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TAXONOMY AND NOMENCLATURE

A new species of *Campylothorax* (Collembola: Paronellidae: Paronellinae) from Northern Brazil

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ABSTRACT. *Campylothorax viruaensis* **sp. nov.**, a new species of paronellid springtail from the Amazon Rainforest, state of Roraima, Brazil, is herein described and illustrated. The new species is characterized by: pale yellow body with dark blue pigment on abdomen III and IV; dorsal chaetotaxy presenting S5i macrochaeta on head, mesothorax with 6-8 macrochaetae in p1-4 complex; A5 as macro or microchaeta on abdomen IV; collophore anterior side with 4+4 anterior long chaetae; and mucro with five teeth. Other characteristics usually omitted in traditional descriptions for the genus are presented such as morphology of apical region of third and fourth antennal segments, labial papillae, chaetotaxy of subcoxae, collophore, abdomen V and ventral region of head. Trunk specialized chaetae (S-chaetae) are also presented. *Campylothorax viruaensis* **sp. nov.** is the fourth record of *Campylothorax* from Brazil, the second from the Brazilian Amazon Rainforest and the first from the state of Roraima.

KEY WORDS. Amazon Rainforest, detailed dorsal chaetotaxy, Paronellini, Roraima, taxonomy.

Campylothorax Schött, 1893 is a small genus of large epiedaphic paronellid springtails that are mostly found over dead litter and vegetation (Bellinger et al. 2016). These animals are characterized by very long antennae (longer than body), well developed appendages, and particularly by a strong bending between an enlarged metathorax and abdomen I, which gives the genus its name (Mitra & Dallai 1980, Mari Mutt 1987, Bellinger et al. 2016).

Campylothorax currently comprises 12 described species which are restricted to the Neotropical and Ethiopian regions, with nine and three species, respectively (Soto-Adames 2016, Bellinger et al. 2016). In Brazil, only three species have been recorded: *C. cassagnaus* Mitra & Dalai, 1980, *C. schaefferi* Börner, 1906 and *C. mitrai* Bellini & Meneses, 2012. Among the species cited above, only *C. schaefferi* had been previously found in Northern Brazil (Abrantes et al. 2012).

Herein we describe a new species of *Campylothorax* from the Amazon Rainforest of the state of Roraima, Northern Brazil, and add new characteristics to the generic diagnosis.

MATERIAL AND METHODS

Specimens were collected with pitfall traps, preserved in 70% ethanol, clarified with potassium dichromate and hydrochloric acid, and mounted on glass slides with Arlé's liquid following the procedures described in Arlé & Mendonça (1982). Habitus was photographed in ethanol gel using a DFC420 digital camera attached to a stereomicroscope. Photographs were digitally corrected using the Leica Application Suite V3.4.1. The overall morphology was described based on specimens of the entire type series. The dorsal chaetotaxy schemes follow Szeptycki (1979), Mitra & Dalai (1980), Mari Mutt (1987), Soto-Adames et al. (2014) and Soto-Adames (2016); trunk specialized chaetae (S-chaetae) follow Zhang & Deharveng (2015); labial chaetotaxy follows Gisin (1964) and labial papilla follows Fjellberg (1999). Abbreviations used in the descriptions are: Ant, Abd and Th for antennae, abdomen and thorax segments, respectively. Type material is deposited at the Invertebrate Collection of Instituto Nacional de Pesquisas da Amazônia (INPA), Manaus, state of Amazonas, Brazil.

