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A FURTHER CONTRIBUTION TO THE KNOWLEDGE OF *PECTINIUNGUIS MINUTUS* (DEMANGE, 1968), A LITTLE KNOWN DWARF SCHENDYLID CENTIPEDE FROM WESTERN EQUATORIAL AFRICA (CHILOPODA: GEOPHILOMORPHA)

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ABSTRACT

The geophilomorph centipede Pectiniunguis minutus *(Demange, 1968), a little known dwarf schendylid from Gabon (Western equatorial Africa), is redescribed and illustrated based on the type material and an additional non-type specimen preserved in the collections of the Muséum national d'Histoire naturelle, Paris.* P. minutus *can be easily differentiated from all the other species currently assigned to the genus* Pectiniunguis, *by the very low number of leg-bearing segments (35 in the males, 37 or 39 in the females) and very small body size (12-16 mm in length).* P. minutus *is also distinguished by having ventral pore-fields on the anterior region of the body only, this character being shared by a single species of the genus,* i.e., P. ascendens *Pereira, Minelli & Barbieri, 1994, from the Neotropics (Brazil: State of Amazonas) with which a morphological comparison is given. Comments about other dwarf centipede species belonging to several families of the order Geophilomorpha, are also added.*

KEY-WORDS: *Pectiniunguis;* Taxonomy; Western Equatorial Africa; Chilopoda; Geophilomorpha; Schendylidae.

INTRODUCTION

Two hundred and nineteen species, in thirty-three genera are currently recognized in the geophilomorph family Schendylidae. The taxon occurs in the Americas including the Antilles; Europe and central-northern Asia, including the Japanese region; scattered records from Africa; Madagascar; from Indochina, through Indonesia, to Australia, New Caledonia, Hawaii and the Fiji Islands (Pereira *et al.,* 1997; Bonato *et al.,* 2009).

In sub-Saharan Africa the family currently includes twenty-three species in four genera: six species in the genus *Mesoschendyla* Attems, 1909; five in *Schendylops* Cook, 1899; 11 in *Ctenophilus* Cook, 1896 and one in *Pectiniunguis* Bollman, 1889. The species of the first two genera are distributed in the equatorial and southernmost regions, while those of the two latter occur in the western equatorial region only. These four taxa are also widespread elsewhere: *Mesoschendyla* also occurs in Madagascar (one species) and Java (one species); *Schendylops* in Northern mainland Africa (two species), Madagascar (5 species), and the Neotropical Region (54 species); *Ctenophilus* in the Neotropics (one species); and *Pectiniunguis* in Oceania Region (one species in Fiji Islands), and the New World (21 species) distributed in southern North America (U.S.A), Central America (Mexico),

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Caribbean Islands (Cuba and Cayo Sombrero (Venezuela)), South American mainland (Colombia, Guyana, continental Ecuador, Brazil and Argentina), and the Galápagos Islands. The last survey of *Mesoschendyla* can be found in Crabill 1968. Recent contributions to the study of the species of *Schendylops* from mainland Africa include Pereira & Minelli, 1995, 2001; studies on those inhabiting Madagascar comprise Hoffman & Pereira, 1997; Pereira *et al.,* 2004. The African species of *Ctenophilus* were revised by Pereira & Demange, 1991, 1997. Latest contributions to the knowledge of the Neotropical species of *Pectiniunguis* can be found in Pereira & Coscarón, 1975(1976); Pereira *et al.,* 1994, 1995, 1999, 2000, 2001; Shear & Peck, 1992; Pereira, 2010a; the single species from Fiji Islands was revised by Pereira, 1982.

The purpose of the present contribution is to redescribe the only known representative of the genus *Pectiniunguis* from Africa (Gabon), which was described by Demange (1968) under the name of *Pleuroschendyla minuta.* The original description lacks information on many important characters of specific value and only includes two inadequately detailed figures. Pereira & Demange (1991) revised the holotype and transferred the species to the genus *Pectiniunguis* on the basis of the morphological features of the pleurites of the second maxillae, but besides the proposal of the new combination [*Pectiniunguis minutus* (Demange, 1968)], no additional morphological data, nor new illustrations were given. Subsequently, no other authors have treated this taxon which has remained poorly known. The opportunity to revise all the type material and an additional non-type specimen during a visit to the Laboratoire de Zoologie (Arthropodes), Muséum national d'Histoire naturelle, Paris, allows a detailed redescription with new illustrations, giving a better understanding of this interesting dwarf schendylid centipede.

MATERIAL AND METHODS

The type and non-type material herein revised, is currently housed at the Muséum national d'Histoire naturelle, Paris (MNHN).

The specimens were examined and illustrated using a compound microscope equipped with a drawing tube attachment. Temporary mounts were prepared by direct transfer of the specimens from the preservation liquid (70 per cent ethanol) onto microscope slides, using as a clearing agent/mounting medium, undiluted 2-Phenoxyethanol (CAS No. 122-99-6). Details on preparation of microscope slides and employed dissection procedures are described in Pereira (2000, 2010a, 2010b); Foddai *et al.* (2002). All measurements are given in mm. Terminology for the external anatomy follows Bonato *et al.* (2010, 2011). The following abbreviation was used in the text and legends of the figures: a.a., antennal article/articles.

RESULTS

Family Schendylidae
Genus *Pectiniunguis* Bollman, 1889

Diagnosis: This genus can be distinguished from other genera currently recognized in the family Schendylidae by the following particular combination of features. Second maxillae: pleurites not fused to the posterior internal border of the coxosternite, apical claw of telopodites pectinate on both dorsal and ventral edge. Sternites: with pore-fields. Ultimate leg-bearing segment: ultimate legs with seven articles, pretarsus in form of a small hairy tubercle or replaced by a small spine or altogether absent, each coxopleuron with two internal coxal organs of composite structure ("heterogeneous coxal glands" *sensu* Brölemann & Ribaut (1912)).

Type species of the genus: Pectiniunguis americanus Bollman, 1889, by original designation.

Species currently included in the genus: P. albemarlensis Chamberlin, 1913 (Ecuador: Galápagos Islands); *P. americanus* Bollman, 1889 (Ecuador: Galápagos; Mexico; U.S.A.); *P. amphibius* Chamberlin, 1923 (Mexico); *P. argentinensis* Pereira & Coscarón, 1976 (Argentina); *P. ascendens* Pereira, Minelli & Barbieri, 1994 (Brazil); *P. bolbonyx* (Brölemann & Ribaut, 1912) (Brazil); *P. bollmani* Pereira, Minelli & Foddai, 1999 (Venezuela); *P. catalinensis* Chamberlin, 1941 (U.S.A.); *P. chazaliei* (Brölemann, 1900) (Colombia); *P. ducalis* Pereira, Minelli & Barbieri, 1995 (Brazil); *P. fijiensis* (Chamberlin, 1920) (Fiji Islands); *P. gaigei* (Chamberlin, 1921) (Guyana); *P. geayi* Brölemann & Ribaut, 1911 (Brazil); *P. halirrhytus* Crabill, 1959 (Mexico; U.S.A.); *P. imperfossus* (Brölemann, 1902) (Brazil); *P. insulanus* (Brölemann & Ribaut, 1911) (Cuba); *P. krausi* Shear & Peck, 1992 (Ecuador: Galápagos Islands); *P. minutus* (Demange, 1968) (Gabon); *P. nesiotes* Chamberlin, 1923 (Mexico); *P. pauperatus* Silvestri, 1907 (West Indies); *P. pectinatus* (Attems, 1934) (Brazil); *P. plusiodontus* Attems, 1903 (Brazil); *P. roigi* Pereira, Foddai & Minelli, 2001 (Ecuador).

TABLE 1: Comparative matrix of differential morphological traits for the Schendylid genera known to occur in Sub-Saharan Africa: *Ctenophilus* Cook, 1896; *Mesoschendyla* Attems, 1909; *Pectiniunguis* Bollman, 1889 and *Schendylops* Cook, 1899.

	Pectiniunguis	*Ctenophilus*	*Schendylops*	*Mesoschendyla*
Pleurites of the second maxillae fused to the internal posterior border of the coxosternite	No (Figs. 14, 37-39, 45)	Yes (Fig. 44)	No	No
Coxopleura of the ultimate leg-bearing segment with 1+1 coxal organs	No	No	No	Yes
Coxopleura of the ultimate leg-bearing segment with 2+2 coxal organs	Yes	Yes	Yes	No
Coxal organs homogeneous (*sensu* Brölemann & Ribaut (1912))	No	No	Yes	Yes
Coxal organs heterogeneous (*sensu* Brölemann & Ribaut (1912))	Yes (Figs. 29, 34, 40-42; 47)	Yes	No	No

Remarks: Differential characters between *Pectiniunguis* and the other three genera of Schendylidae known to occur in Sub-Saharan Africa, *i.e., Ctenophilus, Mesoschendyla* and *Schendylops,* are shown in Table 1.

