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Further contribution to the knowledge of *Ityphilus calinus* Chamberlin, 1957, a poorly known ballophilid centipede from Colombia, with description of *Ityphilus bonatoi,* a new diminutive geophilomorph species from Brazil (Myriapoda: Chilopoda, Geophilomorpha)

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Abstract

Ityphilus calinus Chamberlin, 1957 (Chilopoda: Geophilomorpha, Ballophilidae), a poorly known centipede from Cauca Valley, Colombia, is herein redescribed and illustrated after the male holotype, revealing the condition of the forcipular tarsungulum (which is completely smooth), also giving new data on many other morphological features of specific value until now unknown. A new diminutive species named *Ityphilus bonatoi* **sp. nov.** is herein proposed after the holotype female from Rio de Janeiro State, Brazil. The new species is characterized by having the internal edge of the forcipular tarsungulum serrate; among the other Neotropical members of the genus having the same trait, it only shares with *I. donatellae* Pereira, 2012 (from Central Amazon) a very small body size and a low number of leg-bearing segments. The new species represents the first record of the genus *Ityphilus* from the Atlantic Rainforest biome, and the southernmost representative of the genus in the Continent. A key for identification of the Neotropical species currently included in *Ityphilus* is also given.

Key words: Chilopoda, Geophilomorpha, Ballophilidae, *Ityphilus*, Diminutive new species, Neotropical Region

Introduction

The genus *Ityphilus* Cook, 1899 is the most species-rich and widespread of the ballophilid genera in the Neotropics. It is known from the southernmost part of North America; Central America; Lesser and Greater Antilles (Guadeloupe, Antigua, Barbuda, Bahamas, Cuba); and Continental South America (Colombia, Guyana, French Guiana, Brazil and Peru).

Of the 20 Neotropical species currently recognized in the taxon, 12 (in addition to the new species described below) are characterized by having the internal edge of the forcipular tarsungulum serrate. Of the eight remaining taxa, five are known to have a smooth forcipular tarsungulum. For the other three (*I. calinus* Chamberlin, 1957 (from Colombia); *I. savannus* Chamberlin, 1943 (from Mexico) and *I. ceibanus* Chamberlin, 1922 (from Honduras)) the original descriptions do not state whether the forcipular tarsungulum is serrate or smooth.

The opportunity to examine the holotype of *I. calinus* enabled to reveal the condition of the forcipular tarsungulum and to describe many other morphological characters of specific value omitted by Chamberlin. The knowledge of the mentioned trait allows to confidently identify as belonging to a new species, a tiny adult specimen of *Ityphilus* collected in Rio de Janeiro State, Brazil, described herein under the name of *Ityphilus bonatoi*. Similar to *I. calinus*, the new species is characterized by a low and similar number of leg-bearing segments, and a small body size, but has a serrate, rather than smooth, tarsungulum. The discovery of this new taxon represents the first record of the genus *Ityphilus* from the Atlantic Rainforest biome, and the southernmost representative of the genus in the Continent. The updated key presented below will enable the identification of the Neotropical members of *Ityphilus,* including the new species described herein.

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Material and methods

The holotype of the new species is deposited at the Museu de Zoologia da Universidade de São Paulo (MZUSP). Other type material examined is currently deposited at the California Academy of Sciences, San Francisco (CAS). Dissections were performed using a stereomicroscope and standard dissecting tools. The specimens were examined and illustrated in detail, utilizing a compound microscope equipped with a drawing tube attachment, which was used to delineate the figures (and draw scales bars at their sides with the aid of a glass stage-micrometer). Temporary mounts have been prepared by direct transfer of the specimen from the preservation liquid (70% ethanol) onto microscope slides, using undiluted 2-Phenoxyethanol (CAS # 122-99-6) as a clearing agent and mounting medium. Details of the preparation of microscope slides and dissection procedures are described in Pereira (2000), Foddai *et al*. (2002). All measurements are given in mm. Terminology for external anatomy follows Bonato *et al*. (2010). The following abbreviation is used in the text and legends of the figures: a.a.—antennal article/articles.

Results

Family Ballophilidae

Genus *Ityphilus* Cook, 1899

Diagnosis. This genus can be distinguished from the other genera currently recognized in the family Ballophilidae by the following combination of features. Antennae somewhat curved in the middle to truly geniculate, distally slightly thickened to strongly clavate. Mid-piece of labrum membranous, without teeth or with minute hair-like structures. Forcipular coxosternite with incomplete to nearly complete chitin-lines. Internal edge of forcipular tarsungulum smooth or serrate. Ventral pore-fields of anterior region of the body single (subcircular to transversely elliptical in shape), those of posterior region, single or divided into two areas. Coxopleura of the last leg-bearing segment each with two internal coxal organs of simple structure ("homogeneous coxal glands", *sensu* Brölemann & Ribaut 1912). Legs of the ultimate pair with seven articles, ultimate pretarsus setiform, basally tubercle-like and usually accompanied by a minute spine.

Type species of the genus. *Ityphilus lilacinus* Cook, 1899, by original designation.

Remarks. All species currently assigned to the taxon are listed in Minelli, 2006; Bonato *et al*. (2007); Pereira (2010, 2012, 2013a).

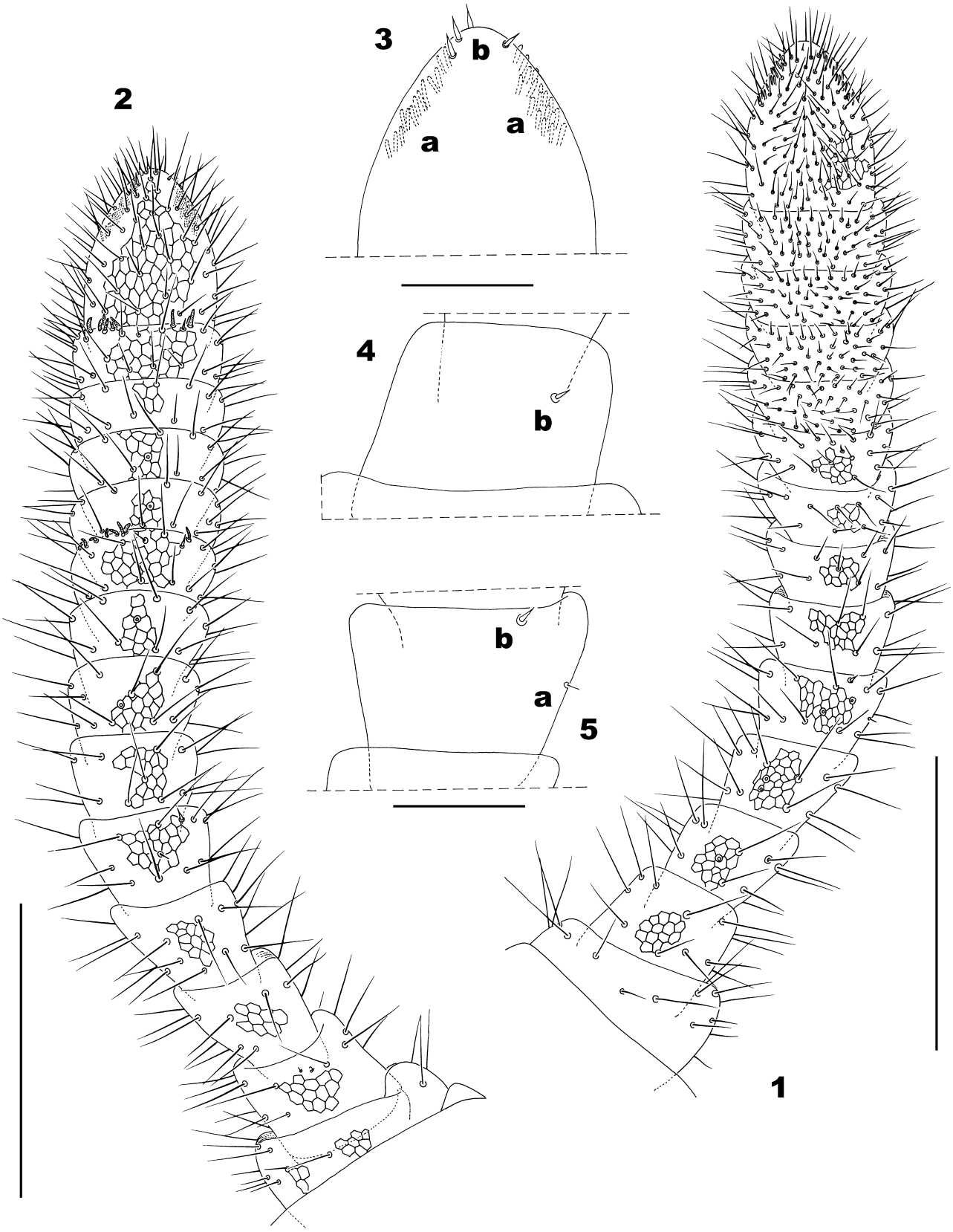
The actual distinction between *Ityphilus* and the probably closely related genera *Ballophilus* Cook, 1896 and *Diplethmus* Cook, 1899 deserves further investigation (cf. Turk 1955, Crabill 1960, Pereira & Minelli 1996, Pereira *et al.* 1997, 2000, Bonato *et al.* 2007).

Ityphilus calinus Chamberlin, 1957

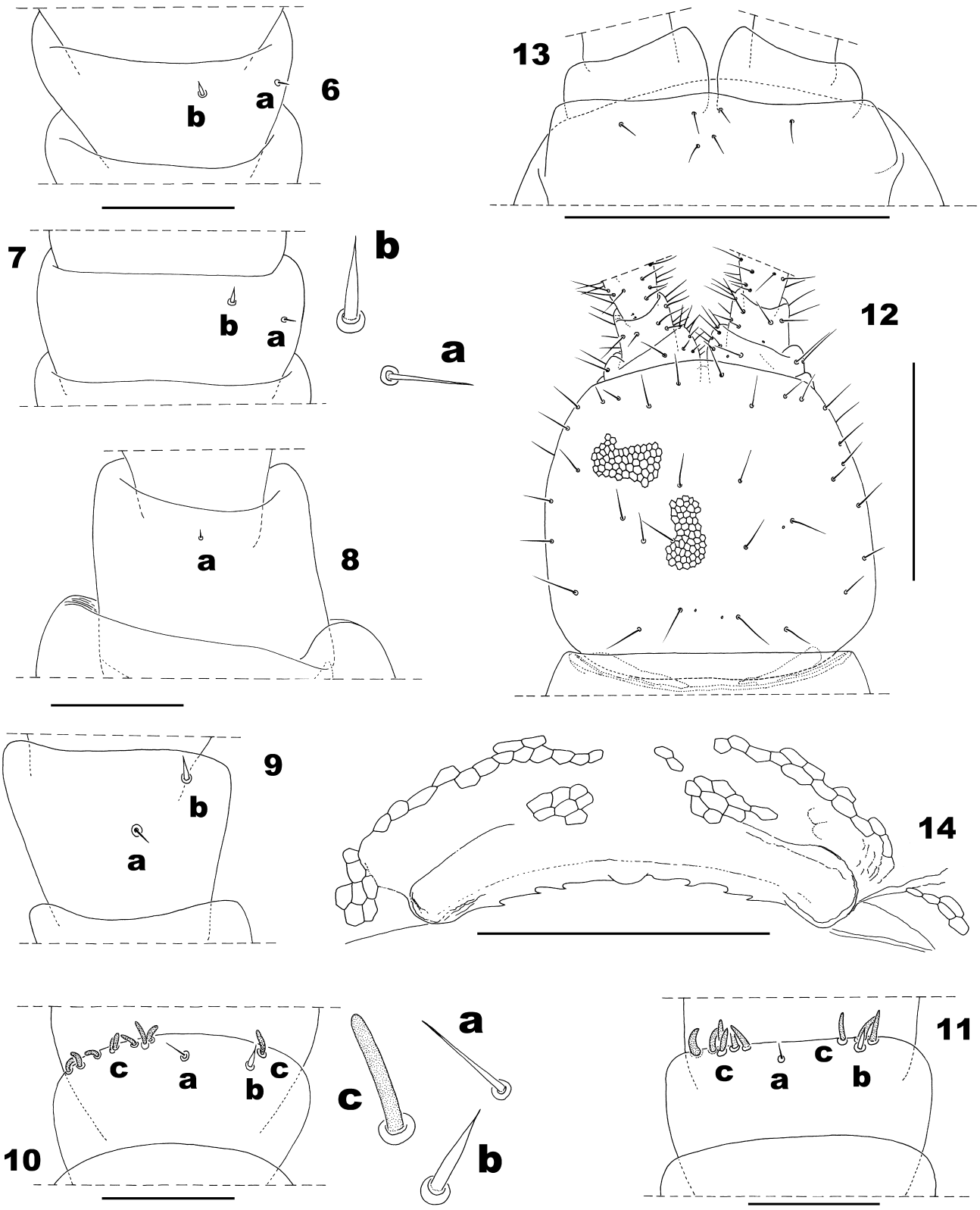
(Figs. 1–52)

Ityphilus calinus Chamberlin, 1957:25, 30; Pereira & Minelli, 1996:110; Foddai *et al.,* 2000:153; Adis *et al.,* 2002:18; Foddai *et al.,* 2002:473; Foddai *et al,* 2004:276; Bonato *et al.,* 2007:3; Pereira, 2010:663; Pereira 2012: 291, 292, 296, 297, 300–302, 304, 306, 307; Pereira 2013a: 13, 23.

