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The nymph of *Callibaetis dominguezi* Gillies (Ephemeroptera: Baetidae)

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ORIGINAL ARTICLE

The nymph of *Callibaetis dominguezi* Gillies (Ephemeroptera: Baetidae)

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Callibaetis dominguezi Gillies was described based on male and female imagines from the northwest of Argentina. Herein the nymph of this species is described for the first time. It can be distinguished from other species in the genus mainly by (1) distal margin of labrum with deep median emargination; (2) maxillary palp almost two times the length of galea-lacinia; (3) abdomen with segments I–X with a reddish brown spot along midline. Diagnoses for male and female imagines are emended after studying specimens reared from nymphs. In males the distal 1/3 of the forewings is pigmented while in females the costal and subcostal areas are brown; this character is unique for this species.

Callibaetis dominguezi Gillies fue descrita a partir de machos y hembras del Noroeste de Argentina. Aquí la ninfa de esta especie se describe por primera vez. Se puede distinguir de las otras especies del género principalmente por (1) el margen distal del labro con una profunda emarginación media; (2) palpo maxilar casi dos veces el largo de la galea-lacinia; (3) abdomen con los segmentos I–X con una mancha castaña rojiza alargada en la línea media. Las diagnósticos para los machos y las hembras adultas están mejoradas después de estudiar los especímenes criados a partir de las ninfas. En los machos el tercio distal de las alas anteriores está pigmentado mientras que en las hembras las áreas costal y subcostal son castañas, este carácter es único para esta especie.

Keywords: Argentina; mayfly; description; taxonomy; aquatic insects

Introduction

Callibaetis Eaton (1881) is one of the first genera described for the family Baetidae. It is distributed in North, Central and South America. Originally most of the species in this genus were described based on adults, especially females (e.g. Navás 1915, 1923, 1930, 1934; Gillies 1990). This is because the females have an intense pigmentation along the body and wings, a conspicuous character which makes the genus atypical in the family. However, in the last decade the knowledge of this genus was much improved by associating nymphs and adults (Salles et al. 2003; Nieto 2008; Cruz et al. 2009).

In South America there are 16 species known from adults, of which eight are known from nymphs as well (Nieto 2008; Cruz et al. 2009). *Callibaetis dominguezi* was described by Gillies (1990), based on male and female imagines from the northwest of Argentina. The original material was collected in 1981 by E. Domínguez. Since then this species was never collected again, despite several field trips searching for it. Finally, in 2009 E. Domínguez and C. Molineri successfully reared adults from nymphs enabling their association with the imagines. Here we describe the nymphs of

C. dominguezi and improve the diagnosis for male, female and nymph.

Materials and methods

Descriptions followed the standardization proposed by Hubbard (1995) with the aid of DELTA (DEscription Language for TAXonomy) open software (Dallwitz 1980).

The male and female subimagines were reared using the technique suggested by Edmunds et al. (1976) and compared with holotype, female imagines from light trap and male imagines collected on the water surface. Material was preserved in 96% ethanol. Dissected parts of the specimens studied were mounted on microscope slides with Canada balsam. Line drawings were made using a camera lucida attached to a microscope. The pictures of adult and nymph were taken using a Nikon SMZ-10 stereomicroscope (Melville, New York, USA) or an Olympus BX-51 microscope (Center Valley, Pennsylvania, USA), with a Nikon D5000 digital camera (Melville, New York, USA). For some of the pictures a series of partially focused images were processed with the

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program Combine ZP (UK; Combine Z5. 2009. <http://www.hadleyweb.pwp.blueyonder.co.uk>) to produce final images with enhanced quality.

The material examined is housed in Instituto-Fundacion Miguel Lillo, Tucumán, Argentina (IFML) and Instituto de Biodiversidad Neotropical, Tucumán, Argentina (IBN).

Results

Callibaetis dominguezi Gillies 1990 (Figures 1–23)

Callibaetis dominguezi Gillies, 1990: 22; Domínguez et al. 2006: 112.

Known stages: ♀, ♂ imagines, nymphs.