Redescription

Pectiniunguis minutus (Demange, 1968) (Figs. 1-43)

Pleuroschendyla minuta Demange, 1968: 283-284.
Pleuroschendyla minuta: Mauriès, 1968: 771.
Pectiniunguis minutus: Pereira & Demange, 1991: 95; Pereira, Minelli & Foddai, 1999: 177.

Diagnosis: A *Pectiniunguis* species with 35, 37 or 39 leg-bearing segments; body length 12-16 mm; ventral pore-fields present on the anterior region of the body only (absent on first sternite). It can be easily differentiated from all the other species currently assigned to the genus, by the very low number of leg-bearing segments and very small body size. The following traits, are also distinctive features for this species: poison glands unusually large, extending along the entire forcipular telopodite and the anterior half of the forcipular coxosternite (Fig. 16: c); a.a. II-XIII all wider than long (Fig. 1); claw of waking legs with two accessory spines only (one anterior and one posterior, Figs. 18, 19); pleurites of second maxillae somewhat expanded on the anterior-external area (Figs. 14, 37-39); a.a. XIV with claviform sensory setae on the external edge only (Fig. 36); coxosternite of first maxillae without setae (Fig. 14); pretarsus of ultimate legs represented by a small tubercle with two diminutive apical spines (Figs. 28, 35, 43).

Type material examined: All specimens from Gabon: Bélinga, H. Coiffait leg. (Ref. *Pleuroschendyla minuta* Demange); 25 March 1963: allotype female with 37 leg-bearing segments, body length 13 mm; 10 May1963: holotype male with 35 leg-bearing segments, body length 12 mm; paratype male with 35 leg-bearing segments, body length 11.5 mm. (MNHN Collection Myriapodes et Onycophores: M206).

Other material examined: Gabon: Bélinga: Station 154 T, route du camp VI. Forêt tropicale, 27 February 1963, H. Coiffait leg. (Ref. *Pleuroschendyla minuta* Demange), female with 39 leg-bearing segments, body length 13 mm (MNHN Collection Myriapodes et Onycophores: M206).

Remarks: The original description mentions the four specimens cited above, and an additional non type from "Bélinga: Station 129 T, carrière, route du débarcadère, Forêt tropicale" (sex and number of leg-bearing segments not specified), but this latter was not revised in the present study.

Male paratype: Thirty-five leg-bearing segments, body length 11.5 mm, maximum body width 0.50 mm. Width of cephalic plate, *ca.* 0.41 mm. Width of forcipular coxosternite, *ca.* 0.40 mm. Ground color (of preserved specimen in alcohol) pale yellowish.

Antennae: ca. 2.4 times as long as the cephalic plate, distally slightly attenuate; a.a. II to XIII all wider than long, a.a. XIV longer than wide (Fig. 1). Setae on a.a. I to VI of different lengths and few in number, those of remaining articles progressively shorter and more numerous towards the tip of the appendage (Fig. 1). Apical a.a. with *ca.* 15 claviform sensilla on the external border and absent on the internal border (similar to the holotype, Fig. 36); distal end of this a.a. with *ca.* 4 specialized sensilla apparently not split apically, (similar to the holotype, Fig. 36). Dorsal and ventral

TABLE 2: Number of type *a, b* and *c* sensilla on a.a. II, V, IX and XIII in the male paratype of *Pectiniunguis minutus* (Demange, 1968).

	Ventral		Dorsal			Figs.
	a	*b*	*a*	*b*	*c*	
II	1	1	1	1		2
V	1	1	1	1		3, 4
IX	1	1	1	2	1	5, 6
XIII	1	1	1	1	2	7

surface of a.a. II, V, IX and XIII (Figs. 2-7) with very small specialized sensilla. On the ventral side these sensilla are restricted to an internal latero-apical area and are represented by two different types: *a* and *b.* Type *a* sensilla are very thin and not divided apically (Fig. 5: a); type *b* sensilla are similar to those on the apex of the terminal a.a. but with two very small apical branches (Fig. 5: b). Specialized sensilla on dorsal side restricted to an external latero-apical area on a.a. II, V and IX (Figs. 2, 4, 6) and to an internal and external sublateral apical areas on a.a. XIII (Fig. 7), and are represented by three different types: *a,* similar to *a* of ventral side (Fig. 7: a); *b,* similar to *b* of ventral side, with two very small apical branches on a.a. II (Fig. 2: b) but apparently not divided apically on a.a. V, IX and XIII (Figs. 4, 6-7: b); and type *c* sensilla, much bigger than type *b,* not divided apically and darker (brownish-ochre in colour) (Figs. 6-7: c). Distribution of type *a, b* and *c* sensilla on a.a. II, V, IX and XIII as in Table 2.

Cephalic plate: slightly longer than wide (ratio length/width *ca.* 1.10: 1), shape and chaetotaxy as in Fig. 8.

Clypeus: with 1+1 postantennal setae, 2+2 median setae and 1+1 prelabral setae arranged as in Fig. 9.

Labrum: with 18 small teeth, those of the central arc dark and round tipped, the lateral ones less sclerotized, each with a very sharp medial extension (Fig. 10).

Mandible: dentate lamella subdivided into two distinct blocks, with 5, 3 teeth; pectinate lamella with *ca.* 12 hyaline teeth (Figs. 11-12).

First maxillae: with lappets on the coxosternite and telopodites, those of coxosternite very poorly developed (Fig. 13). Coxosternite without setae; coxal projections subtriangular, well developed and provided with 1+1 setae (Fig. 14). Article II of telopodite with 2+2 setae on ventral side and 3+3 sensilla on dorsal side (Figs. 13-14).

Second maxillae: with 5+5 setae on the coxosternite arranged as in Fig. 14. Apical claw of telopodite well developed, bipectinate, ventral edge with *ca.* 12 teeth, dorsal edge with *ca.* 15 teeth (Fig. 15). Pleurites somewhat expanded on their anterior external edge (Fig. 14).

Forcipular segment: when closed, the telopodites do not extend beyond the anterior margin of the head. Forcipular tergite with an irregular transverse median row of *ca.* 12 large setae and a few additional smaller setae scattered on the remaining surface. All articles of the telopodites without teeth. Poison glands unusually large (shape and relative size as in Fig. 16: c). Calyx of poison gland subcylindrical and very short (Figs. 16, 17: b). Pilosity of coxosternite and telopodites as in Figure 16.

Walking legs: chaetotaxy similar throughout the entire body length. Distribution, number and relative size of setae as in Fig. 18. Claws with two thin and pale accessory spines ventrobasally, one anterior and one posterior (shape and relative size as in Fig. 19).

Sternites of leg-bearing segments 1 to penultimate: porefields present from sternite 2 to 20 inclusive (wholly absent on the remaining sternites). All fields undivided, transversally subovoidal, shape and relative size changing along the trunk as in Figs. 20-25. Number of pores on selected sternites: sternite 2 (18 pores); 4 (37); 9 (48); 14 (46); 19 (16); 20 (9).

Ultimate leg-bearing segment: intercalary pleurites absent at both sides of the ultimate pretergite. Ultimate presternite not divided along the sagittal plane; length/width ratio of the tergite, 0.73: 1; length/width ratio of the sternite, 0.56: 1. Shape and chaetotaxy of tergite and sternite as in Figs. 26-27. Coxopleura slightly protruding at their distal-internal ventral ends, setae small and numerous on the distal-internal ventral area, remaining surface with few larger setae. Two compound ('heterogeneous') coxal organs in each coxopleuron (Figs. 26, 27, 29). Coxal organs open on the membrane between coxopleuron and sternite, partially covered by the latter (Figs. 27, 29), internal cuticular structure as shown in Fig. 29 (a: individualized areas of mucous layer). Ultimate legs inflated, composed of seven articles. Ratio of length of telopodites of ultimate legs/length of sternite *ca.* 4.03: 1. Shape and chaetotaxy of ultimate legs as in Figs. 26-27. Ultimate pretarsus represented by a rudimentary sub-terminal tubercle with 2 diminutive spines (Fig. 28).

Postpedal segments: intermediate tergite with posterior margin strongly convex (Fig. 26), intermediate sternite and first genital sternite with posterior margin medially slightly convex, laterally slightly concave (Fig. 27). Gonopods biarticulate, basal article with *ca.* 10 setae, apical article with *ca.* 6 setae (Figs. 27, 30), penis with 1+1 apical setae on dorsal side (Fig. 31).

Female allotype: Thirty-seven leg-bearing segments, body length 13 mm, maximum body width 0.60 mm. All features similar to those in the male except for the shape and chaetotaxy of the ultimate leg-bearing segment and postpedal segments.

