I and claws white; femur II with continuous longitudinal black line on internal surface; one light brown mark on apical half on internal surface, tibia II white with light marks on base and apex, tarsus II and claws white. Leg I: tibia 1.4 × length of femur; tarsus 1 × length of femur; and with four segments decreasing in length apically. Wings. Forewing (Figure 5D) hyaline with black bands transversally, medially with transversal band complete; veins white and black; stigmatic area with five or six cross veins touching subcostal vein; marginal intercalary veins paired, except between veins ICu_2 and A; length of each intercalary vein 0.5–0.6 × distance between adjacent longitudinal veins; length of forewing about 2.7 × width. Hind wing (Figure 5E, F) hyaline with brown mark basally, medially and apically; with seven to nine cross veins; costal process compound. **Abdomen.** Terga black, with red mark sublaterally like inverted "V" on terga II to VII; medially with two red maks on terga II and III; terga VIII, IX and X black with few black spots; tracheation black. Sterna with many reddish spots, laterally with reddish brown spot, medially with one brown mark and submedially with two light black marks. Caudal filaments lost. Genitalia (Figure 5C). Forceps segment I with few reddish spots, II and III white. Forceps segment I cylindrical; 0.4 × length of segment II; distance between base of forceps 0.3 × distance between lateral margins of forceps. Forceps segment III oval, 3.3 × as long as wide; 0.2 × length of segment II. Posterior margin of styliger plate with small medial projection.

Female imago. Length: body, 5.6 mm; forewing, 5.2 mm; hind wing, 0.8 mm; antenna, 0.6 mm; tibia, 0.8 mm. ($n = 2$) **Head** (Figure 5G). Coloration light brown; compound eyes black. Antenna. Scape and pedicel white with brown apex, flagellum white. **Thorax** (Figure 5G, K). Anteronotal protuberance and mesoscutum light brown; submesoscutum and posterior scutal protuberance yellowish light brown; scutellum light brown. Anteronotal protuberance rounded. Metascutellar protuberance pointed. Legs: Femur I white with trachea black pigmented on external surface, femora II and III white with trachea black pigmented on internal surface; tibia I white with brown mark ventrally on base and around apex, tibiae II and III white, with brown mark around apex; tarsi I, II, III and claws white. Leg I: tibia 1 × length of femur; tarsus 0.75 × length of femur. Leg II: tibia 0.7 × length of femur; tarsus 0.8 × length of femur. Leg III: tibia 0.7 × length of femur; tarsus 0.5 × length of femur. Wings. Forewing (Figure 5H) completely dark brown, meeting of longitudinal veins with the posterior margin white; veins brown; stigmatic area with eight cross veins touching subcostal vein and two not; marginal intercalary veins paired, except between veins ICu_2 and A; length of each intercalary vein 0.5–0.6 × distance between adjacent longitudinal veins; length of forewing about 2.3 × width. Hind wing (Figure 5I, J) completely dark brown with white veins; three complete longitudinal veins and 12–16 cross veins; costal process compound. **Abdomen** (Figure 5G, K). Terga yellowish brown with brown spots on VI to VIII; medially with red mark; laterally with brown mark; terga VII to IX with submedially brown mark. Tracheation black. Sterna yellowish with brown spots; laterally with one black mark; submedially with brown mark on anterior margin. Pleura with red mark. Caudal filaments lost.

Mature nymph. Length: body, 6 mm; terminal filament, 2.6 mm; antenna, 3.7 mm. ($n = 2$) **Head**. Coloration: light brown. Antenna light brown (Figure 6A) with spines

and fine, simple setae on apex of each segment. Labrum (Figure 6B). Excavate medially; length about 0.6 × maximum width; distal margin with deep medial emargination; anterolateral and distal margin with long and simple setae; dorsally with many, long, fine, simple setae scattered over anterolateral surface; submarginal row of setae absent; ventrally with short spine-like setae near lateral margin and one row of simple spine-like setae near anterolateral and distal margin. Right mandible (Figure 6C) with 4 + 3 denticles; prostheca slender and bifurcated, inner lobe short than outer; margin between prostheca and mola convex, with short projection and tuft of setae present; tuft of spine-like setae at base of mola present. Denticles of mola not constricted. Tuft of setae at apex of mola present; lateral margins slightly convex; basal half bare dorsally. Left mandible (Figure 6D) with 4 + 3 denticles; prostheca robust and bifid; margin between prostheca and mola concave; tuft of spine-like setae at base of mola present; subtriangular process narrow, at same level as area between prostheca and mola; denticles of mola not constricted; tuft of setae at apex of mola present; lateral margins slightly convex; basal half bare dorsally. Hypopharynx (Figure 6E). Superlingua not expanded; short, fine, simple setae scattered over distal margin of lingua and superlingua. Maxilla (Figure 6F). Double row of setae with three simple denti-setae. Medial protuberance of galea with 1 + 6 spine-like setae. Maxillary palp reaching apex of galea-lacinia; palp segment II 0.6 × length of segment I; outer margin of segment I scattered with robust and pointed setae, apex of inner margin with seven or eight pointed setae, dorsal and ventral surface with pores; segment II with short pointed setae in inner margin, outer margin with long, fine and simple setae. Labium (Figure 6G, H). Glossa basally narrow and longer than paraglossa; inner margin with 14 spine-like setae; apex with three to five spine-like setae; outer margin with many spine-like setae. Ventral surface scattered with few long, fine and simple setae. Paraglossa curved inward; apex with three to five robust and simple setae. Ventrally with few long, fine and simple setae. Labial palp with segment I 1 × length of segments II and III combined; segment I dorsally covered with micropores, near outer margin with robust spine-like setae; ventrally, near inner margin with robust spine-like setae, covered with fine, simple and long setae; segment II without distomedial protuberance; inner and outer margin respectively with eight or nine short spine-like setae and few long, fine and simple setae; dorsally with row of six or seven short spine-like setae; segment III concave; length 1.7 × width; covered with spine-like simple setae along margins and fine, simple setae, scattered over outer surface. **Thorax**. Light brown. Foreleg (Figure 7A–D) light brown. Ratio of foreleg 1.4 : (0.6 mm) : 0.7 : 0.4. Fore femur. Length about 5.3 × maximum width; dorsally with row of short spine-like setae; apex with two robust spine-like setae; length of setae about 0.1 × maximum width of femur; ventrally with few long, fine simple setae. Anterior surface with robust spine-like setae near dorsal margin and one row of trifid and bifid spine-like setae near ventral margin. Tibia. Dorsally bare; ventrally with one row of short, spine-like setae. Anterior surface with few short, robust spine-like setae. Tarsus. Dorsally bare; ventrally with one row of spine-like setae and trifid spine-like setae. Tarsal claw with two rows of denticles increasing in size distally. Hind leg (Figure 7E–I). Femur with one row of short spine-like setae dorsally and ventrally. Anterior surface with many robust setae near ventral and dorsal margin; posterior surface near ventral margin with one row of robust, curved, pectinate setae. Tibia ventrally with row of spine-like setae. Tarsus, ventrally with one row of spine-like setae, anterior surface with one row of robust bipectinate setae. **Abdomen** (Figure 8A). Like imago female. Terga. Posterior

margin with regular spines, 3 × as long as wide (Figure 8B). Sterna. Surface bare. Gills (Figure 8C–G). Trachea black pigmented, extending from main trunk to outer margin. Gill I subequal in length to segment II, with three folds. Gill IV subequal in length to segment V, with two folds. Gill VII as long as length of segments VIII to half IX combined, with one fold. Paraproct (Figure 8H) with 23–25 marginal spines; surface with micropores and short, fine, simple setae; posterolateral extension with minute marginal spines. Terminal filament (Figure 8J) light brown, with base of segments brown; posterior margin of segments with spines on each segment. Cerci (Figure 8I) with spines on all segments.

Etymology

The specific epithet is a reference to the abdominal colour pattern (*cruentus*, from Latin, meaning "spotted by blood").

Material examined

Holotype. Female imago with corresponding nymphal exuviae, BRAZIL, Amazonas, Iranduba, Janauari Lake (03°11′11.5″ S, 60°05′05.6″ W), 11/vii/2008, P.V. Cruz col. (INPA).

Paratypes. 19 nymphs and three female imagos reared (with corresponding nymphal exuviae), BRAZIL, Amazonas, Iranduba, Janauari Lake (03°11′11.5″ S, 060°05′05.6″ W), 11/vii/2008, P.V. Cruz col. (INPA, CZNC). Two female imagos reared and five nymphs, BRAZIL, Amazonas, Iranduba, Janauari Lake (03°11′11.5″ S, 060°05′05.6″ W), 11/vii/2008, P.V. Cruz col. (INPA, CZNC). Two female imagos and two male imagos reared, BRAZIL, Amazonas, Iranduba, Janauari Lake (03°11′11.5″ S, 060°05′05.6″ W), 26/viii/2008, P.V. Cruz col. (INPA, CZNC).

Distribution

Brazil: Amazonas state, Iranduba county.

Callibaetis fasciatus (Pictet)
(Figure 9)

Cloe fasciata Pictet, 1843, p. 262.
Callibaetis trifasciatus Esben-Petersen, 1912, p. 339.
Baetis gloriosus Navás, 1923, p. 2.
Callibaetis gloriosus Navás, 1930b, p. 360.
Callibaetis fasciatus Eaton, 1885, p. 197; Gillies, 1990; Domínguez et al. 2006, p. 113.

Known stages: I♀♂

Diagnosis

Male imago. (1) Dorsal portion of turbinate eyes oval (Figure 9A); (2) forewing with three or four transverse pigmented bands (Figure 9C); (3) marginal intercalary veins

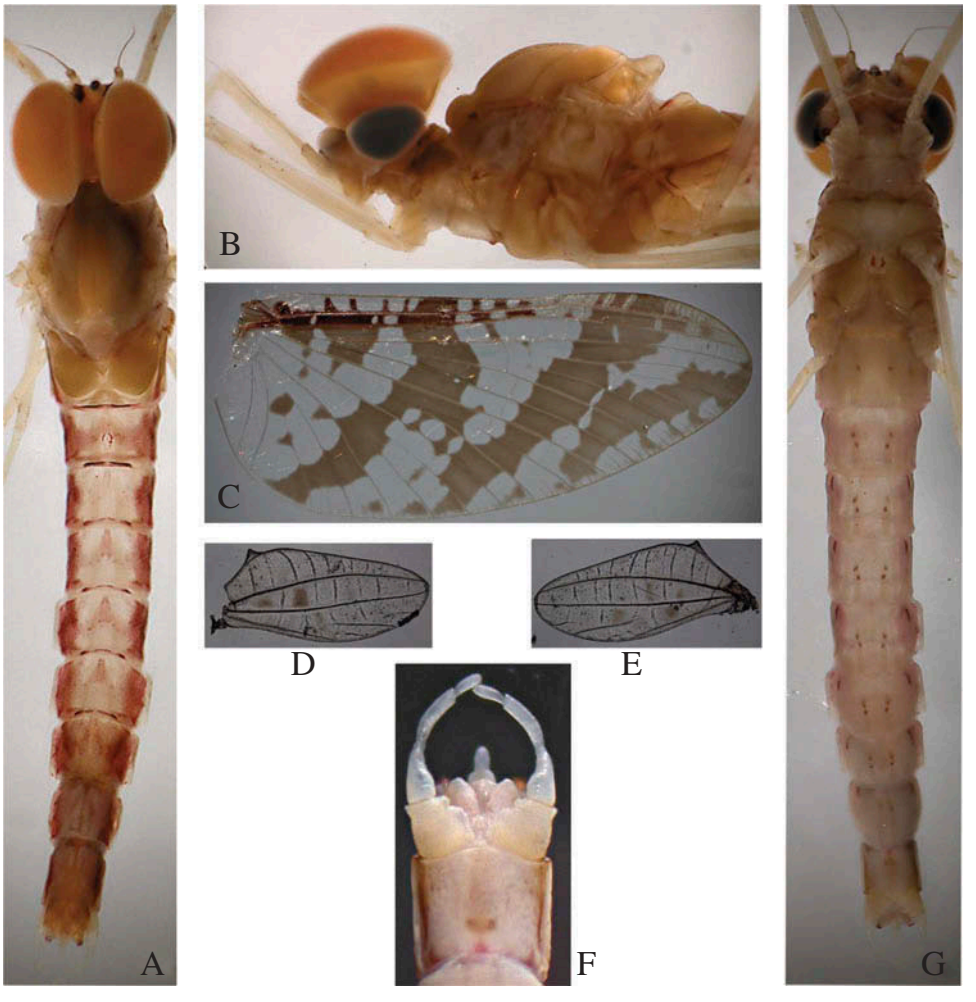

Figure 9. (colour online) *Callibaetis fasciatus*. (A) male imago dorsal view; (B) male imago lateral view; (C) male imago forewing; (D) detail of male imago hind wing; (E) variation of male imago hind wing; (F) genitalia; (G) male imago ventral view.

paired (Figure 9C); (4) hind wing with many cross veins and three complete longitudinal veins (Figure 9D, E); (5) hind wing with small pointed costal projection (Figure 9D, E); (6) forceps segment I wide at base (Figure 9F); (7) abdominal sterna surface with two pair of medial brown marks (Figure 9G).

Female imago. (1) Forewing with three or four transverse bands of pigmentation (fig. 12 in Gillies 1990); (2) marginal intercalary veins paired (fig. 12 in Gillies 1990); (3) hind wing with many cross veins (fig. 13 in Gillies 1990); (4) abdominal sterna I to IX with two pairs of median black marks.

Comments

The adults of *C. fasciatus* and *C. sellacki* are similar, although those of *C. fasciatus* have forewing with three or four transverse bands (Figure 9C) and those of *C. sellacki* have only two (Figure 27G).

Material examined

Three male imagos, BRAZIL, Rio Grande do Sul, Derrubadas, (27°15′58.76″ S, 53°51′50.62″ W), dam, 25/x/2008, E. Raimundi col. (INPA). Male imago, BRAZIL, Paraná, Rio Branco do Sul, (25°11′42.20″ S, 49°18′50.44″ W), Gruta de Lancinha, 31/v/1987 (DZRJ).

Distribution

Argentina, Chile, Uruguay and Brazil: Rio Grande do Sul state, Derrubadas county; Paraná state, Rio Branco do Sul county.

Callibaetis fluminensis Cruz, Salles and Hamada

Callibaetis fluminensis Cruz et al. 2009, p. 25.

Known stages: I♀♂,N

Diagnosis

Male imago. (1) Dorsal portion of turbinate eyes oval (fig. 1 in Cruz et al. 2009); (2) forewing hyaline, except for brownish stigmatic area and small brownish marks along costal vein (fig. 3 in Cruz et al. 2009); (3) marginal intercalary veins paired, except between veins MP and A (fig. 3 in Cruz et al. 2009); (4) hind wing hyaline with five cross veins (fig. 4b in Cruz et al. 2009); (5) costal process of hind wing compound (fig. 4b in Cruz et al. 2009); (6) abdominal sterna with black mark anterolaterally; (7) forceps segment I wide at base and with small distomedial projection (fig. 31 in Cruz et al. 2009).

Female imago. (1) Forewing hyaline, except C, Sc, R_1 and area around bulla brown coloured (fig. 7 in Cruz et al. 2009); (2) marginal intercalary veins paired, except between veins CuA and A (fig. 7 in Cruz et al. 2009); (3) hind wing hyaline, except brown mark at base toward costal process, with six cross veins (fig. 8b in Cruz et al. 2009); (4) costal process of hind wing compound (fig. 8b in Cruz et al. 2009); (5) abdominal sterna white with many red spots (fig. 9 in Cruz et al. 2009); (6) abdominal terga dark brown with red spots medially (fig. 32 in Cruz et al. 2009).

Mature nymph. (1) Antenna with fine, simple setae on apex of each segment (fig. 10 in Cruz et al. 2009); (2) distal margin of labrum with subquadrangular small emargination (fig. 11a in Cruz et al. 2009); (3) lateral and anterolateral margin of labrum with long, fine, simple setae; (4) maxillary palp reaching apex of galea-lacinia (fig. 15 in Cruz et al. 2009); (5) glossa subequal in length to paraglossa (fig. 16a in Cruz et al.

2009); (6) labial palp with inner and outer margin with many robust, simple setae and many long, fine, simple setae (fig. 16a in Cruz et al. 2009); (7) anterior surface of forefemur with robust trifid and bifid spine-like setae near ventral margin (fig. 17b in Cruz et al. 2009); (8) fore tarsus dorsally with one or two short, robust, spine-like setae; ventrally two rows of long spine-like setae and one row of trifid spine-like setae (fig. 17a in Cruz et al. 2009); (9) anterior surface of hind femur with many robust, curved, pectinate setae near ventral and dorsal margin (fig. 18b,c in Cruz et al. 2009; (10) hind claw similar to foreclaw; (11) gill VII as long as length of segments VIII to IX, with two folds (fig. 23 in Cruz et al. 2009); (12) cerci with posterior margin of segments with short spines on each segment, and long spines on every three segments (fig. 25 in Cruz et al. 2009); (13) terminal filament similar to cerci (fig. 26 in Cruz et al. 2009).

Material examined

Female imago with corresponding nymphal exuviae, BRAZIL, Rio de Janeiro, Nova Friburgo, Lumiar (22°23′27.2″ S, 42°20′03,6″ W), third order tributary of the Rio Bonito, pool, V/2008, Souza, M.R. col. (INPA). Ten nymphs, two male imagos same data, both reared (five nymphs and one male imago in INPA, others in DZRJ).

Comments

The male imagos of *C. zonalis* only have as useful diagnostic characteristic the alar pigmentation, which has large variation, matching with alar pigmentation of *C. fluminensis* male imago. This shared characteristic prevents the differentiation of these species at this stage.

Distribution

Brazil: Rio de Janeiro state, Nova Friburgo county.

Callibaetis gelidus sp. nov.
(Figure 10)

urn:lsid:zoobank.org:act:6547C53C-E014-4674-B26D-9B105EFC611A
Known stages: I♀♂, N

Diagnosis

Male imago. (1) Dorsal portion of turbinate eyes circular, apical third with constriction, base is wider than apex in lateral view (Figure 10A); (2) forewing hyaline, except C, Sc, R_1 areas (Figure 10D); (3) marginal intercalary veins paired, except between veins MP and A (Figure 10D); (4) hind wing hyaline, sometimes with one brown mark near costal process (Figure 10E, F); (5) hind wing with costal process compound (Figure 10E, F); (6) abdominal sterna with one brown mark submedially; (7) forceps segment I cylindrical (Figure 10C).

Female imago. (1) Forewing hyaline, except C, Sc, R_1 and area around bulla brown coloured (Figure 10H); (2) marginal intercalary veins single (Figure 10H); (3) hind wing hyaline sometimes with one brown mark near costal process (Figure 10I, J); (4) costal process of hind wing compound (Figure 10I, J); (5) posterior margin of abdominal sterna with one brown mark medially; hyaline after oviposition (Figure 10K); (6) abdominal terga white, sometimes light brown with anterior margin with one brown mark medially; hyaline after oviposition (Figure 10G).

Mature nymph. As in *C. nigracyclus* sp. nov.

Description

Male imago. Length: body, 4.8 mm; cercus, 6.8 mm; forewing, 4.6 mm; hind wing, 0.4 mm; antenna, 0.9 mm; tibia I, 1 mm; tibia II, 0.9 mm; tibia III, 0.7 mm. ($n = 2$) **Head** (Figure 10A, B). Coloration light brown. Turbinate portion of compound eyes dorsally light brown, stalk larger than apex, apical third narrow. Antenna. Scape and pedicel with apex brown, flagellum brown with white base, longer than turbinate eyes. Dorsal portion of turbinate eyes circular; length 1 × width; stalk height 9 × dorsal portion height; base is wider than apex in lateral view; apical third with constriction; inner margins parallel, not reaching each other. **Thorax** (Figure 10A, B). Anteronotal protuberance medially light brown, submedially brown, laterally light brown; mesoscutum, submesoscutum, posterior scutal protuberance and scutellum brown. Anteronotal and metascutellar protuberance rounded. Legs: Femora I, II and III with discontinuous longitudinal black marks on external surface; tibiae I, II and III light brown with brown mark on apex; tarsi I, II, III and claws light brown. Leg I: tibia 0.8 × length of femur; tarsus 0.6 × length of femur. Leg III: tibia 1.3 × length of femur; tarsus 0.7 × length of femur. Wings. Forewing (Figure 10D) hyaline, except C, Sc, R_1 areas; veins light brown; stigmatic area with five to seven cross veins touching subcostal vein; marginal intercalary veins paired, except between veins MP and A; length of each intercalary vein 0.3–0.8 × distance between adjacent longitudinal vein; length of forewing about 3.2 × width. Hind wing (Figure 10E, F) hyaline, sometimes with one brown mark near costal process, with one incomplete and two complete longitudinal veins, without cross veins; costal process compound. **Abdomen**. Terga brown or light brown; tracheation black. Sterna light brown or brown, with one brown mark submedially. Caudal filaments white with brown mark on apex and base of each segment. Genitalia (Figure 10C). Forceps brown. Forceps segment I cylindrical; 0.3 × length of segment II; distance between base of forceps 0.4 × distance between lateral margins of forceps. Forceps segment III oval, 5 × as long as wide; 0.2 × length of segment II. Posterior margin of styliger plate without medial projection.