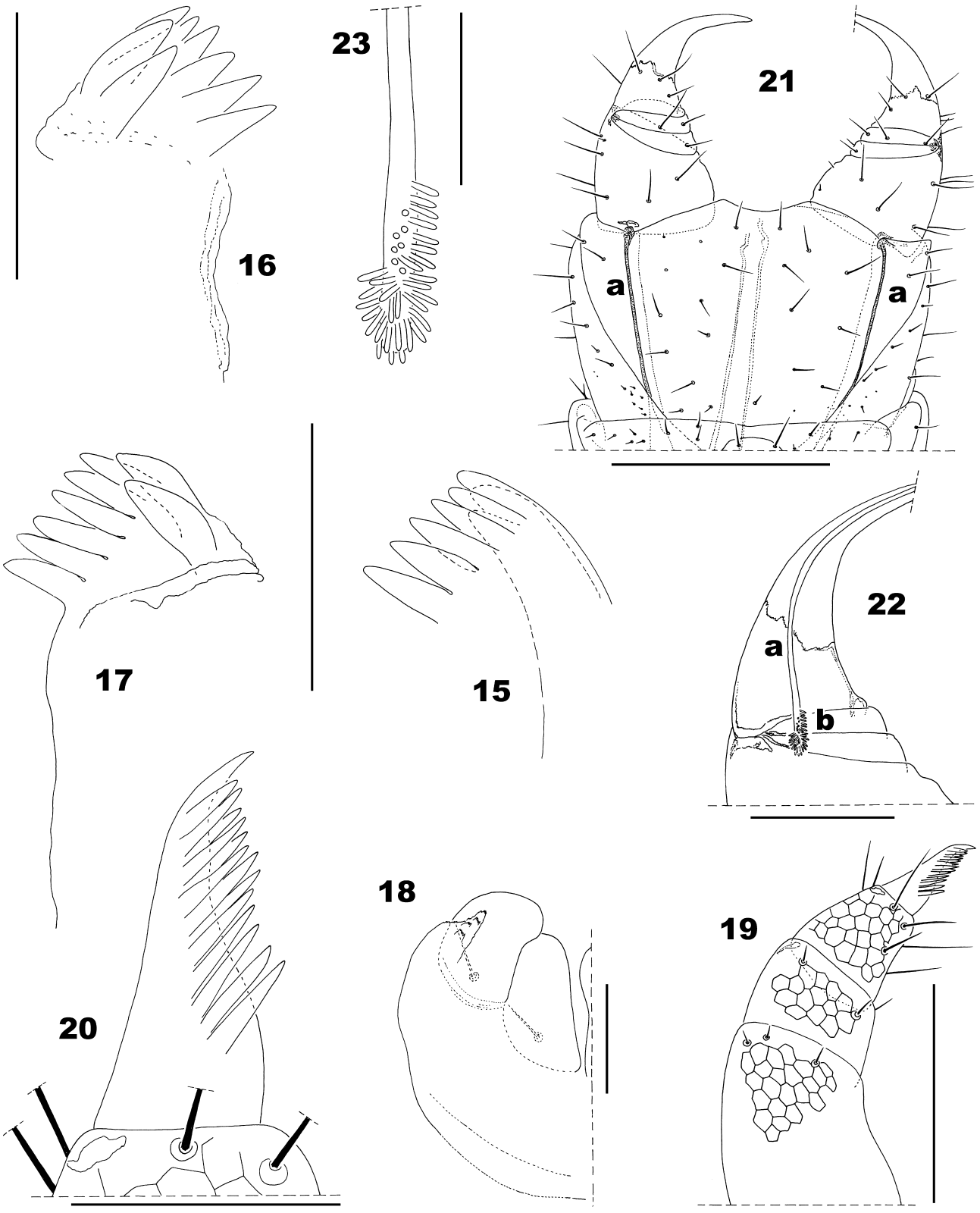
Diagnosis. A Neotropical species of *Ityphilus* with internal edge of the forcipular tarsungulum completely smooth. The other Neotropical members of the genus sharing the same trait are *I. cavernicolus* (Matic, Negrea & Fundora Martinez, 1977) (from Cuba); *I. idanus* Crabill, 1960 (from Antigua and Barbuda); *I. lilacinus* Cook, 1899 (from South Bimini Island: Bahamas: British West Indies; Sugarloaf Key: Florida: USA); *I. palidus* (Matic, Negrea & Fundora Martinez, 1977) (from Cuba); and *I. polypus* (Matic, Negrea & Fundora Martinez, 1977) (from Cuba). *Ityphilus calinus* can be differentiated from all these taxa by the low number of leg-bearing segments, 43 (against 49 to 93 in the others). Among them, those having a range of leg-bearing segments roughly similar to *I. calinus* are *I. cavernicolus* and *I. idanus*.



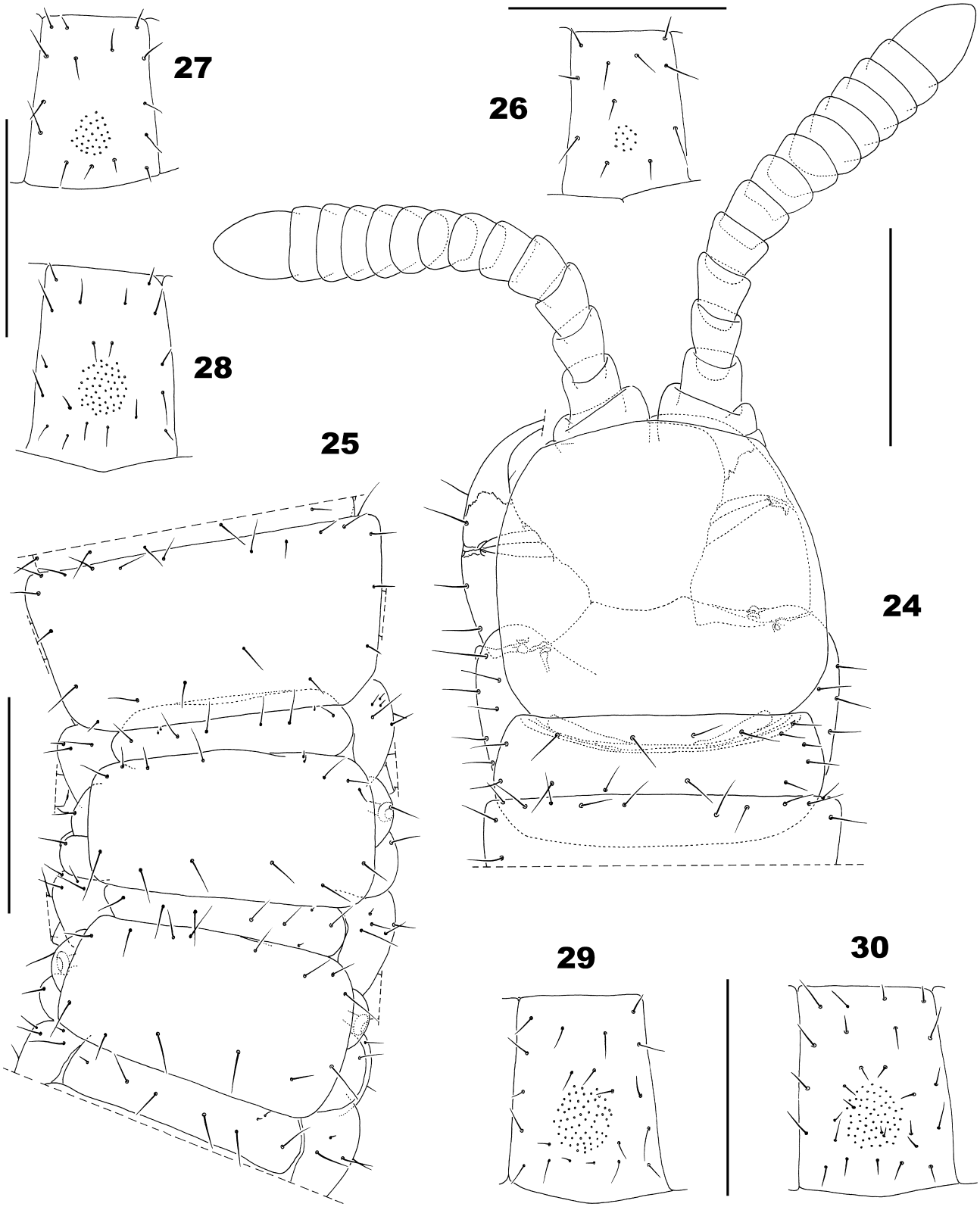
FIGURES 1–5. *Ityphilus calinus* Chamberlin, 1957 (male holotype; COLOMBIA: Valle del Cauca Department: 13 miles W of Santiago de Cali): (1) Right antenna, ventral. (2) Right antenna, dorsal. (3) Apical portion of right a.a. XIV, dorsal (a: claviform sensilla, b: apical specialized sensilla). (4) Right a.a. II, ventral (b: *b* type sensilla). (5) Right a.a. V, ventral (a, b: *a, b* type sensilla). Scale bars: 0.05 mm (3–5); 0.2 mm (1, 2).



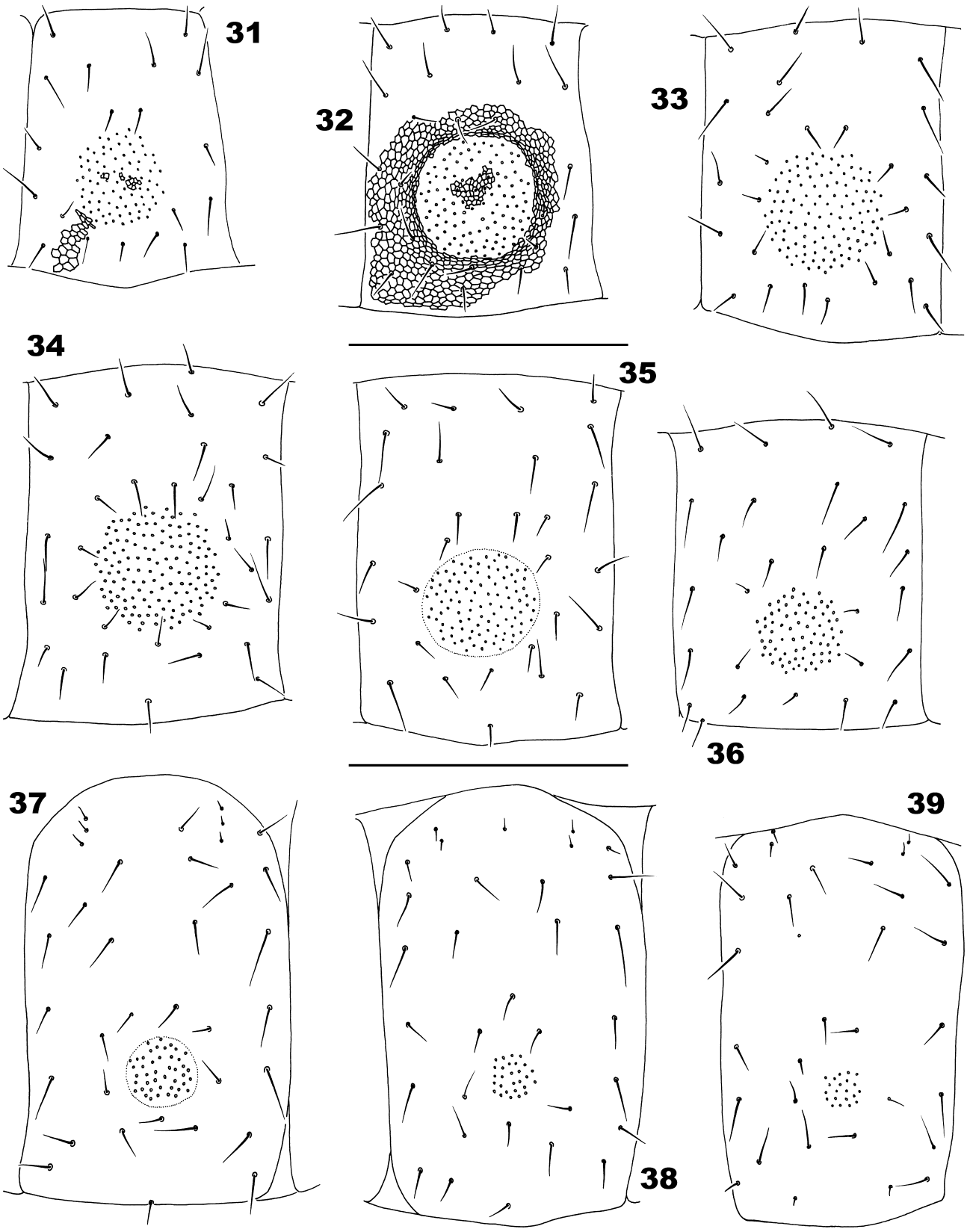
FIGURES 6–14. *Ityphilus calinus* Chamberlin, 1957 (male holotype; COLOMBIA: Valle del Cauca Department: 13 miles W of Santiago de Cali): (6) Right a.a. IX, ventral (a, b: *a, b* type sensilla). (7) Right a.a. XIII, ventral (a, b: *a, b* type sensilla). (8) Right a.a. II, dorsal (a: *a* type sensilla). (9) Right a.a. V, dorsal (a, b: *a, b* type sensilla). (10) Right a.a. IX, dorsal (a, b, c: *a, b, c* type sensilla). (11) Right a.a. XIII, dorsal (a, b, c: *a, b, c* type sensilla). (12) Cephalic plate and bases of antennae. (13) Clypeus and bases of antennae. (14) Labrum. Scale bars: 0.05 mm (6–11); 0.1 mm (14); 0.3 mm (12, 13).



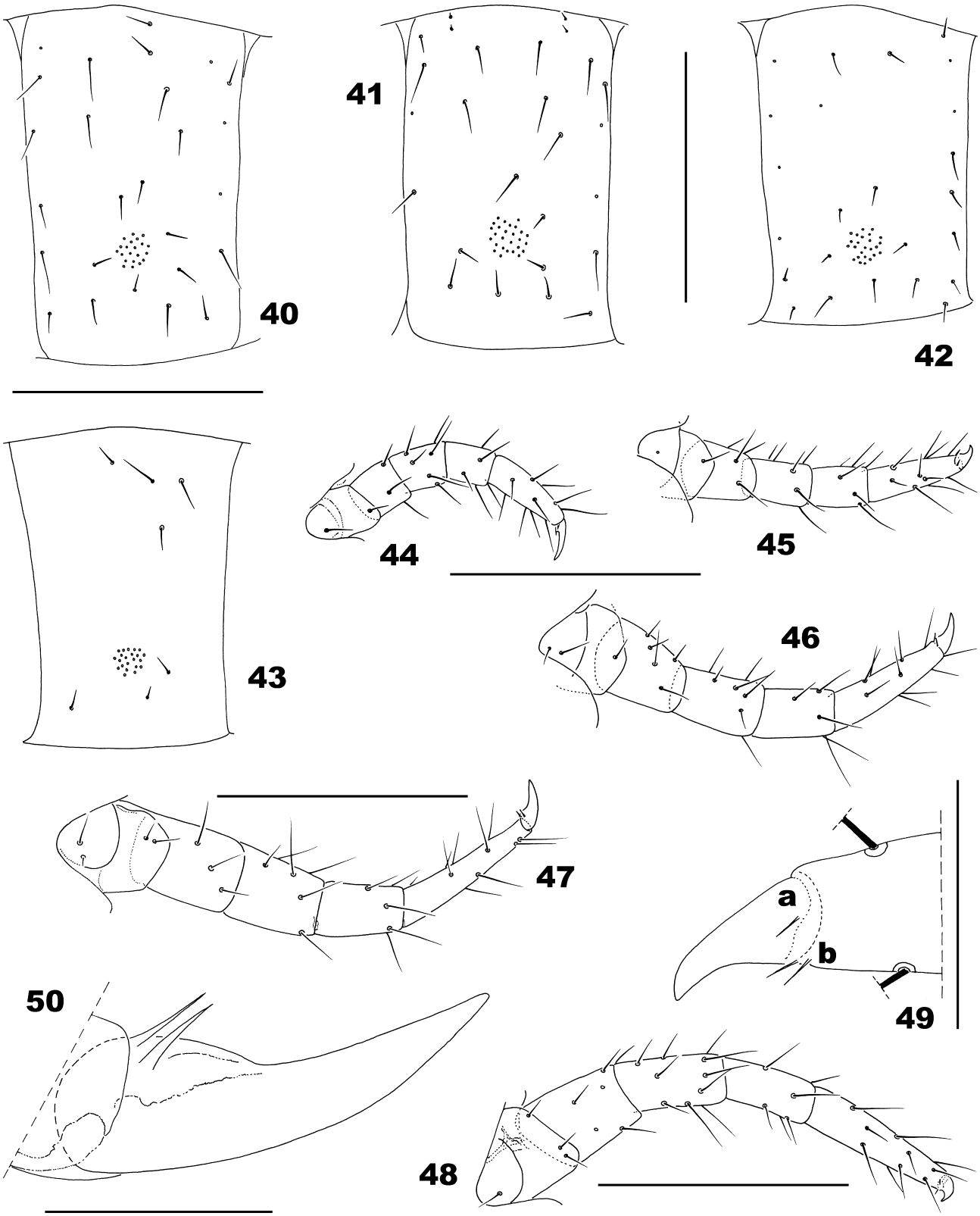
FIGURES 15–23. *Ityphilus calinus* Chamberlin, 1957 (male holotype; COLOMBIA: Valle del Cauca Department: 13 miles W of Santiago de Cali): (15) Dentate lamella of right mandible, dorsal. (16) Dentate lamella of right mandible, ventral. (17) Dentate lamella of left mandible, ventral. (18) Left side of first maxillae, dorsal. (19) Left telopodite of second maxillae, dorsal. (20) Claw of left telopodite of second maxillae, dorsal. (21) Forcipular segment, ventral (a: chitin-lines). (22) Duct (a) and calyx (b) of poison gland in left forcipular telopodite, dorsal. (23) Detail of calyx of poison gland in left forcipular telopodite, dorsal. Scale bars. 0.03 mm (15–17, 20, 23); 0.05 mm (18); 0.1 mm (19, 22); 0.3 mm (21).