TAXONOMY

Campylothorax viruaensis Santos, Cipola & Bellini, **sp. nov.**

Figs. 1-29

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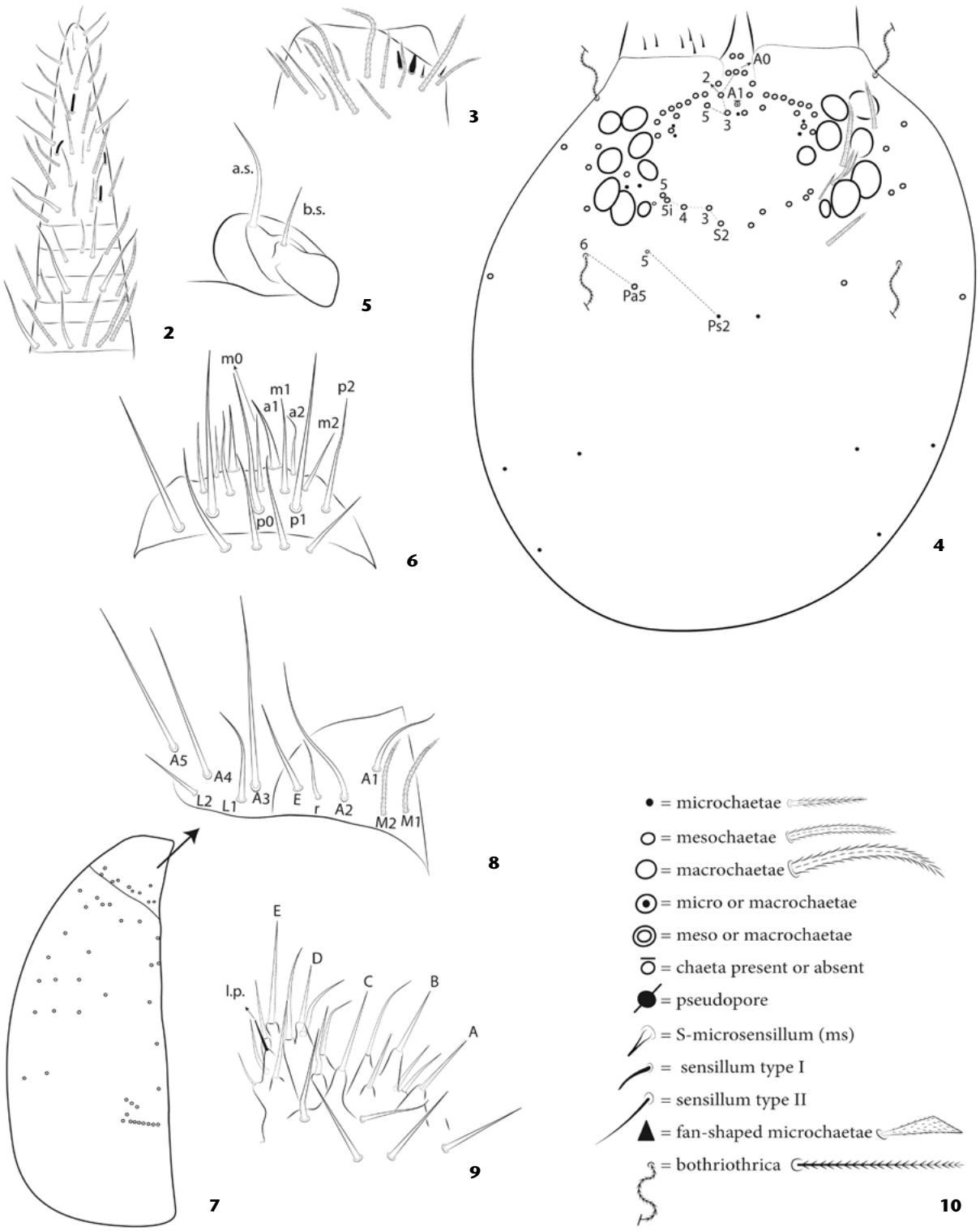
Description. Total length of holotype 2.48 mm. Habitus typical of *Campylothorax* (Fig. 1). Specimens in ethanol pale yellow with dark blue pigment covering Ant I (completely), II (partially), part of head, anterior and lateral regions of Th II, latero-anterior region of Th III, legs, Abd III (almost completely), Abd IV (a large transversal band covering 2/3 centrally in the segment) and middle region of dens (Fig. 1). Brownish scales covering Ant I and II, basal halves of Ant III and IV, head, thorax, abdomen, legs and furcula. Collophore without scales. Dorsal head and trunk with reduced number of macrochaetae.