Female imago. Length: body, 6 mm; cercus, 8.6 mm; forewing, 5.5 mm; hind wing, 0.6 mm; antenna, 0.8 mm; tibia I, 0.9 mm; tibia II, 1.1 mm; tibia III, 1 mm. ($n = 2$). **Head** (Figure 10G). Coloration white, sometimes yellowish light brown; compound eyes black with longitudinal brown line. Antenna. Scape and pedicel with brown apex, flagellum light brown with base white. **Thorax** (Figure 10G, K). Anteronotal protuberance, mesoscutum, submesoscutum, posterior scutal protuberance and scutellum white (sometimes all thorax light brown). Anteronotal and metascutellar protuberance

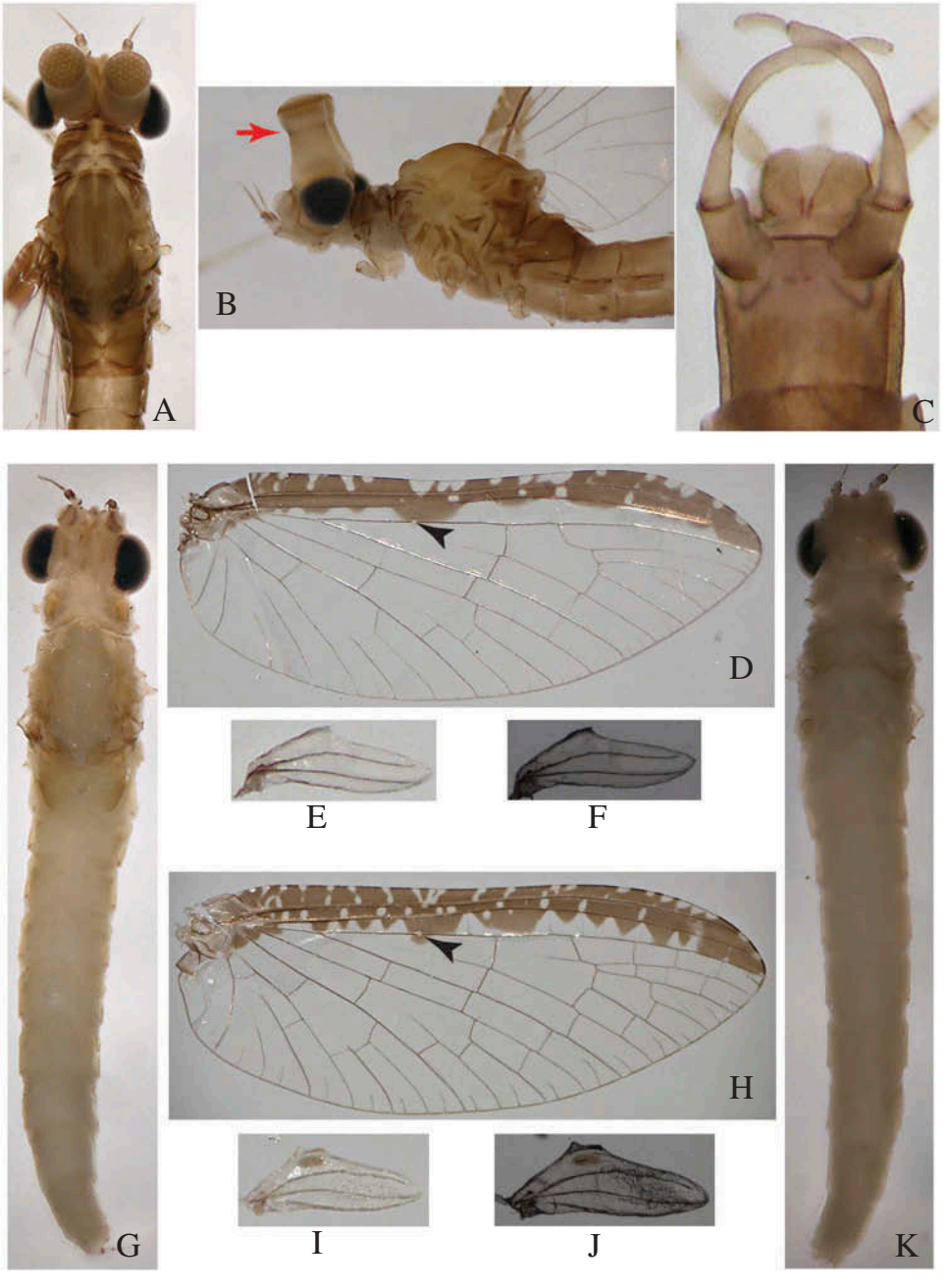

Figure 10. (colour online) *Callibaetis gelidus* sp. nov. (A) male imago dorsal view; (B) male imago lateral view (red arrow indicate constriction); (C) genitalia; (D) male imago forewing (black arrow indicate area around bulla); (E) male imago hind wing; (F) detail of male imago hind wing; (G) female imago dorsal view; (H) female imago forewing (black arrow indicate area around bulla); (I) female imago hind wing; (J) detail of female imago hind wing; (K) female imago ventral view.

rounded. Legs: Femora I, II and III light brown with discontinuous longitudinal pigmented line on external surface; tibiae I, II and III light brown with brown mark ventrally on base and brown around apex; tarsi I, II and III light brown; claws light brown. Leg I: tibia 1.2 × length of femur; tarsus 0.8 × length of femur. Leg II: tibia 1 × length of femur; tarsus 0.4 × length of femur. Leg III: tibia 0.9 × length of femur; tarsus 0.3 × length of femur. Wings. Forewing (Figure 10H) hyaline, except C, Sc, R_1 and area around bulla brown coloured; veins brown; stigmatic area with four to six cross veins touching subcostal vein; marginal intercalary veins single; length of each intercalary vein 0.4–0.8 × distance between adjacent longitudinal veins; length of forewing about 2.7 × width. Hind wing (Figure 10I, J) hyaline, sometimes with one brown mark near costal process; one longitudinal incomplete vein, not reaching apex of hind wing and two longitudinal complete veins; one or two cross veins; costal process compound. **Abdomen** (Figure 10G, K). Terga white, sometimes light brown with anterior margin with one brown mark medially; hyaline after oviposition. Tracheation black. Sterna white, sometimes light brown, posterior margin with one brown mark medially; hyaline after oviposition. Caudal filaments white with base and apex of segments dark brown.

Etymology

The specific epithet is a reference to the abdominal colour, white like ice (*gelidus*, from Latin, meaning "frosty").

Comments

The nymphs of *C. gelidus* sp. nov. and *C. nigracyclus* sp. nov. cannot be distinguished.

Material examined

Holotype. Female imago, BRAZIL, Rondônia, Porto Velho, Igarapé Mamãe Quinó (8°49′36.33″ S, 63°56′4.28″ W), 12/v/2006, P.V. Cruz col. (INPA).

Paratype. Four female imagos, Igarapé Mamãe Quinó (8°49′36.33″ S, 63°56′4.28″ W), 12/v/2006, P.V. Cruz col. (INPA, CZNC). Female imago, five female subimagos, two nymphs, two exuviae, male imago, male subimago, Reserva Kaiari (8°51′7.38″ S, 63°57′33.72″ W), 7/iv/2007, P.V. Cruz col. (INPA, CZNC). Nymph, Reserva Kaiari (8°51′7.38″ S, 63°57′33.72″ W), 15/iv/2007, P.V. Cruz col. (INPA). Three nymphs, three female imagos, 20 exuviae, eight female subimagos, 11 male subimagos, Reserva Kaiari (8°51′7.38″ S, 63°57′33.72″ W), 26/v/2007, P. V. Cruz col. (INPA, CZNC). Three female imagos, BRAZIL, Amazonas Manaus, Lake of Reserva ZF2 (02°38′10.0″ S, 60°09′11.3″ W), 14/viii/2008, illuminated sheet, P.V. Cruz col. (INPA).

Distribution

Brazil: Rondônia state, Porto Velho county; Amazonas state, Manaus county.

Callibaetis gonzalezi (Navás)
(Figure 11)

Cloeon gonzalezi Navás, 1934, p. 27.
Callibaetis gonzalezi Gillies, 1990; Nieto, 2008; Domínguez et al., 2006, p. 113.

Known stages: I♀♂, N

Diagnosis

Male imago. (1) Dorsal portion of turbinate eyes oval (Figure 11A); (2) forewing hyaline (Figure 11E); (3) marginal intercalary veins single (Figure 11E); (4) hind wing hyaline; (5) costal process of hind wing rounded (Figure 11F); (6) abdominal sterna white, with anterolateral brown mark in each segment; (7) forceps segment I wide at base (Figure 11C).

Female imago. (1) Forewing with yellowish green pigmentation at C, Sc, R_1 areas and wing base (Figure 11H) (only yellowish in alcohol); (2) marginal intercalary veins single (Figure 11H); (3) hind wing with 13–15 cross veins, basal half yellowish green (Figure 11I) (yellowish brown in alcohol) (Figure 11J, K); (4) hind wing with costal process rounded (Figure 11J); (5) abdominal sterna with one dark mark anterolaterally (Figure 11L); (6) abdominal terga green (yellowish brown in alcohol).

Mature nymph. (1) Antenna with spines; (2) anterior margin of labrum medially with subquadrangular small emargination (fig. 4 in Nieto 2008), setae of distal margin of labrum long and pointed; (3) maxillary palp scarcely longer than galea-lacinia (fig. 8 in Nieto 2008); (4) glossa subequal than paraglossa; (5) forefemur ventrally with trifid setae (fig. 10 in Nieto 2008) (6) foretarsus ventrally with trifid setae; (7) hind femur with curved and pectinate setae near ventral margin; (8) cerci with spines in all segments (fig. 15 in Nieto 2008); (9) terminal filament with spines in all segments.

Description

Male imago. Length: body, 4.8 mm; forewing, 5.6 mm; hind wing, 4.8 mm; antenna, 1 mm; tibia I, 1.3 mm; tibia II, 1 mm; tibia III, 1 mm; ($n = 1$). **Head** (Figure 11A, B). Coloration light orange. Turbinate portion of compound eyes orange. Antenna white. Dorsal portion of turbinate eyes oval; length 1.5 × width; stalk height 0.5 × dorsal portion height; inner margins parallel, not reaching each other. **Thorax** (Figure 11A, B). Anteronotal protuberance, mesoscutum, submesoscutum, posterior scutal protuberance and scutellum white. Anteronotal protuberance rounded. Metascutellar protuberance pointed. Legs: White. Leg I: tibia 1.1 × length of femur; tarsus 1.2 × length of femur. Leg II and III: tibia 0.6 × length of femur; tarsi 0.3 × length of femur. Wings. Forewing hyaline (Figure 11E), C and Sc areas opaque; veins white; stigmatic area with three to four cross veins touching subcostal vein and three to four veins not touching subcostal vein; marginal intercalary veins single, except between veins R_1 and R_2; length of each intercalary vein 0.3–0.7 × distance between adjacent longitudinal vein; length of forewing about 2.6 × width. Hind wing hyaline (Figure 11F); with seven to nine cross veins, one marginal intercalary vein; costal process rounded. **Abdomen**.

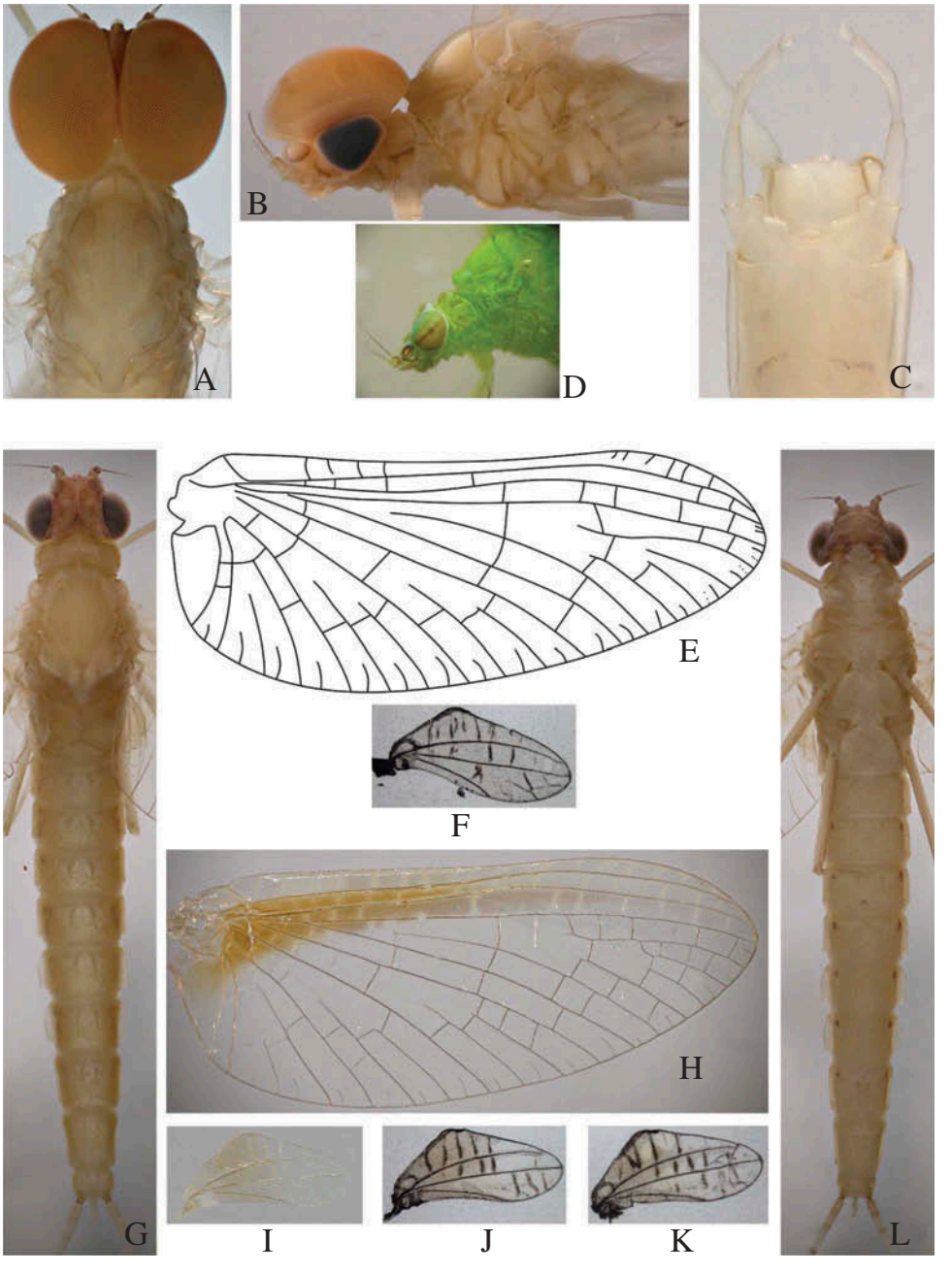

Figure 11. (colour online) *Callibaetis gonzalezi*. (A) male imago dorsal view; (B) male imago lateral view; (C) genitalia; (D) female imago lateral view of head and half thorax with natural color pattern; (E) male imago forewing; (F) male imago hind wing; (G) female imago dorsal view; (H) female imago forewing; (I) female imago hind wing; (J) detail of female imago hind wing; (K) variation of female imago hind wing; (L) female imago ventral view.

Terga white; tracheation black. Sterna white, with anterolateral brown mark in each segment. Caudal filaments white. Genitalia (Figure 11C). Forceps white, segment I wide at base; 0.3 × length of segment II; distance between base of forceps 0.2 × distance between lateral margins of forceps. Forceps segment III apically truncate, 1.8 × as long as wide; 0.1 × length of segment II. Posterior margin of subgenital plate with small rounded projection.

Comments

The nymphs of *C. gonzalezi* and *C. cruentus* sp. nov. are similar, they can be distinguished by differences in the distal margin of labrum, which in *C. gonzalezi* is straight (fig. 4 in Nieto 2008) and in *C. cruentus* sp. nov. it is rounded (Figure 6B); the segments of maxillary palp in *C. gonzalezi* are subequal (fig. 8 in Nieto 2008) whereas in *C. cruentus* sp. nov. the second segment is shorter (0.6 ×) than the first (Figure 6F); abdominal segments V, VII and VIII with two parallel pale bands in *C. gonzalezi* (fig. 3 in Nieto 2008) whereas in *C. cruentus* sp. nov. these pale bands are absent (Figure 8A).

The female natural colour is green (Figure 11D), after fixation the body colour changed to yellowish.

Material examined

Nine nymphs, BRAZIL, Rondônia, Porto Velho, Igarapé da Penal (8°43′22.10″ S, 63°51′12.45″ W), 21/vii/2006, P.V. Cruz col. (INPA, CZNC). Two female imagos, BRAZIL, Rondônia, Porto Velho, Igarapé da Penal (8°43′22.10″ S, 63°51′12.45″ W), 23/ii/2007, P.V. Cruz col. (INPA, UNIR). Female imago, BRAZIL, Rondônia, Porto Velho, Rio Madeira (8°45′42.61″ S, 63°54′07.10″ W), 14/iv/2007, P.V. Cruz col. (INPA). Female imago, BRAZIL, Bahia, Jequié (13°51′3.76″ S, 40° 4′52.22″ W), 22/i/2005, L.R.C. Lima col. (INPA). 39 nymphs, female imago (reared), three female imagos, male imago, BRAZIL, Amazonas, Manaus, Catalão Lake (3°06′54.73″ S, 59°54′33.85″ W), macrophyte, 07/vii/2008, P.V. Cruz col. (INPA). 42 nymphs, BRAZIL, Amazonas, Manaus, Catalão Lake (3°06′54.73″ S, 59°54′33.85″ W), macrophyte, 10/vii/2008, P.V. Cruz col. (INPA). Female imago (reared), male subimago (reared), male imago (reared), 29 nymphs, two female imagos (reared), male imago (reared), BRAZIL, Amazonas, Manaus, Catalão Lake (3°06′54.73″ S, 59°54′33.85″ W), macrophyte, 11/vii/2008, P.V. Cruz col. (INPA). Female imago, BRAZIL, Amazonas, Manaus, Rio Negro (3°06′54.73″ S, 59°54′33.85″ W), 20/viii/2008, P.V. Cruz col. (INPA).

Distribution

Argentina, Paraguay and Brazil: Rondônia state, Porto Velho county; Amazonas state, Manaus county; Bahia state, Jequié county.

Callibaetis gregarius Navás

Callibaetis gregarius Navás, 1930a; Gillies, 1990; Domínguez et al., 2006, p. 113.

Known stages: I♂

Diagnosis

Male imago. (1) Forewing hyaline; (2) hind wing with pointed costal process (fig. 16 in Navás 1930a); (3) abdominal terga with two longitudinal marks.

Comments

In the original description only the hind wing is illustrated. The type series was at the Zoological Museum of Berlin, and one specimen, in poor condition, is deposited in the Zoological Museum of Barcelona (Gillies 1990). Gillies (1990) examined the specimen from Barcelona and reported that it would be necessary to examine more specimens to clarify the status of this taxon.

Material examined

No types or specimens were examined; diagnosis was based on the literature.

Distribution

Brazil: São Paulo state, Ipiranga county.

Callibaetis guttatus Navás
(Figure 12)

Callibaetis guttatus Navás, 1915b; Gillies, 1990; Da-Silva, 1991; Domínguez et al. 2006; Nieto, 2008, p. 232.
Callibaetis apicatus Navás, 1917, p. 189.
Callibaetis bruchius Navás, 1920b, p. 55.
Callibaetis zonatus Navás, 1929, p. 224.

Known stages: I♀♂, N

Diagnosis

Male imago. (1) Forewing hyaline or with sparse pigmentation (figs. 16, 20 in Nieto 2008); (2) marginal intercalary veins paired (fig. 16 in Nieto 2008); (3) hind wing hyaline, sometimes with pigmentation (figs. 17a, 21a in Nieto 2008); (4) costal process of hind wing pointed or compound (fig. 21a in Nieto 2008); (5) abdominal terga III, V and VII dorsally with two submedially oblique marks; (6) segment I of forceps wide at base (fig. 22 in Nieto 2008).

Female imago. (1) Forewing with five to six pigmented bands, sometimes with black marks near posterior margin (Figure 12B); (2) marginal intercalary veins paired (Figure 12B); (3) hind wing with pigmented basal half, sometimes with medial pigmentation (Figure 12C); (4) costal process of hind wing pointed or compound (Figure 12C); (5) abdominal sterna with anterolateral mark (Figure 12D); (6) abdominal terga III, V and VII dorsally with two submedially oblique marks (Figure 12A).