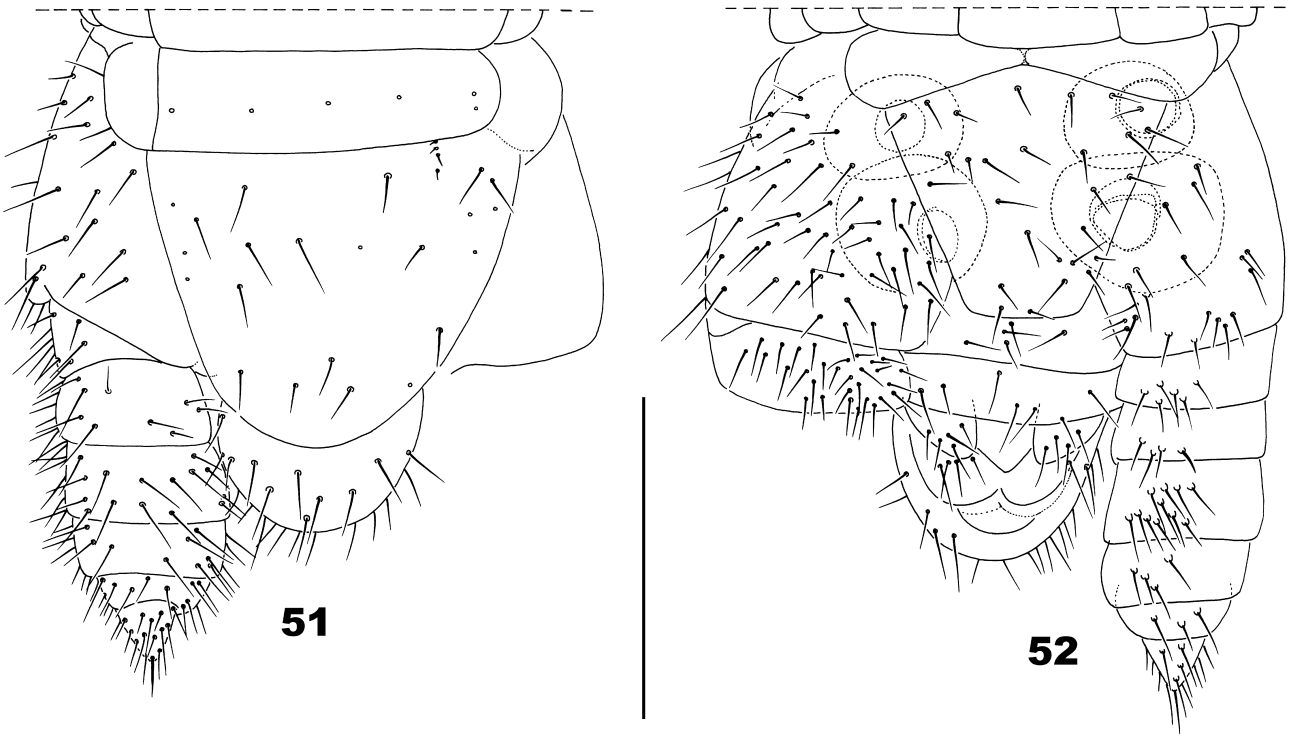
FIGURES 24–30. *Ityphilus calinus* Chamberlin, 1957 (male holotype; COLOMBIA: Valle del Cauca Department: 13 miles W of Santiago de Cali): (24) Dorsal view of anterior region of the body, showing antennae, cephalic plate, forcipular segment and anterior portion of leg-bearing segment 1 (setae suppressed on antennae and cephalic plate). (25) Leg-bearing segments 1–3, dorsal. (26) Sternite 2. (27) Sternite 3. (28) Sternite 4. (29) Sternite 5. (30) Sternite 6. Scale bar: 0.3 mm.



FIGURES 31–39. *Ityphilus calinus* Chamberlin, 1957 (male holotype; COLOMBIA: Valle del Cauca Department: 13 miles W of Santiago de Cali): (31) Sternite 7. (32) Sternite 10. (33) Sternite 14. (34) Sternite 19. (35) Sternite 22. (36) Sternite 24. (37) Sternite 27. (38) Sternite 29. (39) Sternite 31. Scale bar: 0.3 mm.



FIGURES 40–50. *Ityphilus calinus* Chamberlin, 1957 (male holotype; COLOMBIA: Valle del Cauca Department: 13 miles W of Santiago de Cali): (40) Sternite 33. (41) Sternite 34. (42) Sternite 35. (43) Sternite 39. (44) Left leg (pair 1), anteroventral view. (45) Left leg (pair 2), ventral. (46) Left leg (pair 11), posteroventral view. (47) Left leg (pair 19), posteroventral view. (48) Left leg (pair 27), anteroventral view. (49) Claw of the right leg (pair 2), anteroventral view. (50) Claw of the left leg (pair 19), anteroventral view. Scale bars: 0.03 mm (50); 0.05 mm (49); 0.3 mm (40–48).



FIGURES 51–52. *Ityphilus calinus* Chamberlin, 1957 (male holotype; COLOMBIA: Valle del Cauca Department: 13 miles W of Santiago de Cali): (51) Ultimate leg-bearing segment and postpedal segments, dorsal. (52) Ultimate leg-bearing segment and postpedal segments, ventral. Scale bar: 0.3 mm.

Ityphilus calinus can be confidently differentiated from *I. cavernicolus* by means of the following selected traits (the corresponding traits in the latter are given in parentheses): body length of male 19 mm (50 mm (female?)); male with 43 leg-bearing segments (49, 51, 53, 55, 57, 59, "frequently 51–53" (sex not specified for each number)); antennae moderately clavate, not truly geniculate (strongly clavate and geniculate); a.a. XIV longer than wide (wider than long); cephalic plate *ca.* as long as wide (wider than long); telopodites of first maxillae with lappets (without lappets); forcipular coxosternum with complete, strongly developed chitin-lines, Fig. 21: a ("very fine and difficult to observe"); ventral pore-fields circular in shape (transversally subrectangular); tergites smooth (roughened).

Ityphilus calinus can be confidently differentiated from *I. idanus* by means of the following selected traits (the corresponding traits in the latter are given in parentheses): male with 43 leg-bearing segments (male with 55, female with 59); dorsal side of a.a. IX and XIII with *ca.* 9 spine-like deeply pigmented specialized sensilla (*ca.* 2); clypeus with 2+2 postantennal setae (1+1); mid-piece of labrum smooth (with a fringe of minute hair-like structures); first maxillary telopodite lappets present (absent); labrum side-pieces with 3+3 teeth (1-2+1-2); shape of calyx of poison gland cylindrical, Fig. 23 (like a bunch of grapes, Fig. 118: a); sternite of ultimate leg-bearing segment with ratio of width of anterior border/width of posterior border, *ca.* 2.47: 1 (*ca.* 1.58: 1).

Remarks. Morphological traits included in Table 1 differentiate *I. calinus* from all the other Neotropical species of *Ityphilus* with internal edge of forcipular tarsungulum smooth.

Ityphilus calinus can be confidently separated from *I. savannus* and *I. ceibanus* (of which it is unknown whether the forcipular tarsungulum is serrate or smooth) by means of the following selected traits (corresponding features for *I. calinus* already mentioned above).

I. savannus: terminal portion of the antennae greatly thickened; male with 55 leg-bearing segments.

I. ceibanus: antennae strongly clavate and geniculate; head longer than wide; more than 69 leg-bearing segments (sex unknown).

Type material examined. COLOMBIA: Valle del Cauca Department: 13 miles W of Santiago de Cali, 20 March 1955: holotype ♂, 43 leg-bearing segments, body length about 19 mm (right ultimate leg missing, rest of the body complete).

Depository of type. CAS.

TABLE 1. Comparative matrix of morphological traits for *Ityphilus calinus* Chamberlin, 1957, *I. cavernicolus* (Matic, Negrea & Fundora Martinez, 1977), *I. idanus* Crabill, 1960, *I. lilacinus* Cook, 1899, *I. palidus* (Matic, Negrea & Fundora Martinez, 1977) and *I. polypus* (Matic, Negrea & Fundora Martinez, 1977).

	I. calinus	*I. cavernicolus*	*I. idanus*	*I. lilacinus*	*I. palidus*	*I. polypus*
Number of leg-bearing segments	43 (male)	49 to 59, frequently 51, 53 (sex not specified for each number)	55 (male) 59 (female)	71 (male)	71 (female)	93 (male)
Body length	19 mm (male)	Up to 50 mm (female?)	9-13 mm (male) 18 mm (female)	30 mm (male)	50 mm (female)	45 mm (male)
Antennae contiguous at base	No (Figs. 12, 13, 24)	No	?	Yes	?	No
Shape of the antennae	Moderately clavate not truly geniculate (Figs. 1, 2)	Strongly clavate, truly geniculate	Moderately clavate, geniculate	Moderately clavate	Moderately clavate	Moderately clavate
A.a. XIV longer than wide	Yes	No, wider than long	Yes	Yes	Yes	Yes
Number of type *c* sensilla	*Ca.* 9 (on a.a. IX and XIII)	"numerous spine-like sensilla" (on a.a. XIII)	*Ca.* 2 (on a.a. IX and XIII)	?	?	?
Cephalic plate	About as long as wide	Wider than long	"In outline nearly circular", width/length ratio 1.12: 1	Conspicuously broader than long, length/width ratio *ca.* 0.74: 1	Almost as wide as long	Roundish
Clypeus: number of postantennal setae	2 + 2	?	1 + 1	?	?	?
Mid-piece of labrum	Smooth	Smooth	With a fringe of minute hairlike structures	?	?	?
Side-pieces of labrum	With 3 + 3 unpigmented teeth	With 3 + 3 teeth	With 1-2 + 1-2 weak, poorly developed obscure teeth	?	?	?
First maxillae: telopodite lappets	Present	Absent	Absent	?	Absent	Absent
Chitin-lines of forcipular coxosternite	Complete, strongly developed (Fig. 21: a)	Very fine and difficult to observe	With prominent subcondylic sclerotic lines	With chitin-lines	Very evident	The chitin-lines are very large and thick
Shape of calyx of poison gland	Cylindrical (Figs. 22, 23: a)	?	Shaped like a bunch of grapes (Fig. 118: a)	?	?	?
Shape of pore-fields	Subcircular	Transversely subrectangular	Subcircular	Irregular-subcircular	Transversely ovoidal	Transversely "almost ovoidal"

……continued on the next page

TABLE 1. (Continued)

	I. calinus	*I. cavernicolus*	*I. idanus*	*I. lilacinus*	*I. palidus*	*I. polypus*
Ventral pore-field series	Sternites of leg-bearing segments 2 to antepenultimate with pore-fields (antepenultimate and penultimate unknown whether present or absent)	From second to antepenultimate leg-bearing segment	From second to fith leg-bearing segment from rear end of the body	?	From second to antepenultimate leg-bearing segment	From second to antepenultimate leg-bearing segment
Shape of sternite of ultimate leg-bearing segment	Trapezoidal, ratio of width of anterior border/width of posterior border *ca.* 2.47: 1	"More or less trapezoidal"	Trapezoidal (ratio of width of anterior border/width of posterior border *ca.* 1.58: 1	"Subtriangular, posteriorly truncate"	"more or less triangular"	"trapezoidal-triangular"
Body surface, roughened	No, smooth	Tergites roughened	?	"Uneven"	Tergites slightly roughened	Pretergites and tergites strongly roughened

Remarks on Table 1. Data for *I. calinus* taken from the holotype male herein examined. Traits of *I. idanus* come from Crabill (1960); *I. lilacinus* from Cook (1899); *I. cavernicolus, I. palidus* and *I. polypus* from Matic, Negrea & Fundora Martinez (1977).

Matic *et al*. (1977) assigned to *I. lilacinus* numerous specimens (males and females) collected in six different caves in Oriente Province, Camagüey Province, and Las Villas Province (Cuba). On the basis of this material, the authors give a new description for this species, stating that the head is longer than wide (length/with ratio *ca*. 1.26: 1) and the antennae are distinctly separated at the base. Moreover, according to the original description, in *I. lilacinus* Cook 1899 the cephalic plate is conspicuously wider than long (length/width ratio 0.74:1) and the antennae are contiguous at the base. These two differences are strong enough to confidently consider the specimens described by Cook as different to those mentioned from Cuba (which may belong to a taxon new to science). Therefore, in the present Table only the characters given by Cook are considered for *I. lilacinus* (and consequently, Cuba is herein removed from the geographic distribution of *I. lilacinus*).

Remarks. The holotype is on a permanent original slide made in glycerin gelatin water-based mounting medium. The entire specimen is in dorsal position, head not separated from the body (mouth parts not dissected), trunk undivided. Head, forcipular segment, and leg-bearing segments 1 to 35 under the cover slip (very well cleared and preserved); leg-bearing segments 36 to 43 and postpedal segments not covered and included in overflowed mounting medium only (therefore the preservation is not adequate for microscopic observation).