Ultimate leg-bearing segment: tergite and sternite trapezoidal, length/width ratio of tergite 0.67: 1; length/width ratio of sternite 0.63: 1. Shape and chaetotaxy of tergite and sternite as in Figs. 32-33. Coxopleura slightly protruding at their distal-internal ventral ends; setae distributed on the distal ventral-lateral areas, the remaining surface without setae (Figs. 32-33). Articles of ultimate legs not inflated, much thinner than those of the male (Figs. 32-33). Ultimate legs proportionally much shorter than those of the male, with ratio of length of telopodites/length of sternite *ca.* 2.11: 1. Shape and chaetotaxy of ultimate legs as in Figs. 32-33.

Postpedal segments: intermediate tergite with posterior margin strongly convex (Fig. 32), intermediate sternite with posterior margin straight to slightly concave; first genital sternite with posterior margin medially convex, laterally slightly concave (Fig. 33). Gonopods uniarticulate (Fig. 33).

Variation: males with 35, and females with 37 or 39 leg-bearing segments.

The posterior limit of the ventral pore-field series is at the sternite 20 in the male holotype and male paratype (both with 35 leg-bearing segments); sternite 22 in the female allotype (with 37 leg-bearing segments); and sternite 28 in the non-type female (with 39 leg-bearing segments).

Anterior coxal organs with two outer lobes, posterior coxal organs with two-three outer lobes (Fig. 29: b); each lobe internally, with one-three individualized areas of mucous layer (Figs. 29: a, 34, 40-42). (For details on fine structure and function of coxal organs, *see* Rosenberg & Seifert (1977); Lewis (1981); Rosenberg (1982, 1983)).

The body is (according to the original description) "12-16 mm" long. (View comments on this trait, below).

Other features with non-significant variation.

Remarks: The adult condition of the four specimens herein revised is indicated by the tubula seminifera full of mature spermatozoa in the males, and the two spermathecae full of spermatozoa in the females.

The original description by Demange is very short, only includes two figures (labrum, and ultimate leg-bearing segment and postpedal segments in ventral view), and completely lacks information on chaetotaxy of the antennae; kind and number of specialized sensilla on a.a. II, V, IX and XIII; pilosity of clypeus; shape and chaetotaxy of the forcipular segment; relative size of the ventral pore-fields; pilosity of walking legs; details of internal structure of the coxal organs; form of pretarsus of the ultimate legs; shape of the female postpedal segments; etc.

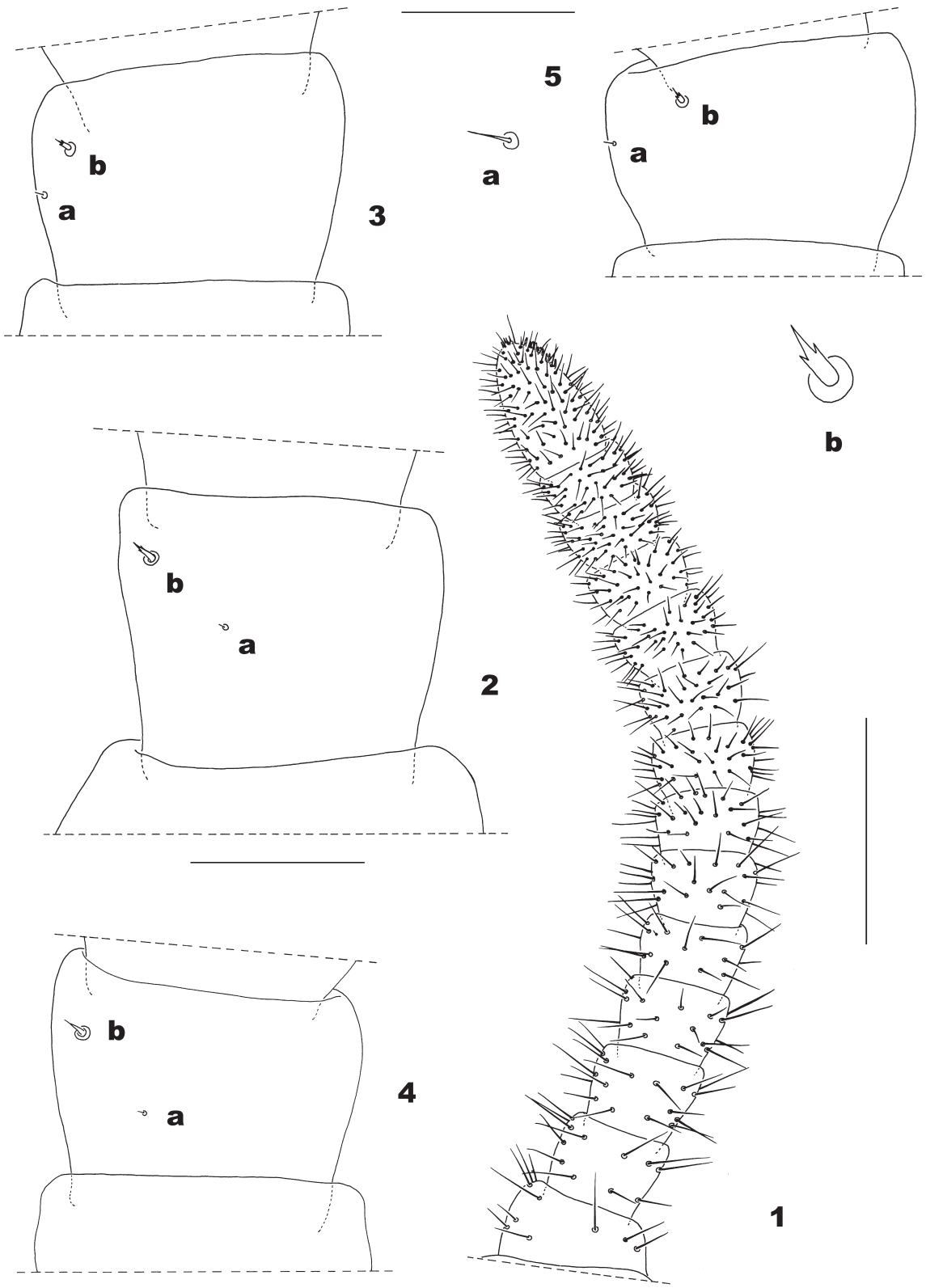
The author states "champs poreux présents du 2e segment au 21-22e segment" (but the posterior limit of the ventral pore-field series varies as detailed above). Of the body length he says "12-16 mm", but none of the four specimens here revised exceeds 13 mm in length, "16 mm" could refer to the specimen from "Bélinga. Station 29 T, carrière, route du débarcadère. Forêt tropicale" (not examined in the present contribution, as stated above).

Type locality: Gabon: Bélinga region.

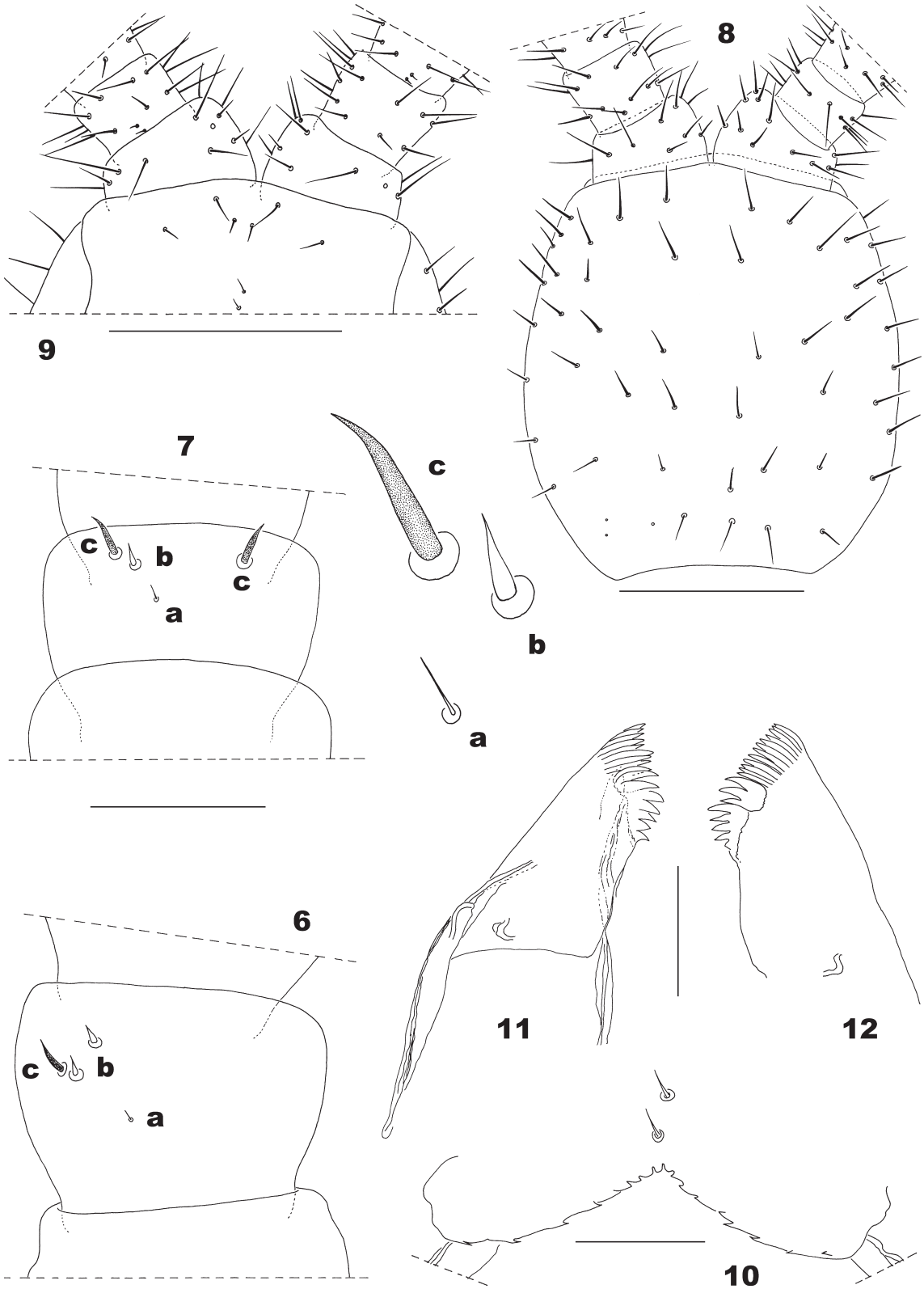
Known range: Only known from the type locality.