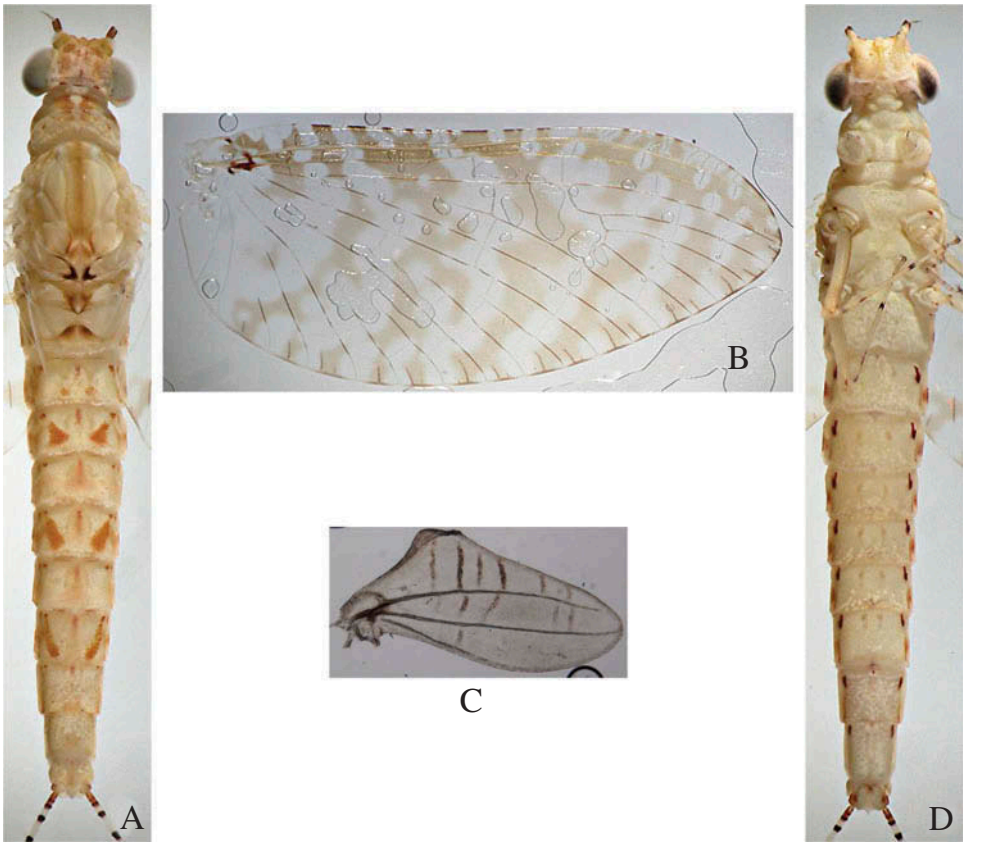

Figure 12. (colour online) *Callibaetis guttatus*. (A) female imago dorsal view; (B) female imago forewing; (C) female imago hind wing; (D) female imago ventral view.

Mature nymph. (1) Anterior margin of labrum medially with small emargination (fig. 25a in Nieto 2008); (2) anterior margin of labrum with simple and bipectinate setae (fig. 25b in Nieto 2008); (3) maxillary palp subequal or shorter in length than galea-lacinia (fig. 29 in Nieto 2008); (4) glossa subequal in length than paraglossa; (5) forefemur with row of trifid spine-like setae (fig. 31 in Nieto 2008); (6) cerci with spines on every one segment (fig. 36 in Nieto 2008).

Comments

Da-Silva (1991), after analysing several specimens from the state of Rio de Janeiro, described their nymphs for the first time, and redescribed the females, although the specimens examined in this paper did not fit exactly the original description of *C. guttatus*, especially regarding the forewing colour pattern. According to Da-Silva (1991) this was due to an intra-specific variation. Nieto (2008) also described two pigmentation variations of *C. guttatus*, one of which is in accordance with Da-Silva (1991). However, when analysing specimens collected in the states of Rio de Janeiro, Espírito Santo and Ceará, we found no variation in the wings or body pigmentation. A detailed

investigation of the body pigmentation pattern, together with the nymph morphology of all specimens classified as *C. guttatus,* will help to establish the diagnostic characters of this species and, perhaps, help to reveal species that are new to science.

The natural colour of the female is green, after fixation the body colour changed to yellowish, and in some females to reddish.

Material examined

Female imago, BRAZIL, Ceará, São Gonçalo do Amarante (3°36′21.67″ S, 38°58′12.33″ W), 14/iv/2008, Ferreira, N. col. (DZRJ). Female imago (with exuviae), BRAZIL, Espírito Santo, Pinheiros, 02/x/2007, Rebio Córrego do Veado (18°43′0.16″ S, 39°51′33.80″ W), Salles, F.F. col. (CZNC). Female imago (with exuviae), BRAZIL, Espírito Santo, Águia Branca (18°58′43.20″ S, 40°44′19.16″ W), 11/ix/2009, Cruz, P.V., Salles, F.F. col. (CZNC). Female imago (with exuviae), BRAZIL, Espírito Santo, São Mateus (18°43′0.16″ S, 39°51′33.80″ W), 09/ix/2009, Campus Litorâneo Lake of UFES, Cruz, P.V. col. (CZNC). Two female imagos, BRAZIL, Rio de Janeiro, Silva Jardim (22°39′34.25″ S, 42°22′56.76″ W), 16/x/1976, Santos, N.D. col. (DZRJ). Female imago, BRAZIL, Rio de Janeiro, Marica (22°55′8.73″ S, 42°49′5.83″ W), 03/vi/1989, (DZRJ). Female imago, BRAZIL, Rio de Janeiro, Marica (22°55′8.73″ S, 42°49′5.83″ W), Restinga, 03/vi/1988, Nessimian, J.L. col. (DZRJ).

Distribution

Argentina, Brazil: Rio de Janeiro state, Silva Jardim county and Marica county; Espírito Santo state, São Mateus county and Águia Branca county; Ceará state, São Gonçalo do Amarante county.

Callibaetis itannae sp. nov.
(Figures 13–16)

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Known stages: I♀♂, N

Diagnosis

Male imago. (1) Dorsal portion of turbinate eyes oval (Figure 13A); (2) forewing hyaline (Figure 13D); (3) marginal intercalary veins paired, except between MP and A veins (Figure 13D); (4) hind wing without cross veins (Figure 13E); (5) costal process of hind wing compound (Figure 13E); (6) abdominal sterna with light brown mark medially on posterior margin of all segments; (7) forceps segment I wide at base (Figure 13C).

Female imago. (1) Forewing hyaline (Figure 13G); (2) marginal intercalary veins paired, except between R_3 and A (Figure 13G); (3) hind wing hyaline without cross veins (Figure 13H); (4) costal process of hind wing compound (Figure 13H); (5) abdominal sterna with light brown mark medially on posterior margin of all segments (Figure 13I); (6) abdominal terga light brown with posterior margin of all segments with brown mark submedially (Figure 13F).

Mature nymph. (1) Antenna with spines and fine, simple setae on apex of each segment (Figure 14A); (2) distal margin of labrum with deep medial emargination (Figure 14B); (3) margin of labrum with long, fine, simple setae laterally and anterolaterally; medially with short, robust pectinate setae (Figure 14B, C); (4) maxillary palp reaching apex of galea-lacinia (Figure 14G); (5) glossa subequal in length to paraglossa (Figure 14H); (6) labial palp segment I with spine-like setae (Figure 14H); (7) anterior surface of fore femur with robust trifid and bifid spine-like setae near ventral margin (Figure 15B); (8) foretarsus ventrally with one row of spine-like setae and trifid spine-like setae (Figure 15C); (9) hind femur anterior surface with many robust setae near ventral and dorsal margin (Figure 15E); (10) hind claw similar to foreclaw (Figure 15G); (11) gill VII with one fold (Figure 16E); (12) cerci with spines on all segments (Figure 16H); (13) terminal filament with short spines on every one segments (Figure 16I).

Description

Male imago. Length: body, 4.8 mm; cercus, 6.24 mm; forewing, 7 mm; hind wing, 0.72 mm; antenna, 0.5 mm; tibia I, 0.9 mm; tibia II, 0.6 mm; tibia III, 0.4 mm. ($n = 2$) **Head** (Figure 13A, B). Coloration brown. Turbinate portion of compound eyes dorsally and stalk light brown. Antenna with apex of scape, pedicel and flagellum brownish. Dorsal portion of turbinate eyes oval; length 1.3 × width; stalk height 0.25 × dorsal portion height; inner margins parallel, not reaching each other. **Thorax** (Figure 13A, B). Anteronotal protuberance and mesoscutum dark brown; submesoscutum and posterior scutal protuberance dark brown; scutellum whitish brown. Anteronotal protuberance rounded. Metascutellar protuberance pointed. Legs: Femur I with trachea black pigmented, tibia I white without brown marks, tarsus I white, claws brown; femora II and III with trachea black pigmented, tibiae II and III white without brown marks, tarsi II and III white, claws brown. Leg I: tibia 1 × length of femur; tarsus 1.3 × length of femur. Leg III: tibia 0.5 × length of femur; tarsus 0.45 × length of femur. Wings. Forewing (Figure 13D) hyaline, apical half of C vein opaque; veins white; stigmatic area with three or four cross veins touching subcostal vein and three or four veins not touching; marginal intercalary veins paired, except between veins MP and A; length of each intercalary vein 0.5–0.8 × distance between adjacent longitudinal veins; length of forewing about 2.7 × width. Hind wing (Figure 13E) hyaline; with one incomplete and two complete longitudinal veins, without cross veins; costal process compound. **Abdomen.** Terga I to VI white, VII to IX yellowish; tracheation black. Sterna I to VI white, VII to IX yellowish, posterior margin with light brown mark medially. Caudal filaments white. Genitalia (Figure 13C). Forceps white. Forceps segment I wide at base; 0.7 × length of segment II; distance between base of forceps 0.3 × distance between lateral margins of forceps. Forceps segment III oval, 4 × as long as wide; 0.3 × length of segment II. Posterior margin of styliger plate with small medial projection.

Female imago. Length: body, 5.7 mm; cercus, 7.5 mm; forewing, 5.2 mm; hind wing, 1.2 mm; antenna, 0.3 mm; tibia I, 0.6 mm; tibia II, 0.9 mm; tibia III, 0.9 mm. ($n = 2$). **Head** (Figure 13F). Coloration light brown; compound eyes black. Antenna with scape, pedicel and flagellum brown. **Thorax** (Figure 13F, I). Anteronotal protuberance, mesoscutum, submesescutum, posterior scutal protuberance and scutellum light brown. Anteronotal protuberance rounded. Metascutellar protuberance pointed.

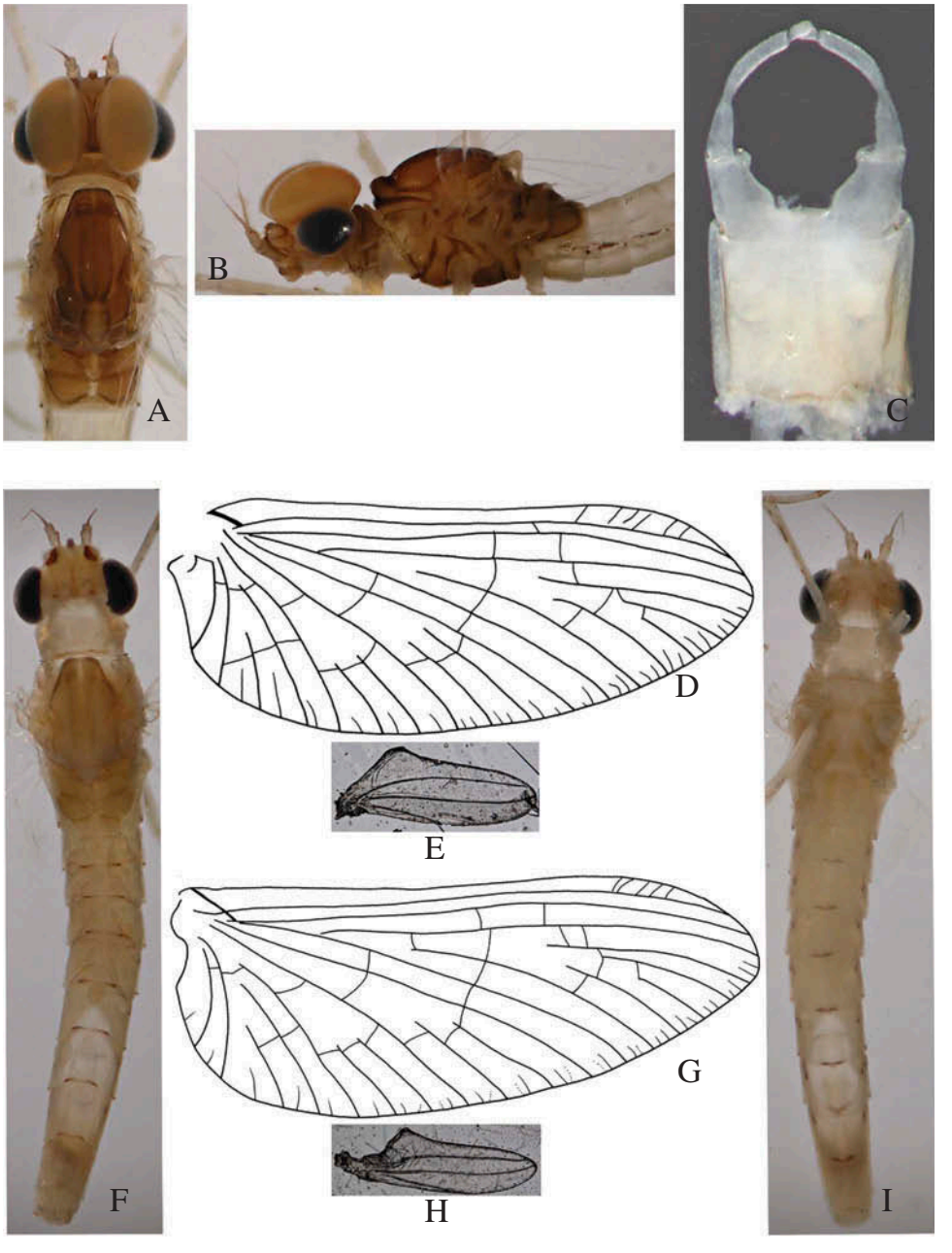

Figure 13. (colour online) *Callibaetis itannae* sp. nov. (A) male imago dorsal view; (B) male imago lateral view; (C) genitalia; (D) male imago forewing; (E) detail of male imago hind wing; (F) female imago dorsal view; (G) female imago forewing; (H) detail of female imago hind wing; (I) female imago ventral view.

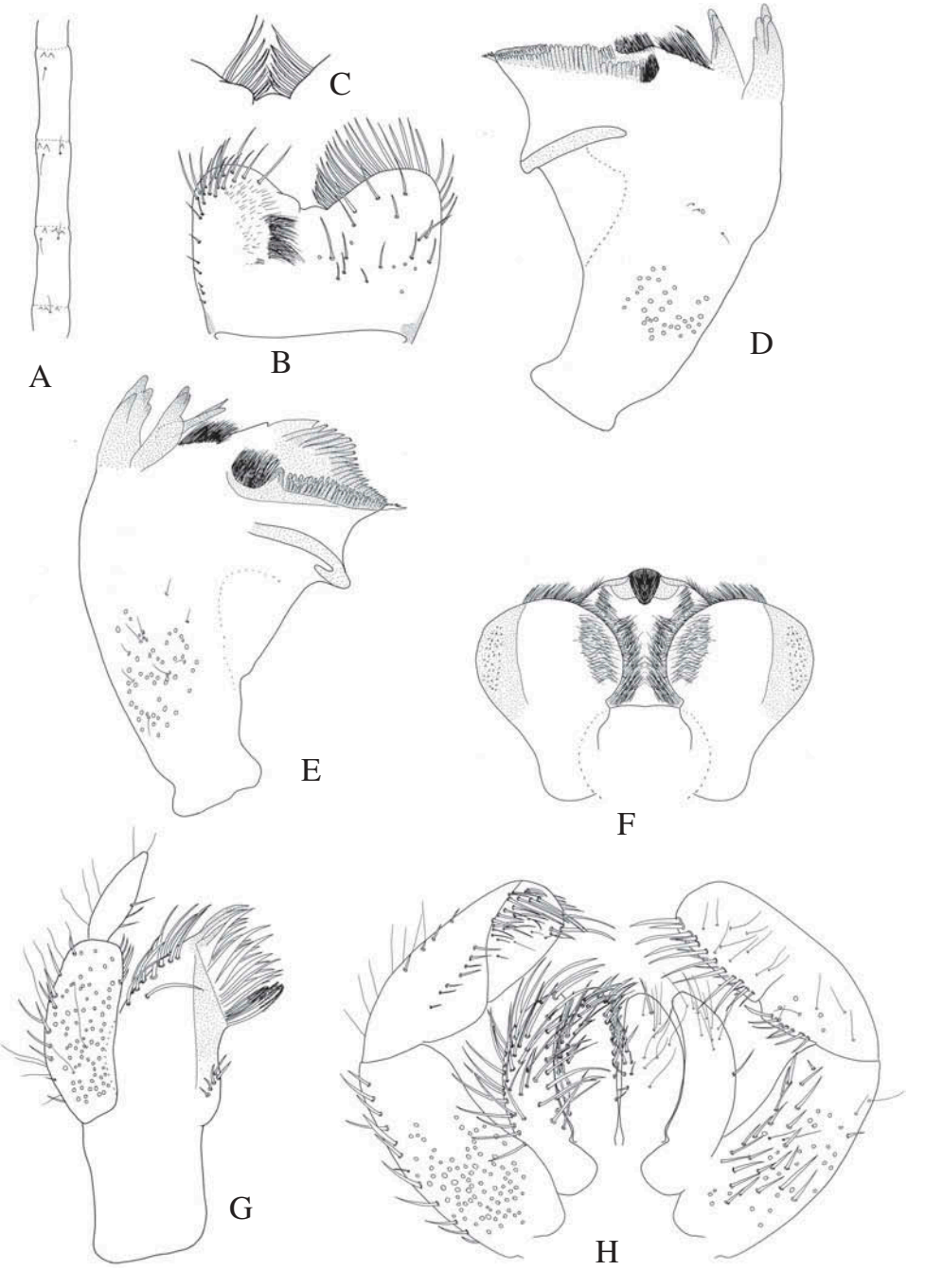

Figure 14. *Callibaetis itannae* sp. nov. Nymph: (A) antenna; (B) labrum (right d.v.; left v.v.); (C) detail of distal margin of labrum; (D) right mandible; (E) left mandible; (F) hypopharynx; (G) maxilla; (H) labium (left d.v.; right v.v.).

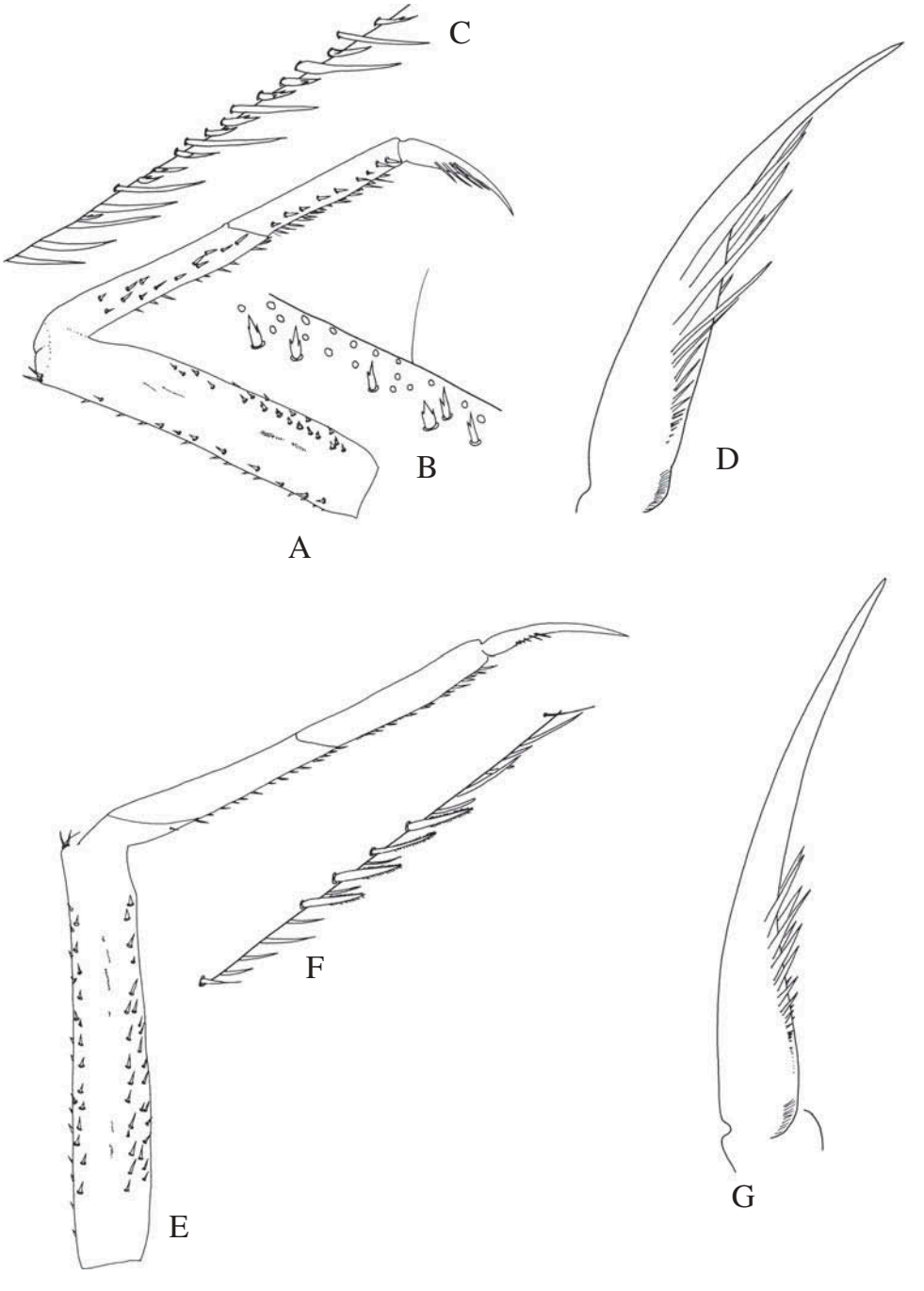

Figure 15. *Callibaetis itannae* sp. nov. Nymph: (A) foreleg; (B) detail of near ventral margin of forefemur; (C) ventral margin of fore tarsus detail; (D) foreclaw; (E) hind leg; (F) ventral margin of fore tarsus detail; (G) hind claw.