Description. Male holotype. Forty-three leg-bearing segments, body length about 19 mm. Trunk attenuate in anterior and posterior regions, with exception of the ultimate leg-bearing segment which is *ca.* 1.25 times as wide as the penultimate. Width of selected leg-bearing segments as follows: 1 (0.50 mm); 2 (0.47 mm); 3 (0.47 mm); 6 (0.54 mm); 12 (0.62 mm); 18 (0.75 mm); 22 (0.80 mm); 27 (0.87 mm); 32 (0.65 mm); 39 (0.61 mm); 42 (0.43 mm); 43 (0.54 mm). Width of cephalic plate 0.45 mm. Width of forcipular coxosternite 0.50 mm. Ground color (of preserved specimen in permanent slide) ocher.

Antennae. Relatively short, *ca*. 1.64 times as long as the cephalic plate, curved at middle, not truly geniculate, apically slightly thickened, moderately clavate (Figs. 1, 2). Basal a.a. not overlapping medially (Figs. 12, 13, 24). Ratio of width of a.a. XII (= widest a.a. of distal antennal half)/width of a.a. III (= narrowest a.a. of basal antennal half) *ca.* 1.34: 1. A.a. XIV of same length as the three previous a.a. taken together. Length/width ratio of right a.a. I–XIV (in ventrodorsal position) as follows: I (0.51:1); II (0.89:1); III (1.04:1); IV (0.92:1); V (0.70:1); VI (0.71:1); VII (0.72:1); VIII (0.68:1); IX (0.64:1); X (0.55:1); XI (0.53:1); XII (0.50:1); XIII (0.52:1); XIV (1.34:1). Ventral chaetotaxy: setae on a.a. I to IX of various lengths, and relatively few in number, those of a.a. X to XIV much shorter and very numerous (Fig. 1). Dorsal chaetotaxy: setae on a.a. I to IX similar to those on ventral side, setae on a.a. XI to XIV much longer and less numerous than those on ventral side (Fig. 2). A.a. XIV with *ca*. 18 claviform sensilla on the external border and *ca*. 13 on the internal border (Fig. 3: a); distal end of this a.a. with *ca. 6* very small hyaline specialized sensilla apparently not split apically (Fig. 3: b). Ventral and dorsal surface of a.a. II, V, IX, and XIII with very small specialized sensilla. Ventrally, sensilla restricted to an apical latero-internal area (Figs. 4–7), represented by two different types: *a* and *b*. Type *a* sensilla very thin and not split apically (Fig. 7: a); type *b* sensilla (Fig. 7: b) very similar to those on the apex of a.a. XIV. Specialized sensilla on dorsal side distributed on apical half of the specified a.a. (Figs. 8–11), represented by three different types: *a* and *b* similar to *a* and *b* of ventral side (Fig. 10: a, b), and type *c* sensilla "spine-like, larger, not divided apically, and more deeply colored (brownish-ochreous) (Fig. 10: c). Number and distribution of specialized sensilla on ventral and dorsal sides of a.a. II, V, IX, and XIII as in Table 2.

TABLE 2. Number of type *a*, *b* and *c* sensilla on antennal articles II, V, IX and XIII in the male holotype of *Ityphilus calinus* Chamberlin, 1957.

	Ventral		Dorsal			Figures
	a	b	a	b	c	
II	-	1	1	-	-	4, 8
V	1	1	1	1	-	5, 9
IX	1	1	1	1	9	6, 10
XIII	1	1	1	1	9	7, 11

Cephalic plate. Ca. as long as wide; about as wide as the forcipular tergite; shape and chaetotaxy as in Figure 12.

Clypeus. With 2+2 setae near the anterior margin and 1+1 setae in the center (Fig. 13).

Labrum. Poorly sclerotized and poorly pigmented. Central part membranous with posterior border convex and without teeth or hairlike structures; sidepieces with 3+3 small sharply pointed teeth (Fig. 14).

Mandibles. Dentate lamella not subdivided into blocks, with 8 teeth of which the two most ventral are largest (Figs. 15–17); pectinate lamella with *ca*. 17 hyaline teeth.

First maxillae. Coxal projections subtriangular, well-developed, round tipped and provided with 1+1 ventral setae (Fig. 18). Telopodites with lappets, bearing 1+1 ventral setae (Fig. 18).

Second maxillae. Apical claw of telopodites well developed, bipectinate, dorsal edge with *ca*. 13 teeth (Figs. 19, 20), ventral edge with *ca*. 10 teeth. Dorsal chaetotaxy of telopodites as in Figure 19.

Forcipular segment. When closed, telopodites not extending beyond anterior margin of head. Forcipular tergite

a little narrower than the tergite of the first leg-bearing segment (ratio 0.93: 1), chaetotaxy represented by 14 setae distributed as in Figure 24. Coxosternite: with complete chitin-lines (Fig. 21: a); maximum width/length at the middle ratio, *ca.* 1.58: 1; central part of anterior margin as in Figure 21. Telopodites: all articles without teeth; trochanteroprefemur with greatest length/greatest width 1.06: 1; internal edge of tarsungula not serrate, completely smooth (Figs. 21, 22). Calyx of poison gland subcylindrical, shape and relative size as in Figures 22, 23. Shape and chaetotaxy of coxosternite and telopodites as in Figures 21, 24.

Tergites. Surface of pretergites and metatergites smooth, sulci not evident, chaetotaxy similar along all the body length (Fig. 25).

Sternites of leg-bearing segments 1 to penultimate. Sternite 1 without pore-field, sternites 2 to 40 with an uninterrupted series of pore-fields; presence/absence of pore-fields on sternite 41 (antepenultimate) and 42 (penultimate) unclear due to inadequate mounting conditions in the original slide. All pore-fields undivided, subcircular in shape, and located on subcircular raised prominences. Form and relative size of pore-fields changing along trunk as in Figures 26–43. Number of pores on selected sternites as follows: sternite 2 (13); 3 (31); 4 (51); 5 (63); 6 (58); 7 (81); 10 (108); 14 (119); 19 (138); 22 (100); 24 (74); 27 (44); 29 (28); 31 (21); 33 (21); 34 (27); 35 (25); 39 (22).

Legs (pair 1 to penultimate). First pair shorter than second pair in the proportion *ca.* 0.86: 1, articles of leg-pair 1 a little narrower that those of leg-pair 2 (relative size as in Figures 44, 45); chaetotaxy of legs similar throughout the entire body. Distribution, number and relative size of setae as in Figures 44–48. Claws with three thin and pale accessory spines ventrobasally, one anterior and two posterior (Fig. 49). Claws of a few walking legs with two accessory spines only, one anterior, one posterior (Fig. 50), (an additional presumptive posterior spine, lost by damage or truly absent?).

Ultimate leg-bearing segment. About 1.25 times as wide as the penultimate leg-bearing segment; intercalary pleurites present at both sides of the ultimate pretergite; ultimate presternite divided along sagittal plane; length/width ratio of the tergite 0.82:1; length/width ratio of the sternite 0.91:1. Shape and chaetotaxy of tergite and sternite as in Figures 51, 52. Coxopleura very slightly protruding at distal internal ventral ends, setae distributed on almost the whole ventral, lateral and dorsal surfaces (Figs. 51, 52). Two single ("homogeneous") coxal organs in each coxopleuron, the anterior being smaller than the posterior (Fig. 52), coxal pores opening on the membrane between coxopleuron and sternite, partially covered by the latter (Fig. 52). Ultimate legs with seven articles. Articles strongly thickened, femur wider than all the other telopodite articles (ratio of width of femur/width of tarsus 2 *ca.* 2.66: 1). Ratio of length of telopodites of ultimate legs/length of sternite *ca.* 1.34: 1. Shape and chaetotaxy of ultimate legs as in Figures 51, 52. Ultimate pretarsus represented by a long, straight, setiform structure.

Postpedal segments. Intermediate tergite with posterior margin convex (Fig. 51); intermediate sternite with posterior margin very slightly concave, posterior margin of first genital sternite very slightly convex (Fig. 52). Gonopods apparently uniarticulate (suture between the presumptive basal and apical articles not evident), bearing *ca.* 4–5 ventral setae (Fig. 52).

Female. Unknown.

Remarks. *Ityphilus calinus* was insufficiently described by Chamberlin on the basis of a unique specimen (male holotype). The original description only includes a single figure, "fig. 7" (here reproduced as Figure 106), showing the anterior end of the body in dorsal view; it does not state whether the forcipular tarsungulum is serrate or smooth; and completely lacks information on pilosity of the antennae, kind and number of specialized sensilla of a.a. II, V, IX and XIII, shape and teeth of labrum, shape and pilosity of the cephalic plate and clypeus, anterior and posterior limits of ventral pore-field series, etc.

In his description Chamberlin stated "Dorsal plates bisulcate, but in the holotype as preserved the sulci are apparently absent. The author also said "Claws of prehensors when closed extending a little beyond anterior margin of head, but, this statement is only valid when the prehensors are fully extended (see Fig. 24), not when flexed. Furthermore, he stated: "This species differs from *I. guianensis* in having the antennae much less strongly crassate and less geniculate; also differing in the number of pairs of legs - 43 as against 49–55". Strikingly, he omitted to mention that the forcipular tarsungulum is smooth in *I. calinus* and serrate in *I. guianensis*.

Since the entire holotype is mounted in dorsal position (and not dissected at all), observing shape and pilosity of first and second maxillae is difficult; for this reason the data and illustrations given herein for these structures are incomplete. Description of the shape of penis is not feasible for the same reason.

Pereira (2012) gave a few approximate length/width ratios of some a.a. and cephalic plate, tentatively deduced from the original illustration given by Chamberlin (Fig. 106). The corresponding new ratios taken directly from the specimen reveal that the figure is imprecise.

The male holotype of *Ityphilus calinus* is the only specimen recorded to date for this species.

Type locality. COLOMBIA: Valle del Cauca Department: 13 miles West of Santiago de Cali.

Known range. Only known from the type locality.

Remark. The inclusion of Brazil in the geographic distribution of *I. calinus* by Adis *et al.* (2002); Foddai *et al.* (2000, 2002, 2004); Pereira *et al.* (2000); and Bonato *et al.* (2007) is not valid, because it was based on specimens described subsequently as *Ityphilus donatellae* Pereira, 2012.

***Ityphilus bonatoi* sp. nov.**
(Figs. 53–105)

Diagnosis. An *Ityphilus* species with internal edge of forcipular tarsungulum serrate. Among the other Neotropical members of the genus having the same trait it only shares with *I. donatellae* Pereira, 2012 a very small body size and a low number of leg-bearing segments.

Ityphilus bonatoi **sp. nov.** can be differentiated from *I. donatellae* by means of the following selected traits (the corresponding traits in the latter are given in parentheses): body length of the female 13 mm (female: 11 mm, male: 8.5 mm); female with 41 leg-bearing segments (female with 43, male with 41); shape of the antennae as in Figures 53, 54 (as in Figure 107); a. a. XIV conspicuously longer than wide, length/width ratio *ca*. 1.34: 1 (about as wide as long); a.a. XIV shorter than a.a. XI–XIII taken together, ratio *ca*. 0.87:1 (a.a. XIV longer than a.a. XI–XIII taken together, ratio *ca*. 1.25:1); shape of type *c* sensilla on dorsal side of a. a. IX and XIII as in Figure 60: c (as in Figure 108: c); internal edge of forcipular tarsungulum expanded inwards bearing 6–7 strong teeth occupying the middle and apical thirds, Figs. 68–70 (internal edge of forcipular tarsungulum not expanded inwards bearing *ca*. 7 small teeth occupying the middle third, Fig. 109); shape of pore-fields as in Figures 71–93 (as in Figures 110–117); sternite 5 with *ca*. 34 pores, 8 (*ca*. 52), 17 (*ca*. 72), 27 (*ca*. 28) (sternite 5 with *ca*. 21 pores, 8 (*ca*. 30), 17 (*ca*. 24), 27 (*ca*. 9)).

Remarks. *I. bonatoi* can be separated from all the other Neotropical species of *Ityphilus* with internal edge of forcipular tarsungulum serrate, by using the key presented below.

For characters differentiating *I. bonatoi* from other Neotropical species of *Ityphilus*, see Discussion below.

Type material examined: BRAZIL: RJ: Ilha Grande, Enseada das Palmas, 2–12 February 1997, M. J. Ramírez leg.: holotype female, 41 leg-bearing segments, body length 13 mm.

Depository of type: MZUSP.

Description. Female holotype. Forty-one leg-bearing segments, body length 13 mm. Trunk attenuate in anterior and posterior regions. Width of selected leg-bearing segments as follows: 1 (0.30 mm); 2 (0.30 mm); 3 (0.28 mm); 6 (0.32 mm); 12 (0.40 mm); 18 (0.45 mm); 22 (0.49 mm); 27 (0.51 mm); 32 (0.48 mm); 38 (0.39 mm); 40 (0.33 mm); 41 (0.36 mm). Width of cephalic plate 0.32 mm. Width of forcipular coxosternite 0.32 mm. Ground color (of preserved specimen in alcohol) pale ocher.

Antennae. About 2.6 times as long as the cephalic plate, conspicuously geniculate, distally clavate (Figs. 53, 54). Basal a.a. slightly overlapping medially (Fig. 62). Ratio of width of a.a. X (= widest a.a. of distal antennal half)/width of a.a. V (= narrowest a.a. of basal antennal half) 1.66: 1. Apical club extending over a.a. IX to XIV, a.a. VIII transitional, being narrow basally and widened distally (Figs. 1, 2). A.a. XIV apically blunt, shorter than the three previous a.a. taken together (ratio of length of a.a. XIV/length of a.a. XI–XIII, *ca*. 0.87:1). Length/width ratio of left a.a. I–XIV (in dorsoventral position) as follows: I (0.69: 1); II (0.77: 1); III (0.80: 1); IV (0.88: 1); V (1.04: 1); VI (0.86: 1); VII (0.56: 1); VIII (0.35: 1); IX (0.28: 1); X (0.29: 1); XI (0.36: 1); XII (0.37: 1); XIII (0.40: 1); XIV (1.35: 1). Ventral chaetotaxy: setae on a.a. I to VIII of various lengths, and relatively few in number, those of a.a. IX to XIV much shorter and very numerous (Fig. 53). Dorsal chaetotaxy: setae on a.a. I to VIII similar to those on ventral side, setae on a.a. IX to XIV much longer and less numerous than those on ventral side (Fig. 54). A.a. XIV with *ca.* 11 claviform sensilla on the external border, and *ca*. 6 on the internal border (Fig. 55); distal end of this a.a. with *ca*. 11 very small hyaline specialized sensilla apparently not split apically (Fig. 55). Ventral and dorsal surface of a.a. II, V, IX, and XIII with very small specialized sensilla. Ventrally, specialized sensilla distributed apically (Figs. 56, 57), and represented by two different types: *a* and *b*. Type *a* sensilla very thin and not split

apically (Fig. 56: a); type *b* sensilla (Fig. 56: b) very similar to those on the apex of a.a. XIV. Specialized sensilla on dorsal side distributed apically (Figs. 58–60) and represented by three different types: *a* and *b* similar to *a* and *b* of ventral side (Fig. 60: a, b), and type *c* sensilla "spine-like, larger, not divided apically, and slightly darker (pale brownish–ochreous) (Fig. 60: c). Number and distribution of specialized sensilla on ventral and dorsal sides of a.a. II, V, IX, and XIII as in Table 3.