Diagnosis

Callibaetis dominguezi can be distinguished from the other species of the genus by the following combination of characters:

Male imago (Figure 1). (1) forewings pigmented in distal 1/3 (Figure 2); (2) forewings with paired marginal intercalary veins, length of each intercalary vein $0.6 \times$ distance between adjacent longitudinal veins (Figure 2); (3) forewings with costal area without cross veins (Figure 2); (4) hind wing without cross veins and with two marginal intercalary veins (Figure 5); (5) hind wing with rounded costal projection (Figure 5); (6) abdominal terga II–IV with small anteromedial pale triangles; (7) abdominal sterna II–IX with a pair of long anterolateral dashes and, internal to this, small spots; (8) forceps with segment I without projection, segment III elongate and oval (Figure 6).

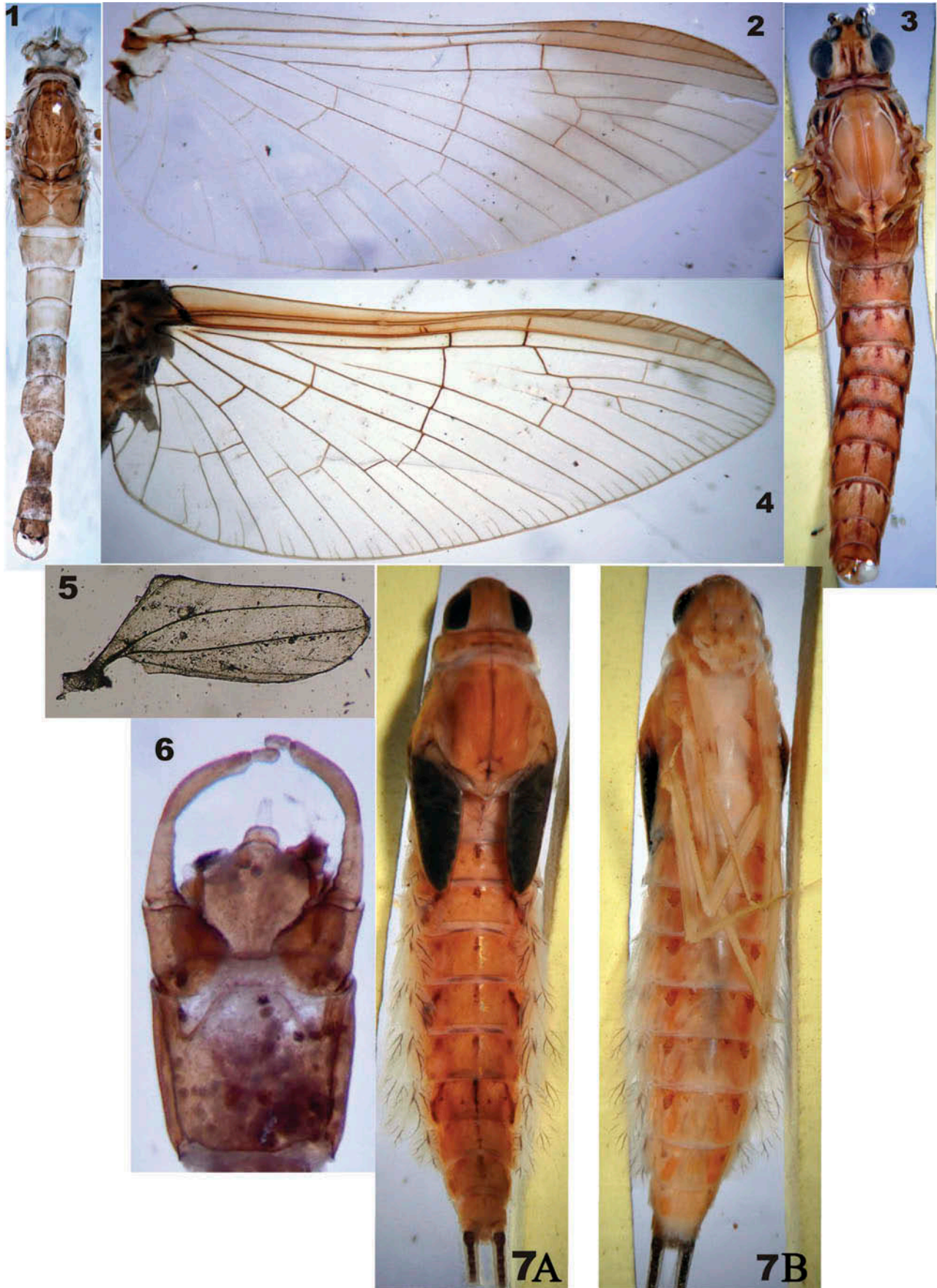
Female imago (Figure 3). (1) Head with two long spots near midline (Figure 3); (2) forewings with costal and subcostal areas brown (Figure 4) and costal area without cross veins (Figure 4); (3) forewings with paired marginal intercalary veins (Figure 4); (4) hind wing without cross veins and with two marginal intercalary veins (similar to Figure 5); (5) hind wing with costal projection rounded (similar to Figure 5); (6) abdominal terga II–IX anteriorly with a pair of pale triangles and reddish spots forming another triangle within (Figure 3), anterolaterally with one brown mark, segments I–X with a reddish medial band; (7) abdominal sterna covered with reddish spots and with two large brown marks, one anteriorly and the other anterolaterally.