Head. Ant IV annulated, with smooth and ciliate chaetae and some blunt sensilla (Fig. 2). Ant III apical sense organ with 2 rods, 2 guard sensilla, surrounded by smooth and ciliate chaetae (Fig. 3). Eye patches oval, largest lenses A and B, smallest G and H, with four interocular chaetae (Fig. 4). Maxillary palp with one smaller (about half length of a.s.) smooth basal chaeta (b.s.) (Fig. 5). Four prelabral and 14 (4/5/5) labral smooth chaetae, four anterior (a1 and a2), five median (m0, m1 and m2) and five posterior (p0, p1 and p2) (Fig. 6). Head ventral chaetotaxy as in Fig. 7, all post-labium chaetae ciliate. Basomedian and basolateral field with chaeta M1-M2, r, E, L1-L2, A1-A5 (Fig. 8). Labium with five smooth proximal chaetae. Labial palp with five papillae (A-E), A and C simple, B and D with 4 smooth appendages and E with lateral process (l.p.) smaller than the papilla and 4 smooth appendages (Fig. 9). Dorsal chaetotaxy (Figs. 4, 10) with 11 antennal macrochaetae; 4 or 5 anterior macrochaetae (A0, A1, A2, A3 and A5), A1 as macro, microchaeta or totally absent; 5 sutural macrochaetae (S2, S3, S4, S5i and S5); 2 post-sutural chaetae, Ps2 as microchaeta and Ps5 as mesochaeta; 2 post-occipital anterior chaetae, Pa5 as macrochaeta and Pa6 as bothriotrichum; posterior region with 3 microchaetae.

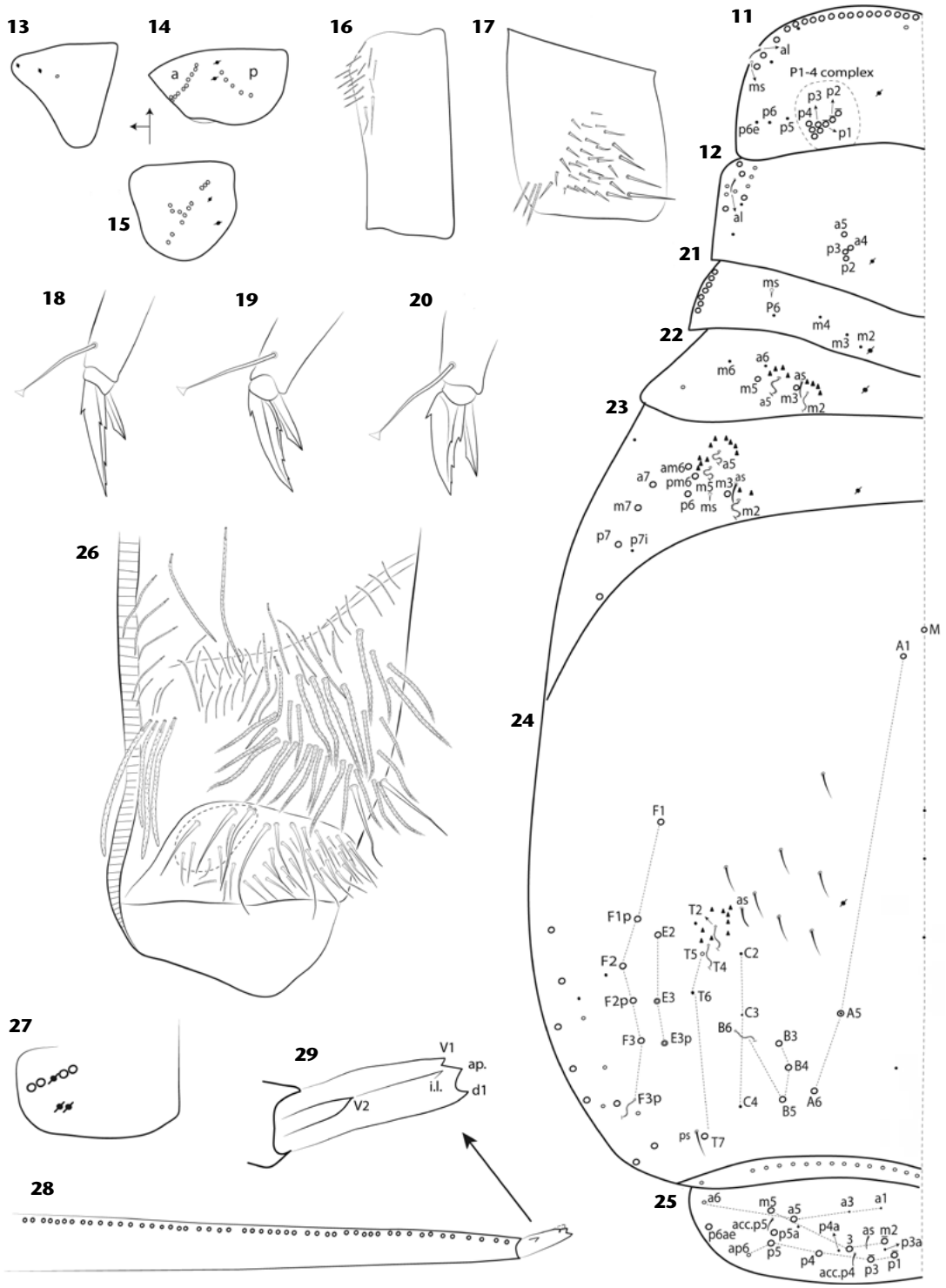
Thorax. Dorsal thorax chaetotaxy as in Figs. 11-12; legends to symbols as in Fig. 10. Th II posterior series 'p' with p1-4 postero-medial complex formed by 6-8 macrochaetae, arranged as typical for *Campylothorax*; p5, p6 and p6e as microchaetae; antero-lateral sensillum 'al' (S-chaeta) and microsensillum 'ms' (S-microchaeta) present (Fig. 11). Th III internal macrochaetae a5, a4, p3 and p2 present, antero-lateral sensillum 'al' (S-chaeta) present (Fig. 12). Legs. Subcoxa I with one macrochaeta and two pseudopores; subcoxa II with an anterior row (a) of 10 macrochaetae, posterior row (p) with five macrochaetae and two pseudopores; subcoxa III with a row of nine anterior plus three posterior macrochaetae and two posterior pseudopores (Figs. 13-15). Trochanter I with 11 anterior ciliate and four smooth chaetae (Fig. 16). Trochanteral organ with approximately 35 spine-like chaetae (Fig. 17). All ungues with four inner teeth, one pair at the basis, one medial and one smaller apical tooth; unguiculi trilamelate with two lamellae acuminate and one truncate, with smooth edges; tenent hair capitate, with smooth edges (Figs. 18-20).