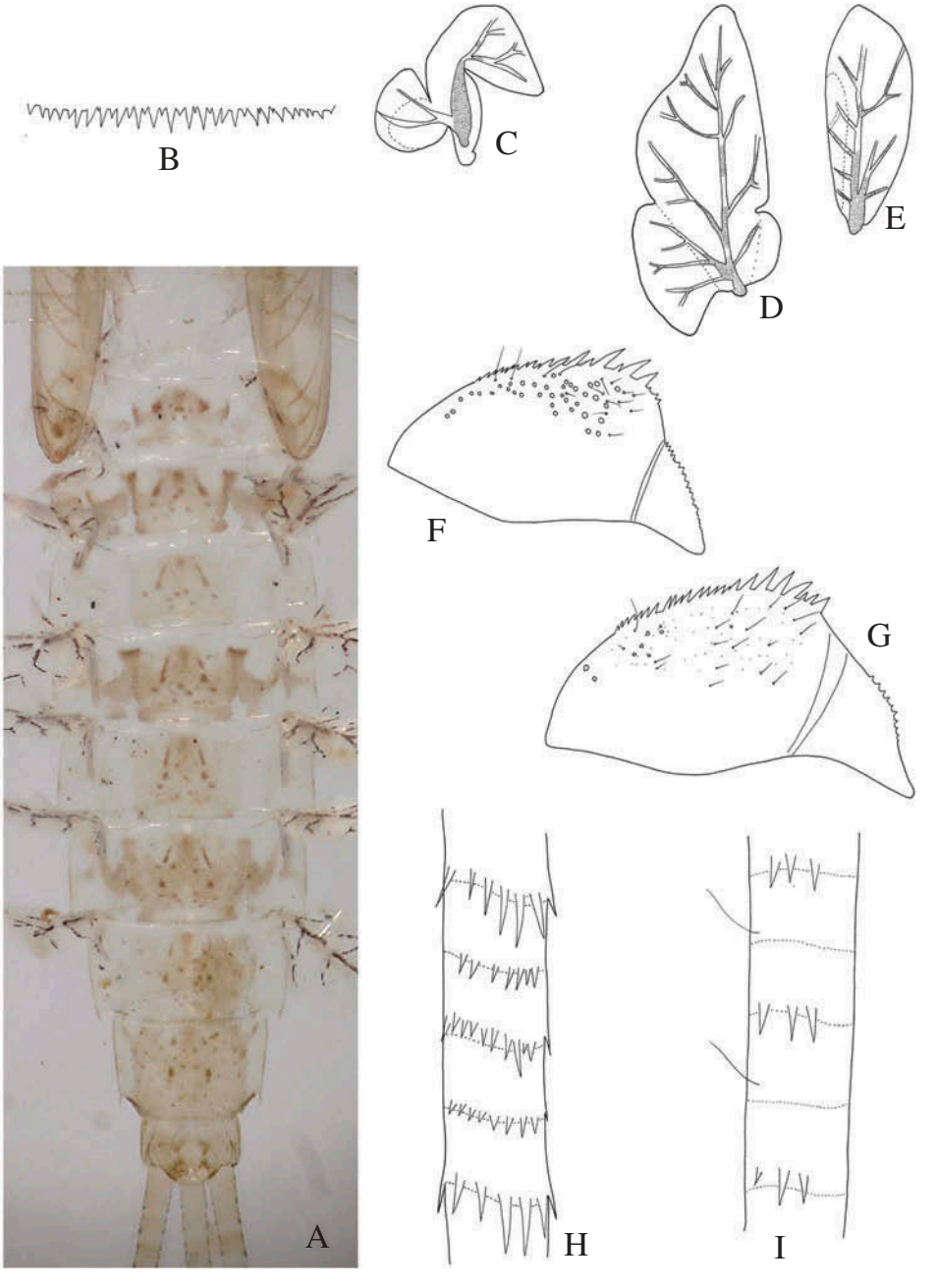

Figure 16. (colour online) *Callibaetis itannae* sp. nov. Nymph: (A) dorsal body view (exuviae); (B) posterior margin of abdominal tergum IV; (C) gill I; (D) gill IV; (E) gill VII; (F) paraproct; (G) paraproct variation; (H) cercus; (I) terminal filament.

Legs: Femora, tibiae and tarsi light brown, femora with trachea black pigmented; claws brown. Leg I: tibia 0.6 × length of femur; tarsus 0.5 × length of femur. Leg II: tibia 0.8 × length of femur; tarsus 0.3 × length of femur. Leg III: tibia 0.8 × length of femur; tarsus 0.3 × length of femur. Wings. Forewing (Figure 13G) hyaline, apical half opaque; veins white; stigmatic area with minimum of four cross veins not touching Sc vein; marginal intercalary veins paired, except between veins R_3 and A; length of each intercalary vein 0.5 × distance between adjacent longitudinal veins; length of forewing about 2.7 × width. Hind wing (Figure 13H) hyaline, without cross veins; costal process compound. **Abdomen** (Figure 13F, I). Terga light brown with posterior margin of all segments with brown mark submedially. Tracheation black. Sterna light brown whitish, posterior margin of all segments with brown mark medially. Caudal filaments white.

Mature nymph. Length: body, 5.4 mm; cercus, 4.4 mm; terminal filament, 5.5 mm; antenna, 7.2 mm. ($n = 2$). **Head**. Coloration: light yellowish brown. Turbinate portion of male compound eyes yellowish brown. Antenna (Figure 14A) yellowish white with spines and fine, simple setae on apex of each segment. Labrum (Figure 14B, C). Excavate medially; length about 0.8 × maximum width; distal margin with deep medial emargination; lateral and anterolateral margin with long, fine, simple setae; distal margin medially with short, robust pectinate setae; long, fine, simple setae scattered over dorsal surface; submarginal row of setae absent; ventrally with short, spine-like setae near lateral margin and many long, simple setae near anterolateral margin. Right mandible (Figure 14D) with 5 + 3 or 4 denticles; prostheca slender, bifurcated subapically, inner lobe short than outer; margin between prostheca and mola slightly convex; tuft of spine-like setae at base of mola present. Denticles of mola not constricted. Tuft of setae at apex of mola present; lateral margins slightly convex; basal half with short, fine, simple setae and pores scattered over dorsal surface. Left mandible (Figure 14E) with 4 + 3 or 4 denticles; prostheca robust and bifid; margin between prostheca and mola straight; tuft of spine-like setae at base of mola present; subtriangular process wide, at the same level as area between prostheca and mola; denticles of mola not constricted; tuft of setae at apex of mola present; lateral margins slightly convex; basal half with short, fine, simple setae and pores scattered over dorsal surface. Hypopharynx (Figure 14F). Lingua with three lobes in distal margin; superlingua not expanded; short, fine, simple setae scattered over distal margin of lingua and superlingua. Maxilla (Figure 14G). Double row of setae with three simple denti-setae. Medial protuberance of galea with 1 + 4 spine-like setae. Maxillary palp reaching apex of galea-lacinia; palp segment II 0.6 × length of segment I; outer margin of segment I scattered with robust, short and pointed setae, apex of inner margin with four or five pointed setae, dorsal and ventral surface with pores; segment II with short pointed setae in inner margin, outer margin with long, fine and simple setae. Labium (Figure 14H). Glossa with regular width along entire length and subequal in length to paraglossa; inner margin with 14 spine-like setae; apex with three to five long spine-like setae; outer margin with many long spine-like setae. Ventral surface scattered with short, fine, simple setae. Paraglossa curved inward; apex with two or three long, robust and simple setae. Ventrally with many long, fine, simple setae. Labial palp with segment I 1 × length of segments II and III combined; segment I covered with robust, simple setae and micropores; segment II without distomedial protuberance; inner and outer margin respectively with four spine-like setae and bare; dorsally with row of seven short

spine-like setae; segment III concave; length 1.5 × width; covered with spine-like simple setae along margins and fine, simple setae, scattered over external surface. **Thorax.** Pronotum with brown spots; mesonotum yellowish with brown and light brown spots; metanotum with yellowish marks; sometimes all thorax light yellowish brown. Foreleg (Figure 15A–D). Femur, tibia and tarsus light yellowish brown; femur with trachea black pigmented. Ratio of foreleg 1.5 : (0.58 mm) : 0.8 : 0.5. Forefemur. Length about 4.5 × maximum width; dorsally with row of short, spine-like setae; apex with two robust spine-like setae; length of setae about 0.1 × maximum width of femur; ventrally with few long, fine and simple setae. Anterior surface with robust spine-like setae near dorsal margin and robust trifid and bifid spine-like setae near ventral margin. Tibia. Dorsally bare; ventrally with one row of short, spine-like setae. Anterior surface with few short, robust spine-like setae. Tarsus. Dorsally bare; ventrally one row of spine-like setae and trifid spine-like setae. Tarsal claw with two rows of denticles increasing in size distally. Hind leg (Figure 15E–G). Femur with one row of short spine-like setae dorsally and ventrally. Anterior surface with many robust setae near ventral and dorsal margin. Tibia ventrally with row of short spine-like setae and one row of robust, pectinate spine-like setae. **Abdomen** (Figure 16A). Yellowish washed with brown or light brown spots on all segments; terga I, II, IV and VI darker, surface creased. Posterior margin with regular spines, 3 × as long as wide (Figure 16B). Sterna. Surface bare. Gills (Figure 16C–E). Margin smooth; trachea black pigmented, extending from main trunk to outer margin. Gill I about 2 × length of segment II, with two folds; trachea black pigmented. Gill IV as long as length of segments V to VI combined, with two folds. Gill VII about 1.5 × length of segment VIII, with one fold. Paraproct (Figure 16F, G) with 21–25 marginal spines; surface with micropores and short fine, simple setae; posterolateral extension with marginal spines. Terminal filament (Figure 16I) light brown; posterior margin of segments with short spines on every segment. Cerci (Figure 16H) with spines on all segments.

Etymology

The specific epithet is a tribute by the first author (PVC) to Itanna O. Fernandes: best friend, fantastic wife and the person who found the lake that is the only location at which this new species has been collected.

Comments

The nymphs of *C. itannae* sp. nov. and *C. willineri* are similar, although those of *C. itannae* sp. nov. have trifid spine-like setae on tarsi (Figure 15C) and labrum ventrally with many long, simple setae near anterolateral margin (Figure 14B). Nymphs of *C. willineri*, on the other hand, have pectinate setae on tarsi (fig. 82 in Nieto 2008) and labrum ventrally without many long, simple setae near anterolateral margin (fig. 76a in Nieto 2008).

Material examined

Holotype. female imago with corresponding nymphal exuviae, BRAZIL, Rondônia, Porto Velho, Lake for Cond. Águas do Belmont (8°40′41,01″ S, 63°53′21,60″ W), 3/iii/2007, P.V. Cruz col. (INPA).

Paratypes. Four male imagos, three exuviae, Lake for Cond. Águas do Belmont, 3/iii/2007, P.V. Cruz col. (two male imagos and two exuviae in INPA, two male imagos and one exuviae in CZNC). One nymph, four female imagos, two male subimagos, female subimago, five exuviae, Lake for Cond. Águas do Belmont, 23/iii/2007, P.V. Cruz col. (two females in INPA, other in CZNC). Four nymphs, Lake for 23 Cond. Águas do Belmont, 30/ix/2007, P.V. Cruz col. (two nymphs in INPA, two nymphs in CZNC). Nymph, Lake for Cond. Águas do Belmont, 17/iii/2007, P.V. Cruz col. (INPA). One male subimago, Lake for Cond. Águas do Belmont, 14/iii/2007, P.V. Cruz col. (INPA). One female imago, Lake for Cond. Águas do Belmont, 21/iii/2007, P.V. Cruz col. (CZNC). One male imago, one exuviae, Lake for Cond. Águas do Belmont, 9/iii/2007, P.V. Cruz col. (INPA). Nymph, four female imagos, five nymphs, three nymphs, female subimago, five exuviae, Lake for Cond. Águas do Belmont, 7/iv/2007, P.V. Cruz col. (INPA). Nymph, Lake for Cond. Águas do Belmont, 5/iv/2007, P.V. Cruz col (CZNC).

Distribution

Brazil: Rondônia state, Porto Velho county.

Callibaetis jocosus Navás
(Figures 17–20)

Callibaetis jocosa Navás, 1912, p. 195.
Callibaetis stictogaster Navás, 1915b, p. 121.
Callibaetis jaffueli Navás, 1918, p. 244.
Callibaetis spegazzinus Navás, 1920c, p. 36.
Callibaetis rimatus Navás, 1933, p. 113.
Callibaetis jocosus Gillies, 1990; Domínguez et al., 2006, p. 115.

Known stages: I♀♂, N

Diagnosis

Male imago. (1) Dorsal portion of tubinate eyes oval (Figure 17A); (2) forewing with three transversal bands, apical third pigmented, base without pigmentation (Figure 17D); (3) marginal intercalary veins paired (Figure 17D); (4) hind wing hyaline, base with small reddish brown mark (Figure 17E); (5) costal process of hind wing basally with reddish mark (Figure 17E); (6) abdominal sterna with many reddish spots, sterna II to IX with one anterolaterally dark mark and one reddish medial mark on anterior margin; (7) forceps segment I wide at base (Figure 17C).

Female imago. (1) Membrane of forewing washed with black, hyaline around cross veins, area between C, Sc and R_1 veins darker (Figure 17G); (2) marginal intercalary veins paired (Figure 17G); (3) hind wing hyaline, base with red mark (Figure 17H); (4) costal process of hind wing basally with black mark, wing base with red mark (Figure 17H); (5) abdominal terga III, V and VII with V-shape marks sublaterally and

laterally (Figure 17F); (6) abdominal sterna I to IX washed with red spots, reddish black mark anterolaterally (Figure 17I).

Mature nymph. (1) Antenna with spines; (2) distal margin of labrum with small medial emargination (Figure 18B); (3) distal margin of labrum medially with robust bipectinate setae (Figure 18B); (4) maxillary palp reaching apex of galea-lacinia (Figure 18F); (5) glossa subequal in length to paraglossa; (6) labial palp with spine-like setae; (7) anterior surface of forefemur with one row of robust trifid and bifid spine-like setae near ventral margin (Figure 19B); (8) fore tarsus ventrally with one row of trifid spine-like setae, one row of long robust and bipectinate setae; (9) hind femur with two rows of curved and pectinate setae, the middle row directed dorsally and the row near ventral margin directed ventrally (Figure 19F); (10) hind claw similar to fore claw; (11) gills IV with two folds (Figure 20F); (12) cerci with spines on all segments (Figure 20I); (13) terminal filament with spines on all segments (Figure 20J).

Redescription

Male imago. Length: body, 7.4 mm; cercus, 14.4 mm; forewing, 7 mm; hind wing, 1.2 mm; antenna, 1 mm; tibia I, 1.9 mm; tibia II, 1.3 mm; tibia III, 1.2 mm. ($n = 2$) **Head** (Figure 17A, B). Coloration dark brown. Turbinate portion of compound eyes reddish dorsally, with white edges; laterally with basal half reddish, apical half white. Antenna. Scape and pedicel dark brown, flagellum light brown. Dorsal portion of turbinate eyes oval; length 4.1 × width; stalk height 0.6 × dorsal portion height; inner margins parallel, not reaching each other. **Thorax** (Figure 17A, B). Anteronotal protuberance light brown, laterally white, submedially brown; mesoscutum and submesoscutum light brown; posterior scutal protuberance brown; scutellum light brown. Anteronotal and metascutellar protuberance rounded. Legs: Femora I, II and III with longitudinal black line on external surface, internal and external surface with red mark on apical third, apex with black mark ventrally; tibia I with black mark ventrally on apex, tibiae II and III with two black marks on base and apex; tarsus I without pigmentation, tarsi II and III with brown apex; claws light brown. Leg I: tibia 1.3 × length of femur; tarsus 1.5 × length of femur. Leg III: tibia 0.7 × length of femur; tarsus 0.3 × length of femur. Wings. Forewing (Figure 17D) with three transversal bands, apical third pigmented, base without pigmentation; around cross veins hyaline; veins light brown; stigmatic area with eight or nine cross veins touching subcostal vein and one or two veins not touching subcostal vein; marginal intercalary veins paired, except between veins ICu_2 and A; length of each intercalary vein 0.5–0.8 × distance between adjacent longitudinal veins; length of forewing about 2.5 × width. Hind wing (Figure 17E) hyaline, base with small reddish brown mark, costal process base with reddish mark; with 11 to 14 cross veins; costal process compound. **Abdomen.** Terga brown, terga II, III, V and VII laterally reddish brown; terga VIII and IX with two longitudinal brown marks submedially; terga II and IX with one red mark medially on anterior margin; tracheation black. Sterna segments I to VI light brown, washed with reddish spots, segments VII to IX whitish washed with reddish spots; segments II to IX with one anterolateral dark mark and one reddish medial mark on anterior margin; submedially with two light brown marks. Caudal filaments white with light brown mark on base and apex of each segment. Genitalia (Figure 17C) brown. Forceps

segment I wide at base; 0.5 × length of segment II; distance between base of forceps 0.3 × distance between lateral margins of forceps. Forceps segment III oval, 1.6 × as long as wide; 0.2 × length of segment II. Posterior margin of styliger plate without medial projection.

Female imago. Length: body, 9 mm; forewing, 8 mm; hind wing, 1.3 mm; antenna, 0.9 mm; tibia I, 1.3 mm; tibia II, 1.1 mm; tibia III, 1.3 mm. ($n = 2$) **Head** (Figure 17F). Coloration reddish brown; compound eyes black with longitudinal line brown. Antenna with apex of scape ventrally reddish brown; pedicel reddish brown with white base; flagellum reddish brown. **Thorax** (Figure 17F, I). Anteronotal protuberance light brown, laterally white; mesoscutum and submesoscutum light brown, white washed; posterior scutal protuberance black; scutellum white. Anteronotal protuberance rounded. Metascutellar protuberance rounded. Legs: Femora I, II and III with longitudinal black line on external surface, external and internal surface with red mark on apical third, apex with black mark ventrally; tibiae I, II and III with two black marks on base and one on apex. Leg I: tibia 0.9 × length of femur. Leg II: tibia 1 × length of femur; tarsus 0.5 × length of femur. Leg III: tibia 0.7 × length of femur; tarsus 0.4 × length of femur. Wings. Forewing (Figure 17G) with membrane washed with black, around cross veins hyaline, C, Sc and R_1 veins areas darker; veins brown; stigmatic area with eight or nine cross veins touching subcostal vein and zero or one not; marginal intercalary veins paired, except between veins ICu_1 and A; length of each intercalary vein 0.3–0.5 × distance between adjacent longitudinal veins; length of forewing about 2.4 × width. Hind wing (Figure 17H) costal process base with black mark, wing base with red mark; with nine cross veins; costal process compound. **Abdomen** (Figure 17F, I). Terga washed with red spots, terga II to IX with one red medial mark; segments III, V and VII with V-shaped mark sublaterally and laterally. Tracheation black. Sterna segments I to IX washed with red spots, one reddish black marks anterolaterally, submedially with two light brown marks. Caudal filaments white, reddish on base and apex of each segment.