Nymph (Figures 7A, B). (1) Distal margin of labrum (Figure 8A) with deep medial emargination, laterally with long, fine and simple setae (Figure 8B); (2) distal margin of labrum medially with short, robust and

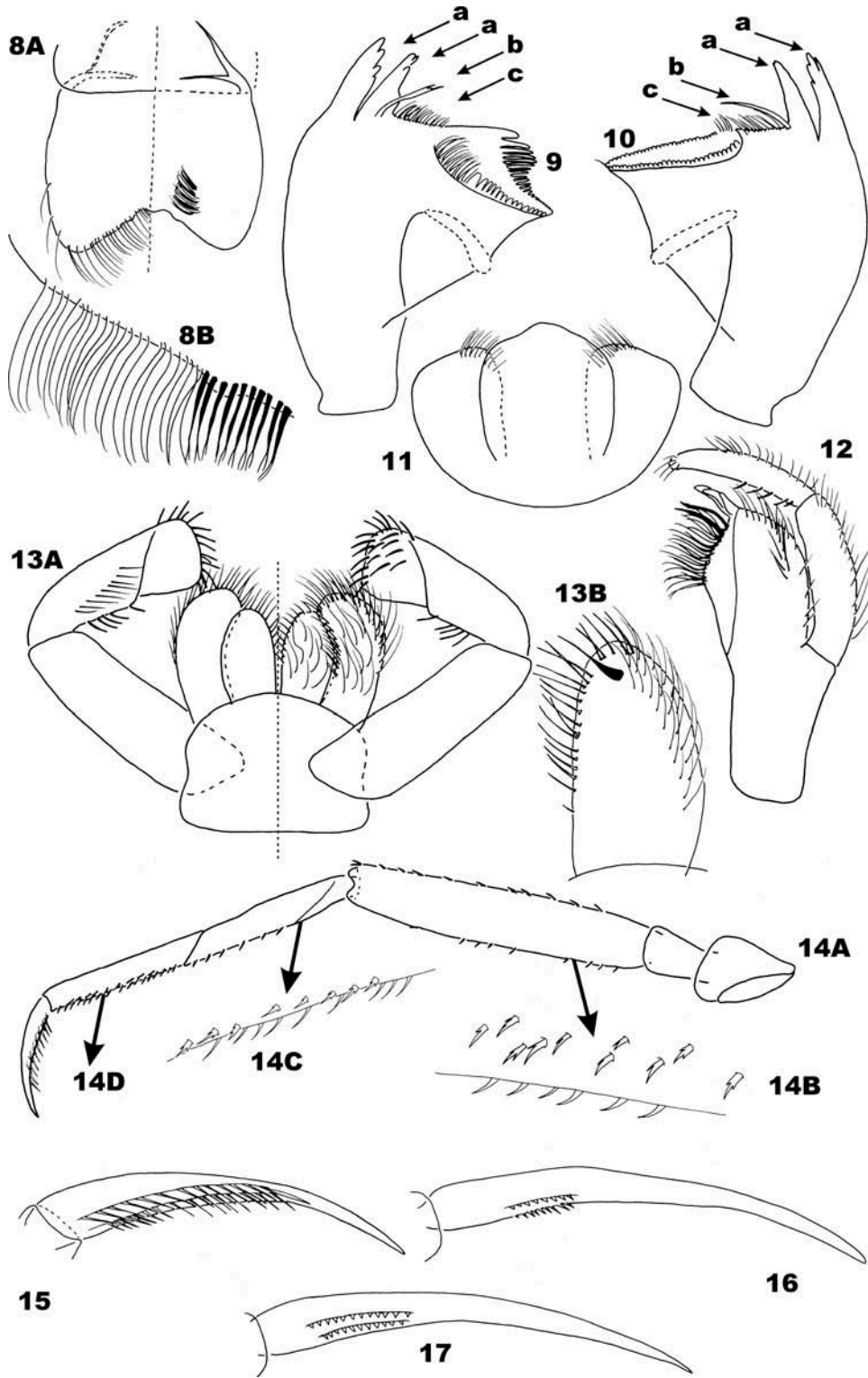
apically bifid setae (Figure 8B); (3) maxilla (Figure 12) with medial protuberance of galea with 15 spine-like setae, palp long, $1.9 \times$ length of galea-lacinia (Figure 12); (4) glossa and paraglossa apically rounded (Figure 13A); (5) glossa with strong spine-like setae (Figure 13B); (6) segment III of labial palp subquadrangular covered with long spine-like simple setae along margins (Figure 13A); (7) anterior surface of forefemur with bifid and trifid spine-like setae near ventral margin (Figure 14B); (8) foretibia ventrally with bifid and trifid spine-like setae (Figure 14C); (9) mid and hind claws with small denticles (Figures 16, 17); (10) abdomen with segments I–X with a reddish brown spot along midline (Figure 7A); (11) terminal filament with long spines on all segments (similar to Figure 23); (12) cerci with long spines on all segments (Figure 23).

