



A new species of *Cryptonympha* Lugo-Ortiz & McCafferty (Ephemeroptera, Baetidae) from Cerro Duida (Venezuela)

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The genus *Cryptonympha* includes three species: *C. copiosa* Lugo-Ortiz & McCafferty, 1998; *C. dasilvai* Salles & Francischetti, 2004 and *C. genevieveae* Thomas, Manchon & Glémet, 2013, known only from the nymphal stage. A description of the nymph of a fourth representative, *Cryptonympha tracheata* sp. n. is provided here, based on material collected in a blackwater stream on the slopes of the Cerro Duida mountain in south-western Venezuela. The nymph of the new species can be easily distinguished from the other species of the genus by very long tracheal gills II–VII, 2.5 times the length of each tergum, gill I small, nearly half length of gill IV and by posterior margin of terga with rounded spines. A complete description of the new species and a key for nymphs of all known *Cryptonympha* species are provided.

The genus *Cryptonympha* was established by Lugo-Ortiz & McCafferty (1998) and it included one species *C. copiosa* widely distributed in Brazil. The authors maintained that this genus was probably distributed also in Peru, based on one unnamed species by Roback (1966). A similar situation occurred with other unnamed species from French Guiana designed to the genus *Cryptonympha* by Orth *et al.* (2000). Since then the type species was reported from different regions of Brazil (Falcão *et al.* 2011; Boldrini *et al.* 2012; Boldrini & Cruz 2014) and south-eastern Venezuela (Nieto *et al.* 2011). Moreover, another two species were described, *C. dasilvai* from Brazil (Salles & Francischetti 2004) and *C. genevieveae* from French Guiana (Thomas *et al.* 2013). The genus *Cryptonympha*, only known from nymphs, can be distinguished from the other genera of the family by prostheca of the right mandible with a transverse and robust seta; glossae and paraglossae acute apically and gill I elongate or narrowed basally (Lugo-Ortiz & McCafferty 1998; Salles & Francischetti 2004; Thomas *et al.* 2013).

The Cerro Duida, where the new species was collected, is one of numerous sandstone table mountains scattered in southern Venezuela, Guyana and northern Brazil. It forms a very large mountain island with an uneven and heavily inclined plateau, rising from altitudes of around 1,300–1,400 meters in the north and east to a maximum of 2,358 meters on its southwestern rim. It has a summit area of 1,089 km² and an estimated slope area, where samples were taken, of 715 km² (Huber 1995a). The region was scientifically explored for the first time by a major expedition of the American Museum of Natural History to Cerro Duida in 1928–1929, led by George Henry Hamilton Tate. It was the first to reach the mountain's summit plateau and the first to climb a tepui of the Venezuelan Amazon (Tate & Hitchcock 1930; Huber 1995b). The material collected on this expedition is still a source of new discoveries (Stark 2011). Mayfly fauna of southern Venezuela remains little explored (for the review see Derka *et al.* 2012, Aubrecht *et al.* 2012), although various new taxa have been described and new records have been published from this region in the last few years (Derka 2002; Derka *et al.* 2009, 2015; Falcão *et al.* 2011, Molineri *et al.* 2011; Nieto *et al.* 2011; Nieto & Derka 2011, 2012; Domínguez *et al.* 2014).

Here we describe a new species of *Cryptonympha*, collected in south-western Venezuela, in the massif of Cerro Duida (Figs. 1–2). A key for the nymphs of the known species is included.