DISCUSSION

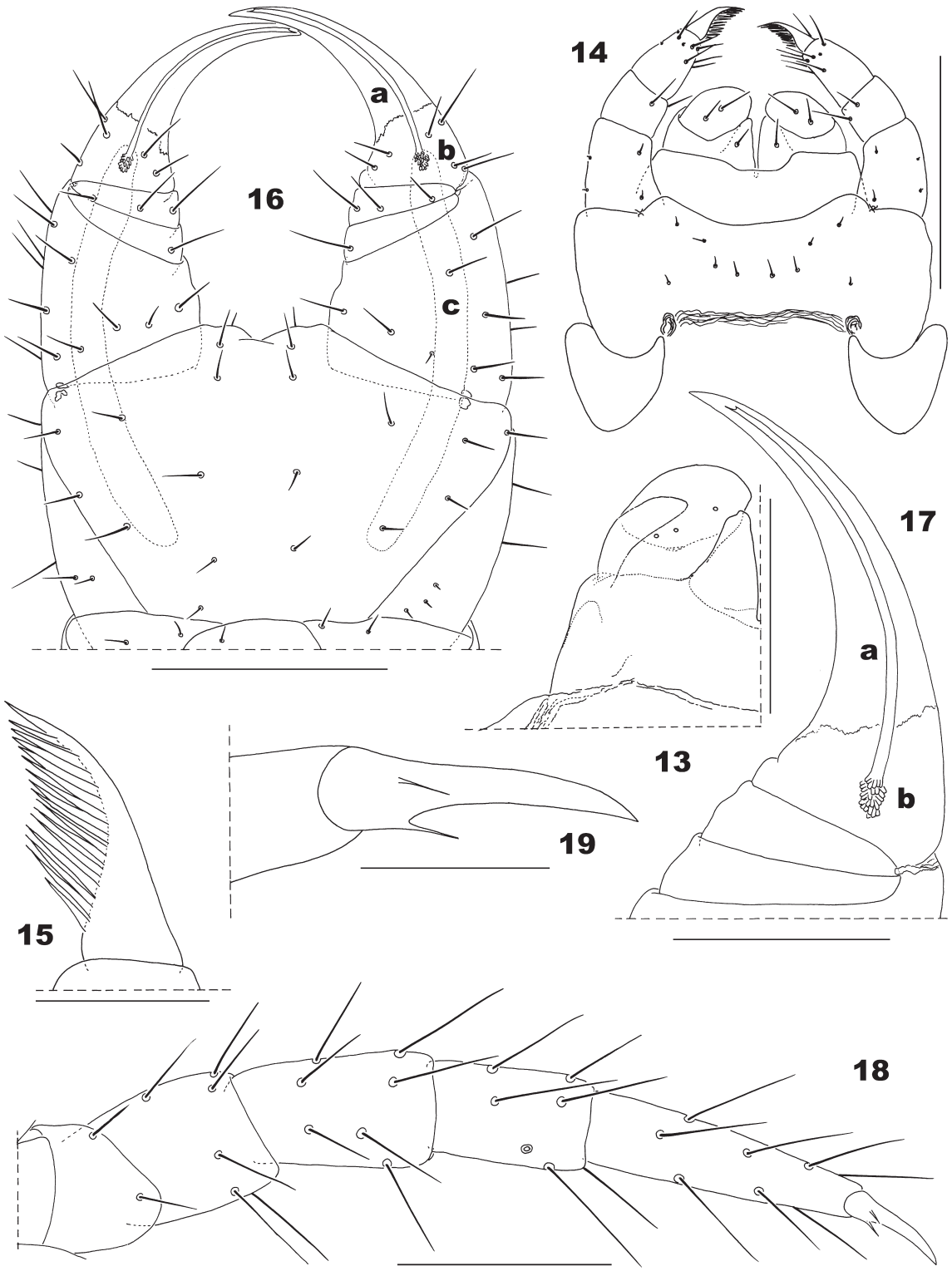
The original description of *Pectiniunguis minutus* mentions as type locality the Bélinga region in Gabon (which according to White (1983) is part of the Guineo-Congolian rainforest). No data are given on the collecting sites of the three type specimens, however it is stated for the two non type specimens that they come from sites in a tropical forest environment (but the altitude a.s.l. is not given). In western equatorial Africa, the tropical lowland rainforest of Gabon is well known for its high biodiversity (Sosef 1994); according to Ngomanda *et al.* (2009) this forest is today well conserved because of the absence of intensive agricultural activities, coupled with low population densities. (Nevertheless, the biodiversity in the Bélinga mountains



FIGURES 1-5: *Pectiniunguis minutus* (Demange, 1968), (male paratype; Gabon: Bélinga): **(1)** Left antenna, ventral; **(2)** Left a.a. II, dorsal (a, b: *a, b* type sensilla); **(3)** Left a.a. V, ventral (a, b: *a, b* type sensilla); **(4)** Left a.a. V, dorsal (a, b: *a, b* type sensilla); **(5)** Left a.a. IX, ventral (a, b: *a, b* type sensilla). Scale bars: 0.05 mm (2-5); 0.2 mm (1).