Description

Mature nymph. Length: body, 6.7 mm; cercus, 6 mm; terminal filament, 3.6 mm; antenna, 7.2 mm. ($n = 2$) **Head**. Coloration: dark brown. Turbinate portion of male compound eyes reddish. Antenna (Figure 18A) yellowish brown with spines and fine, simple setae on apex of each segment. Labrum (Figure 18B). Distal margin with small medial emargination; length about 0.6 × maximum width; distal margin slightly rounded; distal and anterolateral margin with long and simple setae; distal margin medially with robust bipectinate setae; dorsally with long, fine, simple setae scattered over surface; submarginal row of setae absent; ventrally with short spine-like setae near lateral margin and many long, simple setae near anterolateral margin. Right mandible (Figure 18C) with 4 + 4 denticles; prostheca slender and bifurcated, inner lobe shorter than outer; margin between prostheca and mola convex with short projection; tuft of spine-like setae at base of mola present. Denticles of mola not constricted. Tuft of setae at apex of mola present; lateral margins slightly convex; basal half with short, fine, simple setae and pores scattered over dorsal surface. Left mandible (Figure 18D) with 4 + 4 denticles; prostheca robust and bifid; margin between prostheca and

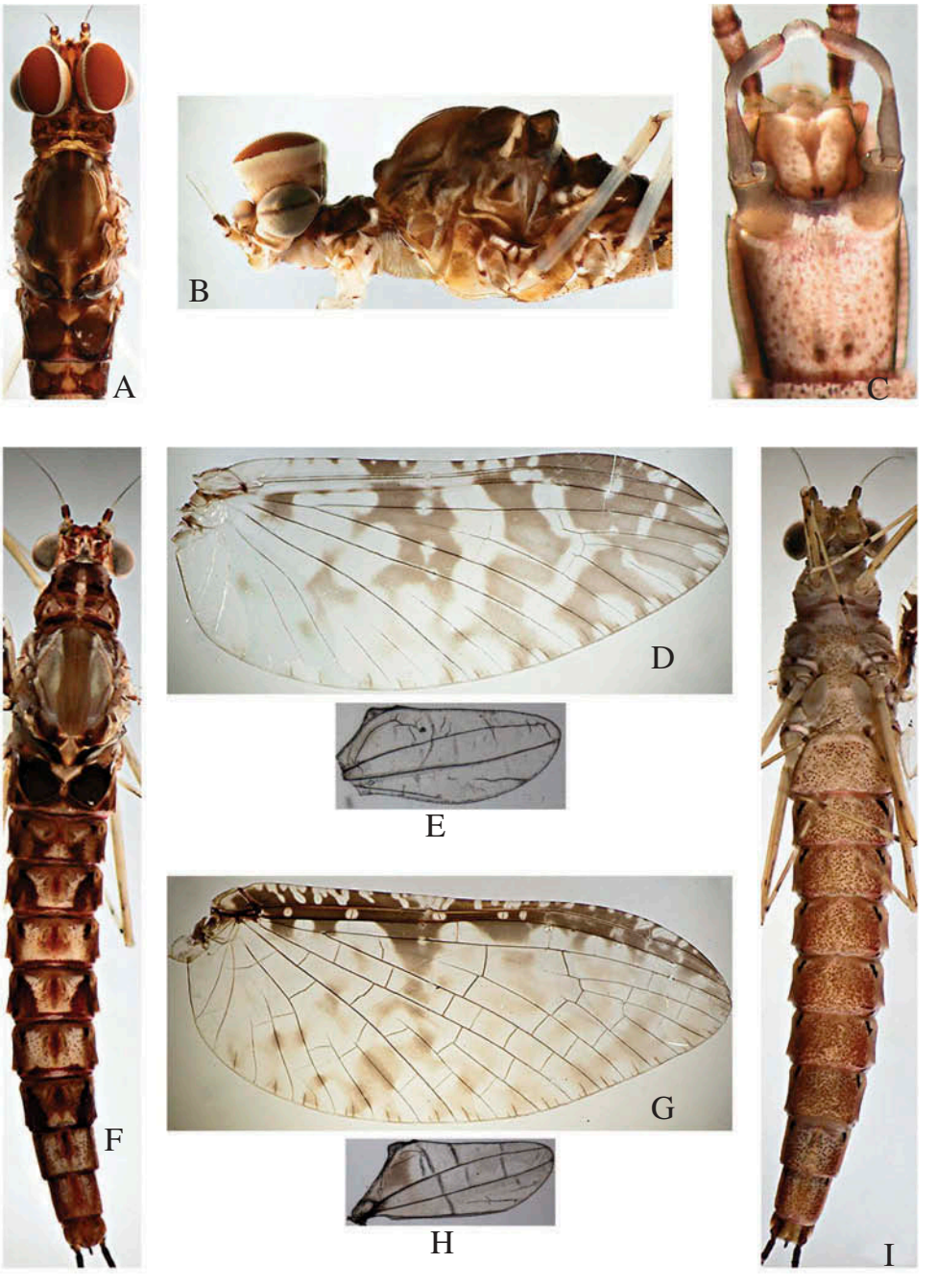

Figure 17. (colour online) *Callibaetis jocosus*. (A) male imago dorsal view; (B) male imago lateral view; (C) genitalia; (D) male imago forewing; (E) detail of male imago hind wing; (F) female imago dorsal view; (G) female imago forewing; (H) detail of female imago hind wing; (I) female imago ventral view.

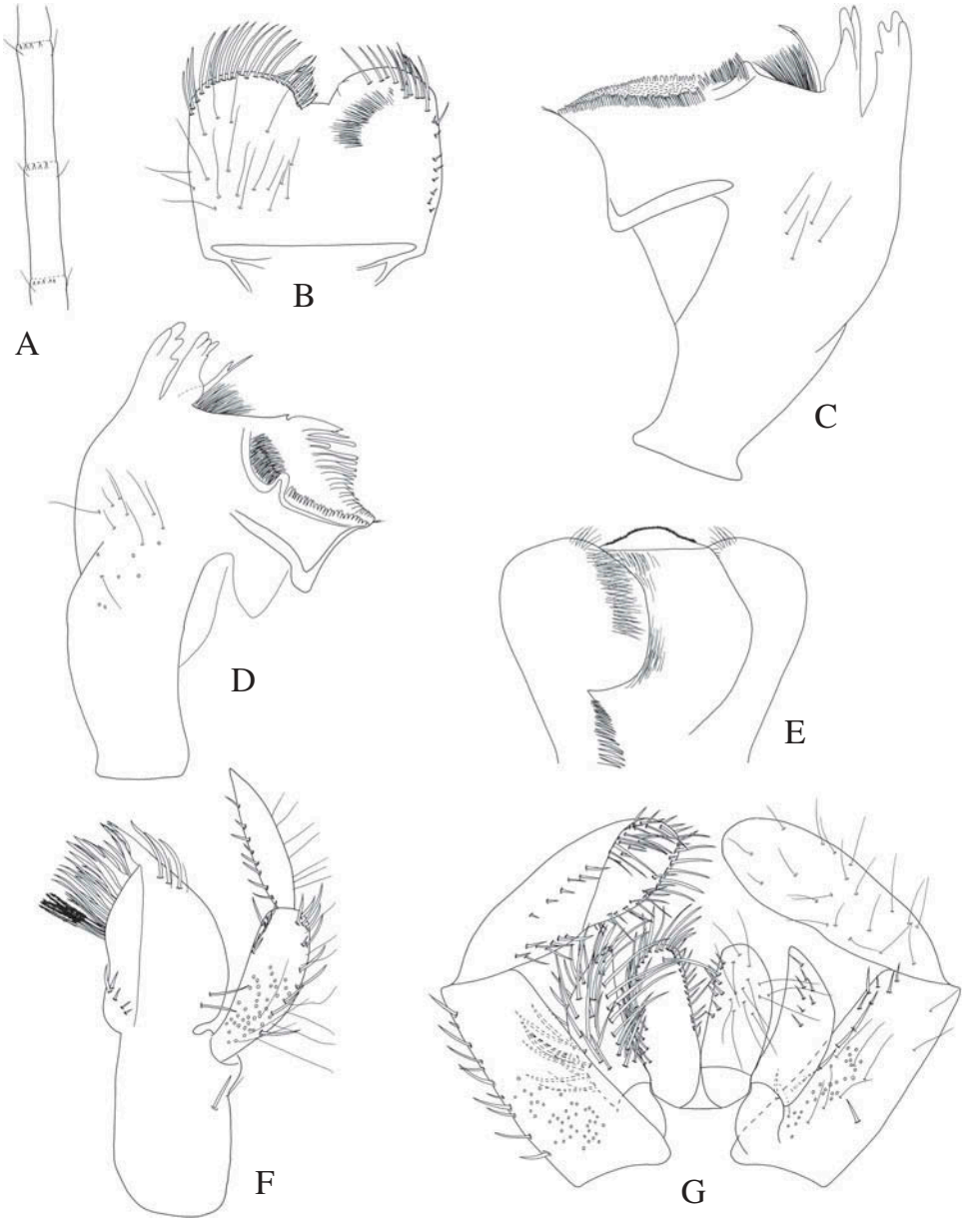

Figure 18. *Callibaetis jocosus*. Nymph: (A) antenna; (B) labrum (left d.v.; right v.v.); (C) right mandible; (D) left mandible; (E) hypopharynx; (F) maxilla; (G) labium (left d.v.; right v.v.).

mola straight; tuft of spine-like setae at base of mola present; subtriangular process narrow, at same level as area between prostheca and mola; denticles of mola not constricted; tuft of setae at apex of mola present; lateral margins slightly convex; basal half with short, fine, simple setae and pores scattered over dorsal surface. Hypopharynx

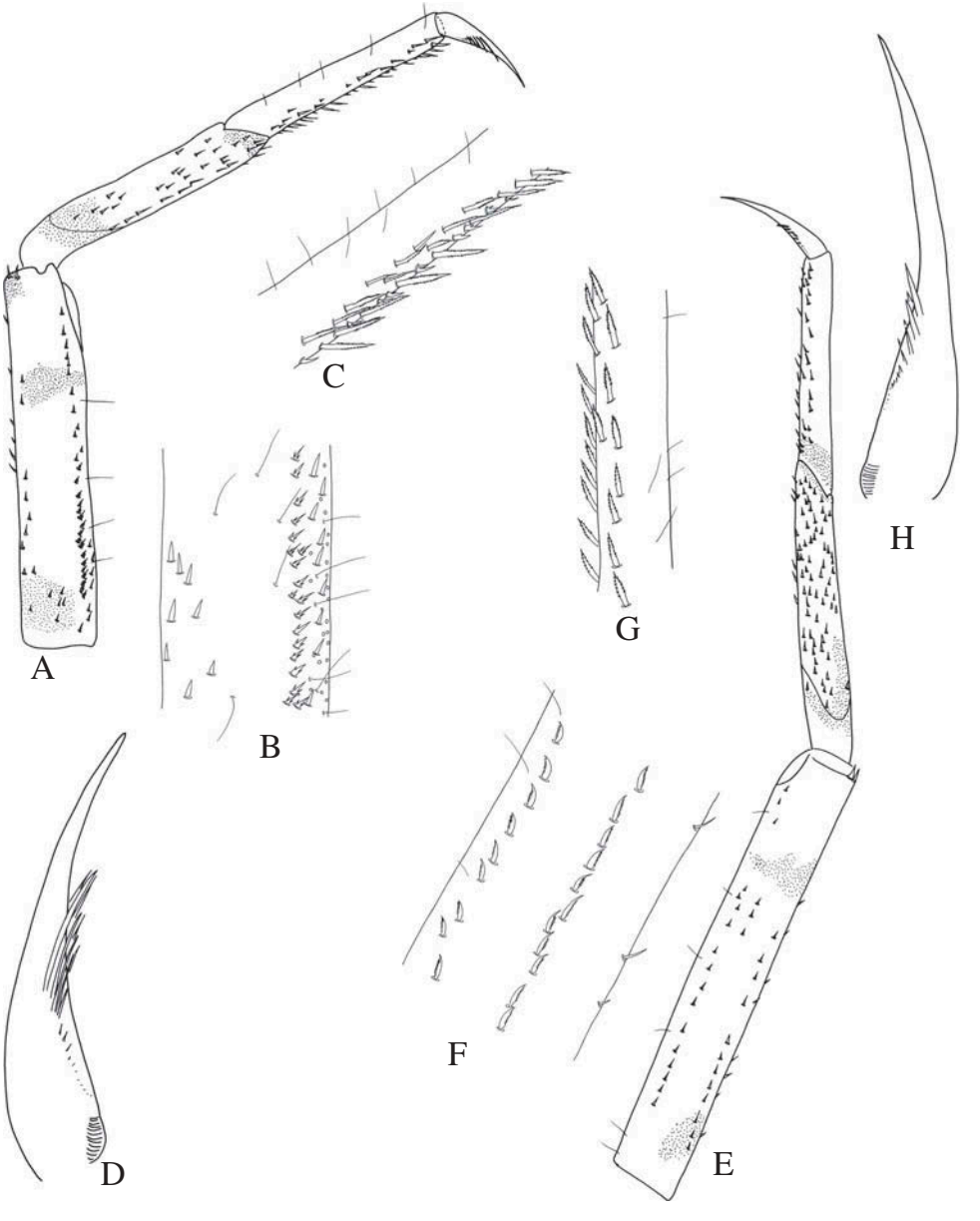

Figure 19. *Callibaetis jocosus*. Nymph: (A) foreleg; (B) detail of anterior surface of forefemur; (C) detail of ventral margin and anterior surface of tarsus; (D) foreclaw; (E) hind leg; (F) detail of posterior surface of hind femur; (G) detail of ventral margin and anterior surface of tarsus; (H) hind claw.

(Figure 18E). Lingua with three lobes in distal margin; superlingua not expanded; short, fine, simple setae scattered over distal margin of lingua and superlingua. Maxilla (Figure 18F). First denti-setae with small spines on outer margin, others bifid. Medial protuberance of galea with 1 + 4 spine-like setae. Maxillary palp reaching apex of

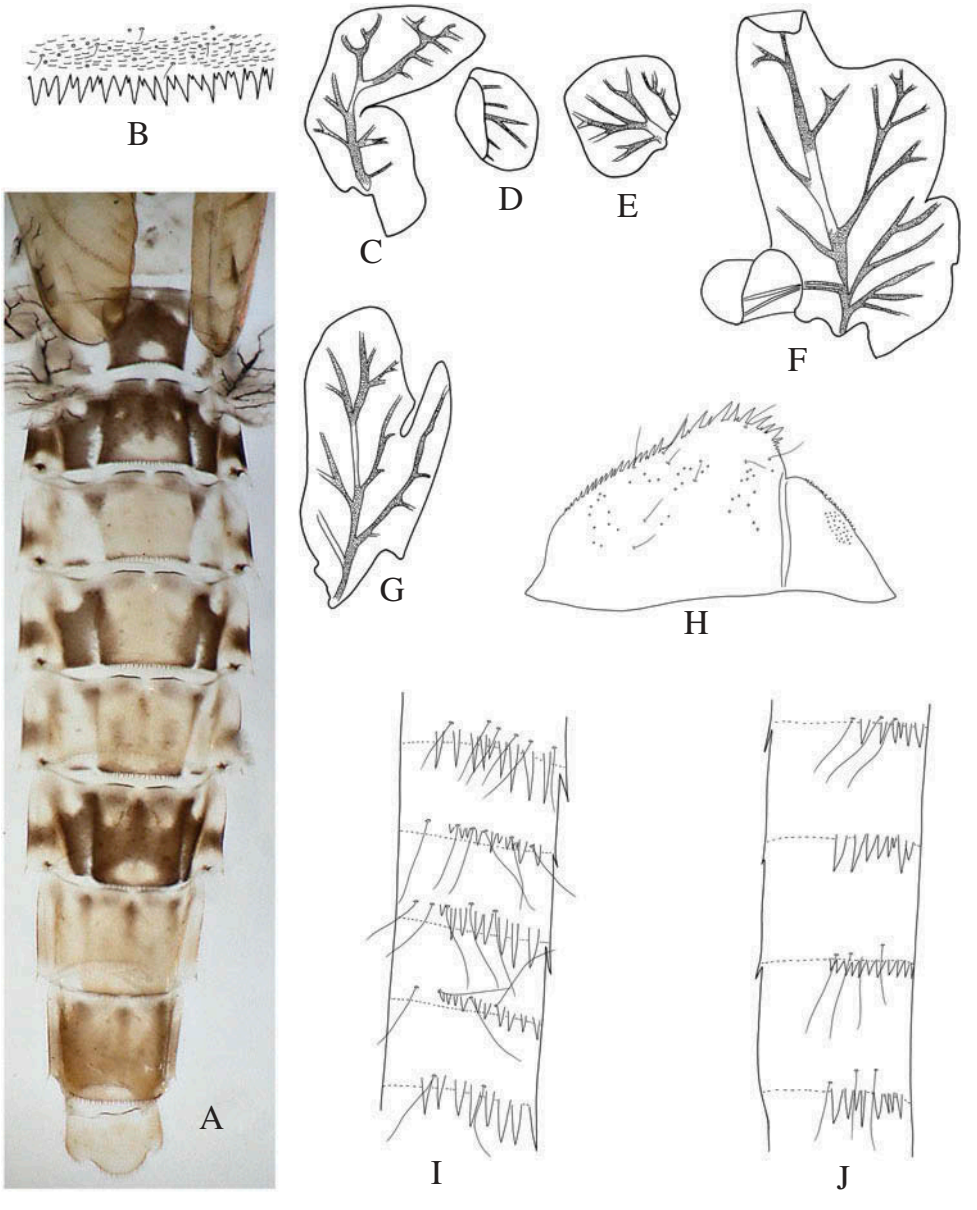

Figure 20. (colour online) *Callibaetis jocosus*. Nymph: (A) dorsal body view (exuviae); (B) posterior margin of abdominal tergum IV; (C) fold I of gill I; (D) fold II of gill I; (E) fold III of gill I; (F) gill IV; (G) gill VII; (H) paraproct; (I) cercus; (J) terminal filament.

galea-lacinia; palp segment II 1 × length of segment I; outer margin of segment I with robust and pointed setae, apex of inner margin with seven or eight pointed setae, dorsal and ventral surface with pores; segment II with short pointed setae in inner margin, outer margin with long, fine and simple setae. Labium (Figure 18G). Glossa

with regular width along entire length and subequal in length to paraglossa; inner margin with 14 spine-like setae increasing in length apically; apex with three to five long spine-like setae; outer margin with many long spine-like setae. Dorsally with many long spine-like setae. Ventral surface scattered with few long, fine and simple setae, inner margin with one row of short spine-like setae. Paraglossa subrectangular, curved only at apex; apex with two or three long, robust and simple setae. Ventrally with one row of spine-like setae near inner margin. Labial palp with segment I 0.8 × length of segments II and III combined; segment I dorsally covered with micropores, robust spine-like setae near outer margin; ventrally covered with micropores, robust spine-like setae near inner margin; surfaces covered by long, fine and simple setae; segment II without distomedial protuberance; inner and outer margin respectively with eight or nine short spine-like setae and bare; dorsally with row of six short spine-like setae; segment III concave; length 1.3 × width; covered with spine-like simple setae along margins and fine, simple setae, scattered over outer surface. **Thorax.** Foreleg (Figure 19A–D). Ratio of foreleg 1.5 : (0.7 mm) : 0.9 : 0.4. Forefemur with black mark on base and other on apical third, tibia with black mark on base and apex. Length about 2.7 × maximum width; dorsally with few short spine-like setae, apex with two robust spine-like setae; length of setae about 0.1 × maximum width of femur; ventrally with few long, fine and simple setae. Anterior surface with robust spine-like setae near dorsal margin and one row of robust trifid and bifid spine-like setae near ventral margin. Tibia. Dorsally bare; ventrally with one row of short and long spine-like setae. Anterior surface with robust and short spine-like setae, one row of robust and long bipectinate setae near ventral margin. Tarsus. Dorsally abundant short, fine, simple setae; ventrally with one row of trifid spine-like setae, one row of long robust and bipectinate setae, surfaces with long, robust and bipectinate setae near ventral margin. Tarsal claw with two rows of denticles increasing in size distally. Mid femur with two rows of curved and pectinated setae directed ventrally, near ventral margin and medially; fore and mid tibiae similar; mid tarsus with one row of long and robust setae ventrally, surfaces with long, robust and bipectinate setae. Hind leg (Figure 19E–H). Hind femur with two rows of curved and pectinated setae, the middle row directed dorsally and the row near ventral margin directed ventrally; hind tibia like fore, although with more long, robust and bipectinate setae; hind tarsus ventrally with one row of long and robust spine-like setae, surfaces with long, robust and bipectinate spine-like setae. **Abdomen** (Figure 20A). Segments II, III and VII dorsally black, ventrally with longitudinal lateral red marks. Terga. Surface creased. Posterior margin with regular spines (Figure 20B). Sterna. Surface with scattered fine, simple setae. Gills (Figure 20C–G). Margin smooth; trachea black pigmented, extending from main trunk to outer margin. Gill I subequal in length to segment II, with three folds. Gill IV as long as length of segments V to VI combined, with two folds. Gill VII subequal in length to segment VIII, with one fold. Paraproct (Figure 20H) with 37–45 marginal spines; surface with micropores and short fine, simple setae; posterolateral extension with marginal spines. Terminal filament (Figure 20J) blackish apex on each four segments; posterior margin with spines on all segments. Cerci (Figure 20I) with spines on all segments.

Material examined

Female imago, photograph of the type of *C. stictogaster* from Museo de Ciencias Naturales de La Plata, 15/x/1913. Male imago, type photograph of *C. jocosus* from

Museu de Zoologia de Barcelona, 8/iv/1910. Female imago (reared), two male imagos (reared), BRAZIL, São Paulo, Jundiaí, Serra do Japií, Lake near two houses, (23°14′15.1″ S, 046°56′26.2″ W), 14/vii/2009, 1043 m, Brito, P. col. (INPA). Two male imagos, one female imago (reared) and two nymphs, BRAZIL, São Paulo, Jundiaí, Serra do Japií, Lake near two houses, (23°14′15.1″ S, 046°56′26.2″ W), 15/ix/2009, Brito, P. col. (INPA).

Distribution

Argentina, Chile, Paraguay and Brazil: São Paulo state, São Paulo county and Jundiaí county; Mato Grosso do Sul state, Porto Esperança county.