TABLE 3. Number of type *a*, *b* and *c* sensilla on antennal articles II, V, IX and XIII in the female holotype of *Ityphilus bonatoi* **sp. nov.**

	Ventral		Dorsal			Figures
	a	b	a	b	c	
II	-	1	-	1	-	
V	1	1	1	1	-	56, 58
IX	1	1	1	1	2	57, 59
XIII	-	1	1	1	2	60

Cephalic plate. About as wide as the forcipular tergite; slightly wider than long (width/length ratio, 1.13:1); shape and chaetotaxy as in Figure 61.

Clypeus. With 7+5 setae distributed as in Figure 62.

Labrum. Poorly pigmented; mid-piece membranous, smooth, slightly concave; sidepieces with 2+2 diminutive sharply pointed denticles (Fig. 63).

Mandibles. Dentate lamella not subdivided into blocks, 9 teeth in the right mandible (Fig. 64), 7 teeth in left mandible; pectinate lamella with *ca*. 17 hyaline teeth.

First maxillae. Coxosternite apparently without lappets, telopodites bearing lappets (Fig. 65). Coxosternite devoid of setae; coxal projections subtriangular, round tipped and provided with 1+1 setae (Fig. 65). Telopodites without visible suture between presumptive basal and distal articles, ventral surface with 1+1 setae near the central part of the medial edge (Fig. 65), dorsal surface with 1+1 sensilla.

Second maxillae. Coxosternite without any trace of suture along the sagittal plane and provided with 4+5 setae arranged as in Figure 65. Apical claw of telopodites well developed, bipectinate, dorsal and ventral edges with 7 teeth (Figs. 66, 67).

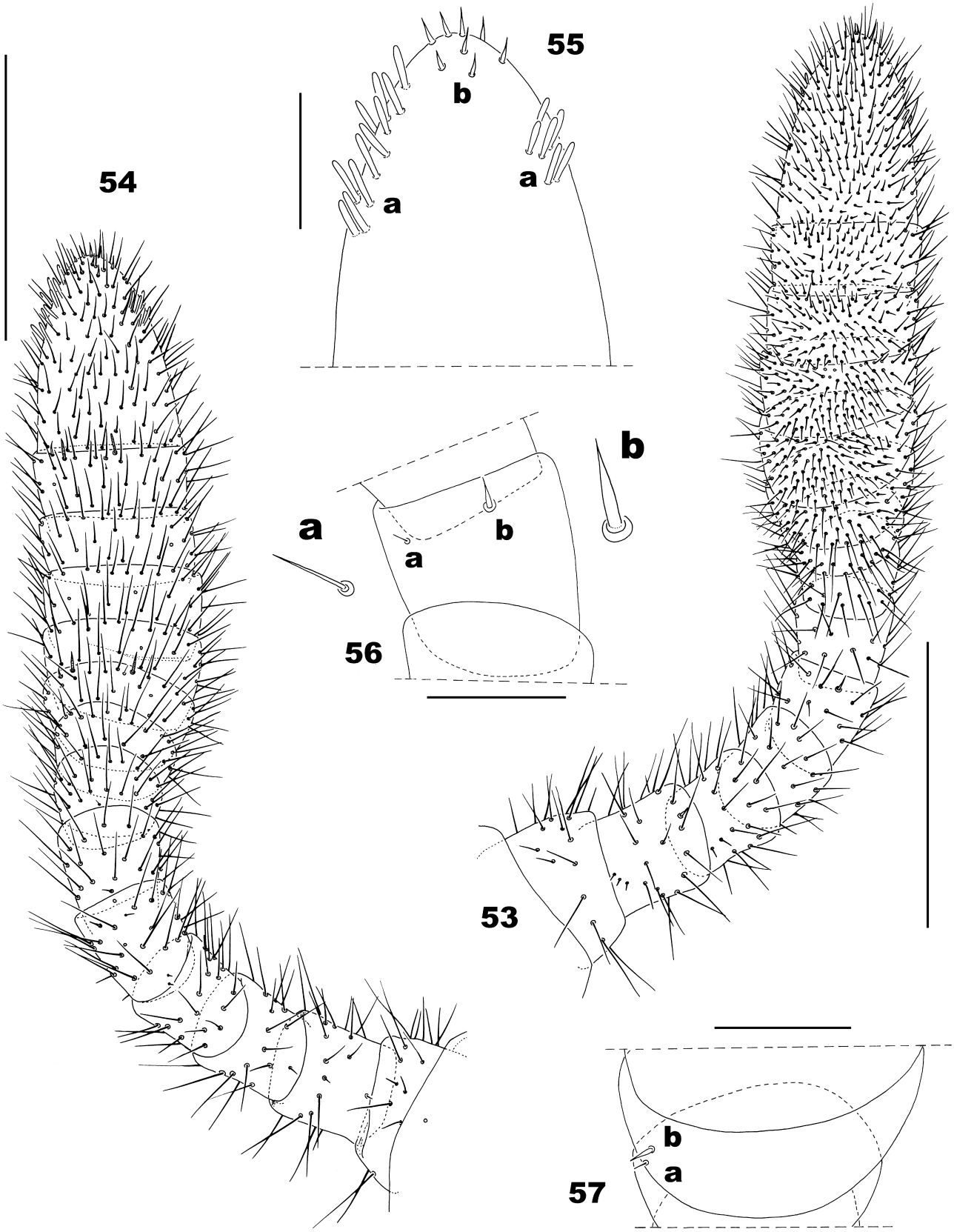
Forcipular segment. When closed, telopodites not reaching the anterior margin of the head (Fig. 61). Forcipular tergite slightly wider than the tergite of the first leg-bearing segment (ratio 1.10:1), chaetotaxy represented by two irregular transverse rows each of *ca*.11–13 setae (Fig. 61). Coxosternite: with complete chitin-lines (Fig. 68: a); maximum width/length at the middle ratio, 1.83:1; central part of anterior margin as in Figure 68. Telopodites: all articles without teeth; trochanteroprefemur with greatest length/greatest width 1.12:1; internal edge of tarsungula expanded inwards, bearing 6–7 strong teeth occupying the middle and apical thirds (Figs. 68–70). Calyx of poison gland with shape and relative size as in Figures 69, 70. Shape and chaetotaxy of coxosternite and telopodites as in Figure 68.

Tergites. Surface of pretergites and metatergites smooth, sulci not evident.

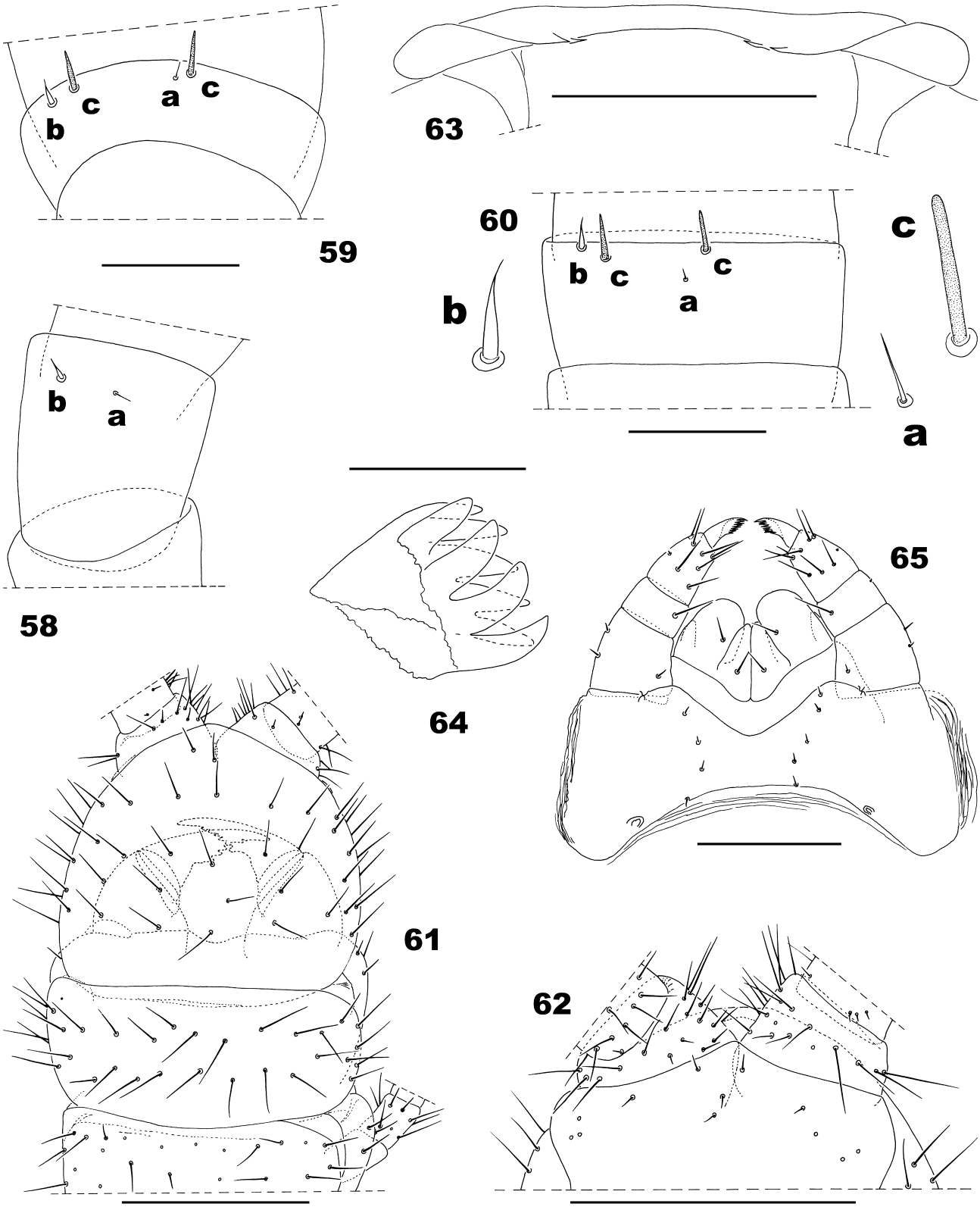
Sternites of leg-bearing segments 1 to penultimate. Pore-fields present in an uninterrupted series from sternite 2 to penultimate (40) inclusive. All pore-fields undivided and located on raised prominences. Form and relative size of pore-fields changing along the trunk as in Figures 71–93. Number of pores on selected sternites as follows: sternite 2 (7); 4 (26); 5 (34); 8 (52); 9 (64); 12 (72); 13 (76); 14 (66); 15 (71); 16 (70); 17 (72); 18 (64); 20 (57); 23 (45); 26 (29); 27 (28); 31 (16); 35 (13); 36 (12); 37 (6); 38 (4); 39 (3); 40 (2).

Legs (pair 1 to penultimate). First pair slightly shorter than second pair (ratio 0.90: 1), aspect and relative size as in Figures 94, 95. Chaetotaxy of legs similar throughout the entire body. Distribution, number and relative size of setae as in Figures 94–99. Claws with three thin pale accessory spines ventrobasally, arrangement and relative size as in Figure 100.

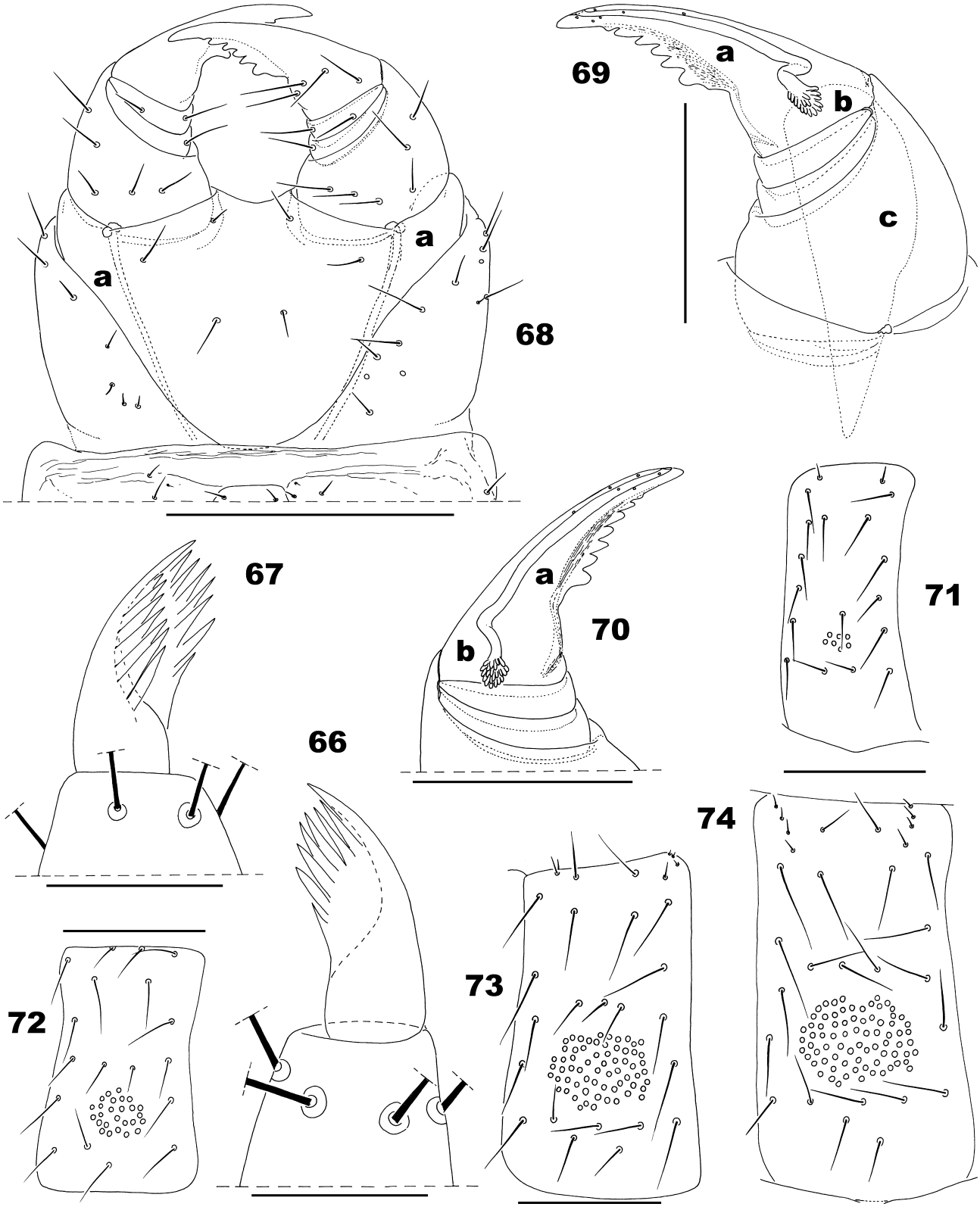
Ultimate leg-bearing segment. About 1.10 times as wide as the penultimate; intercalary pleurites present at both sides of ultimate pretergite; ultimate presternite divided along the sagittal plane; length/width ratio of tergite 0.72: 1; length/width ratio of sternite 1.0: 1. Shape and chaetotaxy of tergite and sternite as in Figures 102, 103. Coxopleura very slightly protruding at distal-internal ventral ends, setae distributed on almost the whole ventral