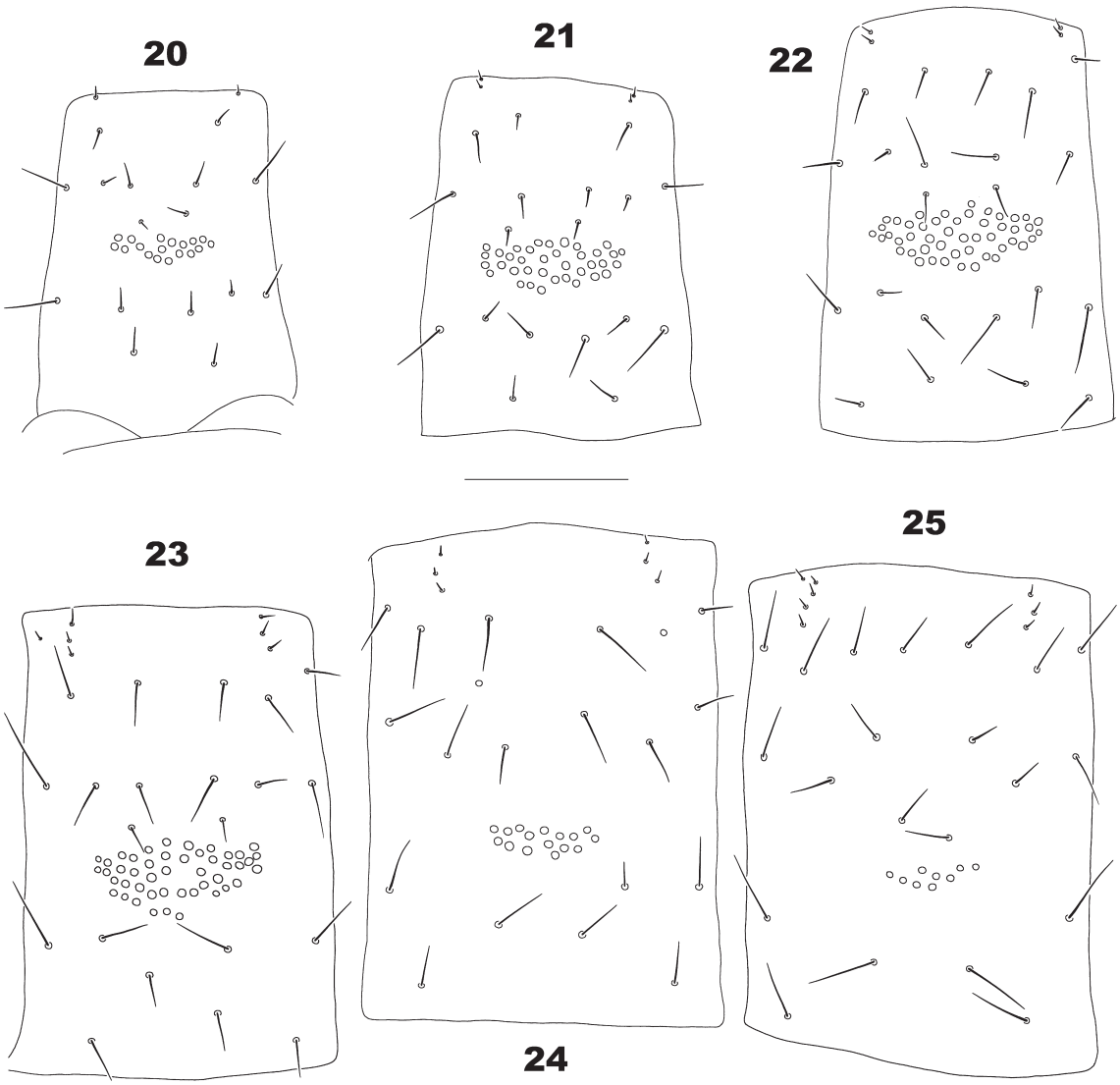
FIGURES 6-12: *Pectiniunguis minutus* (Demange, 1968), (male paratype; Gabon: Bélinga): **(6)** Left a.a. IX, dorsal (a, b, c: *a, b, c* type sensilla); **(7)** Left a.a. XIII, dorsal (a, b, c: *a, b, c* type sensilla); **(8)** Cephalic plate and bases of antennae; **(9)** Clypeus and bases of antennae; **(10)** Labrum; **(11)** Right mandible; **(12)** Left mandible. Scale bars: 0.05 mm (6-7, 10-12); 0.2 mm (8-9).



FIGURES 13-19: *Pectiniunguis minutus* (Demange, 1968), (male paratype; Gabon: Bélinga): **(13)** Left side of first maxillae, dorsal; **(14)** First and second maxillae, ventral; **(15)** Claw of right telopodite of second maxillae, dorsal; **(16)** Forcipular segment, ventral (a: duct, b: calyx, c: poison gland; **(17)** Detail of the duct (a) and calyx (b) of poison gland in left forcipular telopodite, ventral; **(18)** Left waking leg (pair 8), ventral; **(19)** Claw of left waking leg (pair 8), ventral view. Scale bars: 0.03 mm (15, 19); 0.1 mm (13, 17-18); 0.2 mm (14, 16).

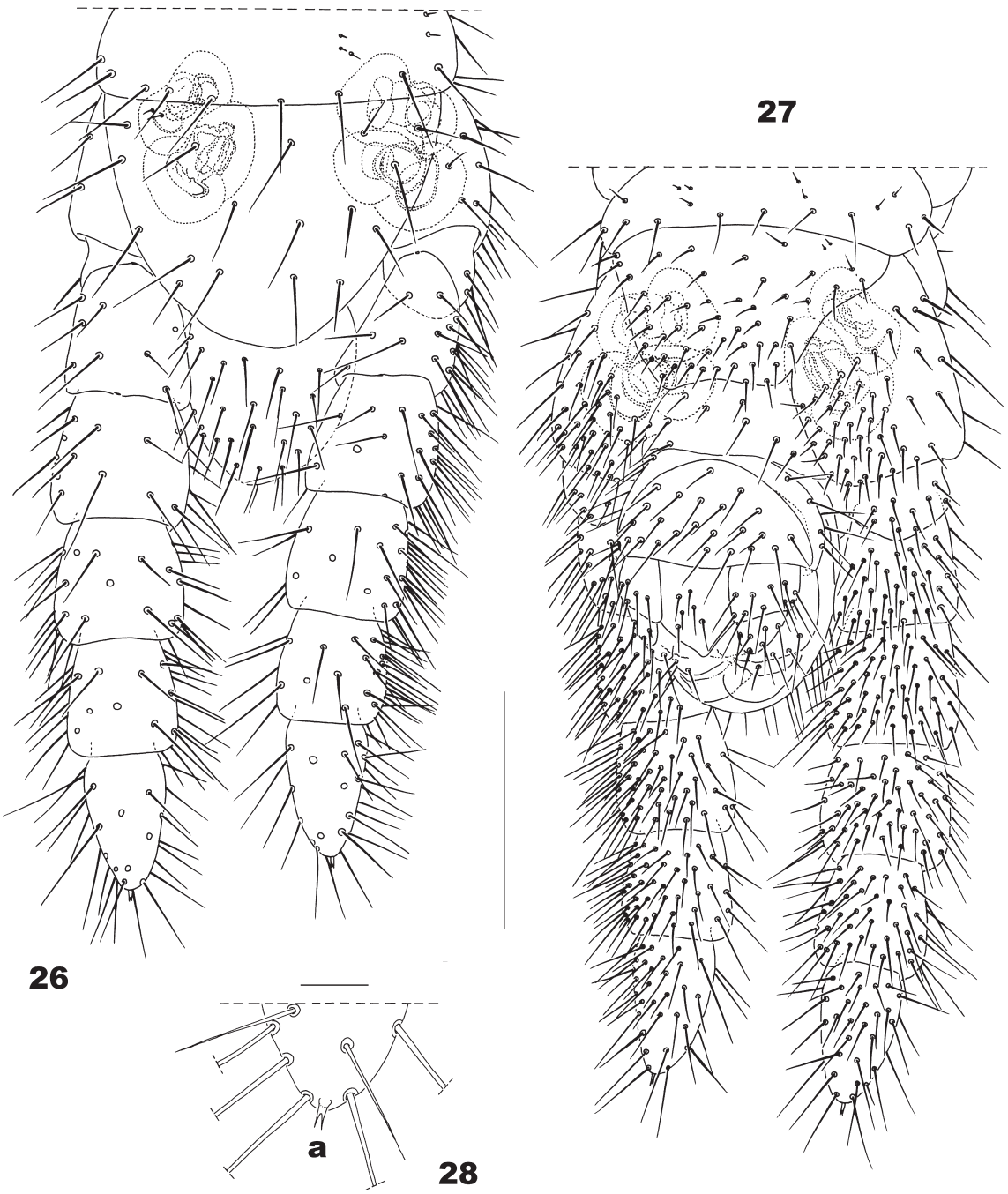
is threatened by global warming and iron mining (Leal, 2008)).

P. minutus is characterized by having thin and pale accessory spines on the claws of the walking legs (Fig. 19), this trait is shared by most of the species of *Pectiniunguis* inhabiting South America and the one from the Fiji Islands. (The opposite condition, *i.e.,* strong and dark accessory spines, occur in some members distributed in southern North America, Central America, West Indies and Northwestern South America, *e.g., P. bollmani* Pereira, Minelli & Foddai, 1999 from Venezuela (Fig. 48)). Among the species currently recognized in the genus, only *P. ascendens* Pereira, Minelli & Barbieri, 1994, from the Neotropical Region (Brazil: State of Amazonas) shares with *P. minutus* the peculiarity of bearing ventral pore-fields on the anterior region of the body only. These two species also share a similar shape of pretarsus of the ultimate legs (represented by a rudimentary tubercle with 2 diminutive spines); a similar internal chitinous structure of the coxal organs (showing one to three individualized areas of mucous layer for each outer lobe); presence of specialized brownish-ochre sensilla, on dorsal side of some a.a. A morphological comparison of these apparently similar taxa, can be made by means of the following selected traits (those for *P. ascendens* are given in parentheses): males with 35, females with 37 or 39 leg-bearing segments