Figure 1. *Campylothorax viruaensis* **sp. nov.**, habitus of a fixed specimen in ethanol. Scale bar: 1 mm.

Abdomen. Dorsal chaetotaxy as in Figs. 21-25; legends to symbols as in Fig. 10. Abd I medial series 'm' with m2, m3 and m4 as microchaetae; p6 as microchaeta, anterior microsensillum 'ms' (S-microchaeta) present (Fig. 21). Abd II bothriothricha m2 and a5 present, with four surrounding fan-shaped elements each; a6 and m6 as microchaetae; m3 and m5 as macrochaetae; medial sensillum 'as' (S-chaeta) near m3 (Fig. 22). Abd III bothriothrica m2, m5 and a5 present, with two, four and six surrounding fan-shaped chaetae, respectively; m3, am6, pm6, p6, a7, m7, p7 plus one unnamed latero-posterior macrochaetae present; medial sensillum 'as' (S-chaeta) and microsensillum 'ms' (S-microchaeta) present (Fig. 23). Abd IV 'M' series with one macrochaeta and three microchaetae; 'A' series with A1 and A6 as macrochaetae and A5 as macro or microchaeta; 'B' series with B3-B5 as macrochaetae; B6 as posterior bothriothricum; 'C' series with C2-C4 as microchaetae; 'T' series with T2 and T4 as bothriothrica with six and three surrounding fan-shaped elements, respectively, T5 as mesochaeta and T7 as macrochaeta,



Figures 2-10. *Campylothorax viruaensis* **sp. nov.**: (2) antenna IV; (3) antenna III; (4) head dorsal chaetotaxy; (5) maxillary palp; (6) prelabral and labral chaetotaxy; (7) head ventral chaetotaxy; (8) labial region (left); (9) labial palp; (10) symbols used in detailed chaetotaxy schemes.



Figures 11-29. *Campylothorax viruaensis* **sp. nov.**: (11) mesothorax dorsal chaetotaxy; (12) metathorax dorsal chaetotaxy; (13) subcoxa I; (14) subcoxa II; (15) subcoxa III; (16) trochanter I; (17) trochanteral organ; (18) foot I complex; (19) foot II complex; (20) foot III complex; (21) abdomen I dorsal chaetotaxy; (22) abdomen II dorsal chaetotaxy; (23) Abdomen III dorsal chaetotaxy; (24) abdomen IV dorsal chaetotaxy; (25) abdomen V dorsal chaetotaxy; (26) collophore; (27) manubrial plate; (28) dental spines; (29) mucro.