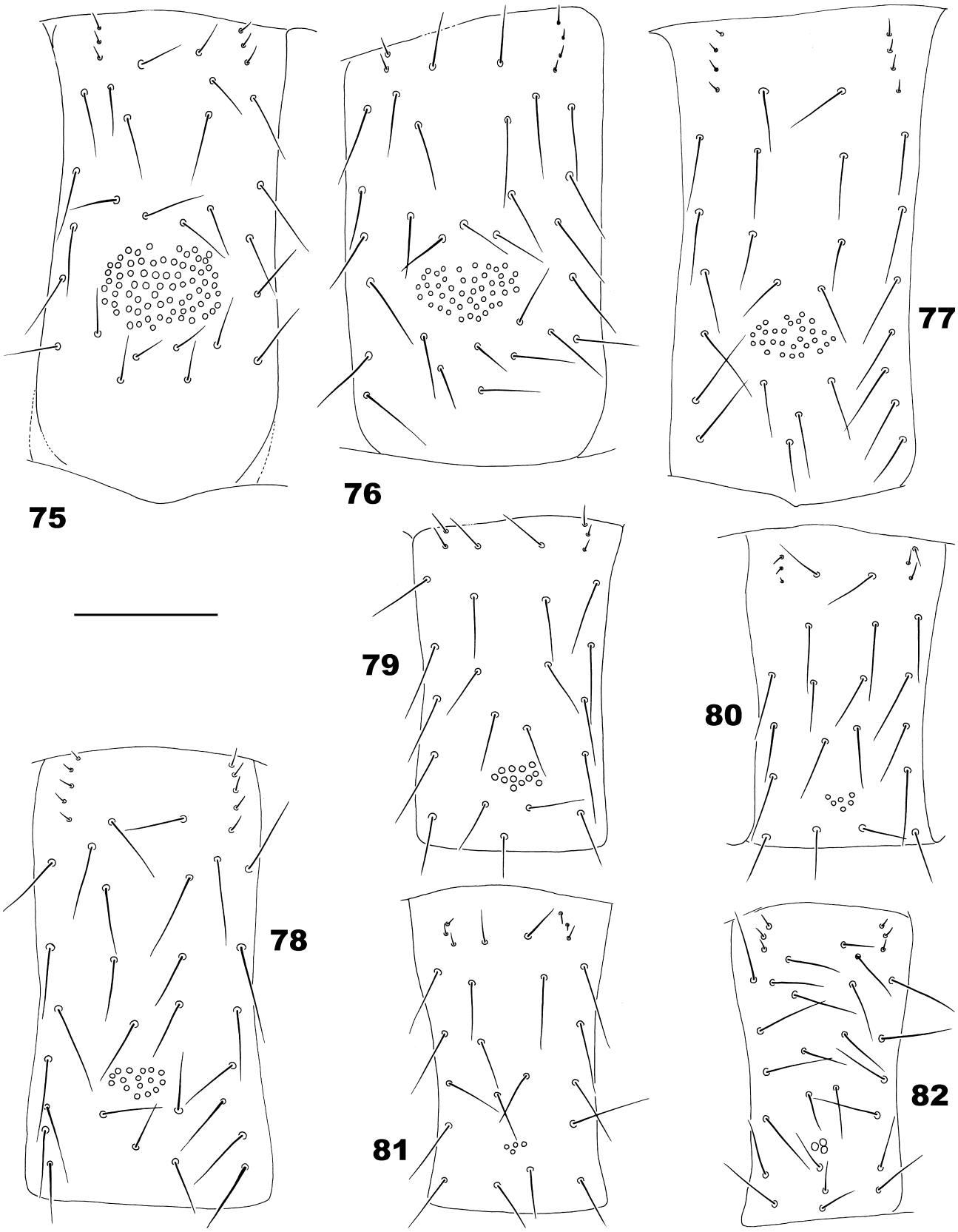
FIGURES 53–57. *Ityphilus bonatoi* **sp. nov.** (female holotype; BRAZIL: RJ: Ilha Grande): (53) Left antenna, ventral. (54) Left antenna, dorsal. (55) Apical portion of left a.a. XIV, dorsal (a: claviform sensilla, b: apical specialized sensilla). (56) Left a.a. V, ventral (a, b: *a, b* type sensilla). (57) Left a.a. IX, ventral (a, b: *a, b* type sensilla). Scale bars: 0.05 mm (55–57); 0.2 mm (53, 54).



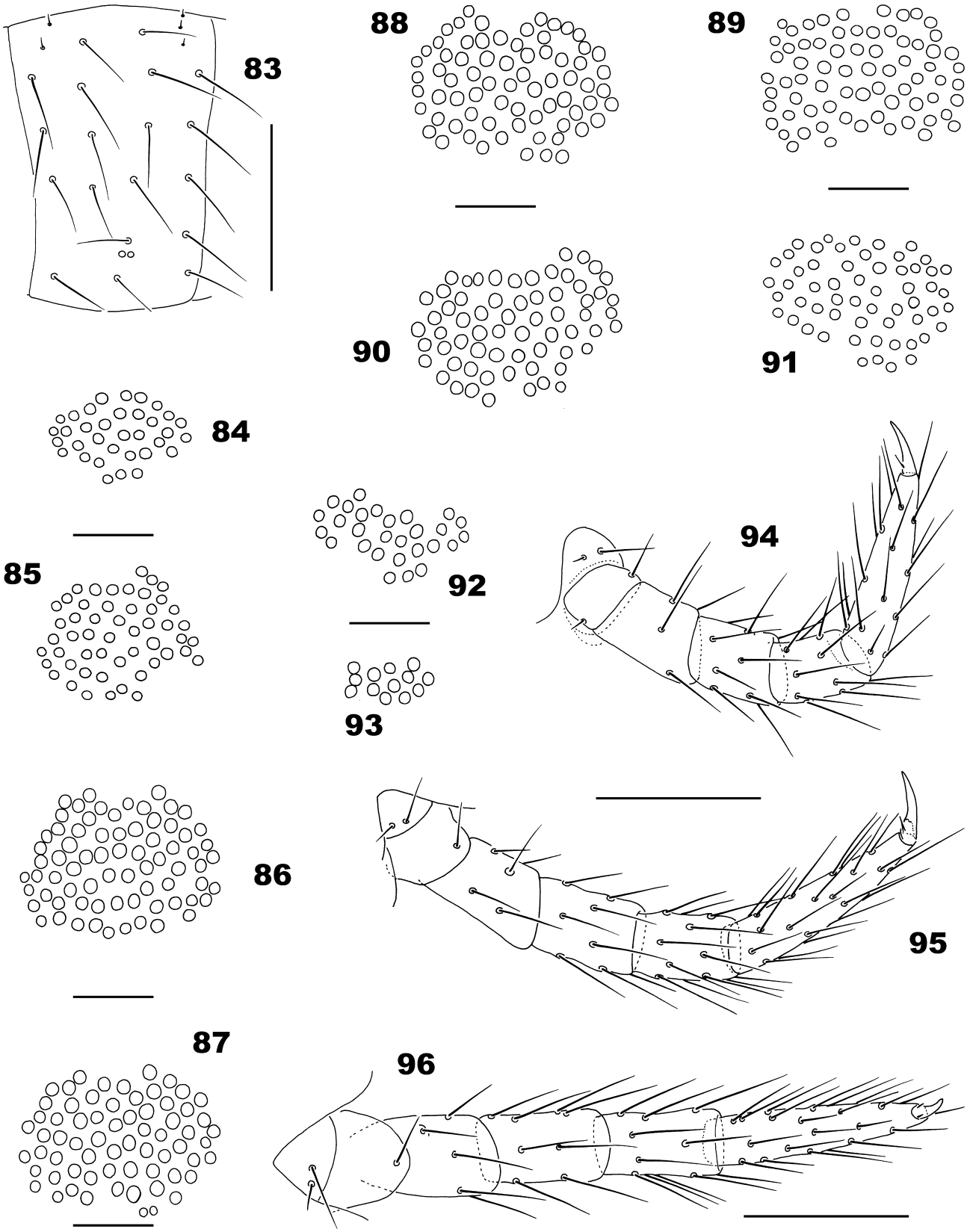
FIGURES 58–65. *Ityphilus bonatoi* **sp. nov.** (female holotype; BRAZIL: RJ: Ilha Grande): (58) Left a.a. V, dorsal (a, b: *a, b* type sensilla). (59) Letft a.a. IX, dorsal (a, b, c: *a, b, c* type sensilla). (60) Left a.a. XIII, dorsal (a, b, c: *a, b, c* type sensilla). (61) Dorsal view of anterior region of the body, showing cephalic plate, bases of antennae, forcipular segment, and anterior portion of leg-bearing segment 1. (62) Clypeus and bases of antennae. (63) Labrum. (64) Dentate lamella of right mandible, ventral. (65) First and second maxillae, ventral. Scale bars: 0.02 mm (64); 0.05 mm (58–60); 0.1 mm (63, 65); 0.2 mm (61, 62).



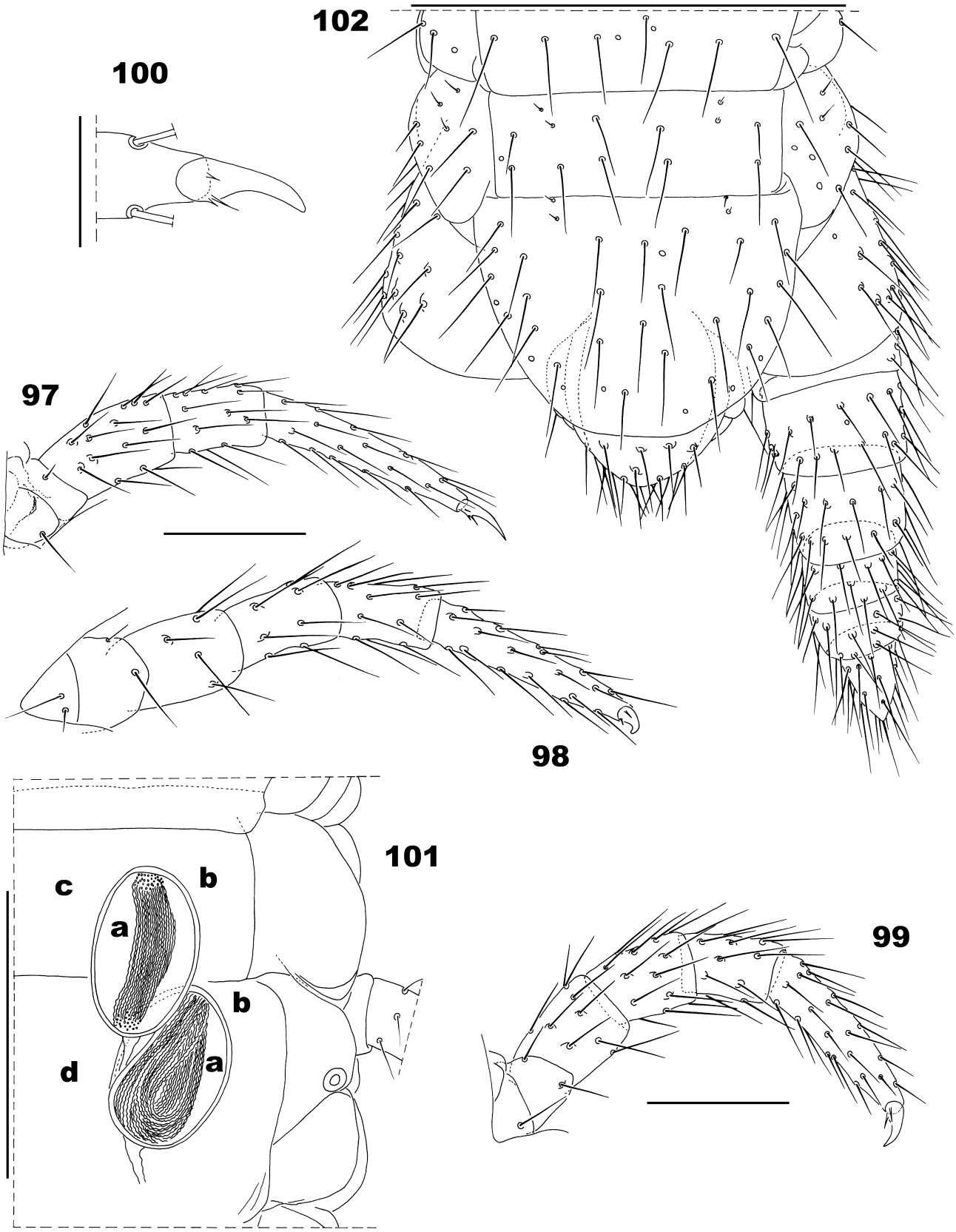
FIGURES 66–74. *Ityphilus bonatoi* **sp. nov.** (female holotype; BRAZIL: RJ: Ilha Grande): (66) Claw of left telopodite of second maxillae, ventral. (67) Claw of left telopodite of second maxillae, dorsal. (68) Forcipular segment, ventral (a: chitin-lines). (69) Detail of duct (a), calyx (b), and poison gland (c), of venom apparatus in left forcipular telopodite, ventral. (70) Detail of duct (a) and calyx (b) of venom apparatus in right forcipular telopodite, ventral. (71) Sternite 2. (72) Sternite 4. (73) Sternite 9. (74) Sternite 13. Scale bars: 0.02 mm (66, 67); 0.1 mm (69–74); 0.2 mm (68).