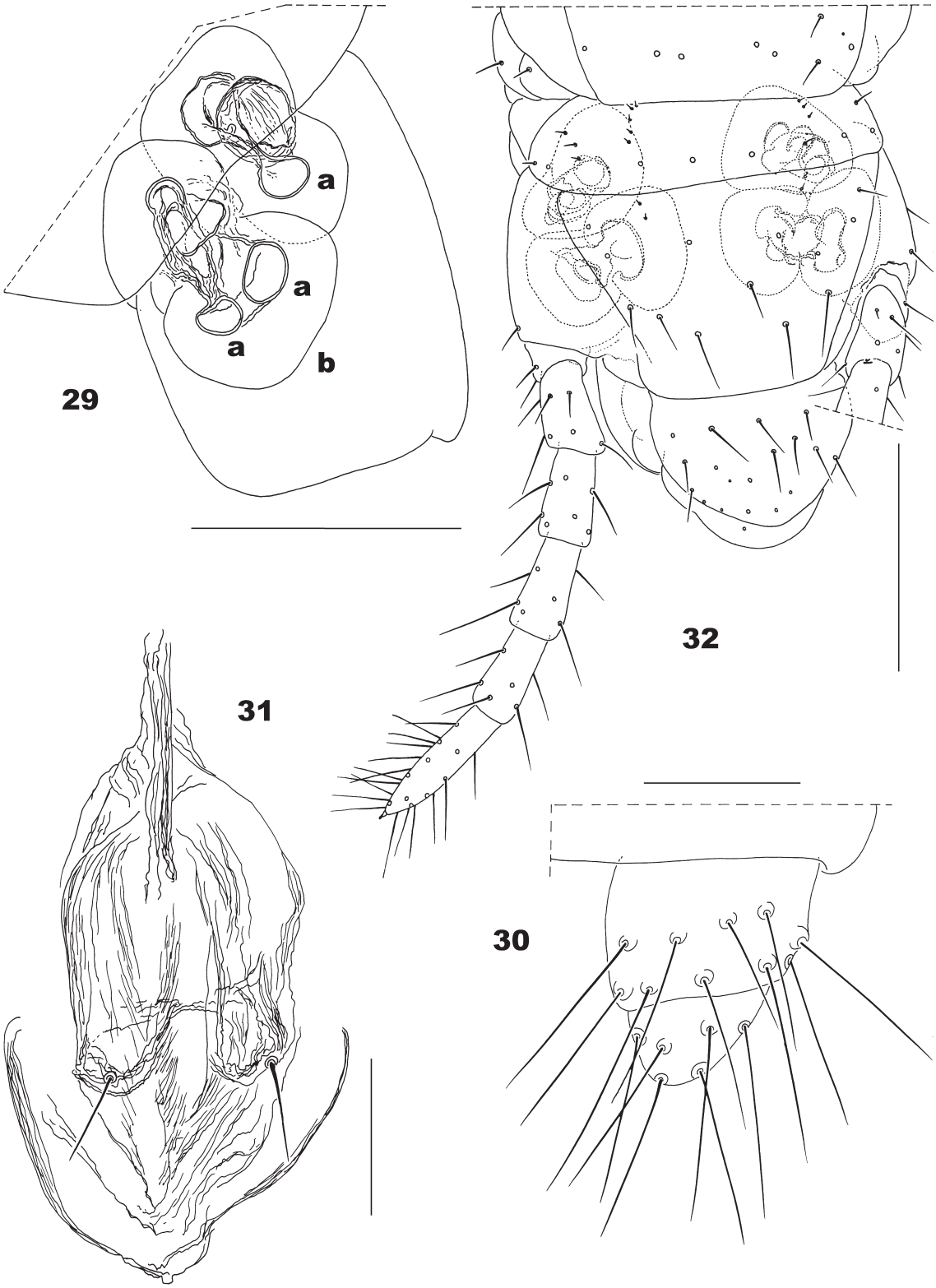


FIGURES 20-25: *Pectiniunguis minutus* (Demange, 1968), (male paratype; Gabon: Bélinga): **(20)** Sternite of leg-bearing segment 2; **(21)** Sternite of leg-bearing segment 4; **(22)** Sternite of leg-bearing segment 9; **(23)** Sternite of leg-bearing segment 14; **(24)** Sternite of leg-bearing segment 19; **(25)** Sternite of leg-bearing segment 20. Scale bar: 0.1 mm.

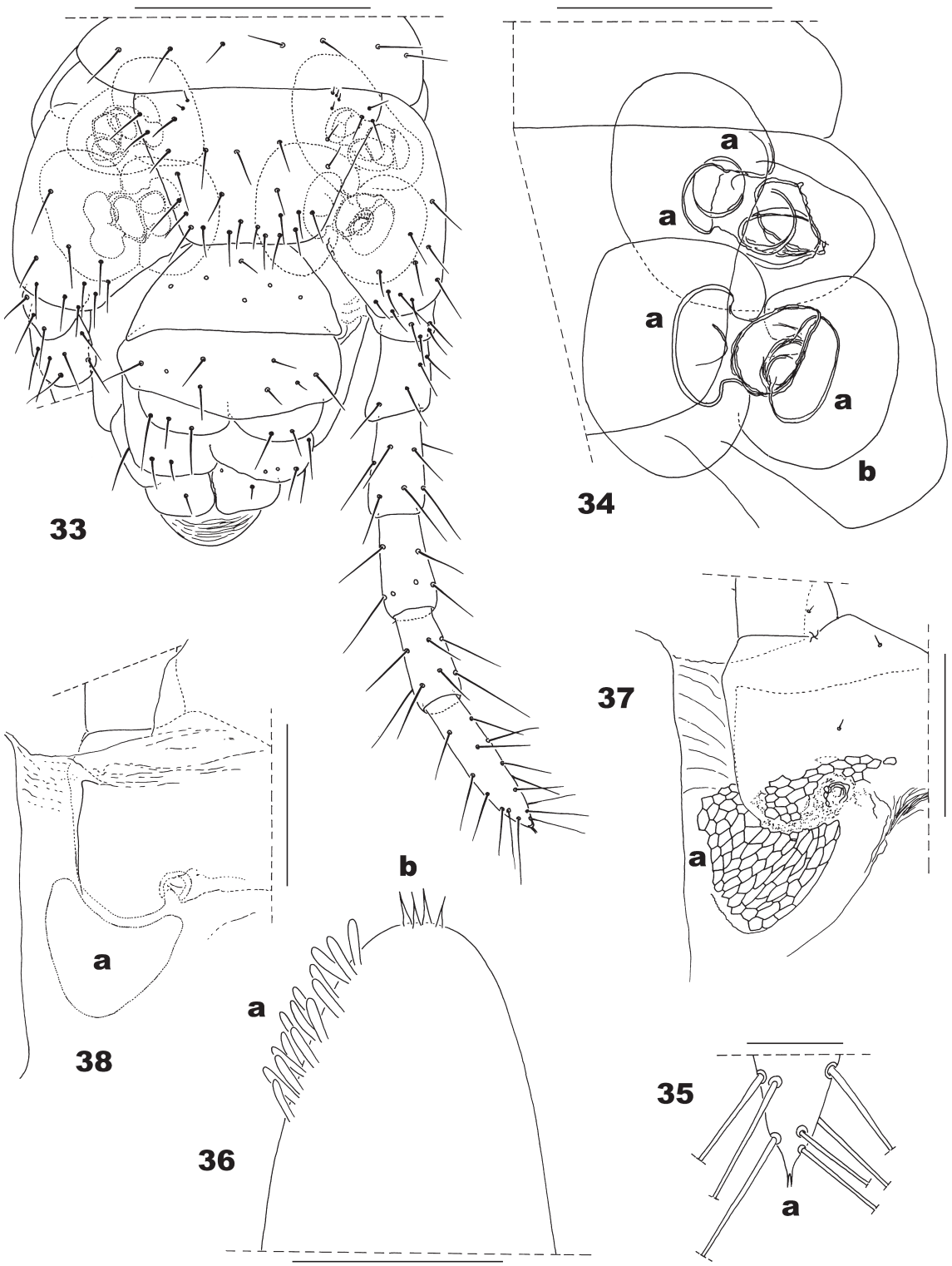
(males with 43 or 45, females with 43, 45 or 47); maximum body length 16 mm (33 mm); a.a. II-XIII all wider than long, Fig. 1 (all longer than wide); specialized brownish-ochre sensilla present on dorsal side of a.a. IX and XIII (on dorsal side of a.a. V, IX and XIII); clypeus with *ca.* 4 setae on the middle, Fig. 9 (with *ca.* 16 setae); pleurites of second maxillae somewhat expanded on the anterior external area, Figs. 14, 37-39 (pleurites not expanded on the anterior external area, Fig. 45); lappets of coxites of first maxillae poorly developed, Fig. 13 (well-developed); dentate lamellae of mandibles divided in two blocks,



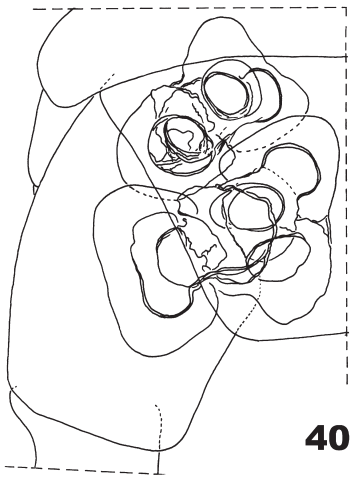
FIGURES 26-28: *Pectiniunguis minutus* (Demange, 1968), (male paratype; Gabon: Bélinga): **(26)** Ultimate leg-bearing segment and postpedal segments, dorsal; **(27)** Ultimate leg-bearing segment and postpedal segments, ventral; **(28)** Detail of distal end of apical article of right ultimate leg, ventral (a: pretarsus). Scale bars: 0.02 mm (28); 0.4 mm (26-27).