Material and methods

Nymphs were collected from all submerged substrates or microhabitats (gravel, stones and woody debris) by using a hydrobiological net. Material was conserved in 96 % ethyl alcohol. For morphological study, mature nymphs were

selected and dissected. Dissected parts of the specimens (3 nymphs) were mounted on microscope slides with Canada balsam. Line drawings were made using a camera lucida attached to a Leica DM 1000 microscope. Photographs of the nymphs were taken with a Leica DFC 425 digital camera with a Leica M 205 C stereomicroscope and Auto-Montage Pro version 5.0 software. Pictures were finally processed in Adobe Photoshop 7.0 (Adobe, Inc.). The material examined is housed at the following institutions (abbreviations are used in the text): IBN—Instituto de Biodiversidad Neotropical, Tucumán, Argentina; MIZA—Museo del Instituto de Zoología Agrícola, Facultad de Agronomía, Universidad Central de Venezuela, Maracay, Venezuela; and FNS—Department of Ecology, Faculty of Natural Sciences, Comenius University, Bratislava, Slovakia.

Results

Cryptonympha tracheata Derka & Nieto, new species (Figs. 6–19)

Nymph. Length (mm). Body: 2.9–3.1, cerci: 1.7 (n=6). Antennae broken. General coloration yellowish brown (Figs 6–7). Head yellowish brown, compound eyes orange brown, ocelli blackish. Antennae pale yellow. Mouthparts (Figs 8–13): Labrum (Fig. 8) rectangular, broader than long, length about 0.7 times maximum width, distal margin with medial emargination; anterolateral margin with simple setae, distal margin with bifid setae apically, dorsal surface with 1 pair of submedial long and fine setae near midline, 1 similar pair of setae located more subapically and 1 pair of similar subapical shorter setae laterally. Left mandible (Fig. 9): incisors partially fused apically, outer and inner set of incisors respectively with 3 + 3 denticles; prosthema robust with 4 denticles; margin between prosthema and mola straight, tuft of spine-like setae at base of mola; thumb of mola area subtriangular and in the same line to anterior margin, denticles of mola not constricted, lateral margins convex. Right mandible (Fig. 10): incisors fused apically, outer and inner set of incisors respectively with 4 + 5 denticles; prosthema robust with 8–9 denticles and with a transverse robust and pectinate seta, margin between prosthema and mola convex and with a row of setae; denticles of mola not constricted, apex of mola with a simple seta, lateral margin of mola concave. Hypopharynx (Fig. 11): lingua subtriangular with a medial lobe rounded, subequal to superlinguae; short and fine setae scattered over distal margin of lingua and superlinguae. Maxillae (Fig. 12): posterior side of lacinia mediobasally with a row of 4–5 fine and short setae, basally to this row a single and longer seta; maxillary palpi 1.2 times the length of galea-lacinia, segment II at least two times the length of segment I. Labium (Fig. 13): glossae subtriangular, basally broader, narrowing apically and subequal to paraglossae, outer margin with long spine-like setae, inner margin with robust spine-like setae, ventral surface covered by thin and long setae. Paraglossae subtriangular, acute apically, curved inward, outer and inner margins with long and robust spine-like setae, dorsal surface with a few short spine-like setae. Labial palpi with segment I, 1.1 times the length of segment II and III combined; segment II with rounded medial projection, outer margin and distomedial projection covered with fine and long setae; segment III conical, length 1.14 times width, covered by fine and simple setae on outer margin.