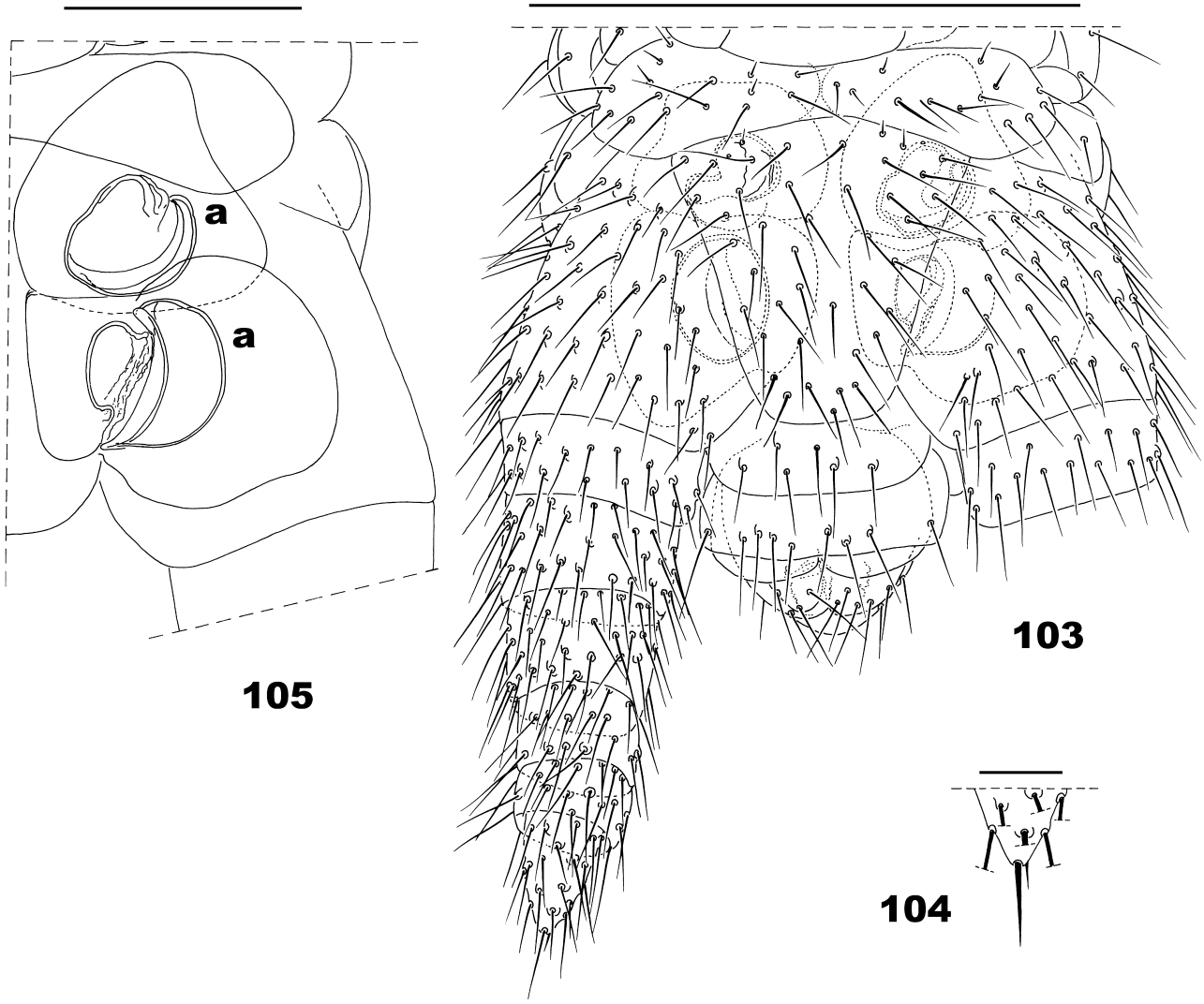
FIGURES 75–82. *Ityphilus bonatoi* **sp. nov.** (female holotype; BRAZIL: RJ: Ilha Grande): (75) Sternite 17. (76) Sternite 23. (77) Sternite 26. (78) Sternite 31. (79) Sternite 36. (80) Sternite 37. (81) Sternite 38. (82) Sternite 39. Scale bar: 0.1 mm.



FIGURES 83–96. *Ityphilus bonatoi* **sp. nov.** (female holotype; BRAZIL: RJ: Ilha Grande): (83) Sternite 40. (84) Pore-field on sternite 5. (85) Pore-field on sternite 8. (86) Pore-field on sternite 12. (87) Pore-field on sternite 14. (88) Pore-field on sternite 15. (89) Pore-field on sternite 16. (90) Pore-field on sternite 18. (91) Pore-field on sternite 20. (92) Pore-field on sternite 27. (93) Pore-field on sternite 35. (94) Left leg (pair 1), posteroventral view. (95) Left leg (pair 2), posteroventral view. (96) Left leg (pair 14), ventral. Scale bars: 0.03 mm (84–93); 0.1 mm (83, 94–96).



FIGURES 97–102. *Ityphilus bonatoi* **sp. nov.** (female holotype; BRAZIL: RJ: Ilha Grande): (97) Left leg (pair 22), anteroventral view. (98) Left leg (pair 32), ventral. (99) Left leg (pair 40), anteroventral view. (100) Claw of the left leg (pair 13), anteroventral view. (101) Anterior and posterior spermathecae at level of leg-bearing segment 38, dorsal (a: spermatozoa, b: contour of spermatheca, c: pretergite, d: metatergite). (102) Ultimate leg-bearing segment and postpedal segments, dorsal. Scale bars: 0.03 mm (100); 0.1 mm (97–99); 0.2 mm (101); 0.3 mm (102).



FIGURES 103–105. *Ityphilus bonatoi* **sp. nov.** (female holotype; BRAZIL: RJ: Ilha Grande): (103) Ultimate leg-bearing segment and postpedal segments, ventral. (104) Detail of distal end of right ultimate leg, ventral. (105) Left coxal organs, ventral (a: mucous layer). Scale bars 0.03 mm (104); 0.1 mm (105); 0.3 mm (103).

and lateral surfaces, dorsal side with setae on the external half only (Figs. 102, 103). Two single ("homogeneous") coxal organs in each coxopleuron, the anterior being smaller than the posterior, shape as in Figure 105. Coxal pores opening on the membrane between coxopleuron and sternite, partially covered by the latter (Fig. 105), internal cuticular structure of coxal organs as shown in Figure 105 (a: mucous layer). Ultimate legs with seven articles. Articles strongly thickened, subconically narrowing from base to distal end, width of trochanter/width of tarsus 2 *ca*. 2.66: 1. Length of telopodites of ultimate legs/length of sternite 1.71: 1. Length of telopodites of ultimate legs/length of legs of the penultimate pair 0.72: 1. Shape and chaetotaxy of ultimate legs as in Figures 102, 103.

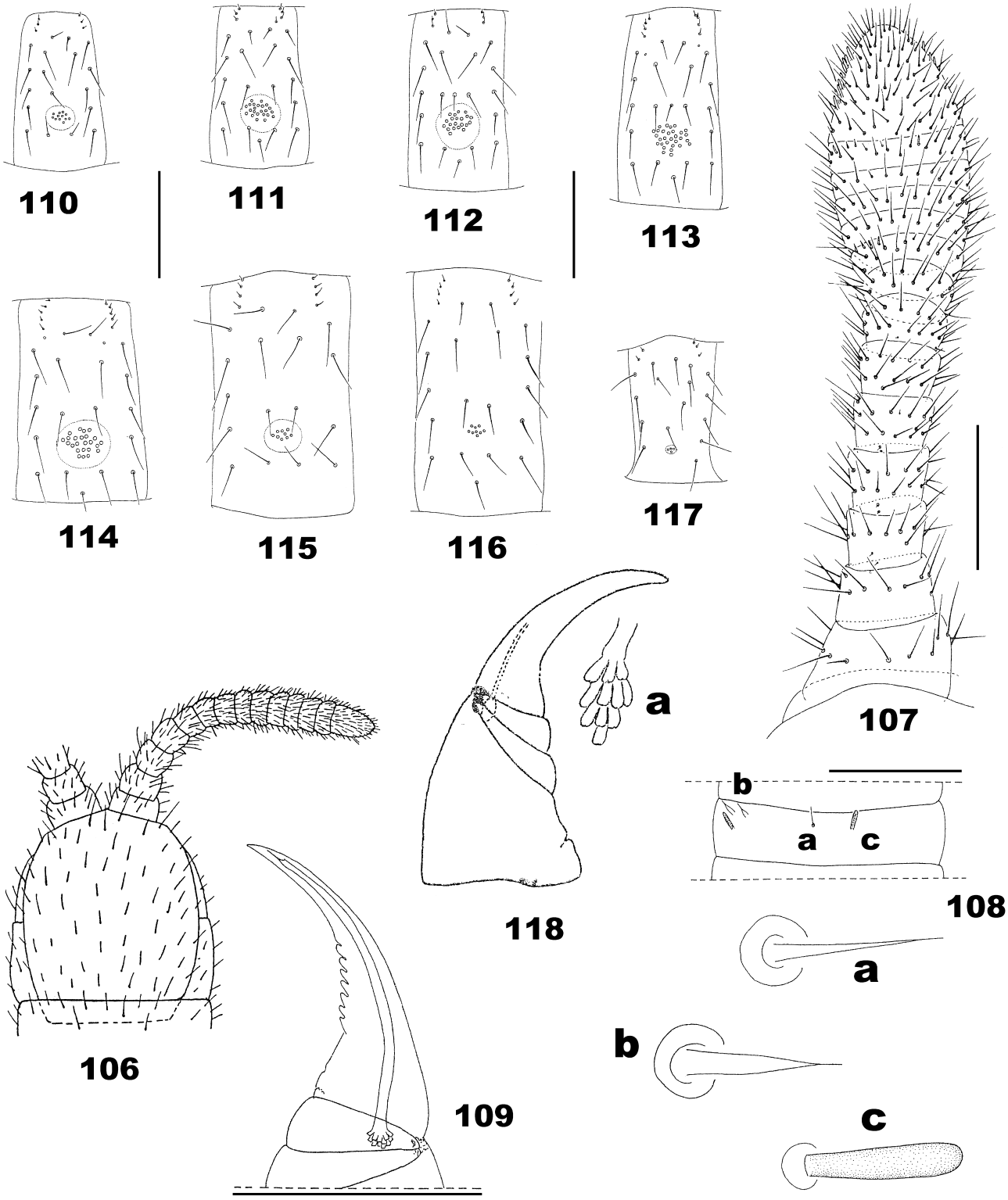
Postpedal segments. Intermediate tergite with posterior margin convex (Fig. 102); intermediate sternite with posterior margin straight to very slightly convex, posterior margin of first genital sternite slightly concave in midline (Fig. 103). Gonopods uniarticulate, without setae (Fig. 103).

Remarks. The adult condition of the female holotype is indicated by the presence of spermatozoa in both spermathecae (Fig. 103: a).

Etymology. The species is dedicated to my distinguished colleague Lucio Bonato (Dipartimento di Biologia, University of Padova, Italy) in recognition of his extraordinary skill, dedication, and hard work as a leader in analysing and establishing a common terminology for the external anatomy of all centipede orders.

Type locality. BRAZIL: RJ: Ilha Grande, Enseada das Palmas.

Known range. Only known from the type locality.



FIGURES 106–118. (106). *Ityphilus calinus* Chamberlin, 1957 (male holotype; COLOMBIA: Valle del Cauca Department): Anterior end of the body, dorsal. (From Chamberlin, 1957). (107). *Ityphilus donatellae* Pereira, 2012 (female paratype; BRAZIL: Amazonas: 02º34´S, 60º06´W): Left antenna dorsal. (From Pereira, 2012). (108–117). *Ityphilus donatellae* Pereira, 2012 (female holotype; BRAZIL: Amazonas: 02º34´S, 60º06´W): (108) Left a.a. XIII, dorsal (a, b, c: *a, b, c*, type sensilla). (109) Detail of calyx of poison gland in left forcipular telopodite, ventral. (110) Sternite 2. (111) Sternite 3. (112) Sternite 5. (113) Sternite 8. (114) Sternite 17. (115) Sternite 27. (116) Sternite 35. (117) Sternite 42. (From Pereira *et al*., 2000). (118). *Ityphilus idanus* Crabill, 1960 (female holotype; BRITISH WEST INDIES: Barbuda, Damby Cave): Right forcipular telopodite, ventral (a: detail of calyx of poison gland). (From Crabill, 1960). Scale bars: 0.05 mm (108); 0.1 mm (107, 109–117). No scales available (106, 118).

Key to the Neotropical species of *Ityphilus*.

1. Internal edge of forcipular tarsungulum completely smooth 2
- Internal edge of forcipular tarsungulum serrate 7
2. With 43 leg-bearing segments . . . . . ***I. calinus*** Chamberlin, 1957
- With 49 to 93 leg-bearing segments 3
3. With 49 to 59 leg-bearing segments 4
- With 71 or 93 leg-bearing segments 5
4. Body length up to 50 mm (female?); antennae strongly clavate; a.a. XIV wider than long; a.a. XIII with numerous type *c* sensilla (spine-like sensilla); mid-piece of labrum smooth; chitin-lines of forcipular coxosternite very fine and very difficult to observe; pore-fields transversely subrectangular; pore-field series present from second to antepenultimate sternite; 49 to 59, frequently 51 or 53 leg-bearing segments (sex not specified) . . . . ***I. cavernicolus*** (Matic, Negrea & Fundora Martinez, 1977)
- Body length 18 mm (female), 9–13 mm (male); antennae moderately clavate; a.a. XIV longer than wide; a.a. XIII with *ca.* 2 type *c* sensilla (spine-like deeply colored specialized sensilla); mid-piece of labrum with a fringe of minute hair-like structures; chitin-lines of forcipular coxosternite prominent; pore-fields subcircular in shape; pore-field series present from second to fifth sternite from rear end of the body; 55 (male), 59 (female) leg-bearing segments . . . . . ***I. idanus*** Crabill, 1960
5. With 93 leg-bearing segments . . . . . ***I. polypus*** (Matic, Negrea & Fundora Martinez, 1977)
- With 71 leg-bearing segments 6
6. Pore-fields subcircular; cephalic plate conspicuously broader than long . . . . . ***I. lilacinus*** Cook 1899
- Pore-fields transversely ovoidal; cephalic plate almost as wide as long. . ***I. palidus*** (Matic, Negrea & Fundora Martinez, 1977)
7. Internal side of a.a. I with strong stout setae; coxosternite of second maxillae with a sulcus along the sagittal plane . . . . . ***I. sensibilis*** Pereira, Foddai & Minelli, 2000
- Internal side of a.a. I without strong stout setae; coxosternite of second maxillae without a sulcus along the sagittal plane . . . 8
8. 113 leg-bearing segments (female), body length 93 mm . . . . . ***I. grandis*** (Turk, 1955)
- 41 to 95 leg-bearing segments, body length 8.5 to 83 mm 9
9. 95 leg-bearing segments (female); body length 83 mm; sternites of posterior third of the body without pore-fields; sternite of the ultimate leg-bearing segment with 1+1 ovoid prominences on the posterior half . . . ***I. mauriesi*** Demange & Pereira, 1985
- 41 to 71 leg-bearing segments; body length 8.5 to 57 mm; sternites of posterior third of the body with pore-fields 10
10. Ventral pore-fields of anterior half of the body undivided, those of the posterior half divided in two subsymmetrical areas . . . . . ***I. krausi*** Pereira & Minelli, 1996
- All pore-fields undivided 11
11. 41 or 43 leg-bearing segments 12
- 47 to 71 leg-bearing segments. 13
12. Body length of female 13 mm; female with 41 leg-bearing segments; shape of the antennae as in Figures 53, 54; a. a. XIV conspicuously longer than wide, length/width ratio *ca.* 1.34: 1; a.a. XIV shorter than a.a. XI–XIII taken together, ratio *ca.* 0.87:1; shape of type *c* sensilla on dorsal side of a. a. IX and XIII as in Figure 60: c; internal edge of forcipular tarsungulum expanded inwards, bearing 6–7 strong teeth occupying the middle and apical thirds (Figs. 68–70); shape of pore-fields as in Figures 71–93; sternite 5 with *ca.* 34 pores, 8 (*ca.* 52), 17 (*ca.* 72), 27 (*ca.* 28) . . . . . ***I. bonatoi*** **sp. nov.**
- Body length of female 11 mm, male 8.5 mm; female with 43 leg-bearing segments, male with 41; shape of the antennae as in Figure 107; a.a. XIV about as wide as long; a.a. XIV longer than the a.a. XI–XIII taken together, ratio *ca.* 1.25:1; shape of type *c* sensilla on dorsal side of a. a. IX and XIII as in Figure 108: c; internal edge of forcipular tarsungulum not expanded inwards, bearing *ca.* 7 small teeth occupying the middle third (Fig. 109); shape of pore-fields as in Figures 110–117; sternite 5 with *ca.* 21 pores, 8 (*ca.* 30), 17 (*ca.* 24), 27 (*ca.* 9) . . . . . ***I. donatellae*** Pereira, 2012
13. Sternite of leg-bearing segment 1 with pore-field 14
- Sternite of leg-bearing segment 1 without pore-field 16
14. Male with 63, 65, female with 67, 69 leg-bearing segments; body length 30–32 mm; antennae moderately clavate distally; chitin-lines of forcipular coxosternite complete . . . . . ***I. demoraisi*** Pereira, Minelli & Barbieri, 1995
- 45 to 55 leg-bearing segments. 15
15. Body length 14 mm (female), 13 mm (male); 47, 51 and probably 49 leg-bearing segments (male), 53 and probably 49, 51 leg-bearing segments (female); antennae basally overlapping medially; all teeth of the dentate lamellae of mandibles similar in size; chitin-lines of forcipular coxosternite complete; pore-fields on sternites 1 to 3–4 and last three, subcircular in shape, on the remaining sternites transversely subovoidal; surface of tergites and pretergites smooth; sternite of the ultimate leg-bearing segment slightly wider than long in the female (length/width ratio *ca.* 0.93:1), about as long as wide in the male (length/width ratio *ca.* 0.97:1) . . . . . ***I. geoffroyi*** Pereira, 2013
- Body length 23 mm (male?); 49, 55 leg-bearing segments (male?); antennae basally not overlapping medially; dentate lamellae of mandibles with about eleven teeth of which the most ventral are largest; chitin-lines of forcipular coxosternite incomplete; pore-fields in a circular area on all sternites; tergites conspicuously roughened with transverse ridges or series of short rugosities or tubercles which bear setae; sternite of the ultimate leg-bearing segment much longer than wide, length/width ratio *ca.* 1.28:1 (male?) . . . . . ***I. guianensis*** Chamberlin, 1921
16. Sternite of leg-bearing segment 2 without a well defined pore-field (only an isolated pore can be present); anterior edge of forcipular coxosternite deeply notched at middle; chitin-lines of forcipular coxosternite complete; ratio of maximum length to maximum width of forcipular trochanteroprefemur *ca.* 1.32: 1 . . . . . ***I. saucius*** Pereira, Foddai & Minelli, 2000
- Sternite of leg-bearing segment 2 with a well defined pore-field; anterior edge of forcipular coxosternite not deeply notched at middle; chitin-lines of forcipular coxosternite incomplete; ratio of maximum length to maximum width of forcipular trochant-