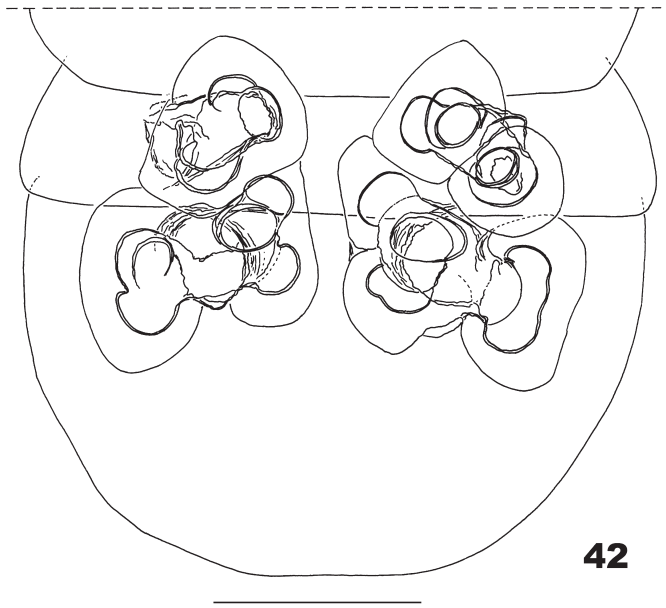


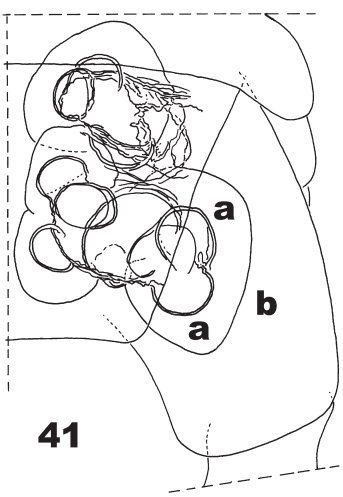
FIGURES 29-32: (29-31) *Pectiniunguis minutus* (Demange, 1968), (male paratype; Gabon: Bélinga): **(29)** Left coxal organs, ventral (a: individualized areas of mucous layer, b: outer lobe); **(30)** Left gonopod, ventral; **(31)** Penis, dorsal. **(32)** *Pectiniunguis minutus* (Demange, 1968), (female allotype; Gabon: Bélinga): Ultimate leg-bearing segment and postpedal segments, dorsal. Scale bars: 0.04 mm (30-31); 0.1 mm (29); 0.2 mm (32).

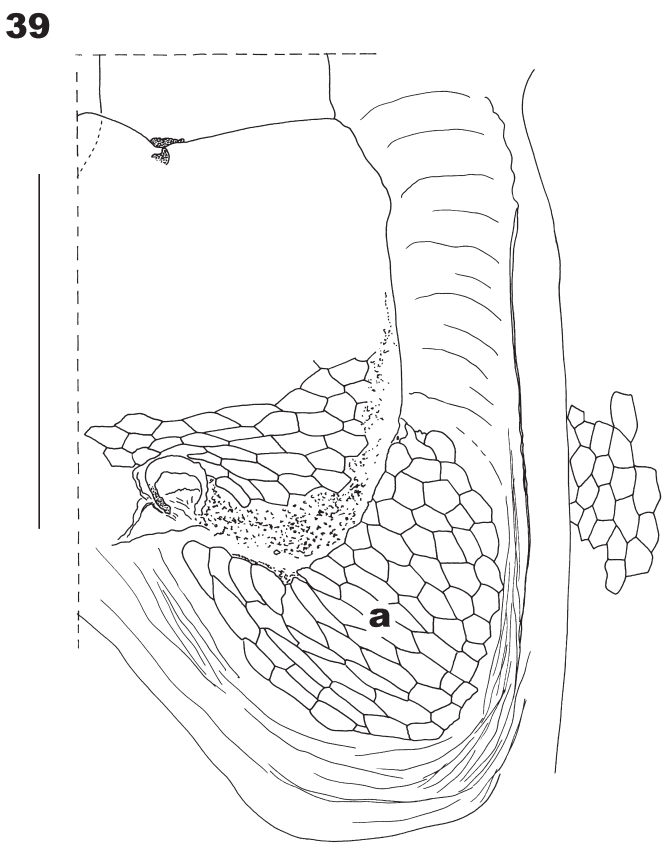


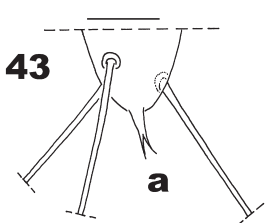
FIGURES 33-38: (33-35) *Pectiniunguis minutus* (Demange, 1968), (female allotype; Gabon: Bélinga): **(33)** Ultimate leg-bearing segment and postpedal segments, ventral; **(34)** Left coxal organs, ventral (a: individualized areas of mucous layer, b: outer lobe); **(35)** Detail of distal end of apical article of left ultimate leg, ventral (a: pretarsus). **(36-38)** *Pectiniunguis minutus* (Demange, 1968), (male holotype; Gabon: Bélinga): **(36)** Distal half of right a.a. XIV, ventral view (a: claviform sensilla, b: apical specialized sensilla); **(37)** Detail of pleurite, coxopodite and base of telopodite of second maxillae, right side, ventral (a: pleurite); **(38)** Pleurite, coxopodite and base of telopodite of second maxillae, left side, dorsal (a: pleurite). Scale bars: 0.03 mm (35); 0.05 mm (36); 0.1 mm (34, 37-38); 0.2 mm (33).