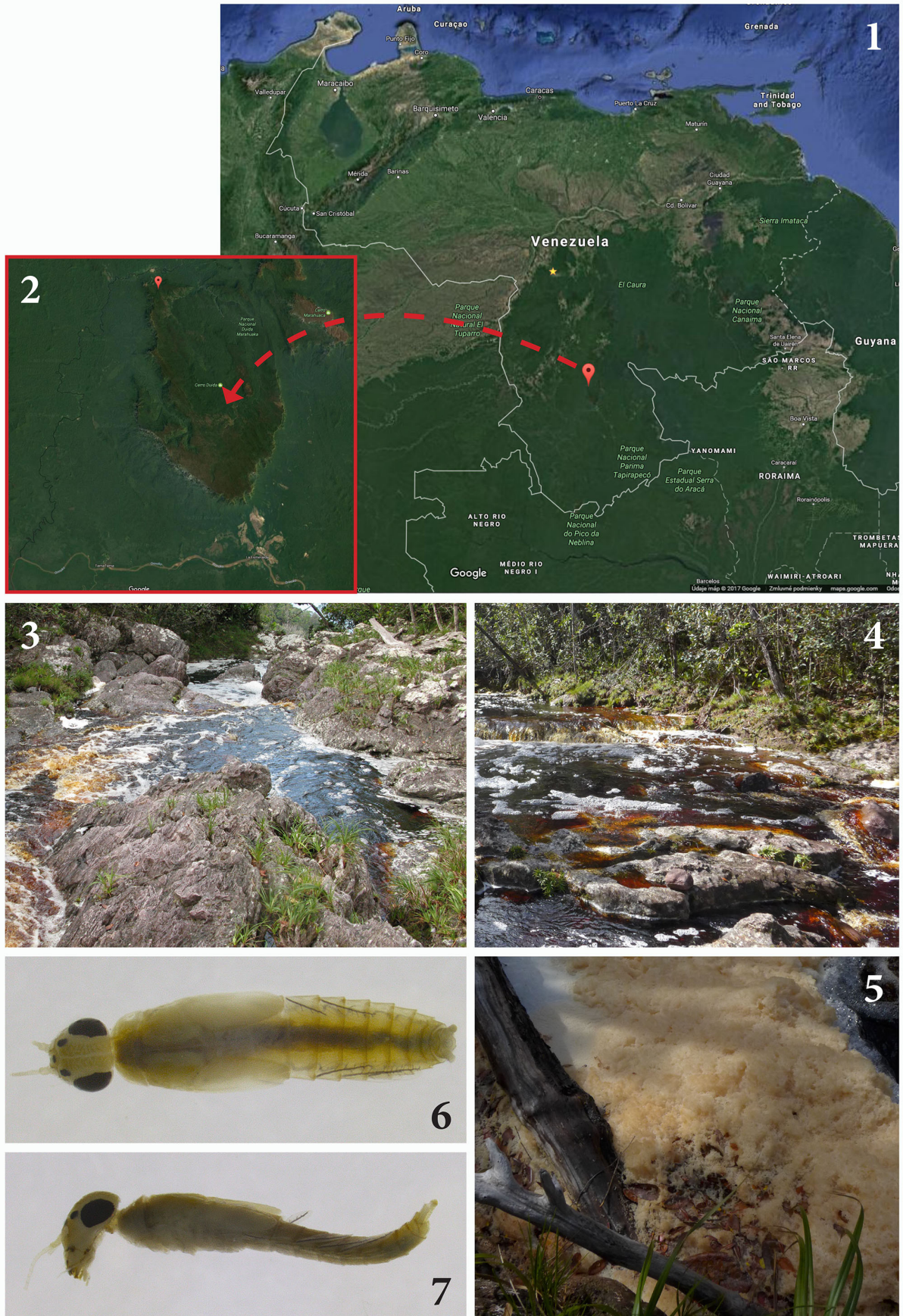
Thorax. Pro, meso and metanotum yellowish brown (Figs 6–7). Pleurae yellowish, sterna pale yellow. Legs (Fig. 14) pale yellow. Dorsal and ventral margin of femora with a row of short and robust spine-like setae, three spines apically. Ventral margin of tibiae and tarsi with a row of short and robust spines. Tarsal claws (Fig. 15) with two rows of 11 and 13 denticles respectively. Abdomen yellowish brown (Figs 6–7) and with scales (following Kluge, 1997). Posterior margin of tergum (Fig. 16) with rounded spines, as long as it is wide. Gill I small, nearly half length of gill IV (Figs 17–18). Gills II–VII (Figs 6–7, 18) long, 2.5 times the length of each tergum, whitish with trachea dark tinged. Paraprocts (Fig. 19) with scales, and with 19–21 marginal spines, postero lateral extension with 10–12 spines. Caudal filaments with spines on each segment. Terminal filament as long as cerci, cerci basal 2/3 whitish, apical 1/3 brownish.