T6 as microchaeta; 'E' series with E2 as macrochaeta, E3 and E3p as meso or macrochaetae; 'F' series with F1-F3 as macrochaetae and F3p as bothriothricum; 14 lateral chaetae with uncertain homology (unnamed) and posterior region with about 15 mesochaetae (Fig. 24). One anterosubmedial sensillum 'as' type I (S-chaetae), seven central unnamed sensilla type II plus one posterior sensillum 'ps' (Fig. 24). Abd V anterior series 'a' with a1 and a3 as microchaetae, a5 as macrochaeta, a6 as mesochaeta; medial series 'm' with m2 (present or absent), m3 and m5 as macrochaetae; posteroanterior series 'pa' with p3a and p4a as macrochaetae, p5a and p6ae as macrochaetae; posterior series 'p' with p1, p3 (present or absent), p4 and p5 as macrochaetae, and ap6 as mesochaeta; sensilla 'as', 'acc.p4' and 'acc.p5' type I present (Fig. 25). Collophore. Anterior side with 4 long slightly ciliate chaetae plus eight small proximal chaetae; latero-distal flap with approximately 38-46 smooth chaetae, eight more anterior chaetae present or absent (circled in Fig. 26), 40 slightly ciliate plus 27 ciliate chaetae on proximo-lateral side (outside flap); posterior side with 2 smooth chaetae (Fig. 26). Furcula. Manubrial plate (dorso-distal region) with 4 ciliate chaetae and 3 pseudopores (Fig. 27). Dens with one row of 41-50 ciliate spines (Fig. 28). Mucro typically elongated with five teeth, one basal tooth and four apical teeth (d1, ap., v1, v2 and i.l.) (Fig. 29).

Material examined. Holotype female, on slide number COLLE 055/INPA, Brasil, *Roraima*: Caracaraí (Parque Nacional de Viruá, 1.486667N, 61.047778 W), 21.ix-9.x.2012, pitfall-trap, I.P.S. Santos coll. Paratypes: 4 males and 2 females on slides COLLE 055A-F/INPA, same data of the holotype. Paratypes: 5 males on slides COLLE 055G-K/INPA, same data of the holotype, except 16.i-6.ii.2013.

Distribution and habitat. Specimens of *C. viruaensis* **sp. nov.** were collected within the Amazon Rainforest and *campinarana* of Viruá National Park, state of Roraima, Brazil, which are included in Good's biogeographic zones 25 and 26, Neotropical Region, high and lowlands of Northern Brazil (Good 1974). The climate of the area is Equatorial (af), fully humid, characterized by seasonal flooding in lower zones (Kottek et al. 2006). The specimens were found in litter of dry and previously flooded forests during the dry season.Etymology. The species name is after its type locality, National Park of Viruá.

Remarks. The dorsal chaetotaxy and body pigmentation of *C. viruaensis* **sp. nov.** resemble *C. sabanus* (Wray, 1953) from Puerto Rico and *C. cubanus* Gruia, 1983 from Cuba. The new species differs from both in dorsal head chaetotaxy, with S5i macrochaeta (as microchaeta in *C. sabanus* and absent in *C. cubanus*). Abd IV central-posterior macrochaetae (4-5 in the new species, 6 in others), and 8 latero-posterior macrochaetae on series 'E' to 'F' (6 in the other two species). *Campylothorax sabanus* also presents a distinct labial chaetotaxy when compared to the new species: L2 is extremely reduced (see Mari-Mutt 1987: 415), while in the new species L2 is only a little smaller. Regarding the collophore anterior side, *C. cubanus* and *C. sabanus* present 3+3 anterior long chaetae, while *C. viruaensis* **sp. nov.** presents 4+4.

Concerning the color pattern, the new species differs especially in Abd IV pigmentation. It only presents a transversal band of dark pigment in its middle region, while *C. sabanus* has almost all the second half of Abd IV pigmented, including the distal region. *Campylothorax schaefferi* presents a similar color pattern to *C. viruaensis* **sp. nov.**, especially regarding Abd IV (with one transversal band of pigment), but the two species are different in the number of mucronal teeth (four in *C. schaefferi*, five in *C. viruaensis* **sp. nov.**) (Mitra & Dallai 1980). Several other morphological features of *C. schaefferi* are currently unclear and a redescription of it with observation of ventral head and whole dorsal chaetotaxy is in need to rightly compare this species with other Neotropical taxa.

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