Description

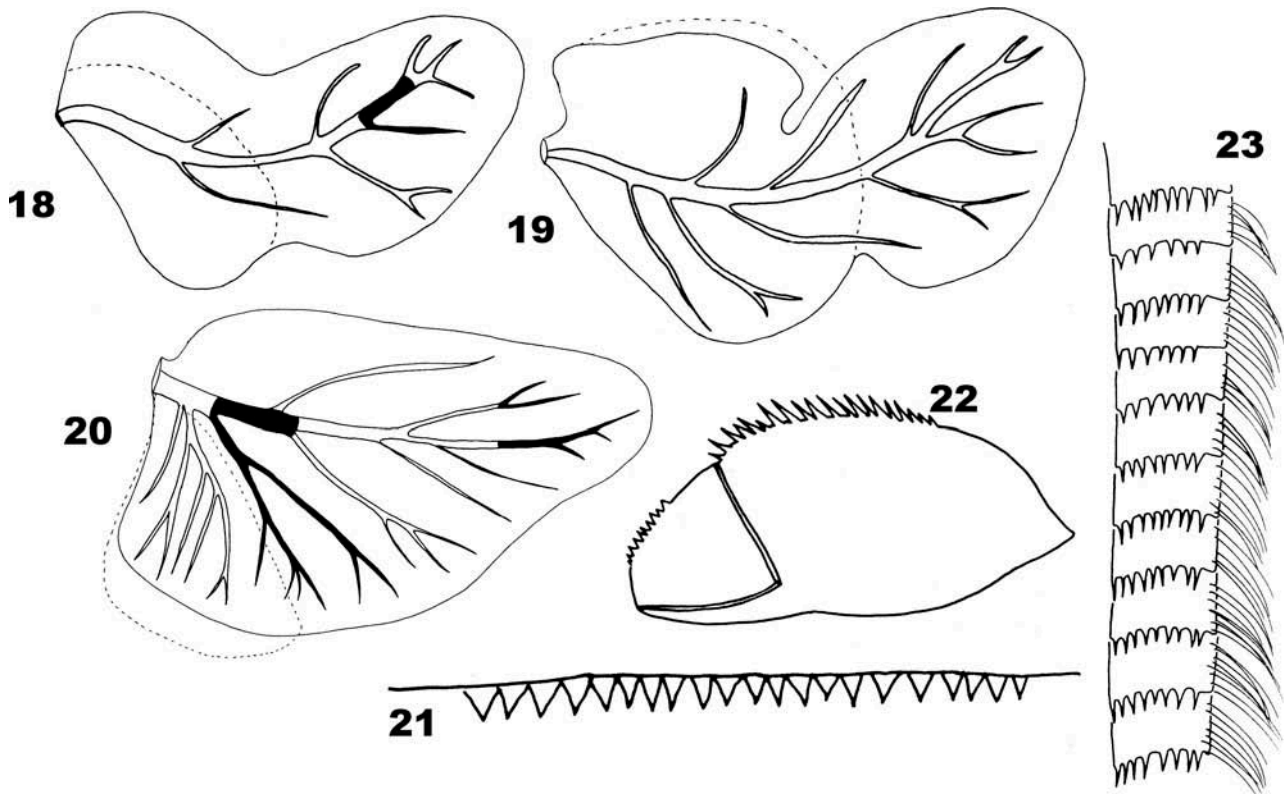
Mature nymph. Body length: female 10 mm, male 7.5 mm; cercus length: female 4.3 mm, male 4.5 mm; length of caudal filaments: female 3.5 mm, male 3.6 mm. Head yellowish brown. Turbinate portion of male compound eyes orange brown. Antennae yellowish. Labrum (Figure 8A) with deep medial emargination; maximum length about $1.4 \times$ minimum length; anterolateral margins with long, fine simple setae, distal margin medially with short, robust and apically bifid setae (Figure 8B); dorsal surface with few setae. Left mandible (Figure 9) with $4 + 3$ denticles; prostheca robust and bifid; margin between prostheca and mola straight; tuft of setae at base of mola present; lateral margin convex. Right mandible (Figure 10) with $4 + 2$ denticles; prostheca slender, margin between prostheca and mola straight, tuft of spine-like setae at base of mola present; lateral margin convex. Hypopharynx (Figure 11) with lingua with one lobe on distal margin; superlingua with simple setae over distal margin. Maxilla (Figure 12) with three rows of setae and three incisors; medial protuberance of galea with 15 spine-like setae. Maxillary palp long, $1.9 \times$ length of galea-lacinia; palp segment II $0.9 \times$ length of segment I; outer margin of segment I with scattered long, fine, simple setae; segment II inner margin with robust spine-like setae. Labium (Figures 13A, B) with glossae shorter than paraglossae; apex rounded; inner margin with 15 spine-like setae; apex with 5 long spine-like setae; outer margin with three rows of long spine-like setae; ventral surface with scattered short, fine, simple setae; ventral surface with one long and robust spine-like seta. Paraglossae curved inward; apex with one row of spine-like setae; ventral surface with many fine, simple setae; dorsal surface with one large tuft of long spine-like setae near outer margin and the other tuft of long



Figures 1–7. (Color online) *Callibaetis dominguezi*. Imagines. 1, male, dorsal habitus; 2, forewing of male; 3, female, dorsal habitus; 4, forewing of female; 5, hind wing of male; 6, male genitalia. Nymph. 7A, dorsal habitus; 7B, ventral habitus.