Etymology. The specific epithet is a Latin adjective meaning tracheate. It is in reference to the long tracheal gills with highly visible tracheae.

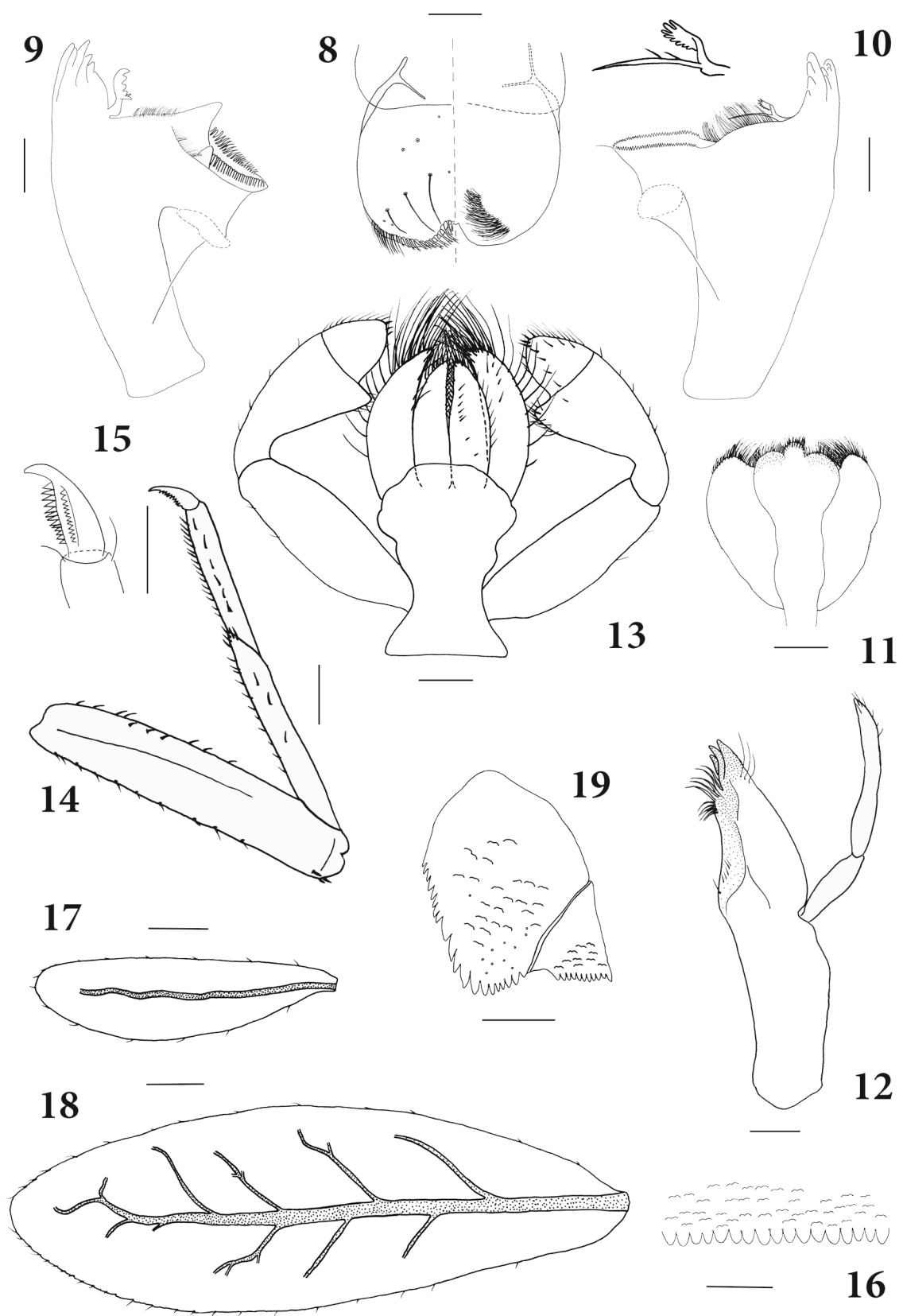
Diagnosis. The nymph of *Cryptonympha tracheata* sp. nov. can be distinguished from the other species of the genus by the following combination of characters. 1) posterior margin of terga (Fig. 16) with rounded spines; 2) gill I small, nearly half length of gill IV (Figs 17–18); 3) gills II–VII (Figs 6–7, 18) long, 2.5 times the length of each tergum; 4) segment II of maxillary palpi (Fig. 12) at least two times the length of segment I.