Callibaetis nigracyclus sp. nov.
(Figures 21–24)

urn:lsid:zoobank.org:act:A21878EB-8D8A-4233-9EBF-AC8AED542405
Known stages: I♀♂, N

Diagnosis

Male imago. (1) Dorsal portion of turbinate eyes circular, base of the turbinate portion of eyes as wide as apex in lateral view; (Figure 21A) (2) forewing hyaline, except C, Sc, R_1 and area around bulla (Figure 21D) brown coloured; (3) marginal intercalary veins paired, except between veins ICu_2 and A (Figure 21D); (4) hind wing hyaline with brown mark basally, medially and apically (Figure 21E); (5) costal process of hind wing compound (Figure 21E); (6) abdominal sterna black; (7) forceps segment I cylindrical (Figure 21C).

Female imago. (1) Forewing hyaline, except C, Sc, R_1 and area around bulla brown coloured; area near posterior margin with some elongate brown marks (Figure 21G); (2) marginal intercalary veins single (Figure 21G); (3) hind wing with two or one brown mark on middle and sometimes with small mark near costal process, always with pigmented apex; (Figure 21H, I); (4) costal process of hind wing compound (Figure 21H); (5) abdominal sterna with many light brown spots and four brown spots submedially (Figure 21J); (6) abdominal terga I, III, IV, V, VI with red inverted "V" mark medially (Figure 21F).

Mature nymph. (1) Antenna without spines, with fine, simple setae (Figure 22A); (2) distal margin of labrum with deep medial emargination (Figure 22B); (3) labrum with lateral and anterolateral margin with long and simple setae; distal margin, submedially with long and apically bifid setae; distal margin, medially with robust bipectinate setae (Figure 22B); (4) maxillary palp reaching apex of galea-lacinia (Figure 22E); (5) glossa subequal in length to paraglossa (Figure 22G); (6) labial palp with spine-like setae (Figure 22G); (7) anterior surface of forefemur with robust spine-like setae near dorsal margin and one row of robust spine-like setae near ventral margin (Figure 23B); (8) tarsus ventrally with one row of robust spine-like setae (Figure 23C); (9) hind femur similar to forefemur (Figure 23F); (10) hind claw without minute spines on

surface (Figure 23H); (11) gill VII as long as length of segments VIII to half IX combined, with one fold (Figure 24F); (12) cerci with spines on all segments (Figure 24H); (13) terminal filament with spines on each segment (Figure 24I).

Description

Male imago. Length: body, 4.2 mm; cercus, 6.8 mm; forewing, 4 mm; hind wing, 0.6 mm; antenna, 1 mm; tibia, I 1 mm; tibia II, 0.7 mm; tibia III, 0.7 mm. ($n = 2$). **Head** (Figure 21A, B). Coloration brown. Turbinate portion of compound eyes dorsally light brown, stalk brown, apical third light brown. Antenna. Scape and pedicel light brown with apex brown, flagellum brown with white base. Dorsal portion of turbinate eyes circular; length 1 × width; stalk height 2.3 × dorsal portion height; base of the turbinate portion of eyes as wide as apex in lateral view; inner margins parallel, not reaching each other. **Thorax** (Figure 21A, B). Anteronotal protuberance, mesoscutum, submesoscutum, posterior scutal protuberance and scutellum brown. Anteronotal protuberance rounded. Metascutellar protuberance pointed. Legs: Femur I with continuous longitudinal black marks on external surface, tibia I, tarsus I and claws white; femur II with continuous longitudinal black marks on internal surface, tibia II white with light marks on base and apex, tarsus II and claws white; femur III with continuous longitudinal black marks on internal surface, tibia III white with light marks on base and apex, tarsus III and claws white. Leg I: tibia 1.1 × length of femur; tarsus 0.7 × length of femur. Leg III: tibia 0.8 × length of femur; tarsus 0.4 × length of femur. Wings. Forewing (Figure 21D) hyaline, except C, Sc, R_1 and area around bulla brown coloured (black arrow in Figure 21D); veins light brown; stigmatic area with seven to eight cross veins touching subcostal vein and one or two veins not touching subcostal vein; marginal intercalary veins paired, except between veins ICu_2 and A; length of each intercalary vein 0.3–0.6 × distance between adjacent longitudinal veins; length of forewing about 2.7 × width. Hind wing (Figure 21E) hyaline with brown marks basally, medially and apically; costal process compound. **Abdomen.** Terga brown; tracheation black. Sterna black. Caudal filaments white with base brown. Genitalia (Figure 21C). Forceps segment I brown, segments II and III light brown. Forceps segment I cylindrical; 0.3 × length of segment II; distance between base of forceps 0.3 × distance between lateral margins of forceps. Forceps segment III oval, 4 × as long as wide; 0.2 × length of segment II. Posterior margin of styliger plate without medial projection.

Female imago. Length: body, 6.2 mm; forewing, 5.4 mm; hind wing, 0.8 mm; antenna, 0.8 mm; tibia I, 0.9 mm; tibia II, 0.9 mm; tibia III, 0.8 mm. ($n = 2$). **Head** (Figure 21F). Coloration light brown, posterior margin with two brown spots; compound eyes black, sometimes with brown transversal line. Antenna. Scape and pedicel with brown apex, flagellum light brown with base white. **Thorax** (Figure 21F, J). Anteronotal protuberance, mesoscutum, submesoscutum, posterior scutal protuberance and scutellum light brown. Anteronotal protuberance rounded. Metascutellar protuberance pointed. Legs: Femora I, II and III light brown with discontinuous longitudinal pigmented line on external surface; tibiae I, II and III light brown with reddish brown mark ventrally on base and brown around apex; tarsi I, II and III light brown, tarsus I with two brown marks on apex of first and second segments, tarsi II and III with one brown mark on first segment; claws light brown. Leg I: tibia 1.2 × length of femur;

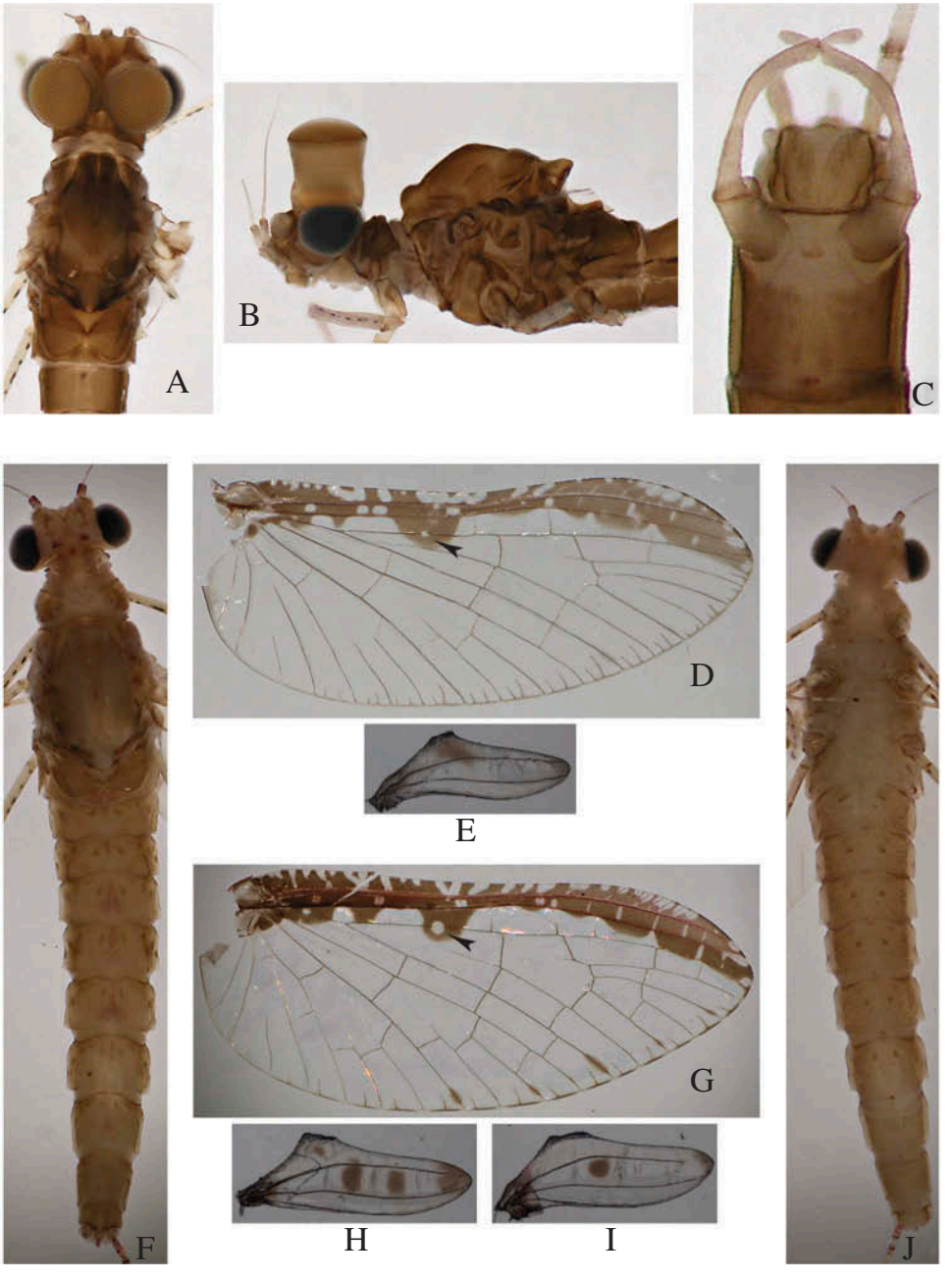

Figure 21. (colour online) *Callibaetis nigracyclus* sp. nov. (A) male imago dorsal view; (B) male imago lateral view; (C) genitalia; (D) male imago forewing (black arrow indicate area around bulla pigmented); (E) detail of male imago hind wing; (F) female imago dorsal view; (G) female imago forewing (black arrow indicate area around bulla pigmented); (H) detail of female imago hind wing; (I) variation of female imago hind wing; (J) female imago ventral view.

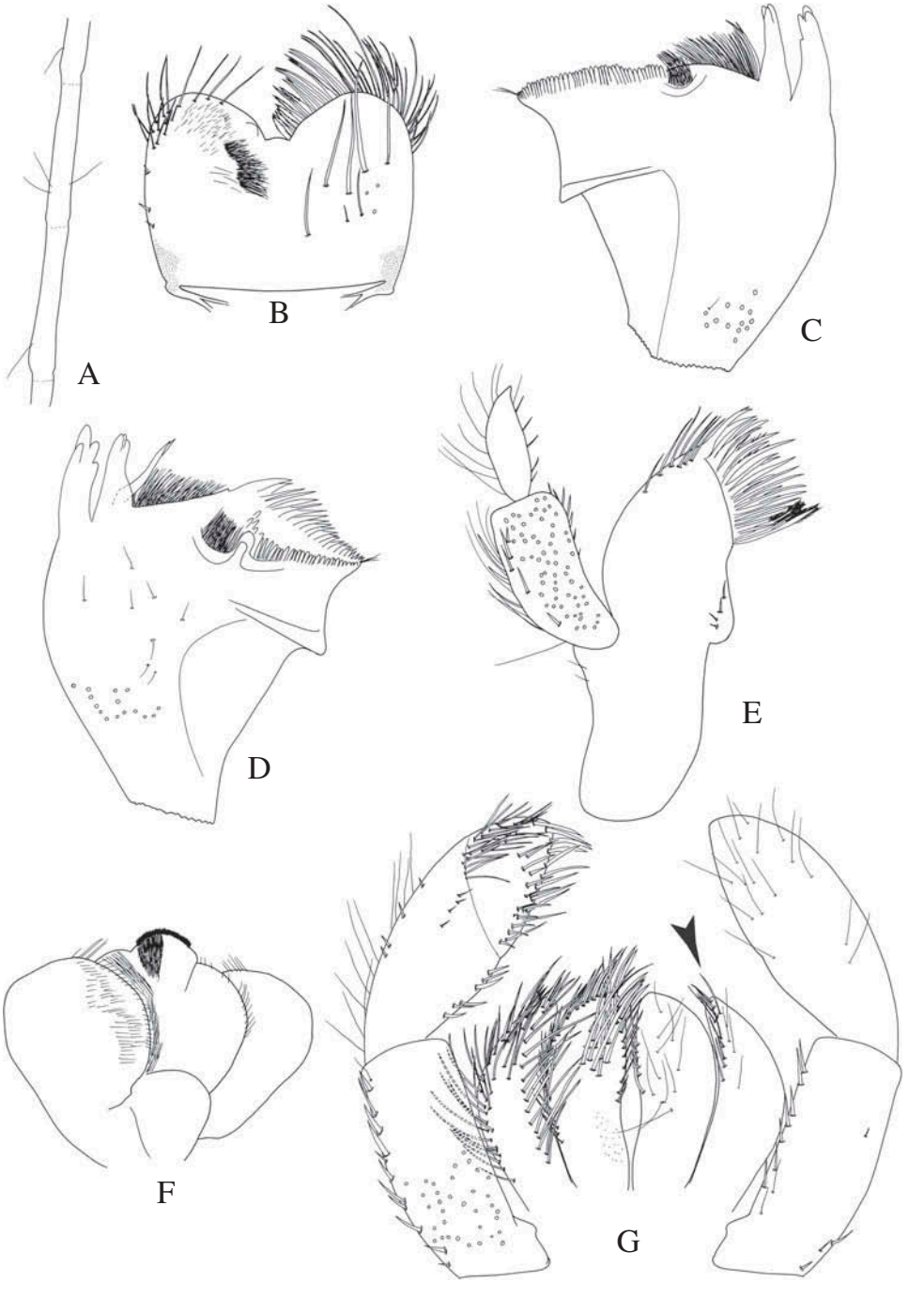

Figure 22. *Callibaetis nigracyclus* sp. nov. Nymph: (A) antenna; (B) labrum (right d.v.; left v.v.); (C) right mandible; (D) left mandible; (E) maxilla; (F) hypopharynx; (G) labium (left d.v.; right v.v.) (black arrow indicate row of spine-like setae near inner margin).

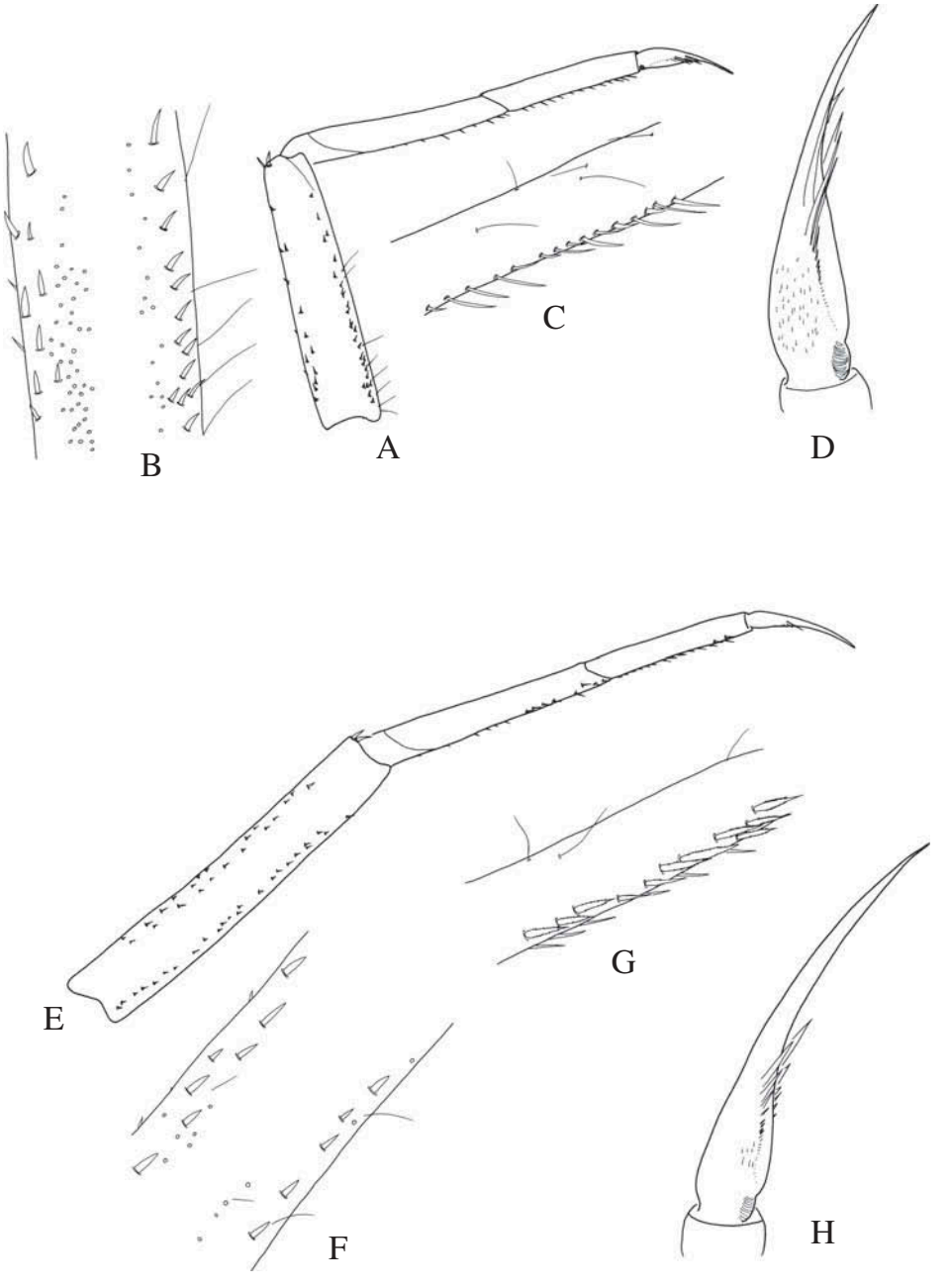

Figure 23. *Callibaetis nigracyclus* sp. nov. Nymph: (A) foreleg; (B) detail of anterior surface of femur; (C) ventral detail of tarsus; (D) foreclaw; (E) hind leg; (F) detail of anterior surface of hind femur; (G) detail of ventral margin and anterior surface of tarsus; (H) hind claw.

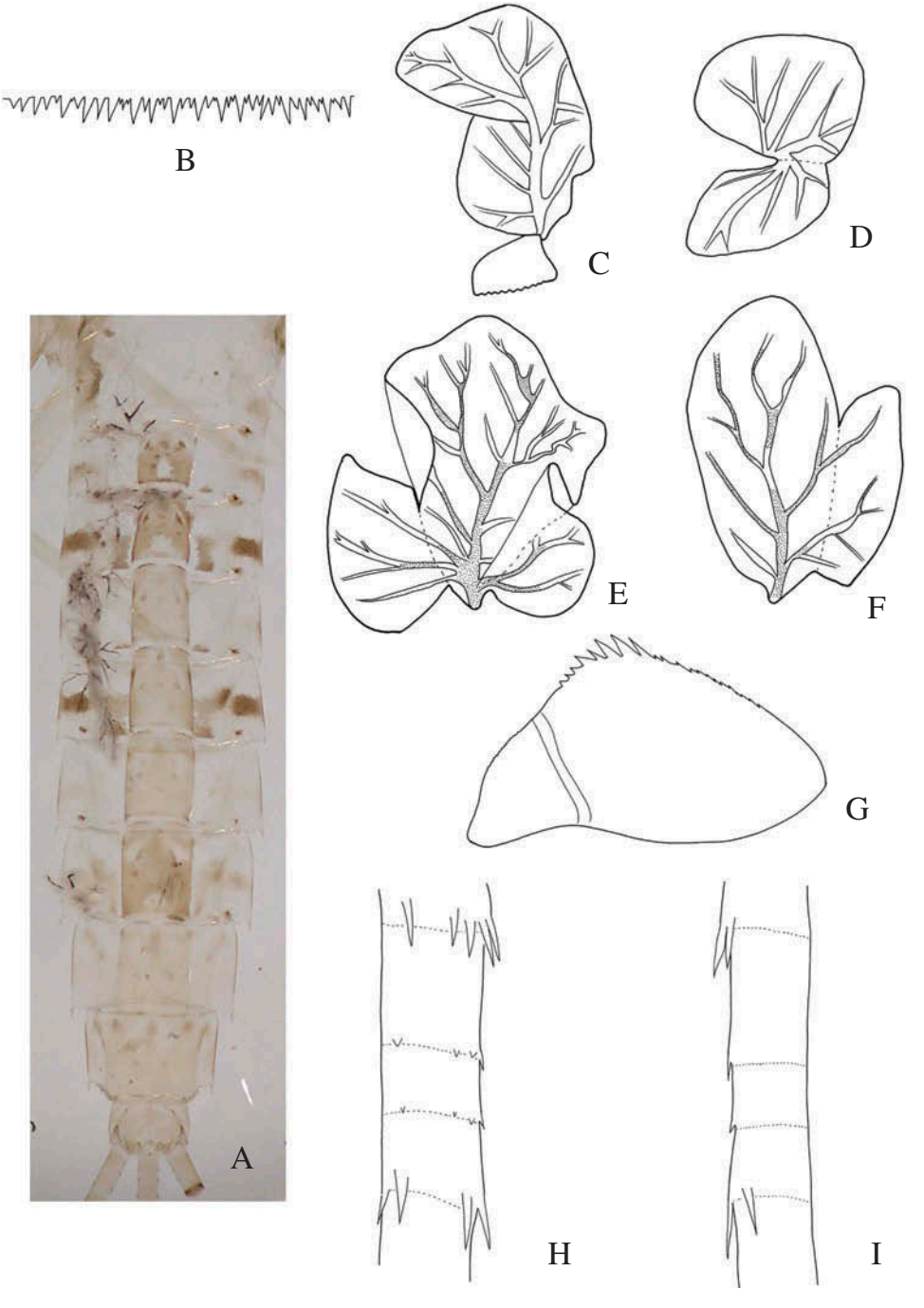

Figure 24. (colour online) *Callibaetis nigracyclus* sp. nov. Nymph: (A) dorsal body view (exuviae); (B) posterior margin of abdominal tergum IV; (C) fold I of gill I; (D) fold II and III of gill I; (E) gill IV; (F) gill VII; (G) paraproct; (H) cercus; (I) terminal filament.

tarsus 0.8 × length of femur. Leg II: tibia 0.8 × length of femur; tarsus 0.5 × length of femur. Leg III: tibia 0.7 × length of femur; tarsus 0.5 × length of femur. Wings. Forewing (Figure 21G) hyaline, except C, Sc, R_1 and area around bulla brown coloured (black arrow in Figure 21G); near posterior margin with some elongate brown marks; veins brown; stigmatic area with seven cross veins touching subcostal vein and one not; marginal intercalary veins single; length of each intercalary vein 0.3–0.5 × distance between adjacent longitudinal veins; length of forewing about 2.3 × width. Hind wing (Figure 21H,I) with two or one brown mark on middle and sometimes with small mark near costal process, always with pigmented apex; normally with three complete longitudinal veins, sometimes first not reaching; costal process compound. **Abdomen** (Figure 21F, J). Terga with all segments with two light brown marks submedially and one spot laterally; terga I, III, IV, V, VI with red inverted "V" mark medially. Tracheation black. Sterna with many brown spots and four brown spots submedially.