eroprefemur *ca.* 1.10–1.17:1 17
17. Male with 47, female with 47, 49, 51, 53 leg-bearing segments . . . . . ***I. crabilli*** Pereira, Minelli & Barbieri, 1994
- With 61 to 71 leg-bearing segments 18
18. 61 (male), 63 (male, female?) leg-bearing segments; body length 17–18 mm; first maxillae without lappets; ventral pore-fields extending to antepenultimate leg-bearing segment . . . . . ***I. perrieri*** (Brölemann, 1909)
- 67 (male), 71 (female) leg-bearing segments; body length 40 mm (male), 57 mm (female); first maxillary lappets present on coxosternite and telopodites; ventral pore-fields extending to penultimate leg-bearing segment . . . . . ***I. betschi*** Pereira, 2010

Discussion

As mentioned above, the original descriptions of *Ityphilus ceibanus* Chamberlin, 1922 (from Honduras), and *Ityphilus savannus* Chamberlin, 1943 (from Mexico) do not state whether the forcipular tarsungulum is serrate or smooth (and only include very scarce and imprecise information on a few morphological features of specific value). Consequently, an adequate comparison with *Ityphilus bonatoi* **sp. nov.** is difficult because their similarities and affinities remain uncertain. Nevertheless, the new species can also be confidently separated from these latter taxa by means of the following selected traits (corresponding features for *I. bonatoi* already mentioned above).

I. ceibanus: head longer than wide; more than 69 leg-bearing segments (sex unknown).

I. savannus: 55 leg-bearing segments (male); ventral pore-field series present from sternite of leg-bearing segment 2 to fourth sternite from rear end of the body.

Owing to the lack of knowledge on the condition of the forcipular tarsungula, *I. ceibanus* and *I. savannus* are not included in the identification key presented above. (The first taxon was described on the basis of a single incomplete specimen lacking the posterior end of the body, for this reason it is even doubtful whether it really belongs to *Ityphilus*).

Ityphilus bonatoi **sp. nov.** is the eighth species of *Ityphilus* hitherto recorded from Brazil, the others being *I. crabilli* Pereira, Minelli & Barbieri, 1994, *I. demoraisi* Pereira, Minelli & Barbieri, 1995, *I. donatellae* Pereira, 2012, *I. guianensis* Chamberlin, 1921, *I saucius* Pereira, Foddai and Minelli, 2000, *I. sensibilis* Pereira, Foddai & Minelli, 2000 (all from Central Amazon); and *I. perrieri* (Brölemann, 1909) (from Haut Carsévène).

The new taxon represents the first record of the genus *Ityphilus* from the Atlantic Rainforest biome, the southernmost representative of the genus in the Continent

As is the case for *I. bonatoi* **sp. nov.** (13 mm in length), and a few other species of the genus, several other examples of reduced body size exist within the Geophilomorpha. Besides the Ballophilidae, this is known to occur in some genera of the Geophilidae, Linotaeniidae, Schendylidae, Macronocophilidae, Mecistocephalidae and Aphilodontidae (where *Mecophilus neotropicus* Silvestri, 1909 with 35 leg-bearing segments is only 8 mm long). (See Foddai & Minelli 1999; Foddai *et al.* 2003; Minelli 2003; Minelli *et al.* 2000; Pereira 2009, 2011, 2012, 2013a, 2013b; Pereira *et al*. 2000; Uliana *et al*. 2007).

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References

Adis, J., Foddai, D., Golovatch, S.I., Hoffman, R.L., Minelli, A., De Morais, J.W., Pereira, L.A., Scheller, U., Schileyko, A.A. & Würmli, M. (2002) Myriapoda at 'Reserva Ducke', Central Amazonia/Brazil. *Amazoniana,* 17 (1/2), 15–25.

Bonato, L., Edgecombe, G.D., Lewis, J.G.E., Minelli, A., Pereira, L.A., Shelley, R.M. & Zapparoli, M. (2010) A common terminology for the external anatomy of centipedes (Chilopoda). *Zookeys*, 69, 17–51. http://dx.doi.org/10.3897/zookeys.69.737

Bonato, L., Pereira, L.A. & Minelli, A. (2007) Taxonomic and nomenclatural notes on the centipede genera *Chomatobius*, *Ityphilus*, *Hapleurytion*, *Plateurytion*, and *Steneurytion* (Chilopoda: Geophilomorpha). *Zootaxa*, 1485, 1–12.

Brölemann, H.W. & Ribaut, H. (1912) Essai d' une monographie des Schendylina (Myriapodes, Géophilomorphes). *Nouvelles Archives du Muséum d' Histoire naturelle*, Paris, sér. 5, 4, 53–183.

Chamberlin, R.V. (1957) Geophiloid chilopods taken in the Northern Andes in 1954–1955. *Proceedings of the Biological Society of Washington,* 70, 21–30.

Cook, O.F. (1899) The Geophiloidea of the Florida Keys. *Proceedings of the Entomological Society of Washington,* 4 (3) (1896–1901), 302–312.

Crabill, R.E. Jr. (1960) Centipedes of the Smithsonian-Bredin Expeditions to the West indies. *Proceedings of the United States National Museum,* 111 (3427), 167–195.
http://dx.doi.org/10.5479/si.00963801.111-3427.167

Foddai, D. & Minelli, A. (1999) A troglomorphic geophilomorph centipede from southern France (Chilopoda: Geophilomorpha: Geophilidae). *Journal of Natural History,* 33, 267–287.
http://dx.doi.org/10.1080/002229399300416

Foddai, D., Minelli, A. & Pereira, L.A. (2002) Chilopoda Geophilomorpha. *In*: Adis, J. (Ed.), *Amazonian Arachnida & Myriapoda*. Pensoft, Sofia-Moscow, pp. 459–474.

Foddai, D., Pereira, L.A. & Minelli, A. (2000) A catalogue of the geophilomorph centipedes (Chilopoda) from Central and South America including Mexico. *Amazoniana*, 16, 59–185.

Foddai, D., Bonato, L., Pereira, L.A. & Minelli, A. (2003) Phylogeny and systematics of the Arrupinae (Chilopoda Geophilomorpha Mecistocephalidae) with the description of a new dwarfed species. *Journal of Natural History,* 37, 1247–1267.
http://dx.doi.org/10.1080/00222930210121672

Foddai, D., Pereira, L.A. & Minelli, A. (2004) The geophilomorph centipedes (Chilopoda) of Brazilian Amazonia. *Anales del Instituto de Biología UNAM Serie Zoología*, 75 (2), 271–282. Available from: http://www.ejournal.unam.mx/zoo/075-02/ZOO007500204.pdf (Accessed 11 Sept. 2013)

Matic, Z., Negrea, S.T. & Fundora Martinez, C. (1977) Recherches sur les Chilopodes hypogés de Cuba. II. *In*: Orghidan, T., Núñez Jiménez, A., Decou, V., Negrea, St. & Viña Bayés, N. (Eds.), *Résultats des expeditions biospéologiques cubano-roumaines à Cuba. Bucaresti*, Ed. *Academiei R. S. Romania*, 2, 277–301.

Minelli, A. (2003) *The development of animal form. Ontogeny, morphology, and evolution*. Cambridge - New York, Cambridge University Press, USA, 323 pp.

Minelli, A. (Ed.) (2006) *Chilobase: a web resource for Chilopoda taxonomy.* Available from: http://chilobase.bio.unipd.it (Accessed 17 June 2013)

Minelli, A., Foddai, D., Pereira, L.A. & Lewis, J.G.E. (2000) The evolution of segmentation of centipede trunk and appendages. *Journal of Zoological Systematics and Evolutionary Research,* 38, 103–117.
http://dx.doi.org/10.1046/j.1439-0469.2000.382137.x

Pereira, L.A. (2000) The preparation of centipedes for microscopical examination with particular reference to the Geophilomorpha. *Bulletin of the British Myriapod Group*, 16, 22–25.

Pereira, L.A. (2009) A new dwarf species of the genus *Strigamia* Gray, 1843 from the Southern Appalachian Mountains of Western Virginia (Chilopoda: Geophilomorpha: Linotaeniidae). *In:* Roble, S.M. & Mitchell, J.C. (Eds.), *A lifetime of contributions to myriapodology and the natural history of Virginia: A Festschrift in honor of Richard L. Hoffman's 80th birthday.* Virginia Museum of Natural History Martinsville, VA, pp. 209–222. [Special Publication No. 16]

Pereira, L.A. (2010) First record of a ballophilid centipede from French Guiana with a description of *Ityphilus betschi* sp. nov. (Myriapoda: Chilopoda: Geophilomorpha). *Papéis Avulsos de Zoologia,* 50 (42), 643–665. http://www.scielo.br/pdf/paz/v50n42/a01v5042.pdf (Accessed 11 Sept. 2013)

Pereira, L.A. (2011) A further contribution to the knowledge of *Pectiniunguis minutus* (Demange, 1968), a little known dwarf Schendylid centipede from western equatorial Africa (Chilopoda: Geophilomorpha). *Papéis Avulsos de Zoologia*, 51 (20), 307–323. Available from: http://www.scielo.br/pdf/paz/v51n20/v51n20.pdf (Accessed 11 Sept. 2013)

Pereira, L.A. (2012) A new dwarf species, new distribution records, and supplementary descriptive notes of the centipede genus *Ityphilus* Cook, 1899 (Chilopoda: Geophilomorpha: Ballophilidae) from central Amazonia, Brazil. *Papéis Avulsos de Zoologia*, 52 (25), 291–309. Available from: http://www.scielo.br/pdf/paz/v52n25/a01v52n25.pdf (Accessed 11 Sept. 2013)

Pereira, L.A. (2013a) A new species of *Ityphilus* (Chilopoda: Geophilomorpha: Ballophilidae) from the tropical rainforest of French Guiana, northern South America. *Studies on Neotropical Fauna and Environment*, 48 (1), 13–24.
http://dx.doi.org/10.1080/01650521.2012.747871

Pereira, L.A. (2013b) Discovery of a second geophilomorph species (Myriapoda: Chilopoda) having twenty-seven leg-bearing segments, the lowest number recorded up to the present in the centipede order Geophilomorpha. *Papéis Avulsos de Zoologia*, 53 (13), 163–185. Available from: http://www.scielo.br/pdf/paz/v53n13/a01v53n13.pdf (Accessed 11 Sept. 2013)

Pereira, L.A., Foddai, D. & Minelli, A. (1997) First record of a ballophilid centipede from Argentina with a description of *Ballophilus ramirezi* n. sp. (Chilopoda: Geophilomorpha: Ballophilidae). *Studies on Neotropical Fauna and Environment,* 31 (1996), 170–178.
http://dx.doi.org/10.1076/snfe.31.3.170.13335

Pereira, L.A., Foddai, D. & Minelli, A. (2000) New taxa of Neotropical Geophilomorpha (Chilopoda). *Amazoniana*, 16 (1–2), 1–57.

Pereira, L.A. & Minelli, A. (1996) *Ityphilus krausi* n. sp., a new Ballophilid centipede from Peru (Chilopoda: Geophilomorpha: Ballophilidae). *Studies on Neotropical Fauna and Environment,* 31 (2), 102–111. http://dx.doi.org/10.1076/snfe.31.2.102.13332

Turk, F.A. (1955) The chilopods of Peru with description of new species and some zoogeographical notes on the Peruvian Chilopod fauna. *Proceedings of the Zoological Society of London,* 125 (3–4), 469–504. http://dx.doi.org/10.1111/j.1096-3642.1955.tb00612.x

Uliana, M., Bonato, L. & Minelli, A. (2007) The Mecistocephalidae of the Japanese and Taiwanese islands (Chilopoda: Geophilomorpha). *Zootaxa*, 1396, 1–84.