Material. Holotype: female nymph (IBN). VENEZUELA, Estado Amazonas, Caño Negro above La Culebra village, N 03°43'5.4'', W 65°45'58.3'', 854 m a.s.l., 25/XI/2013, T. Derka col. Paratypes (IBN, MIZA and FNS): 10 nymphs same data as holotype.

Habitat. The specimens were collected on the slopes of Cerro Duida, in a black-water mountain stream, originating on the Cerro Duida plateau. The stream is 10 m wide, up to 1.5 m deep, with a temperature of 20.1 °C (Figs 3–5). It is surrounded by a pristine montane forest. The stream bed is composed of bedrocks, rocks, boulders and scattered accumulations of sand and gravel. The bedrock bottom is frequently overgrown by macrophytes from the family Podostemaceae.



FIGURES 1–7. 1–2, map of study site location; 3–5, photographs of study site. *Cryptonympha tracheata* sp. n. Nymph. 6, dorsal habitus; 7, lateral view.



FIGURES 8–19. *Cryptonympha tracheata* sp. n. Nymph. 8, labrum, left d.v., right v.v.; 9, left mandible; 10, right mandible with detail of prostheca; 11, hypopharynx v.v.; 12, maxilla v.v.; 13, labium, left d.v., right v.v.; 14, fore leg; 15, fore tarsal claw; 16, posterior margin of tergum IV; 17, gill I; 18, gill IV; 19, paraproct; scale = 0.24 mm.

Discussion

The nymph of *Cryptonympha tracheata* **sp. nov.** is easily distinguishable by posterior margin of terga bearing rounded spines, while other species have triangular spines. The general shape of labial palpi of *C. tracheata* **sp. nov.** is similar to the found in *C. dasilvai*, however can be distinguished from this species by the size of gills II–VII (2.5 times the length of each tergum), and by the posterior margin of terga (rounded in *C. tracheata* and pointed in *C. dasilvai*).

Key to the nymphs of *Cryptonympha*

- 1 Posterior margin of terga with rounded spines (Fig. 16); gills II–VII long, 2.5 times the length of each tergum (Figs. 6–7), segment II of maxillary palpi (Fig. 12) at least two times the length of segment I, gill I nearly half length of gill IV *C. tracheata* **sp. nov.**
- Posterior margin of terga with pointed spines, gills II–VII shorter, 1.5 times the length of each tergum, segment II of maxillary palpi shorter than two times the length of segment I, gill I longer or only slightly shorter than gill IV 2
- 2 Tarsal claw with single row of denticles, prosteca of left mandible with a long, robust and pilose seta *C. copiosa*
- Tarsal claw with two rows of denticles, prosteca of left mandible without a long, robust and pilose seta 3
- 3 Head capsula exteriorly from antennae with two small anterolateral protuberances, gill I large, longer than gill IV, hind wings pads rudimentary *C. genevieveae*
- Head capsula exteriorly from antennae without two small anterolateral protuberances, gill I small, slightly shorter than gill IV, hind wings pads absent *C. dasilvai*

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