Mature nymph. Length: body, 5.5 mm; cercus, 3.3 mm; terminal filament, 2.7 mm. ($n = 2$). **Head**. Coloration: light brown. Antenna light brown, (Figure 22A) without spines, with fine, simple setae. Labrum (Figure 22B). Excavate medially; length about 0.7 × maximum width; distal margin with deep medial emargination; lateral and anterolateral margin with long and simple setae; distal margin submedially with long and apically bifid setae; distal margin medially with robust bipectinate setae; dorsally with long, fine, simple setae scattered over surface; ventrally with short spine-like setae near lateral margin and many long, simple setae near anterolateral margin. Right mandible (Figure 22C) with 4 + 3 denticles; prostheca slender and bifurcated, sometimes simple; margin between prostheca and mola convex; tuft of spine-like setae at base of mola present; tuft of setae at apex of mola present; lateral margins slightly convex; basal half with short, fine, simple setae and pores scattered over dorsal surface. Left mandible (Figure 22D) with 4 + 3 denticles; prostheca robust and bifid, sometimes trifid; margin between prostheca and mola straight; tuft of spine-like setae at base of mola present; subtriangular process wide, above level of area between prostheca and mola; denticles of mola not constricted; tuft of setae at apex of mola present; lateral margins slightly convex; basal half with short, fine, simple setae and pores scattered over dorsal surface. Hypopharynx (Figure 22F). Lingua with three lobes in distal margin; superlingua not expanded; short, fine, simple setae scattered over distal margin of lingua and superlingua. Maxilla (Figure 22E). Double row of setae with one simple denti-setae and other with spines. Medial protuberance of galea with 1 + 4 spine-like setae. Maxillary palp reaching apex of galea-lacinia; palp segment II 0.7 × length of segment I; outer margin of segment I scattered with robust and pointed setae, apex of inner margin with seven or eight pointed setae, dorsal and ventral surface with pores; segment II with short pointed setae in inner margin, outer margin with long, fine and simple setae. Labium (Figure 22G). Glossa with regular width along entire length and subequal in length to paraglossa; inner margin with nine to eleven spine-like setae; apex with three to five spine-like setae; outer margin with many long spine-like setae. Dorsally with many long spine-like setae. Ventral surface scattered with few long, fine and simple setae, inner margin with one row of short spine-like setae. Paraglossa curved inward; apex with three to five robust and simple setae. Ventrally with one row of spine-like setae near inner margin (black arrow in Figure 22G). Labial palp with

segment I 0.8 × length of segments II and III combined; segment I dorsally covered with micropores, near outer margin with robust spine-like setae; ventrally, near inner margin with robust spine-like setae, sometimes with robust spine-like setae on base of outer margin; segment II without distomedial protuberance; inner and outer margin, respectively, with eight or nine short spine-like setae and with few robust spine-like setae; dorsally with row of four to six short spine-like setae; segment III concave; length 1.2 × width; covered with spine-like simple setae along margins and fine, simple setae, scattered over outer surface. **Thorax** light brown. Foreleg (Figure 23A–D) light brown, posterior surface with longitunal discontinous brown mark. Ratio of foreleg 1.2 : (0.8 mm) : 0.6 : 0.4. Forefemur. Length about 4.7 × maximum width; dorsally with few short spine-like setae, apex with two robust spine-like setae; length of setae about 0.3 × maximum width of femur; ventrally with few long, fine and simple setae. Anterior surface with robust spine-like setae near dorsal margin and one row of robust spine-like setae near ventral margin, surface with micropores. Tibia. Dorsally bare; ventrally with one row of short spine-like setae. Anterior surface with few long, fine simple setae. Tarsus. Dorsally abundant short, fine, simple setae; ventrally one row of robust spine-like setae. Tarsal claw with two rows of denticles increasing in size distally, many minute spines on surface. Hind leg (Figure 23E–H). Tarsus, ventrally with one row of spine-like setae, anterior surface with one row of robust bipectinate setae. **Abdomen** (Figure 24A). Light brown, segments I, II and VI darker. Terga. Posterior margin with regular spines, 3 × as long as wide (Figure 24B). Sterna. Surface with scattered fine, simple setae. Gills (Figure 24C–F). Trachea black pigmented, extending from main trunk to outer margin. Gill I about half length of segment II, with two folds. Gill IV 1.5 × length of segment V, with three folds. Gill VII as long as length of segments VIII to half IX combined, with one fold. Paraproct (Figure 24G) with 21–25 marginal spines; surface with micropores and short fine, simple setae; posterolateral extension with minute marginal spines. Terminal filament (Figure 24I) light brown; posterior margin with spines on each segment. Cerci (Figure 24H) with spines on all segments.

Etymology

The specific epithet is a reference to the forewing pigmentation pattern (*nigracyclus*, from Greek and Latin, meaning “black circle”).

Comments

The adults of *C. nigracyclus* sp. nov. and *C. gelidus* sp. nov. are similar; however, the male imago of *C. nigracyclus* sp. nov. has the base of the turbinate portion of eyes as wide as apex and larger number and small size of ommatidia in the upper portion of compound eyes (Figure 21A), while in *C. gelidus* sp. nov. the base is wider than apex and small number and large size of ommatidia in the upper portion of compound eyes (Figure 10A); female imago of *C. nigracyclus* sp. nov. has brown marks near posterior margin of forewing (Figure 21G), while in *C. gelidus* sp. nov. these marks are absent (Figure 10H). The nymphs of *C. nigracyclus* sp. nov. and *C. gelidus* sp. nov. cannot be distinguished.

Material examined

Holotype. Female imago with corresponding nymphal exuviae, BRAZIL, Amazonas, Manaus, Lake of Reserva ZF2 (03°10′59.9″ S,060°05′17.7″ W), 14/vii/2008, illuminated sheet, P.V. Cruz col. (CZNC).

Paratypes. Two female imagos, four male imagos and one female imago (with exuviae), BRAZIL, Amazonas, Manaus, Lake of Reserva ZF2 (03°10′59.9″ S, 060°05′17.7″ W), 14/vii/2008, illuminated sheet, P.V. Cruz col. (CZNC). Two female imagos, BRAZIL, Amazonas, Presidente Figueiredo, Igarapé Pantera (1°28′29.82″ S, 60°16′26.52″ W), AM 240 – Km 20, 19/x/2008, illuminated sheet, P.V. Cruz col. (INPA). Female imago (with nymphal exuviae on slides) and four nymphs, BRAZIL, Amazonas, Manaus, Lake of Reserva SokaGakkai (3°7′28.87″ S, 60° 0′45.68″ W), 03/x/2008, reared, P.V. Cruz col. (CZNC). Female imago (with exuviae), BRAZIL, Amazonas, Manaus, Balneário no Km 18 – Br 174 (2°49′00.8″ S, 60°02′05.6″ W), 17/iv/2009, reared, P.V. Cruz col. (INPA). Female imago, BRAZIL, Pará, Parauapebas (Flona do Carajás – Buritizal) (6°04′14.88″ S, 49°54′15.59″ W), brook, 26/ix/2008, light trap, (INPA).

Distribution

Brazil: Amazonas state, Manaus county, Presidente Figueiredo county; Pará state, Parauapebas county.

Callibaetis pollens Needham and Murphy
(Figure 25)

Callibaetis pollens Needham and Murphy, 1924; Domínguez et al., 2006, p. 116; Nieto, 2008.

Known stages: I♀♂, N

Diagnosis

Male imago. (1) Dorsal portion of turbinate eyes oval; (2) forewings hyaline (fig. 37 in Nieto 2008); (3) marginal intercalary veins single (fig. 37 in Nieto 2008); (4) hind wing hyaline; (5) costal process of hind wing compound (fig. 38a in Nieto 2008); (6) abdominal sterna with black mark anterolaterally; (7) forceps segment I wide at base, with setae on inner margin, segment III elongate (fig. 39 in Nieto 2008).

Female imago. (1) Forewings hyaline (Figure 25B); (2) marginal intercalary veins single (Figure 25B); (3) hind wing hyaline; (4) costal process of hind wing compound (Figure 25C); (5) abdominal sterna II to IX with black mark anterolaterally (Figure 25D); (6) abdominal terga reddish brown (Figure 25A).

Mature nymph. (1) Distal margin of labrum with deep medial emargination, distal margin, medially with row of long and bifid setae (fig. 43a in Nieto 2008); (2) maxillary palp 1.5 × length of galea-lacinia (fig. 47 in Nieto 2008); (3) glossa shorter than paraglossa (fig. 48a in Nieto 2008); (4) segment III of labial palp truncate at apex

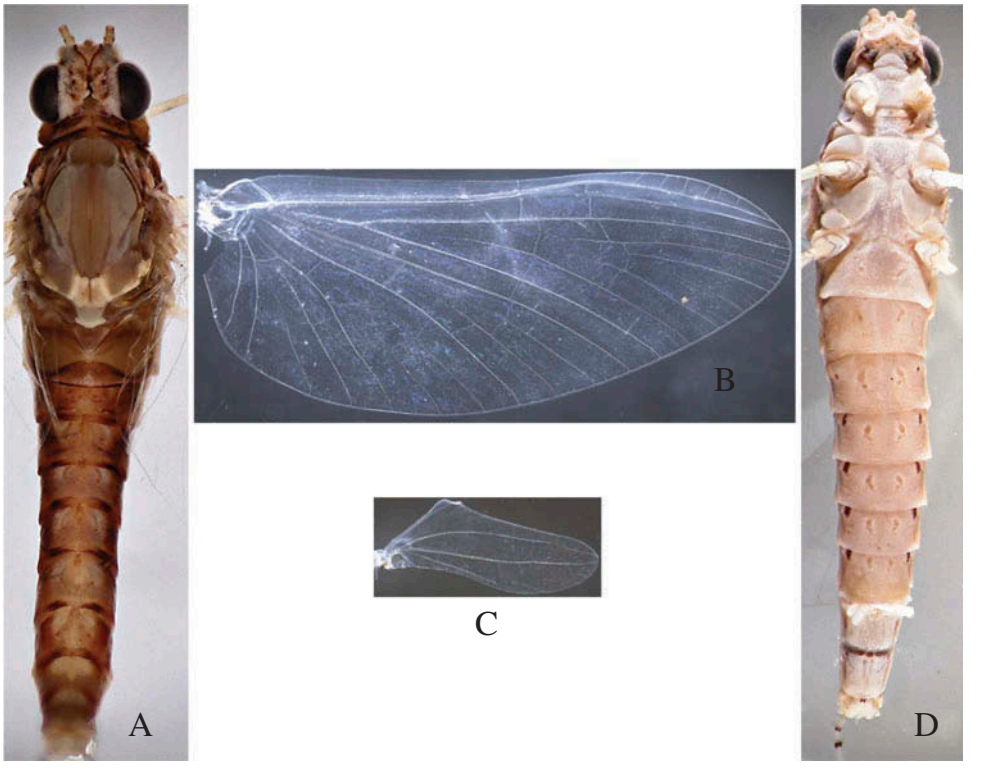

Figure 25. (colour online) *Callibaetis pollens*. (A) female imago dorsal view; (B) female imago forewing; (C) female imago hind wing; (D) female imago ventral view.

(fig. 48 in Nieto 2008); (5) mid and hind tarsal claws with two rows of minute denticles (figs. 49, 51 in Nieto 2008); (6) cerci with spines on all segments (fig. 54 in Nieto 2008); (7) terminal filament with spines on all segments.

Comments

The imagos of *C. pollens* can be easily distinguished from other species in the genus by the forewings hyaline with single marginal intercalary veins; the nymphs can be distinguished from other species in the genus by the mid and hind tarsal claws with two rows of minute spines; labrum with bifid setae medially and posterior margin of metanotum with pointed spines.

Material examined

Two female imagos, ARGENTINA, Acheral, Tucumán, Aranillas River, cruce RP 38, 366 m, (27°06′59.9″ S, 65°27′43.9″ W), 13/ix/2007, Nieto and Molineri col. (CZNC); five nymphs, ARGENTINA, Acheral, Tucumán, Aranillas River, cruce RP 38, 366 m, (27°06′59.9″ S, 65°27′43.9″ W), 28/vii/2006, Nieto and Molineri col. (CZNC); one female imago, one male imago, eight nymphs, BRAZIL, Lajeado River, BR010, under

the brigde, Maranhão, (06°04′15.6″ S, 47°22′56.6″ W), 21/vii/2010, N. Hamada, P.V. Cruz and R. Boldrini col (INPA); two male imagos, five nymphs, BRAZIL, Maranhão, Riachão, Riacho Cocal, Cachoeira Santa Bárbara, (07°13′46.2″ S, 46°27′24.6″ W), 23/vii/2010, N. Hamada, P.V. Cruz and R. Boldrini col (INPA); two female imagos, BRAZIL, Maranhão, Farinha River, BR010, under the brigde, (06°31′47.3 S, 47°28′11.4″ W), 22/vii/2010, N. Hamada, P.V. Cruz and R. Boldrini col (INPA); five male imagos, seven female imagos, twelve nymphs, BRAZIL, Ceará, Jaburu River, Ubajara, Distrito da Cachoeira do Boi Morto, (03°52′36.2″ S, 41°0.1′0.08″ W), 26/vii/2010, N. Hamada, P.V. Cruz and R. Boldrini col (INPA); four nymphs, BRAZIL, Brejinho, near Posto Cachoeira, Bahia, Correntina, (13°43′53.5″ S, 45°23′38.1″ W), 08/viii/2010, N. Hamada, Ranise and R. Boldrini col (INPA); eight nymphs, BRAZIL, Bahia, Côcos, Formoso River, highway to Mambaí county, (14°40′00.6″ S, 45°49′32.3″ W), 11/viii/2010, N. Hamada, Ranise and R. Boldrini col (INPA).

Distribution

Argentina and Brazil: Mato Grosso do Sul state, Corumbá county; Maranhão state, Lajeado River, Riachão county, Farinha River; Ceará state, Ubajara county; Bahia state, Correntina county, Côcos county.

Callibaetis radiatus Navás
(Figure 26)

Callibaetis radiatus Navás, 1920a; Gillies, 1990; Salles et al., 2003, p. 13; Domínguez et al., 2006, p. 116.
Callibaetis venulosus Navás, 1932, p. 114.

Known stages: I♀♂, N

Diagnosis

Male imago. (1) Dorsal portion of turbinate eyes oval (Figure 26A); (2) forewing hyaline (Figure 26D); (3) marginal intercalary veins single (Figure 26D); (4) base of subcostal vein with small light brown spot (Figure 26D); (5) costal process of hind wing compound (Figure 26E); (6) segment I wide at base, segment III of forceps truncated (Figure 26C).

Female imago. (1) Forewing veins C, Sc and R_1 areas brown pigmented (Figure 26G); (2) marginal intercalary veins single (Figure 26G); (3) hind wing hyaline (Figure 26H); (4) costal process of hind wing compound (Figure 26H); (5) abdominal sterna with black anterolateral marks (Figure 26I).

Mature nymph. (1) Labrum with small medial emargination (fig. 1 in Salles et al. 2003); (2) distal margin of labrum with long and simple spine-like setae (fig. 1 in Salles et al. 2003); (3) maxillary palp subequal in length of galea-lacinia; (4) glossa subequal in length than paraglossa; (5) forefemur with short spine-like setae near ventral and dorsal margin (fig. 8 in Salles et al. 2003).

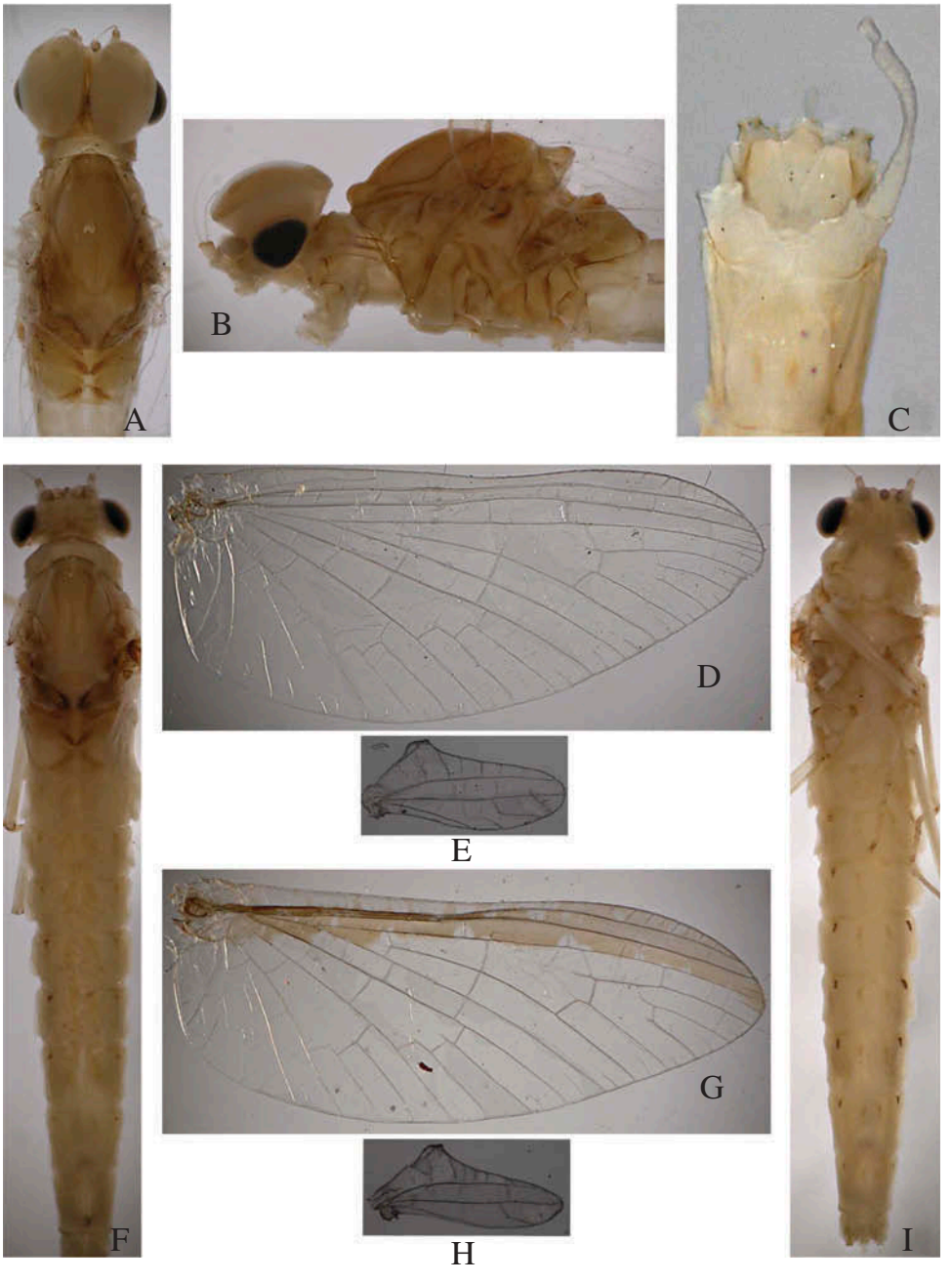

Figure 26. (colour online) *Callibaetis radiatus*. (A) male imago dorsal view; (B) male imago lateral view; (C) genitalia; (D) male imago forewing; (E) detail of male imago hind wing; (F) female imago dorsal view; (G) female imago forewing; (H) detail of female imago hind wing; (I) female imago ventral view.