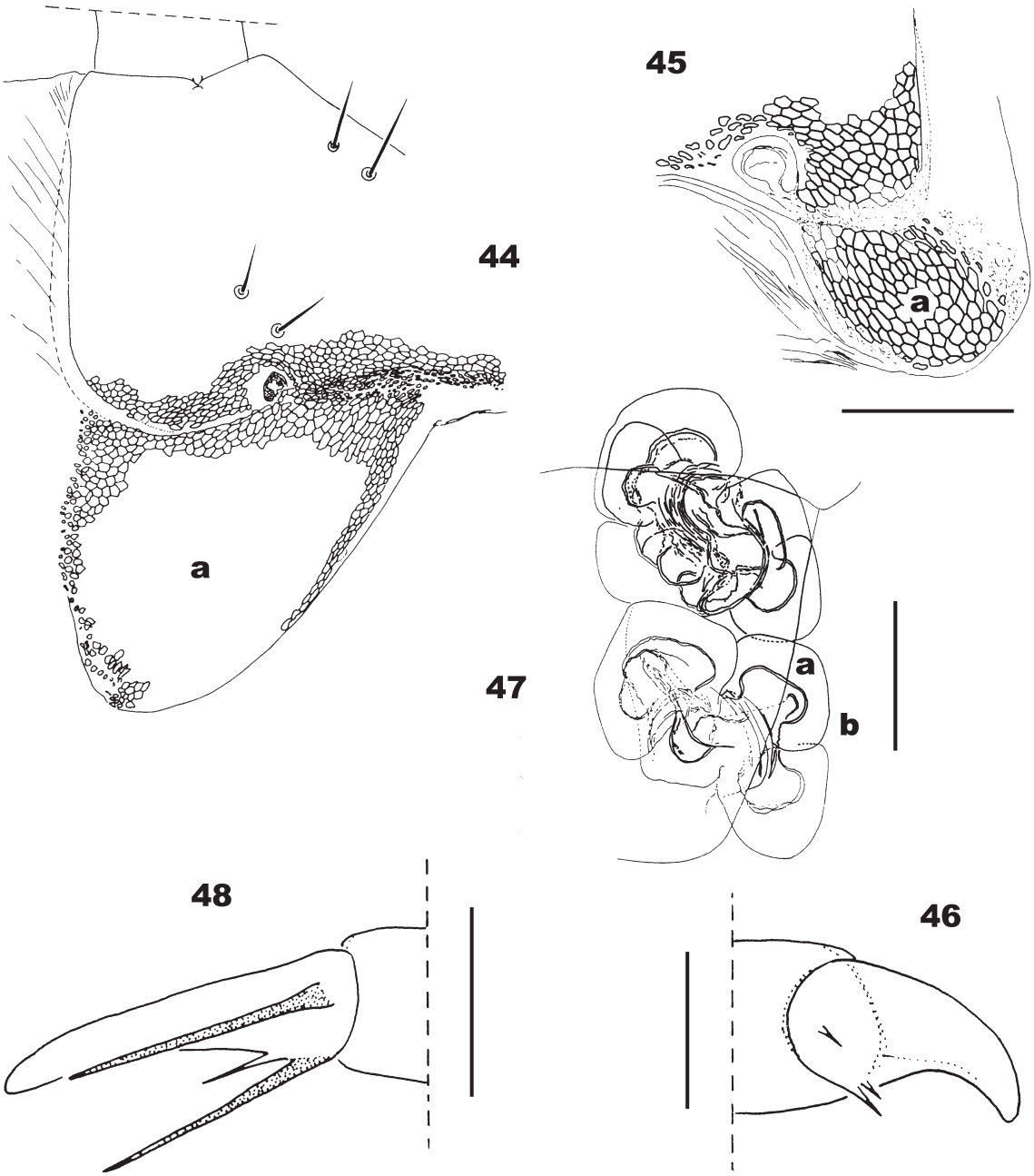






FIGURES 39-43: (39) *Pectiniunguis minutus* (Demange, 1968), (male holotype; Gabon: Bélinga): Detail of pleurite, coxopodite and basis of telopodite of second maxillae, left side, ventral (a: pleurite). **(40-43)** *Pectiniunguis minutus* (Demange, 1968), (female non type; Gabon: Bélinga: Station 154 T, route du camp VI. Forêt tropicale): **(40)** Right coxal organs, ventral (a: individualized areas of mucous layer); **(41)** Left coxal organs, ventral (a: individualized areas of mucous layer, b: outer lobe); **(42)** Coxal organs, dorsal (a: individualized areas of mucous layer); **(43)** Detail of distal end of apical article of right ultimate leg, ventral (a: pretarsus). Scale bars: 0.02 mm (43); 0.1 mm (39-42).

Figs. 11-12 (divided in three blocks); claw of walking legs with two accessory spines, one anterior and one posterior, Fig. 19 (with three accessory spines, one anterior and two posterior, Fig. 46). (The precedent comparison, merely express similarities and differences between presumptively morphologically similar species. Phylogenetic relationships can only be elucidate through appropriate analyses).



FIGURES 44-48: (44) *Ctenophilus amieti* (Demange, 1963), (reference *Pleuroschendyla magna,* female holotype; Ivory Coast: Mont Nimba): Detail of pleurite, coxopodite and basis of telopodite of second maxillae, right side, ventral (a: pleurite). (After Pereira & Demange 1997). **(45-47)** *Pectiniunguis ascendens* Pereira, Minelli & Barbieri, 1994, (female holotype; Brazil: Amazonas: Rio Trumã Mirím): **(45)** Detail of pleurite and proximal external portion of coxopodite of second maxillae, left side, ventral (a: pleurite); **(46)** Claw of left walking leg (pair 12), antero-ventral view; **(47)** Detail of left coxal organs, ventral (a: individualized area of mucous layer, b: outer lobe). (After Pereira *et al.,* 1994). **(48)** *Pectiniunguis bollmani* Pereira, Minelli & Foddai, 1999 (male holotype; Venezuela: State of Falcón: Parque Nacional Morrocoy: Cayo Sombrero): Claw of right walking leg (pair 60), ventral. (After Pereira *et al.,* 1999). Scale bars: 0.03 mm (46); 0.05 mm (48); 0.1 mm (45, 47); no scale available (44).

As mentioned above, *Pectiniunguis minutus* was originally placed in the genus *Pleuroschendyla* Brölemann & Ribaut, 1911, for which the current valid name is *Ctenophilus* Cook, 1896 (senior synonym of the first). Twelve species are currently included in *Ctenophilus; Pectiniunguis minutus* can be easily differentiated from all of them by the shape of the pleurites of the second maxillae which are not fused to the posterior internal border of the coxosternite (Figs. 14, 37-39). (In all species at present assigned to *Ctenophilus,* those pleurites are fused to the postero-internal area of the second maxillary coxosternite, as shown in Fig. 44). At least five African species of *Ctenophilus* share with *P. minutus* the particularity of having pore-fields on the anterior region of the body only: *C. angolae* (Chamberlin, 1951) (from Zaire: Gombe Louzi, Thysville; Angola: Dundo); *C. corticeus* (Demange, 1968) (from Gabon: Bélinga); *C. edentulus* (Porat, 1894) (from Camerun: Bonge, Olounou; Gabon: Makokou, Bélinga); *C. nitidus* (Brölemann, 1926) (from Bénin: Athiémé) and *C. oligopodus* (Demange, 1963) (from Ivory Coast: Mont Nimba). (But in its original description, *P. minutus* is compared with the latter only).

As *Pectiniunguis minutus,* diverse other cases of reduced body size exist within geophilomorphs (*see* Minelli *et al.* 2000, Foddai *et al.* 2003, Pereira 2009). This is known to occur in some genera of the Geophilidae (within *Geophilus* Leach, 1814, where *G. persephones* Foddai & Minelli, 1999, with 29 pairs of legs is 16 mm long, *Hyphydrophilus* Pereira, Minelli & Barbieri, 1994, *Ribautia* Brölemann, 1909, and *Dinogeophilus* Silvestri, 1919, where *D. oligopodus* Pereira, 1984, with 29 pairs of legs, is just 4.5 mm long); Linotaenidae (within *Strigamia* Gray, 1893, where *S. hoffmani* Pereira, 2009, with 33, 35 or 37 leg-bearing segments is 12-16 mm long); the Schendylidae (within *Schendyla* Bergsoe and Meinert, 1866 and *Schendylops* Cook, 1899, where *Schendylops oligopus* (Pereira, Minelli & Barbieri, 1995), with 27, 29, and 31 pairs of legs is 8-9 mm long); the Ballophilidae (within *Taeniolinum* Pocock, 1893, where *T. arborum* Pereira, Minelli & Barbieri, 1994, with 43 or 45 leg-bearing segments is 10-13 mm long); and the Mecistocephalidae (within *Nannarrup* Foddai, Bonato, Pereira & Minelli, 2003, where *N. hoffmani* Foddai, Bonato, Pereira & Minelli, 2003, with 41 pairs of legs is 10 mm long). Reduction in adult body size hence evolved independently in several derived lineages, often coupled with a secondary reduction to the smallest number of pairs of legs actually found in the respective family; nevertheless, no reduction in the number of body segments is involved in some species such as *N. hoffmani,* which was analysed as a possible instance of miniaturization (Foddai *et al.,* 2003).

It remains to be seen whether the numerous species of Schendylidae currently referred to the genus *Pectiniunguis* really form a monophyletic unit. Their geographical distribution with a majority of species in the New World, accompanied by a single one on mainland Africa, and one in the Oceania region, invites closer investigation; but a phylogenetical study is not an easy task as the whole generic classification of schendylid geophilomorphs is still based on characters of uncertain phylogenetic value.

Only three species of Schendylidae (in two genera) are known to occur in Gabon: *Ctenophilus corticeus* (Demange, 1968), *Ctenophilus edentulus* (Porat, 1894) and *Pectiniunguis minutus* (Demange, 1968). They may only represent a small portion of the biodiversity of the family in the rich tropical rainforest biome of that country. It is possible that intensive field work on the whole extension of the region, may result in the discovery of new taxa of geophilomorph centipedes.

RESUMEN

El quilópodo geofilomorfo Pectiniunguis minutus *(Demange, 1968), una especie enana de Schendylidae pobremente conocida de Gabon (Africa ecuatorial occidental), se redescribe e ilustra en base al material tipo y a un espécimen adicional no tipo conservados en las colecciones del Muséum national d' Histoire naturelle, París.* P. minutus *se puede diferenciar fácilmente de todas las otras especies actualmente asignadas al género* Pectiniunguis, *por el número muy bajo de segmentos pedales (35 en los machos, 37 o 39 en las hembras) y la pequeña longitud del cuerpo (12-16 mm).* P. minutus *también se distingue por tener campos de poros ventrales solamente en la región anterior del cuerpo, carácter que es compartido por una sola especie del género,* i.e., P. ascendens *Pereira, Minelli & Barbieri, 1994, distribuída en la Región Neotropical (Brasil: Estado de Amazonas), con la cual una comparación morfológica es brindada. Comentarios sobre otras especies enanas de ciempiés pertenecientes a diversas familias del orden Geophilomorpha, son también incluidos.*

Palabras-Clave: *Pectiniunguis;* Taxonomía; Africa Equatorial Occidental; Chilopoda; Geophilomorpha; Schendylidae.

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