Figures 8–17. *Callibaetis dominguezi* nymph. 8A, labrum, left dorsal view, right ventral view; 8B, labrum anterior margin; 9, left mandible ventral view, a, denticles, b, prosthema, c, tuft of setae; 10, right mandible ventral view, a, denticles, b, prosthema, c, tuft of setae; 11, hypopharynx ventral view; 12, maxilla ventral view; 13A, labium, left dorsal view, right ventral view; 13B, glossa ventral view; 14A, foreleg; 14B, forefemur, detail; 14C, foretibia, detail; 14D, tarsus; 15, tarsal claw I; 16, tarsal claw II; 17, tarsal claw III.



Figures 18–23. *Callibaetis dominguezi* nymph. 18, gill I; 19, gill II; 20, gill IV; 21, posterior margin of tergum IV; 22, paraproct; 23, detail of basal segments of cercus.

spine-like setae on basal half near inner margin. Labial palp with segment I $1.1 \times$ length of segment II and III combined; inner margin of segment II with 5 robust, short spine-like setae and fine setae; dorsally with row of 9 short spine-like setae; segment III concave in the inner margin and subquadrangular covered with long spine-like simple setae along margins and apically truncate. Thorax yellowish brown (Figure 7A). Metanotum without spines. Foreleg (Figure 14A). Length of forefemur about $5.2 \times$ maximum width; dorsally with row of short, spine-like setae; length of setae about $0.1 \times$ maximum width of femur; ventrally with one row of short spine-like setae. Anterior surface near ventral margin with one row of bifid and trifid spine-like setae (Figure 14B). Tibia ventrally with one row of short spine-like setae; anterior surface with one row of short, robust spine-like setae (Figure 14C). Tarsus (Figure 14D) ventrally with one row of spine-like setae and one row of trifid spine-like setae (similar to Figure 14B). Tarsal claws with two rows of laterally inserted denticles increasing in size distally, $0.5 \times$ the length of tarsus (Figure 15). Middle and hind leg similar to foreleg except ventral surface of femur, tibia and tarsus covered with robust

and strong pectinate spine-like setae; claws with small denticles (Figures 16, 17). Abdomen yellowish brown, terga I–X with a reddish brown spot along midline (Figure 7A), terga III, V and VII with oblique lateral mark. Posterior margin of all segments with regular spines (Figure 21). Sterna yellowish brown, with segments II–VIII with two pairs of reddish spots near anterolateral margin. Gills (Figures 18–20) with trachea pigmented. Gill I about $1.0 \times$ length of segment II. Gill IV $1.0 \times$ length of segment V to VI combined. Gills VII $1.0 \times$ length of segment VIII to half IX combined. Paraproct (Figure 22) with 20 marginal spines; posterolateral extension with marginal spines. Caudal filaments with spines on all segments (as in Figure 23).

Material examined

Type material: One male imago (holotype), ARGENTINA, Jujuy, Calilegua, 1.180 m, Mesada de Las Colmenas, 13 December 1981, E. Domínguez col. (IFML N696).

Additional material: 7 nymphs (1 dissected), ARGENTINA, Jujuy, PN Calilegua, Mesada de las

Colmenas, Tres Cruces stream, 970 m, 23°45'8.3" S, 64°51'3.2" W, 7 November 2006, Domínguez & Molineri cols; 51 nymphs, (1 dissected), 1 female and 1 male imago and 1 female subimago (reared), same locality, 12 May 2009, Molineri et al. col. Material housed in IBN.

Discussion

The adults of *C. dominguezi* are clearly distinctive from other species in the genus based on their pigmentation. In males the distal 1/3 of the forewings is pigmented while in females the costal and subcostal areas are brown. This character is unique for this species.

The nymphs of *C. dominguezi* share with *C. pollens* Needham & Murphy, *C. sellacki* (Weyenbergh) and *C. capixaba* Cruz et al. that the distal margin of the labrum is deeply emarginated. However, in *C. sellacki* the apical setae of the labrum are simple instead of bifid as in the other species. The maxillary palp of *C. dominguezi* is almost 2 times the length of galea-lacinia, whereas it is subequal or $1.5 \times$ the length of the galea-lacinia in *C. capixaba* and *C. pollens*, respectively. Moreover, the abdominal color pattern of *C. dominguezi* on segments I–X characterized by a reddish brown spot along the midline is not similar to any other species.

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