Comments

The imagos of *C. radiatus* can be distinguished from other species in the genus by the costal process truncated on hind wing.

Material examined

Male imago and female imago (reared), BRAZIL, Minas Gerais, Viçosa, Ranário – Universidade Federal de Viçosa, 27/i/1997, Silva, E.R. col. (CZNC). Female imago (reared), BRAZIL, Minas Gerais, Viçosa, Ranário – Universidade Federal de Viçosa, 18/i/1997, Silva, E.R. col. (CZNC).

Distribution

Argentina, Paraguay and Brazil: Minas Gerais state, Viçosa county.

Callibaetis sellacki (Weyenbergh)
(Figure 27)

Cloe sellacki Weyenbergh, 1883, p. 164.
Cloe lorentzii Weyenbergh, 1883, p. 167.
Callibaetis sellacki Eaton, 1885, p. 198; Gillies, 1990; Nieto, 2008; Domínguez et al., 2006, p. 116.
Callibaetis trifasciatus (partim) Navás, 1915b, p. 120.
Callibaetis fasciatus Ulmer, 1921, p. 246.
Callibaetis lineatus Navás, 1932, p. 82.

Known stages: I♀♂, N

Diagnosis

Male imago. (1) Forewing with two reddish brown bands, second band parallel to posterior margin of wing (Figure 27D); (2) marginal intercalary veins paired (Figure 27D); (3) hind wing with 15–30 cross veins (Figure 27E); (4) costal process of hind wing compound (Figure 27E); (5) abdominal sterna washed with red spots with one mark anterolaterally; (6) forceps segment I wide at base, segment III elongate (Figure 27C).

Female imago. (1) Forewing with two reddish bands, second parallel to posterior margin of wing (Figure 27G); (2) marginal intercalary veins paired (Figure 27G); (3) hind wing with 15–30 cross veins (Figure 27H); (4) costal process of hind wing compound (Figure 27H); (5) abdominal sterna, medially with one pair of light brown marks (Figure 27I); (6) abdominal terga covered by red spots with one mark anterolaterally (Figure 27F).

Mature nymph. (1) Labrum with deep medial emargination, distal margin with long and simple spine-like setae (fig. 61a in Nieto 2008); (2) maxillary palp longer than galea-lacinia (fig. 65 in Nieto 2008); (3) glossa subequal in length than paraglossa (fig. 66a in Nieto 2008); (4) forefemur, near ventral margin, with row of trifid spine-like

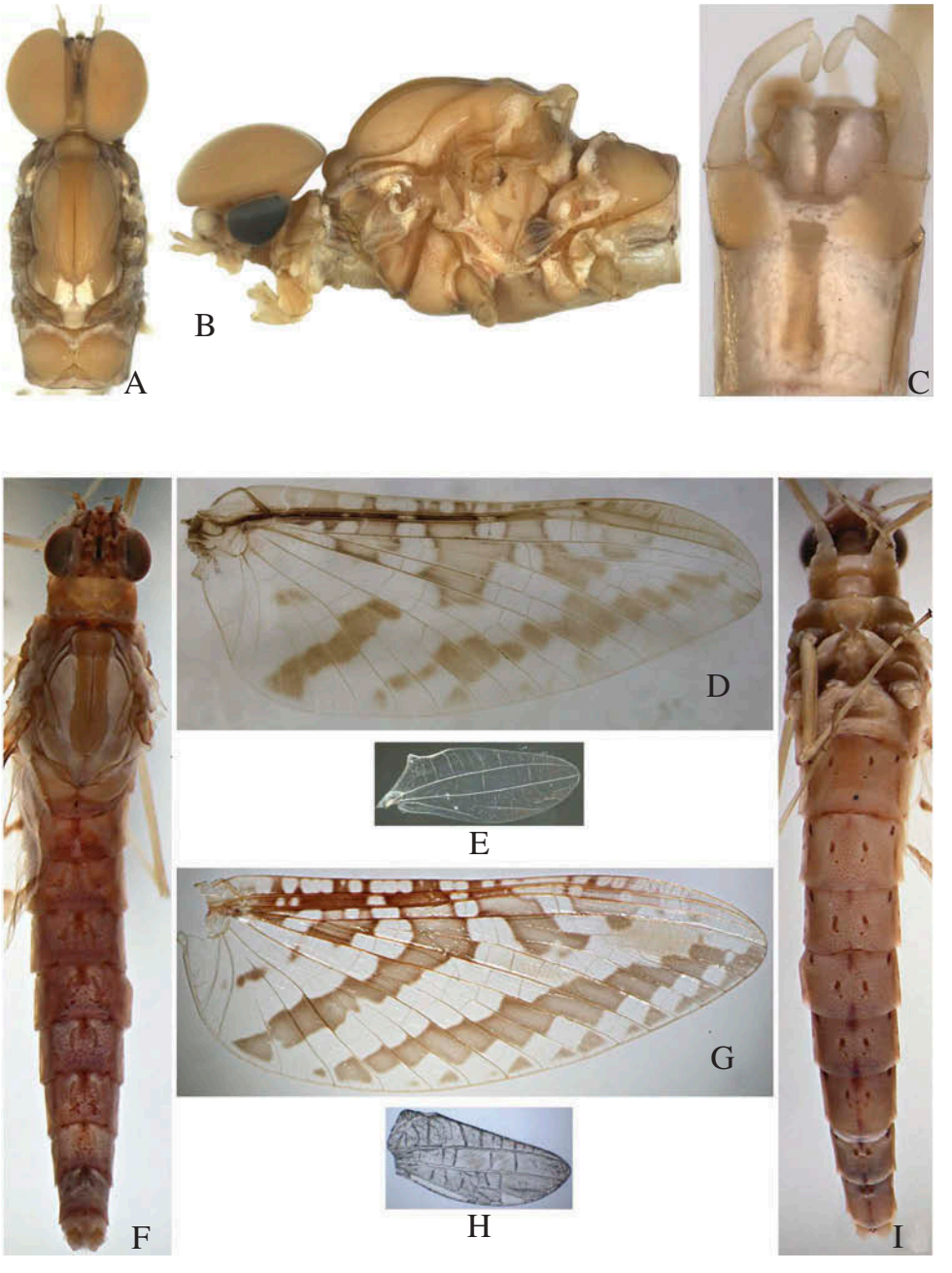

Figure 27. (colour online) *Callibaetis sellacki*. (A) male imago dorsal view; (B) male imago lateral view; (C) genitalia; (D) male imago forewing; (E) detail of male imago hind wing; (F) female imago dorsal view; (G) female imago forewing; (H) detail of female imago hind wing; (I) female imago ventral view.

setae; (5) foretarsus with pectinated setae; (6) cerci with short spines on all segments (fig. 72 in Nieto 2008); (7) terminal filament with spines on all segments.

Comments

Callibaetis sellacki is recorded for the first time from Brazil; the forewing colour pattern allows quick identification of this species. The Brazilian specimen was collected in a lake at an altitude of 1043 m.

Material examined

Three male imagos and one female imago, ARGENTINA, Buenos Aires, Tandil, A° Quequén Chico, 6/i/1983, Domínguez col. (INPA). Female imago, BRAZIL, São Paulo, Jundiaí, Serra do Japií, Lake near two houses, 14/vii/2009, Brito, P. col. (INPA).

Distribution

Argentina, Chile and Brazil: São Paulo state, Jundiaí county.

Callibaetis viviparus Needham and Murphy

Callibaetis viviparus Needham and Murphy, 1924; Domínguez et al., 2006, p. 117.

Known stages: I♀

Diagnosis

Female imago. (1) Forewing hyaline, except C, Sc, R_1 areas, usually with hyaline cross veins in costal area (fig. 152 in Needham & Murphy 1924); (2) marginal intercalary veins single (fig. 152 in Needham & Murphy 1924); (3) costal process of hind wing rounded (fig. 152a in Needham & Murphy 1924); (4) body covered with red spots.

Comments

The diagnosis above, based on literature, is adequate to identify the female imago, although a revision is necessary since the description and illustration include few details.

Material examined

No types or specimens were examined; the diagnosis was based on the literature.

Distribution

Brazil: Mato Grosso do Sul state, Corumbá county.

Callibaetis willineri Navás

Callibaetis willineri Navás, 1933; Gillies, 1990; Domínguez et al., 2006; Nieto, 2008, p. 240.
Callibaetis alegre Traver, 1944, p. 46.

Known stages: I♀♂, N

Diagnosis

Male imago. (1) Wings hyaline; (2) marginal intercalary veins paired; (3) costal process of hind wing rounded; (4) abdominal sterna with one blackish mark anterolaterally.

Female imago. (1) Forewing hyaline, except C, Sc, R_1 areas, pigmentation near or touch R_2 (fig. 73 in Nieto 2008); (2) marginal intercalary veins paired (fig. 73 in Nieto 2008); (3) costal process of hind wing rounded (fig. 74b in Nieto 2008); (4) abdominal sterna covered with red spots.

Mature nymph. (1) Distal margin of labrum with small, subquadrangular medial emargination (fig. 76a in Nieto 2008); (2) distal margin of labrum with simple spine-like setae (fig. 76b in Nieto 2008); (3) maxillary palp subequal in length to galea-lacinia (fig. 80 in Nieto 2008); (4) glossa subequal in length than paraglossa; (5) trifid spine-like setae near ventral margin of forefemur; (6) cerci with short spines on all segments (Figure 87 in Nieto 2008); (7) terminal filament with spines on all segments.

Material examined

No types or specimens were examined; the diagnosis was based on the literature.

Distribution

Argentina, Uruguay and Brazil: Rio Grande do Sul state, Porto Alegre county.

Callibaetis zonalis Navás

Callibaetis zonalis Navás, 1915a; Gillies, 1990; Domínguez et al., 2006, p. 117.
Callibaetis vitreus Navás, 1915b, p. 121; Navás, 1919, p. 81.
Baetis opacus Navás, 1915a, p. 12.
Callibaetis sobrius Navás, 1916, p. 61.
Baetis virellus Navás, 1915b, p. 119.
Callibaetis apertus Navás, 1917, p. 190.
Callibaetis depressus Navás, 1922, p. 59.
Callibaetis amoenus Navás, 1930c, p. 131.

Known stages: I♀♂

Diagnosis

Male imago. (1) Forewing hyaline, sometimes with stigmatic area pigmented.

Female imago. (1) Forewing hyaline, except C, Sc, R_1 areas (fig. 2 in Gillies 1990); (2) marginal intercalary veins paired (fig. 2 in Gillies 1990); (3) costal process of hind wing pointed (fig. 3 in Gillies 1990); (4) hind wing with 15–17 cross veins (fig. 3 in Gillies 1990).

Material examined

No types or specimens were examined; the diagnosis was based on the literature.

Comments

Even though the male imago is described, the large variation presented by Gillies (1990) does not allow a reliable specific identification. Several synonymies were established considering mainly the alar pigmentation. To provide a useful diagnosis it will be necessary to re-evaluate the types and analyse additional specimens from the type locality.

Distribution

Argentina, Paraguay and Brazil: São Paulo state, São Paulo county.

Key to identify the male imagos of *Callibaetis* from Brazil*

1. Forewing with marginal intercalary veins single (Figure 10H) 2
   Forewing with marginal intercalary veins paired (Figure 1I) 4
2. Forceps segment I with setae on inner margin; forceps segment III elongated (fig. 39 in Nieto 2008) ..... *C. pollens*
   Forceps segment I without setae on inner margin; forceps segment III not elongated (Figure 11C) 3
3. Costal process of hind wing rounded (Figure 11F) ..... *C. gonzalezi*
   Costal process of hind wing truncated (Figure 26E) ..... *C. radiatus*
4. Forewing hyaline (Figure 13D) 5
   Forewing with some pigmentation (Figures 17D, 21D) 8
5. Abdominal sterna with red spots (fig. 31 in Cruz et al. 2009) .... *C. capixaba*
   Abdominal sterna without red spots 6
6. Abdominal sterna with transverse light brown mark medially on posterior margin of all segments (Figure 13I); hind wing without cross veins (Figure 13E) ..... *C. itannae* sp. nov.
   Abdominal sterna without light brown mark medially on posterior margin of all segments (Figure 10K); hind wing with cross veins (Figure 26E) 7

7. Abdominal sterna with reddish mark anterolaterally .... *C. guttatus* (in part)
   Abdominal sterna with blackish mark anterolaterally ..... *C. willineri*
8. Dorsal portion of turbinate eyes circular (Figure 10A) 9
   Dorsal portion of turbinate eyes oval (Figure 26A) 10
9. Dorsal portion of turbinate eyes with constriction on apical third (red arrow in Figure 10B) ..... *C. gelidus* sp. nov.
   Dorsal portion of turbinate eyes without constriction (Figure 21B) ..... *C. nigracyclus* sp. nov.
10. Forewing with three or four transversal pigmented bands (Figure 9C) ..... *C. fasciatus*
    Pigmentation of forewing hyaline or with band parallel to posterior margin of wing 11
11. Forewing with one pigmented band parallel to posterior margin of wing (Figure 27D) ..... *C. sellacki*
    Forewing without parallel band to posterior margin of wing 12
12. Forewing hyaline except for stigmatic area (fig. 3 in Cruz et al. 2009) ..... *C. fluminensis* or *C. zonalis*
    Forewing with pigmentation not restrict to stigmatic area 13
13. Forewing without complete band, with marks near outer margin (figs. 6, 8 in Gillies 1990) ..... *C. guttatus*
    Forewing with complete bands, without marks near outer margin 14
14. Apical third of forewing with few or no pigmentation (Figure 1D) ..... *C. calloventer* sp. nov.
    Apical third of forewing strongly pigmented (Figure 17D) 15
15. Forceps segment I with base as wide as apex (Figure 5C) ..... *C. cruentus* sp. nov.
    Forceps segment I wide at base (Figure 17C) ..... *C. jocosus*

*The male imago of *C. viviparus* is not known; the male imago of *C. gregarius* is not in the key since the status of the taxon is not clear.

Key to identify the female imagos of *Callibaetis* from Brazil*

1. Forewing with marginal intercalary veins single (Figure 10H) 2
   Forewing with marginal intercalary veins paired (Figure 5H) 7
2. Forewing without pigmentation (Figure 25B) ..... *C. pollens*
   Forewing with pigmentation 3
3. Fore and hind wing with yellowish brown pigmentation at base (after fixation) (Figure 11H,I) ..... *C. gonzalezi*
   Fore and hind wing without yellowish brown pigmentation at base 4
4. Area around bulla pigmented (black arrow in Figure 21G) 5
   Area around bulla without pigmentation (Figure 26G) 6

5. Forewing with dark marks near outer margin (Figure 21G); hind wing with pigmentation variable, apex always pigmented (Figure 21H); abdominal sterna with many light brown spots (Figure 21J) ..... *C. nigracyclus* sp. nov.
   Forewing without dark marks near outer margin (Figure 10H); hind wing with mark at base of costal process, apex without pigmentation (Figure 10I); abdominal sterna white (Figure 10K) ..... *C. gelidus* sp. nov.
6. Costal process of hind wing truncated (Figure 26H) ..... *C. radiatus*
   Costal process of hind wing rounded ..... *C. viviparus*
7. Forewing not pigmented (Figure 13G) 8
   Forewing pigmented (Figures 12B and 11H) 9
8. Abdominal sterna with many red spots (fig. 35 in Cruz et al. 2009) ..... *C. capixaba*
   Abdominal sterna without red spots (Figure 13I) ..... *C. itannae* sp. nov.
9. Forewing completely pigmented (Figure 5H) 10
   Forewing with hyaline areas (Figure 12B) 12
10. Hind wing hyaline with mark at base of costal process (Figure 17H) ..... *C. jocosus*
    Hind wing completely pigmented (Figure 1J) 11
11. Abdominal terga III, V and VII with two oblique red marks (Figure 1H) ..... *C. calloventer* sp. nov.
    Abdominal terga III, V and VII without two oblique red marks (Figure 5G) ..... *C. cruentus* sp. nov.
12. Forewing with transverse pigmented bands (Figure 27G) 13
    Forewing without transverse pigmented bands 15
13. Forewing with five or six pigmented bands, sometimes with black marks near posterior margin (Figure 12B) ..... *C. guttatus*
    Forewing with less than five bands (Figure 27G) 14
14. Forewing with three or four bands of pigmentation, without parallel band ..... *C. fasciatus*
    Forewing with two bands of pigmentation, second parallel to posterior margin of wing (Figure 27G) ..... *C. sellacki*
15. Area around bulla pigmented (fig. 7 in Cruz et al. 2009) ..... *C. fluminensis*
    Area around bulla not pigmented 16
16. Hind wing with costal process rounded ..... *C. willineri*
    Hind wing with costal process pointed ..... *C. zonalis*

*The female imago of *C. gregarius* is not known.

Key to identify the nymphs of *Callibaetis* from Brazil*

1. Maxillary palp shorter than or subequal to galea-lacinia (Figures 2F and 6F) 2
   Maxillary palp longer than galea-lacinia 9

2. Second segment of maxillary palp extremely reduced, 0.2 × length of segment one (Figure 2F) ..... *C. calloventer* sp. nov.
   Second segment of maxillary palp not reduced (Figure 6F)..... 3

3. Distal margin of labrum with deep medial emargination; dorsal surface of labrum with fine, long and simple setae (fig 37a, b in Cruz et al. 2009); hind claw with two rows of minute spines (fig. 44b in Cruz et al. 2009)..... ..... *C. capixaba*
   Distal margin with small medial emargination; dorsal surface of labrum without fine setae; hind claw with two rows of long spines..... 4

4. Antenna without spines (Figure 22A); paraglossa ventrally with one row of spine-like setae near inner margin (black arrow in Figure 22G); forefemur without trifid spine-like setae (Figure 23B)..... ..... *C. nigracyclus* sp. nov. or *C. gelidus* sp. nov.
   Antenna with spines (Figure 14A); paraglossa ventrally without row of spine-like seta (Figure 14H); forefemur with trifid spine-like setae (Figure 15B) 5

5. Labrum with small medial emargination (fig. 4 in Nieto 2008) ... *C. gonzalezi*
   Labrum with deep medial emargination (Figure 2B) 6

6. Hind femur with curved and pectinated setae near ventral margin (Figure 7G) ..... *C. cruentus* sp. nov.
   Hind femur with curved and pectinated setae not restrict to near ventral margin or without curved setae (Figure 15E) 7

7. Hind femur with two rows of curved and pectinated setae, the middle row directed dorsally and the row near ventral margin directed ventrally (Figure 19F) ..... *C. jocosus*
   Hind femur without curved and pectinated setae (Figure 15E)..... 8

8. Labrum ventrally with many long and simple setae near anterolateral margin (Figure 14B); distal margin of labrum medially with pectinated setae (Figure 14C); glossa and paraglossa with apex rounded (Figure 14H)..... ..... *C. itannae* sp. nov.
   Labrum ventrally without setae on anterolateral margin; distal margin of labrum medially with simple setae (fig. 76b in Nieto 2008); glossa and paraglossa with apex pointed (fig. 81 in Nieto 2008)..... *C. willineri*

9. Labrum with deep medial emargination (Figures 14B, 2B, 22B)..... 10
   Labrum with small medial emargination (fig. 25a in Nieto 2008)..... 11

10. Second segment of labial palp truncated at apex; hind claws with two rows of minute denticles (fig. 51 in Nieto 2008)..... *C. pollens*
    Second segment of labial palp rounded at apex; hind claws with two rows of long denticles (fig. 69 in Nieto 2008) ..... *C. sellacki*

11. Forefemur without trifid spine-like setae ..... *C. radiatus*
    Forefemur with trifid spine-like setae 12

12. Distal margin of labrum medially with short, robust, apically serrated setae (fig. 11b in Cruz et al. 2009); paraglossa ventrally with spine-like setae; all segments of cerci with spines (fig. 25 in Cruz et al. 2009) ..... *C. fluminensis*
Distal margin of labrum medially with simple setae (fig. 25b in Nieto 2008); paraglossa ventrally without spine-like setae; cerci with spines on each one segment (fig. 36 in Nieto 2008) ..... *C. guttatus*

*The nymphs of *C. fasciatus*, *C. gregarius*, *C. viviparus* and *C. zonalis* are not known.

Acknowledgements

We thank Museu de Zoologia de Barcelona and Museo de Ciencias Naturales de la Plata, for photographs of types, Dr Carolina Nieto (CONICET-Facultad de Ciencias Naturales and IML) for sending to us specimens from Argentina and valuable suggestions, Pedro Brito for his help during expeditions and the valuable suggestion of C. Molineri. PVC received a fellowship from Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES), FFS from Instituto Nacional de Pesquisas da Amazônia (INPA)/CNPq – Programa de Capacitação Institucional (PCI), Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq) and Fundação de Apoio à Ciência e Tecnologia do Espírito Santo (FAPES), NH from Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq). Financial support was provided by research projects supported by "Insetos aquáticos: biodiversidade, ferramentas ambientais e a popularização da ciência para melhoria da qualidade de vida humana no Estado do Amazonas"/PRONEX-CNPq-FAPEAM and "Diversidade de Baetidae (Insecta: Ephemeroptera) na Região Sudeste do Brasil com ênfase na Fauna do Estado do Espírito Santo"/FAPES (process number 45429502/2009).

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